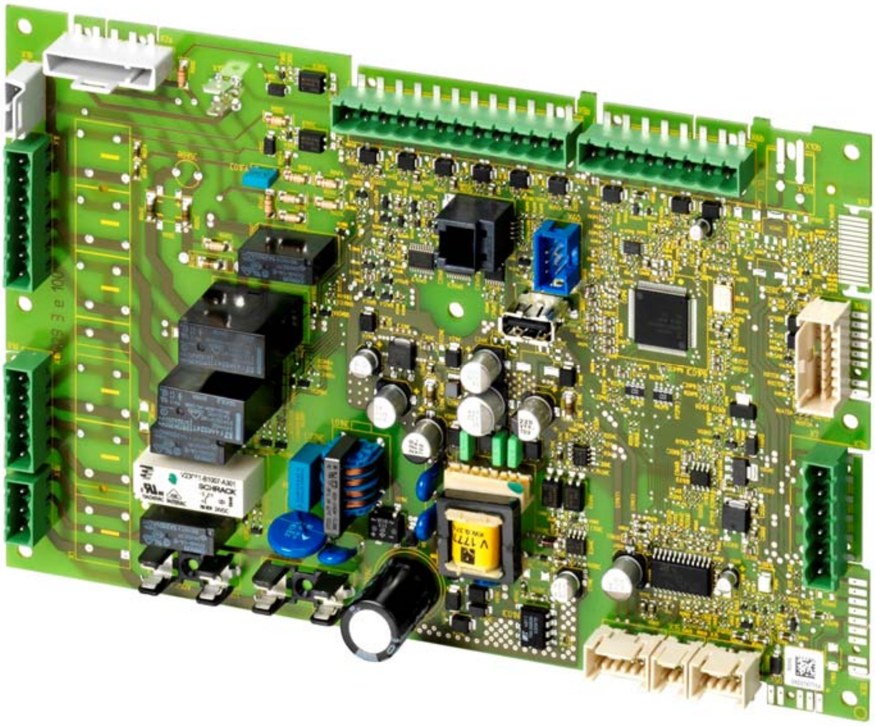


Albatros²
Boiler management unit LMS14...

User Manual

The LMS14… and this User Manual are intended for use by OEMs which integrate the boiler management unit in their products.

Release 5

CC1U7471en
11.05.2012

Building Technologies Division
Infrastructure & Cities Sector

Contents

1 Summary

The present User Manual describes handling and configuration of the following products for OEMs:

Product no. (ASN)	Description	Documentation no.
LMS14...	Boiler management unit	CC1E7471
		CC1U7471
		CC1U7472
AGU2.560...	Parameter stick für LMS..., can be read out	CC1U7471
AGU2.561...	Parameter stick for LMS..., writable	CC1U7471
AGU2.563...	Parameter stick for direct programming of the LMS...	CC1U7471
AGU2.564...	Parameter stick for spare part programming of the LMS...	CC1U7471
OCI345.06/101	LPB ClipIn	CC1U2355xx_04

For more information about accessories, refer to the following documents:

Product no. (ASN)	Description	Documentation no.
LMS15...	Boiler management unit	CC1U7472
Product range	Product range overview Albatros²	CE1Q2359
Subdiagrams	Albatros^2 Hydraulic subdiagrams and extra functions	CE1U2359
AGU2.550...	Extension ClipIn for LMS...	CC1N7492
AGU2.551...	Extension ClipIn for PWM (DC 0...10 V)	CC1N7493
AGU3.6...	Gas/air mixer	CC1N7211
AGU3.7...	Gas/air mixer	CC1N7214
AVS13.399...	Wireless outside sensor	CE1U2354
AVS14.390...	Wireless repeater	CE1U2354
AVS37.294...	Operating unit (*Clear-text*)	CE1U2353
AVS37.390...	Operating unit *(Basic)*	CE1U2358
AVS71.390...	Wireless module	CE1U2354
AVS75.390...	Extension module	CE1U2353
AVS75.391...	Extension module	CE1U2354
QAA55.110...	Room unit basic	CE1U2353
QAA75.610...	Room unit wire	CE1U2353
QAA75.611...	Room unit wire, with backlit display	CE1U2353
QAA78.610...	Room unit wireless	CE1U2353
QAC34/101	Outside sensor NTC 1k	CC1Q1701
QAD36/101	Strap-on temperature sensor NTC 10k	CC1Q1808
QAZ36.522/109	Immersion temperature sensor NTC 10k	CC1Q1843
QAZ36.526/109	Immersion temperature sensor NTC 10k	CC1Q1843
OCI430...	Interface module for PC-LMS... connection	CC1N7635
OCI700	Service tool	CC1E5655
TQG42...	Ignition module, combined with connection line for LMS14..., suitable for VGU smart gas valves	CC1N7630

Product no. (ASN)	Description	Documentation no.
VGU7xS...	Combination gas valves	CC1N7668
VGU8xS...	Combination gas valves	CC1N7668
ACS420	Software for OCI430...	---
ACS432	Parameter stick manager	CC1J7474
ACS435	Setup manager	CC1J7471
ACS700	Remote supervision software/parameterization software for OCI700	Software CD

LMS14…

LMS14... are digital boiler management units (BMUs) for use with gas-fired appliances equipped with premix burners. They are used for startup, control and supervision of premix burners with capacities from <10 kW to 1 MW in intermittent operation with direct ignition of the main flame.

The OEM must make certain that the LMS14… are suited for the application in question.

The LMS14... provide all supervisory and control functions required for burner operation, space heating and DHW heating. They also offer modular system extensions in the form of integrated communication interfaces. Output modulation is performed via a PWM-controlled fan with pneumatic gas-air ratio control.

1.1 Target group of users

- Target group of users are OEMs

1.2 Supplementary documentation

Environmental Declaration LMS... .... E7471

Data Sheet LMS… N7471

Product range overview LMS… Q7471

Type summary Albatros² Q2359

Albatros^2 Hydraulic Partial Diagrams and Extra Functions P2359

1.3 Product range summary

1.3.1 Topology

Wired

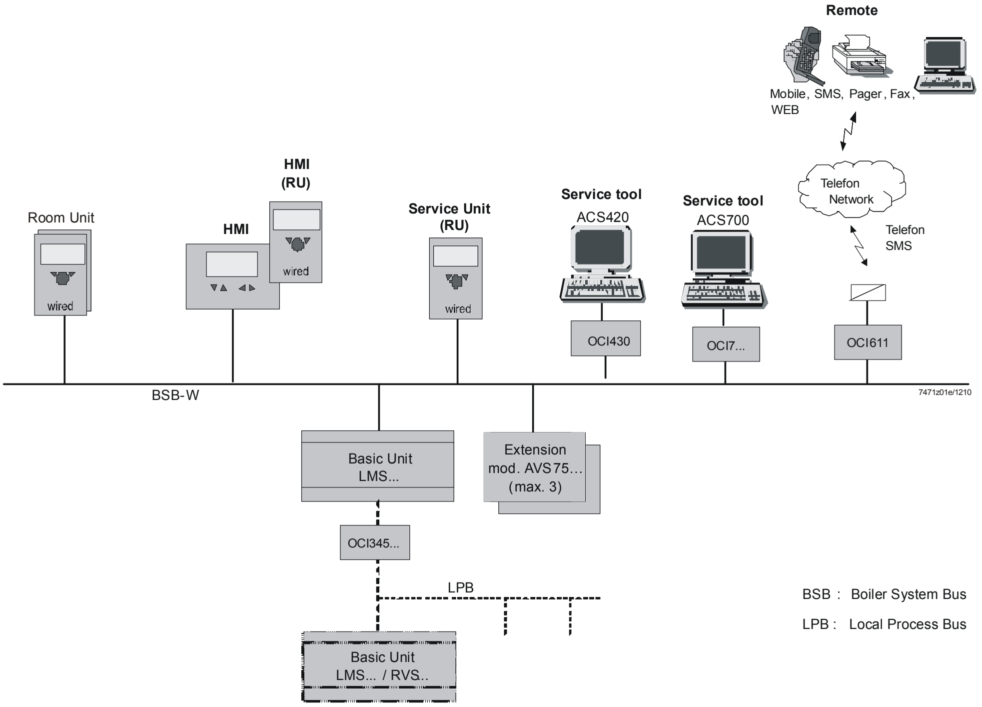


Figure 1: Product range summary – wired

Wireless

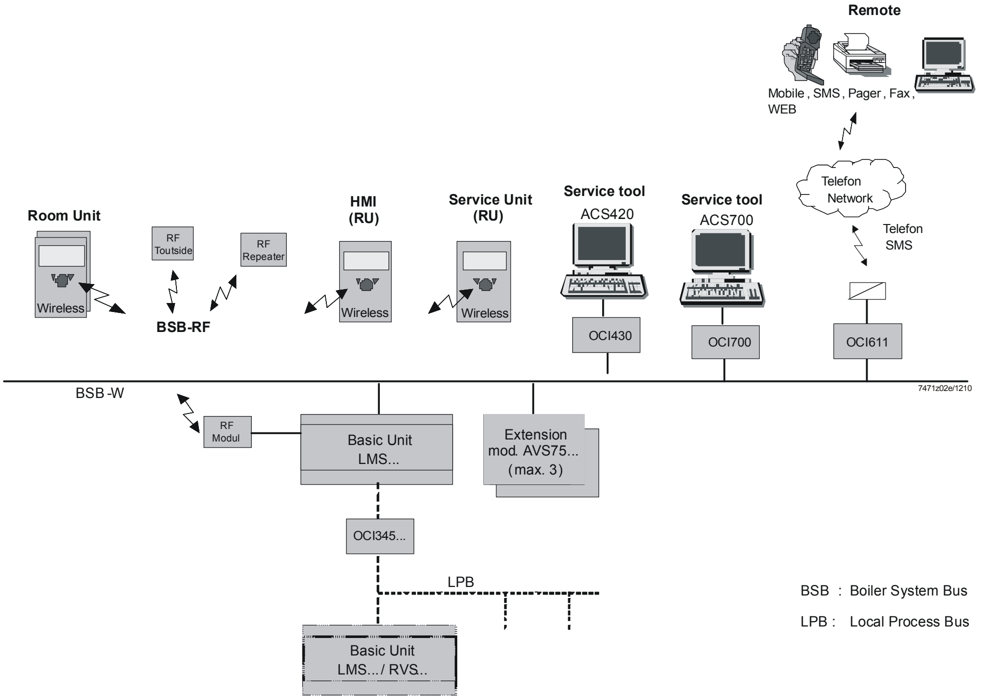
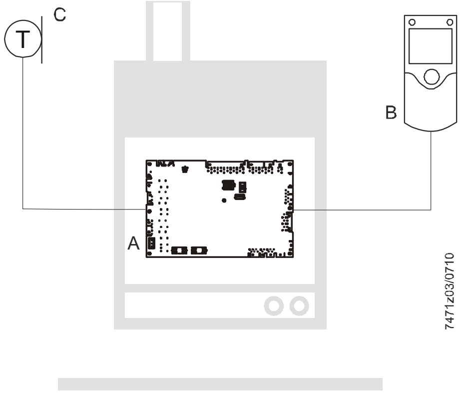


Figure 2: Product range summary – wireless

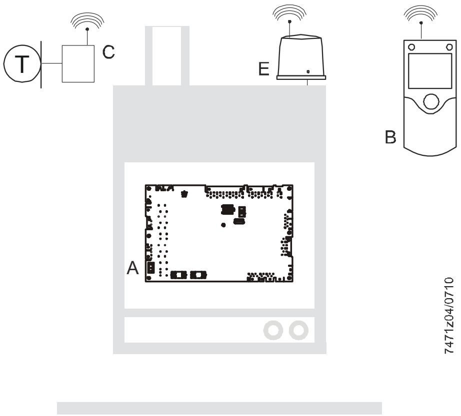
1.3.2 Operating options

Operation via room unit

Wired

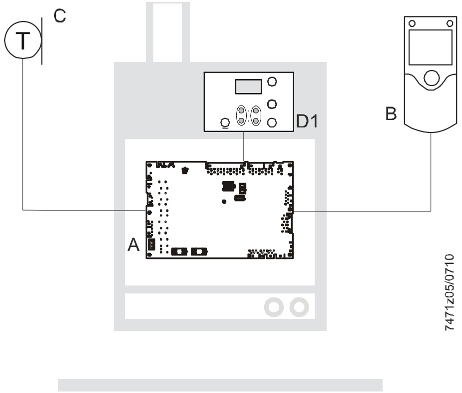


Wireless

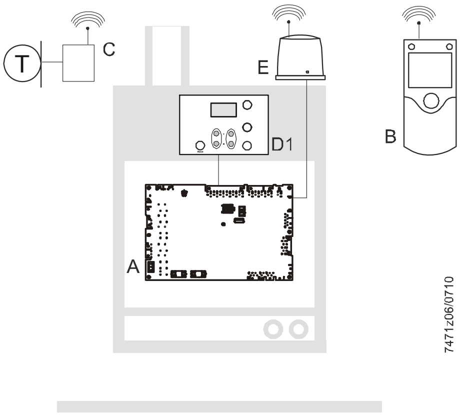


Operation via operator unit *Basic* (optionally with additional room unit)

Wired

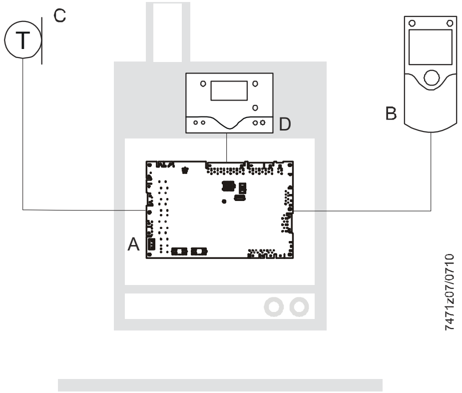


Wireless

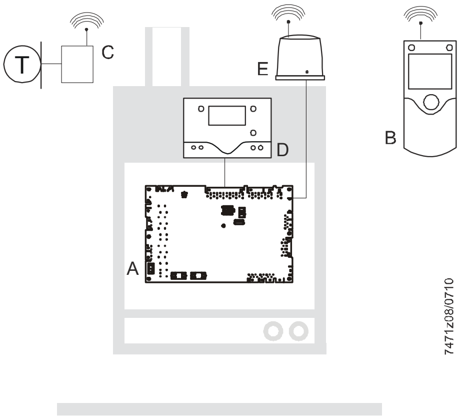


Operation via operator unit *Clear-text* (optionally with additional room unit)

Wired



Wireless



Key

A	Basic unit LMS14...
B	Room unit QAA55.../QAA75.../QAA78...
C	Outside sensor AVS13...
D	Operator unit AVS37.294... (*Clear-text*)
D1	Operator unit AVS37.390... (*Basic*)
E	RF module AVS71...

2 Safety notes

2.1 Notes on product liability

- The LMS14… may only be used in building services plant and only in compliance with the applications covered by this document
- When employing the products, all requirements specified in chapters *Handling* and *Technical data* must be satisfied
- Local safety regulations (installation, etc.) must be complied with
- The units must not be opened. If not observed, warranty by Siemens becomes void

Danger!
Do not open, interfere with or modify the units!

- All activities (mounting, installation, service work, etc.) must be performed by qualified personnel
- Before performing any work in the connection area of the LMS14…, disconnect the unit from mains supply (all-polar disconnection). Ensure that the plant cannot be inadvertently switched on again and that it is indeed dead. If not disconnected, there is a risk of electric shock
- Ensure protection against electric shock by providing adequate protection for the unit's terminals
- After any kind of activity (mounting, installation, service work, etc.), check to ensure that wiring is in an orderly state, that all safety functions are performed correctly and that the parameter settings are correct
- Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage
- AC 230 V terminals that are not used must be protected by dummy plugs fitted by the burner manufacturer
- Never connect or disconnect the stepper motors (WX1 connected to X16 or X16a) when live. If not observed, the built-in driver stage can be damaged

Siemens will not assume liability for damage resulting from unauthorized interference!

If fuses inside the LMS15… are blown, the unit must be returned to Siemens. The mains fuse (FB01/FB02) may be replaced once. Since overcurrents can damage relays, a plant safety check must be made.

Electromagnetic emissions must be checked on an application-specific basis!

The choice of applications and scope of functions covered by this User Manual shall serve as a guideline. The correct operation of the plant must be checked and proven by function tests made on the heating appliance and the relevant plant!

Danger!
At the OEM's request, the quick connector for the mechanical STB (SLT = safety limit thermostat) on the printed circuit board can be bridged ex factory. In that case, the mechanical SLT would be deactivated. When using a mechanical SLT, the resistor must always be removed. LMS14... with different type numbers must never be mixed up.

2.1.1 Use of high-efficiency pumps

When using high-efficiency pumps or pumps with integrated electronics, the resulting switch-on currents can adversely affect the relays' service life. For this reason, use of these types of pump is permitted only if authorized in writing by Siemens.

2.1.2 High-voltage test

Caution!
When making 100% inspections to DIN EN 60335-1, Addendum A, only AC voltage may be applied. If tests are conducted with DC voltage, the LMS14... might be damaged.

2.2 Environmental compatibility

Disposal

The units contain electrical and electronic components and must not be disposed of together with domestic waste.
Local and currently valid legislation must be complied with!

2.3 Lifecycle

The LMS14… have a designed lifetime* of 250,000 burner startup cycles which, under normal operating conditions in *Heating* mode, correspond to approx. 10 years of usage (starting from the production date indicated on the type field). This lifetime is based on the endurance tests specified in standard EN 298 and the table containing the relevant test documentation as published by the European Association of Component Manufacturers (Afecor) (www.afecor.org).

The designed lifetime is based on usage of the LMS14… as specified in the manufacturer's Data Sheet and User Manual. After reaching the designed lifetime in terms of the number of burner startup cycles, or the respective time of usage, the LMS14… are to be replaced by authorized personnel.

* The designed lifetime is not identical with the warranty time specified in the Terms of Delivery

2.4 Standards and certificates

Conformity to EEC directives

- Electromagnetic compatibility EMC (immunity)	2004/108/EC
- Directive for gas-fired appliances	2009/142/EC
- Low-voltage directive	2006/95/EC

ISO 9001: 2008
Cert. 00739

ISO 14001: 2004
Cert. 38233

- **Identification code to EN 298 chapter 4: F M C L B N**

2.5 Typographical conventions

2.5.1 Safety notes

This User Manual contains instructions which must be observed to ensure your personal safety and to prevent damage to equipment and property. The instructions and notes are highlighted by warning triangles, arrows or information symbols and are presented as follows, depending on the hazard level:

⚠	**Danger**	means that death, severe personal injury or substantial property damage **will** occur if adequate precautionary measures are not taken.
⚠	**Warning**	means that death, severe personal injury or substantial property damage **can** occur if adequate precautionary measures are not taken.
⚠	**Caution**	means that minor personal injury or property damage can occur if adequate precautionary measures are not taken.
ℹ	**Note**	draws your attention to **important information** on the product, on product handling, or to a special part of the documentation.
⇨	**Reference**	refers to **further information** given in other pieces of documentation or in chapters of this document.

Qualified personnel

Only **qualified personnel** are allowed to install and operate the equipment. Qualified personnel in the context of the safety-related notes contained in this document are persons who are authorized to commission, ground and tag devices, systems and electrical circuits in compliance with established safety practices and standards.

Correct use

Note the following:

The LMS14… may only be used on applications covered by the technical description.

The use of unsuitable or incorrectly installed accessories can lead to personal injury or damage to property.

When using the unit in connection with third-party products or components, following must be noted:
- The technical data of the LMS14… must be observed; in addition to static data, consideration must be given to dynamic data, such as switch-on and switch-off currents, surge currents, etc.
- EMC-specific properties or retroactive effects can adversely affect the unit’s life and reliability and must be checked by the customer
- The OEM as the system integrator must ensure compliance with the relevant regulations and make certain the correct fuses are used
- Siemens assumes no responsibility for the system

The products can only function correctly and safely if shipped, stored, set up and installed correctly, and operated and maintained as specified.

3 Mounting and installation

3.1 Safety regulations

Electrical installation

- Prior to installation, disconnect power
- The low-voltage and mains voltage terminals are arranged on different sides of the unit
- When making the wiring, the requirements of safety class II must be satisfied

Warning!
Never run ionization probe cable and mains cables in the same trunk.

Warning!
- **When making the wiring, the AC 230 V section must be strictly segregated from the extra low-voltage section, thus ensuring protection against electric shock and electromagnetic interference**
- **In connection with the (safety) limit thermostat, observe the safety-related notes given in chapter *Electronic safety limit thermostat (SLT)***
- **Make certain that spliced individual wires cannot touch neighboring terminals. Fit suitable ferrules**
- **Always run the high-voltage ignition cables separate from the unit and other cables while observing the greatest possible distances**

Danger!
- **Compliance with DIN EN 60 335 and DIN EN 60730-2-5 must be ensured**
- **The electrical wiring inside the boiler must conform to national and local regulations**
- **Degree of protection IP40 as per DIN EN 60529 for burner controls must be ensured by the burner or boiler manufacturer through correct installation of the LMS14...**

3.1.1 Electrical connection of ionization probe

It is important to achieve practically disturbance- and loss-free signal transmission:

- Never run the ionization probe cable together with other cables
  - Line capacitance reduces the magnitude of the flame signal
  - Use a separate cable
- Observe the permissible length of the ionization probe cable (refer to chapter *Technical data* in the relevant pieces of documentation)
- Locate ignition electrode and ionization probe such that the ignition spark cannot arc over to the ionization probe (risk of electric shock)
- Locate the ionization probe and its connections such that adequate protection against direct or indirect contact with active parts is ensured in every unfavorable position allowed under correct usage conditions. If not observed, there is a risk of electric shock

3.2 Boiler management unit LMS14…

When mounting the PCB on a metal plate, the clearance between the lower edge of the PCB and the metal plate must be a minimum of 12 mm (as per DIN EN 60335 → minimum 8 mm air and creepage path to the end of the wires or the solder fillets).

- Spacers must be made of electrically non-conductive material!
- When using metal screws for fixing, the head diameter must be ≤7.5 mm!
- If 2 metal screws are screwed into a spacer from both sides, an air path of 8 mm must be observed or solid insulation of 2 mm must be provided (as per DIN EN 60335)!

Caution!
Mounting (general information)

- Currently valid national safety regulations must be complied with!
- Inside the boiler, the unit must be fitted in a housing ensuring degree of protection IP40 as a minimum requirement
- Depending on the location and environmental conditions, higher degrees of protection may be required
- When mounted, the maximum permissible ambient temperature must never be exceeded
- Condensation water must not drip on the LMS14… or enter the unit, neither in operation nor when service work is carried out

Ignition equipment

Note!
In terms of switching performance, any type of external ignition module used must be approved by Siemens!

Electric ignition sparks generate high-frequency energy which can adversely affects radio and television reception. The high-voltage cable running to the ignition electrode acts as a transmit antenna. For this reason, application-specific tests must be made to confirm that adequate distances are observed. High-frequency energy is also of capacitive and inductive nature, that is, not wire-bound. This must be taken into consideration when laying the cables.
The ignition cable used must satisfy the technical requirements of the ignition module and should be run to the ignition electrode as directly as possible, with no loops in between.
It must never be laid parallel or very close to other electrical cables.

Connections and wiring

When making the wiring, ensure that the protective extra low-voltage side is strictly separated from other sections, thus providing protection against electric shock and making certain that EMC will not be adversely affected! The connectors' predefined coding must be observed! Make the connections only when the components are disconnected from power! AC 230 V terminals that are not used must be covered by dummy plugs to ensure protection against electric shock! A multipole isolator is required to disconnect the unit from mains supply. For wiring the bus users, cables specified by Siemens are mandatory!

External signal sources (air pressure switch, room thermostat, DHW flow switch, etc.) should have gold-plated silver contacts.

Both ionization probe and ignition electrode must be protected against electric shock. Since the line to the ionization probe must be well insulated against ground, that line together with the ionization probe must be protected against condensation and very damp surroundings.

Warning!

Connector X17 for the burner ground (FE – burner GND) must be connected as directly as possible to protective earth (PE) of the mains cable and to function earth X1 or X1a, pin 2, at the mains input of the LMS14...

The burner's housing must also be connected to the protective earth of the mains cable.

The safety regulations for protective earth wiring must be complied with in all cases.

Neutral point is the protective earth terminal of the mains cable.

The way protective earth is wired has a considerable impact on whether the emission limits as per DIN EN 60335 are adhered to and on the unit's EMC performance inside the boiler.

The low-voltage ground of the LMS14... is connected to protective earth, but is classified as PELV since no protective function is required.

Tests made by the customer

If the boiler or burner manufacturer wants to make additional insulation and high-voltage tests, prior approval by Siemens is required!

Engineering

- Air circulation around the LMS14… must be ensured, enabling the unit to dissipate the heat produced by its controller
- The LMS14… is designed in compliance with the directives for safety class II and must be mounted in accordance with these directives
- Power may be switched on only when the unit is completely mounted. Otherwise, there is a risk of electric shock at the terminals and through the cooling slots
- The unit must not be exposed to drip water
- Mains cables must be run completely separate from low-voltage cables (sensors), observing a minimum distance of 100 mm

Mounting location

The LMS14… has been designed for mounting inside the burner or inside a control panel. Protection against electric shock must be ensured!

3.3 Basic diagram LMS14…

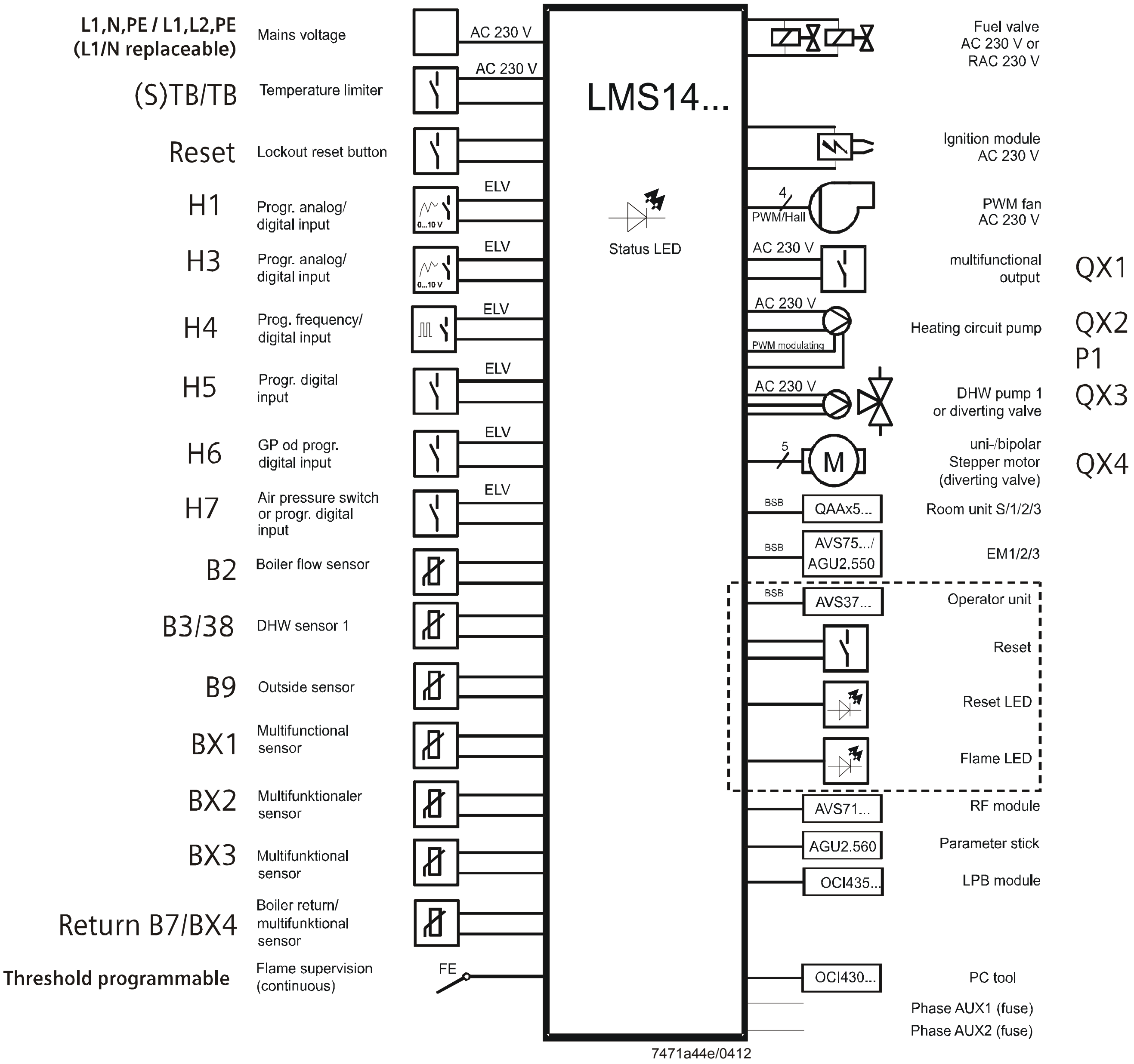


Figure 3: Basic diagram

The diagram shows the full scope of functions of the LMS… system. The actual functions are to be determined based on the respective execution/configuration.

3.4 Basic unit LMS14… complete (*Basic*)

Dimensions in mm

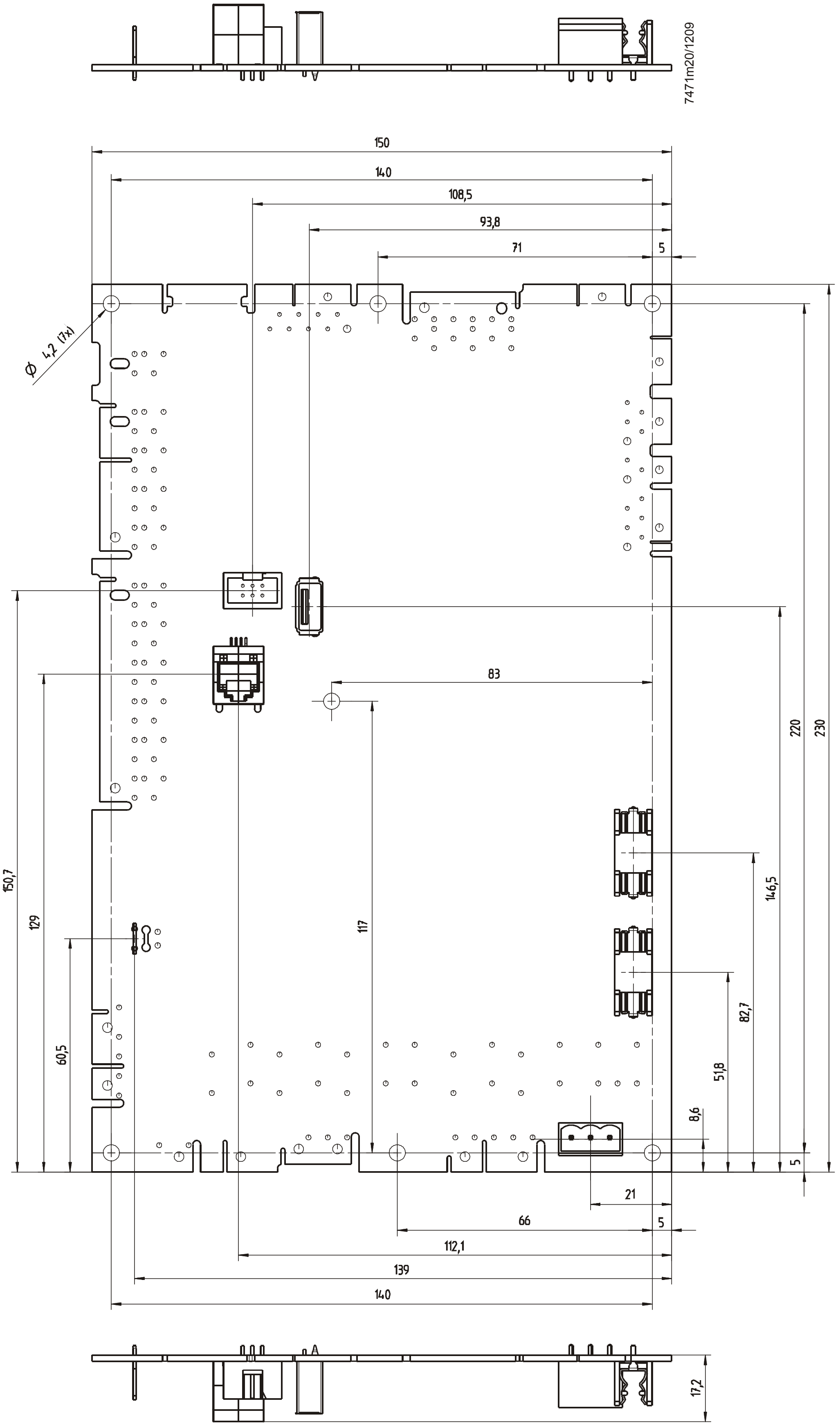


Figure 4: Dimensions of basic unit complete (*Basic*)

3.4.1 Terminals of LMS14… complete (*Basic*)

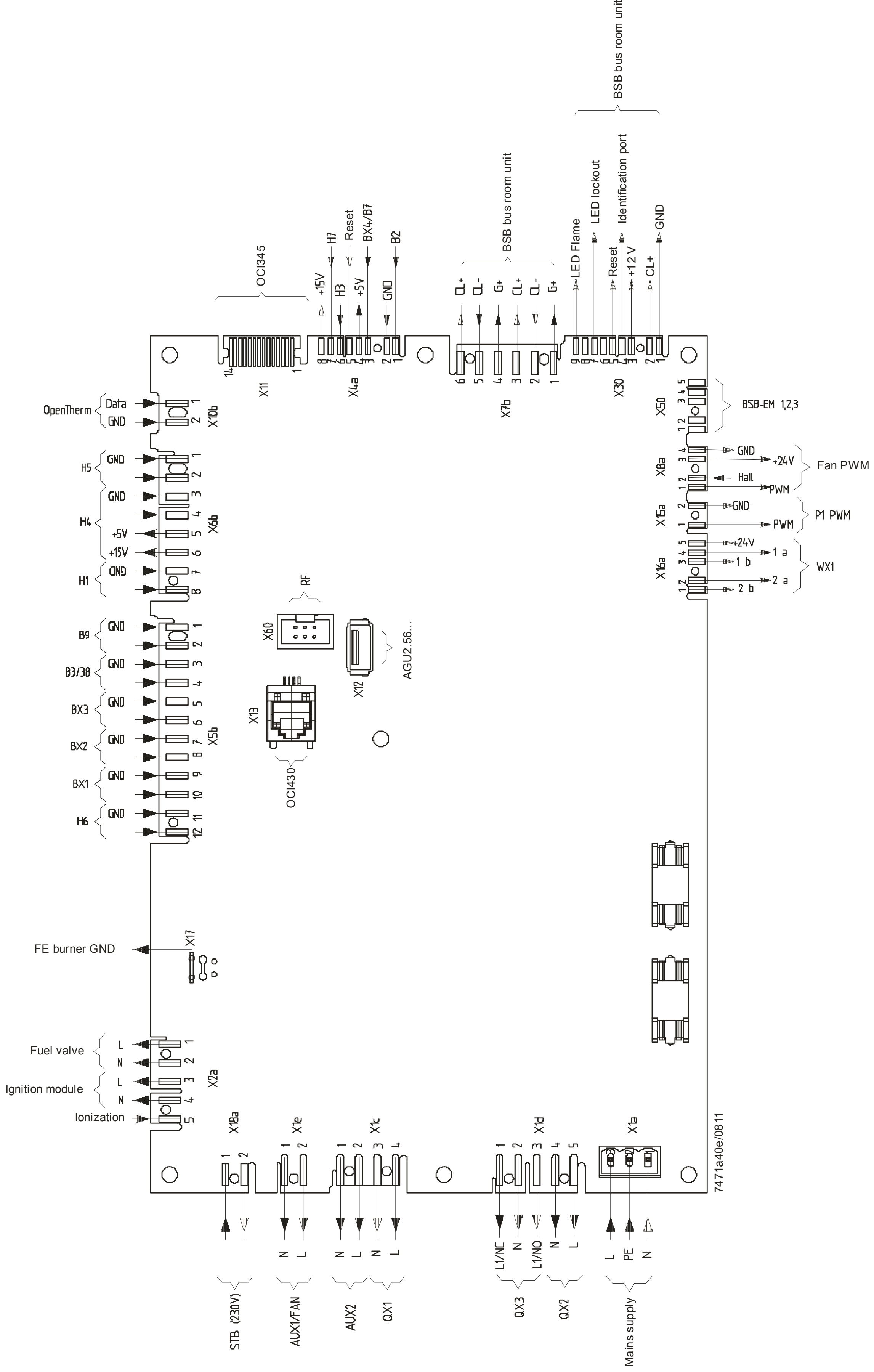


Figure 5: Terminals of LMS14… complete

3.4.2 Assignment of terminal X30

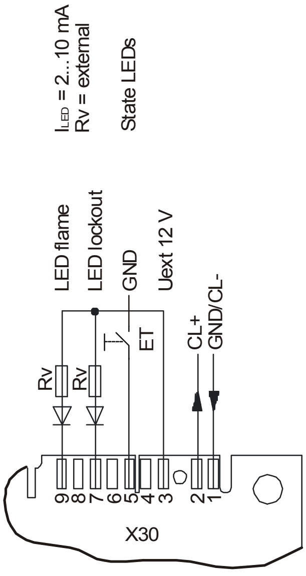


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Figure 6: Assignment of terminal X30

3.4.3 List of terminals of LMS14… complete (*Basic*)

LMS14... standard (*Basic*)			
Terminal		Mating connector	
marking	Number of pins	Supplier	Type/coding
X1a	3	Wieland	25.320.3353.0 green
X1c	4	Lumberg	3636 04K02
X1d	5	Lumberg	3636 05K02
X1e	2	Lumberg	3636 02K10
X2a	5	Lumberg	3636 05K22
X4a	8	Lumberg	3515 08K20
X5b	12	Lumberg	3636 12K01
X6b	8	Lumberg	3636 08K10
X7b	6	Lumberg	3636 06K09
X8a	4	Lumberg	3515 04K06
X10b	2	Lumberg	3636 02K01
X11	14	Lumberg	302299 14 uncoded
X12	4	Molex	48037-2200 uncoded
X13	6/4		Uncoded
X15a	2	Lumberg	3516 02K05
X16a	5	Lumberg	3515 05K25
X17	1		Uncoded
X18a	2	Lumberg	3636 02K05
X30	9	Lumberg	3515 09K15
X50	5	Lumberg	3515 05K23
X60	2x3		Uncoded

Key to LMS14… complete (*Basic*)

AUX...	Auxiliary output
B2	Boiler sensor
B3	DHW sensor
B7	Boiler return sensor
B9	Outside sensor
B38	DHW outlet sensor
BX...	Sensor input
H...	Function input
P1	Function output
QX...	Relay output
STB	Safety limit thermostat (SLT)
WX1	Stepper motor output

Note!
The connector designations only specify coding and type. When ordering, also consider the requirements placed on the material (e.g. filament test) and design.

3.5 Basic unit LMS14... complete (*Medium*)

Dimensions in mm

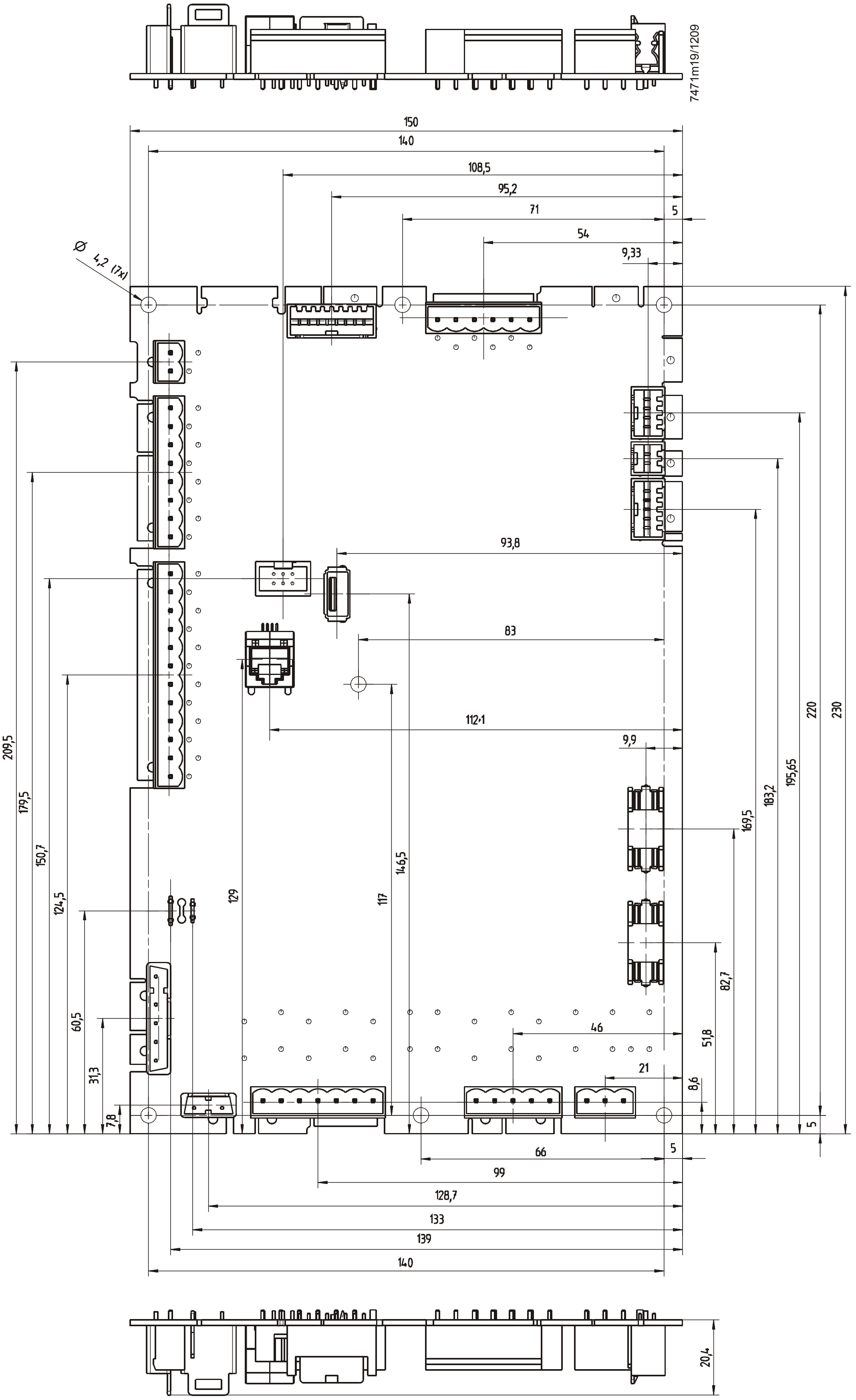

Figure 7: Dimensions of basic unit complete (*Medium*)

3.5.1 Terminals of LMS14… complete (*Medium*)

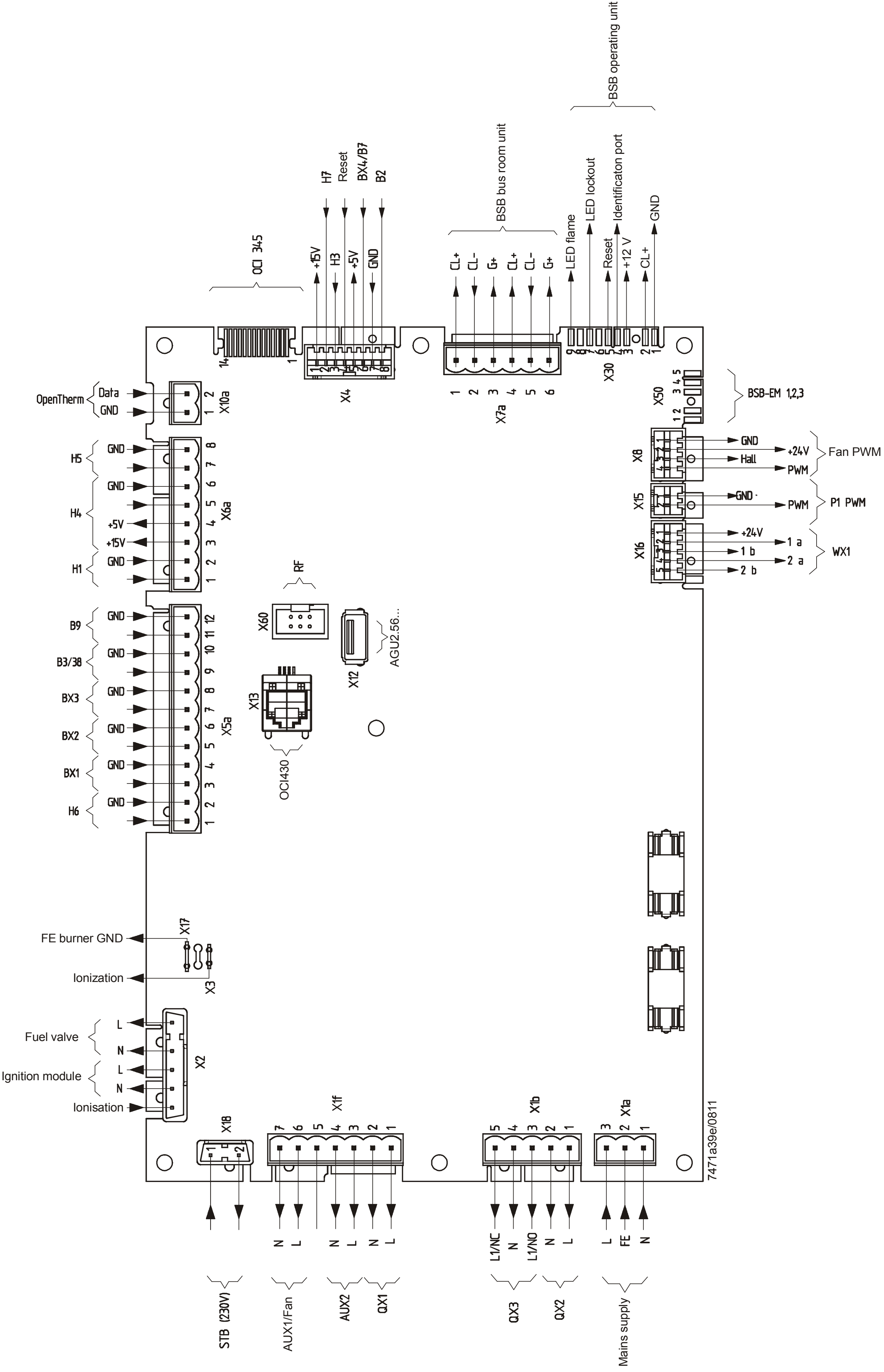

Figure 8: Terminals of LMS14… complete

3.5.2 Assignment of terminal X30

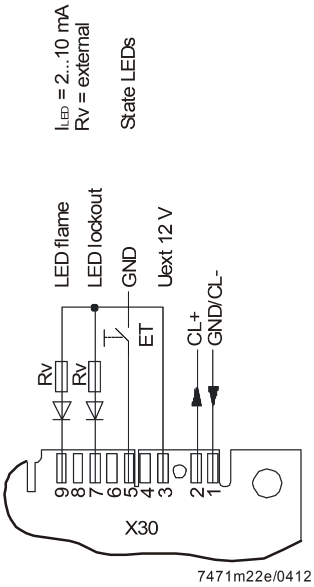

Figure 9: Assignment of terminal X30

3.5.3 List of terminals of LMS14… complete (*Medium*)

LMS14... standard (*Medium*)			
Terminal		Mating connector	
marking	Number of pins	Supplier	Type/coding
X1a	3	Wieland	25.320.3353.0 green
X1b	5	Wieland	25.320.3553.0 green
X1f	7	Wieland	25.320.3753.0 green
X2	5	Stocko	Housing: MKH 2805-1-0-500 Contact: RFB 7851 V 0,6-0,5
X3	1		Uncoded
X4	8	Lumberg	3521 08K00
X5a	12	Wieland	25.320.4253.0 green
X6a	8	Wieland	25.320.3853.0 green
X7a	6	Wieland	25.320.3653.0 green
X8	4	Lumberg	3521 04K00
X10a	2	Wieland	25.320.3253.0 green
X11	14	Lumberg	302299 14 uncoded
X12	4	Molex	48037-2200 uncoded
X13	6/4		Uncoded
X15	2	Lumberg	3521 02K00
X16	5	Lumberg	3521 05K00
X17	1		Uncoded
X18	2	Stocko	Housing: MKH 2805-1-0-200 Contact: RFB 7851 V 0,6-5
X30	9	Lumberg	3515 09K15
X50	5	Lumberg	3515 05K23
X60	2x3		Uncoded

Key to LMS14… complete (*Medium*)

AUX...	Auxiliary output
B2	Boiler sensor
B3	DHW sensor
B7	Boiler return sensor
B9	Outside sensor
B38	DHW outlet sensor
BX...	Sensor input
H...	Function input
P1	Function output
QX...	Relay output
STB	Safety limit thermostat (SLT)
WX1	Stepper motor output

Note!
The connector designations only specify coding and type. When ordering, also consider the requirements placed on the material (e.g. filament test) and design.

3.6 Basic unit LMS14... complete (*Deluxe*)

Dimensions in mm

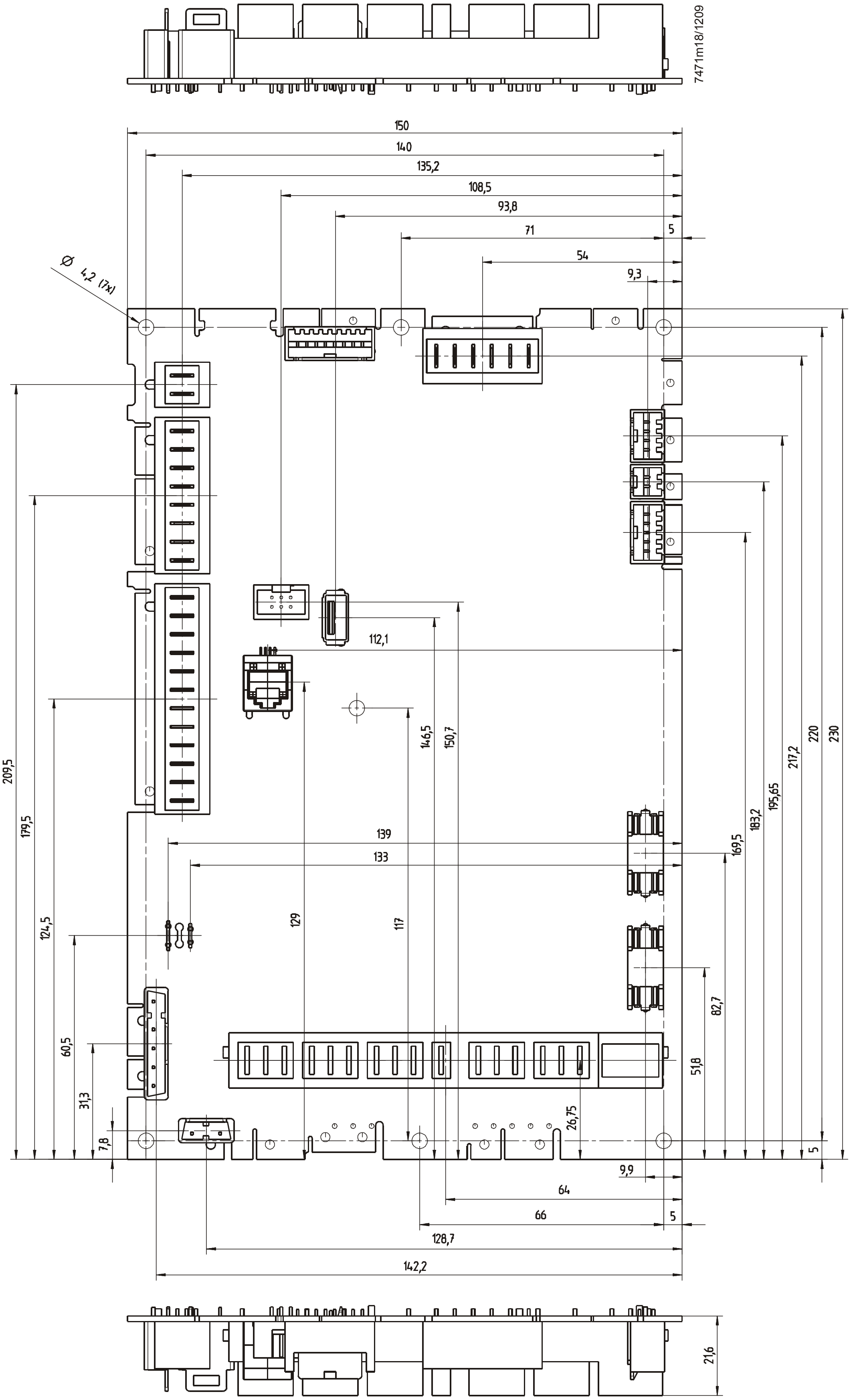

Figure 10: Dimensions of basic unit complete (*Deluxe*)

3.6.1 Terminals of LMS14… complete (*Deluxe*)

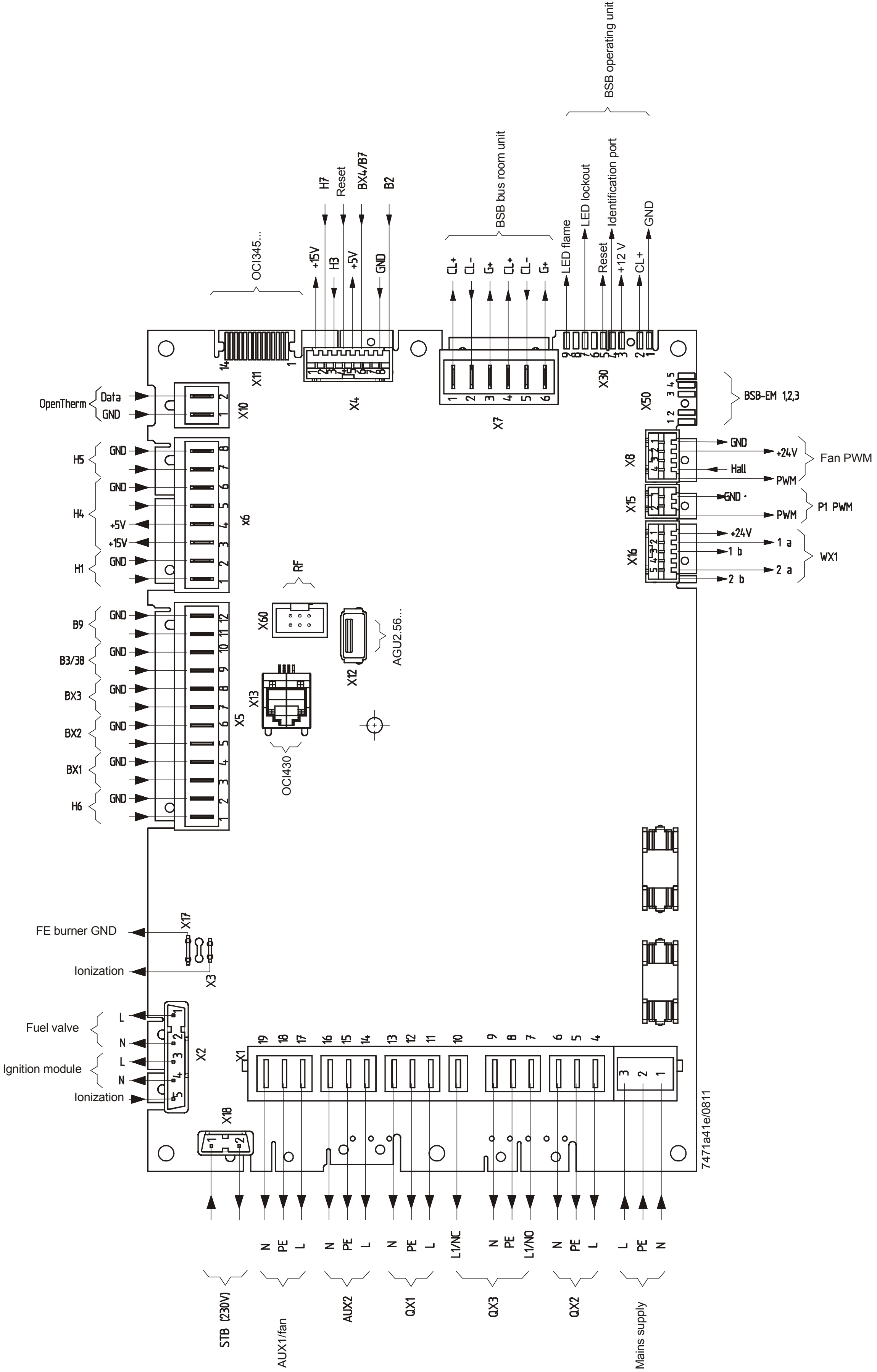

Figure 11: Terminals of LMS14… complete

3.6.2 Assignment of terminal X30

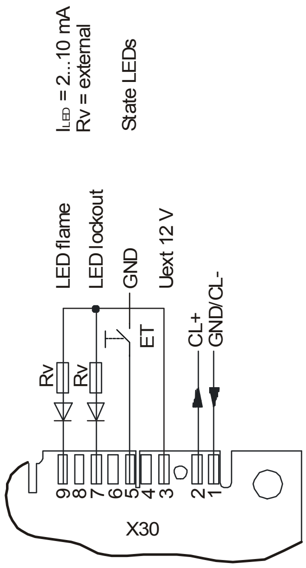

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Figure 12: Assignment of terminal X30

3.6.3 List of terminals of LMS14… complete (*Deluxe*)

LMS14... standard (*Deluxe*)			
Terminal		Mating connector	
marking	Number of pins	Supplier	Type/coding
X1	19	Lumberg	3615-1 03K117P30 3618-1 03K19P5 3618-1-03K20P4 **or** 3618-1-05K129 3618-1 03K02P7 3618-1 03K10 3618-1 03K10
X2	5	Stocko	Housing: MKH 2805-1-0-500 Contact: RFB 7851 V 0,6-0,5
X3	1		Uncoded
X4	8	Lumberg	3521 08K00
X5	12	Lumberg	3615-1 02K09P19 3615-1 02K15P17 3615-1 02K35P18
X6	8	Lumberg	3615-1 02K04 3615-1 02K09P19
X7	6	Lumberg	3615-1 03K131P33
X8	4	Lumberg	3521 04K00
X10	2	Lumberg	3615-1 02K12
X11	14	Lumberg	302299 14 uncoded
X12	4	Molex	48037-2200 uncoded
X13	6/4		Uncoded
X15	2	Lumberg	3521 02K00
X16	5	Lumberg	3521 05K00
X17	1		Uncoded
X18	2	Stocko	Housing: MKH 2805-1-0-200 Contact: RFB 7851 V 0,6-5
X30	9	Lumberg	3515 09K15
X50	5	Lumberg	3515 05K23
X60	2x3		Uncoded

Key to LMS14… complete (*Deluxe*)

AUX...	Auxiliary output
B2	Boiler sensor
B3	DHW sensor
B7	Boiler return sensor
B9	Outside sensor
B38	DHW outlet sensor
BX...	Sensor input
H...	Function input
P1	Function output
QX...	Relay output
STB	Safety limit thermostat (SLT)

Note!
The connector designations only specify coding and type. When ordering, also consider the requirements placed on the material (e.g. filament test) and design.

3.7 Cable AGU2.110x109

Dimensions in mm

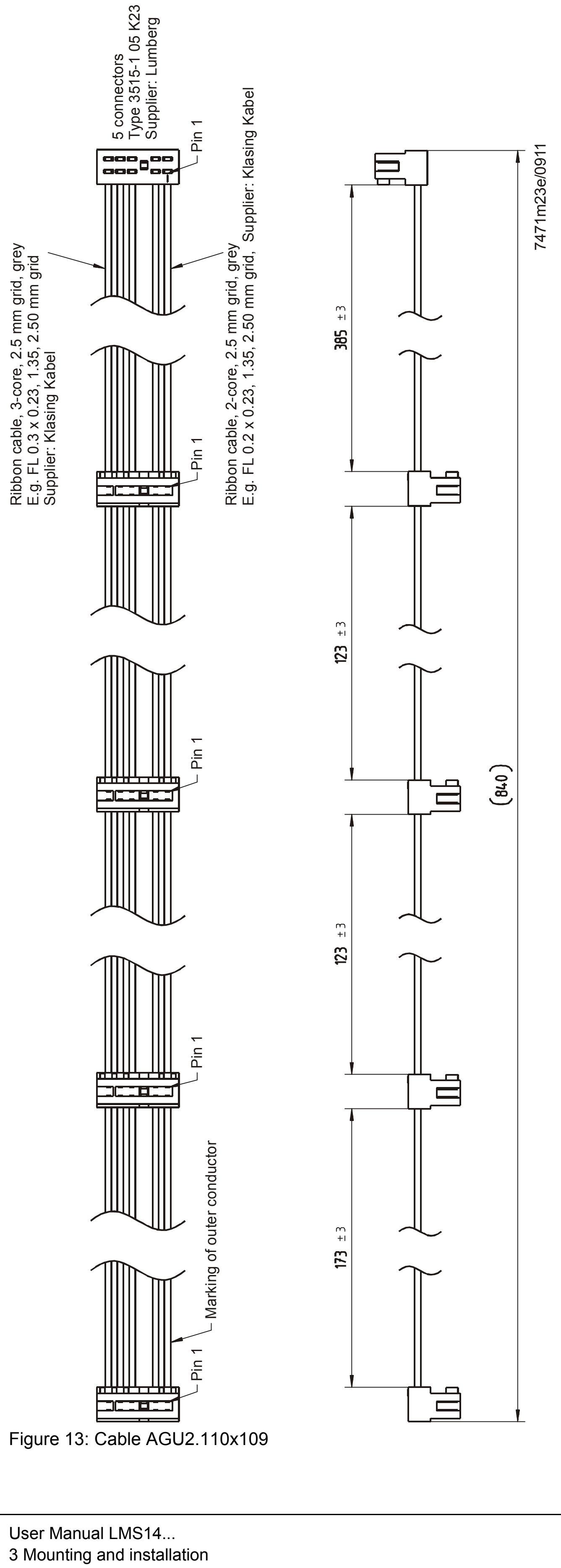


Figure 13: Cable AGU2.110x109

3.8 Parameter stick AGU2.56xx109

Dimensions

Dimensions in mm

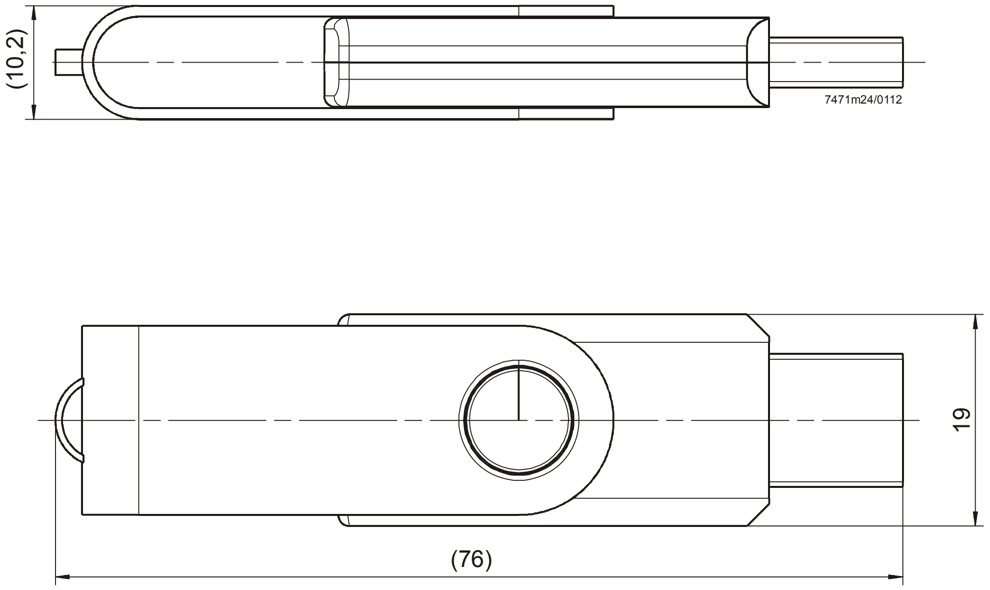


Figure 14: Dimension AGU2.56xx109

4 Commissioning

Prerequisites

To commission the unit, follow these steps:

- Prerequisite is correct mounting, correct electrical installation and, in the case of wireless solutions, correctly working RF links to all required auxiliary units
- Make all plant-specific settings. Special attention must be paid to operating page *Configuration*.
  For that purpose, select the relevant operating level as follows:
  - Press **OK** on the room unit to switch to programming
  - Press the **Info** button for at least 3 seconds and select operating level *Commissioning* with the setting knob. Then, press **OK**
  - Make the function check as described below
  - Reset the attenuated outside temperature (operating page *Diagnostics of consumers*, operating line *Outside temp attenuated* (operating page *Outside temp attenuated (*8703))

Note!

- The boiler manufacturer assumes responsibility for the correct parameterization of the LMS14…, which must meet the requirements of the relevant standards and directives
- The connectors do not ensure total protection against false wiring. For this reason, the connections must be checked prior to commissioning
- Static charges must be avoided since they can damage the unit's electronic components when touched
  Recommendation: Use ESD equipment!

Function check

To facilitate commissioning and fault tracing, the controller offers output and input tests. When making these tests, the controller's inputs and outputs can be checked. To perform the tests, switch to operating page *Input/output test* and go through all available setting lines.

Operating state

The current operating state can be checked via operating page *State*.

Diagnostics

For detailed diagnostics of the plant, check operating pages *Diagnostics heat source* and *Diagnostics consumer*.

4.1 Basic units

Checking the LED

State of LED	**Meaning**
Off	No power
On	Ready
Flashing	Local fault

5 Handling

5.1 Operation and display

Via ACS420 PC software and OCI430...

User	Siemens, OEM, for laboratory use
Function	Changing individual parameters or a complete parameter set
Parameter types	Safety-related and non-safety-related parameters
Parameter levels	All
Connection	OCI430... to LMS14..., terminal X13

Via QAA75.../AVS37…

User	Siemens, OEM, heating engineer, enduser
Function	Changing individual LMS14… parameters
Parameter types	Non-safety-related parameters
Parameter levels	Enduser, heating engineer, OEM
Connection QAA75...	To LMS14..., terminal X7
Connection AVS37…	To LMS14..., terminal X30

Via QAA75.../ACS700/ ACS790

User	Siemens, OEM, heating engineer, enduser
Function	Changing individual LMS14… parameters
Parameter types	Non-safety-related parameters
Parameter levels	Enduser, heating engineer, OEM
Connection QAA75...	To LMS14... plug-in position X7
Connection AVS700…	To LMS14... plug-in position X30

When setting the parameters via the LMS14… PC software, the unit runs to a special programming position. Before changed parameter are stored in EEPROM, the respective backup values (CRC, test values of the transmission programs, plausibility of parameters) – if available – and the permitted value range are checked.

Note!
If parameter settings at the heating engineer level (or higher) are changed, the LMS14… must be restarted, especially when making changes to the *Configuration* menu.

Warning!
The OEM must check to ensure the parameter settings (values, access levels, etc.) of the LMS14... fully satisfy the requirements of the respective application and make certain that the application conforms to the relevant directives and standards. If not observed, there is a risk of malfunction or non-compliance with the directives and standards.

LED flame

LED flame is lit when the unit detects a flame.
If no flame is detected, LED flame is off or flashes at 1 Hz if errors with the following error codes occur:
- 118 (water pressure below critical value at H1)
- 177 (water pressure below critical value at H2 [EM1/EM2/EM3]
- 323 (water pressure below critical value at H3)

Note!
If one of these errors occurs, the fuel valve is shut down.

For connection of the external LED, refer to chapter *Assignment of terminal X30*.

LED alarm

LED alarm is lit when the unit detects an error with a response other than the lockout position (e.g. water pressure below critical value).
It flashes at 1 Hz if the detected error leads to lockout.

For connection of the external LED, refer to chapter *Assignment of terminal X30*.

LED test

After power ON or a reset, LED flame and LED alarm are lit for a moment.

5.2 Overview of settings

The table below shows all available functions. Certain functions can be hidden however, depending on the unit version or the configuration made.

¹) Only QAA75.../QAA78...

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
Time of day and date							
1	Hours/minutes			-	00:00	23:59	hh:mm
2	Day/month			-	01.01	31.12	tt.MM
3	Year			-	2004	2099	jjjj
5	Start of summertime			25.03	01.01	31.12	tt.MM
6	End of summertime			25.10	01.01	31.12	tt.MM
Wireless							
120	Binding No ¦ Yes			No			
121	Test mode Off ¦ On			Off			
130	Room unit 1 Missing ¦ In operation ¦ No recept'n ¦ Change batt	Room unit 1	Room unit 1	-			-
131	Room unit 2 Missing ¦ In operation ¦ No recept'n ¦ Change batt	Room unit 2	Room unit 2	-			-
132	Room unit 3 Missing ¦ In operation ¦ No recept'n ¦ Change batt	Room unit 3	Room unit 3	-			
133	Outside sensor Missing ¦ In operation ¦ No recept'n ¦ Change batt	Outside sensor	Outside sensor	-			-
134	Repeater Missing ¦ In operation ¦ No recept'n ¦ Change batt	Repeater	Repeater	-			-
135	Operator unit 1 Missing ¦ In operation ¦ No recept'n ¦ Change batt	Operator unit 1	Operator unit 1	-			
136	Operator unit 2 Missing ¦ In operation ¦ No recept'n ¦ Change batt	Operator unit 2	Operator unit 2	-			
137	Operator unit 3 Missing ¦ In operation ¦ No recept'n ¦ Change batt	Operator unit 3	Operator unit 3	-			-
138	Service unit	Service unit	Service unit	-			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	Missing ¦ In operation ¦ No recept'n ¦ Change batt						
140	Delete all devices No ¦ Yes	Delete all devices	Delete all devices	No			-
Time prog heating circuit 1							
500	Preselection Mo - Su ¦ Mo – Fr ¦ Sa - Su ¦ Mo ¦ Tu ¦ We ¦ Th ¦ Fr ¦ Sa ¦ Su			Mo - So			-
501	1st phase on			6:00	00:00	24:00	hh:mm
502	1st phase off			22:00	00:00	24:00	hh:mm
503	2nd phase on			24:00	00:00	24:00	hh:mm
504	2nd phase off			24:00	00:00	24:00	hh:mm
505	3rd phase on			24:00	00:00	24:00	hh:mm
506	3rd phase off			24:00	00:00	24:00	hh:mm
516	Default values No ¦ Yes	Standard TSP HC1	Standard values TSP HC1	No			-
Time prog heating circuit 2							
520	Preselection Mo - Su ¦ Mo - Fr ¦ Sa - Su ¦ Mo ¦ Tu ¦We ¦ Th ¦ Fr ¦ Sa ¦ Su			Mo - So			-
521	1st phase on			6:00	00:00	24:00	hh:mm
522	1st phase off			22:00	00:00	24:00	hh:mm
523	2nd phase on			24:00	00:00	24:00	hh:mm
524	2nd phase off			24:00	00:00	24:00	hh:mm
525	3rd phase on			24:00	00:00	24:00	hh:mm
526	3rd phase off			24:00	00:00	24:00	hh:mm
536	Default values No ¦ Yes	Standard TSP HC2	Standard values TSP HC2	No			-
Time prog 3/heating circuit 3							
540	Preselection Mo - Su ¦ Mo - Fr ¦ Sa - Su ¦ Mo ¦ Tu ¦We ¦ Th ¦ Fr ¦ Sa ¦ Su			Mo - So			-
541	1st phase on			6:00	00:00	24:00	hh:mm
542	1st phase off			22:00	00:00	24:00	hh:mm
543	2nd phase on			24:00	00:00	24:00	hh:mm

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
544	2nd phase off			24:00	00:00	24:00	hh:mm
545	3rd phase on			24:00	00:00	24:00	hh:mm
546	3rd phase off			24:00	00:00	24:00	hh:mm
556	Default values No ¦ Yes	Standard TSP HC3	Standard values TSP3	No			-
Time program 4/DHW							
560	Preselection Mo - Su ¦ Mo - Fr ¦ Sa - Su ¦ Mo ¦ Tu ¦We ¦ Th ¦ Fr ¦ Sa ¦Su			Mo - So			-
561	1st phase on			6:00	00:00	24:00	hh:mm
562	1st phase off			22:00	00:00	24:00	hh:mm
563	2nd phase on			24:00	00:00	24:00	hh:mm
564	2nd phase off			24:00	00:00	24:00	hh:mm
565	3rd phase on			24:00	00:00	24:00	hh:mm
566	3rd phase off			24:00	00:00	24:00	hh:mm
576	Default values No ¦ Yes	Standard TSP 4	Standard values TSP 4	No			-
Time program 5							
600	Preselection Mo - Su ¦ Mo - Fr ¦ Sa - Su ¦ Mo ¦ Tu ¦We ¦ Th ¦ Fr ¦ Sa ¦ Su			Mo - So			-
601	1st phase on			6:00	00:00	24:00	hh:mm
602	1st phase off			22:00	00:00	24:00	hh:mm
603	2nd phase on			24:00	00:00	24:00	hh:mm
604	2nd phase off			24:00	00:00	24:00	hh:mm
605	3rd phase on			24:00	00:00	24:00	hh:mm
606	3rd phase off			24:00	00:00	24:00	hh:mm
616	Default values No ¦ Yes	Standard TSP 5	Standard values TSP 5	No			-
Holidays heating circuit 1							
641	Preselection Period 1 ¦ Period 2 ¦ Period 3¦ Period 4¦ Period 5¦ Period 6¦ Period 7¦ Period 8			Period 1			-
642	Start			--.--	01.01	31.12	tt.MM

Line no.	Operator unit	Operating line		Default value	Min	Max	Unit
		ACS420	**ACS700/ACS790**				
643	End			--.--	01.01	31.12	tt.MM
648	Operating level Frost protection ¦ Reduced	HolidayOptgLevel HC1	Holiday operating level HC1	Frost protection			-
Holidays heating circuit 2							
651	Preselection Period 1 ¦ Period 2 ¦ Period 3¦ Period 4¦ Period 5¦ Period 6¦ Period 7¦ Period 8			Period 1			-
652	Start			--.--	01.01	31.12	tt.MM
653	End			--.--	01.01	31.12	tt.MM
658	Operating level Frost protection ¦ Reduced	HolidayOptgLevel HC2	Holiday operating level HC2	Frost protection			-
Holidays heating circuit 3							
661	Preselection Period 1 ¦ Period 2 ¦ Period 3¦ Period 4¦ Period 5¦ Period 6¦ Period 7¦ Period 8			Period 1			-
662	Start			--.--	01.01	31.12	tt.MM
663	End			--.--	01.01	31.12	tt.MM
668	Operating level Frost protection ¦ Reduced	HolidayOptgLevelHC3/P	Holiday operating level HC3/P	Frost protection			-
Heating circuit 1							
700	Operating mode Protection ¦ Automatic ¦ Reduced ¦ Comfort	OptgMode HC1	Operating mode HC 1	Automatic			-
710	Comfort setpoint	RmTmp ComfSetp HC1	Room temperature Comfort setpoint HC1	20.0	BZ 712	BZ 716	°C
712	Reduced setpoint	RmTmp RedSetp HC1	Room temp Reduced setpoint HC1	16	BZ 714	BZ 710	°C
714	Frost protection setpoint	RmTmpFrostProtSetpHC1	Room temp frost protection setpoint HC1	10.0	4	BZ 712	°C
716	Comfort setpoint max	ComfSetp max HC1	Comfort setpoint max HC1	35.0	BZ 710	35	°C
720	Heating curve slope	Heating curve 1 slope	Heating curve 1 slope	1.50	0.10	4.00	-
721	Heating curve displacement	HeatCurvParalDisplHC1	Heating curve parallel displacement HC1	0.0	-4,5	4,5	°C
726	Heating curve adaption Off ¦ On	HeatCurve adapt HC1	Heating curve adaption HC1	Off			-
730	Summer/winter heating limit	Su/WiCh’overTmpHC1	Summer/winter changeover temp	18	– – – / 8	30	°C

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
			HC1				
732	24-hour heating limit	24hourHeatLimit HC1	24-hour heating limit HC1	-3	– – – / -10	10	°C
733	Ext'n 24-hour heating limit No ¦ Yes	Ext 24hour HeatLimHC1	Ext 24-hour heating limit HC1	Yes			
740	Flow temp setpoint min	FlowTmp MinLimitn HC1	Flow temp min limitation HC1	8	8	BZ 741	°C
741	Flow temp setpoint max	FlowTmp MaxLimitn HC1	Flow temp max limitation HC1	80	BZ 740	95	°C
742	Flow temp setpoint room stat	FlowSetpRmStat HC1	Flow temp setpoint room thermostat HC1	65	– – –/BZ 740	– – –/BZ 741	°C
744	Swi-on ratio room stat	SwiOnRat RmStat HC1	Swi-on ratio room thermostat HC1	– – –	– – –/1	99	%
746	Delay heat request	Delay request HC1	Delay heat request HC1	0	0	600	s
750	Room influence	RmTmp gain factor HC1	Room temp gain factor HC1	– – –	– – –/1	100	%
760	Room temp limitation	RmTmp limitation HC 1	Room temperature limitation HC1	1	– – –/0.5	4	°C
761	Heating limit room controller	HeatLimit RmContr HC1	Heating limit room control HC1	– – –	– – –/0	100	%
770	Boost heating	RmTmp SetpBoost HC1	Room temp setpoint boost HC1 (boost heating)	5	– – –/0	20	°C
780	Quick setback Off ¦ Down to reduced setpoint ¦ Down to frost prot setpoint	Quick setback HC1	Quick setback HC1	Down to reduced setpoint			-
790	Optimum start control max	OptStartCtrl MaxTime1	Optimum start control max forward shift HC1	0	0	360	Min.
791	Optimum top control max	OptStopCtrl MaxTime1	Optimum stop control max forward shift HC1	0	0	360	Min.
794	Heat up gradient	Heat up gradient	Heat up gradient	60	0	600	min/k
800	Reduced setp increase start	StartRedRTSetpIncrHC1	Start reduced room temp setpoint increase HC1	– – –	– – –/BZ 801	10	°C
801	Reduced setp increase end	EndRedRTSetpIncrHC1	End reduced room temp setpoint increase HC1	-15	-30	BZ 800	°C
809	Continuous pump operation No ¦ Yes	Continuous PumpOp HC1	Continuous pump operation HC1	No			
812	Frost protection flow temp Off ¦ On	FrostProtFlowTemp HC1	Frost protection flow temp HC1	On			-
820	Overtemp prot pump circuit Off ¦ On	OvertempProt HC1	Pump heating circuit overtemp protection HC1	On			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
830	Mixing valve boost	MixValveSetpBoost HC1	Mixing valve setpoint boost HC1	5	0	50	°C
832	Actuator type 2-positioin ¦ 3-position	Actuator CtrlMod HC1	Actuator control mode HC1	3-position			-
833	Switching differential 2-pos	ActuatorSwiDiff HC1	Actuator switching differential HC1	2	0	20	°C
834	Actuator running time	Actuator RunTime HC1	Actuator running time HC1	120	30	873	s
835	Mixing valve Xp	Xp heating circuit 1	P-band (Xp) HC1	32	1	100	°C
836	Mixing valve Tn	Tn heating circuit 1	Integral action time (Tn) HC1	120	10	873	s
850	Floor curing function Off ¦ Functional heating ¦ Curing heating ¦ Functional/curing heating ¦ Curing/functional heating ¦ Manually	FloorDryUp funct 1	Floor dry up function HC1	Off			-
851	Floor curing setp manually	FloorSetp man HC1	Floor setpoint manually HC1	25	0	95	°C
855	Floor curing setp current	FlowTempSetp floor1	Flow temp setpoint floor curing HC1		0	95	°C
856	Floor curing day current	FloorDryUp day 1	Floor dry up day HC1		0	32	
861	Excess heat draw Off ¦ Heating mode ¦ Always	Overtemp drop HC1	Overtemperature drop HC1	Always			
870	With buffer No ¦ Yes	HC1 with buffer	Heating circuit 1 with buffer	Yes			-
872	With prim contr/system pump No ¦ Yes	HC1 prectrl/SystPump	Heating circuit 1 with precontrol/system pump	Yes			
880	Pump speed reduction Operating level ¦ Characteristic	Pump speed red HC1	Pump speed reduction HC1	Characteristic			
881	Starting speed	Starting speed HC1	Starting speed HC1	100	0	100	%
882	Pump speed min	Pump speed min HC1	Pump speed min HC1	50	BZ 885	BZ 883	%
883	Pump speed max	Pump speed max HC1	Pump speed max HC1	100	BZ 882	BZ 886	%
885	Pump speed min OEM	Pump speed minOEMHC1	Pump speed min OEM HC1	50	0	BZ 882	%
886	Pump speed max OEM	Pump speed maxOEMHC1	Pump speed max OEM HC1	100	BZ 883	100	%
888	Curve readj at 50% speed	CurveReadj50%SpeedHC1	Curve readj at 50% speed HC1	33	0	100	%
889	Filter time const speed ctrl	FilterTmeSpeedCtrlHC1	Filter time const speed ctrl HC1	5	0	20	Min.
890	Flow setp readj speed ctrl No ¦ Yes	FlowReadjSpeedCtrlHC1	Flow setp readj speed ctrl HC1	Yes			
898	Operating level changeover Frost protection ¦ Reduced ¦ Comfort	OptgLevelCh’over HC1	Operating level changeover HC1	Reduced			
900	Optg mode changeover	OptgModeCh’over HC1	Operating mode changeover HC1	Protection			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	None ¦ Protection ¦ Reduced ¦ Comfort ¦ Automatic						
[4291.1]		Delay speed ctrl HC1	Delay speed control HC1	5	- - - / 0	60	Min.
Cooling circuit 1							
901	Operating mode cooling circuit 1 Off ¦ Automatic	OptgMode CC1	Operating mode cooling circuit 1	Off			-
904	Protection setpoint cooling circuit 1	RmTmp prot setp CC1	Room temp protection setpoint cooling circuit 1	40	- - - / 15	40	°C
932	Room temp limitation cooling circuit 1	RmTmp limitation CC1	Room temp limitation cooling circuit 1	1	- - - / 0,5	4	°C
Heating circuit 2							
1000	Operating mode Protection ¦ Automatic ¦ Reduced ¦ Comfort	OptgMode HC2	Operating mode heat circuit 2	Automatic			-
1010	Comfort setpoint	RoomTemp ComfSetp HC2	Room temperature Comfort setpoint HC2	20.0	BZ 1012	BZ 1016	°C
1012	Reduced setpoint	RmTmp RedSetp HC2	Room temp reduced setpoint heat circuit 2	16	BZ 1014	BZ 1010	°C
1014	Frost protection setpoint	RmTmpFrostProtSetpHC2	Room temp frost protection setpoint HC2	10.0	4	BZ 1012	°C
1016	Comfort setpoint max	ComfortSetp max HC2	Comfort setpoint max HC2	35.0	BZ 1010	35	°C
1020	Heating curve slope	Heating curve 2 slope	Heating curve 2 slope	1.50	0.10	4.00	-
1021	Heating curve displacement	HeatCurvParalDisplHC2	Heating curve parallel displacement HC2	0.0	-4.5	4.5	°C
1026	Heating curve adaption Off ¦ On	HeatCurve adapt HC2	Heating curve adaptation heat circuit 2	Off			-
1030	Summer/winter heating limit	Su/WiCh’overTmpHC2	Summer/winter changeover temp heat circuit 2	18	– – –/8	30	°C
1032	24-hour heating limit	24hour HeatLimit HC2	24-hour heating limit HC2	-3	– – –/-10	10	°C
1033	Ext’n 24-hour heating limit No ¦ Yes	Ext 24hour HeatLimHC2	Ext 24-hour heating limit HC2	Yes			
1040	Flow temp setpoint min	FlowTmp MinLimitn HC2	Flow temp min limitation heat circuit 2	8	8	BZ 1041	°C
1041	Flow temp setpoint max	FlowTmp MaxLimitn HC2	Flow temp max limitation heat circuit 2	80	BZ 1040	95	°C

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
1042	Flow temp setpoint room stat	FlowSetp RmStat HC2	Flow temp setpoint room thermostat HC2	65	– – –/BZ 1040	BZ 1041	°C
1044	Swi-on ratio room stat	SwiOnRat RmStat HC2	Swi-on ratio room thermostat HC2	– – –	– – –/1	99	%
1046	Delay heat request	Delay request HC2	Delay heat request HC2	0	0	600	s
1050	Room influence	RmTmp gain factor HC2	Room temp gain factor HC2	20	– – –/1	100	%
1060	Room temp limitation	RmTmp limitation HC 2	Room temperature limitation HC2	1	– – –/0.5	4	°C
1061	Heating limit room controller	Heating limit RC HC2	Heating limit room control HC2	– – –	– – –/0	100	%
1070	Boost heating	RmTmp SetpBoost HC2	Room temp setpoint boost HC2 (boost heating)	5	– – –/0	20	°C
1080	Quick setback Off ¦ Down to reduced setpoint ¦ Down to frost prot setpoint	Quick setback HC2	Quick setback HC2	Down to reduced setpoint			-
1090	Optimum start control max	OptStartCtrl MaxTime2	Optimum start control max forward shift HC2	0	0	360	Min.
1091	Optimum top control max	OptStopCtrl MaxTime2	Optimum stop control max forward shift HC2	0	0	360	Min.
1094	Heat up gradient	Heat up gradient	Heat up gradient	60	0	600	min/k
1100	Reduced setp increase start	StartRedRTSetpIncrHC2	Start reduced room temp setpoint increase HC2	– – –	– – –/BZ 1101	10	°C
1101	Reduced setp increase end	EndRedRTSetpIncrHC2	End reduced room temp setpoint increase HC2	-15	-30	BZ 1100	°C
1109	Continuous pump operation No ¦ Yes	Continuous PumpOp HC2	Continuous pump operation HC2	No			
1112	Frost protection flow temp Off ¦ On	FrostProtFlowTemp HC2	Frost protection flow temp HC2	On			
1120	Opertemp prot pump circuit Off ¦ On	HC2 overtemp prot	Pump heating circuit overtemp protection HC2	On			-
1130	Mixing valve boost	MixValveSetpBoost HC2	Mixing valve setpoint boost HC2	5	0	50	°C
1132	Actuator type 2-position ¦ 3-position	Actuator CtrlMode HC2	Actuator control mode HC2	3-position			-
1133	Switching differential 2-pos	Actuator SwiDiff HC2	Actuator switching differential HC2	2	0	20	°C
1134	Actuator running time	Actuator RunTime HC2	Actuator running time HC2	120	30	873	s
1135	Mixing valve Xp	Xp heating circuit 2	P-band (Xp) HC2	32	1	100	°C

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
1136	Mixing valve Tn	Tn heating circuit 2	Integral action time (Tn) HC2	120	10	873	s
1150	Floor curing function Off ¦ Functional heating ¦ Curing heating ¦ Functional/curing heating ¦ Curing/functional heating ¦ Manually	FloorDryUp funct 2	Floor dry up function HC1	Off			-
1151	Floor curing setp manually	FloorSetp man HC2	Floor setpoint manually HC2	25	0	95	°C
1155	Floor curing setp current	FlowTmpSetFloorDryUp2	Flow temp setpoint floor dry up HC2		0	95	°C
1156	Floor curing day current	FloorDryUp day 2	Floor dry up day HC2		0	32	~~°C~~
1161	Excess heat draw Off ¦ Heating mode ¦ Always	Overtemp drop HC2	Overtemperature drop HC2	Always			
1170	With buffer No ¦ Yes	HC2 with buffer	Heating circuit 2 with buffer	Yes			-
1172	With primary contr/system pump No ¦ Yes	HC2 prectrl/SystPump	Heating circuit 2 with precontrol/system pump	Yes			
1180	Pump speed reduction Operating level ¦ Characteristic	Pump speed red HC2	Pump speed reduction HC2	Characteristic			
1181	Starting speed	Starting speed HC2	Starting speed HC2	100	0	100	%
1182	Pump speed min	Pump speed min HC2	Pump speed min HC2	50	BZ 1185	BZ 1183	%
1183	Pump speed max	Pump speed max HC2	Pump speed max HC2	100	BZ 1182	BZ 1186	%
1185	Pump speed min OEM	Pump speed minOEMHC2	Pump speed min OEM HC2	50	0	BZ 1182	%
1186	Pump speed max OEM	Pump speed maxOEMHC2	Pump speed max OEM HC2	100	BZ 1183	100	%
1188	Curve readj at 50% speed	CurveReadj50%SpeedHC2	Curve readj at 50% speed HC2	33	0	100	%
1189	Filter time constant speed ctrl	FilterTimeSpCtrl HC2	Filter time const speed ctrl HC2	5	0	20	Min.
1190	Flow setp readj speed ctrl No ¦ Yes	FlowReadjSpeedCtr HC2	Flow setp readj speed ctrl HC2	Yes			
1198	Operating level changeover Frost protection ¦ Reduced ¦ Comfort	OptgLevel Ch'over HC2	Operating level changeover HC2	Reduced			
1200	Optg mode changeover None ¦ Protection ¦ Reduced¦ Comfort ¦ Automatic	OptgMode Ch'over HC 2	Operating mode changeover HC2	Protection			
[4291.2]		Delay speed ctrl HC2	Delay speed control HC2	5	- - -/0	60	Min.
Heating circuit 3							
1300	Operating mode Protection ¦ Automatic ¦ Reduced ¦ Comfort	OptgMode HC3	Operating mode HC3/P	Automatic			-
1310	Comfort setpoint	RoomTemp ComfSetp HC3	Room temperature Comfort setpoint	20.0	BZ 1312	BZ 1316	°C

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
			HC3/P				
1312	Reduced setpoint	RedRTSetp HC3/P	Reduced room temperature setpoint HCP	16	BZ 1314	BZ 1310	°C
1314	Frost protection setpoint	RTFrostProtSetp HC3/P	Room temperature frost protection setpoint HC3/P	10.0	4	BZ 1312	°C
1316	Comfort setpoint max	ComfSetp max HC3/P	Comfort setpoint max HC3/P	35.0	BZ 1310	35	°C
1320	Heating curve slope	HeatCurvSlope HC3/P	Heating curve slope HC3/P	1.50	0.10	4.00	-
1321	Heating curve displacement	HeatCurvParalDisplHCP	Heating curve parallel displacement HC3/P	0.0	-4.5	4.5	°C
1326	Heating curve adaption Off ¦ On	HeatCurvAdapt HC3/P	Heating curve adaption HC3/P	Off			-
1330	Summer/winter heating limit	Su/WiCh'overT HC3/P	Summer/winter changeover temperature HC3/P	18	– – – / 8	30	°C
1332	24-hour heating limit	24hourHeatLim HC3/P	24-hour heating limit HC3/P	-3	– – – / -10	10	°C
1333	Ext'n 24-hour heating limit No ¦ Yes	Ext 24hour HeatLim HC3	Ext 24-hour heating limit HC3	Yes			
1340	Flow temp setpoint min	FT min limit HC3/P	Flow temperature min limitation HC3/P	8	8	BZ 1341	°C
1341	Flow temp setpoint max	FT max limit HC3/P	Flow temperature max limitation HC3/P	80	BZ 1340	95	°C
1342	Flow temp setpoint room stat	FlowRmStat HC3/P	Flow temp setpoint room thermostat HC3/P	65	– – – / BZ 1340	BZ 1341	°C
1344	Swi-on ratio room stat	SwiOnRat RmStat HC3/P	Swi on ratio room thermosta HC3/P	– – –	– – – / 1	99	%
1346	Delay heat request	Delay request HC3	Delay heat request HC3	0	0	600	s
1350	Room influence	RmTmpAuthority HC3/P	Room temperature authority HC3/P	20	– – – / 1	100	%
1360	Room temp limitation	RmTmpLimitn HC3/P	Room temperature limitation HC3/P	1	– – – / 0,5	4	°C
1361	Heating limit room controller	Heating lim RC HC3/P	Heating limit room controller HC3/P	– – –	– – – / 0	100	%
1370	Boost heating	RmSetpBoost HC3/P	Room setpoint boost HC3/P (boost heating)	5	– – – / 0	20	°C
1380	Quick setback Off ¦ Down to reduced setpoint ¦ Down to frost prot setpoint	QuickSetback HC3/P	Quick setback HC3/P	Down to reduced setpoint			-
1390	Optimum start control max	OptStartMaxShift 3/P	Optimum start control max forward	0	0	360	Min.

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
			shift HC3/P				
1391	Optimum top control max	OptStopMaxShift 3/P	Optimum stop control max forward shift HC3/P	0	0	360	Min.
1394	Heat up gradient	Heat up gradient	Heat up gradient	60	0	600	min/K
1400	Reduced setp increase start	StartRedRTIncr HC3/P	Start reduced room temp setpoint increase HC3/P	– – –	– – – / BZ 1401	10	°C
1401	Reduced setp increase end	EndRedRTIncr HC3/P	End reduced room temp setpoint increase HC3/P	-15	-30	BZ 1400	°C
1409	Continuous pump operation No ¦ Yes	Continuous PumpOp HC3	Continuous pump operation HC3	No			
1412	Frost protection flow temp Off ¦ On	FrostProtFlowTemp HC3	Frost protection flow temp HC3	On			
1420	Overtemp prot pump circuit Off ¦ On	OvertempProt HC3/P	Pump heating circuit overtemp protection HC3/P	On			-
1430	Mixing valve boost	MixValveBoost HC3/P	Mixing valve setpoint boost HC3/P	5	0	50	°C
1432	Actuator type 2-position ¦ 3-position	ActuatorCtrlMod HC3/P	Actuator control mode HC3/P	3-position			-
1433	Switching differential 2-pos	ActuatorSwiDiff HC3/P	Actuator switching differential heat circuit 3/P	2	0	20	°C
1434	Actuator running time	ActuatorRunTime HC3/P	Actuator running time heat circuit 3/P	120	30	873	s
1435	Mixing valve Xp	Xp heating circuit 3/P	P-band (Xp) HC3/P	32	1	100	°C
1436	Mixing valve Tn	Tn heating circuit 3/P	Integral action time (Tn) HC3/P	120	10	873	s
1450	Floor curing function Off ¦ Functional heating ¦ Curing heating ¦ Functional/curing heating ¦ Curing/functional heating ¦ Manually	FloorCur funct HC3/P	Floor curing function HC3/P	Off			-
1451	Floor curing setp manually	FloorSetp man HC3/P	Floor setpoint manually HC3/P	25	0	95	°C
1455	Floor curing setp current	FTSetpFloorCur HC3/P	Flow temperature setpoint floor curing HC3/P		0	95	°C
1456	Floor curing day current	FloorCuringDay HC3/P	Floor curing day HC3/P		0	32	
1461	Excess heat draw Off ¦ Heating mode ¦ Always	Overtemp drop HC3/P	Overtemperature drop HC3/P	Always			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
1470	With buffer No ¦ Yes	HC3/P with buffer	Heating circuit 3/P with buffer	Yes			-
1472	With primary contr/system pump No ¦ Yes	HC3/P prectrl/SystPu	Heating circuit 3/P with precontrol/system pump	Yes			
1480	Pump speed reduction Operating level ¦ Characteristic	Pump speed red HC3/P	Pump speed reduction HC3/P	Characteristic			
1481	Starting speed	Starting speed HC3	Starting speed HC3	100	0	100	%
1482	Pump speed min	Pump speed min HC3/P	Pump speed min HC3/P	50	BZ 1485	BZ 1483	%
1483	Pump speed max	Pump speed max HC3/P	Pump speed max HC3/P	100	BZ 1482	BZ1486	%
1485	Pump speed min OEM	Pump speed minOEMHC3	Pump speed min OEM HC3	50	0	BZ 1482	%
1486	Pump speed max OEM	Pump speed maxOEMHC3	Pump speed max OEM HC3	100	BZ 1483	100	%
1488	Curve readj at 50% speed	CurveReadj50%SpeedHC3	Curve readj at 50% speed HC3	33	0	100	%
1489	Filter time const speed ctrl	FilterTimeSpCtrlHC3	Filter time const speed ctrl HC3	5	0	20	Min.
1490	Flow setp readj speed ctrl No ¦ Yes	FlowReadjSpeedCtr HC3	Flow setp readj speed ctrl HC3	Yes			
1498	Operating level changeover Frost protection ¦ Reduced ¦ Comfort	OptgLevelCh'overHC3	Operating level changeover HC3	Reduced			
1500	Optg mode changeover None ¦ Protection ¦ Reduced ¦ Comfort ¦ Automatic	OptgModeCh'over HC3/P	Operating mode changeover HC3/P	Protection			
[4291.3]		Delay speed ctrl HC3	Delay speed control HC3	5	- - - / 0	60	Min.
DHW							
1600	Operating mode Off ¦ On ¦ Eco	DHW OptgMode	DHW operating mode	On			-
1610	Nominal setpoint	DHW NomSetp	DHW temperature nominal setpoint	55	BZ 1612	BZ 1614	°C
1612	Reduced setpoint	DHW RedSetp	DHW temperature reduced setpoint	40	8	BZ 1610	°C
1614	Nominal setpoint max	DHW NomSetp max	DHW temperature nominal setpoint max	65	BZ 1610	80	°C
1620	Release 24h/day ¦ Time programs HCs ¦ Time program 4/DHW	DHW release	DHW release	Time programs HCs			-
1630	Charging priority Absolute ¦ Shifting ¦ None ¦ MC shifting, PC absolute	DHW charging priority	DHW charging priority	MC shifting, PC absolute			-
1640	Legionella function Off ¦ Periodically ¦ Fixed weekday	Legionella function	Legionella function	Fixed weekday			-
1641	Legionella funct periodically	LegioFunctPeriodicity	Legionella function periodicity	3	1	7	Days

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
1642	Legionella funct weekday Monday ¦ Tuesday ¦ Wednesday ¦ Thursday ¦ Friday ¦ Saturday ¦ Sunday	LegioFunction Day	Legionella function day	Monday			
1644	Legionella function time	LegioFunctTime	Time for legionella function	– – –	– – – / 00:00	23:50	hh:mm
1645	Legionella funct setpoint	LegionellaFunctSetp	Legionella function setpoint	65	55	95	°C
1646	Legionella funct duration	DwellTimeLegFunctSetp	Dwelling time at legionella function setpoint	30	– – – / 10	360	Min.
1647	Legionella funct circ pump Off ¦ On	CircPumpOpLegioFunct	Circulating pump operation during legionella function	On			-
1660	Circulating pump release Time program 3/HC3 ¦ DHW release ¦ Time program 4/DHW ¦ Time program 5	DHW CircPump release	DHW circulation pump release	DHW release			-
1661	Circulating pump cycling Off ¦ On	DHW CircPump cycling	DHW circulating pump cycling	On			-
1663	Circulation setpoint	DHW Circ Setpoint	DHW circulation setpoint	45	8	80	°C
1680	Optg mode changeover None ¦ Off ¦ On ¦ Eco	OptgModeCh’over DHW	Operating mode changeover DHW	Off			
Consumer circuit 1							
1859	Flow temp setp cons request	FlowTSetpConsReq 1	Flow temp setp cons request 1	70	8	120	°C
1874	DHW charging priority No ¦ Yes	DHWChargPrio ConsC1	DHW charging priority consumer circuit 1	Yes			
1875	Excess heat draw Off ¦ On	Overtemp drop ConsC1	Overtemperature drop consumer circuit 1	On			
1878	With buffer No ¦ Yes	ConsC1 with buffer	Consumer circuit 1 with buffer	Yes			
1880	With prim contr/system pump No ¦ Yes	ConsC1 prectrl/SystPu	Consumer circuit 1 with precontrol/system pump	Yes			
Consumer circuit 2							
1909	Flow temp setp cons request	FlowTSetpConsReq 2	Flow temp setp cons request 2	70	8	120	°C
1924	DHW charging priority No ¦ Yes	DHWChargPrio ConsC2	DHW charging priority consumer circuit 2	Yes			
1925	Excess heat draw Off ¦ On	Overtemp drop ConsC2	Overtemperature drop consumer circuit 2	On			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
1928	With buffer No ¦ Yes	ConsC2 with buffer	Consumer circuit 2 with buffer	Yes			
1930	With prim contr/system pump No ¦ Yes	ConsC2PreCtrl/SystPu	Consumer circuit 2 with precontrol/system pump	Yes			
Swimming pool circuit							
1959	Flow temp setp swi pool	FlowTmpSetp SwiPool	Flow temp setp swimming pool	70	8	120	°C
1974	DHW charging priority No ¦ Yes	DHWChargPrio SwiPool	DHW charging priority swimming pool circuit	Yes			
1975	Excess heat draw Off ¦ On	Overtemp drop SwiPool	Overtemperature drop swimming pool circuit	On			
1978	With buffer No ¦ Yes	SwiPool with buffer	Swimming pool circuit with buffer	Yes			
1980	With prim contr/system pump No ¦ Yes	SwiPoolPrectrl/SystPu	Swimming pool circuit with precontrol/system pump	Yes			
Swimming pool							
2055	Setpoint solar heating	SwiPool setpoint solar	Swimming pool setpoint solar heating	26	8	80	°C
2056	Setpoint source heating	SwiPool setp source	Swimming pool setpoint heat source	22	8	80	°C
2065	Charging priority solar Priority 1 ¦ Priority 2 ¦ Priority 3	SwiPool temp max	Swimming pool temperature maximum	Priority 3			
2070	Swimming pool temp max	SwiPool with solar	Swimming pool with solar	32	BZ 2055	95	°C
2080	With solar integration No ¦ Yes	SwiPool setpoint solar	Swimming pool setpoint solar heating	Yes			
Primary contr/system pump							
2110	Flow temp setpoint min	FT MinLimitn prectrl	Flow temp min limitation precontrol	8	8	BZ 2111	°C
2111	Flow temp setpoint max	FT MaxLimitn prectrl	Flow temp max limitation prectrl	80	BZ 2110	95	°C
2121	System pump on heat gen lock Off ¦ On	SystPump HeatGenLock	System pump on heat gen lock	Off			
2130	Mixing valve boost	MixVaSetpBstPrimContr	Mixing valve setpoint boost primary controller	10	0	50	°C
2132	Actuator type 2-position ¦ 3-position	ActCtrlMode prectrl	Actuator control mode prectrl	3-position			
2133	Switching differential 2-pos	ActSwiDiff prectrl	Actuator switching differential prectrl	2	0	20	°C

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
2134	Actuator running time	ActRunTime prectrl	Actuator running time prectrl	120	30	873	s
2135	Mixing valve Xp	Xp primary controller	P-band (Xp) primary controller	32	1	100	°C
2136	Mixing valve Tn	Tn primary controller	Integral action time (Tn) primary controller	120	10	873	s
2150	Primary contr/system pump Before buffer ¦ After buffer	PrimContr/SystPump	Primary controller/system pump	After buffer			-
Boiler							
2203	Release below outside temp	Release below OT	Release below outside temp	0	- - - / -50	50	°C
2208	Full charging buffer Off ¦ On	Full charging buffer	Full charging buffer	Off			
2210	Setpoint min	BoilTmp MinLimitn	Boiler temp min limitation	40	BZ 2211	BZ2214	°C
2211	Setpoint min OEM	BoilTmp MinLimitn OEM	Boiler temp min limitation OEM	40	8	BZ 2210	°C
2212	Setpoint max	BoilTmp MaxLimitn	Boiler temp max limitation	80	BZ 2214	BZ 2213	°C
2213	Setpoint max OEM	BoilTmp MaxLimitn OEM	Boiler temp max limitation OEM	85	BZ 2212	120	°C
2214	Setpoint manual control	BoilerSetp man	Boiler temperature setpoint in manual operation	60	BZ 2210	BZ 2212	°C
2217	Setpoint frost protection	Setp frost protection	Setpoint frost protection	8	- - - / -20	20	°C
2233	P-band Xp HCs	P-band Xp HCs	P-band Xp HCs	52	1	200	°C
2234	Int action time Tn HCs	Tn heating	Integral action time (Tn) heating	80	4	873	s
2235	Der action time Tv HCs	Tv heating	Derivative action time (Tv) heating	0	0	30	s
2236	P-band Xp DHW	P-band Xp DHW	P-band Xp DHW	34	1	200	°C
2237	Int action time Tn DHW	Tn DHW	Integral action time (Tn) DHW	80	4	873	s
2238	Der action time Tv DHW	Tv DHW	Derivative action time (Tv) DHW	8	0	30	s
2241	Burner running time min	BurnRunTime MinLimtn	Burner running time min limitation	0	0	20	Min.
2243	Burner off time min	Burner off time min	Burner off time min	0	0	20	Min.
2245	SD burner off time	SD burner off time	Max control diff without aborting pause	15	0	80	°C
2250	Pump overrun time	Pump overrun time	Pump overrun time	5	0	240	Min.
2253	Pump overr time after DHW	PumpOverrun after DHW	Pump overrun time after DHW	1	0	20	Min.
2260	Prot boil startup consumers	ProtStartupConsumers	Protective startup consumers	Off			
2263	Setpoint min on shutdown	SetpMin on shutdown	Setpoint min on shutdown	Off			
2264	Prot boil startup anticipation	ForeseeTmeStartupProt	Foreseeable time during protective	0	0	240	s

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
			startup				
2270	Return setpoint min	RetTmp limitation	Return temp limitation	8	BZ 2271	95	°C
2271	Return setpoint min OEM	MinLimtnBoilRetTmpEXP	Min limitation of the boiler return temp EXP	8	8	BZ 2270	°C
2272	Return influence consumers Off ¦ On	Boiler return	Boiler return	On			
2300	Frost prot plant boiler pump Off ¦ On	FrostProt Plant BoilPump	Frost protection for plant boiler pump	Off			
2301	Boiler pump on heat gen lock Off ¦ On	BoilPump HeatGenLock	Boiler pump at heat gen lock	Off			
2305	Impact heat generation lock Heating mode only ¦ Heating and DHW mode	Impact HeatGenLock	Impact heat generation lock	Heating mode only			
2310	Limit thermostat function Off ¦ On	Limit stat function	Limit stat function	On			
2316	Temp differential max	TempDifferential max	Temp differential max	20	– – – / 0	80	°C
2317	Temp differential nominal	TempDifferential nom	Temp differential nominal	10	– – – / 0	80	°C
2320	Pump modulation None ¦ Demand ¦ Boiler setpoint ¦ Temp differential nominal ¦ Burner output	Pump modulation	Pump modulation	Demand			
2321	Starting speed	Starting speed	Starting speed	100	– – – / 0	100	%
2322	Pump speed min	Pump speed min boiler	Pump speed min boiler	40	BZ 2327	BZ 2323	%
2323	Pump speed max	Pump speed max boiler	Pump speed max boiler	100	BZ 2322	BZ 2328	%
2324	Speed Xp	Pump speed XP boiler	Pump speed P-band XP boiler	32	1	200	°C
2325	Speed Tn	Pump speed Tn boiler	Pump speed integral action time (Tn) boiler	120	10	873	s
2326	Speed Tv	Pump speed Tv boiler	Pump speed derivative action time (Tv) boiler	10	0	30	s
2327	Pump speed min OEM	PumpSpeedMinOEMBoiler	Pump speed min OEM boiler	40	0	BZ 2322	%
2328	Pump speed max OEM	Pump speed max OEM	Pump speed max OEM	100	BZ 2323	100	%
2329	Pump setpoint reduction	Pump setp reduction	Pump setpoint reduction	10	0	20	°C
[6066.1]		LimMinBoilPumpMod Off | On	Limitation of minimum boiler pump modulation	Off			
2330	Output nominal	Nominal boiler output	Nominal boiler output	50	0	2000	kW

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
2331	Output basic stage	Nominal output 1st st	Nominal output 1st stage	30	0	2000	kW
2334	Output at pump speed min	Outp at pump speed min	Output at pump speed min	0	0	100	%
2335	Output at pump speed max	Outp at pump speed max	Output at pump speed max	100	0	100	%
2441	Fan speed heating max	FanSpeed heating max	Max speed at maximum output in heating mode	3800	BZ 9525	BZ 9530	Min.$^{-1}$
2442	Fan speed full charging max	FanSp full charg max	Fan speed full charging max	3800	BZ 9525	BZ 9530	Min.$^{-1}$
2443	Fan sp start value inst WH	FanSpStrtValInstWH	Fan speed start value inst WH	0	0	BZ 9530	Min.$^{-1}$
2444	Fan speed DHW max	Fan speed DHW max	Fan speed DHW max	- - -	- - - / BZ 9525	BZ 9530	Min.$^{-1}$
2445	Fan shutdown heating mode Off ¦ On	FanShDownHeatMode	Fan shutdown heating mode	Off			
2446	Fan shutdown delay	Fan shutdown delay	Fan shutdown delay	3	0	200	s
2450	Controller delay Off ¦ Heating mode only ¦ DHW mode only ¦ Heating and DHW mode	Fan switch-off delay	Fan switch-off delay	Heating mode only			
2452	Controller delay speed	Controller delay speed	Controller delay speed	2400	BZ 9525	BZ 9530	Min.$^{-1}$
2453	Controller delay duration	Controller delay	Controller delay after burner is started up	10	0	255	s
2454	Switching diff on HCs	SwiDiff on HCs	Switching diff on HCs	4	0	20	°C
2455	Switching diff off min HCs	SwiDiffOffMin HCs	Switching diff off min HCs	5	0	20	°C
2456	Switching diff off max HCs	SwiDiffOffMax HCs	Switching diff off max HCs	7	0	20	°C
2457	Settling time HCs	Settling time HCs	Settling time HCs	10	0	240	Min.
2460	Switching diff on DHW	SwiDiffOn DHW	Switching diff on DHW	5	0	20	°C
2461	Switching diff off min DHW	SwiDiffOffMin DHW	Switching diff off min DHW	6	0	20	°C
2462	Switching diff off max DHW	SwiDiffOffMax DHW	Switching diff off max DHW	8	0	20	°C
2463	Settling time DHW	Settling time DHW	Settling time DHW	10	0	240	Min.
2464	Dyn SD on setpoint change Off ¦ On	DynSDOnSetpChange	Dyn SD on setpoint change	Off			
2465	Min setpoint change dyn SD	MinSetpChange dyn SD	Min setpoint change dyn SD	20	0	80	°C
2466	Dyn SD with HC/DHW change Off ¦ On	Dyn SD HC/DHW change	Dyn SD with HC/DHW change	Off			
2467	Dyn SD when burner on Off ¦ On	Dyn SD burner on	Dyn SD when burner on	On			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
2470	Delay heat req special op	Delay req special	Delay heat req special op	0	0	600	s
2473	Flue gas temp output red	FlueGasT OutpRed	Treshold for output reduction at high flue gas temp	80	0	200	°C
2474	Flue gas temp swi-off limit	FlueGasTmp off limit	Flue gas temp switch-off limit	85	0	200	°C
2476	Flue gas superv shutdown Start prevention ¦ Lockout position	FlueGasSupervShDown	Flue gas superv shutdown	Lockout position			
2477	Flue gas superv st prev tme	FlueGasSupervStPrevT	Flue gas superv start prev tme	10	10	218	Min.
2478	Flue gas temp output limit	Flue gas OutputLimit	Flue gas temp output limit	80	0	200	°C
2479	Fl'g superv time con rel mod	Fl'gTimeConRelMod	Fl'g superv time con rel mod	0	0	50	s
2480	Static press superv sh'down Start prevention ¦ Lockout position	StatPrSupervShDown	Static press superv shutdown	Lockout position			
2490	Dyn press superv sh'down Start prevention ¦ Lockout position	DynPressSupervShDown	Dyn press superv shutdown	Lockout position			
2491	Dyn superv press diff min	DynSupervPressDiffMin	Dyn superv press diff min	0	0	5	bar
2492	Dyn superv press diff max	DynSupervPressDiffMax	Dyn superv press diff max	5	0	5	bar
2494	Dyn superv press increase No ¦ Yes	DynSupervPressInc	Dyn superv press increase	Ja			
2495	Dyn press superv time	Dyn PressSupervTime	Dyn press superv time	0,2	0	10	s
2496	Dyn press superv time const	Dyn PressSupervTConst	Dyn press superv tme const	1,6	0,6	5	s
2500	Pressure switch shutdown Start prevention ¦ Lockout position	PressSwitchShutdown	Pressure switch shutdown	Lockout position			
2502	Flow switch shutdown Start prevention ¦ Lockout position	FlowSwitchShutdown	Flow switch shutdown	Lockout position			
2504	Min on time switch	Min on time switch	Min on time switch	0,2	0	25	s
2510	Quick shutdown temp grad	QuickShDownTempGrad	Quick shutdown temp grad	– – –	– – – / 0	10	°C
2511	Quick shutdown superv time	QuickShDownSupervTime	Quick shutdown superv time	10	1	20	s
2512	Quick shutdown superv RT Off ¦ On	QuickShDownSupervRT	Quick shutdown superv RT	Off			
2527	Boiler temp output reduction	Boil temp output red	Boiler temp output reduction	80	0	140	°C
2528	Swi diff output reduction	SwiDiff output red	Swi diff output reduction	5	0	20	°C
2531	Cutout temp LT	Cutout temp limit stat	Cutout temperature limit thermostat	90	0	100	°C
[3911.1]		D't care trans TGrad	Duration of don't care transition temperature gradient	0	0	51	s
[3912.1]		D't care tr Ret ab Fl	Duration of don't care transition	0	0	51	s

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
			return above flow				
[4091.1]		Max rate FT increase	Maximum rate of flow temperature increase	3	0	20	K
[3913.1]		NumErr TmpGrad in 24h	Number of errors of temperature gradient in 24 hours	20	0	50	
[3914.1]		NumErr SLT in 24h	Number of errors SLT cutout in 24 hours	20	0	50	
[3916.1]		Max delta flow-return	Max delta between flow and return	40	0	50	°C
[3921.1]		NumErr d-T in 24h	Number of errors delta T in 24 hours	20	0	50	
[3923.1]		SwiDiff Ret ab Flow	Switching differential return above flow	15	5	20	°C
[3924.1]		NumErr Ret ab Fl 24h	Number of errors return above flow in 24 hours	20	0	50	
[3639.1]		TempBoilMaxSLTSec	TempBoilerMaxSLTSec	95	0	110	°C
[3925.1]		TempReturnMaxSLTSec	TempReturnMaxSLTSec	95	0	110	°C
2630	Auto deaeration procedure Off ¦ On	Auto deaeration proc	Auto deaeration procedure	Off			
2655	ON time deaeration	ON time deaeration	ON time deaeration	10	0	240	s
2656	OFF time deaeration	OFF time deaeration	OFF time deaeration	5	0	240	s
2657	Number of repetitions	Number of repetitions	Number of repetitions	3	0	100	~~s~~
2662	Deaeration time heat circuit	Deaeration time HC	Deaeration time heating circuit	10	0	255	Min.
2663	Deaeration time DHW	Deaeration time DHW	Deaeration time DHW	5	0	255	Min.
[4195.1]		Dyn press supervision	Dynamic press supervision	None			
[4196.1]		Flow supervision	Flow supervision	None			
[4197.1]		Outp red press switch	Output reduction with pressure switch	On			
[4198.1]		Dyn PressSupPumpDelay	Dynamic pressure supervision pump delay	0	0	10	s
[4199.1]		Dyn PressSupRepet	Dynamic pressure supervision repetitions	6	0	10	
[4200.1]		Dyn PressSup Pause	Dynamic pressure supervision pause	600	0	1200	s

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
[4201.1]		Dyn PressSup WarnOffs	Dynamic pressure supervision warning offset	0,2	0	1	bar
[4202.1]		Dyn PressSup AutoAct	Dynamic pressure supervision AutoActive	On			
Cascade							
3510	Lead strategy Late on, early off ¦ Late on, late off ¦ Early on, late off	CascadeControlStrat	Cascade control strategy	Late on, early off			
3511	Output band min	Output range Pmin	Output range, lower limit (Pmin)	40	0	BZ 3512	%
3512	Output band max	Output range Pmax	Output range, upper limit (Pmax)	90	BZ 3511	100	%
3530	Release integral source seq	RelLimit SourceSeq	Release limit source sequence	50	0	500	°C*Min.
3531	Reset integral source seq	ResetLimit SourceSeq	Reset limit source sequence	20	0	500	°C*Min.
3532	Restart lock	Restart lock time	Restart lock time	300	0	1800	s
3533	Switch on delay	SwitchOnDelayLagSourc	Switch-on delay lag heat source	5	0	120	Min.
3534	Forced time basic stage	ForcedTimeBasicStage	Forced time basic stage when source is switched on	60	0	1200	s
3540	Auto source seq ch'over	Time SourceSeqSwitch	Time to automatic source sequence switching	500	– – – / 10	990	h
3541	Auto source seq exclusion None ¦ First ¦ Last ¦ First and last	Excl SourceSeqSwitch	Exclusion automatic source sequence switching	None			
3544	Leading source Source 1 ¦ Source 2 ¦ Source 3 ¦ Source 4 ¦ Source 5 ¦ Source 6 ¦ Source 7 ¦ Source 8 ¦ Source 9 ¦ Source 10 ¦ Source 11 ¦ Source 12 ¦ Source 13 ¦ Source 14 ¦ Source 15 ¦ Source 16	Leading source	Leading source	Source 1			
3560	Return setpoint min	Cascade RetSetpMin	Cascade return setpoint minimum	8	BZ 3561	95	°C
3561	Return setpoint min OEM	Cascade RetSetpMinOEM	Cascade return setpoint minimum OEM	8	8	BZ 3560	°C
3562	Return influence consumers Off ¦ On	Boiler return	Cascade return	On			
3590	Temp differential min	MinTmpDiff HydrBalanc	Min temp differential hydraulic balancing	- - -	– – – / 0	20	°C
Extra heat source							
3690	Setpoint incr main source	SetpIncrMainSource	Setpoint incr main source	5	0	10	°C

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
Solar							
3810	Temp diff on	TempDiff solar on	Temp differential solar on	8	BZ 3811	40	°C
3811	Temp diff off	TempDiff solar off	Temp differential solar off	4	0	BZ 3810	°C
3812	Charg temp min DHW st tank	MinChargTemp DHW	Min charging temperature DHW storage tank	– – –	– – – / 8	95	°C
3813	Temp diff on buffer	TempDiff buffer on	Temperature differential buffer on	– – –	– – – / BZ 3814	40	°C
3814	Temp diff off buffer	TempDiff buffer off	Temperature differential buffer off	– – –	– – – / 0	BZ 3813	°C
3815	Charging temp min buffer	MinChargTemp buffer	Min charging temperature buffer	– – –	– – – / 8	95	°C
3816	Temp diff on swi pool	TempDiffSwiPool on	Temperature differential swimming pool ON	– – –	– – – / BZ 3817	40	°C
3817	Temp diff off swi pool	TempDiffSwiPool off	Temperature differential swimming pool OFF	– – –	– – – / 0	BZ 3816	°C
3818	Charging temp min swi pool	MinChargTemp SwiPool	Min charging temperature swimming pool	– – –	– – – / 8	95	°C
3822	Charging prio storage tank None ¦ DHW storage tank ¦ Buffer storage tank	ChargPrioStorTank	Charging priority storage	DHW storage tank			
3825	Charging time relative prio	Charg time rel prio	Charging time relative priority	– – –	– – – / 2	60	Min.
3826	Waiting time relative prio	Wait time rel prio	Wait time relative priority	5	1	40	Min.
3827	Waiting time parallel op	Wait time parallel	Wait time parallel operation	– – –	– – – / 0	40	Min.
3828	Delay secondary pump	Start delay sec pump	Start delay secondary pump	60	0	600	s
3830	Collector start function	Coll start function	Collector start function	– – –	– – – / 5	60	Min.
3831	Min run time collector pump	Min CollPump RunTime	Min collector pump running time	20	5	120	s
3832	Collector start function on	CollStart function on	Collector start function on	07:00	00:00	23:50	hh:mm
3833	Collector start function off	CollStart funct off	Collector start function off	19:00	00:00	23:50	hh:mm
3834	Collector start funct grad	CollStart funct grad	Collector start function gradient	– – –	– – – / 1	20	Min./°C
3840	Collector frost protection	CollFrostProtTemp	Collector frost protection temp	– – –	– – – / -20	5	°C
3850	Collector overtemp prot	CollOvertempProt	Collector overtemperature protection	– – –	– – – / 30	350	°C
3860	Evaporation heat carrier	Evaporation temp	Evaporation temperature of heat carrier	– – –	– – – / 60	350	°C
3865	Starting speed coll pump 1	StartSpeed CollPump 1	Starting speed coll pump 1	100	– – – / 0	100	%

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
3867	Starting speed exch pump	StartSpeed ExchPump	Starting speed exch pump	100	– – – / 0	100	%
3868	Starting speed buffer pump	StartSpeed BuffPump	Starting speed buffer pump	100	– – – / 0	100	%
3869	Starting speed swi pool pump	StartSpeed SwiPool pu	Starting speed swi pool pump	100	– – – / 0	100	%
3870	Pump speed min	PumpSpeed min solar	Pump speed min solar	40	BZ 3875	BZ 3871	%
3871	Pump speed max	PumpSpeed max solar	Pump speed max solar	100	BZ 3870	BZ 3876	%
3872	Speed Xp	PumpSpeed XP solar	Pump speed P-band XP solar	32	1	100	°C
3873	Speed Tn	PumpSpeed Tn solar	Pump speed Integral action time Tn solar	120	10	873	s
3875	Pump speed min OEM	PumpSpeed minOEM sol	Pump speed min OEM solar	40	0	BZ 3870	%
3876	Pump speed max OEM	PumpSpeed max OEM	Pump speed max OEM	100	BZ 3871	100	%
3880	Antifreeze None ¦ Ethylene glycol ¦ Propylene glycol ¦ Etyl and propyl glycol	TypeAntifreezeAdded	Type of antifreeze added	None			
3881	Antifreeze concentration	AntifreezeConcentr	Antifreeze concentration	30	1	100	%
3884	Pump capacity	VolumetricFlowSolPump	Volumetric flow solar pump	200	10	1500	l/h
3887	Pulse unit yield	Pulse unit yield	Pulse unit yield	10	0	100	l
Solid fuel boiler							
4102	Locks other heat sources Off ¦ On	SolidFuel LocksSources	Solid fuel boiler locks other sources	On			
4110	Setpoint min	SetpMin SolidFuel	Min solid fuel boiler setpoint	40	8	120	°C
4130	Temp diff on	TempDiff on SolidFuel	Temp differential on solid fuel boiler	8	BZ 4131 but min. 1	40	°C
4131	Temp diff off	TempDiff off SolidFuel	Temp differential off solid fuel boiler	4	0	BZ 4130	°C
4133	Comparative temp DHW sensor B3 ¦ DHW sensor B31 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flow temp setpoint ¦ Setpoint min	ComparTemp SolidFuel	Comparative temperature solid fuel boiler	Setpoint min			
4140	Pump overrun time	PumpOverrun SolidFuel	Pump overrun time solid fuel boiler	20	0	120	Min.
4141	Excess heat discharge	OverTmpDrop SolidFuel	Overtemperature drop solid fuel boiler	90	60	140	°C
4170	Frost prot plant boiler pump Off ¦ On	FrostPlntSolidFuelBoil	Frost protection for plant solid fuel boiler	Off			
Buffer storage tank							
4720	Auto generation lock	Auto generation lock	Automatic generation lock	With B4			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	None ¦ With B4 ¦ With B4 and B42/B41						
4721	Auto heat gen lock SD	Auto generation lock SD	Automatic generation lock switching differential	8	0	20	°C
4722	Temp diff buffer/HC	TempDiff Buffer/HC	Diff. Buffer/HC temp to source release	-5	-20	20	°C
4724	Min st tank temp heat mode	MinBufferTempHeatMode	Min buffer temp in heating mode	– – –	– – – / 8	95	°C
4750	Charging temp max	BufferCharg temp max	Buffer charging temp max	80	8	BZ 4751	°C
4751	Storage tank temp max	Buffer temp max	Buffer temp max	90	BZ 4750	95	°C
4755	Recooling temp	ReturnCooling buffer	Return cooling temperature buffer	60	8	95	°C
4756	Recooling DHW/HCs Off ¦ On	BufReturnCool DHW/HC	Buffer return cooling DHW/HC	Off			
4757	Recooling collector Off ¦ Summer ¦ Always	BufReturnCool Coll	Buffer return cooling collector	Off			
4783	With solar integration No ¦ Yes	Buffer with solar	Buffer with solar	None			
4790	Temp diff on return div	RetDivertingTmpDiffOn	Return diverting temp differential On	10	BZ 4791	40	°C
4791	Temp diff off return div	RetDivTempDiffOff	Return diverting temp differential Off	5	0	BZ 4790	°C
4795	Compar temp return div With B4 ¦ With B41 ¦ With B42	ComparTemp RetDiv	Comparative temperature return diverting	With B42			
4796	Optg action return diversion Temp decrease ¦ Temp increase	OptgAction RetDiv	Operating action return diverting	Temp increase			
4800	Partial charging setpoint	BufferPartialCharging	Buffer partial charging setpoint	– – –	– – – / 8	95	°C
4810	Full charging Off ¦ Current heat request ¦ Buffer setpoint	Full charging buffer	Full charging buffer	Off			
4811	Full charging temp min	FullChargTempMin	Full charging temperature min	8	8	80	°C
4813	Full charging sensor With B4 ¦ With B42/B41	Full charging sensor	Full charging sensor	With B42/B41			
DHW storage tank							
5010	Charging Once/day ¦ Several times/day	DHW charging	DHW charging	Several times/day			
5011	Forward shift charging	DHW ForwardShiftCharg	DHW forward shift charging	– – –	– – – / 00:30	04:00	h
5012	Forced charging Off ¦ On	DHW forced charging	DHW forced charging	On			
5020	Flow setpoint boost	DHW FlowSetpBoost	DHW flow setpoint boost	16	0	30	°C

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
5021	Transfer boost	DHW transfer boost	DHW transfer boost	8	0	30	°C
5022	Type of charging Recharging ¦ Full charging ¦ Full charging legio ¦ Full charg 1st time day ¦ Full charg 1st time legio	DHW RechargingControl	DHW recharging control	Full charging			
5024	Switching diff	DHW SwitchingDiff	DHW switching differential	5	0	20	°C
5030	Charging time limitation	DHW ChargTimeLimitn	DHW charging time limitation	150	– – – / 10	600	Min.
5040	Discharging protection Off ¦ Always ¦ Automatically	DHW DischargingProt	DHW discharging protection	Automatically			
5050	Charging temp max	DHW ChargTemp max	DHW charging temperature max	80	8	BZ 5051	°C
5051	Storage tank temp max	DHW StorTankTemp max	DHW storage tank temperature max	90	BZ 5050	95	°C
5055	Recooling temp	DHW ReturnCool Temp	DHW storage tank return cooling temperature	80	8	95	°C
5056	Recooling heat gen/HCs Off ¦ On	DHWReturnCool Gen/HC	DHW storage tank return cooling generation/HC	Off			-
5057	Recooling collector Off ¦ Summer ¦ Always	DHW ReturnCool Coll	DHW storage tank return cooling collector	Off			-
5060	El imm heater optg mode Substitute ¦ Summer ¦ Always	DHW el OptgMode	DHW electric immersion heater operating mode	Substitute			-
5061	El immersion heater release 24h/day ¦ DHW release ¦ Time program4/ DHW	DHW el release	DHW electric immersion heater release	DHW sensor			-
5062	El immersion heater control External thermostat ¦ DHW sensor	DHW el control	DHW electric immersion heater control	DHW sensor			-
5070	Automatic push Off ¦ On	DHW automatic push	DHW automatic push	On			
5071	Charging prio time push	ChargPrioTimePush	charging priority time push	0	0	120	Min.
5085	Excess heat draw Off ¦ On	DHW overtemp drop	DHW storage tank overtemperature drop	On			-
5090	With buffer No ¦ Yes	DHW buffer	DHW storage tank with buffer	No			
5092	With prim contr/system pump No ¦ Yes	DHW prectrl/SystPump	DHW storage tank with precontrol/system pump	No			
5093	With solar integration	DHW with solar	DHW storage tank with solar	Yes			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	No ¦ Yes						
5101	Pump speed min	Pump speed min DHW	Pump speed min DHW	40	BZ 5106	BZ 5102	%
5102	Pump speed max	Pump speed max DHW	Pump speed max DHW	100	BZ 5101	BZ 5107	%
5103	Speed Xp	PumpSpeed Xp DHW	Pump speed proportional band Xp	32	1	100	°C
5104	Speed Tn	PumpSpeed Tn DHW	Pump speed integral action time Tn	120	10	873	s
5105	Speed Tv	PumpSpeed Tv DHW	Pump speed derivative action time Tv	0	0	60	s
5106	Pump speed min OEM	PumpSpeed min OEM DHW	Pump speed min OEM	40	0	BZ 5101	%
5107	Pump speed max OEM	PumpSpeed max OEM DHW	Pump speed max OEM	100	BZ 5102	100	%
5108	Starting speed charg pump	StartSpeedCharg pump	Starting speed charg pump	100	--- / 0	100	%
5109	St speed interm circ pump	StartSpIntermCircPump	Starting speed intermediate circuit pump	100	--- / 0	100	%
5130	Transfer strategy Off ¦ Always ¦ DHW release	Transfer strategy	Transfer strategy	Always			
5131	Comparison temp transfer DHW sensor B3 ¦ DHW sensor B31	ComparTemp transfer	Comparative temperature transfer	DHW sensor B3			
5139	Interm circ boost recharging	IntermCircBoostRech	Interm circ boost recharging	2	0	10	°C
5140	Intermediate circuit boost	DHW charg circ boost	DHW charging circuit boost	2	0	10	°C
5141	Excess interm circ temp max	DHW charg cir bst max	DHW charging circuit boost max	2	2	20	°C
5142	Flow setp compensation delay	Delay flow setp contr	Delay flow setpoint contr	30	- - - / 0	60	s
5143	Flow setp compensation Xp	Xp flow setp contr	Prop band flow setpoint contr	24	1	100	°C
5144	Flow setp compensation Tn	Tn flow setp contr	Int act time flow setpoint contr	120	10	873	s
5145	Flow setp compensation Tv	Tv flow setp contr	Der act time flow setpoint contr	0	0	60	s
5146	Full charging with B36 No ¦ Yes	Full charge with B36	Full charge with B36	Yes			
[2385.1]		Foresee time DHW prio	Foreseeable time boiler temperature for DHW priority	240	0	240	s
[3196.1]		Tn boil temp DHW prio	Tn boiler temp DHW priority	10	0	255	min
5148	Min start temp diff Q33	MinStartTDiffQ33	Min start temp diff Q33	0	- - - / -20	20	°C
5151	Excess interm circ temp del	T Char cir exc supv	Charg cir excess superv delay	30	0	255	s
Instantaneous water heater							
5420	Flow setpoint boost	DHW FlowSetpBoost	DHW flow setpoint boost	16	0	30	°C
5429	Switching diff	DHW SwitchingDiff	DHW switching differential	5	0	20	°C

Line no.	Operating line Operator unit	 ACS420	 ACS700/ACS790	Default value	Min	Max	Unit
5444	Threshold flow detection	Threshold FlowDetect	Threshold flow detection	5	0,1	25,5	l/min
5445	Switching diff flow detection	SD FlowDetecSuppBu	Sw diff flow det supp bu	0,5	0,1	25,5	l/min
5450	Gradient end cons	Gradient end cons	Gradient end cons	0,25	-2	1,984375	K/s
5451	Gradient start cons keep hot	GradStartConsKeepHot	Grad start cons keep hot	-1	-2	0	K/s
5452	Gradient start cons	Gradient start cons	Gradient start cons	-1	-2	0	K/s
5455	Setp readj cons 40°C	Setp readj cons 40°C	Setp readj cons 40°C	0	-20	20	°C
5456	Setp readj cons 60°C	Setp readj cons 60°C	Setp readj cons 60°C	0	-20	20	°C
5460	Setpoint keep hot	Setpoint keep hot	Setpoint keep hot	50	- - - / 10	60	°C
5461	Readj setp keep hot 40°C	ReadjSetpKeepHot 40°C	Readj setp keep hot 40°C	0	-20	20	°C
5462	Readj setp keep hot 60°C	ReadjSetpKeepHot 60°C	Readj setp keep hot 60°C	0	-20	20	°C
5464	Keep hot release 24h/day ¦ DHW release ¦ Time program 3/HC3 ¦ Time program 4/DHW ¦ Time program 5	Keep hot release	Keep hot release	DHW release			
5468	Min cons time for keep hot	MinConsT keep hot	Min cons time for keep hot	5	0	60	s
5470	Keep hot time wo heating	Keep hot time wo heat	Keep hot time wo heating	10	0	1440	Min.
5471	Keep hot time with heating	Keep hot T with heat	Keep hot time with heating	5	0	30	Min.
5472	Pump overrun time keep hot	Pump over T keep hot	Pump overrun time keep hot	20	0	255	Min.
5473	Pump overrun time keep hot	Pump over T keep hot	Pump overrun time keep hot	0	0	59	s
5475	Control sensor keep hot Boiler sensor B2 ¦ Return sensor B7 ¦ DHW outlet sensor B38	Contr sensor keep hot	Control sensor keep hot	Boiler sensor B2			
5482	Flow switch time cons	Tme DHW FlowSwi cl	Time DHW flow switch is closed	0	0	10	s
5489	Overrun via inst WH Off ¦ On	Overrun via instWH	Overrun via inst WH	On			
5530	Pump speed min	PumpSpeedMin instWH	Pump speed min instantaneous water heater	40	BZ 5535	BZ 5531	%
5531	Pump speed max	PumpSpeedMax instWH	Pump speed max instantaneous water heater	100	BZ 5530	BZ 5536	%
5535	Pump speed min OEM	PumpSp minOEM instWH	Pump speed min OEM instantaneous water heater	40	0	BZ 5530	%
5536	Pump speed max OEM	Pump speed max OEM	Pump speed max OEM	100	BZ 5531	100	%
5537	Starting speed	Starting speed	Starting speed	100	- - - / 0	100	%
5550	Aqua booster	Aqua booster	Aqua booster	No			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	No ¦ Yes ¦ Yes, wo gradient detection						
[4765.1]		Aqua booster Ge	Aqua booster Ge	Off			
[4766.1]		Abs SwiOffCondAquaB	Absolute switch-off condition aqua booster	Off			
[4767.1]		Output increase AquaB	Output increase aqua booster	Off			
[4768.1]		Min KeepHotTime AquaB	Min keep hot time aqua booster	0	0	255	Min.
[4769.1]		Interv burner off time	Interval burner off time	0	0	255	s
[4770.1]		Interv burner on time	Interval burner on time	0	0	255	s
[4771.1]		Interv outp increase	Interval output increase	0	0	255	Min.
[4772.1]		Abs TempSwiOffThresh	Absolute temperature switch-off threshold	0	-20.0	20.0	°C
[4773.1]		Pump overrun AquaB	Pump overrun aqua booster	0	0	255	s
[4774.1]		Pump overr KeepHotEnd	Pump overrun keep hot end	0	0	1024	s
[4775.1]		OnDiff KeepHot AquaB	Switch-on differential keep hot aqua booster	0	0	255	°C
[4776.1]		OffDiff KeepHot AquaB	Switch-off differential keep hot aqua booster	0	0	255	°C
Configuration							
5700	Presetting Changed ¦ Unchanged	PlantDiagram sel		Changed 1...4			-
			Plant diagram preselection	- - -	- - - / 1	4	-
			Plant diagram preselection Changed ¦ Unchanged	Changed			
5710	Heating circuit 1 Off ¦ On	HC 1	Heating circuit 1	On			-
5711	Cooling circuit 1 Off ¦ 4-pipe system	Cooling circuit 1	Cooling circuit 1	Off			-
5715	Heating circuit 2 Off ¦ On	Heating circuit 2	Heating circuit 2	Off			-
5721	Heating circuit 3 Off ¦ On	Heating circuit 3	Heating circuit 3	Off			-
5730	DHW sensor DHW sensor B3 ¦ Thermostat | DHW outlet sensor B38	DHW sensor	DHW sensor	DHW sensor B3			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
5731	DHW controlling element No charging request ¦ Charging pump ¦ Diverting valve	DHW control element	DHW controlling element	Charging pump			-
5732	Pump off change div valve	Pump off change DV	Pump off time at change from heating to DHW	0	0	10	s
5733	Delay pump off	Delay pump off	Pump off delay on change from heating to DHW	0	0	10	s
5734	Basic pos DHW div valve Last request ¦ Heating circuit ¦ DHW	BasicPos DHW DV	Basic pos DHW diverting valve	Last request			-
5736	DHW separate circuit Off ¦ On	DHW dedicated	Dhw dedicated	Off			-
5737	Optg action DHW div valve Position on DHW ¦ Position on heating circuit	Type DHW DV	Contact type DHW diverting valve	Position on DHW			-
5738	Midposition DHW div valve Off ¦ On	MidPos DHW DV	Midposition DHW diverting valve	Off			-
[4486.1]		DV DHW steps ph1	Number of steps diverting valve DHW stepper in startup phase	20	0	600	
[4489.1]		DV DHW step time ph1	Duration (part) step diverting valve DHW in startup phase	5	3	120	
[4483.1]		DV DHW st length ph1	Step length diverting valve DHW in startup phase	Eight-step			
[4487.1]		DV DHW steps ph2	Number of steps diverting valve DHW in adjusting phase	385	0	600	
[4490.1]		DV DHW step time ph2	Duration (part) step diverting valve DHW in adjusting phase	3	3	120	
[4484.1]		DV DHW st length ph2	Step length diverting valve DHW in adjusting phase	Full step			
[4488.1]		DV DHW steps ph3	Number of steps diverting valve DHW in end phase	75	0	600	
[4491.1]		DV DHW step time ph3	Duration (part) step diverting valve DHW in end phase	5	3	120	
[4485.1]		DV DHW st length ph3	Step length diverting valve DHW in end phase	Eight-step			
5774	Ctrl boiler pump/DHW valve All requests ¦ Request HC1/DHW only	CtrlBoilPump/DHWvalve	Ctrl boiler pump/DHW valve	All requests			-

Line no.	Operating line Operator unit	 ACS420	 ACS700/ACS790	Default value	Min	Max	Unit
5840	Solar controlling element Charging pump ¦ Diverting valve	Solar control elem	Solar controlling element	Charging pump			
5841	External solar exchanger None ¦ Commonly ¦ DHW storage tank ¦ Buffer storage tank	Ext solar exchanger	External solar exchanger	Commonly			
5870	Combi storage tank Yes ¦ No	Combi storage tank	Combi storage tank	No			-
5890	Relay output QX1 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Flue gas damper K37 ¦ Fan shutdown K38	Relay output QX1	Relay output QX1	Boiler pump Q1			-
5891	Relay output QX2 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦	Relay output QX2	Relay output QX2	None			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Flue gas damper K37 ¦ Fan shutdown K38						
5892	Relay output QX3 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Flue gas damper K37 ¦ Fan shutdown K38	Relay output QX3	Relay output QX3	None			
5894	Relay output QX4 None ¦ Heat gen shutoff valve Y4 ¦ Buffer return valve Y15 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34	Relay output QX4	Relay output QX4	None			
5930	Sensor input BX1 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26	Sensor input BX1	Sensor input BX1	None			-
5931	Sensor input BX2 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW	Sensor input BX2	Sensor input BX2	None			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	ACS420	ACS700/ACS790				
	charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26						
5932	Sensor input BX3 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26	Sensor input BX3	Sensor input BX3	None			
5950	Function of input H1 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure measurement 10V ¦ Output request 10V	H1 function selection	Input H1 function selection	None			-
5951	Contact type H1 NC ¦ NO	Typ of contact H1	Type of contact H1	NO			-
5953	Voltage value 1 H1	Voltage value 1 H1	Voltage value 1 H1	0	0	10	Volt
5954	Function value 1 H1	Function value 1 H1	Function value 1 H1	0	-1000	5000	-
5955	Voltage value 2 H1	Voltage value 2 H1	Voltage value 2 H1	0	0	10	Volt
5956	Function value 2 H1	Function value 2 H1	Function value 2 H1	0	-1000	5000	-
5960	Function input H3 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦	H3 function selection	Input H3 function selection	None			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure measurement 10V ¦ Output request 10V						
5961	Contact type H3 NC ¦ NO	Type of contact H3	Type of contact H3	NO			-
5963	Voltage value 1 H3	Voltage value 1 H3	Voltage value 1 H3	0	0	10	Volt
5964	Function value 1 H3	Function value 1 H3	Function value1 H3	0	-1000	5000	-
5965	Voltage value 2 H3	Voltage value 2 H3	Voltage value 2 H3	0	0	10	Volt
5966	Function value 2 H3	Function value 2 H3	Function value 2 H3	0	-1000	5000	-
5970	Function input H4 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Flow measurement Hz	H4 function selection	Input H4 function selection	None			-
5971	Contact type H4 NC ¦ NO	Type of contact H4	Type of contact H4	NO			-
5973	Frequency value 1 H4	Frequency value 1 H4	Frequency value 1 H4	0	0	1000	-
5974	Function value 1 H4	Function value 1 H4	Function value 1 H4	0	-1000	5000	-
5975	Frequency value 2 H4	Frequency value 2 H4	Frequency value 2 H4	0	0	1000	-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	ACS420	ACS700/ACS790				
5976	Function value 2 H4	Function value 2 H4	Function value 2 H4	0	-1000	5000	-
5977	Function input H5 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch	H5 function selection	Input H5 function selection	Room thermostat HK1			-
5978	Contact type H5 NC ¦ NO	Type of contact H5	Type of contact H5	NO			-
6008	Function input H6 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Gas pressure switch	H6 function selection	Input H6 function selection	None			-
6009	Contact type H6 NC ¦ NO	Type of contact H6	Type of contact H6	NO			-
6011	Function input H7 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦	H7 function selection	Input H7 function selection	None			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	ACS420	ACS700/ACS790				
	Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch						
6012	Contact type H7 NC ¦ NO	Type of contact H7	Type of contact H7	No			-
6020	Function extension module 1 None ¦ Multifunctional ¦ Heating circuit 1 ¦ Heating circuit 2 ¦ Heating circuit 3 ¦ Return temp controller ¦ Solar DHW ¦ Primary contr/system pump	Fctn ext module1	Function extension module 1	None			-
6021	Function extension module 2 None ¦ Multifunctional ¦ Heating circuit 1 ¦ Heating circuit 2 ¦ Heating circuit 3 ¦ Return temp controller ¦ Solar DHW ¦ Primary contr/system pump	Fctn ext module2	Function extension module 2	None			-
6022	Function extension module 3 None ¦ Multifunctional ¦ Heating circuit 1 ¦ Heating circuit 2 ¦ Heating circuit 3 ¦ Return temp controller ¦ Solar DHW ¦ Primary contr/system pump	Fctn ext module3	Function extension module 3	None			-
6024	Funct input EX21 module 1 None ¦ Limit thermostat HC	Fctn input EX21 mod1	Function input EX21 module 1	None			-
6026	Funct input EX21 module 2 None ¦ Limit thermostat HC	Fctn input EX21 mod2	Function input EX21 module 2	None			
6028	Funct input EX21 module 3 None ¦ Limit thermostat HC	Fctn input EX21 mod2	Function input EX21 module 2	None			
6030	Relay output QX21 module 1 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade	Relay QX21 module 1	Relay output QX21 module 1	None			

Line no.	Operating line Operator unit	ACS420	ACS700/ACS790	Default value	Min	Max	Unit
	pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38						
6031	Relay output QX22 module 1 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38	Relay QX22 module 1	Relay output QX22 module 1	None			
6032	Relay output QX23 module 1 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦	Relay QX23 module 1	Relay output QX23 module 1	None			

Line no.	Operating line Operator unit	ACS420	ACS700/ACS790	Default value	Min	Max	Unit
	DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38						
6033	Relay output QX21 module 2 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38	Relay QX21 module 2	Relay output QX21 module 2	None			
6034	Relay output QX22 module 2 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38	Relay QX22 module 2	Relay output QX22 module 2	None			

Line no.	Operating line Operator unit	ACS420	ACS700/ACS790	Default value	Min	Max	Unit
6035	Relay output QX23 module 2 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38	Relay QX23 module 2	Relay output QX23 module 2	None			
6036	Relay output QX21 module 3 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38	Relay QX21 module 3	Relay output QX21 module 3	None			
6037	Relay output QX22 module 3 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm	Relay QX22 module 3	Relay output QX22 module 3	None			

Line no.	Operating line Operator unit	ACS420	ACS700/ACS790	Default value	Min	Max	Unit
	output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38						
6038	Relay output QX23 module 3 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38	Relay QX23 module 3	Relay output QX23 module 3	None			
6040	Sensor input BX21 module 1 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦	Sensor BX21 module 1	Sensor input BX21 module 1	None			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	Solar return sensor B64 ¦ Primary exch sensor B26						
6041	Sensor input BX22 module 1 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26	Sensor BX22 module 1	Sensor input BX22 module 1	None			
6042	Sensor input BX21 module 2 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26	Sensor BX21 module 2	Sensor input BX21 module 2	None			
6043	Sensor input BX22 module 2 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26	Sensor BX22 module 2	Sensor input BX22 module 2	None			
6044	Sensor input BX21 module 3 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26	Sensor BX21 module 3	Sensor input BX21 module 3	None			
6045	Sensor input BX22 module 3 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common	Sensor BX22 module 3	Sensor input BX22 module 3	None			

Line no.	Operator unit	Operating line		Default value	Min	Max	Unit
		ACS420	**ACS700/ACS790**				
	return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26						
6046	Function of input H2 module 1 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Limit thermostat HC ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure measurement 10V ¦ Output request 10V	Function H2 module 1	Function input H2 module 1	None			
6047	Contact type H2 module 1 NC ¦ NO	Contact type H2 mod1	Contact type H2 module 1	NO			-
6049	Voltage value 1 H2 module 1	VoltageValue1 H2 mod1	Voltage value 1 H2 module 1	0	0	10	Volt
6050	Function value 1 H2 module 1	Funct value 1 H2 mod1	Funct value 1 H2 module 1	0	-1000	5000	-
6051	Voltage value 2 H2 module 1	VoltageValue2 H2 mod1	Voltage value 2 H2 module 1	0	0	10	Volt
6052	Function value 2 H2 module 1	Funct value 2 H2 mod1	Funct value 2 H2 module 1	0	-1000	5000	-
6054	Function of input H2 module 2 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Limit thermostat HC ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure	Function H2 module2	Function input H2 module 2	None			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	measurement 10V ¦ Output request 10V						
6055	Contact type H2 module 2 NC ¦ NO	Contact type H2 mod2	Contact type H2 module 2	NO			-
6057	Voltage value 1 H2 module 2	VoltageValue1 H2 mod2	Voltage value 1 H2 module 2	0	0	10	Volt
6058	Funct value 1 H2 module 2	Funct value 1 H2 mod2	Funct value 1 H2 module 2	0	-1000	5000	-
6059	Voltage value 2 H2 Module 2	VoltageValue2 H2 mod2	Voltage value 2 H2 module 2	0	0	10	Volt
6060	Funct value 2 H2 module 2	Funct value 2 H2 mod2	Funct value 2 H2 module 2	0	-1000	5000	-
6062	Function of input H2 module 3 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool generator ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Limit thermostat HC ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure measurement 10V ¦ Output request 10V	Function H2 module3	Function input H2 module 3	None			
6063	Contact type H2 module 3 NC ¦ NO	Contact type H2 mod 3	Contact type H2 module 3	NO			-
6065	Voltage value 1 H2 module 3	VoltageValue1 H2 mod3	Voltage value 1 H2 module 3	0	0	10	Volt
6066	Funct value 1 H2 module 3	Fctn value 1 H2 mod3	Funct value 1 H2 module 3	0	-1000	5000	-
6067	Voltage value 2 H2 module 3	VoltageValue2 H2 mod3	Voltage value 2 H2 module 3	0	0	10	Volt
6068	Funct value 2 H2 module 3	Fctn value 2 H2 mod3	Funct value 2 H2 module 3	0	-1000	5000	-
6085	Function output P1 None ¦ Boiler pump Q1 ¦ DHW pump Q3 ¦ DHW interm circ pump Q33 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ Heat circuit pump HC3 Q20 ¦ Collector pump Q5 ¦ Solar pump ext exch K9 ¦ Solar pump buffer K8 ¦ Solar pump swi pool K18 ¦ Instant WH pump Q34	P1 FctnSel	Output P1 function selection	None			
6097	Sensor type collector NTC ¦ Pt 1000	Sensor type collector	Sensor type collector	NTC			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
6098	Readjustm collector sensor	ValCorr CollTemp 1	Measured value corr collector sensor 1 (B6)	0	-20	20	°C
6100	Readjustm outside sensor	OT readjustment	Outside temp sensor measuring readjustment	0	-3.0	3.0	°C
6101	Sensor type flue gas temp NTC ¦ Pt 1000 ¦ NTC 20k	Sensor type flue gas	Sensor type flue gas temperature	NTC			
6102	Readjustm flue gas sensor	ValCorr FlueGasTemp	Measured value corr flue gas sensor (B8)	0	-20	20	°C
6110	Time constant building	Building time const	Building time constant	15	0	50	h
6116	Time constant setp compens	TimeConstSetpCompens	Time constant setpoint compensation	0	0	14	Min.
6117	Central setp compensation	CentralSetpShift	Central setpoint shift	20	– – – / 1	100	°C
6118	Setpoint drop delay	Setp reduct delay	Setpoint reduction delay	– – –	– – – / 1	200	°C
6120	Frost protection plant Off ¦ On	FrostProtection plant	Frost protection for the plant	Off			-
6127	Pump/valve kick duration	Pump/valve kick dur	Pump/valve kick duration	30	0	51	s
6140	Water pressure max	Water pressure max	Water pressure max	3	– – – / 0,0	10,0	bar
6141	Water pressure min	Water pressure min	Water pressure min	0,8	– – – / 0,0	10,0	bar
6142	Water pressure critical min	Water pressure crit min	Water pressure critical min	0,5	– – – / 0,0	10,0	bar
6143		Water pressure SD	Water pressure switching differential	0,3	0,0	10,0	bar
6150	Water pressure 2 max	Water pressure 2 max	Water pressure 2 max	3	– – – / 0,0	10,0	bar
6151	Water pressure 2 min	Water pressure 2 min	Water pressure 2 min	0,8	– – – / 0,0	10,0	bar
6152	Water press 2 critical min	Water pressure 2 crit min	Water pressure 2 critical min	0,5	– – – / 0,0	10,0	bar
6153		Water pressure 2 SD	Water pressure 2 switching differential	0,3	0,0	10,0	bar
6180	Water pressure 3 max	Water pressure 3 max	Water pressure 3 max	3	– – – / 0,0	10,0	bar
6181	Water pressure 3 min	Water pressure 3 min	Water pressure 3 min	0,8	– – – / 0,0	10,0	bar
6182	Water press 3 critical min	Water pressure 3 crit min	Water pressure 3 critical min	0,5	– – – / 0,0	10,0	bar
6183		Water pressure 3 SD	Water pressure 3 switching differential	0,3	0,0	10,0	bar
6200	Save sensors No ¦ Yes	Store sensor	Store sensor	None			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
6204	Save parameters No ¦ Yes	Store parameter	Store parameter	None			-
6205	Reset to default parameters No ¦ Yes	Reset parameter	Reset parameter	None			-
6212	Check no. heat source 1	CtrlNumber source 1	Control number heat generation 1	-	0	199999	-
6213	Check no. heat source 2	CtrlNumber source 2	Control number heat generation 2	-	0	199999	-
6215	Check no. storage tank	CtrlNumber storage	Control number storage tank	-	0	199999	-
6217	Check no. heating circuits	CtrlNumber HCs	Control number heating circuits	-	0	199999	-
6220	Software version	Device SW version	Device SW version	-	0	99	-
6221	Development index	Development index	Development index	-	0	99	-
6224		Device identification	Device identification	LMS14.xxxxk09			
6225		Device family	Device family				
6226		Device variant	Device variant	-			
6227		Object directory version	Object directory version	-			
6230	Info 1 OEM	Info 1 OEM	Info 1 OEM	-			
6231	Info 2 OEM	Info 2 OEM	Info 2 OEM	-			
6232		Parameter version	Parameter version	-			
6233		Parameter set number	Parameter set number	-			
6234		Boiler type number OEM	Boiler type number OEM	-			
6235		Parameter set group OEM	Parameter set group OEM	-			
6236		Parameter set number OEM	Parameter set number OEM	-			
[1564.1]		PartDiagram oil/gas	Partial diagram oil/gas-fired boiler	-	0	255	
[1565.1]		PartDiagram solar	Partial diagram solar collector	-	0	255	
[1566.1]		PartDiagram HC1	Partial diagram heat circuit 1	-	0	255	
[1566.2]		PartDiagram HC2	Partial diagram heat circuit 2	-	0	255	
[1566.3]		PartDiagram HC3	Partial diagram heat circuit 3	-	0	255	
[1567.1]		PartDiagram buffer	Partial diagram buffer storage tank	-	0	255	
[1568.1]		PartDiagram DHW	Partial diagram DHW storage tank	-	0	255	
[1984.1]		PartDiagram HeatExch	Partial diagram heat exchanger	-	0	255	
[1563.1]		PartDiagram SolidFuel	Partial diagram solid fuel boiler	-	0	255	
[2090.1]		PartDiagram SwiPool	Partial diagram swimming pool	-	0	255	
[2835.1]		PartDiagramHydrBalanc	Partial diagram hydraulic balancing	-	0	255	

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
[2836.1]		PartDiagram instWH	Partial diagram instantaneous water heater	-	0	255	
[4365.1]		PartDiagram ConsC1	Partial diagram consumer circuit 1	-	0	255	
[4365.2]		PartDiagram ConsC2	Partial diagram consumer circuit 2	-	0	255	
[4365.3]		PartDiagram SwiPool	Partial diagram swimming pool circuit	-	0	255	
[2748.1]		Cascade status Inactive ¦ Active	Cascade status	Inactive			
LPB system							
6600 *			LPB address	S0/G1	S0/G1	S14/G16	-
6600 *	Device address	Device address		1	0	16	-
6601 *	Segment address	Segment address		0	0	14	-
	* Depending on operating tool, either one operating line with LPB address or 2 operating lines with separate device and segment address						
6604	Bus power supply function Off ¦ Automatically	LPB PowSup Fctn Sel	LPB power supply function selection	Automatically			-
6605	Bus power supply state Off ¦ On	LPB PowSup state	LPB power supply state	On			-
6610	Display system messages No ¦ Yes	Display system message	Display system message	Yes			
6612	Alarm delay	Alarm delay	Alarm delay	– – –	– – – / 2	60	Min.
6620	Action changeover functions Segment ¦ System	CentrSwitch-OverArea	Central switch-over working area	System			-
6621	Summer changeover Locally¦ Centrally	Su/Wi changeover	Summer/winter changeover automatic	Locally			-
6623	Optg mode changeover Locally ¦ Centrally	OptgMode Ch’over	Operating mode changeover	Centrally			
6624	Manual source lock Locally ¦ Segment	Man source lock	Manual source lock	Locally			
6625	DHW assignment Local HCs ¦ All HCs in segment ¦ All HCs in system	DHW allocation	DHW allocation	All HCs in system			-
6630	Cascade master	Cascade master	Cascade master	Automatically			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	Always ¦ Automatically						
6631	Ext source with eco mode Off ¦ On DHW ¦ On	ExtSource withEcoMode	Ext source with eco mode	Off			
6632	Note OT limit ext source No ¦ Yes	OT lim ext sou accept	Outside temp limit external source accept	No			
6640	Clock mode Autonomously ¦ Slave without remote ¦ Slave with remote setting ¦ Master	Clock time source	Clock time source	Autonomously			-
6650	Outside temp source	Outside temp source	Outside temp source	S0/G1	S0/G1	S14/G16	-
Fault							
6700	Message	Error signal	Error signal				-
6705	SW diagnostic code	Diagnostic code	Internal value of diagnostic code				-
6706	Burn ctrl phase lockout pos	StrPn_akt	Current value of lockout phase				-
6710	Reset alarm relay No ¦ Yes	Reset Alarm Relay	Reset alarm relay	No			
6740	Flow temp 1 alarm	TimeFlowTempAlarm HC1	Time flow temperature alarm HC1	– – –	– – – / 10	240	Min.
6741	Flow temp 2 alarm	TimeFlowTempAlarm HC2	Time flow temperature alarm HC2	– – –	– – – / 10	240	Min.
6742	Flow temp 3 alarm	TimeFlowTempAlarm HC3	Time flow temperature alarm HC3	– – –	– – – / 10	240	Min.
6743	Boiler temp alarm	Time BoilerTempAlarm	Time boiler temperature alarm	– – –	– – – / 10	240	Min.
6745	DHW charging alarm	Time DHWChargingAlarm	Time DHW charging alarm	– – –	– – – / 1	48	h
6800	History 1	Time ErrorHistory 1	Time stamp error history entry 1	-			
6803	Error code 1	ErrorCode History 1	Error code history entry 1	-	0	65535	-
6805	SW diagnostic code 1	StrDia1	Historical value 1 of internal diagnostic code	-	0	65535	-
6806	Burner control phase 1	StrPn1	Historical value 1 of lockout phase	-	0	255	-
6810	History 2	Time ErrorHistory 2	Time stamp error history entry 2	-			
6813	Error code 2	ErrorCode History 2	Error code history entry 2	-	0	65535	-
6815	SW diagnostic code 2	StrDia2	Historical value 2 of internal diagnostic code	-	0	65535	-
6816	Burner control phase 2	StrPn2	Historical value 2 of lockout phase	-	0	255	-
6820	History 3	Time ErrorHistory 3	Time stamp error history entry 3	-			
6823	Error code 3	ErrorCode History 3	Error code history entry 3	-	0	65535	-
6825	SW diagnostic code 3	StrDia3	Historical value 3 of internal	-	0	65535	-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
			diagnostic code				
6826	Burner control phase 3	StrPn3	Historical value 3 of lockout phase	-	0	255	-
6830	History 4	Time ErrorHistory 4	Time stamp error history entry 4	-			
6833	Error code 4	ErrorCode History 4	Error code history entry 4	-	0	65535	-
6835	SW diagnostic code 4	StrDia4	Historical value 4 of internal diagnostic code	-	0	65535	-
6836	Burner control phase 4	StrPn4	Historical value 4 of lockout phase	-	0	255	-
6840	History 5	Time ErrorHistory 5	Time stamp error history entry 5	-			
6843	Error code 5	ErrorCode History 5	Error code history entry 5	-	0	65535	-
6845	SW diagnostic code 5	StrDia5	Historical value 5 of internal diagnostic code	-	0	65535	-
6846	Burner control phase 5	StrPn5	Historical value 5 of lockout phase	-	0	255	-
6850	History 6	Time ErrorHistory 6	Time stamp error history entry 6	-			
6853	Error code 6	ErrorCode History 6	Error code history entry 6	-	0	65535	-
6855	SW diagnostic code 6	StrDia6	Historical value 6 of lockout diagnostics	-	0	65535	-
6856	Burner control phase 6	StrPn6	Historical value 6 of lockout phase	-	0	255	-
6860	History 7	Time ErrorHistory 7	Time stamp error history entry 7	-			
6863	Error code 7	ErrorCode History 7	Error code history entry 7	-	0	65535	-
6865	SW diagnostic code 7	StrDia7	Historical value 7 of lockout diagnostics	-	0	65535	-
6866	Burner control phase 7	StrPn7	Historical value 7 of lockout phase	-	0	255	-
6870	History 8	Time ErrorHistory 8	Time stamp error history entry 8	-			
6873	Error code 8	ErrorCode History 8	Error code history entry 8	-	0	65535	-
6875	SW diagnostic code 8	StrDia8	Historical value 8 of lockout diagnostics	-	0	65535	-
6876	Burner control phase 8	StrPn8	Historical value 8 of lockout phase	-	0	255	-
6880	History 9	Time ErrorHistory 9	Time stamp error history entry 9	-			
6883	Error code 9	ErrorCode History 9	Error code history entry 9	-	0	65535	-
6885	SW diagnostic code 9	StrDia9	Historical value 9 of lockout diagnostics	-	0	65535	-
6886	Burner control phase 9	StrPn9	Historical value 9 of lockout phase	-	0	255	-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
6890	History 10	Time ErrorHistory 10	Time stamp error history entry 10	-			
6893	Error code 10	ErrorCode History 10	Error code history entry 10	-	0	65535	-
6895	SW diagnostic code 10	StrDia10	Historical value 10 of lockout diagnostics	-	0	65535	-
6896	Burner control phase 10	StrPn10	Historical value 10 of lockout phase	-	0	255	-
6900	History 11	Time ErrorHistory 11	Time stamp error history entry 11	-			
6903	Error code 11	ErrorCode History 11	Error code history entry 11	-	0	65535	-
6905	SW diagnostic code 11	StrDia11	Historical value 11 of lockout diagnostics	-	0	65535	-
6906	Burner control phase 11	StrPn11	Historical value 11 of lockout phase	-	0	255	-
6910	History 12	Time ErrorHistory 12	Time stamp error history entry 12	-			
6913	Error code 12	ErrorCode History 12	Error code history entry 12	-	0	65535	-
6915	SW diagnostic code 12	StrDia12	Historical value 12 of lockout diagnostics	-	0	65535	-
6916	Burner control phase 12	StrPn12	Historical value 12 of lockout phase	-	0	255	-
6920	History 13	Time ErrorHistory 13	Time stamp error history entry 13	-			
6923	Error code 13	ErrorCode History 13	Error code history entry 13	-	0	65535	-
6925	SW diagnostic code 13	StrDia13	Historical value 13 of lockout diagnostics	-	0	65535	-
6926	Burner control phase 13	StrPn13	Historical value 13 of lockout phase	-	0	255	-
6930	History 14	Time ErrorHistory 14	Time stamp error history entry 14	-			
6933	Error code 14	ErrorCode History 14	Error code history entry 14	-	0	65535	-
6935	SW diagnostic code 14	StrDia14	Historical value 14 of lockout diagnostics	-	0	65535	-
6936	Burner control phase 14	StrPn14	Historical value 14 of lockout phase	-	0	255	-
6940	History 15	Time ErrorHistory 15	Time stamp error history entry 15	-			
6943	Error code 15	ErrorCode History 15	Error code history entry 15	-	0	65535	-
6945	SW diagnostic code 15	StrDia15	Historical value 15 of lockout diagnostics	-	0	65535	-
6946	Burner control phase 15	StrPn15	Historical value 15 of lockout phase	-	0	255	-
6950	History 16	Time ErrorHistory 16	Time stamp error history entry 16	-			
6953	Error code 16	ErrorCode History 16	Error code history entry 16	-	0	65535	-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
6955	SW diagnostic code 16	StrDia16	Historical value 16 of lockout diagnostics	-	0	65535	-
6956	Burner control phase 16	StrPn16	Historical value 16 of lockout phase	-	0	255	-
6960	History 17	Time ErrorHistory 17	Time stamp error history entry 17	-			
6963	Error code 17	ErrorCode History 17	Error code history entry 17	-	0	65535	-
6965	SW diagnostic code 17	StrDia17	Historical value 17 of lockout diagnostics	-	0	65535	-
6966	Burner control phase 17	StrPn17	Historical value 17 of lockout phase	-	0	255	-
6970	History 18	Time ErrorHistory 18	Time stamp error history entry 18	-			
6973	Error code 18	ErrorCode History 18	Error code history entry 18	-	0	65535	-
6975	SW diagnostic code 18	StrDia18	Historical value 18 of lockout diagnostics	-	0	65535	-
6976	Burner control phase 18	StrPn18	Historical value 18 of lockout phase	-	0	255	-
6980	History 19	Time ErrorHistory 19	Time stamp error history entry 19	-			
6983	Error code 19	ErrorCode History 19	Error code history entry 19	-	0	65535	-
6985	SW diagnostic code 19	StrDia19	Historical value 19 of lockout diagnostics	-	0	65535	-
6986	Burner control phase 19	StrPn19	Historical value 19 of lockout phase	-	0	255	-
6990	History 20	Time ErrorHistory 20	Time stamp error history entry 20	-			
6993	Error code 20	ErrorCode History 20	Error code history entry 20	-	0	65535	-
6995	SW diagnostic code 20	StrDia20	Historical value 20 of lockout diagnostics	-	0	65535	-
6996	Burner control phase 20	StrPn20	Historical value 20 of lockout phase	-	0	255	-
6999	Reset history No ¦ Yes	Reset ErrorHistory	Reset error history	No			-
Maintenance/special operation							
7040	Burner hours interval	BurnHours MaintInt	Burner hours run maintenance interval	– – –	– – – / 100	10000	h
7041	Burner hrs since maintenance	BurnHours sinceMaint	Burner hours run since maintenance	0	0	10000	h
7042	Burner start interval	BurnStarts MaintInt	Burner starts maintenance interval	– – –	– – – / 100	65500	-
7043	Burner starts since maint	BurnStarts sinceMaint	Burner starts since maintenance	0	0	65535	-
7044	Maintenance interval	Maintenance Interval	Maintenance interval	– – –	– – – / 1	240	Months

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
7045	Time since maintenance	Time sinceMaint	Time since maintenance	0	0	240	Months
7050	Fan speed ionization current	FanSp ServiceThresh	Fan speed threshold for service message	0	0	10000	min^{-1}
7051	Message ionization current No ¦ Yes	IonCurr ServMessage	Ionization current service message	No			
7130	Chimney sweep function Off ¦ On	ChimneySweep function	Chimney sweep function	Off			-
7131	Burner output Partial load ¦ Full load	Chimney BurnerOutput	Chimney sweep function burner output	Full load			-
7140	Manual control Off ¦ On	Manual operation	Manual operation	Off			-
7143	Controller stop function Off ¦ On	Contr stop function	Controller stop function	Off			-
7145	Controller stop setpoint	Controller stop setpoint	Controller stop setpoint	50	0	100	%
7146	Deaeration function Off ¦ On	Deaeration function	Deaeration function	On			-
7147	Type of venting None ¦ Heating circuit continuous ¦ Heating circuit cycled ¦ DHW continuous ¦ DHW cycled	Type of venting	Type of venting	None			-
7170	Telephone customer service			0		0	9
7250	PStick storage pos	PStick storage pos	PStick storage pos	0	0	250	-
7251			Pstick data description				-
7252	PStick command No operation ¦ Reading from stick ¦ Writing on stick	PStick command	PStick command	No operation			
7253	PStick progress	PStick progress	PStick progress	0	0	100	%
7254		PStick status	PStick state No stick ¦ Stick ready ¦ Writing on stick ¦ Reading from stick ¦ EMC test active ¦ Writing error ¦ Reading error ¦ Incompatible data set ¦ Wrong stick type ¦ Stick format error ¦ Check data set ¦ Data set disabled ¦ Reading disabled	No stick			
[4566.1]		PStick series number	Series number of parameter stick used last	0	0	4294967295	-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
[4693.1]		PStick storage location	PStick storage location	0	0	250	-
[4733.1]		OEM PStickDataSetNo	OEM PStick data set number	0	0	65535	-
[4734.1]		HQ PStickDataSetNo	HQ PStick data set number	0	0	65535	-
Input/output test							
7700	Relay test No test ¦ Everything off ¦ Relay output QX1 ¦ Relay output QX2 ¦ Relay output QX3 ¦ Relay output QX4 ¦ Relay output QX21 module 1 ¦ Relay output QX22 module 1 ¦ Relay output QX23 module 1 ¦ Relay output QX21 module 2 ¦ Relay output QX22 module 2 ¦ Relay output QX23 module 2 ¦ Relay output QX21 module 3 ¦ Relay output QX22 module 3 ¦ Relay output QX23 module 3	Relay test	Relay test	No test			-
7713		Output test P1	Output test P1	- - -	- - - / 0	100	%
7714		PWM output P1	PWM output P1	-	0	100	%
7730	Outside temp B9	Outside temp B9	Outside temperature B9	-	-50	50	°C
7750	DHW temp B3/B38	DHW temp B3/B38	DHW temp B3/B38	-	0	140	°C
7760	Boiler temp B2	Boiler temp B2	Boiler temperature B2	-	0	140	°C
7820	Sensor temp BX1	Sensor temp BX1	Sensor temperature BX1	-	-28	350	°C
7821	Sensor temp BX2	Sensor temp BX2	Sensor temperature BX2	-	-28	350	°C
7822	Sensor temp BX3	Sensor temp BX3	Sensor temperature BX3	-	-28	350	°C
7823	Sensor temp BX4	Sensor temp BX4	Sensor temperature BX4	-	-28	350	°C
7830	Sensor temp BX21 module 1	Temp BX21 module 1	Sensor temperature BX21 module 1	-	-28	350	°C
7831	Sensor temp BX22 module 1	Temp BX22 modul 1	Sensor temperature BX22 module 1	-	-28	350	°C
7832	Sensor temp BX21 module 2	Temp BX21 modul 1	Sensor temperature BX21 module 2	-	-28	350	°C
7833	Sensor temp BX22 module 2	Temp BX22 modul 1	Sensor temperature BX22 module 2	-	-28	350	°C
7834	Sensor temp BX21 module 3	Temp BX21 modul 3	Sensor temperature BX21 module 3	-	-28	350	°C
7835	Sensor temp BX22 module 3	Temp BX22 modul 3	Sensor temperature BX22 module 3	-	-28	350	°C
7840	Voltage signal H1	Voltage signal H1	Voltage signal H1	-	0	10	V-
7841	Contact state H1 Open ¦ Closed	Contact state H1	Contact state H1	Open			
7845	Voltage signal H2 module 1	Voltage sig H2 mod1	Voltage signal H2 module 1	-	0	10	V

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
7846	Contact state H2 module 1 Open ¦ Closed	Contact state H2 mod1	Contact state H2 module 1	Open			
7848	Voltage signal H2 module 2	Voltage sig H2 mod2	Voltage signal H2 module 2	-	0	10	V
7849	Contact state H2 module 2 Open ¦ Closed	Contact state H2 mod2	Contact state H2 module 2	Open			
7851	Voltage signal H2 module 3	Voltage sig H2 mod3	Voltage signal H2 module 3	-	0	10	V
7852	Contact state H2 module 3 Open ¦ Closed	Contact state H2 mod3	Contact state H2 module 3	Open			-
7854	Voltage signal H3	Voltage signal H3	Voltage signal H3	-	0	10	V
7855	Contact state H3	Contact state H3	Contact state H3	Open			
7860	Contact state H4 Open ¦ Closed	Contact state H4	Contact state H4	Open			
7862	Frequency H4	Frequency H4	Frequency H4	-	0	2000	
7865	Contact state H5 Open ¦ Closed	Contact state H5	Contact state H5	Open			
7872	Contact state H6 Open ¦ Closed	Contact state H6	Contact state H6	Open			
7874	Contact state H7 Open ¦ Closed	Contact state H7	Contact state H7	Open			
7950	Input EX21 module 1 0V ¦ 230V	Inputl EX21 module 1	Input EX21 module 1	0V			-
7951	Input EX21 module 2 0V ¦ 230V	Inputl EX21 module 2	Input EX21 module 2	0V			-
7952	Input EX21 module 3 0V ¦ 230V	Inputl EX21 module 3	Input EX21 module 3	0V			-
State							
8000	State heating circuit 1	State HC1	State heating circuit 1	-			
8001	State heating circuit 2	State HC2	State heating circuit 2	-			-
8002	State heating circuit 3	State HC3	State heating circuit 3	-			-
8003	State DHW	State DHW	State DHW	-			-
8005	State boiler	State boiler	State boiler	-			-
8007	State solar	State solar	State solar	-			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
8008	State solid fuel boiler	State solid fuel	State solid fuel boiler	-			
8009	State burner	State burners	State burners	-			
8010	State buffer	State buffer	State buffer	-			
8011	State swimming pool	State swimming pool	State swimming pool	-			
Diagnostics cascade							
8100 *	Priority/state source 1 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 1	Priority source 1	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8101		Status producer 1	State source 1 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8102 *	Priority/state source 2 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 2	Priority source 2	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8103		Status producer 2	State source 2	Missing			

Line no.	Operating line Operator unit	 ACS420	 ACS700/ACS790	Default value	Min	Max	Unit
			Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released				
8104 *	Priority/state source 3 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 3	Priority source `3	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8105		Status producer 3	State source 3 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8106 *	Priority/state source 4 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 4	Priority source `4	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						

Line no.	Operating line Operator unit	 ACS420	 ACS700/ACS790	Default value	Min	Max	Unit
8107		Status producer 4	State source 4 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8108 *	Priority/state source 5 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 5	Priority source `5	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8109		Status producer 5	State source 5 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8110 *	Priority/state source 6 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 6	Priority source `6	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
8111		Status producer 6	State source 6 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8112 *	Priority/state source 7 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 7	Priority source `7	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8113		Status producer 7	State source 7 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8114 *	Priority/state source 8 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 8	Priority source `8	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						

Line no.	Operating line Operator unit	 ACS420	 ACS700/ACS790	Default value	Min	Max	Unit
8115		Status producer 8	State source 8 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8116 *	Priority/state source 9 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 9	Priority source `9	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8117		Status producer 9	State source 9 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8118 *	Priority/state source 10 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 10	Priority source `10	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
8119		Status producer 10	State source 10 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8120 *	Priority/state source 11 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 11	Priority source `11	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8121		Status producer 11	State source 11 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8122 *	Priority/state source 12 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 12	Priority source `12	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790:Priority and state are shown on different lines						

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
8123		Status producer 12	State source 12 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8124 *	Priority/state source 13 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 13	Priority source `13	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8125		Status producer 13	State source 13 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8126 *	Priority/state source 14 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 14	Priority source `14	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
8127		Status producer 14	State source 14 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8128 *	Priority/state source 15 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 15	Priority source `15	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790: Priority and state are shown on different lines						
8129		Status producer 15	State source 15 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8130 *	Priority/state source 16 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Priority producer 16	Priority source `16	Missing			
	* Operator unit: Lines with priority of the source also show the state ACS420: Priority and state are not shown ACS700/ACS790:Priority and state are shown on different lines						

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
8131		Status producer 16	State source 16 Missing ¦ Faulty ¦ Manual control active ¦ Generation lock active ¦ Chimney sweep fct active ¦ Temporarily not available ¦ Outside temp limit active ¦ No released ¦ Released	Missing			
8138	Cascade flow temp	Cascade supply temp	Cascade supply temperature actual value	0	0	140	°C
8139	Cascade flow temp setp	CascadeSupply tmp set	Cascade supply temperature setpoint	0	0	140	°C
8140	Cascade return temp	Cascade RetTmp act	Cascade return temp actual value	0	0	140	°C
8141	Cascade return temp setp	Cascade RetTmp setp	Cascade return temp actual setpoint	0	0	140	°C
8150	Source seq ch'over current	Time ProdSeqSwitch	Time to automatic source sequence switching	0	0	990	h
	Cascade pump Q25 Off ¦ On		State cascade pump (Q25)	Off			
Diagnostics heat generation							
8304	Boiler pump Q1 Off ¦ On	Boiler pump Q1	Status boiler pump (Q1)				
8308	Boiler pump speed	Speed boiler pump	Speed boiler pump	-	0	100	%
8310	Boiler temp	BoilTmp actual value	Control temperature	-	0	140	°C
		Control temperature	Control temperature	-	0	140	°C
8311	Boiler setpoint	BoilTmp Setp	Boiler temp setpoint	-	0	140	°C
		Control setpoint	Control setpoint	-	0	140	°C
8312	Boiler switching point	Boiler switch point	Boiler switch point	-	0	140	°C
8313	Switch point DHW operation	Swi point inst heater	Swi point for inst heater operation	-	0	140	°C
		Control sensor	Control sensor	-	0	140	°C
8314	Boiler return temp	RetTmp actual value	Return temp actual value	-	0	140	°C
8315	Boiler return temp setpoint	Boiler ReturnTempSetp	Boiler return temp setpoint	-	0	140	°C
8316	Flue gas temp	FlueGasTmp actual	Flue gas temp actual value	-	0	350	°C
8318	Flue gas temp max	FlueGasTmp MaxActual	Flue gas temp max actual value	-	0	350	°C
8321	Primary exchanger temp	Primary exchang temp	Primary exchanger temp	0	0	140	°C

Line no.	Operating line Operator unit	 ACS420	 ACS700/ACS790	Default value	Min	Max	Unit
8323	Fan speed	Fan speed	Fan speed	-	0	10000	U/min
8324	Setpoint fan	Set point fan	Set point fan	-	0	10000	U/min
8325	Current fan control	Current fan control	Current fan control	0	0	100	%
8326	Burner modulation	Boiler modulation	Boiler modulation	-	0	100	%
8327	Water pressure	Water pressure	Water pressure	0	0	10	bar
8329	Ionization current	Ion current	Measured value of ionization current	-	0	100	µA
8330	Hours run 1st stage	Burner hours run st 1	Burner hours run stage 1	-	0	65535	h
8331	Start counter 1st stage	Burner starts stage 1	Number of burner starts stage 1	-	0	199'999	-
8338	Hours run counter burner	HoursRunBurner	Hours run burner	-	0	199'999	h
8339	Start counter burner	HoursRunDHW	Hours run DHW heating	-	0	199'999	h
8390	Current phase number	Current phase number	Current phase number	-	1	21	
8499	Collector pump 1 Off ¦ On	Collector pump 1 Q5	State collector pump 1 (Q5)	Off			
8501	Solar ctrl elem buffer Off ¦ On	Solar buffer K8	State solar actuator buffer (K8)	Off			
8502	Solar ctrl elem swi pool Off ¦ On	Solar pool K18	State solar actuator pool (K18)	Off			
8505	Speed collector pump 1	Speed collect pump 1	Speed collector pump 1	0	0	100	%
8506	Speed solar pump ext exch	SpeedSolar ExtExch	Speed solar pump ext. exchanger	-	0	100	%
8507	Speed solar pump buffer	Speed solar buffer	Speed solar pump buffer	-	0	100	%
8508	Speed solar pump swi pool	Speed solar SwiPool	Speed solar pump swimming pool	-	0	100	%
8510	Collector temp 1	CollTemp1 actual B6	Collector temp 1 actual value (B6)	-	-28	350	°C
8511	Collector temp 1 max	CollTemp MaxActual 1	Collector temp max actual value 1 (B6)	-28	-28	350	°C
8512	Collector temp 1 min	CollTemp MinActual 1	Collector temp min actual value 1 (B6)	350	-28	350	°C
8513	dT collector 1/DHW	TempDiff Coll1/DHW	Temp differential collector 1/DHW	-	-168	350	°C
8514	dT collector 1/buffer	TempDiff Coll1/buffer	Temp differential collector 1/buffer	-	-168	350	°C
8515	dt collector 1/swimming pool	TmpDiff Coll1/SwiPool	Temp differential collector 1/swimming pool	-	-168	350	°C
8519	Solar flow temp	SolFlowSensB63	Solar flow sensor for yield measurement B63	-	-28	350	°C

Line no.	Operating line Operator unit	ACS420	ACS700/ACS790	Default value	Min	Max	Unit
8520	Solar return temp	SolReturnSensB64	Solar return sensor for yield measurement B64	-	-28	350	°C
8526	24-hour yield solar energy	24h yield solar energy	24-hour yield solar energy	-	0	999.9	kWh
8527	Total yield solar energy	TotalYieldSolarEnergy	Total yield solar energy	-	0	9999999.9	kWh
8530	Hours run solar yield	Solar Yield OptgHours	solar yield operating hours	-	0	199999	h
8531	Hours run collect overtemp	CollOverTempProtHours	Collector overtemp protection operating hours	-	0	199999	h
8532	Hours run collector pump	HoursRun CollectPump	Hours run collector pump	-	0	199999	h
8560	Solid fuel boiler temp	Solid fuel temp B22	Solid fuel boiler temperature B22	-	0	140	°C
8570	Hours run solid fuel boiler	HoursRun solid fuel	Operating hours solid fuel boiler	-	0	199999	h
[4459.1]		2nd BoilPumpSpeed Q27	State of 2nd boiler pump speed (Q27)	Off			
[2476.1]		BoilerBypassPump Q12	State of boiler bypass pump (Q12)	Off			
[2310.1]		SourceLock via cont H	Source locking via contact H	Off			
[2698.1]		SolarPumpExtExch K9	State solar pump ext. heat exchanger K9	Off			
[2579.1]		SolidFuel BoilPumpQ10	State solid fuel boiler pump (Q10)	Off			
	Ion'strom Begr. Drehz. Untergrenze		Ionization current limitation lower speed limit	0	0	10000	min^{-1}
[4379.1]		Integr dyn WaterPress	Integrator dynamic water pressure	0	0	10	
[4380.1]		Boiler FlowTemp Sec	Boiler flow temperature seconds	0	0	140	°C
[4381.1]		Boiler RetTemp Sec	Boiler return temperature seconds	0	0	140	°C
Diagnostics consumer							
8700	Outside temp	Outside temp	Outside temp	-	-50.0	50.0	°C
8701	Outside temp min	Outside temp min	Outside temperature min	-	-50.0	50.0	°C
8702	Outside temp max	Outside temp max	Outside temperature max	-	-50.0	50.0	°C
8703	Outside temp attenuated	Outside temp attenuated	Outside temp attenuated	-	-50.0	50.0	°C
8704	Outside temp composite	Outside temp composite	Outside temp composite	-	-50.0	50.0	°C
8730	Heating circuit pump 1 Off ¦ On	Heating circuit pump 1	Status heat circuit pump 1	Off			-
8731	Heat circ mix valve 1 open Off ¦ On	HC MixVlv 1 opens	Status heat circuit mixing valve 1 opens	Off			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
8732	Heat circ mix valve 1 close Off ¦ On	HC MixVlv 1 closes	Status heat circuit mixing valve 1 closes	Off			-
8735	Speed heating circuit pump 1	Pump speed HC1	Heat circuit pump speed HC1	0	0	100	%
8740	Room temp 1	RmTmp act val HC1	Room temp actual value heat circuit 1	-	0.0	50.0	°C
8741	Room setpoint 1	RmTmp Setp act HC1	Room temp setpoint actual HC1	-	4.0	35.0	°C
8742	Room temp 1 model	RoomModelTemp HC1	Room model temperature HC1	-	0.0	50.0	°C
8743	Flow temp 1	FlowTmp act HC1	Flow temp actual value heat circuit 1	-	0.0	140.0	°C
8744	Flow temp setpoint 1	FlowTmp SetpResult HC1	Flow temp setpoint resulting HC1	-	0.0	140.0	°C
8749	Room thermostat 1 No demand ¦ Demand	Room thermostat HC1	Room thermostat HC1	No demand			
8760	Heating circuit pump 2 Off ¦ On	Heating circuit pump 2	State heating circuit pump 2	Off			-
8761	Heat circ mix valve 2 open Off ¦ On	HC MixValve 2 open	State heating circuit mixing valve 2 opening	Off			-
8762	Heat circ mix valve 2 close Off ¦ On	HC MixValve 2 close	State heating circuit mixing valve 2 closing	Off			-
8765	Speed heating circuit pump 2	Pump speed HC2	Heat circuit pump speed HC2	0	0	100	%
8770	Room temp 2	RmTmp act val HC2	Room temp actual value heat circuit 2	-	0.0	50	°C
8771	Room setpoint 2	RmTmp Setp act HC2	Room temp setpoint actual HC2	-	4.0	35	°C
8772	Room temp 2 model	RoomModelTemp HC2	Room model temperature HC2	-	0.0	50	°C
8773	Flow temp 2	FlowTmp act HeatCirc2	Flow temp actual value heat circuit 2	-	0.0	140	°C
8774	Flow temp setpoint 2	FlowTmp SetpResult HC2	Flow temp setpoint resulting HC2	-	0.0	140	°C
8779	Room thermostat 2 No demand ¦ Demand	Room thermostat HC2	Room thermostat HC2	No demand			
8790	Heating circuit pump 3 Off ¦ On	Heating circuit pump 3	State heating circuit pump 3	Off			-
8791	HC mixing valve 3 open Off ¦ On	HC MixValve 3 open	State heating circuit mixing valve 3 opening	Off			
8792	HC mixing valve 3 closed	HC MixValve 3 close	State heating circuit mixing valve 3	Off			

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
	Off ¦ On		closing				
8795	Speed heating circuit pump 3	HeatCircuitSpeed HC3	Heat circuit pump speed HC3	0	0	100	%
8800	Room temp 3	RmTmp act val HC3	Room temp actual value HC3	-	0.0	50	°C
8801	Room setpoint 3	RmTmp setp current HC3	Room temperature setpoint current HC3	-	4.0	35	°C
8802	Room temp 3 model	RoomModelTemp HC3	Room model temperature HC3	-	0.0	50	°C
8803	Flow temp setpoint 3	FlowTmp act HeatCirc3	Flow temp actual value heat circuit 3	-	0.0	140	°C
8804	Flow temp 3	FlowTmp setp res HC3	Flow temperature setpoint resulting HC3	-	0.0	140	°C
8809	Room thermostat 3 No demand ¦ Demand	Room thermostat HC3	Room thermostat heating circuit 3	No demand			
8820	DHW pump Q3 Off ¦ On	DHW charging pump	State DHW pump	Off			-
8825	Speed DHW pump	DHW pump speed	DHW pump speed	0	0	100	%
8826	Speed DHW interm circ pump	DHWInterCirPump speed	DHW intermediate circuit pump speed	0	0	100	%
8827	Speed inst DHW heater pump	SpeedInstanWHPump	Speed instantaneous water heater pump	0	0	100	%
8830	DHW temp 1	DHW TempActTop B3/BMU	DHW temperature actual value top (B3)	-	0.0	140	°C
8831	DHW temp setpoint	DHW Setp current	DHW temperature setpoint current	-	8.0	80	°C
8832	DHW temp 2	DHW TempActBott B31	DHW temperature actual value bottom (B31)	-	0.0	140	°C
8835	DHW circulation temp	DHC Circ temp	DHW circulating temperature	-	0.0	140	°C
8836	DHW charging temp	DHW charging temp	DHW charging temperature	-	0	140	°C
8852	DHW consumption temp	DHW consumption temp	DHW consumption temp	-	0	140	°C
8853	Instant WH setpoint	DHW instan heat setp	DHW instantaneous water heater setpoint	-	0	140	°C
8860	DHW flow	DHW flow	DHW flow	-	0	30	l/min
8875	Flow temp setp VK1	FlowTmp Setp ConsC1	Flow temp setpoint consumer circuit 1	-	5	130	°C

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
8885	Flow temp setp VK2	FlowTmp Setp ConsC2	Flow temp setpoint consumer circuit 2	-	5	130	°C
8895	Flow temp setp swi pool	FlowTmpSetp SwiPool	Flow temp setp swimming pool	-	5	130	°C
8900	Swimming pool temp	ActSwiPoolTemp B13	Actual value of swimming pool temp B13	0	0	140	°C
8901	Swimming pool setpoint	SetpointTempSwiPool	Setpoint temperature swimming pool	24	8	80	°C
8930	Primary controller temp	Prectrl actual value	Precontrol actual value	-	0.0	140.0	°C
8931	Primary controller setpoint	Prectrl setpoint	Precontrol setpoint	-	0.0	140.0	°C
8950	Common flow temp	SegmFlowTemp actual	Segment flow temperature actual value	-	0.0	140.0	°C
8951	Common flow temp setpoint	Segm FlowTemp setpoint	Segment flow temperature setpoint	-	0.0	140.0	°C
8952	Common return temp	Segm RetTmp	Segment return temp	0	0	140	°C
8962	Common output setpoint	OutputSetpSegment	Output setpoint segment	0	0	100	%
8980	Buffer temp 1	Buffer temp act top	Buffer temp actual value top (B4)	-	0.0	140.0	°C
8981	Buffer setpoint	Buffer setpoint	Buffer storage tank setpoint	0	0	140	°C
8982	Buffer temp 2	Buffer temp act bottom	Buffer temp actual value bottom (B41)	-	0.0	140.0	°C
8983	Buffer temp 3	Buffer temp act middle	Buffer temp actual value middle (B42)	0	0	140	°C
9005	Water pressure H1	Water pressure H1	Water pressure H1	-	0.0	10.0	bar
9006	Water pressure H2	Water pressure H2	Water pressure H2	-	0.0	10.0	bar
9009	Water pressure H3	Water pressure H3	Water pressure H3	0	0	10	bar
9031	Relay output QX1 Off ¦ On	Multifunct relay QX1	State multifunctional relay (QX1)	Off			-
9032	Relay output QX2 Off ¦ On	Multifunct relay QX2	State multifunctional relay (QX2)	Off			-
9033	Relay output QX3 Off ¦ On	Multifunct relay QX3	State multifunctional relay (QX3)	Off			-
9034	Relay output QX4 Off ¦ On	Multifunct relay QX4	State multifunctional relay (QX4)	Off			
9050	Relay output QX21 module 1 Off ¦ On	Multi relay QX21 mod1	State multifunctional relay (QX21 module 1)	Off			-

Line no.	Operating line Operator unit	ACS420	ACS700/ACS790	Default value	Min	Max	Unit
9051	Relay output QX22 module 1 Off ¦ On	Multi relay QX22 mod1	State multifunctional relay (QX22 module 1)	Off			-
9052	Relay output QX23 module 1 Off ¦ On	Multi relay QX23 mod1	State multifunctional relay (QX23 module 1)	Off			-
9053	Relay output QX21 module 2 Off ¦ On	Multi relay QX21 mod2	State multifunctional relay (QX21 module 2)	Off			-
9054	Relay output QX22 module 2 Off ¦ On	Multi relay QX22 mod2	State multifunctional relay (QX22 module 2)	Off			-
9055	Relay output QX23 module 2 Off ¦ On	Multi relay QX23 mod2	State multifunctional relay (QX23 module 2)	Off			-
9056	Relay output QX21 module 3 Off ¦ On	Multi relay QX21 mod3	State multifunctional relay (QX21 module 3)	Off			-
9057	Relay output QX22 module 3 Off ¦ On	Multi relay QX22 mod3	State multifunctional relay (QX22 module 3)	Off			-
9058	Relay output QX23 module 3 Off ¦ On	Multi relay QX23 mod3	State multifunctional relay (QX23 module 3)	Off			-
[2481.1]		2nd speed HC pump Q21	State 2nd speed heating circuit pump (Q21)	Off			-
[1219.1]		OptgMode Ch'over HC1	Operating mode changeover HC1	Inactive			-
[2482.1]		2nd speed HC pump Q22	State 2nd speed heating circuit pump (Q22)	Off			-
[1219.2]		OptgMode Ch'over HC 2	Operating mode changeover HC2	Inactive			-
[2483.1]		2nd speed HC pump Q23	Stat 2nd speed heating circuit pump (Q23)	Off			-
[1219.3]		OptgMode Ch'over HC3/P	Operating mode changeover HC3/P	Inactive			-
[2478.1]		El ImmHeater DHW	State electric immersion heater DHW	Off			-
[2468.1]		DHW CircPump Q4	State DHW circulating pump (Q4)	Off			-
[1208.1]		OptgMode Ch'over DHW	Operating mode changeover DHW	Inactive			-
[2477.1]		Pump H1 Q15	State pump H1 (Q15)	Off			-
[2484.1]		Pump H2 Q18	State pump H2 (Q18)	Off			-
[2718.1]		Pump H3 Q19	State pump H3 (Q19)	Off			-

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
[2495.1]		Primary pump Q14	State primary pump (Q14)	Off			-
[2239.1]		PreC MixVlv opens Y19	State precontroller mixing valve opens (Y19)	Off			-
[2240.1]		PreC MixVlv close Y19	State precontroller mixing valve closes (Y20)	Off			-
[2496.1]		HeatGenLock (Y4)	Output heat generation lock (Y4)	Off			-
[2775.1]		TSP 5 relay K13	Status time program 5 relay (K13)	Off			-
[2776.1]		Return temp valve Y15	Status return temp valve (Y15)	Off			-
[2818.1]		Heat demand K27	Status heat demand (K27)	Off			-
[2824.1]		Instant WH pump Q34	State instantaneous WH pump (Q34)	Off			-
[2821.1]		StorageTransferPmpQ11	State storage transfer pump (Q11)	Off			-
[2822.1]		DHW circulating pump Q35	State DHW circulating pump (Q35)	Off			-
[2823.1]		DHWInterCircuitPmpQ33	DHW intermediate circuit pump (Q33)	Off			-
[2729.1]		Flow switch	Flow switch	Off			-
Burner control [1]							
9500	Prepurge time	Prepurge time	Prepurge time	10	0	51	s
9501	Prepurge time min	Prepurge time min	Prepurge time min	10	0	51	s
9504	Required speed prepurging	Req fan sp prepurging	Required fan speed during prepurging	2400	200	10000	min^{-1}
9505	Req speed prepurging min	ReqSpeedPrepurgMin	Req speed prepurging min	2400	200	10000	min^{-1}
9506	Speed tolerance prepurging	Speed tol prepurging	Speed tolerance prepurging	600	50	1200	min^{-1}
9512	Required speed ignition	Req speed ignition	Speed required at ignition load	2700	200	10000	min^{-1}
9513	Required speed ignition max	Req SpeedIgnitMax	Required speed ignition max	2700	200	10000	min^{-1}
9514	Speed tolerance ignition	Speed tol ignition	Speed tolerance ignition	600	50	1200	min^{-1}
9517	Preignition time	Preignition time	Preignition time	1	0,4	20	s
9518	Safety time	Safety time	Safety time	5	1,8	9,8	s
9519	Safety time with ignition	Safety time ignition	Safety time with ignition	4,6	0,2	9,6	s
9524	Required speed LF	Req speed LF	Required speed LF	1250	0	10000	min^{-1}
9525	Required speed LF min	Req speed LF min	Required speed LF min	1250	0	10000	min^{-1}
9526	Speed tolerance LF	Speed tol LF	Speed tolerance LF	600	50	1200	min^{-1}

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
9529	Required speed HF	Req speed HF	Required speed HF	6000	0	10000	min^{-1}
9530	Required speed HF max	Req speed HF max	Required speed HF max	6000	0	10000	min^{-1}
9531	Speed tolerance HF	Speed tol HF	Speed tolerance HF	600	50	1200	min^{-1}
9534	Optg time with ignition load	Optg time ignit load	Optg time with ignition load	1	0,2	10	s
9540	Postpurge time	Postpurge time	Postpurge time	5	0	51	s
9541	Postpurge time TL max	PostpurgeTime TL max	Max. overrun time when TL/LT cuts out	5	0	10	Min
9542	Postpurge time min	Postpurge time min	Postpurge time min	5	0	51	s
9544	Postpurge time 2	Postpurge time 2	Postpurge time 2	0,2	0,2	51	s
9551	Required speed stop max	Req speed stop max	Required speed stop max	300	0	2000	min^{-1}
9552	Required speed stop	Req speed stop	Required speed stop	0	0	2000	min^{-1}
9610	Capacity Up to 70kW ¦ Up to 120kW ¦ Above 120kW	Capacity	Capacity	Up to 70kW			-
9611	LP configuration LP mode 1 ¦ LP mode 2 ¦ LP mode 3 ¦ LP mode 4 ¦ LP mode 5	LP configuration	LP configuration	LP mode 1			-
9612	GP configuration GP not connected ¦ GP connected	GP configuration	GP configuration	GP not connected			-
9613	Home run mode Startup with home run ¦ Startup without home run	Home run mode	Home run mode	Startup with home run			-
9614	Postpurging level Run ¦ Prepurge	Postpurging level	Postpurging level	Run			-
9615	Forced prepurging on error Off ¦ On	Forced prepurg error	Forced prepurging on error	On			-
9616	Max speed	Max speed	Max speed	10000	0	10000	min^{-1}
9617	Hall sensor pulses/rev	Hall sens pulses/rev	Hall sensor pulses/rev	2	0	6	-
9618	Ion curr level extran light	IonCurrLevExtranLight	Ion curr level extran light	0.61	0	100	µA
9619	Ion curr level flame exting	IonCurrLevFlameExting	Ion curr level flame exting	0.78	0	100	µA
9626 *)	Fan output/speed slope	Fan output/speed slope	Fan output/speed slope	0	-1000	1000	-
9627 *)	Fan output/speed Y-section	Fan outp/sp Y-section	Fan output/speed Y-section	0	-1500	1500	-
9630	Speed Kp	Speed Kp	Speed Kp	1,125	0	15,9375	-
9631	Speed Tn	Speed Tn	Speed Tn	8	0	600	s
9632	Speed Tv	Speed Tv	Speed Tv	0	0	1.75	s

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
9650	Chimney drying Off ¦ Temporarily ¦ Permanently	Chimney drying	Chimney drying	Off			-
9651	Req speed chimney drying	Req speed chimney dry	Req speed chimney drying	500	0	10000	min^{-1}
9652	Duration chimney drying	Duration chimney dry	Duration chimney drying	10	10	1440	Min.
[3694.1]		Time const 1 falling	Pt1 time constant 1 on falling speed	7	0	100	s
[3695.1]		Time const 2 falling	Pt1 time constant 2 on falling speed	6	0	100	s
[3696.1]		Time const 3 falling	Pt1 time constant 3 on falling speed	5	0	100	s
[5283.1]		Pt1TmeConst4MaxMin_1	Time constant 4 falling	0	0	100	s
[5284.1]		Pt1TmeConst1MinMax_1	Time constant 1 rising	0	0	100	s
[3697.1]		Time const rising	Pt1 time constant on rising speed	0	0	100	s
[5285.1]		Diff SetpFiltTmeConst No ¦ Yes	Lower setpoint filter	No			-
[3698.1]		Upper speed threshold	Pt1 upper speed threshold falling	3710	0	10000	min^{-1}
[3699.1]		Lower speed threshold	Pt1 lower speed threshold falling	2010	0	10000	min^{-1}
[3997.1]		Fan PWM min	Lower limit manipulated variable fan	0	0	100	%
[3998.1]		Fan PWM max	Upper limit manipulated variable fan	100	0	100	%
[4269.1]		Ion limitn low limit	Ionization current limitation low limit	0	0	100	µA
[4270.1]		Ion limitn delta	Ion'strom Begrenzung Stromänderung	0,2	0	100	µA
[4398.1]		IonFlGuard slope pos	Ion'strom Begr. Pos. Drehz'steigung	10	1	10000	min^{-1}
[4397.1]		IonFlGuard slope neg	Ion current limitation negative speed slope	10	1	10000	min^{-1}
[4273.1]		Ion limitn filt time	Ion current limitation filter time	600	0	10000	s
[4337.1]		Enable QAA fan para Off ¦ On	Enable QAA fan parameters	Off			-
[4352.1]		Fan PWM min prepurg	Min manipulated variable prepurging fan	0	0	100	%
[4612.1]		Fan PWM max prepurg	Max manipulated variable prepurging fan	100	0	100	%
[4613.1]		Fan PWM min ignition	Min manipulated variable ignition fan	0	0	100	%
[4353.1]		Fan PWM max ignition	Max manipulated variable ignition	100	0	100	%

Line no.	Operating line			Default value	Min	Max	Unit
	Operator unit	**ACS420**	**ACS700/ACS790**				
			fan				
[4354.1]		Fan PWM min low-fire	Min manipulated variable low-fire fan	0	0	100	%
[4355.1]		Fan PWM max high-fire	Max manipulated variable high-fire fan	100	0	100	%
[4366.1]		Max speed prepurging	Max speed prepurging	10000	200	10000	min^{-1}
[4378.1]		Config reaction LT/SLT Start prevention ¦ Lockout position	Configure reaction mech LT/SLT	Start prevention			-
[3633.1]		RepCounter flame TSA	Repetition counter establishment of flame	4	1	25	-
[3632.1]		RepCounter flame	Repetition counter loss of flame in operation	25	1	25	-
[6086.1]		Max StartAttempts Opt 1 Inactive | Active	Maximum start attempts option 1	Inactive			
[4495.1]		Remote reset SLT	ParRemoteUnlockEnableSLT	No			-
[4496.1]		Remote reset air	ParRemoteUnlockEnableAir	No			-
[4497.1]		Rem res extran light	ParRemoteUnlockEnableExtranLight	No			-
[4498.1]		Remote reset flame	ParRemoteUnlockEnableFlame	No			-
[4777.1]*)		Prepu outp OEM limit	Prepurge output OEM limit	0	0	2000	kW
[4778.1] *)		Ign outp OEM limit	Ignition output OEM limit	0	0	2000	kW
[4779.1] *)		LF outp OEM limit	Low-fire output OEM limit	0	0	2000	kW
[4780.1] *)		HF outp OEM limit	High-fire output OEM limit	0	0	2000	kW
[4781.1] *)		Max output OEM limit	Max output OEM limit	0	0	2000	kW
[4782.1] *)		Min output OEM limit	Min output OEM limit	0	0	2000	kW
Production							
[5000.1]		SW version number	SW version number	-	0	65535	
[4763.1]		ParaSettingHistory	History of last 4 parameterizations	-	0	255	
[4762.1]		OnlineDD group number	OnlineDD group number	-	0	65535	
[4689.1]		CustomerNo_ParaSet	Customer number from parameter set	-	-	-	-
[3891.1]		Mains frequency	Mains frequency	-	0	65535	

Line no.	Operating line Operator unit	 ACS420	 ACS700/ACS790	Default value	Min	Max	Unit
[3907.1]		Mains voltage	Mains voltage	-	0	65535	V

ℹ Note!
*) These parameters appear only when enabling the output parameters (factory setting).
Refer to chapter *Fan parameters settable as load values via QAA75.../AVS37...*

⚠ **Warning!**
Under the most unfavorable conditions, it may take up to 40 seconds for signal H2 from the extension modules via BSB to become refreshed in the LMS14… This can lead to functional limitations with the DHW flow switch and to crucial situations in connection with limit functions! For such functions, use inputs H1 and inputs H3…H7.

6 The settings in detail

6.1 Time of day and date

The controller has a yearly clock with time of day, weekday and date. To ensure the controller will operate as required, both time of day and date must be correctly set.

6.1.1 Summer-/wintertime changeover

The dates set for the changeover from wintertime to summertime, and vice versa, ensure that on the first Sunday after the set date the time of day will change from 02:00 (wintertime) to 03:00 (summertime), and from 03:00 (summertime) to 02:00 (wintertime).

Hours/minutes

Line no.	*Operating line*
1	**Hours/minutes**

Day/month

Line no.	*Operating line*
2	**Day/month**

Year

Line no.	*Operating line*
3	**Year**

Start of summertime

Line no.	*Operating line*
5	**Start of summertime**

End of summertime

Line no.	*Operating line*
6	**End of summertime**

6.2 RF link

6.2.1 Binding

For more detailed information, refer to chapter *RF components*.

Binding

Line no.	*Operating line*
120	**Binding** No Yes

When commissioning the system, assign the wireless peripheral devices (room unit) to the basic unit.

Test mode

Line no.	*Operating line*
121	**Test mode** Off On

Test mode is used for checking the wireless communication. The test should be made when the installation is fully completed.

6.2.2 List of wireless devices

Room unit 1/2/3

Line no.	*Operating line*
130	**Room unit 1** Missing In operation No recept'n Change batt
131	**Room unit 2** Missing In operation No recept'n Change batt
132	**Room unit 3** Missing In operation No recept'n Change batt

Outside sensor

Line no.	*Operating line*
133	**Outside sensor** Missing In operation No recept'n Change batt

Repeater

Line no.	*Operating line*
134	**Repeater** Missing In operation No recept'n Change batt

Operator unit 1/2/3

Line no.	*Operating line*
135	**Operator unit 1** Missing In operation No recept'n Change batt
136	**Operator unit 2** Missing In operation No recept'n Change batt
137	**Operator unit 3** Missing In operation No recept'n Change batt

Service unit

Line no.	*Operating line*
138	**Service unit** Missing In operation No recept'n Change batt

Delete all devices

Line no.	*Operating line*
140	**Delete all devices** No Yes

The RF link to all devices is canceled. If wireless communication is required again, set up a new binding.

6.3 Time programs

For the heating circuits and DHW heating, a number of switching programs are available. They are activated in *Automatic* operation and control the change of the temperature levels (including the associated setpoints) via the selected switching times. During occupancy periods, the *Comfort* level is maintained, outside the occupancy periods the *Reduced* level. Switching programs are only active in *Automatic* operation. Available is a 7-day program with a maximum of 3 occupancy periods per day (6 switching points).

Entering the switching times

The switching times can be set in a combined way, that is, either jointly for several days or as separate times for individual days. When preselecting groups of days like for instance Mo…Fr and Sa…Su that use the same switching times, the setting of switching programs is simplified.

6.3.1 Switching points

Preselection

Line no.					*Operating line*
HC1	*HC2*	*3/HC3*	*4/DHW*	*5*	
500	**520**	**540**	**560**	**600**	**Preselection** Mo - Su Mo - Fr Sa - Su Mo…Su

Phase on

Line no.					*Operating line*
HC1	*HC2*	*3/HC3*	*4/DHW*	*5*	
501	**521**	**541**	**561**	**601**	**1st phase on**
503	**523**	**543**	**563**	**603**	**2nd phase on**
505	**525**	**545**	**565**	**605**	**3rd phase on**

Phase off

Line no.					*Operating line*
HC1	*HC2*	*3/HC3*	*4/DHW*	*5*	
502	**522**	**542**	**562**	**602**	**1st phase off**
504	**524**	**544**	**564**	**604**	**2nd phase off**
506	**526**	**546**	**566**	**606**	**3rd phase off**

Note!
When using function *Optimum start/stop control*, the effective switching times can differ from the programmed switching times, the reason being the optimization process.

6.3.2 Standard program

Default values

Line no.	*Operating line*
516, 536, 556, 576, 616	**Default values** No Yes

All time programs can be reset to their default settings. Each time program has its own operating line to make the reset.

Note!
In that case, individual settings will be lost!

6.4 Holidays

Preselection

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
641	**651**	**661**	**Preselection**
			Period 1
			Period 2
			Period 3
			Period 4
			Period 5
			Period 6
			Period 7
			Period 8

Start

Line no.			*Operating line*
HC1	*HC2*	*HC1*	
642	**652**	**662**	**Start**

End

Line no.			*Operating line*
HC1	*HC2*	*HC1*	
643	**653**	**663**	**End**

Operating level

Line no.			*Operating line*
HC1	*HC2*	*HC1*	
648	**658**	**668**	**Operating level**
			Frost protection
			Reduced

The holiday program enables holiday periods to be preprogrammed for a full calendar year. When a holiday period is active, the operating level switches to *Reduced* or *Frost protection* (selectable).

Note!
The holiday program can only be used in *Automatic* operation.

Holiday periods are only active in *Automatic* operation. In the other operating modes, they are started and run in the background to become active whenever *Automatic* operation is selected.

When a holiday period has elapsed, the controller automatically deletes it. The same holiday period the following year would have to be reprogrammed.
A holiday period starts at 0:00 of the first day and ends/is deleted at 24:00 of the last day of the holiday period.

An active holiday period is indicated by the suitcase symbol. The heating circuit's operating mode does not change.

It is possible to enter a holiday period with the date of the first and last day of the period (dd.mm). The operating level that shall apply during active holiday periods can be selected (*Reduced* or *Protection*).

The impact of a currently active holiday period can only be canceled by switching to non-automatic operation or by deleting the programmed holiday period.

Note!
The holiday program has an impact on DHW heating. If, for example, all heating circuits are *on holiday,* DHW heating assigned to these heating circuits will be switched off.

Note!
The LMS14… offers 8 holiday periods per year:

Setting several holiday periods:
Use parameter *Preselection* (641/651/661) to select the required holiday period (1 - 8). Then, enter to dates required for the corresponding holiday period using *Start* (642/652/662) and *End* (643/653/663).

Note!
The selected operating level is the same for all holiday periods.

6.5 Heating circuits

For the heating circuits, a number of functions are available which can be individually set for each heating circuit. Every heating circuit can be a virtual circuit, pump circuit or mixing circuit. The *Mixing* function is available only when an external extension module is used.

Note!
Heating circuits 1, 2 and 3 can be switched on/off via parameter if, for example, a request for heat shall only be generated via external consumer group 1/2/3.

If, with the mixing circuit, the flow sensor is not connected, it becomes a pump circuit with regard to functions.

6.5.1 Operating mode

Operating mode

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
700	**1000**	**1300**	**Operating mode** Protection Automatic Reduced Comfort

The operating modes of the heating circuits are selected directly with the operating mode button.

This setting is used to switch between different operating modes. Functionality corresponds to the operating mode selection via the operating mode button. For details, refer to section *Operation*.

Note!
The operating mode can also be changed via input H (refer to chapter *Operating mode changeover via input H*).

Protection
Continuous operation (24 hours) at the *Frost protection* level.
Switching program, presence button, holiday program, optimum start/stop control and *ECO* program have no impact.

Note!
When using a room thermostat, it normally prevents the room temperature from falling and must be set to a level that ensures frost protection for the room (also refer to chapters *Compensation variant, Room model,* and *Frost protection for the room)*.
In the case of compensation variants RT-RR and RT-WR, frost protection for the room according to chapter *Frost protection for the room* can become active because a room sensor is installed and as a result of the acquired room temperature, even if the room thermostat signals *Warm*.

Automatic
Automatic operation at the *Comfort*, *Reduced* or *Frost protection* level in accordance with the switching program, the presence button, the holiday program, optimum start/stop control and the *ECO* function.

Reduced

Continuous operation (24 hours) at the *Reduced* level.
Switching program, presence button, holiday program, optimum start/stop control and *ECO* program have no impact. The protective functions remain active.

Comfort

Continuous operation (24 hours) at the *Comfort* level.
Switching program, presence button, holiday program, optimum start/stop control and *ECO* program have no impact. The protective functions remain active.

6.5.2 Compensation variants

The compensation variant (CV) determines the variable (outside temperature or room temperature setpoint) according to which the flow temperature of the heating circuits shall be controlled.

Generation of compensation variant

The compensation variant is generated automatically based on the existing temperature values of outside temperature (OT), room temperature (TR), parameterization of room thermostat setpoint and the room thermostat inputs. Parameter *Room influence* (750/1050/1350) impacts the compensation behavior if there is no room thermostat and if both temperature values are available.

Compensation variants

The following compensation variants are available:

Weather compensation alone (WW)
Control is performed via the heating curve, based solely on the outside temperature.

Room temperature control (RR):
Control is performed based solely on the room temperature.

Weather compensation with room influence (WR):
Control is performed via the heating curve and the room temperature, based on the outside temperature.

Room thermostat control with setpoint (RT-S)
Control is performed only when the room thermostat's state is *Cold*, using a fixed setpoint.

Room thermostat control with weather compensation alone (RT-WW)
Control is performed only when the room thermostat's state is *Cold*, based on the outside temperature and the heating curve.

Room thermostat control with room control (RT-RR)

Note!
Control is performed only when the room thermostat's state is *Cold*, based on the room temperature. This setting may result from the use of a room thermostat in connection with a room unit with built-in sensor, but does not make much sense from a practical point of view.

Room thermostat control and weather compensation with room influence (RT-WR)

Note!
Control is performed only when the room thermostat's state is *Cold*, based on the outside temperature, the heating curve and the room temperature. This setting may result from the use of a room thermostat in connection with a room unit with built-in sensor, but does not make much sense from a practical point of view.

Room thermostat input	Room thermostat setpoint	Room temperature	Outside temperature	Room influence	Compensation variant	Compensation variant error
Not available	●	Not available	Not available	●	WW	Outside temperature not available
Not available	●	Not available	Installed	●	WW	No
Not available	●	Installed	Not available	●	Room control	No
Not available	●	Installed	Installed	--- (Off)	WW	No
Not available	●	Installed	Installed	1...99%	WR	No
Not available	●	Installed	Installed	100%	Room control	No
Installed	Valid	▲	▲	●	RT-S	No
Installed	--- (Off)	Not available	Not available	●	RT-WW	Outside temperature not available
Installed	--- (Off)	Not available	Installed	●	RT-WW	No
Installed	--- (Off)	Installed	Not available	●	RT-RR	No
Installed	--- (Off)	Installed	Installed	--- (Off)	RT-WW	No
Installed	--- (Off)	Installed	Installed	1...99%	RT-WR	No
Installed	--- (Off)	Installed	Installed	100%	RT-RR	No

● = setting with no impact

▲ = setting has no impact on the compensation variant; ECO functions (summer/winter heating limit/ 24-hour heating limit/room temperature limitation) remain active depending on the availability of a sensor (room sensor/outside sensor)

Key

WW	Weather compensation alone
WR	Weather compensation with room influence
RT-S	Room thermostat control with setpoint
RT-WW	Room thermostat control with weather compensation alone
RT	Room thermostat control
RT-WR	Room thermostat control and weather compensation with room influence
RT-RR	Room thermostat control with room control
RR	Room control

Room thermostat input: An input Hx as a room thermostat is assigned to the heating circuit
Room thermostat setpoint: *Flow temp setpoint room stat* (742/1042/1342)
Room influence: 750/1050/1350

Note!
If neither of the temperature values (room temperature and outside temperature) is available, weather compensation (WW) is used with the substitution value 0 °C for the outside temperature. In that case, an error message is delivered. With room control, frost protection for the plant must be switched off if there is no outside sensor.

Generation of the compensation variant is possible for each heating circuit and can be set accordingly.

6.5.3 Occupancy button (presence button)

If, as a result of the time switch settings, current comfort needs are not satisfied, the operating level can be manually changed via the operator unit by pressing the occupancy button (presence button). The presence button is only active in *Automatic* operation.

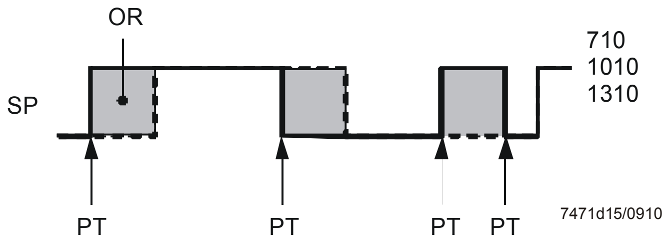


Figure 15: Presence button

Key

Line no.			*Meaning*	
HC1	*HC2*	*HC3*		
710	1010	1310	TRK	Room temperature *Comfort* setpoint
			SP	Switching program
			OR	Override
			PT	Pressing the presence button

The effect of pressing the presence button continues until the next switching point is reached. When the button is pressed again, the state is canceled.

6.5.4 Operating level

Based on the different impacts (operating mode, input Hx, holiday program, time switch, presence button), the operating level is generated which, however, does not yet include the influence of optimum start/stop control.

Generating the operating level (BN)

Operating mode of heating circuit	**State of time switch**	**State of presence button**	**State of holiday program**	**Operating level HC (before optimization)**
Automatic	●	●	Active	*Reduced/Frost* *
Automatic	*Reduced* phase	No override	Inactive	*Reduced*
Automatic	*Reduced* phase	Override	Inactive	*Comfort*
Automatic	*Comfort* phase	No override	Inactive	*Comfort*
Automatic	*Comfort* phase	Override	Inactive	*Reduced*
Comfort	●	●	●	*Comfort*
Reduced	●	●	●	*Reduced*
Protection	●	●	●	*Frost*

● = can be any

* Selectable whether the holiday program shall switch to *Reduced* or *Frost*

Note!
The operating level can also be changed via input H (refer to chapter *Operating level changeover via input H*).

6.5.5 Setpoints

Comfort setpoint

Line no.			Operating line
HC1	HC2	HC3	
710	**1010**	**1310**	**Comfort setpoint**

Reduced setpoint

Line no.			Operating line
HC1	HC2	HC3	
712	**1012**	**1312**	**Reduced setpoint**

Frost protection setpoint

Line no.			Operating line
HC1	HC2	HC3	
714	**1014**	**1314**	**Frost protection setpoint**

In *Protection* mode, the room temperature is prevented from falling below a certain level. This means that the *Frost Protection* setpoint of the room temperature is maintained.

Comfort setpoint max

Line no.			Operating line
HC1	HC2	HC3	
716	**1016**	**1316**	**Comfort setpoint max**

Room temperature

The room temperature can be shifted according to different setpoints. These setpoints become active depending on the selected operating mode, thus producing different temperature levels in the rooms. The ranges of adjustable setpoints result from interdependencies, as this is shown in the following diagram:

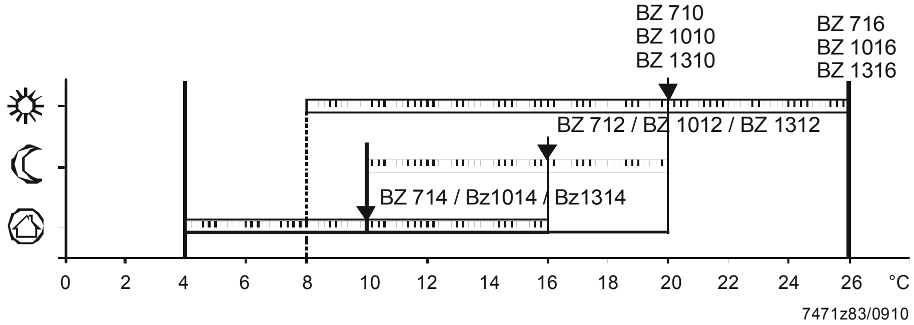


Figure 16: Setpoints

Key

Line no.			Meaning	
HC1	HC2	HC3		
710	1010	1310	TRK	Room temperature *Comfort* setpoint
712	1012	1312	TRR	Room temperature *Reduced* setpoint
714	1014	1314	TRF	*Frost protection* setpoint
716	1016	1316	TRKmax	Maximum room temperature *Comfort* setpoint

6.5.6 Heating curve

The heating curve generates the flow temperature setpoint, which is used to maintain a certain flow temperature level depending on the prevailing weather conditions. The heating curve can be adjusted in different ways, thus matching the heat output and the room temperature to individual needs.

Heating curve slope

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
720	**1020**	**1320**	**Heating curve slope**

When the heating curve slope is raised, the flow temperature increases as the outside temperature drops. Or, in other words, if the room temperature is not correct at low outside temperatures but correct at higher outside temperatures, the heating curve slope must be readjusted.

Increasing the slope:	Raises the flow temperature, especially when the outside temperature is low.
Decreasing the slope:	Lowers the flow temperature, especially when the outside temperature is low.

Note!
The set heating curve is based on a room temperature setpoint of 20 °C. If this setpoint is changed, the heating curve adapts automatically to the new value.

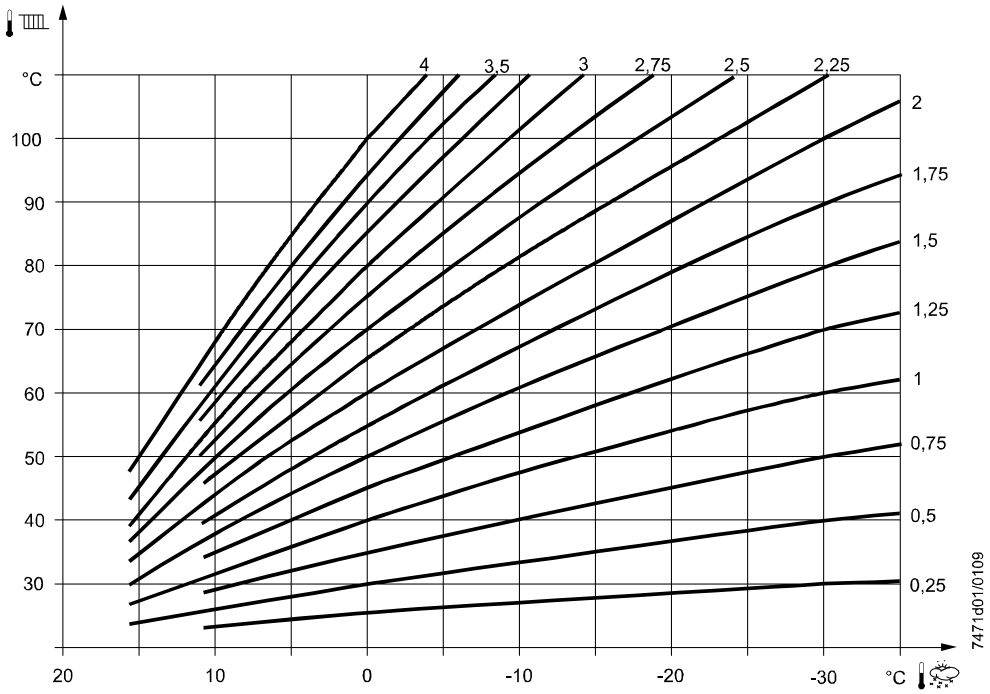


Figure 17: Heating curve – heating curve slope

Calculation

The resulting flow temperature can be calculated as follows:

$$TV = TR + [2 + (TR - TAgem) - 0.005 * (TR - TAgem)2] * s$$

The impact of compensation variant *Weather compensation with room influence* on the flow temperature setpoint is calculated as follows:

$$\Delta TV = \Delta TRw * (1 + s)$$

Key

Line no.	*Meaning*	
	ΔTV	Resulting flow temperature adaption
	ΔTRw	Room temperature setpoint readjustment (due to room influence)
	TV	Flow temperature setpoint heating circuit
	TR	Room temperature setpoint – heat gains + room influence
	TAgem	Composite outside temperature
	s	Heating curve slope

Heating curve displacement

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
721	**1021**	**1321**	**Heating curve displacement**

Parallel displacement of the heating curve is used to change the flow temperature evenly across the entire outside temperature range or, in other words, if the room temperature is always too high or too low, a readjustment must be made via parallel displacement.

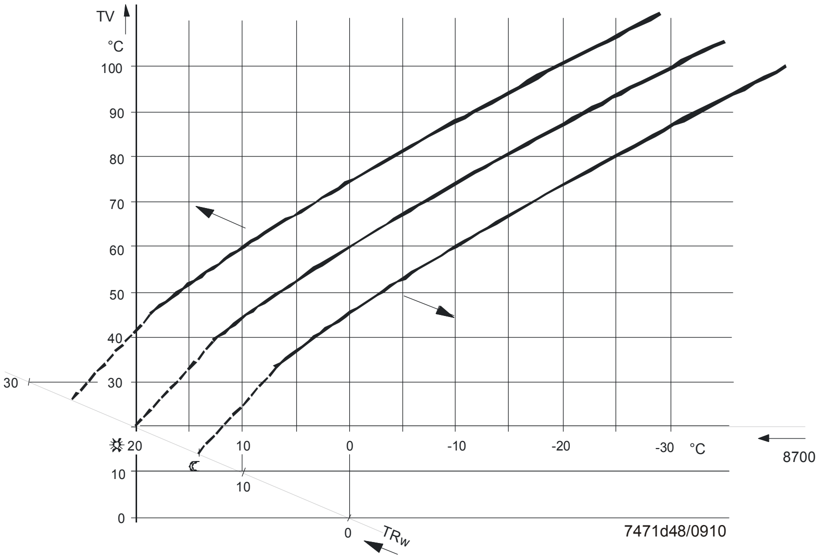


Figure 18: Heating curve – heating curve displacement

Key

Line no.	*Meaning*	
8700	TA	Outside temperature
	TRw	Room temperature setpoint
	TV	Flow temperature

Heating curve adaption

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
726	**1026**	**1326**	**Heating curve adaption** Off On

Adaption of the heating curve is used by the controller to automatically adapt the heating curve to the prevailing weather conditions. In that case, a readjustment of heating curve slope and parallel displacement is not required. It can only be switched on or off.

ℹ

Note!
To provide this function, following must be observed:

- A room sensor must be connected
- The *Room influence* setting must be selected between 1 and 99
- No thermostatic radiator valves should be used in the reference room, where the room sensor is located (if installed, such valves must be fully opened and locked in that position)

Off
Function is deactivated.

On
Function is activated.

The function is activated via parameter, provided a room sensor is used and the compensation variant WR (Weather compensation with room influence).
If the required flow temperature is exceeded or is not reached for more than 2 hours, no adaption is made for that day. With pump heating circuits, the boiler temperature is used in place of the flow temperature. Heating curve adaption readjusts the heating curve’s slope and the parallel displacement (heat gains). In *Comfort* mode (nominal operating level), the function integrates the room temperature control deviation and readjusts at midnight the parameters for calculating the heating curve, depending on the attenuated outside temperature and the learning sensitivity. During boost heating, the deviation of room temperature control is not taken into consideration. After each learning step, the learning sensitivity is reduced step by step. If the heating curve’s slope or parallel displacement (heat gains) is changed, the sensitivity is automatically set to the maximum. A certain minimum sensitivity is always maintained.

If the attenuated outside temperature is below 4 °C, the heating curve slope is readjusted through the learning process.
If the attenuated outside temperature lies between 4 °C and 12 °C, heating curve slope and parallel displacement are readjusted through learning.
If the attenuated outside temperature exceeds 12 °C, the learning process is stopped.
These basic values apply to a *Comfort* setpoint of 20 °C, heat gains of 0 K and a heating curve displacement of 0 K.

6.5.7 *ECO* function

Summer/winter heating limit

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
730	**1030**	**1330**	**Summer/winter heating limit**

The summer/winter heating limit is used to switch the heating on and off in the course of the year, depending on the outside temperature. In *Automatic* operation, switching on/off takes place automatically, so there is no need for the user to do this manually. The respective periods of time are shortened or extended by changing the setting.

The *Summer/winter changeover* function switches the heating off when the attenuated outside temperature exceeds the adjusted changeover temperature. The heating system is switched on again when the attenuated outside temperature drops 1 K below the adjusted value. The required changeover temperature can be parameterized. The function can be activated/deactivated.

Increase:	Winter operation will start *earlier*. Summer operation will start *later*.
Decrease:	Winter operation will start *later*. Summer operation will start *earlier*.

Note!

- The function is not active in *Comfort* mode ☼
- The display shows ECO
- To give consideration to the building's thermal dynamics, the outside temperature is attenuated

Example:

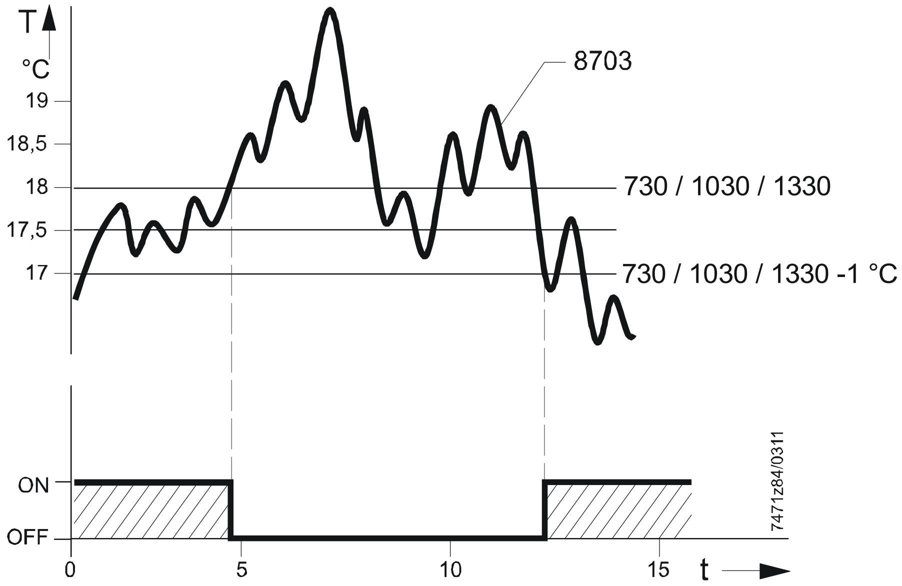


Figure 19: ECO function – summer/winter heating limit

Key

Line no.			*Meaning*	
HC1	*HC2*	*HC3*		
730	1030	1330	SWHG	Summer/winter heating limit
8703			TAged	Attenuated outside temperature
			t	Days
			T	Temperature

24-hour heating limit

Line no.			Operating line
HC1	*HC2*	*HC3*	
732	**1032**	**1332**	**24-hour heating limit**

The 24-hour heating limit is used to switch the heating on and off in the course of the day, depending on the outside temperature. This function is used primarily during spring and autumn to respond to short-term temperature variations.

The *24-hour heating limit* function switches the heating system off when the current outside temperature or the composite outside temperature rises to a level of one adjusted differential below the current operating level. The heating is switched on again when the current outside temperature and the composite outside temperature drop 1 K below the adjusted differential.

Note!
In *Comfort* mode, the function is always deactivated.

The required ECO temperature differential can be parameterized. The function can be activated/deactivated.

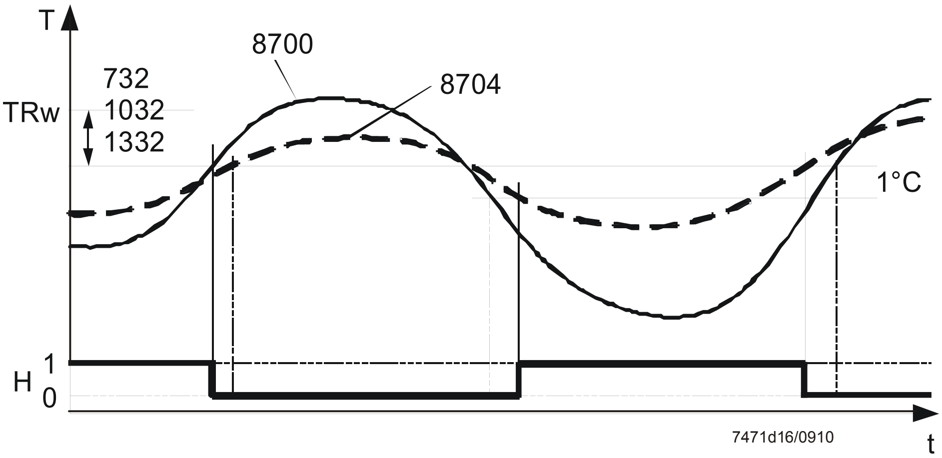


Figure 20: Eco function – 24-hour heating limit

Key

Line no.			Meaning	
HC1	*HC2*	*HC3*		
8700			TA	Outside temperature
8704			TAgem	Composite outside temperature
732	1032	1332	THG	24-hour heating limit
			H	Heating (1 = On, 0 = Off)
			t	Time
			T	Temperature
			TRw	Room temperature setpoint

Example:

Operating line	*E.g.*
Room temperature setpoint	22 °C
24-hour heating limit (THG)	-3 °C
Changeover temperature (room temperature setpoint – setpoint of 24-hour heating limit), heating Off	= 19 °C

Switching differential (fixed)	-1 °C
Changeover temperature, heating On	= 18 °C

The respective heating period is shortened or extended by changing the setting.

Increase: *Heating* mode will start *earlier*.
Changeover to ECO *later*.

Decrease: *Heating* mode will start *later*.
Changeover to ECO *earlier*.

ℹ

Note!
- The function is not active in operating mode *Continuously Comfort temperature* ☼
- The display shows ECO
- To give consideration to the building's thermal dynamics, the outside temperature is attenuated

Ext'n 24-hour heating limit

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
733	**1033**	**1333**	**Ext'n 24-hour heating limit** No Yes

The 24-hour heating limit is extended by giving consideration to the composite outside temperature when the heating is switched on. Alternatively, the heating can be switched on again solely depending on the current outside temperature.

No
The 24-hour heating limit takes effect solely depending on the current outside temperature.

Yes
The 24-hour heating limit takes effect as described under *24-hour heating limit*, depending on both the current and the composite outside temperature.

6.5.8 Flow temperature setpoint limits

Flow temp setpoint min/max

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
740	**1040**	**1340**	**Flow temp setpoint min**
741	**1041**	**1341**	**Flow temp setpoint max**

Using this limitation, a temperature range for the flow temperature setpoint can be defined. If the flow temperature setpoint called for by the heating circuit reaches the relevant limit and the request for heat increases or decreases, the flow temperature setpoint is maintained at the maximum or minimum limit.

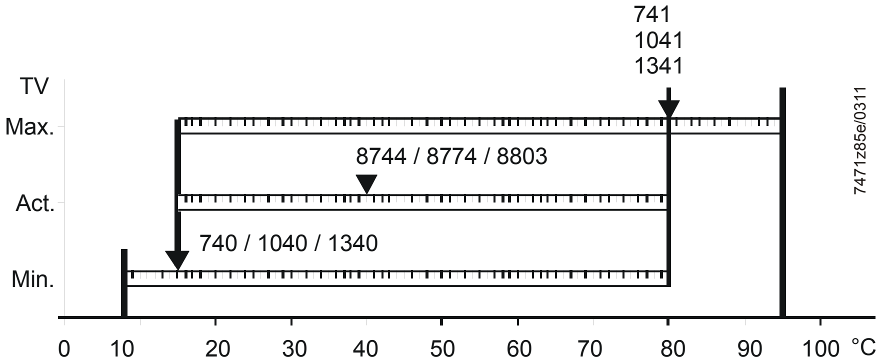


Figure 21: Flow temperature setpoint limits

Key

Line no.			*Meaning*	
HC1	*HC2*	*HC3*		
740	1040	1340	TVmin	Minimum flow temperature setpoint
741	1041	1341	TVmax	Maximum flow temperature setpoint
8744	8774	8803	TVw	Flow temperature setpoint 1/2/3

Flow temp setpoint max

The calculated flow temperature setpoint is limited according to the setting made. The limitation is active in all operating modes. Even forced signals cannot push the flow temperature setpoint above that level.

Warning!
Maximum limitation is not a safety function. If the flow temperature exceeds this limit, the heating circuit pump will not be deactivated.

Flow temp setpoint min

The flow temperature setpoint is limited according to the setting made. This also applies to heat requests made to the heat sources.

6.5.9 Room thermostat

On applications with room thermostat, the heating is switched on only when the room thermostat calls for heat. When the thermostat is in the *Cold* state, a fixed or weather-dependent flow temperature setpoint can be selected.

Flow temp setpoint room stat

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
742	**1042**	**1342**	**Flow temp setpoint room stat**

The differentiation is made via parameter *Flow temp setpoint room stat*:

- When a setting is made, the flow temperature setpoint corresponds to the fixed value, which can be readjusted via the room thermostat's adaption function
- When **no** setting is made (---), the flow temperature setpoint is calculated according to the heating curve. This offers the advantage that – as usual – the output of the heating system can be adjusted via the heating curve slope and the room temperature setpoint. In that case, the room thermostat's *Adaption* function acts on the heating curve. If no outside sensor is connected, the value of the heating curve at
  0 °C (backup value) is used, and an error message (*Outside sensor missing*) is delivered

Functions with room thermostat

The following table gives an overview of the room functions and their modes of operation when using a room thermostat:

Function	**Description**
Automatic summer/winter changeover	As parameterized; function is not available without outside sensor
24-hour heating limit	As parameterized; function is not available without outside sensor
Boost heating	As parameterized; ended when room thermostat switches to the *Warm* state
Quick setback	Flow temperature setpoint as parameterized: Function is not available. Outside the *Comfort* phases, the heating is Off Flow temperature setpoint according to the heating curve: - With room sensor: As parameterized and according to the current room temperature if room influence is active - Without room sensor and with outside sensor: As parameterized and according to the room model Without outside sensor and without room sensor: - ParQuickSetback = off → no quick setback - ParQuickSetback = reduced → heating continuously on - ParQuickSetback = frost → heating continuously on
Optimum start/stop control	As parameterized; function is not available without outside sensor
Room influence	As parameterized and according to the current room temperature, if room influence is active
Room limitation	As parameterized; function is not available without room sensor
Adaption	The room thermostat's *Adaption* function can be specifically parameterized. For that purpose, the required cycling ratio of the room thermostat must be parameterized Flow temperature setpoint as parameterized: → adaption of setpoint Flow temperature setpoint according to the heating curve: → adaption of heating curve

Flow temperature setpoint based on a fixed value

If the flow temperature setpoint is predefined via parameterization, the parameterized setpoint for the *Comfort* phases is only maintained when the room thermostat is in the *Cold* state.
Outside the *Comfort* phases, the heating is also Off when the room thermostat is in the *Cold* state.
If the room thermostat does not call for heat, the heating remains Off.

Boost heating function:
With functions *Boost heating with room thermostat* und *Setpoint based on a fixed value,* the flow temperature boost is calculated as a percentage and added to the parameterized setpoint.
Boost heating remains active until the room thermostat switches to the *Warm* state.
The function can be deactivated.

Note!
When an outside sensor is connected, frost protection for the plant can be activated.
When frost protection for the plant has responded (at low outside temperatures), the pump is also activated outside the *Comfort* phases.
Heat requests do not become active.

If, in addition, a room sensor is used, room temperature limitation can also be activated.
Function *Room influence* is not active.

The fixed flow temperature setpoint can be deactivated (---) (if a fixed value is not parameterized, the flow temperature is calculated based on the heating curve).
If no outside sensor is connected, the backup outside temperature of 0 º C is used (refer to chapters *Flow temperature setpoint according to the heating curve* and *Adaption with flow temperature setpoint according to the heating curve*.)

Flow temperature setpoint in case of fixed value with adaption

If the flow temperature setpoint is predefined via parameterization, the value can be adapted depending on the demand for heat. This function ensures that the heat request sent to the heat source during the entire heating season does not always represent the high setpoint required for the very cold season.
The function requires no outside sensor.

Adaption can be deactivated (---).

Swi-on ratio room stat

Line no.			Operating line
HK1	*HK2*	*HK3*	
744	**1044**	**1344**	**Swi-on ratio room stat**

Adaption of the setpoint is subdivided into 2 functions:

Dynamic readjustment of flow temperature setpoint
If the current flow temperature setpoint is too low, dynamic readjustment adapts the current demand for heat.
To make the readjustment, the room thermostat’s current cold-warm time ratio is compared with the target value.
If, during *Comfort* phases, the cold phase is too long, the setpoint is increased.
If a cold-warm time ratio is not yet available when switching to *Comfort*, the setpoint is increased if the room thermostat remains in the *Cold* state for more than 2 hours.
To prevent the flow temperature from rising too quickly in the case of very short warm phases, dynamic readjustment is activated after 30 minutes at the earliest.

Midnight adaption for the next day
Based on the demand for heat of the previous day, midnight adaption readjusts the amount of heat required for the next day.
This adaption changes the parameterized flow temperature setpoint.
The adapted value is stored and used should a power failure occur.
For adaption, a cold-warm time ratio of the room thermostat is predefined as a target value (1…99%).
If, during *Comfort* phases, the cold phase is too long, the setpoint is raised.
If the cold phase is too short, the setpoint is lowered.
Parameterized boost heating is taken into consideration when calculating the required readjustment.
The setpoint is readjusted at midnight.
If, at midnight, the room thermostat is in the *Warm* state, the setpoint readjustment is not made until the room thermostat switches to the *Cold* state.

Flow temperature setpoint according to the heating curve

In the case of a weather-compensated flow temperature setpoint (fixed value not parameterized), the setpoint is calculated based on the outside sensor and the heating curve.
When the room thermostat is in the *Cold* state, the heating is switched on according to the current heating level, irrespective of operating mode.
Functions *Boost heating*, *Quick setback* and *Optimum start/stop control* are taken into consideration.
Without room sensor, the room model is used.
Functions *Room temperature limitation* and *Room influence* can be provided only if a room sensor is connected.

Note!
If an outside sensor is not connected, the heating curve is calculated based on the backup outside temperature of 0 °C.

Adaption with flow temperature setpoint according to the heating curve

If the flow temperature setpoint is calculated via the heating curve (no fixed value parameterized) and the room thermostat's *Adaption* function is active, the heating curve's slope and thus the flow temperature setpoint will be adapted.
Adaption takes place at midnight (like with the normal heating curve adaption with room sensor).
To ensure adaption, neither a room sensor nor an outside sensor is mandatory.

Adaption at midnight
Based on the demand for heat of the previous day, adaption of the heating curve readjusts the slope.
The adapted slope is stored and used should a power failure occur.
For adaption, a cold-warm time ratio of the room thermostat is predefined as a target value (1…99%).
If, during *Comfort* phases, the cold phase is too long, the heating curve slope is increased.
If the cold phase is too short, the heating curve slope is decreased.
The duration of boost heating – if parameterized – is not taken into account for the cold-warm time ratio.

Dynamic readjustment during the *Comfort* phases
With the weather-compensated flow temperature setpoint, dynamic readjustment of the setpoint is not required.
In that case, the heat request is continuously matched to varying conditions in accordance with the composite outside temperature.

Adaption can be deactivated (---).

6.5.10 Delay heat request

Delay heat request

Line no.			Operating line
HC1	*HC2*	*HC3*	
746	**1046**	**1346**	**Delay heat request t**

Certain types of heating systems use heating circuit valves in place of heating circuit pumps as actuating elements. Such valves are sometimes characterized by relatively long changeover times. As a result, the heat source/burner might reach its operating position before the heating circuit valve has opened, meaning that the produced heat cannot be drawn by the heating circuit.
Parameter *Delay heat request* (746, 1046, 1346) can be used to delay the heat request from the heating circuit to the heat source, thus ensuring that the actuating element releases the heating circuit before the heat source reaches its operating position.

Note!
It should be taken into account that the system pump/heating circuit pump will be switched on in the case of a forced signal due to…

- recooling of the DHW storage tank,
- excess heat discharge by the solid fuel boiler,
- excess heat discharge via input H1/H2/EX2.

If the system pump is installed downstream from the buffer storage tank, it will also be switched on in the case of a forced signal due to recooling of the buffer storage tank.

The delayed heat request is inactive in these cases so that the system pump is activated before the heating circuit is released by a heating circuit valve.

Note!
If the application requires function *Overtemp prot pump circuit* (820, 1120, 1420), it must be made certain that the heating circuit's slow-acting actuating element (valve) meets the requirements.

Note!
If parameter *Delay heat request* (746, 1046, 1346) is set to a value >0 and DHW *Charging priority* (1639) is set to *Absolute*, that heating circuit's actuating element continues to be controlled.
This means that DHW charging priority *Absolute* will not be considered for this valve circuit and – depending on the function of *boiler pump* Q1 and the *type of hydraulic system* (e.g. charging pump) – both heating circuit and DHW are being served simultaneously.

But function *Overtemperature protection* continues to be active for this heating circuit, provided it is parameterized.

Note!
When using *Funct input EX21 module* x (6024, 6026, 6028), *Limit thermostat HC*, on one of the extension modules , it must be taken into consideration that the heating circuit's actuating element (valve) is switched off directly by the extension module. When switching off by the limit thermostat becomes inactive again, the delayed heat request remains inactive so that the heat source resumes operation before an installed heating circuit valve releases the heating circuit.

Note!
For the instantaneous water heater, it can be selected whether the residual heat resulting from overrun shall be delivered to the instantaneous water heater or the heating circuits – *Overrun via inst WH* (5489). When supplied to the heating circuits, the delayed heat request becomes inactive.
If the heat resulting from overrun is supplied to the heating circuit, the heating circuit's actuating element must first be opened. If it is a valve, it might not be possible to supply the residual heat to that heating circuit.

Note!
For the DHW diverting valve, parameter *Pump off change div valve* (5732) can be used to set the period of time the pump shall be off. Using *Delay pump off* (5733), a time shift between pump shutdown and control of the diverting valve can be parameterized.
To ensure the heating circuit's actuating element releases the heating circuit before the heat source is put into operation, parameter *Delay heat request* (746, 1046, 1346) must be increased by the amount of time the DHW diverting valve requires to change over.

Note!
Parameter *Delay heat request* (746, 1046, 1346) is used to delay the heat request of the respective heating circuit to the heat source while the valve is already controlled.
If the heat request results from a special function of the heat source (e.g. Chimney sweep function), the delay becomes inactive. In this case, parameter *Delay heat request special op* (2470) must be set as well.

6.5.11 Room model

The room model calculates a fictive room temperature for rooms without room sensor.

This allows boost heating, quick setback and optimum start/stop control to be implemented with no need for using a room sensor. The calculation takes into account the attenuated outside temperature and the heat up gradient for switching to a higher setpoint, plus the building's time constant for switching to a lower setpoint.

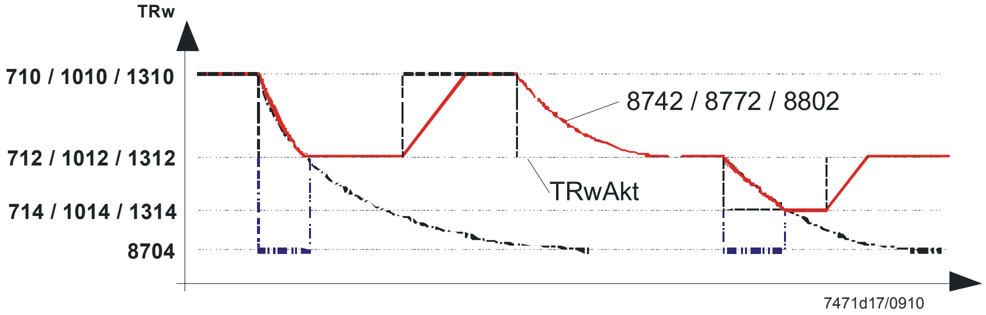


Figure 22: Room model

Key

Line no.			Meaning	
HC1	*HC2*	*HC3*		
710	1010	1310	TRK	Room temperature *Comfort* setpoint
712	1012	1312	TRR	Room temperature *Reduced* setpoint
714	1014	1314	TRF	*Frost protection* setpoint
8704			TAgem	Composite outside temperature
8742	8772	8802	TRmod	Room temperature model
			TRwAkt	Current room temperature setpoint

Note!
The room model is always calculated. If the outside temperature is not available, the room model performs the calculation with a substitute value of 0 °C. Then, the *Heating* functions themselves decide on the source of the room temperature, based on the compensation variant and the state of the room sensor:

- The model temperature is always used for the calculation if no room sensor is available
- The model temperature is used for the calculation if weather compensation alone is required
- The current temperature is used for the calculation if there is a room sensor and room influence or room control is required

Note!
For applications with room thermostat, the temperature of the room model (TRmod) is set to the room temperature *Comfort* setpoint as soon as the room thermostat signals *Warm*.

The heat up gradient is available for every heating circuit and can be set.

Additional parameters

Line no.			*Meaning*
HC1	*HC2*	*HC3*	
794	**1094**	**1394**	**Heat up gradient**
6110			**Time constant building**
8703			**Outside temp attenuated**

6.5.12 Room influence

Room influence

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
750	**1050**	**1350**	**Room influence**

Compensation variants

When a room sensor is used, there is a choice of 3 different types of compensation:

Setting	*Type of compensation*
– – – %	Weather compensation alone *
1…99%	Weather compensation with room influence *
100%	Room compensation alone

* Outside sensor required

Weather compensation alone

The flow temperature is calculated via the heating curve, depending on the composite outside temperature. This type of compensation calls for a correct adjustment of the heating curve since the control system gives no consideration to the room temperature in this case.

Weather compensation with room influence

Deviations of the current room temperature from the setpoint are acquired and taken into account when controlling the temperature. Heat gains can thus be considered, allowing more accurate room temperature control. The authority of deviation is set as a percentage figure. The better the reference room (correct room temperature, correct mounting location, etc.) the higher the value can be set.

Example:

Approx. 60%	Good reference room conditions
Approx. 20%	Unfavorable reference room

Note!
To activate the function, following must be considered:

- A room sensor must be connected
- *Room influence* must be set to a value between *1%* and *99%*
- No thermostatic radiator valves should be used in the reference room where the room sensor is located (if installed, such valves must be fully opened and locked in that position)

The impact of the selected room influence can be calculated as follows:

$\Delta TRw = \Delta TR * \text{room influence}/10$

Key

Line no.	*Meaning*	
	ΔTR	Room deviation (room temperature setpoint – actual value of room temperature)
	ΔTRw	Resulting room temperature setpoint readjustment

Example of a room temperature deviation of 1 °C with a selected room temperature influence of 50%:

$\Delta TRw = 1\ °C * 50\%/10 = 5\ °C$

Note!
Weather compensation with room influence leads to an adaption of the heating curve.

Room compensation alone

The flow temperature is controlled depending on the room temperature setpoint, the current room temperature and the progression of the room temperature. For example, a slight increase of the room temperature causes an immediate drop of the flow temperature.

Note!
To activate the function, following must be considered:

- A room sensor must be connected
- *Room influence* must be set to *100%*
- No thermostatic radiator valves should be used in the reference room where the room sensor is located (if installed, such valves must be fully opened and locked in that position)

6.5.13 Room temperature control and limitation

Room temp limitation

Line no.			Operating line
HC1	*HC2*	*HC3*	
760	**1060**	**1360**	**Room temp limitation**

Using the *Room temperature limitation* function, the heating circuit pump can be deactivated if the room temperature exceeds the current room temperature setpoint by more than the preset differential. The heating circuit pump is activated again when the room temperature returns to a level below the current room temperature setpoint. While the *Room temperature limitation* function is active, no requests for heat are sent to the heat source.

Note!
Room temperature limitation does not work with weather compensation alone.

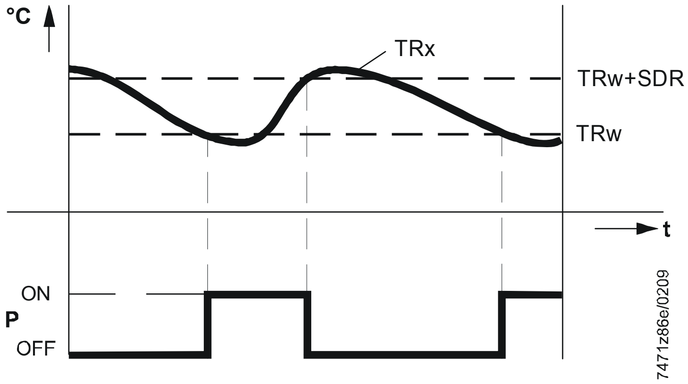


Figure 23: Room temperature control and limitation

Key

Line no.	*Meaning*	
	P	Pump
	SDR	Switching differential room
	t	Time
	TRw	Room temperature setpoint
	TRx	Actual value of room temperature

6.5.14 Heading limit room controller

Heating limit room controller

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
761	**1061**	**1361**	**Heating limit room controller**

In the case of room control alone, the request for heat becomes invalid if the current flow temperature setpoint request is smaller than the set limit value (x% of maximum flow temperature setpoint – room temperature setpoint). The request is activated again when the setpoint called for exceeds the switch-off threshold by more than 8%. The function can be activated and deactivated.

ℹ Note!
If an outside sensor is available, functions *24-hour heating limit* and *Summer/winter changeover* – if parameterized – can shut down the heating as well.

6.5.15 Boost heating

Boost heating

Line no.			Operating line
HC1	*HC2*	*HC3*	
770	**1070**	**1370**	**Boost heating**

Boost heating is used to reach the new setpoint more quickly when switching from the *Reduced* setpoint to the *Comfort* setpoint, thus shortening the heating up time. During boost heating, the room temperature setpoint is raised by the value set here. A higher setting leads to shorter heating up times, a lower setting to longer heating up times.

Boost heating with room thermostat:
Boost heating becomes active if parameterized and when the room temperature setpoint changes from *Reduced* to *Comfort*. It remains active until the room thermostat reports *warm*.

For boost heating, the flow temperature setpoint is calculated as follows:

Flow temp setpoint (8744/8774/8803) = Flow temp setpoint room stat (742/1042/1342) * [1+ boost heating (770/1070/1370)/20].

Example:

Flow temp setpoint room stat (742)	48 °C
Boost heating (770)	3 °C

Flow temp setpoint (8744) = 48 °C * [1 + 3/20] = 55.2 °C

Boost heating with heating curve:
Boost heating becomes active if parameterized and when the room temperature setpoint changes from *Reduced* to *Comfort*. It remains active until the room temperature reaches the level of comfort setpoint -0.25 K. During boost heating, the room temperature setpoint is increased by the parameterized amount of boost heating.

Note!
Boost heating is possible with or without room sensor.

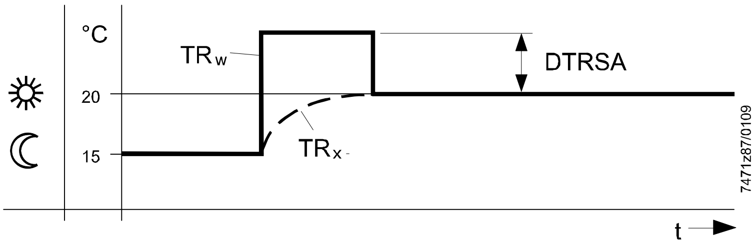


Figure 24: Boost heating

Key

Line no.	Meaning	
	DTRSA	Room temperature setpoint increase
	TRw	Room temperature setpoint
	TRx	Actual value of room temperature

6.5.16 Quick setback

Quick setback

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
780	**1080**	**1380**	**Quick setback** Off Down to reduced setpoint Down to frost prot setpoint

During quick setback, the heating circuit pump is deactivated and, in the case of mixing valve circuits, the mixing valve is fully closed.

Note!
Function *Continuous pump operation* enables the heating circuit pump to keep running during quick setback also.

- Function with room sensor:
  When using the room sensor, the function keeps the heating switched off until the room temperature drops to the level of the *Reduced* setpoint or the *Frost protection* level. When the room temperature falls to the *Reduced* or *Frost protection* level, the heating circuit pump is activated and the mixing valve released.

- Function without room sensor:
  Quick setback switches the heating off for a certain period of time, depending on the outside temperature and the building time constant.

The duration of quick setback can be calculated as follows:

t = 3 * building time constant * ln ((*Comfort* setpoint – composite outside temperature)/ (*Reduced* setpoint – composite outside temperature)

Example:
Duration of quick setback when *Comfort* setpoint – *Reduced* setpoint = 2 °C
(e.g. *Comfort* setpoint = 20 °C, *Reduced* setpoint = 18 °C).

Composite outside temperature	Building time constant						
	0	2	5	10	15	20	50
15 °C	0	3.1	7.7	15.3	23	30.6	76.6
10 °C	0	1.3	3.3	6.7	10	13.4	33.5
5 °C	0	0.9	2.1	4.3	6.4	8.6	21.5
0 °C	0	0.6	1.6	3.2	4.7	6.3	15.8
-5 °C	0	0.5	1.3	2.5	3.8	5	12.5
-10 °C	0	0.4	1	2.1	3.1	4.1	10.3
-15 °C	0	0.4	0.9	1.8	2.6	3.5	8.8
-20 °C	0	0.3	0.8	1.5	2.3	3.1	7.7
	Duration of quick setback in hours						

Duration of quick setback when *Comfort* setpoint – *Reduced* setpoint = 4 °C (e.g. *Comfort* setpoint = 20 °C, *Reduced* setpoint =16 °C)

Composite outside temperature	Building time constant						
	0 h		0 h		0 h		0 h
15 °C	0	15 °C	0	15 °C	0	15 °C	0
10 °C	0	10 °C	0	10 °C	0	10 °C	0
5 °C	0	5 °C	0	5 °C	0	5 °C	0
0 °C	0	0 °C	0	0 °C	0	0 °C	0
-5 °C	0	-5 °C	0	-5 °C	0	-5 °C	0
-10 °C	0	-10 °C	0	-10 °C	0	-10 °C	0
-15 °C	0	-15 °C	0	-15 °C	0	-15 °C	0
-20 °C	0	-20 °C	0	-20 °C	0	-20 °C	0

Duration of quick setback when *Comfort* setpoint – *Reduced* setpoint = 6 °C (e.g. *Comfort* setpoint = 20 °C, *Reduced* setpoint =14 °C)

Composite outside temperature	Building time constant						
	0 h		0 h		0 h		0 h
15 °C	0	15 °C	0	15 °C	0	15 °C	0
10 °C	0	10 °C	0	10 °C	0	10 °C	0
5 °C	0	5 °C	0	5 °C	0	5 °C	0
0 °C	0	0 °C	0	0 °C	0	0 °C	0
-5 °C	0	-5 °C	0	-5 °C	0	-5 °C	0
-10 °C	0	-10 °C	0	-10 °C	0	-10 °C	0
-15 °C	0	-15 °C	0	-15 °C	0	-15 °C	0
-20 °C	0	-20 °C	0	-20 °C	0	-20 °C	0

Note!

- The function can be activated/deactivated and it can be parameterized whether quick setback shall be active down to the *Reduced* or the *Frost protection* level
- Quick setback is possible with or without room sensor

6.5.17 Optimum start/stop control

Optimum start/stop control puts forward in time the change of operating level against the scheduled point in time, thereby giving consideration to the building dynamics (heating up and cooling down time). This ensures that the required temperature level is reached at the scheduled point in time. If this is not the case (too early or too late), a new changeover point is calculated, which is used the next time.

Optimum start control max

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
790	**1090**	**1390**	**Optimum start control max**

The change from one temperature level to the other is optimized in a way that the *Comfort* setpoint is reached at the respective switching time.

Optimum stop control max

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
791	**1091**	**1391**	**Optimum stop control max**

The change from one temperature level to the other is optimized in a way that the *Comfort* setpoint minus ¼ °C is reached at the respective switching time.

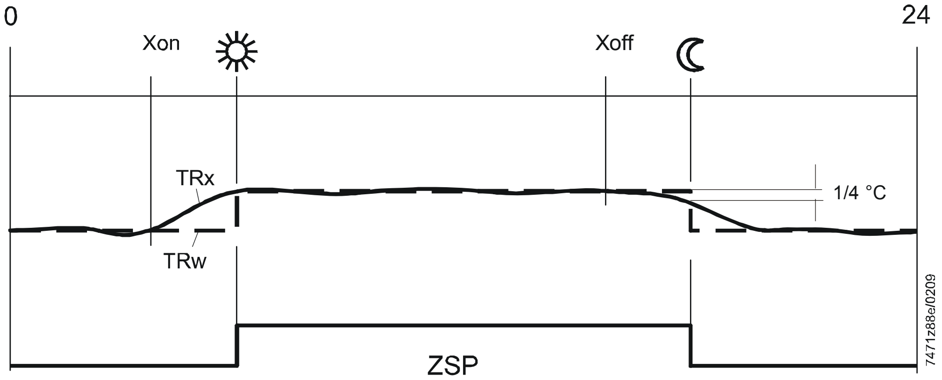


Figure 25: Optimum start/stop control

Key

Line no.	*Meaning*	
	TRw	Room temperature setpoint
	TRx	Actual value of room temperature
	Xoff	Forward shift of switch-off time
	Xon	Forward shift of switch-on time
	ZSP	Time program

Note!
The time of optimization (forward shift) can be limited to a maximum, separately for optimum start and optimum stop control. When setting the time of optimization to *0*, the function is deactivated. Optimum start/stop control is possible with or without room sensor.

6.5.18 Heating up gradient room model

Heat up gradient

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
794	**1094**	**1394**	**Heat up gradient**

The heating up gradient represents the time in minutes the heating system requires to raise the room temperature by 1 °C. This setting is used to calculate a fictive room temperature for rooms without room sensor (*Room temp 1 model* (8742), *Room temp 2 model* (8772), and *Room temp 3 model* (8802)).

6.5.19 Raising the *Reduced* setpoint

This function is used primarily with heating systems that have only little spare capacity (e.g. low-energy houses). In such cases, the heating up time would be too long at low outside temperatures. When the *Reduced* setpoint is increased, the rooms are prevented from cooling down to extremely low levels, thus shortening the heating up time when changing to the *Comfort* setpoint.

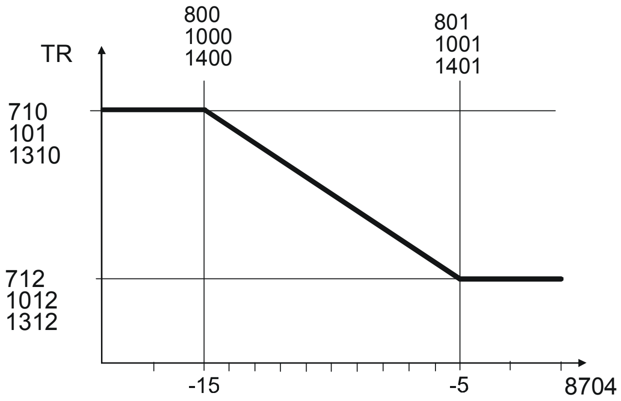


Figure26: Raising the reduced setpoint

Key

Line no.			*Meaning*	
HC1	*HC2*	*HC3*		
710	1010	1310	TRK	Room temperature *Comfort* setpoint
712	1012	1312	TRR	Room temperature *Reduced* setpoint
800	1000	1400	TRwA1	Start of *Reduced* setpoint increase
801	1001	1401	TRwA2	End of *Reduced* setpoint increase
8704			TAgem	Composite outside temperature
			TR	Room temperature setpoint – heat gains + room influence

Reduced setp increase start

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
800	**1100**	**1400**	**Reduced setp increase start**

Reduced setp increase end

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
801	**1101**	**1401**	**Reduced setp increase end**

When heat output is relatively low and the outside temperature is low, the *Reduced* setpoint can be raised. The increase is dependent on the composite outside temperature.
The lower the composite outside temperature, the more the *Reduced* setpoint is raised. Start and end of the increase are adjustable. Between these 2 points, the *Reduced* setpoint is increased in a linear manner up to the *Comfort* setpoint.

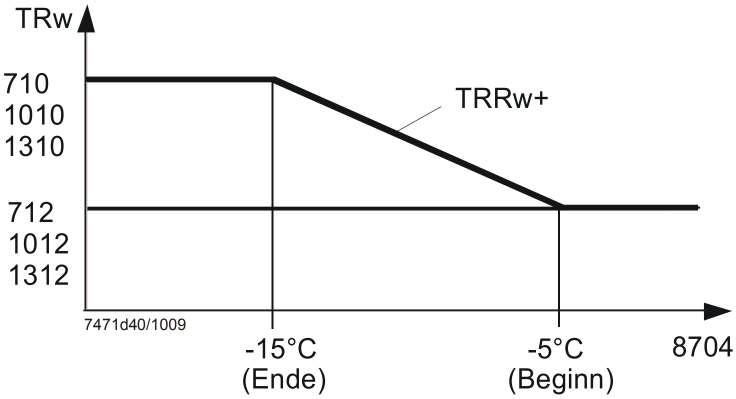


Figure 27: Reduced setpoint increase end

Key

Line no.			*Meaning*	
HC1	*HC2*	*HC3*		
710	1010	1310	TRK	Room temperature *Comfort* setpoint
712	1012	1312	TRR	Room temperature *Reduced* setpoint
8704			TAgem	Composite outside temperature
			TRw	Room temperature setpoint
			TRRw+	Increased *Reduced* setpoint

6.5.20 Continuous pump operation

Continuous pump operation

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
809	**1109**	**1409**	**Continuous pump operation** No Yes

In the case of continuous pump operation, the pump (boiler or heating circuit pump) also keeps running when the heating circuit receives no valid heat request (e.g. during quick setback, or when the room thermostat's contacts have opened).
Continuous pump operation does not generate a valid heat request, which means that the burner will not be put into operation. For mixing circuits, a local setpoint of 8 °C applies so that the mixing valve maintains the flow temperature at that level.
In the case of heating circuits without own heating circuit pump, the diverting valve's normal position must be parameterized as the *heating circuit* position. Otherwise, the diverting valve changes over to the *DHW position* during continuous pump operation.

No
The heating circuit pump/boiler pump can be deactivated via quick setback or when reaching the room temperature setpoint.

Yes
The heating circuit pump/boiler pump also keeps running during quick setback and when reaching the room temperature setpoint.

Note!
If *Overtemp prot pump circuit* (820, 1120, 1420) is released, it becomes active due to the low local setpoint of 8 °C – even in the case of continuous pump operation. To prevent this, *Overtemp prot pump circuit* (820, 1120, 1420) must be deactivated.

6.5.21 Frost protection for the room

Frost protection for the room ensures that the heating is switched on whenever the room temperature drops below the *Frost protection setpoint* (714/1014/1314), independent of operating mode, holidays or *ECO* functions.

Frost protection for the room On when: Room temperature < *Protection* level minus 1 K
Frost protection for the room Off when: Room temperature > *Protection* level minus 0.5 K

ℹ Note!
This function cannot be deactivated. If frost protection for the room becomes active, the heat source is switched on also. Without room sensor or with compensation variant *Weather compensation*, the *Frost protection* function is performed by making use of the room model.

Additional parameters

Line no.			*Operation line*
HC1	*HC2*	*HC3*	
714	**1014**	**1314**	**Frost protection setpoint**

6.5.22 Frost protection for the heating circuit in *Heating* mode

The *Frost protection* function for the heating circuit ensures that the heating is switched on whenever the flow temperature drops below the *Frost protection* level of 5 °C, independent of operating mode, holidays or *ECO* functions.

The function remains active until the flow temperature exceeds the *Frost protection* level by 2 K and then continues to be active for another 5 minutes. This ensures that the entire heat distribution system reaches a certain temperature level.

While frost protection for the heating circuit is active, a request for heat is sent to the heat source. The function can be deactivated. Without flow sensor, the *Frost protection* function for the heating circuit is performed with the temperature delivered by the heat source.

Frost protection flow temp

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
812	**1112**	**1412**	**Frost protection flow temp** Off On

This parameter can be used to switch frost protection for the heating circuit on and off.

ℹ Note!
Frost protection for the heating circuit should be switched off only if adequate measures are taken (e.g. antifreeze in the heating circuit water), ensuring that external frost protection is provided.

6.5.23 Overtemperature protection for the pump heating circuit

Overtemp prot pump circuit

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
820	**1120**	**1420**	**Overtemp prot pump circuit** Off On

In the case of heating plant with pump heating circuits, the flow temperature of the heating circuit can be higher than the flow temperature called for by the heating curve, due to requests from other heat consumers (mixing heating circuit, DHW charging, external heat demand), or due to a parameterized minimum boiler temperature. As a result of too high flow temperatures, the pump heating circuit would assume excessive temperatures. Function *Overtemperature protection for pump heating circuits* ensures that the amount of heat supplied to pump heating circuits corresponds to the demand from the heating curve by activating/deactivating the pump.

The cycling period is fixed at 10 min. This period of time is broken down according to the following on time ratio:

On time ratio

$$\text{On time ratio} = \frac{\text{Required flow temperature setpoint} - \text{room temperature setpoint}}{\text{Attenuated actual value of flow temperature} - \text{room temperature setpoint}}$$

Running time

Multiplying the on time ratio by the cycling period (10 minutes) gives the number of minutes during which the pump is running. This means that if the on time ratio is 0.6, the pump runs for 6 minutes and is then switched off for the remaining 4 minutes of the cycling period.

Limitations

The pump's running time is set to a minimum of 3 minutes. The pump's off time is set to a minimum of 2 minutes. Also, the pump is activated and deactivated at the following switching points:

• Pump continuously On	Attenuated actual value of flow temperature ≤ required flow temperature setpoint (on time ratio ≥1)
• Pump continuously Off	Required flow temperature setpoint ≤ room temperature setpoint < attenuated actual value of flow temperature

Note!
Since overtemperature protection may deactivate the consumer pump, boiler flow must be ensured when overtemperature protection is activated, as the deactivated pump may be the last consumer pump running.

6.5.24 Locking signals

Pump heating circuits receive locking signals from heat sources or locking signals resulting from DHW heating. They are used to reduce or prevent heat consumption.

Critical locking signals

Locking signals from the heat source (protective boiler startup, maintained boiler return temperature) are considered critical. If received, the heating circuit pump is immediately deactivated.

Uncritical locking signals

Locking signals from DHW heating (shifting or absolute priority) are considered uncritical.

Impact on the heating circuit pump:

State	*Effect*
Locking signal ≤20%	Normal pump operation
Locking signal >20% to <70%	Heating circuit pump cycles. The cycling frequency is dependent on the magnitude of the locking signal
Locking signal ≥70%	Heating circuit pump cycles at a fixed rate (3 minutes On/4 minutes Off)
Locking signal 100%	Heating circuit pump Off

6.5.25 Forced signals

Pump heating circuits receive forced signals from the heat source (*Boiler overtemperature protection* or *Chimney sweep* function). This means that heat consumers can make use of forced signals to extend or enforce heat consumption.

6.5.26 Overtemperature protection for the mixing heating circuit

If the flow temperature exceeds the maximum flow temperature setpoint by more than 15%, the mixing heating circuit pump is deactivated. The pump is activated again when the flow temperature drops below the maximum flow temperature setpoint.

Note!
This function is active only if the *Temperature limiter* function is not activated.

6.5.27 Pulse lock

With 3-position actuators, relays *Mixing valve opening* and *Mixing valve closing* are no longer energized if it can be reliably assumed that the actuator is already fully open or fully closed.

The relay's output is suppressed if the controller has driven the actuator in the same control direction for at least 5 times the actuator's running time.

To prevent the actuator from assuming incorrect positions because there are no relay output signals, the actuator receives drive signals for one minute at 10-minute intervals (opening and closing).

ℹ Note!
This function cannot be deactivated.

6.5.28 Flow temperature alarm

This function can be used to maintain the required flow temperature in mixing heating circuits. The required flow temperature is considered reached when the deviation from the setpoint is less than 1 K. If the flow temperature deviates constantly from the required level for a period exceeding the set time, an error message is delivered. If, during an active alarm, the setpoint is maintained again, the error message disappears.

Alarm flow temperature heating circuit 1
Alarm flow temperature heating circuit 2
Alarm flow temperature heating circuit 3

ℹ Note!
If the flow temperature setpoint is reduced by more than 4 K, monitoring is deactivated until the flow temperature has dropped to the new setpoint.

This function is only available in connection with mixing heating circuits.

The function is automatically deactivated when, due to an *ECO* function or quick setback, the heating circuit pump is switched off.

The function can be deactivated.

Additional parameters

Line no.	*Operating line*
6740	**Flow temp 1 alarm**
6741	**Flow temp 2 alarm**
6742	**Flow temp 3 alarm**

6.5.29 Locking signals

Mixing heating circuits receive locking signals from the heat source (protective boiler startup, maintained boiler return temperature) or locking signals resulting from DHW heating with priority (shifting, absolute).

With a valid locking signal, the amount of heat drawn is reduced resulting from the decrease of the flow temperature setpoint. This shortens considerably the heating up time for DHW, with minimum impact on the heating circuits.

The mixing heating circuit pump is deactivated when the locking signal stays at 100% for more than 10 minutes. It is activated again as soon as the locking signal drops below 100%.

Impact on the mixing valve:

State	***Effect***
Locking signal >0%	Flow temperature setpoints is lowered. The extent of lowering is dependent on the magnitude and the period of time of undershoot
Locking signal reduced to 0%	Setpoints according to the normal control condition

6.5.30 Forced signals

Mixing heating circuits receive forced signals from the heat source (*Boiler overtemperature protection* or *Chimney sweep* function). This means that heat consumers can make use of forced signals to extend or enforce heat consumption.

6.5.31 Mixing valve control

Mixing valve boost

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
830	**1130**	**1430**	**Mixing valve boost**

To ensure proper flow temperature control via the mixing valve, the current flow temperature must be higher than the flow temperature setpoint demanded for the mixing valve. The value set here is added to the heat request.

Note!
If, in addition to mixing heating circuits, pump heating circuits are connected, the pump heating circuits compensate the increased common flow temperature via the *Overtemperature protection* function, and the heating circuit pump cycles accordingly.

Actuator type

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
832	**1132**	**1432**	**Actuator type** 2-position 3-position

The selection of the type of actuator determines the control behavior of the mixing valve actuator used.

The controller supports both 2-position and 3-position actuators.

2-position
The controller drives the actuator via one relay output. When the output delivers a signal, the valve opens. If there is no signal, the valve closes automatically (thermally or mechanically).

Note!
Control is accomplished with a 2-position controller having an adjustable switching differential. If the flow temperature lies more than half the switching differential below the setpoint, relay *Mixing valve opening* is energized and remains energized until the flow temperature exceeds the setpoint by half the switching differential.

3-position
The controller drives the actuator via 2 relay outputs. One of the outputs is used for opening the valve and one for closing it. If none of the relays is energized, the actuator maintains its position.

Note!
Control is accomplished with a PID controller, whereby the mixing valve's P-band (Xp) and integral action time (Tn) can be adjusted. The actuator running time can also be set. The controller's neutral zone is +/- 1 K. In the case of difficult controlled systems, the control parameters can be matched to the system.

Switching differential 2-pos

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
833	**1133**	**1433**	**Switching differential 2-pos**

With 2-position actuators, the 2-position switching differential must be adapted also. This is not required with 3-position actuators.

Actuator running time

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
834	**1134**	**1434**	**Actuator running time**

Set the running time of the actuator used with the mixing valve.

Mixing valve Xp

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
835	**1135**	**1435**	**Mixing valve Xp**

The mixing valve's P-band Xp can be adjusted, thereby matching the control behavior of the valve's actuator to that of the plant (controlled system). The P-band influences the controller's P-control action.

Mixing valve Tn

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
836	**1136**	**1436**	**Mixing valve Tn**

The mixing valve's integral action time Tn can be adjusted, thereby matching the control behavior of the valve's actuator to that of the plant (controlled system). The integral action time influences the controller's I-control action.

6.5.32 *Floor curing* function

Floor curing function

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
850	**1150**	**1450**	**Floor curing function** Off Functional heating Curing heating Functional/curing heating Curing/functional heating Manually

The *Floor curing* function ensures controlled drying of the floor. It controls the flow temperature according to a certain temperature profile. Drying of the floor is effected via the floor heating system and the mixing or pump heating circuit.

Any overtemperatures in the case of pump heating circuits can be prevented by overtemperature protection (pump cycling) or the temperature limiter.

Note!
In the event of a power failure, the *Floor curing* function is resumed where operation had stopped.

Off
Function is deactivated.

Functional heating
The first part of the temperature profile is completed automatically.

Curing heating
The second part of the temperature profile is completed automatically.

Functional/curing heating
The entire temperature profile (first and second part) is completed automatically.

Curing/functional heating
The entire temperature profile (first and second part) is completed automatically.

Manually
It is not a temperature profile that is completed, but the floor setpoint is controlled manually.

Warning!

- **Observe the relevant standards and regulations specified by the floor manufacturer**
- **Proper functioning is ensured only when the plant is correctly installed (hydraulic system, electrical installation, settings)! If not observed, the floor might be damaged**
- **The function can be aborted by selecting *Off***
- **Maximum limitation of flow temperature remains active**

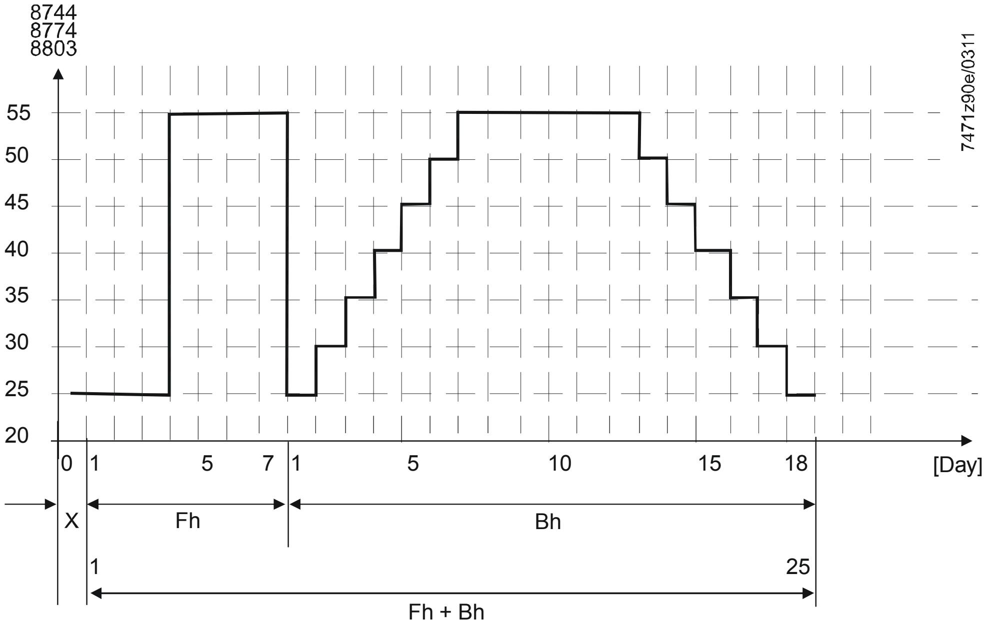


Figure28: *Floor curing* function

Key

Line no.			*Meaning*	
HC1	*HC2*	*HC3*		
8744	8774	8803	TVw	Flow temperature setpoint 1/2/3
			Bh	Curing heating
			Fh	Functional heating
			X	Start day

The temperature change always takes place at midnight. The start day (day 0), that is, the period of time from activation of the function to midnight, does not count as a functional day. The setpoint used for the start day is the value of the first functional day.

During *Floor curing*, the profile temperature (TVEp) is limited within the 2 values *Flow temp setpoint max* (TVmax) and *Flow temp setpoint min* (TVmin).

The function is ended when the functional days have elapsed or when deactivated via parameterization.

Modulating pump

If the floor curing function is active in one of the heating circuits, a flow temperature increase based on a modulating pump is not calculated for that heating circuit. The modulating pump (heating circuit or boiler pump) is controlled to the parameterized maximum speed.

Floor curing setp manually

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
851	**1151**	**1451**	**Floor curing setp manually**

The flow temperature setpoint for the *Manual floor curing* function can be set separately for each heating circuit.

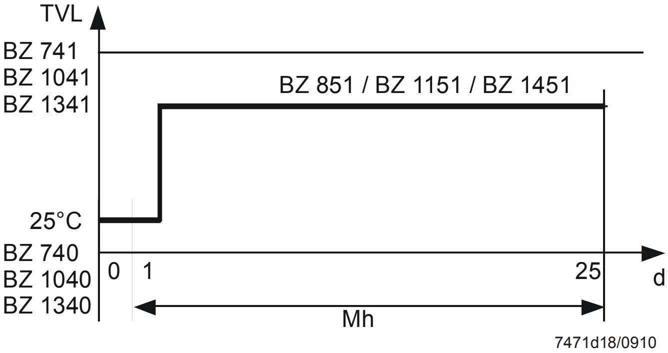


Figure29: Floor curing setpoint manually

Key

Line no.			*Meaning*	
HC1	*HC2*	*HC3*		
741	1041	1341	TVmax	Maximum flow temperature setpoint
740	1040	1340	TVmin	Minimum flow temperature setpoint
851	1151	1451	TVEm	Floor curing setpoint manually
			TVL	Flow temperature
			Mh	Manual heating (functional heating + curing heating = 25 days)
			d	Days

The function is ended when the functional days (manual heating) have elapsed or when deactivated via parameterization. The start day (day 0) does not count as a functional day. *Floor curing setp manually* (TVEm) can only be adjusted within the 2 limit values *Flow temp setpoint max* (TVmax) and *Flow temp setpoint min* (TVmin).

Floor curing setp current

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
855	**1155**	**1455**	**Floor curing setp current**

Shows the current flow temperature setpoint while the *Floor curing* function is in progress.

Floor curing day current

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
856	**1156**	**1456**	**Floor curing day current**

Shows the current weekday of the *Floor curing* function in progress.

6.5.33 Forced signal and locking signal

Excess heat draw

Line no.			Operating line
HC1	*HC2*	*HC3*	
861	**1161**	**1461**	**Excess heat draw** Off Heating mode Always

Excess heat draw can be triggered by the following functions:

- Inputs Hx
- Storage tank recooling
- Solid fuel boiler excess heat draw

When dissipation of excess heat is activated, it can be drawn by space heating. This can be selected separately for each heating circuit.

Off
Excess heat draw is deactivated.

Heating mode
Excess heat is drawn only when the controller operates in *Heating* mode.

Always
Excess heat is drawn in all operating modes.

6.5.34 Buffer storage tank/primary controller

With buffer

Line no.			Operating line
HC1	*HC2*	*HC3*	
870	**1170**	**1470**	**With buffer** No Yes

If there is a buffer storage tank, select whether the heating circuit can draw heat from it. When using alternative heat sources, the buffer storage tank temperature is used as a control criterion for the release of additional heat sources.

With prim contr/system pump

Line no.			Operating line
HC1	*HC2*	*HC3*	
872	**1172**	**1472**	**With prim contr/system pump** No Yes

Enter whether the heating circuit receives its heat via the primary controller or with the help of the system pump (depending on the type of plant).

6.5.35 Speed-controlled pump

Pump speed reduction

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
880	**1180**	**1480**	**Pump speed reduction** Operating level Characteristic

Speed reduction of the heating circuit pump can be effected based on the operating level or the characteristic.

Operating level
When using this option, the speed of the heating circuit pump is calculated based on the operating level. The pump is controlled according to the *Comfort* level (incl. optimization) or – during the time the *Floor curing* function is active – with the parameterized maximum speed. In the case of the *Reduced* operating level, the pump is controlled to the parameterized minimum speed.

Characteristic
The speed of the heating circuit pump is calculated based on the flow temperature effectively received and the current flow temperature setpoint. The current temperature of the common flow is used as the actual value. If no common flow sensor is installed, the actual value of the boiler flow temperature is used. The actual value is damped by a filter (time constant can be parameterized).
During the time the floor curing function is active, pump control ensures operation at the parameterized maximum speed.

Starting speed

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
881	**1181**	**1481**	**Starting speed**

The speed of the heating circuit pump for the start kick can be defined here.

Pump speed min

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
882	**1182**	**1482**	**Pump speed min**

The minimum speed of the heating circuit pump can be defined here.

Pump speed max

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
883	**1183**	**1483**	**Pump speed max**

The maximum speed of the heating circuit pump can be defined here.

Pump speed min OEM

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
885	**1185**	**1485**	**Pump speed min OEM**

The minimum speed of the heating circuit pump can be defined here.

Pump speed max OEM

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
886	**1186**	**1486**	**Pump speed max OEM**

The maximum speed of the heating circuit pump can be defined here.

Curve readj at 50% speed

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
888	**1188**	**1488**	**Curve readj at 50% speed**

Readjustment of the flow temperature setpoint when the pump speed is reduced by 50%. This readjustment is calculated based on the differential of flow temperature setpoint according to the heating curve and current room temperature setpoint.

Filter time const speed ctrl

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
889	**1189**	**1489**	**Filter time const speed ctrl**

Here, the filter time constant for filtering the flow temperature is defined. The speed of the modulating pump is calculated based on this filtered flow temperature.

Flow setp readj speed ctrl

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
890	**1190**	**1490**	**Flow setp readj speed ctrl** No Yes

Here, it can be selected whether or not the calculated readjustment of the flow temperature setpoint shall be included in the request for heat.
If the floor curing function is active in one of the heating circuits, the temperature request is not increased – irrespective of the parameter setting.

No
The request for heat remains unchanged. The calculated readjustment is not added.

Yes
The request for heat gives consideration to the calculated readjustment of the flow temperature setpoint.

6.5.36 Operating level changeover via input H

Operating level changeover

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
898	**1198**	**1498**	**Operating level changeover** Frost protection Reduced Comfort

The operating level to which the heating circuits shall be switched can be selected via an external time switch and inputs Hx.

6.5.37 Operating mode changeover via input H

The heating circuit can be forced to adopt a selectable operating mode via input H by actuating a contact. The operating mode required when changeover takes place can be defined for each heating circuit via the *Optg mode changeover* (900/1200/1500). In that case, selection of the operating modes on the controller is disabled.

The contact type can be set.

Optg mode changeover

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
900	**1200**	**1500**	**Optg mode changeover** None Protection Reduced Comfort Automatic

None
Function is deactivated.

ℹ

Note!
A basic unit with LPB device address = 1 can provide the function of central operating mode changeover. In that case, changeover on the central basic unit (via input H) also acts on the heating circuits and on DHW heating of the other basic units connected to LPB.

Additional parameters

Line no.	*Operating line*
6620	**Action changeover functions**

6.5.38 Behavior in the case of burner cycling

When the burner shuts down, the amount of heat available is not sufficient after a certain time to satisfy the demand (actual value of flow temperature < flow temperature setpoint). Speed control would respond to this situation by increasing the pump's speed. But this would lead to shorter burner off times. Also, due to pump modulation to a higher speed, the noise level would increase. For this reason, modulation of the heating circuit pump was matched to the situation of burner cycling.
When the burner shuts down, the pump's modulation is maintained at the parameterized minimum level.

When the burner is switched on, the speed of the heating circuit pump remains unchanged for a selectable period of time.
It is only on completion of this delay time that modulation of the heating circuit pump is again calculated and delivered based on the current common flow temperature (boiler flow temperature). This means that the pump's speed is increased only if the filtered common flow temperature is lower than the flow temperature setpoint. An increase of the pump speed leads to longer burner on times.
Then, filtering of the common flow temperature prevents the speed from dropping rapidly if the boiler temperature already lies above the setpoint, but the burner's switch-off point is not yet reached.
When the burner shuts down, the pump's speed is reduced again to the parameterized minimum level.

Delay speed ctrl HCx

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
[4291.1]	**[4291.2]**	**[4291.3]**	**Delay speed ctrl HCx**

Here, the delay for speed control after *Burner On* can be set.

6.5.39 2-speed heating circuit pump

This function facilitates the control of a 2-speed heating circuit pump, allowing the pump's capacity to be lowered in *Reduced* mode (e.g. during night setback).

To provide this function, a multifunctional relay output must be set to *2nd pump speed HC1/HC2/ HC3* (Q21, Q22, Q23).

The second speed is switched on when the heating circuit's operating level is *Comfort* (including optimization) or when the *Floor curing* function is active.

Relay HC pump (1st speed) Q2/Q6/Q20	**Relay 2nd speed Q21/Q22/Q23**	**State**
Off	Off	Off
On	Off	Low-fire
On	On	High-fire

Note!
If the second speed needs a potential-free or inverted relay output, an intermediate relay is required.

6.5.40 2-speed boiler pump

This function affords control of a 2-speed boiler pump. Use of the second pump speed is made only if the first pump speed is activated. To enable the function, a multifunctional relay output must be set to the *2nd boiler pump speed Q27*. The function supports 2 operating principles. Changeover of the operating principle is effected via *Pump speed min* (2322) and *Pump speed max* (2323):

Operating principle 1 applies when:
Pump speed max = Pump speed min

Operating principle 2 applies when:
Pump speed max > Pump speed min

Operating principle 1:
In *DHW* mode, the second speed of the boiler pump is always On. This also applies to pump overrun. In *Heating* mode, the second speed is used if at least one of the heating circuits calls for it.

Operating principle 2:
In principle, the 2-speed boiler pump can be regarded as a modulating pump with 3 speeds (Off/1st speed/2nd speed). For this reason, control is effected in accordance with PWM of the modulating boiler pump. When the first speed of the boiler pump is deactivated, the second speed is deactivated also. For changeover between the first and the second speed, a switching point with a hysteresis is calculated, depending on *Pump speed min* (2322) and *Pump speed max* (2323).

Switching point = ((*Pump speed max – Pump speed min*)/2) + *Pump speed min*

Hysteresis = (*Pump speed max – Pump speed min*)/20

The 2-speed boiler pump kicks its second speed – like the modulating boiler pump.

Second speed On:
Boiler pump speed >= switching point + hysteresis

Second speed Off:
Boiler pump speed <= switching point – hysteresis

Additional parameters

Line no.	*Operating line*
2322	**Pump speed min**
2323	**Pump speed max**

Info/Diagnostics

Line no.	*Operating line*
8308	**Boiler pump speed**

Note!
- The speed of the boiler pump is displayed only if *Function output P1 (*6085) is set to *Boiler pump Q1*. This parameterization is not required for the *2-speed boiler pump* function
- If the second speed needs a potentialfree or inverted relay output, an intermediate relay is required

6.6 Cooling circuit 1

For operation of a cooling circuit, the *Cooling* function must be activated via *Operating mode cooling circuit 1* (901) and a multifunctional relay output QX for *Refrigeration request K28* must be configured. Cooling operation is started automatically when the room temperature exceeds the *Comfort* setpoint for *Cooling*. That setpoint can be adjusted via *Comfort setpoint* (710) of menu **Heating circuit 1**. Cooling operation is aborted when there is a heat request from heating circuit 1.

The *Cooling* function is deactivated in the following cases:

- Room sensor not available
- *Protection setpoint cooling circuit 1* (904) set to OSV (- - -)

6.6.1 Operating mode

Operating mode cooling circuit 1

Line no.	*Operating line*
901	**Operating mode cooling circuit 1** Off Automatic

The operating mode for cooling can be selected via this operating line.

Note!
This selection is analogous to the operating mode selection for cooling via a cooling mode button on a room unit.

Off
Cooling mode is deactivated.

Automatic
Automatic operation based on room temperature control.

Note!
In terms of function, the cooling mode button can be used as an On/Off button.

6.6.2 Setpoints

Protection setpoint cooling circuit 1

Line no.	*Operating line*
904	**Protection setpoint cooling circuit 1**

The room temperature ensured by the *Protection* setpoint prevents the room from overheating, provided the LMS14… is in *Standby* mode. Cooling is automatically switched on when the room temperature exceeds this value by *Room temp limitation cooling circuit 1* (932) and is switched off again when the room temperature drops below the protection setpoint.

6.6.3 Room temperature limitation

Room temp limitation cooling circuit 1

Line no.	*Operating line*
932	**Room temp limitation cooling circuit 1**

Here, room temperature limitation acts like a switching differential. Cooling is switched on when the room temperature exceeds the current room temperature setpoint by the value set here.
It is switched off again when the room temperature drops below the current room temperature setpoint.

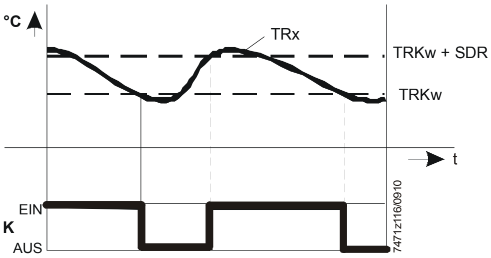


Figure30: Room temperature limitation

Key

Line no.	*Meaning*	
	TRKw	Room temperature setpoint cooling
	TRx	Actual value of room temperature
932	SDR	Room temperature limitation
	K	Relay: Cooling request K28
	t	Time

6.7 DHW heating

The LMS14… makes possible the following types of DHW heating:

1. Charging with oil- or gas-fired boiler
2. Charging with electric immersion heater
3. Charging with solar collectors
4. Charging with solid fuel boiler

Charging with controllable heat sources

Heat generation with an oil- or gas-fired boiler or electric immersion heater can be controlled. If there is demand for DHW, these heat sources can be switched on at any time. The strategy is to produce the amount of heat required at a certain point in time – and no more. For that purpose, switching programs, different setpoints and release criteria are available. If several heat sources and an electric immersion heater are available at the same time, they are used alternately, e.g. after summer/winter changeover.

Charging with uncontrolled heat sources

Heat generation with solar collectors and solid fuel boilers is not controllable. This means that with these types of heat sources, the DHW is not heated when there is demand, but when heat is available. The strategy is to fully charge the DHW storage tank whenever possible. Here, switching programs, setpoints and release criteria do not exist. Charging takes place whenever there is a sufficient temperature differential between solar collector or solid fuel boiler and storage tank, and when the DHW storage tank is not yet fully charged.

Since it is not always possible to satisfy the total demand for heat via the solar collectors, the deficit must be covered by a controllable heat source (boiler or electric immersion heater). So boiler or electric immersion heater are only used to compensate for the heat deficit. This deficit is calculated from the storage tank's current temperature and the required setpoint. In that case, the switching program and the release for recharging should become active during the night when it is certain that solar energy alone is not able to ensure the required temperature level.

Note!
DHW storage tanks are usually designed such that the lower part of the tank is reserved for solar energy.

Warning!
To prevent scalding, the pipe to the tap must have scalding protection integrated.

6.7.1 *DHW* mode

Operating mode

Line no.	*Operating line*
1600	**Operating mode** Off On Eco

Select the *DHW* mode with the operating mode button.

ℹ Note!
DHW mode can also be influenced by operating mode changeover via inputs H1 up to H7.

Off
Continuous operation, the setpoint being the DHW *Frost Protection* setpoint (5 °C).

On
DHW charging takes place automatically, the setpoint being the *Nominal* DHW setpoint or the *Reduced* DHW setpoint according to the selected kind of DHW release.

Eco
ECO mode is only used in connection with instantaneous water heaters. While the *Keep hot* function is generally enabled in *On* mode, it is deactivated in *ECO* mode. In connection with the aqua booster, *ECO* mode is always disabled.

6.7.2 Setpoints

Different setpoints are available for DHW heating, with partly interlocked adjustability.

Nominal setpoint max:	Only used to provide maximum limitation of the *Nominal* setpoint's adjustability
Nominal setpoint:	*DHW* setpoint during release times
Reduced setpoint:	Backup temperature outside release times
Frost Protection setpoint:	*Frost Protection* setpoint when DHW heating is Off. Not adjustable, fixed at 5 °C (factory setting)

The DHW setpoint acting on the control is selected based on the current operating level, which includes impact of the operating mode, the release (possibly the switching program), the DHW push and the *Legionella* function.

Nominal setpoint

Line no.	*Operating line*
1610	**Nominal setpoint**

The DHW can be heated up according to different setpoints. These setpoints are activated depending on the selected operating mode, thus leading to different temperature levels in the DHW storage tank.

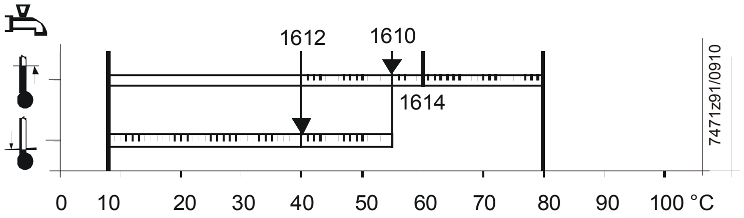


Figure31: Nominal setpoint

Key

Line no.	*Meaning*	
1614	TWWmax	Maximum nominal DHW setpoint
1610	TWWN	Nominal DHW setpoint
1612	TWWR	Reduced DHW setpoint

Reduced setpoint

Line no.	*Operating line*
1612	**Reduced setpoint**

Reduced setpoint: Backup temperature outside release times.

Nominal setpoint max

Line no.	*Operating line*
1614	**Nominal setpoint max**

This setting ensures maximum limitation of the *Nominal setpoint* (1610).

6.7.3 Holiday program

If the holiday program is active with *all* heating circuits (*Automatic* operation and holiday program active), the DHW setpoint is set to the *Frost protection* level and the circulating pump is deactivated. At the end of the holiday period, the operating level according to the release applies again. While the holiday program is active, DHW heating can be triggered at any time by making a manual DHW push (one-time DHW charging to the *Nominal* setpoint).

Note!
If the *Legionella* function was not effected because of a holiday period, it will be performed the next time DHW is heated to the *Nominal* setpoint.

6.7.4 DHW release

Release

Line no.	*Operating line*
1620	**Release** 24h/day Time programs HCs Time program 4/DHW

When DHW heating is On, the release parameter can be used to determine when – within a 24-hour period – DHW charging shall take place.

Note!
The time of release does not apply to DHW charging with the electric immersion heater. A specific parameter is used for release of the electric immersion heater (refer to chapter *Electric immersion heater*).

DHW heating can be released in 3 different ways:

24h/day
When this setting is used, DHW heating is continuously released as long as it is On. The DHW setpoint is always the *Nominal* setpoint, unless the *Legionella* function has been activated. Setting *Once/day* or *Several times/day* has no impact. When DHW heating is Off, the *Frost Protection* setpoint applies.

Example:

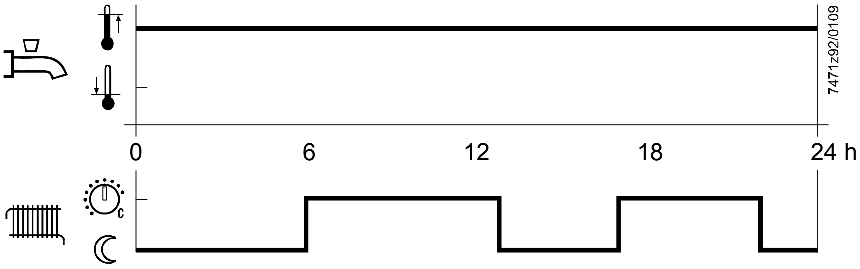


Figure32: DHW release – 24h/day

Time programs HCs
When this setting is used, DHW heating is released during the occupancy times of the connected heating circuits. If at least one of the heating circuits operates at the *Comfort* level, DHW heating is released also. If all heating circuits operate at the *Reduced* level or in *Protection* mode, the DHW level is set to *Reduced* also.

Note!
Evaluated are the time programs of the heating circuits. If the heating circuits are switched off due to active *ECO* functions, DHW release is still maintained.

To ensure that the DHW storage tank is already charged when space heating is started, the release of DHW heating is brought forward in time against the switch-on point for space heating (including optimum start control). The extent of forward shift depends on *Charging* (5010) (*Once/day* or *Several times/day*).

When selecting *Once/day*, the forward shift for the release of DHW heating is 2.5 hours.

When selecting *Several times/day*, the forward shift for the release of DHW heating is 1.0 hour.

If the *Legionella* function is pending, it will be performed when DHW heating is released for the first time in the morning.

When DHW heating is Off, the *Frost Protection* setpoint applies.

Example:

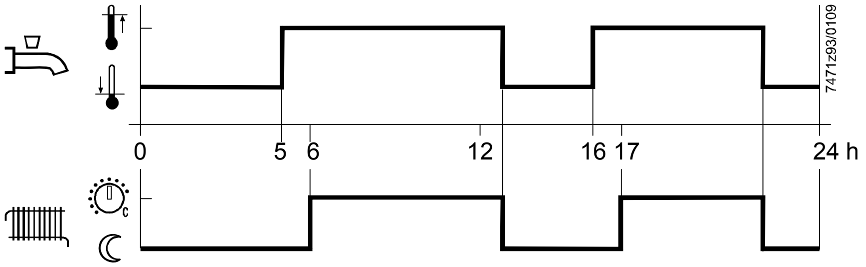


Figure 33: DHW release – time programs HCs

Time program 4/DHW

When using this setting, a specific time program is available for DHW heating. For every weekday, a time program with a maximum of 3 on phases can be set. During the release time, the *Nominal* DHW setpoint applies, outside the release time, the *Reduced* DHW setpoint.

If the *Legionella* function is pending, it will be performed when DHW heating is released for the first time in the morning. Setting *Once/day* or *Several times/day* has no impact. When DHW heating is Off, the *Frost Protection* setpoint applies.

Example:

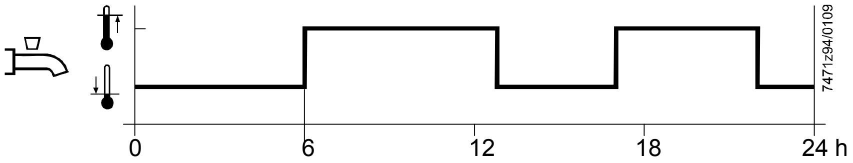


Figure 34: DHW release – time program 4/DHW

6.7.5 Priority

Charging priority

Line no.	*Operating line*
1630	**Charging priority** Absolute Shifting None MC shifting, PC absolute

When both space heating and DHW heating call for heat, the *DHW priority* function ensures that while DHW charging is in progress, the boiler's capacity is used primarily for DHW heating.

Note!
On applications with diverting valves, the function is automatically deactivated.

Absolute
Mixing and pump heating circuits stay locked until DHW heating is completed.

Shifting
If the capacity of the heat source is not sufficient, the mixing and pump heating circuits will be restricted until the DHW is heated up.

None
DHW heating and space heating take place at the same time. In the case of tightly sized boilers and mixing heating circuits, the DHW setpoint may not be reached if space heating calls for considerable amounts of heat.

MC shifting, PC absolute
The pump heating circuits stay locked until the DHW storage tank is heated up. If the capacity of the heat source is not sufficient, the mixing heating circuits will be restricted also.

6.7.6 Locking signals

Locking signals are used by the heat source to reduce or prevent heat consumption by the consumers.

If the locking signal exceeds 50%, the DHW charging pump is deactivated. It will be activated again when the locking signal drops below the threshold value of 50%.

Also, the heat source can calculate a critical locking signal based on a parameterized maintained boiler return temperature. The impact on the DHW charging pump is the same as with locking signal *Boiler protection*.

6.7.7 Forced signals

If required, the heat source can send forced signals to its consumers. When the heat source delivers a valid forced signal, the DHW setpoint is set to the *Legionella* setpoint and – if the DHW temperature is lower – the charging pump is activated. When the forced signal becomes invalid, the charging pump is deactivated again and the DHW setpoint will be reset to the normal setpoint.

6.7.8 Pump overrun

On completion of DHW charging, the charging pump continues to operate for the parameterized DHW overrun time. If none of the other consumers draws significant amounts of heat, the heat source can generate a forced *Overrun* signal for the boiler pump during that period of time. The overrun time can be set via the heat source parameters.

On applications with diverting valve, the boiler pump overruns. The diverting valve maintains the *DHW charging* position during the overrun time.

Pump overrun can be aborted by *Discharging protection after DHW charging*.

6.7.9 *Legionella* function

Legionella function

Line no.	*Operating line*
1640	**Legionella function** Off Periodically Fixed weekday

When the *Legionella* function is activated, the DHW storage tank temperature is periodically raised to the *Legionella funct setpoint*. The *Legionella funct setpoint* can be maintained during the set dwelling time.

Off
Function is deactivated.

Periodically
The *Legionella* function is repeated according to the period (*Legionella funct periodically* 1641)). If the *Legionella* setpoint is attained via solar heating – independent of the selected interval – the time period is started again.
This means that the heat source is switched on only if the solar plant was not able to ensure the required *Legionella funct setpoint* within the set period of time.

Fixed weekday
(The *Legionella* function can be activated on a fixed *Legionella funct weekday* (1642)). When using this setting, heating up to the *Legionella* setpoint takes place on the selected weekday, independent of previous storage tank temperatures.
This setting is intended primarily for plant without solar integration.

Note!
Delayed start of *Legionella* function:
In connection with DHW storage tanks, the *Legionella* function is started 1 hour after power ON at the earliest.

Warning!
During the time the *Legionella* function is performed, there is a risk of scalding when opening the taps.

Legionella funct periodically

Line no.	*Operating line*
1641	**Legionella funct periodically**

Setting *Legionella funct periodically* is used to select the number of weekdays after which the function shall be activated again. (This setting is active only if *Legionella function* (1640) is set to *Periodically*).

Note!
If, in addition to a controllable heat source (oil- or gas-fired boiler, electric immersion heater, heat pump), the DHW storage tank is charged by a non-controllable heat source (solar plant, wood-fired boiler), the *Legionella* function can be activated at any time, depending on the availability of alternative energy. With this type of plant, it can be useful not to set a fixed weekday but to enter a minimum period of time to perform the *Legionella* function. If, for example, the function shall be effected every 5 days, but the solar plant raises the storage tank temperature to the *Legionella funct setpoint* after only 3 days, the 5-day period is restarted.

Legionella funct weekday

Line no.	*Operating line*
1642	**Legionella funct weekday** Monday...Sunday

This function is used to select the weekday the function shall be performed. The function is then effected on the selected weekday, independent of the availability of alternative energy.

Legionella function time

Line no.	*Operating line*
1644	**Legionella function time**

The *Legionella* function is started at the set time. The *DHW* setpoint is raised to the adjusted *Legionella* setpoint and DHW charging is started.

If no time is parameterized, the *Legionella* function is started on the respective day together with the first normal release of DHW heating. If no release of DHW heating is scheduled for that day (continuously reduced), the *Legionella* function is performed at 24:00.

If DHW heating is Off (DHW operating mode button = Off, or holidays), the *Legionella* function is effected whenever DHW heating is switched on again (DHW operating mode button = On, and end of holiday period).

Legionella funct setpoint

Line no.	*Operating line*
1645	**Legionella funct setpoint**

The higher the temperature level of the storage tank, the shorter the required dwelling time at that level.

Guide values

Storage tank temperature	Dwelling time
80 °C	A few seconds
70 °C	1 minute
66 °C	2 minutes
60 °C	32 minutes
55 °C	6 hours
50 °C	No killing of viruses
45 °C	Ideal conditions for viruses

Warning!
The figures given in the table are guide values. They do not guarantee that legionella viruses will be completely killed.

Note!
The *Legionella* setpoint can be adjusted between 55 °C and 95 °C. When the *Legionella* function is activated, the DHW storage tank is heated up until the value set here is reached. For the *Legionella* function to be regarded as fulfilled, sensor B3 at the top or both sensors B3 and B31 must reach the *Legionella* setpoint which must be maintained for the set dwelling time, depending on *Type of charging* (5022).

Legionella funct duration

Line no.	*Operating line*
1646	**Legionella funct duration**

The demanded *Legionella funct setpoint* must be fully maintained during the set dwelling time. If the storage tank temperature (in the case of 2 sensors, the temperature acquired by the *colder* sensor) exceeds the *Legionella funct setpoint* minus 1 K, the *Legionella funct setpoint* is considered fulfilled and the *Dwelling time* timer elapses. If the storage tank temperature drops below the demanded *Legionella funct setpoint* by more than the DHW switching differential plus 2 K before the dwelling time has elapsed, the dwelling time must be fulfilled again. If no dwelling time is set, the *Legionella* function is performed the moment the *Legionella funct setpoint* is reached.

Note!
If the *Legionella* function cannot be performed within a 48-hour period, an error message is delivered.

Legionella funct circ pump

Line no.	*Operating line*
1647	**Legionella funct circ pump** Off On

During the time the *Legionella* function is performed, the DHW circulating pump can be activated.

Off
Function is deactivated.

On
Function is activated.

When the function is activated, the circulating pump is switched on while the *Legionella* function is performed as soon as the storage tank temperature (in the case of 2 sensors the temperature acquired by the *colder* sensor) lies above the *Legionella funct setpoint* minus 1 K. The pump runs during the set dwelling time. If the storage tank temperature falls below the required *Legionella funct setpoint* by more than the DHW switching differential plus 2 K, the circulating pump is deactivated.

Note!
Periodic *Legionella* function:
If the *Legionella funct setpoint* is reached via a non-controllable heat source (solar or wood-fired boiler), the circulating pump is activated for the demanded dwelling time. The *Legionella* function is performed a maximum of 3 days before the calculated day for fighting legionella. When the *Legionella* function is completed (parameterized dwelling time reached), the set *Legionella funct duration* commences again.

Warning!
During the time the *Legionella* function is effected, there is a risk of scalding when opening the taps.

6.7.10 Circulating pump

The circulating pump is controlled by a multifunctional relay. The relay must be appropriately parameterized.

Circulating pump release

Line no.	*Operating line*
1660	**Circulating pump release** Time program 3/HC3 DHW release Time program 4/DHW Time program 5

The circulating pump runs during the release time (see below), provided DHW heating is On and at least one of the connected heating circuits is not in *Holiday* mode. If *DHW* mode is Off, or if all connected heating circuits are in *Holiday* mode, the circulating pump remains deactivated, independent of the parameterized release. Release of the circulating pump can take place in different ways:

Time program 3/HC3
The circulating pump is released according to *Time program 3/Heating circuit 3*.

DHW release
When using this setting, the circulating pump is released when DHW heating is released also.

Note!
Release of DHW heating can be set with a specific release parameter.

Time program 4/DHW
The circulating pump is released according to *Time program 4/DHW*.

Time program 5
The circulating pump is released according to *Time program 5*.

Circulating pump cycling

Line no.	*Operating line*
1661	**Circulating pump cycling** Off On

To minimize circulation losses, the circulating pump can be controlled in cycling mode.

When the function is activated, the circulating pump is switched on for 10 minutes within the release time and then switched off again for 20 minutes.

Note!
If the pump is activated due to the *Legionella* function, it does not cycle. When the *Legionella* function is deactivated, the pump runs continuously during the release time.

Off
Function is deactivated.

On
Function is activated.

Circulating setpoint

Line no.	*Operating line*
1663	**Circulating setpoint**

When using a circulation sensor, the circulating pump is activated within the release time whenever the temperature acquired by that sensor falls below the circulation value. The pump keeps running until the circulation value is reached again. The minimum on time is 10 minutes. At the top, the setting of the circulation value is limited by the nominal setpoint.

Note:
When using a circulation sensor, the temperature acquired by it is also used for the legionella function (dwelling time).

6.7.11 Frost protection for the circulation pipe

If the temperature acquired by the circulation sensor drops below the *Frost protection* level, the pump is also activated outside the release times until the *Frost protection* level of 5 °C is reached. The minimum on time is 10 minutes.

Note!
This function is only available if a circulation sensor is connected.

6.7.12 Operating mode changeover via input H

Optg mode changeover

Line no.	*Operating line*
1680	**Optg mode changeover** None Off On

In the case of external changeover via inputs Hx, the operating mode where changeover is to take place can be selected.

None
Function is deactivated. No changeover of operating mode.

Off
Operating mode is changed to Off.

On
Operating mode is changed to On.

6.8 Consumer circuit and swimming pool circuit

Flow temp setp cons request

Line no.			Operating line
VK1	*VK2*		
1859	**1909**		**Flow temp setp cons request**

Flow temp setp swi pool

Line no.			Operating line
		SK	
		1959	**Flow temp setp swi pool**

Set the flow temperature setpoint that becomes active when there is a request for heat from the consumer circuit or swimming pool circuit.

DHW charging priority

Line no.			Operating line
VK1	*VK2*	*SK*	
1874	**1924**	**1974**	**DHW charging priority** No Yes

With this setting, the connected consumer circuit pump/swimming pool pump can be excluded from or included in the impact resulting from DWH charging priority. This means that in the case of ventilation applications, for instance, constant delivery of heat can be ensured without getting any impact from DHW charging priority.

No

Excess heat draw

Line no.			Operating line
VK1	*VK2*	*SK*	
1875	**1925**	**1975**	**Excess heat draw** Off On

If excess heat draw is activated, the surplus heat can be delivered to the consumer circuits or to the swimming pool circuit. This can be selected separately for each consumer circuit or for the swimming pool circuit.

With buffer

Line no.			Operating line
VK1	*VK2*	*SK*	
1878	**1928**	**1978**	**With buffer** No Yes

If a buffer storage tank is used, it is to be entered whether the consumer circuit or the swimming pool circuit is allowed to draw heat from the pump storage tank. When employing alternative heat sources, the buffer storage tank temperature is used as a control criterion for the release of additional heat sources.

With prim contr/system pump

Line no.			Operating line
VK1	*VK2*	*SK*	
1880	**1930**	**1980**	**With prim contr/system pump** No Yes

The setting made here defines whether the consumer circuit or the swimming pool circuit shall receive heat via the primary controller or the system pump (depending on the type of plant).

6.9 Swimming pool

6.9.1 Setpoints

Setpoint solar heating

Line no.	*Operating line*
2055	**Setpoint solar heating**

When making use of solar energy, the swimming pool is heated to this setpoint.

Note!
Function *Collector overtemp prot* can put the collector pump back into operation until the maximum swimming pool temperature is reached.

Setpoint source heating

Line no.	*Operating line*
2056	**Setpoint source heating**

When using other heat sources, the swimming pool is heated to this setpoint.

6.9.2 Priority

Charging priority solar

Line no.	*Operating line*
2065	**Charging priority solar** Priority 1 Priority 2 Priority 3

Priority 1
Swimming pool charging has the first priority.

Priority 2
Swimming pool charging has the second priority (after the buffer storage tank and the DHW storage tank).

Priority 3
Swimming pool charging is effected without priority (after the buffer storage tank, the DHW storage tank, the heating circuits, and the consumer circuits).

Note!
Release and priority can also be influenced via inputs Hx.

6.9.3 Overtemperature protection

Swimming pool temp max

Line no.	*Operating line*
2070	**Swimming pool temp max**

If the swimming pool temperature reaches the limit set here, the collector pump is deactivated. It is released again only when the swimming pool temperature drops 1 °C below the maximum limit.

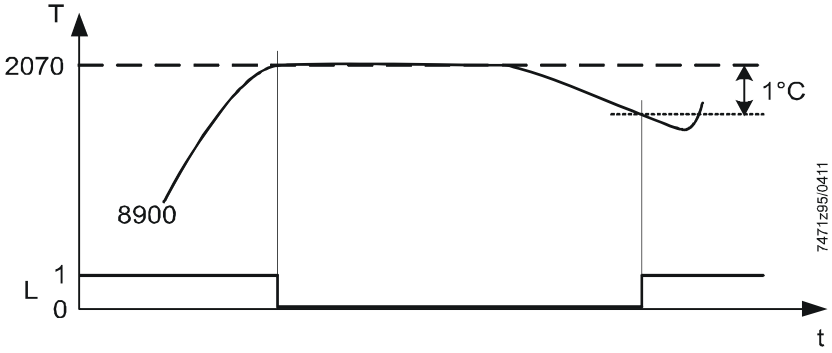


Figure 35: Overtemperature protection swimming pool temperature maximum

Key

Line no.	*Meaning*	
2070	TSbMax	Maximum storage tank temperature (buffer/DHW/swimming pool)
8900	TSb	Swimming pool temperature

6.9.4 Plant hydraulics

With solar integration

Line no.	*Operating line*
2080	**With solar integration** No Yes

The setting made here decides whether the swimming pool can be heated by solar energy.

6.10 Primary controller/system pump

6.10.1 Limitations of the flow temperature setpoint

Flow temp setpoint min/max

Line no.	*Operating line*
2110	**Flow temp setpoint min**
2111	**Flow temp setpoint max**

These limitations can be used to define a range for the flow temperature setpoint in *Heating* mode.

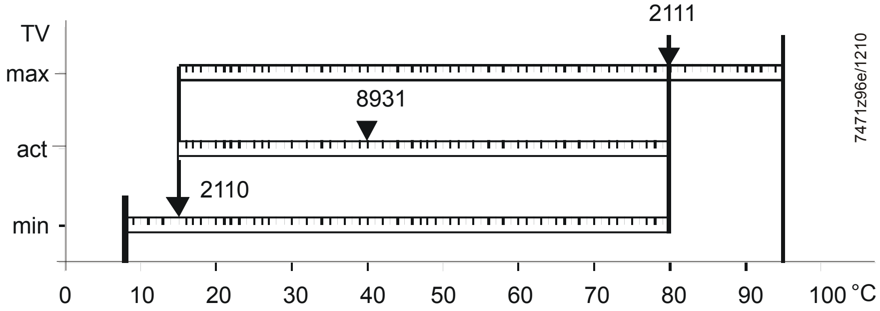


Figure 36: Primary controller/system pump flow temperature setpoint minimum/maximum

Key

Line no.	*Meaning*	
8931	TVw	Precontroller setpoint

Syst pump on heat gen lock

Line no.	*Operating line*
2121	**Syst pump on heat gen lock** Off On

This parameter is used to select whether or not the system pump shall be locked when the heat generation lock is active.

Off
The system pump is also locked when the heat generation lock is active.

On
The system pump is not locked when the heat generation lock is active.

Warning!
Due to the locked system pump in the case of heat generation lock (*System pump on heat gen lock* (2121) set to *Off*), frost protection requests from consumers downstream from the system pump cannot be satisfied while heat generation lock is active. Also, cold water from these consumers is prevented from reaching the boiler to ensure it does not trigger frost protection for the boiler.
Also refer to chapter *Boiler pump,* parameter *Boiler pump on heat gen lock* (2301)**.**

Note!
Due to the locked system pump resulting from heat generation lock (*System pump on heat gen lock* (2121) set to *Off*), the system pump is also locked when a solid fuel boiler meets the request for heat and *Locks other heat sources* (4102) is set to *On.*
In that case, consumers downstream from the system pump do not receive any heat.

6.10.2 Mixing valve control

Mixing valve boost

Line no.	*Operating line*
2130	**Mixing valve boost**

To ensure accurate control, the flow temperature delivered by the boiler must be higher than the flow temperature setpoint demanded downstream from the mixing valve. For this reason, the controller generates the boiler temperature setpoint based on the mixing valve boost set here and the current flow temperature setpoint.

Actuator type

Line no.	*Operating line*
2132	**Actuator type** 2-position 3-position

The selected type of actuator determines the control action of the mixing valve actuator used.

2-position
The controller drives the actuator via one relay output. When a control signal is delivered, the valve opens. When there is no control signal, the valve closes automatically (thermal or mechanical action).

Note!
The control employs a 2-position controller with an adjustable switching differential. If the flow temperature lies more than half the switching differential below the setpoint, relay *Mixing valve Open* is energized to remain energized until the flow temperature reaches a level half the switching differential above the setpoint.

3-position
The controller drives the actuator via 2 relay outputs. One of the outputs is used for opening the valve, the other for closing it. If none of the relays is energized, the actuator maintains its present position.

Note!
The control employs a PID controller whose proportional band (Xp) and integral action time (Tn) can be parameterized. The actuator's running time can also be adjusted. The controller's neutral zone is +/- 1 K. The control parameters can be matched to the requirements of difficult controlled systems.

Switching differential 2-pos

Line no.	*Operating line*
2133	**Switching differential 2-pos**

With 2-position actuators, the 2-position switching differential must be adapted also. This is not required with 3-position actuators.

Actuator running time

Line no.	*Operating line*
2134	**Actuator running time**

Setting the running time of the actuator used with the mixing valve.

Mixing valve Xp

Line no.	*Operating line*
2135	**Mixing valve Xp**

By setting the right proportional band Xp, the control action of the mixing valve's actuator is matched to the behavior of the plant (controlled system).

The proportional band influences the controller's P-control action.

Mixing valve Tn

Line no.	*Operating line*
2136	**Mixing valve Tn**

By setting the right integral action time Tn, the control action of the mixing valve's actuator is matched to the behavior of the plant (controlled system).

The integral action time influences the controller's I-control action.

6.10.3 Plant hydraulics

Primary contr/system pump

Line no.	*Operating line*
2150	**Primary contr/system pump** Before buffer After buffer

If the plant is equipped with a buffer storage tank, it must be entered here whether – hydraulically speaking – the primary controller or the system pump is located upstream of or downstream from the buffer storage tank.

6.11 Boiler

6.11.1 Release threshold *Outside temperature*

Release of the boiler can be effected as a function of the outside temperature.

Release below outside temp

Line no.	*Operating line*
2203	**Release below outside temp**

The boiler is put into operation only when the composite outside temperature lies below this threshold. The setting range is from -50 to 50 °C. For the release, the calculation is based on a fixed switching differential of 0.5 K.

6.11.2 Full charging of buffer storage tank

Full charging buffer

Line no.	*Operating line*
2208	**Full charging buffer** Off On

Function *Full charging buffer* makes it possible to switch off released heat sources only when the buffer storage tank is fully charged, despite automatic heat generation lock. But full charging must be demanded by the buffer storage tank.
If and when the buffer storage tank shall call for full charging can be set via *Full charging* (4810).
When the function is activated, the heat source is switched off only when full charging is ended or if, due to control of the burner, switching off must be effected.
Heat sources that are not in operation are not switched on because full charging is required.

6.11.3 Setpoints

The controlled boiler temperature setpoint can be limited by *Setpoint min* and *Setpoint max*. These limitations can be considered to be a protective function for the boiler. In normal operation, minimum limitation of the boiler temperature is the lower limit value for the controlled boiler temperature setpoint, depending on the boiler's operating mode. In normal operation, maximum limitation of the boiler temperature is the upper limit value for the controlled boiler temperature setpoint.

Note!
The setting range of *Setpoint min* and *Setpoint max* is limited by *Setpoint manual control.*

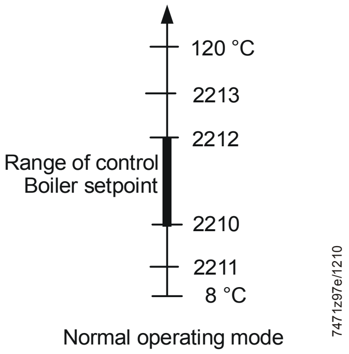


Figure 37: Boiler setpoints

Key

Line no.	*Meaning*
2210	Setpoint minimum
2211	Setpoint minimum OEM
2212	Setpoint maximum
2213	Setpoint maximum OEM

Setpoint min/max – min/max OEM

Line no.	*Operating line*
2210	**Setpoint min**
2211	**Setpoint min OEM**
2212	**Setpoint max**
2213	**Setpoint max OEM**

The upper setpoint level for the boiler is defined via the limit value of the electronic temperature controller:
All setpoints and switch-on/switch-off thresholds are limited such that (cutout temperature limit thermostat) – 3 K is the resulting maximum switch-off threshold.
As a result, the requested setpoint is reduced to *Maximum Switch-off threshold – switch-off differential*.

The switch-on threshold is reduced to *Maximum Switch-off threshold – switch-off differential – switch-on differential*.
When the switching thresholds and the setpoint have been redefined, a check is made to see whether the switch-on threshold satisfies at least the requirement of minimum limitation.
If the switch-on threshold is lower, it is raised to the minimum limitation. Setpoint and switch-off threshold are not readjusted here.
Due to unfavorable parameterization of *Minimum boiler temperature, Maximum boiler temperature safety limit thermostat* and *Switching differentials*, a situation might now occur where the switch-on threshold lies above the setpoint or above the switch-off threshold.
For this reason, the last adaption step makes certain that the switch-on threshold lies at least 2 K below the switch-off threshold. And the setpoint is not changed anymore.

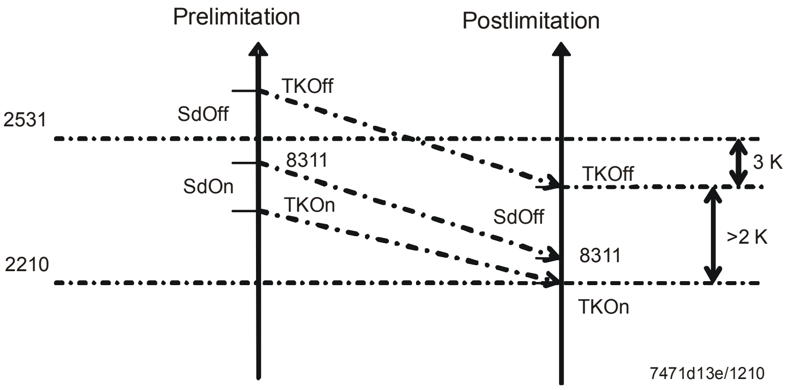


Figure 38: Boiler setpoints OEM

Key

Line no.	*Meaning*	
2210		Setpoint minimum
2531		Cutout temperature limit thermostat
8311	TKSoll	Boiler temperature setpoint
	TKAus	Switch-off threshold boiler
	TKEin	Switch-on threshold boiler
	SdAus	Dynamic switch-off threshold (heating circuit/DHW)
	SdEin	Switch-on threshold (heating circuit/DHW)

6.11.4 Setpoint manual control

In *Manual control* mode, the common flow temperature setpoint can be set to a fixed value.

Setpoint manual control

Line no.	*Operating line*
2214	**Setpoint manual control**

The setpoint of manual control and the switch-on and switch-off thresholds are generated depending on the electronic temperature controller (*Limit thermostat function* (2310)):

Temperature controller On:

Switch-off threshold:	Setpoint of manual control
Controller setpoint:	Switch-off threshold – parameterized switch-off differential (can be dynamic)
Switch-on threshold:	Controller setpoint – parameterized switch-on threshold

Temperature controller Off:

Switch-off threshold:	Setpoint of manual control + parameterized switch-off differential (can be dynamic)
Controller setpoint:	Setpoint of manual control
Switch-on threshold:	Setpoint of manual control – parameterized switch-on threshold

Note!
In addition, switching thresholds and setpoint can be limited by function *Cutout temp LT*.

Note!
If dynamic switching limits are activated ((*Dyn SD on setpoint change* (2464), *Min setpoint change dyn SD* (2465), *Dyn SD with HC/DHW change* (2466), *Dyn SD when burner on* (2467)), they also apply to manual control.

Additional parameters

Line no.	*Operating line*
2464	*Dynamic switching differential when setpoint changes*
2465	*Minimum setpoint change with dynamic switching differential*
2466	*Dynamic switching differential changeover heating circuit/DHW*
2467	*Dynamic switching differential when burner On*

6.11.5 Frost protection for the boiler

Setpoint frost protection

Line no.	*Operating line*
2217	**Setpoint frost protection**

The setpoint for the boiler's frost protection can be set by the OEM.

Frost protection for the boiler is ensured, independent of heat requests or connected plant components. Therefore, boiler control checks frost protection autonomously and also causes the burner to be started up, if necessary.

If there is no request for heat and the burner is Off, the frost protection threshold is used as the switch-on threshold.

Frost protection for the boiler is activated whenever the boiler temperature drops below the *Frost Protection* setpoint.

The switch-off threshold is determined as follows:	Switch-off threshold boiler = *Frost protection* setpoint + *Switching diff on HCs* (2454) + *Switching diff off min HCs* (2455)
The boiler temperature setpoint is determined as follows:	Boiler temperature setpoint = frost protection threshold + *Switching diff on HCs* (2454) + *Switching diff off min HCs* (2455)

If *Ctrl boiler pump/DHW valve* (5774) is set to *All requests*, the boiler pump runs during the time frost protection for the boiler is active.
If set to *Request HC1/DHW only,* the boiler pump will not be activated.
If the boiler pump ran during the time frost protection for the boiler was active, pump overrun is performed when frost protection for the boiler has ended.

If *Setpoint frost protection* (2217) is set to OSV (- - -), frost protection for the boiler is not deactivated, but the frost protection setpoint is set to -20 °C.

Key

Line no.	*Meaning*	
2454	SdHkEin	Switch-on differential heating circuits
2455	SdHkAusMin	Minimum switch-off differential heating circuits
5774		Control boiler pump/DHW diverting valve

6.11.6 PID control algorithm

To parameterize the PID control algorithm, 2 sets of controller coefficients are available. One set is used for *Heating* mode, the other for drawing DHW from the instantaneous water heater or for charging a DHW storage tank (DHW).

Control parameters for *Heating* mode:

Line no.	*Operating line*
2233	**P-band Xp HCs**
2234	**Int action time Tn HCs**
2235	**Der action time Tv HCs**

Control parameters for *DHW* mode:

Line no.	*Operating line*
2236	**P-band Xp DHW**
2237	**Int action time Tn DHW**
2238	**Der action time Tv DHW**

P-band Xp HCs/DHW

Line no.	*Operating line*
2233	**P-band Xp HCs**
2236	**P-band Xp DHW**

P-band Xp defines the controller's gain. A small Xp leads to higher burner fan speeds without changing the control offset ΔT = (temperature setpoint – actual value of temperature).

Int action time Tn HCs/DHW

Line no.	*Operating line*
2234	**Int action time Tn HCs**
2237	**Int action time Tn DHW**

The integral action time Tn defines the controller's rate of response when correcting proportional offsets. A shorter Tn leads to faster correcting actions.

Der action time Tv HCs/DHW

Line no.	*Operating line*
2235	**Der action time Tv HCs**
2238	**Der action time Tv DHW**

The derivative action time Tv determines the extent of after-effect of a spontaneous change of control offset. A short Tv only has a short-time impact on the manipulated variable.

6.11.7 Boiler/burner control

Burner running time min

Line no.	*Operating line*
2241	**Burner running time min**

Here, set a period of time after burner startup during which the off time differential is increased by 50%. This means that with similar heating up processes, the 2-position controller switches off later. But this parameter setting does not guarantee continuous burner operation for the parameterized period of time.

This option is used only when none of the 3 criteria for the dynamic switching differentials is parameterized:
Dyn SD on setpoint change (2464), *Dyn SD with HC/DHW change* (2466), and *Dyn SD when burner on* (2467) are switched off.

Switching diff off max HCs (2456) and *Switching diff off max DHW* (2462) for the maximum switch off differentials are thus deactivated.

The switch-off threshold is calculated based on the switching thresholds of the respective *Heating*/*DHW* mode:
Switch-off threshold = setpoint + (min. switch-off differential) * 1.5.

Generally speaking, the use of dynamic switch-off thresholds seems more advantageous. For this reason, the minimum burner running time should be seen in the context of backward compatibility.

Burner off time min

Line no.	*Operating line*
2243	**Burner off time min**

The minimum burner off time acts exclusively between successive startup cycles resulting from space heating requests. It locks the boiler for an adjustable time. This period of time is started after regular shutdowns or when the limit thermostat cuts out in *Heating* mode. The 2-position controller initiates new startups resulting from space heating requests only when this period of time has elapsed.

SD burner off time

Line no.	*Operating line*
2245	**SD burner off time**

If *SD burner off time* is exceeded, the minimum off time is aborted.

Release of minimum off time

If a request for heat puts the burner into operation, the minimum off time is enabled, which means that it will commence the next time the 2-position controller or the limit thermostat initiates shutdown.

Start of minimum off time

In the event of shutdown initiated by the 2-position controller or limit thermostat, the minimum off time commences if previously enabled.

Interruption of minimum off time

If one of the following requests is received during the minimum off time, it is immediately processed:

- DHW request
- Frost protection for the boiler
- *Controller stop* function
- *Chimney sweep* function

The minimum off time for heat requests continues to elapse in the background.

End of minimum off time

Requests for heat cause the burner to restart when…

- the minimum off time has elapsed,
- the parameterized control deviation (SD burner off time) is exceeded.

Note!
Calculation of the switching point for aborting the burner off time!
In the case of a modulating heating circuit/boiler pump, limitation of the boiler temperature increase must be active.
The reduced setpoint for limiting the boiler temperature increase is used.

6.11.8 Overtemperature protection

If the burner shuts down or if the request for heat becomes invalid, a forced overrun signal is forwarded during the parameterized pump overrun time. If such a signal is received, consumer groups must not be shut down. During the time the forced signal is active, the mixing valve setpoint for flow temperature control is maintained at the former setpoint. If the last pending heat request was received from a DHW component (instantaneous water heater or storage tank), the overrun parameter for DHW heating is used for boiler pump Q1.

Pump overrun time

Line no.	*Operating line*
2250	**Pump overrun time**

Pump overrun time after *Heating* mode and external requests for heat.

Pump overr time after DHW

Line no.	*Operating line*
2253	**Pump overr time after DHW**

Pump overrun time after DHW heating.

6.11.9 Minimum limitation of boiler temperature

Prot boil startup consumers

Line no.	*Operating line*
2260	**Prot boil startup consumers** Off On

Protective startup with consumer pumps
The consumer pumps (heating circuit pump, DHW charging pump, external load) are deactivated, or stay deactivated, if the locking signal exceeds the relevant value.

Threshold value for heating circuit pump = 5%
Threshold value for DHW charging pump = 50%

Note!
If protective startup occurs during DHW charging with shifting DHW charging priority, the locking signal for shifting priority is set to *100%*. This ensures that the DHW charging pump can be activated before the heating circuit pumps are put into operation.

Protective startup with consumer mixing valves
When protective startup is activated, the consumers with mixing valve are restricted in their heat consumption in accordance with the locking signal value.
The function can be deactivated.

Off
Function is deactivated.

On
Function is activated.

Setpoint min on shutdown

Line no.	*Operating line*
2263	**Setpoint min on shutdown** Off On

When this function is activated, the boiler also maintains its minimum temperature when – for certain periods of time – there are no more requests for heat from the consumers. If the burner is running, it is shut down only if the boiler temperature exceeds its minimum level. This means that when the requests for heat from the consumers are satisfied, the boiler temperature is at least at its minimum level.
However, when there are no requests for heat from the consumers, the boiler is not maintained at the minimum temperature: If the boiler temperature drops below its minimum while the burner is Off, the burner is not put into operation.

Note!
This functionality is not available for certain special hydraulic systems. With hydraulic configurations where the boiler pump is activated only if heating circuit 1 calls for heat, the boiler cannot be kept hot without getting a simultaneous request for heat from the consumer and without heat usage by the same consumer.

Off
Function is deactivated.

On
Function is activated.

Prot boil startup anticipation

Line no.	*Operating line*
2264	**Prot boil startup anticipation**

When the burner is started up, the boiler temperature is expected to rise. If the rise is not sufficient, locking signals are forwarded to the consumers, requesting them to reduce their heat demand. This allows the boiler to reach the required temperature level more quickly.

During protective boiler startup, the locking signal value to the consumers is calculated based on the anticipated progression of the boiler temperature. The anticipated boiler temperature at the current point in time + anticipation time are calculated as follows:

Actual value of boiler temperature [$t_{aktuell}$+ t_{voraus}] = actual value of boiler temperature [$t_{aktuell}$] + (TKgradient * t_{voraus})

Eventually, the difference of anticipated boiler temperature and minimum boiler temperature determines the value of the locking signal (0…100%).

6.11.10 Minimum limitation of return temperature

The required minimum setpoint of the return temperature can be parameterized. If the boiler return temperature drops below the setpoint, maintained boiler return temperature is activated.

In connection with the maintained boiler return temperature, the following functions can be provided:

- Locking signal acting on the consumers
- Control of a modulating valve

Return setpoint min

Line no.	*Operating line*
2270	**Return setpoint min**

The required minimum return temperature setpoint can be parameterized. If the boiler return temperature falls below the return temperature setpoint, maintained boiler return temperature becomes active.

Return setpoint min OEM

Line no.	*Operating line*
2271	**Return setpoint min OEM**

This minimum limitation of the return temperature OEM is the lower limit value for the minimum return temperature setpoint.

Return influence consumers

Line no.	*Operating line*
2272	**Return influence consumers** Off On

If, with the boiler released, the return temperature falls below the set minimum temperature, a locking signal is calculated. With proper pump circuits (heating circuit pump, DHW charging pump, external load), the consumer pumps are deactivated, or stay deactivated, if the locking signal exceeds the relevant threshold value

Off
Function is deactivated.

On
Function is activated.

6.11.11 Boiler pump

Frost prot plant boiler pump

Line no.	*Operating line*
2300	**Frost prot plant boiler pump** Off On

This parameter is used to select whether frost protection for the plant shall also act on the boiler pump.

Off
Frost protection for the plant does not act on the boiler pump.

On
Frost protection for the plant also acts on the boiler pump.

Boiler pump on heat gen lock

Line no.	*Operating line*
2301	**Boiler pump on heat gen lock** Off On

This parameter is used to define whether the heat generation lock shall also act on the boiler pump.

Off
Boiler pump locked when the heat generation lock is active.

On
Boiler pump not locked when the heat generation lock is active.

Warning!
Due to the locked boiler pump in the case of heat generation lock (*Boiler pump on heat gen lock* (2301) set to *Off*), frost protection requests from consumers cannot be satisfied while heat generation lock is active.
Also, cold water from consumers is prevented from reaching the boiler to ensure it does not trigger frost protection for the boiler.
It is only frost protection for the boiler called for by sensor B2 that can put the burner and the boiler pump into operation.
Also refer to chapter *Boiler pump,* parameter *System pump on heat gen lock* (2121).

Impact heat generation lock

Line no.	*Operating line*
2305	**Impact heat generation lock** Heating mode only Heating and DHW mode

This parameter is used to select whether the heat generation lock shall only be active in the case of heat requests from the heating circuit, or in the case of DHW heating requests also.

Heating mode only
Only space heating requests are locked. DHW heating requests continue to be met.

Heating and DHW mode
All space heating and DHW heating requests are locked.

6.11.12 Electronic temperature controller

Limit thermostat function

Line no.	*Operating line*
2310	**Limit thermostat function** Off On

Limit thermostat function only acts in connection with manual control. In all other operating situations, the function is deactivated.

Off
When the *Limit thermostat function* is deactivated, the maximum switch-off point is limited to the limit thermostat's cutout temperature – 3 K, the maximum setpoint to the limit thermostat's cutout temperature – 3 K – switch-off threshold.

On
When the *Limit thermostat function* is activated, maximum switch-off point and maximum setpoint are limited to the limit thermostat's cutout temperature – 3 K.

Additional parameters

Line no.	*Operating line*
2531	**Cutout temp LT**

6.11.13 Limitation of boiler temperature increase

Use of a speed-controlled pump in heating operation is aimed at meeting the request for heat at minimum pump speeds whenever possible. Reduced pump speeds lead to lower volumetric flow. To ensure that reduced volumetric flow is able to meet the demand for heat, the flow temperature must be increased.
Also, reduced volumetric flow leads to lower return temperatures. Higher flow temperatures and lower return temperatures result in higher boiler temperature increases. To protect the boiler from thermal stress due to excessive boiler temperature increases, the increase is limited. This limitation is accomplished by limiting the boiler temperature setpoint as a function of the current return temperature.
Limitation of the boiler temperature setpoint means that the flow temperature setpoint calculated for the heating circuit will not be reached. Speed control for the pump responds by increasing the speed. As long as the pump is not controlled to the maximum speed, the boiler temperature increase is limited to the parameterized nominal increase (*Temp differential nominal* (2317)).
If the pump is already controlled to the maximum speed, the volumetric flow cannot be further increased. In that case, the boiler temperature increase is no longer limited to the nominal but to the maximum increase (*Temp differential max* (2316)). The transition from limitation to nominal boiler temperature increase aimed at limiting the maximum boiler temperature increase is made via the ramp in a linear manner.
The slope of the ramp is determined by the time constant for speed control (*Filter time const speed ctrl* (889, 1189, 1489)). For the transition, the time constant is multiplied by 5. If the pump speed returns to a level below the maximum speed, the transition is made in the other direction with the same time constant.

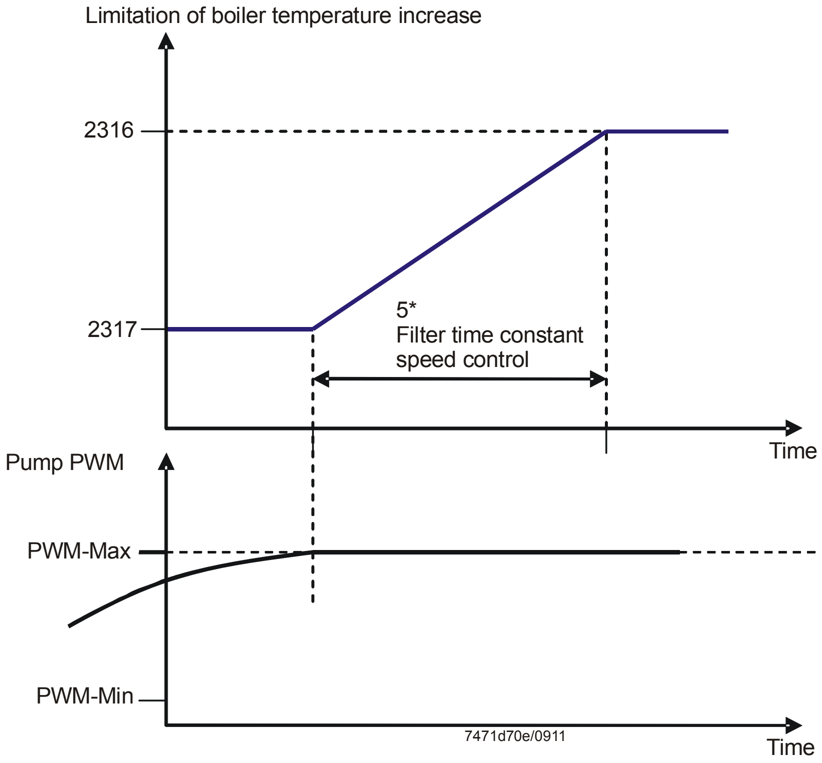


Figure 39: Limitation of boiler temperature increase

Key

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
889	1189	1489	Filter time constant speed control

Line no.	*Operating line*	
2316		Temp differential max
2317		Temp differential nominal
	PWM-Min	Parameterized minimum speed of heating circuit or boiler pump
	PWM-Max	Parameterized maximum speed of heating circuit or boiler pump

Limitation of the boiler temperature increase in connection with a speed-controlled pump (heating circuit or boiler pump) is only active in space heating mode. It is deactivated as soon as there a request for DHW heating.

Prerequisite for limitation of the boiler's temperature differential is a correctly working sensor B7 and a parameterized upper limit for the permitted boiler temperature differential: *Temp differential max*.

Temp differential max

Line no.	*Operating line*
2316	**Temp differential max**

The maximum boiler temperature differential in connection with a speed-controlled heating circuit pump is maintained when the pump is controlled at the maximum permissible speed.
The function can be deactivated by setting *OSV* (---).

Temp differential nominal

Line no.	*Operating line*
2317	**Temp differential nominal**

In connection with a speed-controlled heating circuit pump and pure *Heating* mode, the nominal boiler temperature differential is maintained as long as the heating circuit pump is not controlled at the maximum permissible speed.

6.11.14 Speed control

To calculate modulation of a speed-controlled boiler pump, several functions are available. The required function can be selected via parameter *Pump modulation* (2320).

Pump modulation

Line no.	*Operating line*
2320	**Pump modulation** None Demand Boiler setpoint Temp differential nominal Burner output

None
No speed is selected for the boiler pump. The output delivers 0% PWM.

Demand
The speed of the boiler pump is calculated based on the speed requests from the consumers. Calculation of the speed is dependent on the consumers in the plant, the currently valid heat requests, and the pump speeds calculated by the individual consumers.

Only consumers acting on the same controller are considered.

When there is a request for DHW heating, the speed calculated for the DHW pump (charging pump Q3 or instantaneous water heater pump Q34) is used for the boiler pump. The speed limits of the DHW pump apply.

If there is no request for DHW heating, the pump speed is calculated based on the speed requests from the heating circuits. The speed of the boiler pump results from the highest pump speed calculated by the heating circuits. The pump speed calculated by heating circuits 2 and 3 is evaluated only if these heating circuits are hydraulically dependent on the position of the diverting valve (*Ctrl boiler pump/DHW valve* (5774)) and thus on the boiler pump.

The speed of the DHW or heating circuit pump is also used for the boiler pump. Hence, only the speed limits of the DHW pump or the respective heating circuit pump apply. In this case, the speed limits parameterized for the boiler pump are not considered.

Additional parameters

Line no.	*Operating line*
5774	**Ctrl boiler pump/DHW valve**

Note!
This function is only for use with single-boiler plants.
For cascaded systems, one of the other functions must be selected.

Boiler setpoint
With modulation based on the boiler temperature setpoint, the speed of the boiler pump is reduced to such a degree that the sensor B2 will reach the required boiler temperature setpoint.

Reaching the boiler temperature setpoint is primarily the task of the boiler controller. Also, reaching this setpoint is dependent on the amount of water supplied by the boiler pump.

The required boiler temperature setpoint can be attained more quickly if the amount of water supplied by the boiler pump is reduced. But if the amount of water supplied is reduced excessively, the boiler controller modulates the burner's output down. In that case, the burner's capacity would only be partly used.

The speed of the boiler pump is calculated such that it can be lowered to the parameterized minimum only when the burner's full capacity is reached.

When the burner operates at low output (relative output below 66%), the setpoint for speed control is reduced by the parameterized difference (*Pump setpoint reduction* (2329)). If the relative burner output exceeds 66%, the setpoint for speed control is increased to such an extent that at 100% relative output, the setpoint for calculating the speed corresponds to the setpoint for boiler temperature control.

This prevents the boiler from reaching the setpoint at a reduced output while the pump continues to operate at reduced speed.

Speed control is ensured by a PID controller, using the controller coefficients for the boiler pump (*Speed Xp* (2324), *Speed Tn* (2325), and *Speed Tv* (2326)).

For control of the pump speed with an active DHW heating request (in instantaneous water heater operation also), the parameterized speed limits for charging pump Q3 apply. With all the other heat requests (heating circuit, consumer circuit, zone extension), the speed limits parameterized for the boiler pump apply.

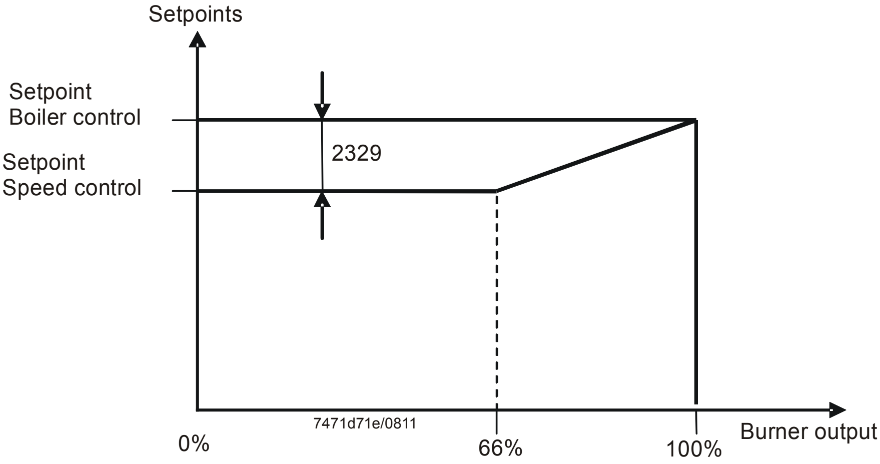


Figure 40: Speed control – boiler setpoint

Additional parameters

Line no.	*Operating line*
2324	**Speed Xp**
2325	**Speed Tn**
2326	**Speed Tv**
2329	**Pump setpoint reduction**

Temp differential nominal

The objective of this function is to modulate the speed of the boiler pump such that the boiler temperature increase is maintained at the level of the parameterized nominal increase (*Temp differential nominal* (2317)). The boiler temperature increase is the difference of return temperature (sensor B7) and flow temperature (sensor B2). If the current boiler temperature increase is greater than the nominal increase, speed control responds by increasing the pump speed and, on the other hand, by reducing the pump speed.

The pump‘s speed is controlled by a PID controller based on the control coefficients for the boiler pump (*Speed Xp* (2324), *Speed Tn* (2325), and *Speed Tv* (2326)).

Limitation of the pump speed results from the minimum and maximum speed parameterized for the boiler pump.

In DHW heating operation, control of the boiler pump speed is not effected according to the parameterized boiler temperature increase. Here, the speed of the boiler pump is calculated based on the *Demand* function (see above).

For all other operating modes – with the exception of DHW heating – following applies: If the boiler return temperature is not available (sensor faulty or not configured), or if no valid nominal boiler temperature increase is configured, the speed of the boiler pump is calculated based on the *Boiler setpoint* function.

Additional parameters

Line no.	*Operating line*
2324	**Speed Xp**
2325	**Speed Tn**
2326	**Speed Tv**

Burner output

This function is suited for use with single-boiler plants and cascaded systems, with or without pressureless header.

With this function, the speed of the boiler pump is directly dependent on the burner’s current output. When the burner operates at low output, the boiler pump is controlled at low speed, when the output is high, the boiler pump is controlled at high speed.

The speed of the boiler pump is calculated based on the burner’s current output. As long as the burner’s output does not exceed the parameterized threshold (*Output at pump speed min* (2334)), the boiler pump is parameterized at minimum speed. When the burner’s output exceeds the parameterized threshold, the pump’s speed is raised as the burner’s output increases until, at the upper threshold (*Output at pump speed max (2335)*), the pump is parameterized at maximum speed. If the burner’s output increases further, the pump’s speed is maintained at its maximum.

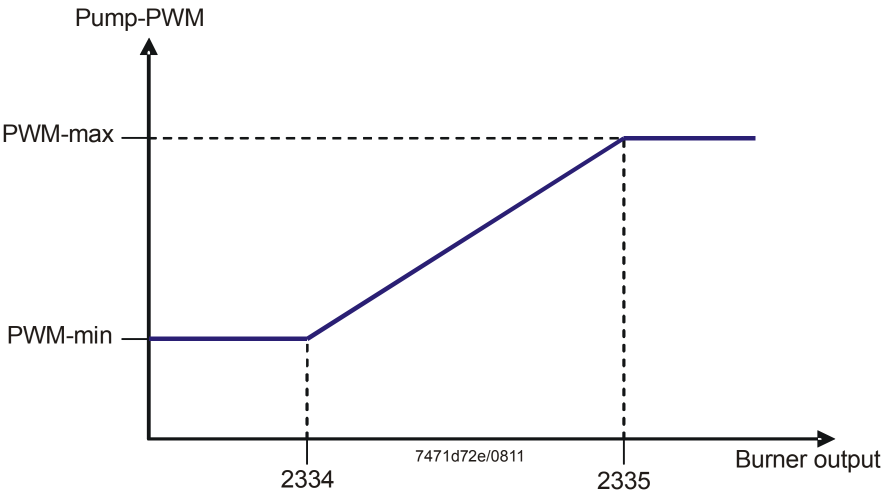


Figure 41: Pump speed as a function of burner output

Key

Line no.	*Operating line*	
2334		Output at pump speed minimum
2335		Output at pump speed maximum
	PWM-min	Parameterized minimum speed of boiler pump
	PWM-max	Parameterized maximum speed of boiler pump

When calculating the pump speed, the burner’s output is attenuated with a time constant of 30 seconds.
If the output changes abruptly, it can therefore take up to 3 minutes for the pump speed to be matched to the current burner output.

PWM limits relative/absolute

The PWM limits for the pumps on the *Heating engineer* level are either relative or absolute.

The selection is made via factory settings at headquarters level.

With absolute PWM limits, the setting range for the heating engineer is restricted by the OEM limits. This means that the heating engineer can vary the minimum speed only above the minimum set by the OEM, and the maximum speed only below the maximum set by the OEM.

In the case of relative PWM limits, the speed range restricted by the OEM represents the basis for the heating engineer’s setting range which, here, always reaches from 0% to 100%, where 0% corresponds to the OEM’s minimum value and 100% to the OEM’s maximum value. Values between 0% and 100% restrict accordingly the speed range defined by the OEM. Here, the pump speed values displayed are not identical with the control values for the pump.

For every pump, a set of 6 parameters are available for limiting the speed. These are the absolute min./max. values at the *Heating engineer* level, the relative min./max. values at the *Heating engineer* level, and the min./max. values at the *OEM* level. The parameters for the relative speed limits are not interlocked with the limits at the *OEM* level. The only active limitation is that between minimum and maximum values (minimum cannot be set above maximum, and vice versa).

ℹ

Note!
The setting limits at the *OEM* level are still confined by the parameters for the absolute speed limits at the *Heating engineer* level. This means that the upper speed limit at the *OEM* level cannot be set below the maximum value at the *Heating engineer* level. When using the relative PWM limits, it is therefore recommended to set both the low and the high speed limit at the *Heating engineer* level to *50%*. Hence, the range from 0% to 50% is available for the lower OEM limit, and the range from 50% to 100% for the upper OEM limit.

Starting speed

Line no.	*Operating line*
2321	**Starting speed**

Starting speed of boiler pump.

Pump speed min

Line no.	*Operating line*
2322	**Pump speed min**

For the modulating pump, the working range can be defined as a percentage of output. Internally, the control translates percentage figures to speed.

The minimum value should be selected such that the pump is reliably activated when controlled.

Pump speed max

Line no.	*Operating line*
2323	**Pump speed max**

Power consumption can be limited via the maximum value.

Speed Xp

Line no.	*Operating line*
2324	**Speed Xp**

Speed Tn

Line no.	*Operating line*
2325	**Speed Tn**

Speed Tv

Line no.	*Operating line*
2326	**Speed Tv**

Pump speed minimum/maximum

Boiler pump speed range:
The boiler pump speed is limited by a minimum and maximum permissible speed.
To ensure reliable startup, the pump is started running at the parameterized starting speed for 10 seconds.

Pump speed min OEM

Line no.	*Operating line*
2327	**Pump speed min OEM**

Minimum limitation of pump speed at the *OEM* level.

Pump speed max OEM

Line no.	*Operating line*
2328	**Pump speed max OEM**

Maximum limitation of pump speed at the *OEM* level.

Pump setpoint reduction

Line no.	*Operating line*
2329	**Pump setpoint reduction**

This parameter is used to set the setpoint reduction for the boiler pump's speed control.
This setpoint reduction is only active in connection with *Pump modulation* (2320).

LimMinBoilPumpMod

Line no.	*Operating line*
[6066.1]	**LimMinBoilPumpMod** Off On

The burner shall be prevented from shutting down or the boiler temperature shall be prevented from exceeding the safety limiter thermostat cutout temperature due to residual heat because pump modulation is not sufficiently high. For this reason, the pump's minimum permissible modulation is constantly adapted, depending on boiler temperature and burner modulation.

This ensures that the modulating boiler pump operates above the parameterized minimum modulation when…
- the burner is started with 100% burner modulation,
- the burner reaches the switch-off threshold with burner modulation above the minimum output,
- the boiler temperature lies above the switch-off threshold.

Also, when the burner is switched on, the pump's minimum modulation is limited to 100% for 10 seconds, thus setting modulation to the maximum.
The function can be deactivated.

Off
Function is deactivated.

On
Function is activated.

6.11.15 Output data

Output nominal

Line no.	*Operating line*
2330	**Output nominal**

Output basic stage

Line no.	*Operating line*
2331	**Output basic stage**

These settings are required when several boilers with different capacities operate in a cascaded system.

Output at pump speed min

Line no.	*Operating line*
2334	**Output at pump speed min**

If option *Pump modulation* (2320) is selected, the boiler pump is operated at minimum speed until the burner output set on *Output at pump speed min* (2334) is reached, and at maximum speed from the burner output set on *Output at pump speed max* (2335). If the burner's output lies between these 2 values, the boiler pump's speed is calculated through linear conversion.

Output at pump speed max

Line no.	*Operating line*
2335	**Output at pump speed max**

If option *Pump modulation* (2320) is selected, the boiler pump is operated at minimum speed until the burner output set on *Output at pump speed min* (2334) is reached, and at maximum speed from the burner output set on *Output at pump speed max (*2335).

If the burner's output lies between these 2 values, the boiler pump's speed is calculated through linear conversion.

6.11.16 Fan

Fan speed heating max

Line no.	*Operating line*
2441	**Fan speed heating max**

This parameter is used to limit the maximum output in *Heating* mode.

Fan speed full charging max

Line no.	*Operating line*
2442	**Fan speed full charging max**

This parameter can be used to limit the maximum output with full charging in connection with stratification storage tanks.

Fan sp start value inst WH

Line no.	*Operating line*
2443	**Fan sp start value inst WH**

To ensure quick and stable control of the required output when DHW is consumed, a modulation start value for the instantaneous water heater can be preset.

If, due to a small control deviation, the controller calls for a lower fan speed, this start value ensures that the fan is controlled to a lower speed. If evaluation of the control deviation demands a higher speed, the fan is controlled to a higher speed.

Fan speed DHW max

Line no.	*Operating line*
2444	**Fan speed DHW max**

This parameter is used to limit the maximum fan speed for DHW heating. The parameter is OSV-compatible. With OSV, the maximum fan speed applies to DHW heating.

Fan shutdown heating mode

Line no.	*Operating line*
2445	**Fan shutdown heating mode** Off On

This parameter belongs to function *Fan shutdown K38*.

This function is used to switch off the fan’s power supply. Power supply to the fan is released as soon as the fan’s PWM control is active or whenever there is a request for DHW. Fan shutdown is delayed and takes place after PWM control is switched off, or when there is no more demand for DHW. This delayed shutdown can be set via *Fan shutdown delay (*2446). During the time a request for DHW is active, the fan’s power supply also remains released when PWM control is inactive.
Fan shutdown heating mode (2445) can be used to select whether the fan’s power supply shall also be released when there are requests for space heating, independent of PWM control.

Off
Function is deactivated.

On
Function is activated.

Fan shutdown delay

Line no.	*Operating line*
2446	**Fan shutdown delay**

This parameter belongs to function *Fan shutdown K38*.

This function is used to switch off the fan's power supply. Power supply to the fan is released as soon as the fan's PWM control is active or whenever there is a request for DHW. Fan shutdown is delayed and takes place after PWM control is switched off, or when there is no more demand for DHW. This delayed shutdown can be set via *Fan shutdown delay* (2446).
During the time a request for DHW is active, the fan's power supply also remains released when PWM control is inactive.
Fan shutdown heating mode (2445) can be used to select whether the fan's power supply shall also be released when there are requests for space heating, independent of PWM control.

6.11.17 Control of the boiler/burner

The controller delay serves for stabilizing the combustion process, especially after a cold start. After the burner control's release by the controller, the latter maintains the parameterized output for a predefined period of time. The modulating controller – and thus modulation – are released only when this period of time has elapsed.

The following graph shows an example:

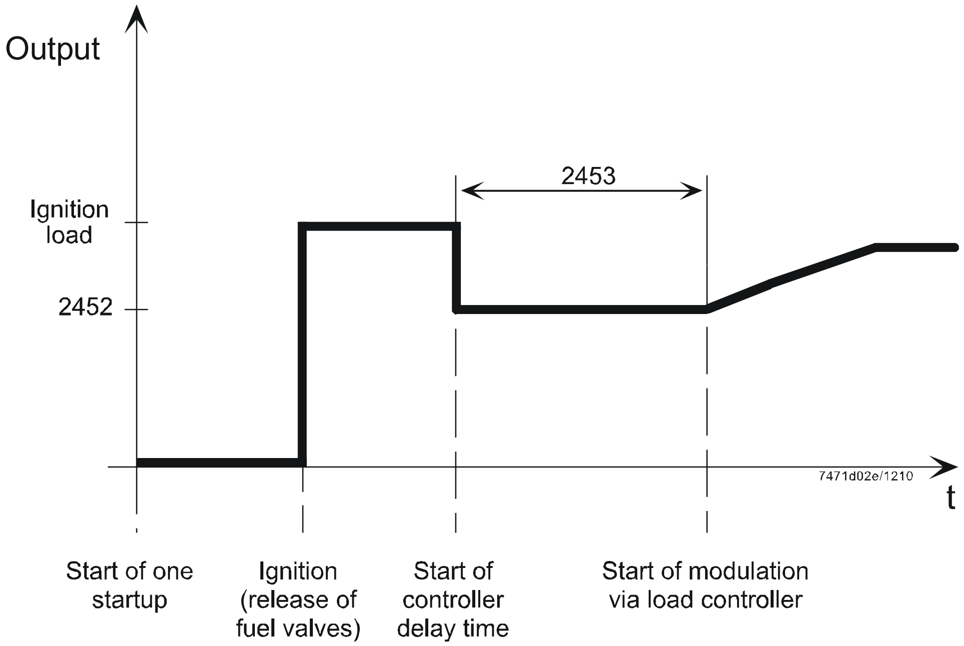


Figure 42: Control of the boiler/burner

Key

Line no.	*Meaning*
2452	LmodRgVz Controller delay speed
2453	ZReglVerz Controller delay duration

Via parameter is set to determine whether and how the controller delay shall act.
The controller delay can be deactivated.
Activation can take place in the case of heating requests only, DHW requests only, or both.

Note!
During operation of the instantaneous water heater, the controller delay never takes effect.

The parameterized output in percent is limited to the available setting range of the respective operating mode (heating circuit/DHW).
This means that in *Heating* mode, the parameterized *Max fan speed heating mode* is used as the 100% value. In *DHW* mode, the maximum output is used as the 100% value. Another parameter defines for what period of time the controller delay shall be active.

Controller delay

Line no.	*Operating line*
2450	**Controller delay** Off Heating mode only DHW mode only Heating and DHW mode

Here, you can set the operating mode where the controller delay shall become active.

Off
Function is deactivated.

Heating mode only
Controller delay only acts in *Heating* mode.

DHW mode only
Controller delay only acts in *DHW* mode.

Heating and DHW mode
Controller delay acts in *Heating* and *DHW* mode.

Controller delay speed

Line no.	*Operating line*
2452	**Controller delay speed**

Speed delivered during the controller delay time.

Controller delay duration

Line no.	*Operating line*
2453	**Controller delay duration**

Duration of controller delay. This delay time is started the moment a flame is definitively detected after ignition.

6.11.18 Dynamic switching differentials

To avoid unnecessary cycling during startup, the switch-off differential is dynamically adapted, depending on the progression of temperature. As a matter of principle, the switch-off differential is reduced depending on the extent of oscillation during the settling out process. In the case of aperiodic processes, the reduction is made via a time criterion.

The following graph shows a typical settling out process:

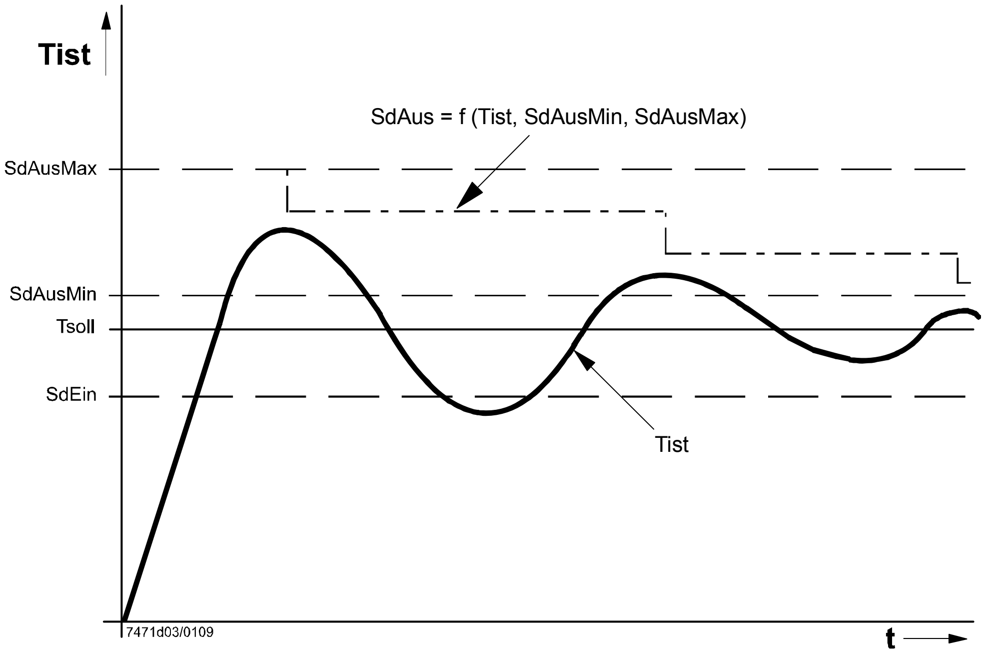


Figure 43: Switching differentials

Key

Line no.	*Meaning*	
	TIst	Actual value of temperature
	SdAus	Dynamic switch-off threshold
	SdEin	Switch-on threshold (heating circuit/DHW)
	Tsoll	Temperature setpoint
	SdAusMin	Minimum switch-off threshold
	SdAusMax	Maximum switch-off threshold
	TKAus	Switch-off threshold boiler

During the time parameterized for the dynamic adaption of the switch-off differential, the local maximum (highest point of overshoot) leads to the dynamic reduction of the switch-off threshold: Switch-off threshold boiler = (temperature setpoint + maximum switch-off threshold – actual value of temperature)/2.

But the switch-off threshold is always limited at the bottom:
Switch-off threshold boiler > = temperature setpoint + minimum switch-off threshold.

The switch-on differential is ready parameterized.

The following assignments apply, depending on the operating mode:

	Heating mode	*DHW storage* mode	*Instantaneous water heater* mode
Minimum switch-off differential	2455	2461	2461
Maximum switch-off differential	2456	2462	2462
Switch-off differential SdAus	f (heating circuit)	f (DHW)	f (DHW)
Switch-on differential SdEin	2454	2460	2460
Time to reduction to minimum switch-off differential	2457	2463	2463

Key

Line no.	*Meaning*	
2454	SdHkEin	Switch-on differential heating circuits
2455	SdHkAusMin	Minimum switch-off differential heating circuits
2456	SdHkAusMax	Maximum switch-off differential heating circuits
2457	ZsdHkEnde	Settling time heating circuits
2460	SdTwwEin	Switch-on differential DHW
2461	SdTwwAusMin	Minimum switch-off differential DHW
2462	SdTwwAusMax	Maximum switch-off differential DHW
2463	ZsdTwwEnde	Settling time DHW
	f	Function of

By equating the switching differentials (*2455* = *2456* or *2461* = *2462)*, the dynamic switch-off differential can be deactivated. In that case, the switching differentials are still dynamically calculated, but – due to limitation of the switching threshold – the result obtained is always the value parameterized for the switch-off differential.
In addition to limiting the switch-off thresholds, it is made certain that a minimum switching differential of 2 K is observed. If switch-on and switch-off thresholds have a smaller temperature difference, the switch-on threshold is forced to a reduced level of (switch-off threshold boiler – 2 K). In that case, no consideration is given to minimum limitations.

For better illustration, an example is given here:

2210 = 40 °C   *2454* = 1 °C   *SkHkAus* = 0 °C   *8311* = 40 °C

Based on these temperatures, the following thresholds are calculated:
Switch-off threshold boiler = 8311 + SdHkAus = 40 °C + 0 °C = 40 °C
Switch-on threshold boiler = 8311 - 2454 = 40 °C - 1 °C = 39 °C

The difference of (switch-off threshold boiler – switch-on threshold boiler) is only 1 °C.

This means that the minimum switching differential is not observed. For this reason, the switch-on threshold is lowered:
Switch-on threshold boiler = *switch-off threshold boiler* - 2 °C = 40 °C - 2 °C = 38 °C

Key

Line no.	*Meaning*	
2210		Setpoint minimum
2454	SdHkEin	Switch-on differential heating circuits
8311	TKSoll	Boiler temperature setpoint
	SdHkAus	Switch-off differential heating circuits

Note!
The dynamic switching differentials can only be parameterized with positive values.

Switching diff on HCs

Line no.	*Operating line*
2454	**Switching diff on HCs**

The switch-on threshold is calculated from the required setpoint minus the switch-on differential. The parameter represents the switch-on differential used for requests from space heating.

Switching diff off min HCs

Line no.	*Operating line*
2455	**Switching diff off min HCs**

The switch-off threshold is calculated from the required setpoint plus the switch-off differential. The parameter represents the switch-off differential used for requests from space heating. During the settling time, the switch-off differential can vary between the minimum and the maximum value. At the end of the settling out process, it is always the minimum switch-off differential that is used.

Switching diff off max HCs

Line no.	*Operating line*
2456	**Switching diff off max HCs**

The switch-off threshold is calculated from the required setpoint plus the switch-off differential. The parameter represents the switch-off differential used for requests from space heating. The maximum switch-off differential is only used during the settling out process.

Settling time HCs

Line no.	*Operating line*
2457	**Settling time HCs**

This parameter represents the period of time after the burner was switched on during which the switch-off threshold can be calculated based on the maximum switch-off differential. The parameter is used for requests from space heating.

Switching diff on DHW

Line no.	*Operating line*
2460	**Switching diff on DHW**

The switch-on threshold is calculated from the required setpoint minus the switch-on differential. The parameter represents the switch-on differential used for DHW heating requests.

Switching diff off min DHW

Line no.	*Operating line*
2461	**Switching diff off min DHW**

The switch-off threshold is calculated from the required setpoint plus the switch-off differential. The parameter represents the switch-off differential used for DHW heating requests. During the settling out process, the switch-off differential can vary between the minimum and the maximum value. At the end of the settling out process, it is always the minimum switch-off differential that is used.

Switching diff off max DHW

Line no.	*Operating line*
2462	**Switching diff off max DHW**

The switch-off threshold is calculated from the required setpoint plus the switch-off differential. The parameter represents the switch-off differential used for DHW heating requests. The maximum switch-off differential is only used during the settling out process.

Settling time DHW

Line no.	*Operating line*
2463	**Settling time DHW**

This parameter represents the period of time after the burner was switched on during which the switch-off threshold can be calculated based on the maximum switch-off differential. The parameter is used for DHW heating requests.

To control the process of dynamic switching thresholds on an application-specific basis, a number of parameters are available. The 3 methods described below can be independently activated and deactivated.

- Setpoint change with a significant setpoint difference
- Changeover of operating mode between space heating and DHW heating
- Startup of burner

So the dynamics of the switching thresholds can be activated by a significant setpoint change. Via *Dyn SD on setpoint change* (2464) can be activated/deactivated. The temperature parameter defines the minimum temperature difference between the former and the new setpoint above which the dynamics of the switching thresholds are activated. When checking the temperature difference between the setpoints, both positive and negative setpoint changes are taken into consideration.

Dyn SD on setpoint change

Line no.	*Operating line*
2464	**Dyn SD on setpoint change** Off On

Activation of the dynamic switching thresholds with setpoint changes.

Off
Function is deactivated.

On
Function is activated.

Min setpoint change dyn SD

Line no.	*Operating line*
2465	**Min setpoint change dyn SD**

Setpoint difference above which the dynamic switching thresholds apply.

Dyn SD with HC/DHW change

Line no.	*Operating line*
2466	**Dyn SD with HC/DHW change** Off On

The dynamic switching thresholds can also be activated when the request for heat changes from *DHW* mode to *Heating* mode. This function is activated/deactivated via parameter *Dyn SD with HC/DHW* (2466).

Off
Function is deactivated.

On
Function is activated.

Dyn SD when burner on

Line no.	*Operating line*
2467	**Dyn SD when burner on** Off On

The third option is to activate the dynamic switching thresholds each time the burner is started up. This function is activated/deactivated via parameter *Dyn SD when burner on* (2467)

Off
Function is deactivated.

On
Function is activated.

Dyn SD deactivated

If the application with dynamic switching thresholds is not required (all *Dyn SD* parameters set to *Off*), the maximum switch-off thresholds remain deactivated. In that case, the switch-on thresholds and minimum switch-off thresholds are used for the 2-position controller.

6.11.19 Delay heat request special operation

Delay heat req special op

Line no.	*Operating line*
2470	**Delay heat req special op**

Certain types of heating systems use heating circuit valves in place of heating circuit pumps as actuating elements. Such valves are sometimes characterized by relatively long changeover times. As a result, with special operating modes (chimney sweep, controller stop, manual control), the heat source/burner might reach its operating position before the heating circuit valve/mixing valve has opened, meaning that the produced heat cannot be drawn by the heating circuit.
Parameter *Delay heat req special op* (2470) can be used to delay burner startup, thus allowing the actuating element to release the heating circuit before the heat source reaches its operating position.

Note!
Since in this case both system pump and heating circuit valve are controlled via the forced signal, the heating circuit valve cannot be switched on before the system pump. So the system pump works against the fully closed heating circuit valve until it opens.

6.11.20 Flue gas supervision

Flue gas temp output red

Line no.	*Operating line*
2473	**Flue gas temp output red**

This parameter defines the flue gas temperature above which output reduction becomes active.

Flue gas temp swi-off limit

Line no.	*Operating line*
2474	**Flue gas temp swi-off limit**

If the flue gas temperature exceeds the limit set here, the burner is shut down.

Flue gas superv shutdown

Line no.	*Operating line*
2476	**Flue gas superv shutdown** Start prevention Lockout position

This parameter is used to select the way the LMS14… shall respond if the burner is shut down due to too high flue gas temperatures.

Flue gas superv st prev tme

Line no.	*Operating line*
2477	**Flue gas superv st prev tme**

This parameter is used to set the period of time during which start is prevented upon shutdown due to too high flue gas temperatures.

Flue gas temp output limit

Line no.	*Operating line*
2478	**Flue gas temp output limit**

This parameter is used to set the flue gas temperature level above which the burner's output is limited.

Fl'g superv time con rel mod

Line no.	*Operating line*
2479	**Fl'g superv time con rel mod**

This parameter is used to set the filter time constant for filtering falling flue gas temperatures. The filter is used to delay the release of output when output limitation is active.

Plausibility check of sensor

If a configuration with flue gas sensor is selected, the LMS14… must read in a valid flue gas temperature value. Otherwise, either start prevention with message code or lockout will be initiated (*Flue gas superv shutdown* (2476)).
The lockout position is only reached when a tolerance time of 10 minutes has elapsed. As long as the lockout position is not reached, the burner is prevented from starting up and the status code appears.

Function

Flue gas temperature supervision is classified as non-safety-related and overrides control of the boiler. If the flue gas temperature exceeds the lowest threshold (Flue gas temp output limit (2478)), boiler output limitation becomes active. If the flue gas temperature continues to rise, the boiler's output is further limited – in a linear manner to the flue gas temperature. Output limitation is conceived such that only minimum output is delivered if the flue gas temperature reaches the next threshold (Flue gas temp output red (2473)).

If the flue gas temperature exceeds that threshold as well, boiler output will be limited to the minimum. If, in spite of output reduction, the flue gas temperature continues to rise, reaching the switch-off threshold (Flue gas temp swi-off limit (2474)), the boiler is shut down. Depending on the parameter setting (Flue gas superv shutdown (2476)), start prevention takes effect for at least 10 minutes (Flue gas superv st prev tme (2477)) or the LMS14… goes to lockout. The boiler is released again only when the flue gas temperature has dropped.

The *Output limitation* function can be deactivated. For that, the output limitation threshold (Flue gas temp output limit (2478)) must be set to OSV (---).

The *Output limitation* function provides P-control. To attenuate possible control oscillations, an additional PT1 filter can be activated. This filter dampens falling flue gas temperatures, but has no impact on rising flue gas temperatures. It can be activated by setting the filter time constant (Fl'g superv time con rel mod (2479)) to a value >0.

Note:
The boiler's output is not limited if combustion optimization (Sitherm Pro) calls for a higher output.

The following graph shows the various phases of flue gas supervision:

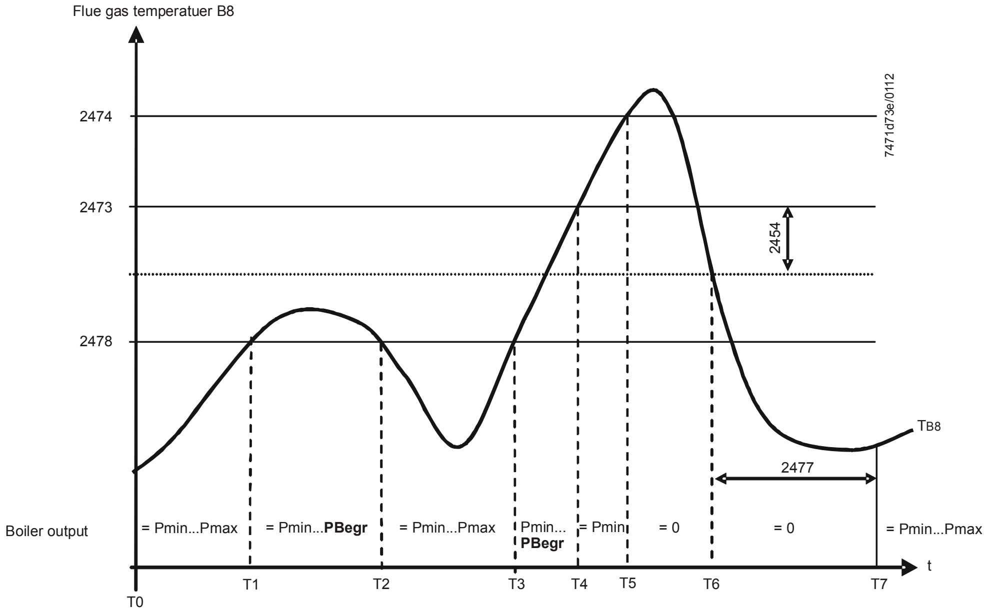


Figure 44: Flue gas supervision

Key

Line no.	*Meaning*	
2454	Switching diff on HCs	Switch-on differential heating circuits
2473	Flue gas temp output red	Flue gas temperature output reduction
2474	Flue gas temp swi-off limit	Flue gas temperature switch-off limit
2476	Flue gas superv shutdown	Flue gas supervision switch-off limit
2477	Flue gas superv st prev tme	Flue gas supervision start prevention time
2478	Flue gas temp output limit	Flue gas temperature output limitation
2479	Fl'g superv time con rel mod	Filter time constant for falling flue gas temp.
8316	Flue gas temp	Flue gas temperature
9541	Postpurge time TL max	Postpurge time TL max
	Pmax	Maximum boiler output
	PBegr	Limited boiler output
	Pmin	Minimum boiler output

Limitation of output is triggered when:
Flue gas temperature ≥ flue gas temperature output limitation.

Output reduction (limiting the burner's output to low-fire) is triggered in the following case:
Flue gas temperature ≥ Flue gas temperature output reduction

Boiler shutdown is triggered when:
Flue gas temperature ≥ flue gas temperature switch-off limit.

Output reduction or shutdown is canceled when:
Flue gas temperature < *Flue gas temp output red* (2473) – *Switching diff on HCs* (2454)

If flue gas supervision takes effect, a status code or error code appears. Also, a forced signal is delivered. If the boiler shuts down, fan overrun is started (Postpurge time TL max (9541)). To ensure that there is no immediate response when the flue gas temperature thresholds are exceeded for short periods of time, the acquired flue gas

6.11.21 Static pressure supervision

Static press superv sh'down

Line no.	*Operating line*
2480	**Static press superv sh'down** Start prevention Lockout position

Basics of static supervision

Function:
Water pressure supervision overrides boiler control.

When the water pressure exceeds or drops below certain thresholds, the LMS14... responds as follows:

- Shutdown (water pressure Hx maximum),
- Reduction of output (water pressure Hx minimum), or
- Shutdown of boiler and pump (water pressure Hx critical min)

Note!
With manual control, the pump cannot be deactivated, due to fixed control of the actuators.
For this reason, manual control is ended in this case.

If the water pressure is too high or too low, either start prevention or lockout is triggered, depending on the parameter settings (*Static press superv sh'down*).

When the water pressure returns to its normal range, the boiler is released again with no delay.

The following graph shows the various phases of water pressure supervision:

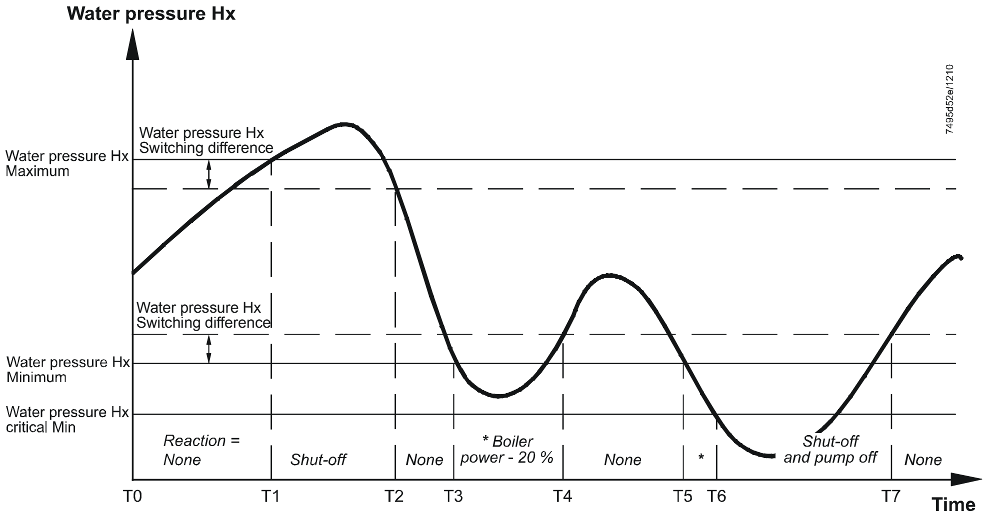


Figure 45: Static water pressure supervision with LMS14…

- Boiler shutdown is triggered when:
  Water pressure Hx ≥ maximum water pressure
- Limitation of output is triggered when:
  Water pressure Hx ≤ minimum water pressure
- Boiler and pump shutdown are triggered when:
  Water pressure Hx ≤ critical minimum water pressure
- Limitation is canceled when:
  Water pressure Hx < maximum water pressure – water pressure switching differential
  Water pressure Hx > minimum water pressure + water pressure switching differential
- Boiler shutdown is canceled when:
  Water pressure Hx < maximum water pressure – water pressure switching differential
  Water pressure Hx > critical minimum water pressure + water pressure switching differential

When water pressure supervision becomes active, a maintenance message or lockout code appears.

- The maintenance message is triggered when:
  Water pressure Hx ≤ minimum water pressure
- The fault status message is triggered when:
  Water pressure Hx ≤ critical minimum water pressure
- The maintenance message or lockout code is canceled when:
  Water pressure Hx < maximum water pressure – water pressure switching differential
  Water pressure Hx > minimum water pressure + water pressure switching differential

In the case of *Static press superv sh'down* = *Lockout*, the lockout code is canceled only when making a reset.

Additional parameters

Line no.	*Operating line*
[4197.1]	**Outp red press switch**
6140	**Water pressure max**
6141	**Water pressure min**
6142	**Water pressure critical min**
6143	**Water pressure SD**
6150	**Water pressure 2 max**
6151	**Water pressure 2 min**
6152	**Water press 2 critical min**
6153	**Water pressure 2 SD**
6180	**Water pressure 3 max**
6181	**Water pressure 3 min**
6182	**Water press 3 critical min**
6183	**Water pressure 3 SD**

Note!
The parameters used for the water pressure limits are OSV- (out of service) compatible. OSV functionality allows certain pressure tests of the static pressure switch to be deactivated.
If all types of pressure supervision are deactivated via the *OSV* function, only the respective water pressure is displayed.

Caution!
If all types of static pressure supervision are deactivated via the *OSV* function, dynamic pressure supervision remains activated. In that case, a plausibility check of the sensor is not made, which means that sensor faults can no longer be detected since the test is performed by acquiring the static pressure values.

Info/diagnostics

Line no.	*Operating line*
9005	**Water pressure H1**
9006	**Water pressure H2**
9007	**Water pressure H3**

6.11.22 Dynamic pressure supervision

Dyn press superv sh'down

Line no.	*Operating line*
2490	**Dyn press superv sh'down** Start prevention Lockout position

Dyn superv press diff min

Line no.	*Operating line*
2491	**Dyn superv press diff min**

Dyn superv press diff max

Line no.	*Operating line*
2492	**Dyn superv press diff max**

Note!

- The parameters used for the dynamic water pressure limits are not OSV- (out of service) compatible. Nevertheless, the individual supervisory functions can be deactivated by setting parameter *Dyn superv press diff min* (2491) to *0 bar*, or parameter *Dyn superv press diff max* (2492) to *5 bar*. If all types of pressure supervision are deactivated, only the respective water pressure is displayed
- If only dynamic water pressure supervision is required, static pressure supervision can be deactivated by setting the parameters for the static water pressure limits to *OSV* (out of service). In that case, a plausibility check of the sensor is not made, which means that sensor faults can no longer be detected since the test is performed by acquiring the static pressure values

Dyn superv press increase

Line no.	*Operating line*
2494	**Dyn superv press increase** No Yes

Dyn press superv time

Line no.	*Operating line*
2495	**Dyn press superv time**

Dyn press superv time const

Line no.	*Operating line*
2496	**Dyn press superv time const**

Basics of dynamic supervision

When a heating circuit pump is activated, the pressure downstream from the pump rises and the pressure upstream drops. These pressure changes depend on the pump head and the volumetric flow.

Function:

The pressure sensor acquires the water pressure before and after the pump is activated. To ensure the pump functions correctly, the pressure differential must exceed a certain minimum threshold *Dyn superv press diff min* (2491).
At the same time, the pressure differential must not exceed the maximum threshold *Dyn superv press diff max* (2492), possibly an indication of too little water circulation or no circulation at all.
If these criteria are not satisfied, startup is prevented for the period of time *Dyn PressSup Pause* [4200.1] and a status code is delivered. If this start prevention occurs successively the number of times parameterized under *Dyn PressSupRepet* [4199.1], the unit initiates lockout if activated via parameter *Dyn press superv sh'down* (2490).

If, during start prevention, the pump continues to run, it will be locked in the last seconds (Tdelay + 2 s) of start prevention in order to be able to acquire the pressure change as the pump is reactivated upon a new boiler release.

Note!
With manual control, the pump cannot be deactivated, due to fixed control of the actuators.
This means that the dynamic pressure test cannot be repeated.
For this reason, manual control is ended in this case, enabling the tests to be repeated.

The pressure thresholds can be parameterized in the range from 0…5 bar with a resolution of 0.02 bar. Pressure threshold checking is deactivated by selecting *0 bar* as the minimum value and *5 bar* as the maximum value.
Parameter *Dyn superv press increase* (2494) is used to define whether a pressure increase or decrease is expected when the pump is activated.

Note!
If a plant diagram without boiler pump (Q1) was configured, this function must be deactivated.
The differential pressure is checked on completion of *Tdelay* after the pump has been activated.

Then, as the pump runs, the differential pressure is not checked anymore.
If a configuration with water pressure sensor was selected and supervision of water circulation is released *Dyn superv press diff min* (2491)/*Dyn superv press diff max* (2492), the LMS14… must read in a valid value for the water pressure. Otherwise, either startup is prevented and a status code is delivered, or the unit goes to lockout *Dyn press superv sh'down* (2490).

Tdelay is calculated as follows:

Tdelay = 5 * *Dyn press superv tme const* (2496) + *Dyn press superv pump delay* [4198.1]

This means that the pressure signal after *Pump on* is acquired with a certain delay when *Tdelay* has elapsed.
The pressure signal is acquired for a period of time called *Dyn press superv time* (2495).

1. Checking the minimum pressure change:
During this period of time, the measured values of the differential pressure ΔP are summed up at 200-ms intervals. At the end of the measuring time *Dyn press superv time* (2495), the measured values summed up are compared with limit value *Dyn superv press diff min* (2491), which means that the parameterization of *Dyn superv diff press min* (2491) must be matched to the parameterization of *Dyn press superv time* (2495). This approach enables the measured pressure increase to be amplified and filtered.

2. Checking the maximum permissible pressure change:
During the measuring time *Dyn press superv time* (2495), the current measured value of the differential pressure ΔP is compared with limit value *Dyn superv diff press max* (2492) at 200-ms intervals and, if necessary, the LMS14… responds to the fault.

Caution!
If *Dyn press superv time* (2495) and *Dyn superv diff press min* (2491) are not correctly parameterized, electromagnetic interference might adversely affect the acquired pressure, erroneously indicating a correctly working pump.

Note!
The acquired differential pressure values are always absolute values.

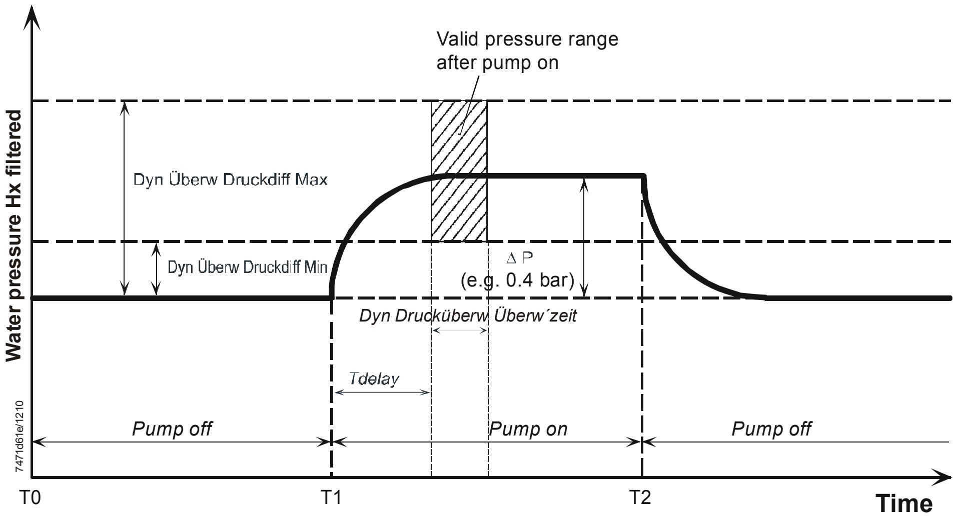


Figure 46: Dynamic water pressure supervision with LMS14...

Key

Line no.	*Meaning*
8327	Water pressure

Automatic deactivation of dynamic pressure supervision at low static water pressures:
If the static water pressure falls below a certain level, this may have an impact on the measurement of dynamic pressures (depending on the location of the pressure sensor, the pump, and the pressure expansion vessel in relation to the hydraulic resistances in the system). In that case, it is possible to select automatic deactivation of dynamic pressure supervision via parameters *Dyn PressSup WarnOffs* [4201.1]*, Dyn PressSup AutoAct* [4202.1]*,* and *Dyn PressSupAutoActive upper limit*.
Automatic deactivation can be switched on/off via parameter *Dyn PressSup AutoAct*.
If the function is activated, dynamic pressure supervision is automatically deactivated if the static pressure drops below the limit value:

Water pressure Hx < *Water pressure min* + *Dyn PressSup WarnOffs* [4201.1]*.*

Dynamic pressure supervision is automatically reactivated when:

Water pressure Hx > *Water pressure min* + *Dyn PressSup WarnOffs* [4201.1]

Info/diagnostics

Line no.	*Operating line*
8327	**Water pressure**
[4379.1]	**Integr dyn WaterPress**

Additional parameters

Line no.	*Operating line*
[4195.1]	**Dyn press supervision**
[4198.1]	**Dyn PressSupPumpDelay**
[4199.1]	**Dyn PressSupRepet**
[4200.1]	**Dyn PressSup Pause**
[4201.1]	**Dyn PressSup WarnOffs**
[4202.1]	**Dyn PressSup AutoAct**

Note!
The water pressure is displayed with a resolution of 1 mbar (without physical unit), even if the sensor does not physically offer this resolution.
The resolution in mbar that can actually be measured depends on the sensor's output voltage range in relation to the acquired pressure range and must be clarified on a case-to-case basis.
Due to strong filtering of the measuring signal, intermediate values of the quantization stages may dynamically occur. For this reason, always wait until the settling state is reached (*Tdelay*).

6.11.23 Water pressure sensor

The pressure sensor for static or dynamic pressure supervision must be configured at one of the inputs H.
Due to the special requirements placed on the read in and filter algorithms, the pressure sensor for dynamic pressure measurements must always be configured at one of the local terminals of the LMS14… (H1/H3). Otherwise, the pressure sensor is to be configured the same way as it is for static pressure measurements.

Plausibility check of the sensor:

If a configuration with water pressure sensor was selected, the LMS14… must read in a valid value for the water pressure.
The kind of response to the fault depends on the check of the static water pressure.

⚠ **Caution!**
If all types of static pressure supervision are deactivated via the *OSV* function, dynamic pressure supervision remains activated. In that case, a plausibility check of the sensor will not be made, which means that sensor faults can no longer be detected since the test is performed by acquiring the static pressure values.

The water pressure sensor makes possible the following functions:

- Display of water pressure
- Triggering start prevention in case of under- or overpressure
- Water filling
- Water circulation

Additional parameters

Line no.	*Operating line*
5950	**Function input H1**
5953	**Voltage value 1 H1**
5954	**Function value 1 H1**
5955	**Voltage value 2 H1**
5956	**Function value 2 H1**
5960	**Function input H3**
5963	**Voltage value 1 H3**
5964	**Function value 1 H3**
5965	**Voltage value 2 H3**
5966	**Function value 2 H3**
6046	**Function input H2 module 1**
6049	**Voltage value 1 H2 module 1**
6050	**Funct value 1 H2 module 1**
6051	**Voltage value 2 H2 module 1**
6052	**Funct value 2 H2 module 1**
6054	**Function input H2 module 2**
6057	**Voltage value 1 H2 module 2**
6058	**Funct value 1 H2 module 2**
6059	**Voltage value 2 H2 module 2**
6060	**Funct value 2 H2 module 2**
6062	**Function input H2 module 3**
6065	**Voltage value 1 H2 module 3**
6066	**Funct value 1 H2 module 3**
6067	**Voltage value 2 H2 module 3**
6068	**Funct value 2 H2 module 3**

The linear characteristic is defined by 2 fixed points. The setting is made with the help of 2 pairs of parameters for the function value and the voltage value (F1/U1 and F2/U2).

The function value to be set is calculated as follows:

Function value = pressure value [bar]/0.1 bar

Example of pressure measurement at DC 10 V:

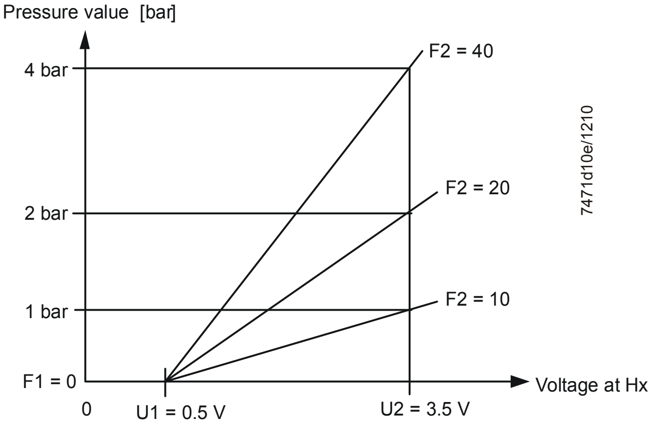


Figure 47: Water pressure sensor

Key

F1	Function value 1
F2	Function value 2
U1	Voltage value 1
U2	Voltage value 2

6.11.24 Filling/flow supervision

Pressure switch shutdown

Line no.	*Operating line*
2500	**Pressure switch shutdown** Start prevention Lockout position

This function checks the static water pressure with the help of the pressure switch. The response in the event of insufficient static water pressure (contact open) can be parameterized. Depending on parameter *Pressure switch shutdown* (2500), a change to start prevention or lockout is made, including the respective diagnostics.

Warning!
Start prevention/lockout via this input is not implemented as a safety-related function.

A water pressure switch whose contacts are closed releases immediately burner control startup and control of the pumps. If the contacts of the pressure switch are open, start prevention or lockout is triggered only when the set *Min on time switch* (2504) has elapsed.

Caution!
If the value parameterized for *Min on time switch* (2504) is too small, error detection may be wrong. The OEM is responsible for making certain that the values set for the respective plant are correct.

To prevent the pump from running dry, pump control is disabled also.
When the water pressure rises again so that the contacts of the pressure switch close, start prevention – if previously triggered – is automatically canceled and pump control is released again.

Note!
With manual control, the pump cannot be deactivated, due to fixed control of the actuators.
For this reason, manual control is ended in this case.

Flow switch shutdown

Line no.	*Operating line*
2502	**Flow switch shutdown** Start prevention Lockout position

Using the boiler flow switch, this function checks if there is flow – and also sufficient flow – through the primary heat exchanger.

Note!
For this reason, the contact may be evaluated only if, in the case of a heat request, there is flow through the primary heat exchanger; as a result, the boiler flow switch is not actively checked with the *BwDl2* instantaneous water heater system and the *DHW* function.

The response in the case of insufficient flow (contact open) can be parameterized. Depending on parameter *Flow switch shutdown* (2502), a change to start prevention or lockout is made, including the respective diagnostics.

Warning!
Start prevention/lockout via this input is not implemented as a safety-related function.

Min on time switch

Line no.	*Operating line*
2504	**Min on time switch**

The test of the boiler flow switch is always made when a startup request (request for heat) is sent to the burner. When the contacts of the flow switch are closed, the burner can immediately be started up. When the contacts are open, the LMS14… locks startup after an adjustable waiting time (parameter *Min on time switch*). When the contacts make on completion of this period of time, start prevention – if previously triggered – is canceled again and the diagnostics are ended. If no request for heat is pending (during pump overrun or a *Pump kick* function), the boiler flow switch is not evaluated.

Caution!
The parameterization of small values for *Min on time switch* can lead to erroneous error identifications. The OEM is responsible for making certain that the values set for the respective application are correct.

6.11.25 Quick shutdown of burner

To prevent boiler overtemperatures under certain operating conditions, quick shutdown with boiler temperature supervision is introduced. Resetting the DHW flow switch at the instantaneous water heater and – with activated room thermostat supervision – resetting the last active room thermostat of a heating circuit, starts the monitoring time for quick shutdown. As soon as the DHW flow switch at the instantaneous water heater makes, the monitoring time is ended. If, during the monitoring time, the boiler temperature rises by more than the set temperature gradient within 400 ms, the burner is switched off for the remaining monitoring time. The monitoring time is adjustable, the function can be deactivated.

Quick shutdown temp grad

Line no.	*Operating line*
2510	**Quick shutdown temp grad**

Here, you can set the maximum permissible boiler temperature rise within 400 ms. The parameter can be used to deactivate the function.

Quick shutdown superv time

Line no.	*Operating line*
2511	**Quick shutdown superv time**

Here, you can set the supervision time.

Quick shutdown superv RT

Line no.	*Operating line*
2512	**Quick shutdown superv RT** Off On

This parameter can be used to activate monitoring of the heating circuit's room thermostat.

Off
Only the DHW flow switch is monitored.

On
In addition to the DHW flow switch, the room thermostats of the heating circuits are monitored.

Note!
When quick shutdown is activated and monitoring of the room thermostat is active, the local boiler of a cascaded system can be switched off, independent of whether other cascaded consumers demand heat and whether other boilers are in operation. Quick shutdown is dependent on the progression of the local boiler temperature during the monitoring time.

Prerequisites for quick shutdown:
- Quick shutdown on the local boiler is active
- The contacts of the last local room thermostat are open

6.11.26 Limitation of output

If the burner's output is controlled based on the boiler flow temperature, the PID controller can reduce the burner's output before the flow temperature reaches the switch-off point.
If the burner's output is not controlled based on the boiler flow temperature, but on the temperature acquired by some other control sensor, the PID controller does not respond directly to a flow temperature rise.

With stratification storage tanks and instantaneous water heaters e.g., it is not sensor B2, but some other sensor that is used for control of the boiler's output in certain cases.

In such cases, it is still necessary to monitor the boiler temperature and to limit the boiler's output, or to shut the boiler down, if required. This situation can especially occur when a heat exchanger integrated in the system is not able to transfer the heat.

To ensure that, in these cases, the PID controller does not push the boiler flow temperature to a level where the limit thermostat responds, the *Output limitation* function can be activated.
Output limitation reduces the burner's output when the boiler flow temperature reaches a level lying the parameterized switching differential below the threshold value for output limitation. As the boiler flow temperature continues to rise, the burner's output is constantly reduced until, eventually, it is limited to the minimum when the parameterized threshold for output limitation is reached. Should the boiler flow temperature rise above this threshold, the burner is shut down. The burner is switched on again only after the boiler flow temperature has dropped by at least the switching differential below the threshold for output limitation.

For practical reasons, the output limitation temperature (*Boiler temp output reduction* (2527)) should be set to a level below the switch-off threshold of the limit thermostat (*Cutout temp LT* (2531)). If set to a higher level, the *Reduction* function might not be able to become active since the limit thermostat initiates shutdown before.

Boiler temp output reduction

Line no.	*Operating line*
2527	**Boiler temp output reduction**

This parameter is used to set the threshold for limiting the output. The closer the boiler flow temperature gets to this value, the more the burner's output is limited. Should the boiler flow temperature rise above this level, the burner is shut down. The burner is switched on again only after the boiler flow temperature has dropped by the switching differential (*Swi diff output reduction* (2528)) below this value.

Swi diff output reduction

Line no.	*Operating line*
2528	**Swi diff output reduction**

Here, the switching differential for limiting the output is set. The switching differential defines the working range of output limitation from 100% (no limitation of output) to 0% (limitation to minimum output = low-fire).
Output limitation becomes active when the boiler flow temperature reaches a level lying this switching differential below the threshold for output limitation (*Boiler temp output reduction* (2527)). The more the boiler temperature rises, the more the output is limited. When the boiler flow temperature reaches the threshold for limiting the output (*Boiler temp output reduction* (2527)), the output is limited to the minimum.

Note!
Output limitation works with absolute values. This means that with a limitation set to *50%* absolute output, for instance, the resulting relative burner output differs from 50%.

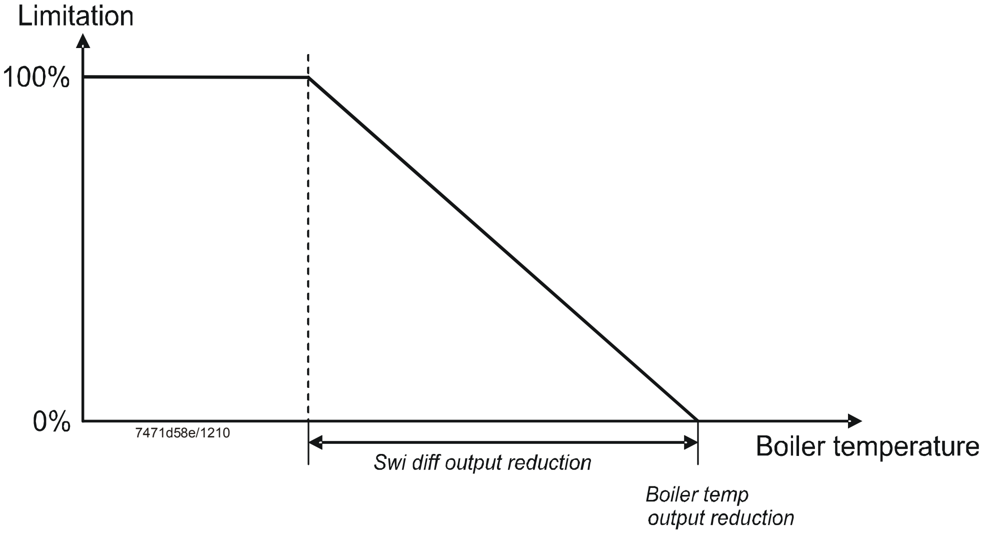


Figure 48: Limitation of output – switching differential output reduction

6.11.27 Electronic limit thermostat

Cutout temp LT

Line no.	*Operating line*
2531	**Cutout temp LT**

The electronic limit thermostat monitors the current boiler temperature and switches the burner off when the set limit temperature (*Cutout temperature LT*) is reached, or when the boiler temperature can be no longer acquired (short-circuit or interruption of sensor).

Note!
If an electronic safety limit thermostat (SLT) is used, *Cutout temperature LT* should always be set to a level below *TempBoilMaxSLTSec* [3639.1], thus preventing the electronic safety limit thermostat from responding before the limit thermostat cuts out.

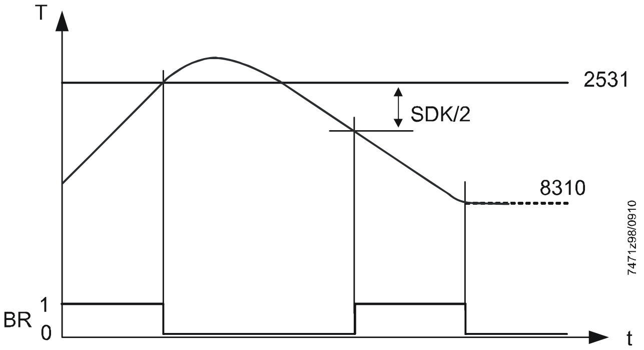


Figure 49: Electronic limit thermostat – cutout temperature

Key

Line no.	*Operating line*	
8310	TKx	Current boiler temperature
2531		Cutout temperature limit thermostat
	T	Temperature
	SDK	Switching differential boiler
	BR	Burner operation (0 = Off, 1 = On)

Additional parameters

Line no.	*Operating line*
[3639.1]	**TempBoilMaxSLTSec**

6.11.28 Electronic safety limit thermostat (SLT)

Warning!
If the safety limit thermostat (SLT) has the bridge resistor fitted (with LMS14…: R13SC), an external limit thermostat (LT) must not be connected since its cutting out in the case of overtemperature would not lead to shutdown so there would be a risk of excessive boiler temperatures.
Units using a safety limit thermostat (SLT) with bridge resistor fitted require a flow and a return sensor (mandatory) and a suitable parameter set to provide a reliable *Switch-off* function (safety limit thermostat (SLT)).
If not observed, there is a risk of excessive boiler temperatures.

Basics of electronic safety limit thermostat (SLT)

The electronic (S)LT of the LMS14... consists of function blocks which provide the following functions:

- Shutdown in the event of overtemperatures
- Performance of a number of plausibility checks, enabling the system to intervene in the process in due time to avoid overtemperatures
- Checks aimed at detecting faulty states and triggering appropriate actions

Warning!
The 2 sensors used in connection with the (S)LT (flow and return sensor) are safety-related!
These 2 sensors are to be located and fitted such that constant and reliable heat transfer is ensured (during the whole time of usage and after replacement).

- Sensor B2 **must** be fitted in a location where it acquires the effective maximum boiler temperature!
- The return sensor **must** be fitted in a location where it acquires the effective boiler return temperature!

When fitting the flow and the return sensors, note the following:

- Clamping bands are **not** permitted!
- When using a holding spring for fixing, additional strain relief must be provided!
- Screwed immersion sensors can be fitted with no need for taking any additional measures

Note!
Adequate measures may be required for checking the heat transfer inside the boiler.

Parameterization must be matched to the type of boiler(s) and the type of plant!

- The relevant regulations for boiler and plant must be observed!
- We recommend to use an **external** safety limit thermostat in the following cases:
  - Boiler capacity >120 kW
  - Applications with pressure class 3

Error handling

The following table lists the types of errors that can occur. Also shown are the relevant error reactions, that is, whether startup will be prevented or lockout triggered.

List of errors and error reactions

Type of error	**Function**	**Operating state**			**Error reactions**			
						Lockout		
		Faulty	Unfavorable	Diagnostics/ error display	Start prevention	Immediately	After (min)	After number of errors (in 24 hours)
Short-circuit flow sensor		●		●	●		10	
Interruption flow sensor		●		●	●		10	
Acquired flow temperature not plausible	Actual value of boiler temperature <0 °C	●		●	●		10	
Acquired flow temperature not plausible	Actual value of boiler temperature >124 °C	●		●	●		10	
Short-circuit return sensor		●		●	●		10	
Interruption return sensor		●		●	●		10	
Acquired return temperature not plausible	Boiler return temperature <0 °C	●		●	●		10	
Max. return temperature exceeded	Boiler return temperature > TempReturnMaxSLTSec 3925.1]	●		●	●		10	
Max. return temperature exceeded [1]	Boiler return temperature > TempReturnMaxSLTSec [3925.1]	●		●		●		
(S)LT cutout temperature exceeded	Actual value of boiler temperature > TempBoilMaxSLTSec 3639.1] Burner has shut down		●	Residual heat	Already activated by limit thermostat			Parameter: Number of errors SLT cutout temp in 24 h
Max. temperature gradient exceeded	ΔTkIst > maximum rate of temperature increase flow Shut burner down		●	Small heat draw	●			Parameter: Number of errors temp gradient in 24 h
ΔT too great	Δϑ > maximum delta between flow and return Output reduced by 20%		●					
	Δϑ > maximum delta between flow and return + 8 K Output reduced to minimum		●					
	Δϑ > maximum delta between flow and return + 16 K Burner Off	●		●	●			Parameter: Number of errors delta-T within 24 h
Return temperature higher than flow	Boiler return temperature > actual value of boiler temperature + Switching differential return higher than flow	(●)	●	●	●			Parameter: Number of errors return higher than flow in 24 h

[1] Function must be separately activated by Siemens

Key

Line no.	*Meaning*	
	Δϑ	*Actual value of boiler temperature* minus *boiler return temperature*
	ΔTKIst	Gradient of current boiler temperature

D’t care trans TGrad

Line no.	*Operating line*
[3911.1]	**D’t care trans TGrad**

Duration of don’t care transition for checking the temperature gradient of the boiler flow.

D’t care tr Ret ab Fl

Line no.	*Operating line*
[3912.1]	**D’t care tr Ret ab Fl**

Duration of don’t care transition for making the comparison return above flow.

Max rate FT increase

Line no.	*Operating line*
[4091.1]	**Max rate FT increase**

Maximum rate of boiler flow temperature increase.

NumErr TmpGrad in 24h

Line no.	*Operating line*
[3913.1]	**NumErr TmpGrad in 24h**

Counter limit for triggering lockout in the event of an error in connection with the gradient.

NumErr SLT in 24h

Line no.	*Operating line*
[3914.1]	**NumErr SLT in 24h**

Counter limit for triggering lockout in the event of an error in connection with residual heat.

Max delta flow-return

Line no.	*Operating line*
[3916.1]	**Max delta flow-return**

Maximum delta between boiler flow and boiler return temperature at which temperature limitation does not yet intervene.

NumErr d-T in 24h

Line no.	*Operating line*
[3921.1]	**NumErr d-T in 24h**

Counter limit for triggering lockout in the event of a delta T error.

SwiDiff ret ab flow

Line no.	*Operating line*
[3923.1]	**SwiDiff Ret ab Flow**

Switch-off threshold for the difference of return temperature minus flow temperature (temperature limitation).

NumErr ret ab fl 24h

Line no.	*Operating line*
[3924.1]	**NumErr Ret ab Fl 24h**

Counter limit for triggering lockout in the event of error resulting from return temperature above flow temperature.

TempBoilMaxSLTSec

Line no.	*Operating line*
[3639.1]	**TempBoilMaxSLTSec**

Triggering value for temperature limitation through boiler flow.

TempReturnMaxSLTSec

Line no.	*Operating line*
[3925.1]	**TempReturnMaxSLTSec**

Triggering value for temperature limitation via boiler return.

SLT supervisory functions (return temperature > flow temperature) and temperature gradient

In certain situations, supervision of the temperature gradient and checking the plausibility of flow and return temperature (return temperature > flow temperature) can be deactivated for a certain period of time.

Assuming that – at first – no request for heat is active, the *Don’t care transition* is started when there is a request for DHW or space heating to be active for the parameterized period of time. During the time the *Don’t care transition* is active, the SLT supervisory functions (plausibility flow/return and temperature gradient of flow) are disabled. At the end of the *Don’t care transition*, the supervisory functions are enabled for at least 3 times the *Don’t care transition* time. During this period of time, any request for heat from the controller (DHW or space heating) can trigger the supervisory functions and lead to safety shutdown or even lockout of the LMS14...

The *Don’t care transition* can be reactivated only when the sum of the elapsed time represents 4 times the *Don’t care transition* time.

The supervisory functions are active only when the burner is in operation.

The *Don’t care transition* is used both for checking the plausibility of flow and return temperature and for monitoring the temperature gradient. With the latter, the *Don’t care transition* can be separately deactivated and its time of action is separately adjustable.

Error handling routines

If an error occurs and the limit thermostat cuts out because the set temperature is exceeded, the fan or the boiler pump (Q1) (if not already running) must be activated to dissipate the heat.

Response at the respective temperature levels when the limit thermostat's cutout temperature is exceeded:

- **Pump and fan overrun**

For all the aforementioned errors, following applies:
If the *Cutout temp LT* (2531) is exceeded, the boiler pump (Q1) is activated to dissipate the heat and – optionally – heating circuits are forced to draw heat.
If the *TempBoilMaxSLTSec* [3639.1] is exceeded, the fan is activated also.
Both will stay activated until the respective trigger criterion no longer exists, at maximum for the *Postpurge time TL max* (9541).

Additional parameters

Line no.	*Operating line*
[3911.1]	**D't care trans TGrad**
[3912.1]	**D't care tr Ret ab Fl**
[4091.1]	**Max rate FT increase**
[3913.1]	**NumErr TmpGrad in 24h**
[3914.1]	**NumErr SLT in 24h**
[3916.1]	**Max delta flow-return**
[3921.1]	**NumErr d-T in 24h**
[3923.1]	**SwiDiff Ret ab Flow**
[3924.1]	**NumErr Ret ab Fl 24h**
[3639.1]	**TempBoilMaxSLTSec**
[3925.1]	**TempReturnMaxSLTSec**
9541	**Postpurge time TL max**

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8314	**Boiler return temp**

6.11.29 Deaeration function

Using the automatic deaerator installed in the boiler, the function removes air from the space heating and DHW system. For that purpose, the pumps in the system are activated and deactivated according to a certain sequence.
The *Deaeration* function is performed in up to 4 preselectable phases. The phases are termed heating circuit deaeration, DHW circuit deaeration, cycled pump control, and static pump control for the entire phase. During these phases, a 3-port valve is driven to a certain position.
When the preselected phases of the *Deaeration* function have elapsed, the function is automatically ended. The *Deaeration* function can also be manually aborted (for more detailed information, refer to chapter *Central functions)*.
To ensure protection from scalding, the *Deaeration* function in the DLH diagrams is aborted without delivering any message, if the boiler temperature at sensor B2 exceeds the maximum *Nominal* setpoint of the DHW temperature (OEM).
When this function is started, the burner control changes to *Standby*, which means that it is Off during the whole time the *Deaeration* function is performed.

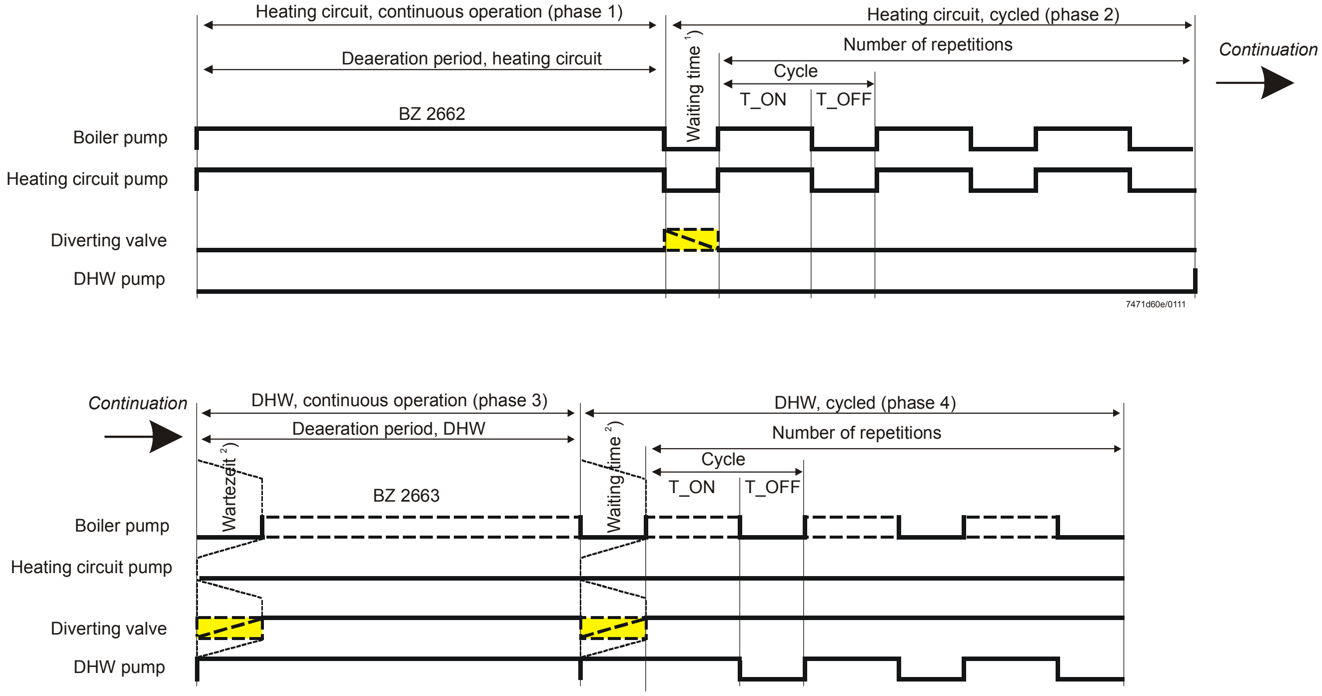


Figure 50: Deaeration phases

Legend

1) Time required for opening the heating circuit mixing valve/3-port valve
2) Time required for opening the 3-port valve after DHW
(when parameterized *Diverting valve present*)

Line no.	*Meaning*	
2655	T-ON	On time of the boiler/heating circuit pumps
2656	T-OFF	Off time of the boiler/heating circuit pumps
2657		Number of repetitions
2662	Deaeration time heat circuit	Duration of deaeration with continuous control of the boiler/heating circuit pumps
2663	Deaeration time DHW	Duration of deaeration with continuous control of the boiler/DHW pumps

Auto deaeration procedure

Line no.	*Operating line*
2630	**Auto deaeration procedure** Off On

The procedure must be enabled via this parameter (On), allowing it to be started. Deaeration takes place automatically, e.g. after an error in connection with deaeration.

The function can also be triggered manually (for more detailed information, refer to chapter *Central functions)*.

Off
Function is deactivated.

On
Function is activated.

ON time deaeration

Line no.	*Operating line*
2655	**ON time deaeration**

T_ON: On time of the boiler/heating circuit pumps in phases 2 and 4 of the deaeration procedure.

OFF time deaeration

Line no.	*Operating line*
2656	**OFF time deaeration**

T_OFF: Off time of the boiler/heating circuit pumps in phases 2 and 4 of the deaeration procedure.

Number of repetitions

Line no.	*Operating line*
2657	**Number of repetitions**

Number of repetitions of pump switching cycles (T_On, T_Off) in phases 2 and 4 of the deaeration procedure.

Deaeration time heat circuit

Line no.	*Operating line*
2662	**Deaeration time heat circuit**

Duration of deaeration with continuous control of the boiler/heating circuit pumps in phase 1 of the deaeration procedure.

Deaeration time DHW

Line no.	*Operating line*
2663	**Deaeration time DHW**

Duration of deaeration with continuous control of the boiler/DHW pumps in phase 3 of the deaeration procedure.

Additional parameters

Line no.	*Operating line*
7146	**Deaeration function**
7147	**Type of venting**

Info/diagnostics

Line no.	*Operating line*
7147	**Type of venting**

When the *Deaeration function* (7146) is activated, the *Type of venting* shows the current phase of deaeration. When ended, deaeration shows *None*.

6.11.30 Input configuration dynamic pressure supervision

Dyn press supervision

Line no.	*Operating line*
[4195.1]	**Dyn press supervision** None Via input H1 Via input H3

To acquire the water pressure, different inputs can be configured (also simultaneously), allowing the water pressure to be monitored in parallel by static pressure supervision. For dynamic pressure supervision, only connections configured locally on the LMS14 can be used, due to the dynamic requirements (resolution/timing). For this reason, *Dyn press supervision* can be used to select the connection whose signal serves for dynamic pressure supervision. Also refer to chapter *6.12.23 Water pressure sensor*.

None
No dynamic pressure supervision.

Via input H1
Dynamic pressure supervision via input H1.

Via input H3
Dynamic pressure supervision via input H3.

6.11.31 Input configuration flow supervision

A number of controller functions can access the measured flow value. For that purpose, flow supervision must be activated. Activation is effected via *Flow supervision* [4196.1]. The way the value is then used with the individual controller functions is described with the respective functions.

Flow supervision

Line no.	*Operating line*
[4196.1]	**Flow supervision** None Via input H4

The input to be used for flow supervision can be selected here.

None
No flow supervision.

Via input H4
Flow supervision via input H4.

6.11.32 Additional settings for static pressure supervision

Outp red press switch

Line no.	*Operating line*
[4197.1]	**Outp red press switch** Off On

When this function is activated and the pressure drops below the water pressure threshold Hx minimum, the LMS14 responds by reducing the output by 20% in relation to the current output. Also refer to chapter 6.12.21 *Static pressure supervision*.

Off
Function is deactivated.

On
Function is activated.

6.11.33 Additional settings for dynamic pressure supervision

Dyn PressSupPumpDelay

Line no.	*Operating line*
[4198.1]	**Dyn PressSupPumpDelay** 0…10 s; resolution 0.2 s

For function of this parameter, refer to section *Basics of dynamic supervision*.

Dyn PressSupRepet

Line no.	*Operating line*
[4199.1]	**Dyn PressSupRepet** 0…10; resolution 1

For function of this parameter, refer to section *Basics of dynamic supervision*.

Dyn PressSupPause

Line no.	*Operating line*
[4200.1]	**Dyn PressSup Pause** 0…1200; resolution 0.2 s

For function of this parameter, refer to section *Basics of dynamic supervision*.

Dyn PressSup WarnOffs

Line no.	*Operating line*
[4201.1]	**Dyn PressSup WarnOffs** 0…1 bar; resolution 0.1 bar

For function of this parameter, refer to section *Basics of dynamic supervision*.

Dyn PressSup AutoAct

Line no.	*Operating line*
[4202.1]	**Dyn PressSup AutoAct** Off On

For function of this parameter, refer to section *Basics of dynamic supervision*.

Off
Function is deactivated.

On
Function is activated.

6.12 Special boiler functions

6.12.1 Change of operating mode

When there is a change between space heating and DHW heating, the controller responds as follows:

- DHW heating is ended and, at the same time, there is a request from space heating:
  The controller switches the burner off. DHW overrun is performed while the position of the DHW controlling element is maintained
- The request from space heating is overridden by a DHW request:
  The controller adopts the new DHW setpoint and makes use of the DHW thresholds. The DHW controlling element switches over to DHW heating. The controller switches off the burner only if the DHW switch-off threshold is or will be exceeded when changing from heating circuit to DHW operation mode. In general, however, the DHW setpoint lies above the setpoint for the heating circuit so that shutdown will not take place

6.12.2 Loading the setpoint/actual value

Depending on the operating mode, the respective setpoints/actual values are loaded to the LMS14....

	Heating mode	DHW storage tank charging	Instantaneous water heating
Setpoint	Boiler temperature setpoint	Boiler temperature setpoint/DHW charging setpoint	TwwSoll
Actual value	Actual value of boiler temperature	Actual value of boiler temperature/ DHW charging temperature	TwwIst1/TRueck/ actual value of boiler temperature

Key

Line no.	*Meaning*	
	TwwIst1	Sensor B38 at outlet of instantaneous water heater
	TwwSoll	Setpoint DHW outlet/keep hot setpoint
	TRueck	Boiler return temperature

In the case of instantaneous water heaters, the DHW setpoint is used. Depending on the configured type of instantaneous water heater, the respective actual value is loaded. With instantaneous water heaters, this is dependent on the type of hydraulic system, *Outlet* or *Comfort* mode and parameterization.

6.12.3 Automatic heat generation lock

This function can be activated by the buffer storage tank (sensor B4/B41). The boiler is locked by the automatic heat generation lock when all valid requests for heat can be satisfied by the buffer storage tank and when the respective heat consumers are hydraulically connected with the buffer storage tank.
Requests for heat from heat consumers not hydraulically connected with the buffer storage tank lead to a release of the boiler, even if the buffer storage tank holds sufficient amounts of heat.
Each consumer segment can have its own buffer storage tank. Hence, the automatic heat generation lock can be parameterized per segment (refer to chapter *Buffer storage tank*).
If the boiler is disabled by automatic heat generation lock while the burner is running, the burner is shut down, either immediately or only when the set minimum boiler temperature is reached, depending on the parameterization.

6.12.4 Manual heat generation lock

An active manual heat generation lock disables the boiler, independent of current requests for heat.
When there is an external request for heat, manual heat generation lock does not disable the boiler.
For that purpose, one of the input contacts Hx, which can be parameterized, can be used.

- Protective boiler startup in progress with a boiler switch-off point at the minimum boiler temperature is completed
- Maintained boiler return temperature acting on the consumers and shifting DHW priority is aborted
- Boiler pump is deactivated on completion of the overrun time
- Frost protection for the boiler continues to be active

When setting the parameters, the *Heat generation lock* function must be selected for the respective input Hx. The type of contact can be parameterized also (NC or NO).

With certain hydraulic configurations, it may be necessary to exclude the boiler pump from the *Locking* function when the heat generation lock is active. This applies particularly to configurations where a buffer storage tank is available as a heat source. In that case, parameter *Boiler pump on heat gen lock* (2301) must be set to *On*.

6.12.5 Generation of common flow temperature setpoint

The controller collects all valid heat requests from the consumers (heating circuits 1...3, DHW, instantaneous water heater, external requests 1...3) and classifies them according to their priorities. A maximum selection is made between requests for heat received from the heating circuits and external requests, which means that the highest temperature value called for becomes the common flow temperature setpoint. Requests for heat from DHW heating equipment are always given priority over other requests, thus enabling them to also let a temperature value lower than that demanded by the heating circuit and external consumers become the common flow temperature setpoint.

6.12.6 Generation of boiler temperature setpoint

The boiler temperature setpoint represents the basis for control of the burner and is primarily dependent on the common flow temperature setpoint. If no request for heat from the consumers is active, there is also no valid setpoint. For the switch-on threshold in *Standby* mode, the temperature of parameter *Setpoint frost protection* (2217) is used. Whenever the burner is put into operation because there is a request for heat from the consumers, or because of the *Frost protection* function, the boiler temperature setpoint is limited downward to at least the adjusted minimum boiler temperature. A number of other functions can also influence the boiler temperature setpoint, either permanently or temporarily (functions *Manual control*, *Chimney sweep*, or *Heat generation lock*).

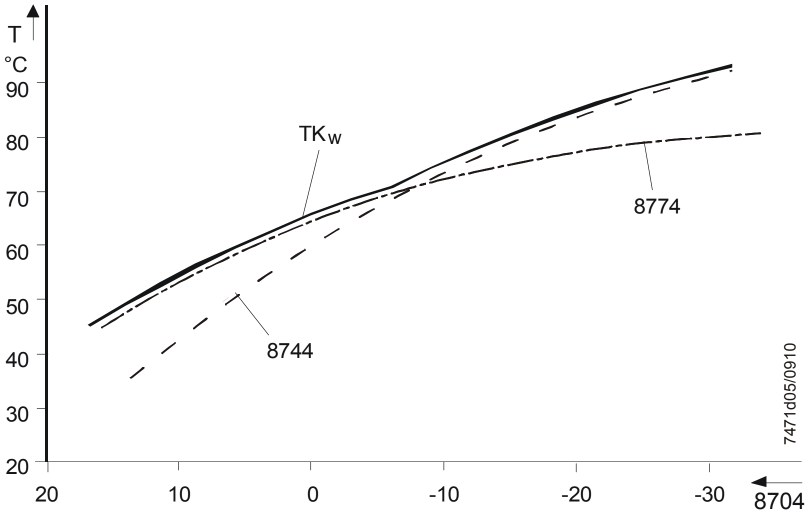


Figure 51: Generation of boiler temperature setpoint

Key

Line no.	Meaning	
8704	TAgem	Composite outside temperature
8744	TVw	Flow temperature setpoint of HC 1 (including setpoint increase, if any)
8774	TVw	Flow temperature setpoint of HC 2 (including setpoint increase, if any)
	TKw	Boiler temperature setpoint

6.12.7 Boiler control

Boiler control comprises all functions that translate a request (boiler temperature setpoint) to an output signal (control of burner as a percentage).

Such functions include:

- Frost protection for the boiler
- 2-position control
- Modulating control
- Limitation and output of manipulated variable
- Chimney sweep
- Controller stop
- Manual control

Modulating control

The boiler loop is in the form of a single temperature control loop.

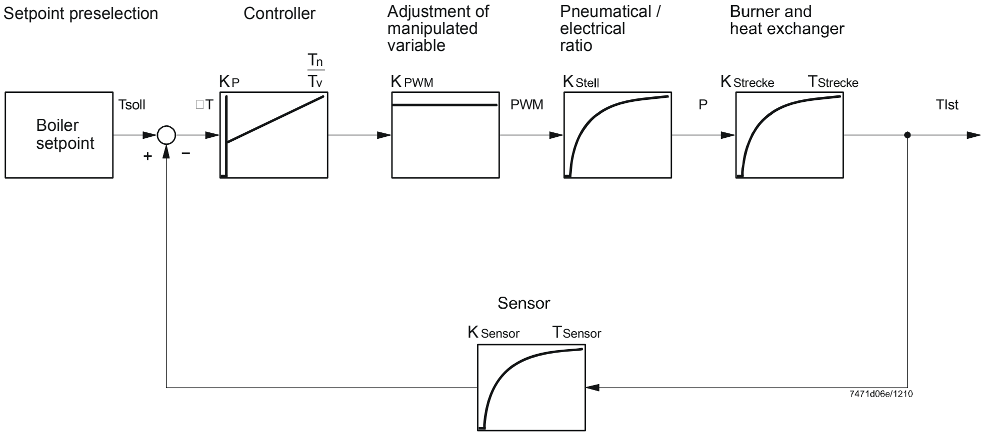


Figure 52: Boiler control – modulating control

Key

Line no.	Meaning	
	KFühler	Sensor characteristic
	KP	Controller gain 1/XP
	KPWM	Conversion factor for positioning signal
	KStell	Fan characteristic
	KStrecke	Gain of controlled system
	TStrecke	Temperature of controlled system
	P	Pressure
	PWM	Fan control
	TFühler	Temperature acquired by sensor
	TIst	Actual value of temperature
	Tn	Integral action time
	Tsoll	Temperature setpoint
	Tv	Derivative action time

In the boiler loop, the temperature is controlled to the preselected setpoint. The boiler is used to supply heat to the heating circuits, the DHW heating equipment and the storage tanks.

In *DHW* mode, a separate group of controller parameters are provided since a quick response is required should the tap be opened.

The PID control algorithm calculates the required manipulated variable based on the control deviation (ΔT = temperature setpoint minus actual value) and the selected control parameter settings. Using the control parameters, the respective controller part can be activated/hidden or matched to the controlled system. The heat output called for by the PID controller is limited to the permissible output range.

Due to the overriding 2-position controller, the aforementioned modulating control loop is released and adjusted to the respective preselected setpoint. The result obtained by the temperature controller is passed to the burner control as the preselected output in percent.

In all situations, the limit thermostat overrides the temperature control loop. The limit thermostat shuts down the boiler should its cutout temperature (*Cutout temp LT* (2531)) be reached.

6.12.8 Heat output limits

The burner control ascertains the fan speed at which the burner maintains the minimum output without loss of flame.

The maximum burner output in *Heating* mode can be preset via parameter in the form of fan speed.

With the following operating modes, the heat output is statically preselected, which means that the results obtained by the LMS14... are ignored, and a load value in accordance with the function is forwarded to the burner control.

Function	**Required output**
Chimney sweep	Low-fire/high-fire/maximum heating load
Controller stop	Controller stop output setpoint

6.12.9 2-position controller

The 2-position controller generates the signal for switching the burner control on and off:

Startup	= On	at	Actual value of boiler temperature < boiler temperature setpoint – switch-on threshold
Shutdown	= Off	at	Actual value of boiler temperature > boiler temperature setpoint + switch-off threshold

The switching differentials are loaded depending on the type of compensation (DHW or heating circuit). In addition, the dynamic switch-off differential influences the value of the switch-off threshold (also refer to chapter *Dynamic switching differentials*).

6.12.10 Protective boiler startup

Below the boiler's minimum temperature, protective boiler startup ensures that the boiler is heated up more quickly by shutting down or reducing loads, depending on the hydraulic choices available.
To exert influence on the consumers, a so-called locking signal is generated to which the consumers can gradually respond. The consumers' response can be parameterized via *Prot boil startup consumers* (2260).

Calculation of locking signal

When the burner is switched on and the boiler temperature lies below the minimum (cold start), or drops below it within a predictable period of time (warm start), the locking signal increases.
If the current boiler temperature lies above the minimum, or reaches this level within a predictable period of time, the locking signal becomes smaller.
If the boiler temperature remains constantly in the range between the minimum boiler temperature and half a boiler switching differential below that level, or will reach this range after a predictable period of time, the locking signal is maintained.

Note!
To ensure that the minimum boiler temperature can be reliably reached, the neutral zone within the parameterized integral action time from the boiler temperature's turning point is reduced from half the boiler's switching differential to zero. Next time the burner is switched on, the new start will be made with half the boiler's switching differential.

To ensure that this dynamic behavior is made possible, a virtual boiler temperature is calculated. This virtual boiler temperature is composed of the current boiler temperature and the current boiler gradient, amplified by the anticipation time. The anticipation time required for calculating the virtual boiler temperature can be set.

Virtual boiler temperature = current boiler temperature + (TKgradient * Tvoraus)

The locking signal has a value range from 0% upto 100%.

The switching differential (SDK) used is the *Switching diff on HCs* (2454) or *Switching diff on DHW* (2460) respectively, in accordance with the source of the current request for heat (heating circuit or DHW).

Graph for calculating the locking signal:

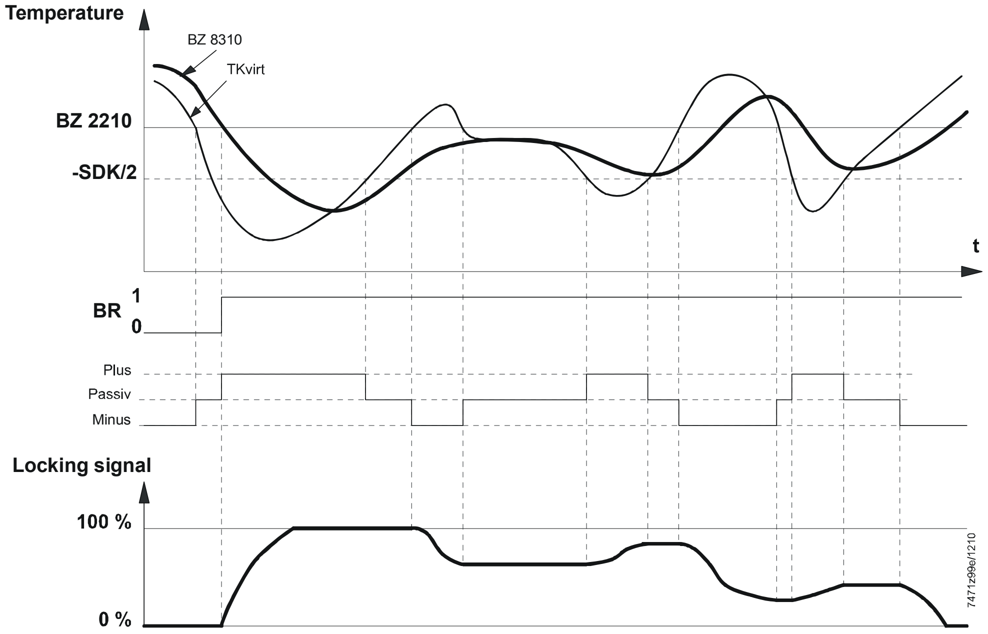


Figure 53: Protective boiler startup – calculation of locking signal

Key

Line no.	*Meaning*	
2210		Setpoint minimum
8310	TKx	Current boiler temperature
8310	TKIst	Actual value of boiler temperature
	BR	Burner (0 = Off, 1 = On)
	Minus	Locking signal is decreased
	Passiv	Locking signal remains constant
	Plus	Locking signal is decreased
	SDK	Switching differential boiler
	t	Time
	TKvirt	Virtual boiler temperature
	TKgradient	Gradient of boiler temperature
	Tvoraus	Foreseeable time boiler temperature

Additional parameters

Line no.	*Operating line*
2260	**Prot boil startup consumers**
2264	**Prot boil startup anticipation**
2454	**Switching diff on HCs**
2460	**Switching diff on DHW**

6.12.11 Keeping the boiler hot

By parameterizing a minimum boiler temperature, lower setpoints called for by heat requests from the consumers are raised to this minimum boiler temperature. Whenever there is valid request for heat from the consumers, the boiler temperature is maintained at this minimum level.

If there is no request for heat from the consumers, the boiler temperature is not always kept at the minimum level. If the boiler temperature drops below that minimum while the burner is Off, the burner is not started up. This functionality is not available for special hydraulic configurations. Hydraulic configurations with which the boiler pump is activated only if heating circuit 1 calls for heat cannot use the *Keep hot* function.

6.12.12 Alternative setting of output

The speed settings (*Fan speed heating max* (2441), *Fan speed full charging max* (2442), *Fan sp start value inst WH* (2443), *Fan speed DHW max* (2444) and *Controller delay speed* (2452)) can be made in the form of speed values in min^{-1} (rpm) or load values in kW. The active setting is selected when generating the menu and is then defined for the unit on the online DD (EEPROM).

6.13 Cascaded systems

6.13.1 Addressing devices

For configuration of the heat source cascade, the relevant address is the LPB device address:

Device address = 0:	No communication, standalone device.
Device address = 1:	Cascade master Collects the requests for heat, controls the heat source sequence within the cascaded system, performs common functions (maintained return temperature, cascade lock, shifting DHW priority, etc.). Own heat source is integrated in the cascaded system like a cascade slave.
Device address = 2...16:	Cascade slave Controls own heat source based on information received from the cascade master.

All consumers (heating circuit, DHW, pumps H1/H2/H3) in the cascade master can still be used. In addition, consumers (heating circuit and pumps H1/H2/H3) can be used in the cascade slave. All requests for heat are forwarded to the cascade master (with the exception of *HW separate circuit* (5736)).
Functions only used with device address 1 (buffer storage tank, system pump/primary controller) are only available with the cascade master.

⚠ **Warning!**
In the case of instantaneous HW systems with *Instant WH ctrl elem Q34* and *DHW controlling element* (5731) = *Diverting valve, Basic position DHW div valve* in connection with cascade applications must be set to *Heating circuit*, thus ensuring that the diverting valve is in the right position when there is a heat request from the cascade.

All parameters in connection with the cascade are to be set on the cascade master.

Per LPB segment, **one** heat source cascade can be operated. Heat sources with the same segment address belong to the same cascade. If there is more than one cascade, none of them is allowed to be in segment 0.

Additional parameters

Line no.	*Operating line*
6600	**LPB address**

6.13.2 Cascade master

If there is more than one heat source, the device with device address 1 assumes the role of the cascade master. It activates the required functions and shows the additional menus with the parameters for use with the cascaded system.

Identification of the master role can be effected automatically (*Auto*) or can be ready set (*Always*).

Device address	**Parameters cascade master**	**Number of heat sources**	**State of cascade master**
●	●	0	No cascade (zone)
0	●	1 (internally)	No cascade (individual boiler)
1	Auto	1 (internally or externally)	No cascade (individual boiler)
1	Auto	> 1 (internally and externally)	Cascade
1	Always	1 (internally or externally)	Cascade
1	Always	>1 (internally and externally)	Cascade
>1	●	1 (internally)	No cascade (cascade slave)

● = can be any

In a cascaded system, it is recommended to have the cascade master always running. This is to make certain that the cascade menus and common functions (e.g. common maintained return temperature) will not be lost if, for some reason, all heat sources except one are turned off.

Additional parameters

Line no.	*Operating line*
6630	**Cascade master**

6.13.3 Operating mode

Lead strategy

Line no.	*Operating line*
3510	**Lead strategy** Late on, early off Late on, late off Early on, late off

Output band min

Line no.	*Operating line*
3511	**Output band min**

Output band max

Line no.	*Operating line*
3512	**Output band max**

The heat sources are switched on and off according to the selected lead strategy while giving consideration to the preset output band.
To deactivate the impact of the output band, the limit values must be set to *0%* and *100%*, and the lead strategy to be selected is *Late on, late off*.

Late on, early off
Additional boilers are switched on as late as possible (output band max) and switched off again as early as possible (output band max). This means that the **smallest possible number of boilers are in operation,** or additional boilers operate with short on times.

Late on, late off
Additional boilers are switched on as late as possible (output band max) and switched off again as late as possible (output band min). This leads to the **smallest possible number of switch-on/off actions** for the boilers.

Early on, late off
Additional boilers are switched on as early as possible (output band min) and switched off again as late as possible (output band min). This means that the **largest possible number of boilers are in operation,** or additional boilers operate with the longest possible on times.

6.13.4 Control

Release integral cource seq

Line no.	*Operating line*
3530	**Release integral source seq**

When, with the heat source currently in operation, the demand for heat cannot be met – the difference being the release integral set here – another boiler is switched on. When the value is increased, additional heat sources are switched on at a slower rate. When the value is decreased, additional heat sources are switched on at a faster rate.

Reset integral source seq

Line no.	*Operating line*
3531	**Reset integral source seq**

When, with the heat source currently in operation, the demand for heat is exceeded by the reset integral set here, the heat source with the highest priority is shut down. When the value is increased, heat sources operate for longer periods of time (in the case of surplus heat). When the value is decreased, heat sources are switched off at a faster rate.

Restart lock

Line no.	*Operating line*
3532	**Restart lock**

The restart lock prevents a deactivated heat source from being switched on again. It is released again only after the set time has elapsed. This prevents too frequent switching actions of the heat sources and ensures stable plant operating states.

Switch on delay

Line no.	*Operating line*
3533	**Switch on delay**

Correct adjustment of the switch-on delay ensures that plant operating conditions will be stable. This prevents too frequent switching actions of the boilers (cycling).
In the case of a DHW request, the delay time is fixed at 1 minute.

Forced time basic stage

Line no.	*Operating line*
3534	**Forced time basic stage**

When switched on, every boiler operates with its basic stage for the period of time set here. The next stage is released only when this period of time has elapsed.

6.13.5 Boiler sequence

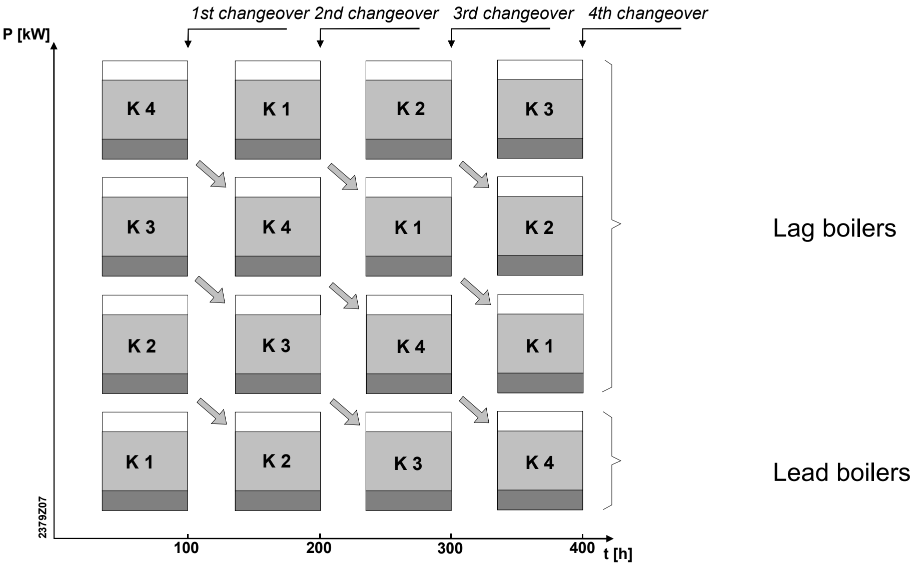
Auto source seq ch'over

Line no.	*Operating line*
3540	**Auto source seq ch'over**

With automatic changeover of the heat source sequence, the boiler loads in a cascaded system can be influenced by defining the order of lead and lag boiler.

Fixed order
Setting - - - defines a fixed order. In that case, the lead boiler can be selected via *Leading source* (3544); the other boilers are then switched on and off in the same order as the LPB device addresses.

Order according to the number of operating hours
On completion of the set number of operating hours, the boiler sequence in the cascaded system changes. It is always the boiler with the next higher device address which assumes the role of the lead boiler.



t = total number of operating hours of all lead boilers [h]
P = total output of cascaded system [kW]

Auto source seq exclusion

Line no.	*Operating line*
3541	**Auto source seq exclusion** None First Last First and last

Setting *Auto source seq exclusion* is only used in connection with the activated heat source sequence (*Auto source seq ch'over* (3540)).
When using *Auto source seq exclusion*, the first and/or the last boiler can be excluded from automatic changeover.

None
The order of switching on the boilers changes when the set number of operating hours are reached (*Auto source seq ch'over* (3540)).

First
The first boiler in terms of addressing always remains the lead boiler. With the other boilers, the order of switching on changes when the set number of operating hours are reached (*Auto source seq ch'over* (3540)).

Last
The last boiler in terms of addressing always remains the last. The other boilers change when the set number of operating hours are reached (*Auto source seq ch'over* (3540)).

First and last
The first boiler in terms of addressing always remains the lead boiler. The last boiler in terms of addressing always remains the last. The boilers in between change when the set number of operating hours are reached (*Auto source seq ch'over* (3540)).

Leading source

Line no.	*Operating line*
3544	**Leading source** Source 1 Source 2 Source 3 Source 4 Source 5 Source 6 Source 7 Source 8 Source 9 Source 10 Source 11 Source 12 Source 13 Source 14 Source 15 Source 16

The leading heat source is only selected in connection with the fixed order of the heat source sequence (*Auto source seq ch'over* (3540)).
The boiler selected as the lead boiler is always the first to be switched on, or the last to be switched off. The other boilers are switched on and off in the order of their device addresses.

6.13.6 Minimum limitation of return temperature

Return setpoint min

Line no.	*Operating line*
3560	**Return setpoint min**

If the return temperature drops below the adjusted setpoint, maintained boiler return temperature becomes active. The maintained boiler return temperature allows consumers to be influenced or a return temperature controller to be used.

Return setpoint min OEM

Line no.	*Operating line*
3561	**Return setpoint min OEM**

Minimum limitation of the cascade return temperature (*Return setpoint min (*3560)) can be adjusted by the OEM. In that case, the person using the *Heating engineer* level can no longer set the minimum limitation of the cascade return temperature below the minimum value required for the boiler.

Return influence consumers

Line no.	*Operating line*
3562	**Return influence consumers** Off On

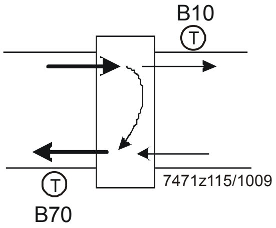
If, with the boilers released, the cascade return temperature drops below the minimum temperature, a locking signal is calculated.

- In the case of pump circuits, the consumer pumps (heating circuit pump, DHW charging pump, ext. load) are or will stay deactivated if the locking signal exceeds the respective threshold value
- In the case of mixing circuits, the flow temperature setpoint is reduced according to the locking signal value

6.13.7 Supervision of temperature differential

Temp differential min

Line no.	Operating line
3590	**Temp differential min**



This function prevents excessive cascade return temperatures and improves the system's switch-off behavior.

If the temperature differential between sensor B10 and sensor B70 becomes smaller than the set minimum temperature differential (*Temp differential min* (3590), one of the heat sources is switched off as early as possible, independent of the selected lead strategy. When the temperature differential is sufficiently great again, the selected lead strategy is resumed.

Note!
Switching off due to the minimum temperature differential does not apply to the last heat source in the cascaded system.

6.14 Extra heat source

The extra heat source is activated by configuring one of the Qx outputs to *Heat request K27.*

Setpoint incr main source

Line no.	Operating line
3690	**Setpoint incr main source**

For the period of time the extra heat source is released, the setpoint of the main heat source is increased by the value set here.
This prevents the main heat source from reducing its level of modulation.
So the output of the main heat source is not reduced due to the additional output delivered by the extra heat source.

6.15 Solar

6.15.1 General

The basic unit supports solar DHW heating or heating backup via a buffer storage tank.

Solar charging is performed with a single-speed charging pump on the basis of the temperature differential between DHW storage tank and collector, or between buffer storage tank and collector.

The LMS14… supports:
- One collector panel with sensor B6
- Collector pump Q5 (1-speed)
- One heat exchanger with sensor B3 or B31
- One heat exchanger with sensor B4 or B41

The following functions are available:
- dT control of DHW storage tank and buffer storage tank
- Minimum and maximum charging temperature
- Minimum running time
- Pump and valve kick
- Status display (operating state)
- Overtemperature protection for the collector
- Storage tank recooling via the collector
- Storage tank recooling via the boiler/space heating
- Frost protection for the collector
- Evaporation of collector medium (protection for the pump)
- Collector start
- Collector hours run
- Display of minimum and maximum collector temperature

Note!
A sensor B6 and collector pump Q5 must be parameterized at the multifunctional inputs/outputs (BX, QX) for configuration of the solar diagram and for the associated parameters to be displayed, or else the *Solar DHW* application must be used via an extension module.

6.15.2 Sensors

Sensor selection for the DHW storage tank

In addition to sensor B6, sensor B31 at the bottom is used for solar charging control. If that sensor is not available, sensor B3 at the top is automatically used. If both storage tank sensors are not available and the solar diagram is active, an error message is delivered and the collector pump deactivated, irrespective of collector temperature.

Sensor connected to ...		**Sensors used for solar charging control**
B3	**B31**	
--	--	Solar DHW heating not possible
●	Sensors	Sensor B6 → collector temperature Sensor B31 at the bottom → storage tank temperature
Sensors	--	Sensor B6 → collector temperature Sensor B3 at the top → storage tank temperature

-- no sensor connected
● with or without sensor or thermostat)

Note!
If both storage tank sensors are not available (short-circuit or interruption), the collector pump is deactivated. If the collector sensor is not available (short-circuit or interruption), the collector pump is switched off also. In both cases, an error message is displayed.

Sensor selection for the buffer storage tank

In addition to sensor B6, sensor B41 at the bottom is used for solar charging control. If that sensor is not available, sensor B4 at the top is automatically used. If both storage tank sensors are not available and the solar diagram is active, an error message is delivered and the collector pump deactivated, irrespective of collector temperature.

Sensor connected to ...		**Sensors used for solar charging control**
B4	**B41**	
--	--	Solar buffer storage tank charging not possible
●	Sensors	Sensor B6 → collector temperature Sensor B41 at the bottom → storage tank temperature
Sensors	--	Sensor B6 → collector temperature Sensor B4 at the top → storage tank temperature

-- no sensor connected
● with or without sensor

Note!
If both storage tank sensors are not available (short-circuit or interruption), the collector pump is deactivated. If the collector sensor is not available (short-circuit or interruption), the collector pump is switched off as well. In both cases, an error message is displayed.

Sensor for the swimming pool

The swimming pool sensor is always sensor B13. If the solar plant is activated and the collector sensor or swimming pool sensor is not available (short-circuit or interruption), the collector pump is switched off and an error message appears.

Display of actual values

The temperatures acquired by sensor B6, B3 and B31 are displayed as collector temperature 1, DHW temperature 1, and DHW temperature 2. The temperature values of sensor B4 and B41 are displayed as *Buffer storage tank temperature 1* and *Buffer storage tank temperature 2*. The swimming pool temperature acquired by sensor B13 is displayed as the *Swimming pool temperature.*

Additional parameters

Line no.	*Operating line*
8510	**Collector temp 1**
8830	**DHW temp 1**
8980	**Buffer temp 1**
8982	**Buffer temp 2**

Display of minimum and maximum values

Collector temperature (sensor B6) features a *Slave pointer* function displayed as *Collector temperature 1 max* and *Collector temperature 1 min*. They show the maximum and minimum collector temperatures reached. When making a reset, the values are reset to the current collector temperature.

Additional parameters

Line no.	*Operating line*
8511	**Collector temp 1 max**
8512	**Collector temp 1 min**

Collector sensor measured value correction

Readjustm collector sensor (6098) makes it possible to correct the temperature acquired by sensor B6 by ±20 K. The correction is linear across the entire measuring range.

Note!
The temperature value of the *Sensor temperature BX* input test displays the uncorrected measured value. The logical temperature value *Collector temperature 1* displays the corrected measured value used by the control system.

Additional parameters

Line no.	*Operating line*
6098	**Readjustm collector sensor**
8510	**Collector temp 1**

6.15.3 Charging controller (dT)

Temp diff on

Line no.	*Operating line*
3810	**Temp diff on**

Temp diff off

Line no.	*Operating line*
3811	**Temp diff off**

Charg temp min DHW st tank

Line no.	*Operating line*
3812	**Charg temp min DHW st tank**

Temp diff on buffer

Line no.	*Operating line*
3813	**Temp diff on buffer**

Temp diff off buffer

Line no.	*Operating line*
3814	**Temp diff off buffer**

Temp diff on swi pool

Line no.	*Operating line*
3816	**Temp diff on swi pool**

Temp diff off swi pool

Line no.	*Operating line*
3817	**Temp diff off swi pool**

Charging temp min swi pool

Line no.	*Operating line*
3818	**Charging temp min swi pool**

Note!
When using setting **- - -**, the general temperature differential solar (*Temp diff on* (3810) and *Temp diff off* (3811)) is adopted.

When charging the storage tank via the heat exchanger, the temperature differential between collector and storage tank/swimming pool must be sufficient, and the collector must have reached the minimum charging temperature for the storage tank/swimming pool.

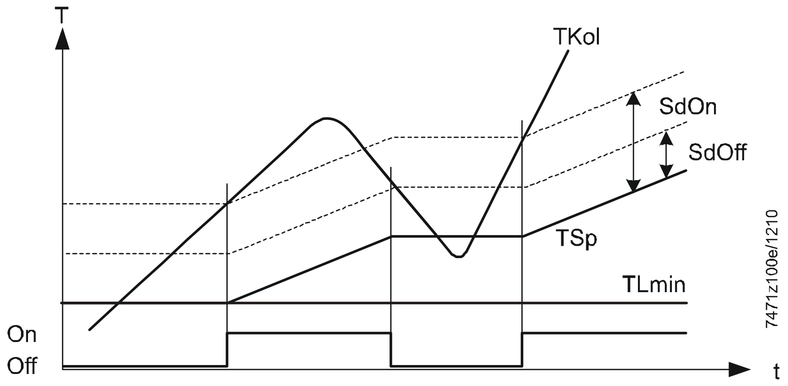


Figure 54: Charging controller – charging temperature minimum swimming pool

Key

Meaning	
On/Off	Collector pump
SdAus	Dynamic switch-off threshold
SdEin	Switch-on threshold (heating circuit/DHW)
TKol	Collector temperature
TLmin	Minimum charging temperature DHW storage tank/buffer/swimming pool
TSp	Storage tank temperature

Charging temp min buffer

Line no.	*Operating line*
3815	**Charging temp min buffer**

This function is used to activate the collector pump only when the collector temperature reaches a certain minimum level. In addition, the required temperature differential to the storage tank must be reached.

Note!
If the function is deactivated, the collector pump is switched on whenever the required temperature differential to the storage tank is reached.

If the collector temperature lies below the minimum charging temperature, charging is aborted (even if the temperature differential still exists):
Collector temperature < minimum collector temperature.
If the collector temperature exceeds the minimum charging temperature by the switching differential (switch-on threshold – switch-off threshold) and the required temperature differential exists, charging can take place:
Collector temperature > minimum collector temperature + (switch-on threshold – switch-off threshold).

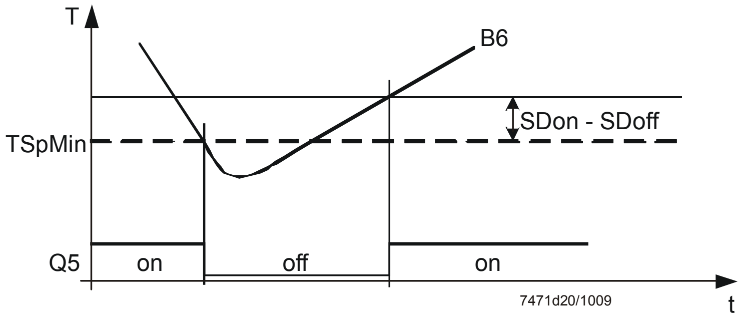


Figure 55: Charging controller – charging temperature minimum buffer

Key

Meaning	
T	Temperature
B6	Collector sensor
TSpMin	Minimum storage tank temperature
SDon	Switching differential On
SDoff	Switching differential Off
Q5	Collector pump (On/Off)
t	Time

6.15.4 Maximum charging temperature, maximum safety temperature

The storage tank is charged with solar energy up to the set *Charging temp max* at sensor B31/B41. If sensor B31/B41 is not available, sensor B3/B4 is used.

Charging is aborted (storage tank temperature > maximum storage tank temperature) whenever the charging temperature in the storage tank is exceeded. Charging is released again (storage tank temperature < storage tank temperature – 1 K) when the storage tank temperature drops 1 K below the maximum charging temperature.

Caution!
Function *Protective collector overtemperature* can reactivate the collector pump until the maximum storage tank temperature is reached.

Note!
When using 2 sensors (B3 + B31 or B4 + B41), charging is aborted whenever one of the temperatures acquired by the 2 sensors lies above the maximum charging temperature.

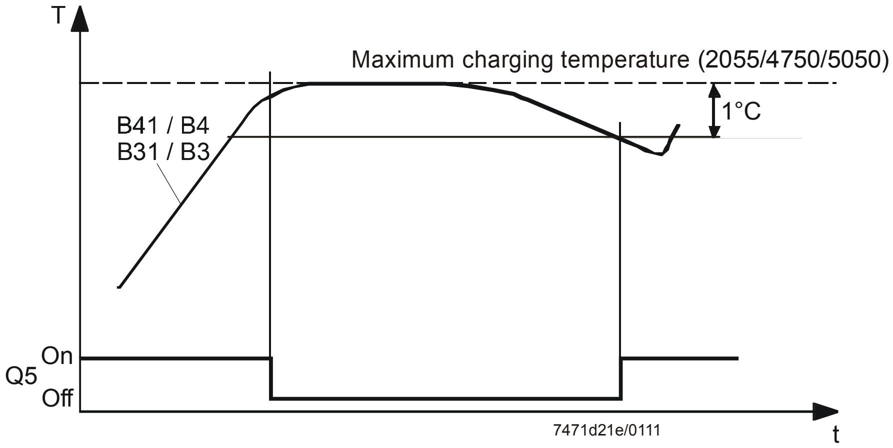


Figure 56: Maximum charging temperature, maximum safety temperature

Key

Meaning	
B31/B3	DHW storage tank sensors
B41/B4	Buffer sensors
Q5	Collector pump (On/Off)
t	Time
T	Temperature
TSp	Storage tank temperature

Note!
Since the swimming pool temperature setpoint (*Setpoint solar heating* (2055)) equals the maximum charging temperature, the swimming pool is always charged until this temperature level is reached.

Additional parameters

Line no.	*Operating line*
4750	**Charging temp max**
4751	**Storage tank temp max**
2055	**Setpoint solar heating**
2070	**Swimming pool temp max**
5050	**Charging temp max**
5051	**Storage tank temp max**

6.15.5 Priority

Note!
The priority circuit for the swimming pool (*Charging priority solar* (2065)) can impact the storage tank priority of solar charging and possibly charge the swimming pool before the storage tanks are charged.

Charging prio storage tank

Line no.	*Operating line*
3822	**Charging prio storage tank** None DHW storage tank Buffer storage tank

If a plant uses several heat exchangers, it is possible to set a priority for the integrated storage tanks, which defines the charging sequence.

None
Every storage tank is charged alternately by 5 °C at a time, until every setpoint of level A, B or C (see below) is reached. The setpoints of the next higher level are approached only when all setpoints of the previous level have been reached.

DHW storage tank
During solar charging, preference is given to the DHW storage tank. At every level A, B or C (see below), the storage tank is charged with priority. Only then will the other consumers of the same level be charged. As soon as all setpoints of a level are attained, those of the next level are approached, whereby priority is again given to the DHW storage tank.

Buffer storage tank
During solar charging, preference is given to the buffer storage tank. At every level A, B or C (see below), the storage tank is charged with priority. Only then will the other consumers of the same level be charged. As soon as all setpoints of a level are attained, those of the next level are approached, whereby priority is again given to the buffer storage tank.

Storage tank setpoints:

Level	**DHW storage tank**	**Buffer storage tank**	**Swimming pool (1)**
A	*Nominal setpoint* (1610)	Buffer setpoint (slave pointer)	*Setpoint solar heating* (2055)
B	*Charging temp max* (5050)	*Charging temp max* (4750)	*Setpoint solar heating* (2055)
C	*Storage tank temp max* (5051)	*Storage tank temp max* (4751)	*Swimming pool temp max* (2070)

(1) When priority for the swimming pool is activated (*Charging priority solar* (2065)), the swimming pool is charged before the storage tanks are charged

Charging time relative prio

Line no.	*Operating line*
3825	**Charging time relative prio**

If the preferred storage tank cannot be charged in accordance with charging control, priority is transferred to the next storage tank or the swimming pool for the set period of time (e.g. too great temperature differential between collector and storage tank). As soon as the preferred storage tank (according to setting *Charging priority storage tank*) is again ready to be charged, the transfer of priority is immediately stopped.

If this parameter is disabled (---), charging proceeds in accordance with the *Charging prio storage tank* settings.

Waiting time relative prio

Line no.	*Operating line*
3826	**Waiting time relative prio**

During the set time, the transfer of priority is delayed. This prevents relative priority from intervening too frequently.

Waiting time parallel op

Line no.	*Operating line*
3827	**Waiting time parallel op**

If solar output is sufficient and solar charging pumps are used, parallel operation is possible. In that case, the storage tank of the priority model can be the next to be simultaneously charged, in addition to the storage tank to be charged next. Parallel operation can be delayed by introducing a waiting time. This way, in the case of parallel operation, switching on of the storage tanks can be effected in steps. Setting (---) disables parallel operation.

Delay secondary pump

Line no.	*Operating line*
3828	**Delay secondary pump**

To carry away any cold water resting in the primary circuit, the secondary pump of the external heat exchanger can be delayed.

6.15.6 *Collector start* function

Collector start function

Line no.	*Operating line*
3830	**Collector start function**

If the collector temperature cannot be correctly acquired because the pump is not running (especially in the case of vacuum tubes), the pump can be activated from time to time.

The function activates the collector pump at the set interval for at least the parameterized minimum running time. If the required collector temperature is reached within the minimum running time, the pump keeps running. If the collector temperature does not reach the required level, the pump is deactivated again.

Note!
The *Collector start* function is only performed if the storage tank temperature does not lie above the storage tank safety temperature.

Min run time collector pump

Line no.	*Operating line*
3831	**Min run time collector pump**

When the collector pump is activated, it operates for the minimum running time, independent of temperature differentials. The minimum running time of the pump can be parameterized and is active with all functions that activate the collector pump.

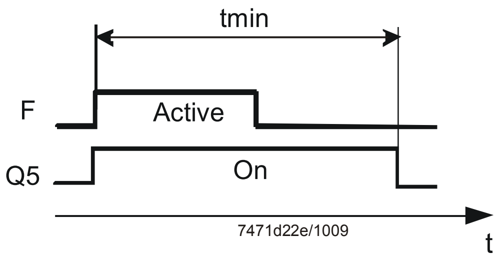


Figure 57: *Collector start* function – minimum run time collector pump

Key

Meaning	
F	Function (Active/Inactive)
Q5	Collector pump (On/Off)
tmin	Minimum collector pump running time
t	Time

Collector start function on

Line no.	*Operating line*
3832	**Collector start function on**

The *Collector start* function starts at the time of day set here.

Collector start function off

Line no.	*Operating line*
3833	**Collector start function off**

The *Collector start* function ends at the time of day set here.

Collector start funct grad

Line no.	*Operating line*
3834	**Collector start funct grad**

The collector pump is activated whenever the temperature acquired by the collector sensor rises.

Special case:
Frost protection

To ensure that the flow pipe from the collector to the storage tank also receives hotter water, deactivation of the collector pump after reaching the frost protection threshold at the collector sensor is delayed by the minimum running time.

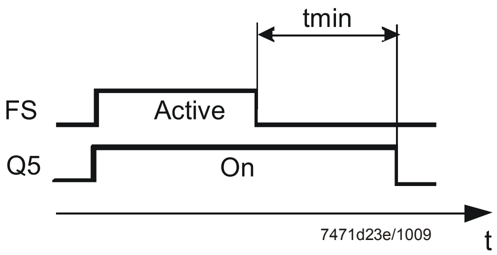


Figure 58: *Collector start* function – special case frost protection

Key

Meaning	
F	Function (Active/Inactive)
Q5	Collector pump (On/Off)
tmin	Minimum collector pump running time
t	Time

6.15.7 Frost protection for the collector

Collector frost protection

Line no.	*Operating line*
3840	**Collector frost protection**

When there is risk of frost at the collector, the collector pump is activated to prevent the heat-carrying medium from freezing.

- If the collector temperature falls below the frost protection temperature, the collector pump is activated: Collector temperature < frost protection collector temperature
- When the collector temperature returns to a level of 1 K above the frost protection temperature, the collector pump is deactivated again: Collector temperature > frost protection collector temperature + 1

Note!
No consideration is given to the temperature in the storage tank. In normal situations, the storage tank is discharged while the collector assumes a higher temperature.

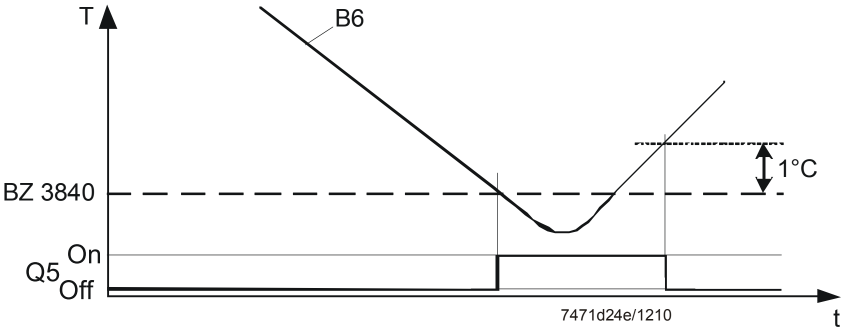


Figure 59: Frost protection for the collector

Key

Line no.	*Meaning*	
3840	TKolFrost	Frost protection collector temperature
	B6	Temperature acquired by collector sensor
	Q5	Collector pump (On/Off)
	t	Time
	T	Temperature

6.15.8 Overtemperture protection for the collector

Collector overtemp prot

Line no.	*Operating line*
3850	**Collector overtemp prot**

If there is a risk of overtemperature at the collector, storage tank charging is continued to reduce the amount of surplus heat. When the maximum storage tank temperature is reached, charging is stopped.

If the collector temperature exceeds the temperature level of *Overtemperature protection for the collector*, and if the maximum storage tank temperature is not yet reached, the collector pump is activated (collector temperature > overtemperature protection for the collector and storage tank temperature < maximum storage tank temperature).
If the collector temperature drops by the switching differential below the temperature level of *Overtemperature protection for the collector*, the collector pump is deactivated again (collector temperature < overtemperature protection for the collector – switching differential overtemperature).
If the storage tank temperature increases to the maximum storage tank temperature, the collector pump is deactivated (storage tank temperature > maximum storage tank temperature).
If the storage tank temperature drops 1 K below the tank's safety temperature, the collector pump is activated again (storage tank temperature < maximum storage tank temperature – 1).

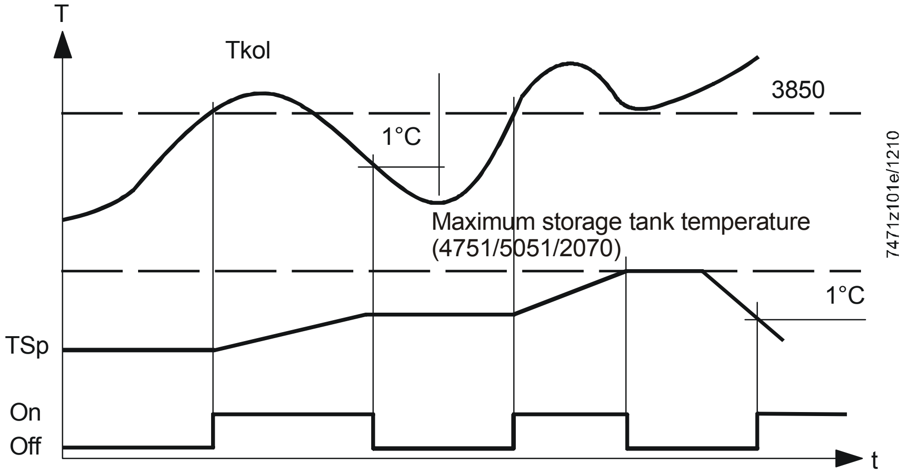


Figure 60: Overtemperature protection for the collector

Key

Line no.	*Meaning*	
3850	TKolUe	Overtemperature protection for collector
2070		Maximum storage tank temperature (buffer/DHW/swimming pool)
4751		Maximum storage tank temperature (buffer/DHW/swimming pool)
5051		Maximum storage tank temperature (buffer/DHW/swimming pool)
	On/Off	Collector pump
	SdUe	Switching differential overtemperature (fixed at 5 K)
	t	Time
	T	Temperature
	TKol	Collector temperature
	TSp	Storage tank temperature

Note!

If 2 storage tank sensors are used, the sensor acquiring the higher temperature is considered.

Caution!

The collector pump is deactivated if one of the storage tank temperatures is not available (short-circuit or interruption).

Additional parameters

Line no.	*Operating line*
2070	**Swimming pool temp max**
3850	**Collector overtemp prot**
Menu: Buffer storage tank	
4751	**Storage tank temp max** (buffer storage tank)
Menu: DHW storage tank	
5051	**Storage tank temp max** (DHW storage tank)

6.15.9 Recooling

It makes sense to use recooling together with overtemperature protection. If the DHW storage tank has already reached the maximum storage tank temperature level, which means that overtemperature protection for the collector is no longer possible, recooling can again lower the storage tank's temperature level (typically during the night).

Recooling of the storage tank can be accomplished via the collector's surface or the heat source and space heating.

Note!
Cooling mode is canceled if the DHW storage tank must be recooled during *Cooling* mode.

Recooling via the collector's surface

The surplus energy held by the storage tank can be released to the environment by circulating the water through the cold collector.

The collector pump is activated if the lower storage tank temperature at sensor B31/B41 is at least
2 K above the recooling setpoint and higher than the collector temperature by at least the parameterized charging switching differential.

(Storage tank temperature > recooling temperature + 2 K and storage tank temperature > collector temperature + switching difference).

The collector pump is switched off if the collector temperature comes within 2 K of the storage tank temperature (collector temperature > storage tank temperature – 2 K)

The function is ended if the recooling temperature within 1 K of the room temperature setpoint for cooling (Storage tank temperature < recooling temperature + 1 K)

The function can be deactivated. In addition, it is possible to select whether it should be active throughout the year or only in the summer.

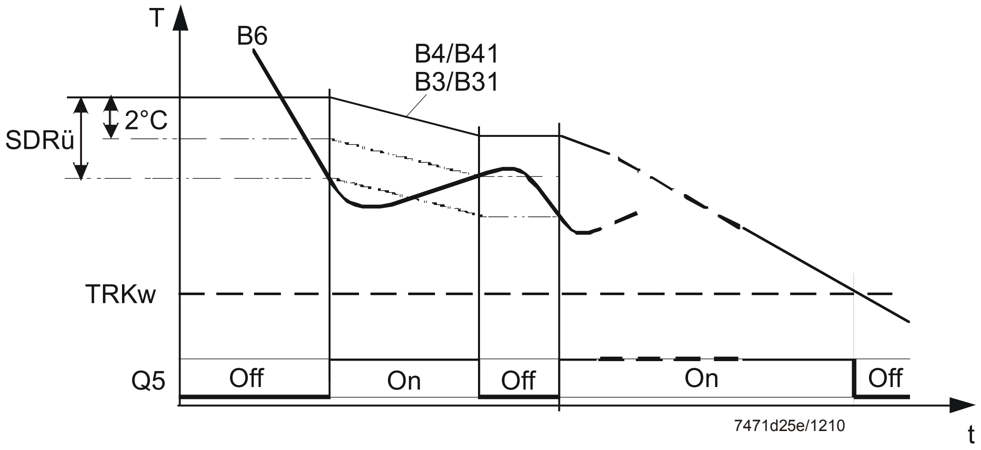


Figure 61: Recooling – recooling via the collector's surfaces

Key

Line no.	Meaning	
	B3/B31	DHW storage tank sensors
	B4/B41	Buffer sensors
	B6	Collector sensor
	Q5	Collector pump (On/Off)
	t	Time
	T	Temperature
	SdRü	Switching differential for recooling
	TRKW	Recooling temperature

Note!
The switching differential for recooling (SdRü) corresponds to the value of the switch-on differential (SdEin) of the charging controller, but is limited for recooling to a minimum of 3 °C.
The function is performed with sensor B3/B4 if sensor B31/B41 at the bottom is not connected. The function is not available if there are no storage tank sensors.

Additional parameters

Line no.	*Operating line*
Menu: DHW storage tank	
5024	**Switching diff** (DHW storage tank)
5055	**Recooling temp** (DHW storage tank)
5057	**Recooling collector** (DHW storage tank)
Menu: Buffer storage tank	
4755	**Recooling temp** (buffer storage tank)
4757	**Recooling collector** (buffer storage tank)

Recooling via heat source/cooling source/ space heating

Surplus energy in the storage tank can be released to the environment via the heat source/cooling source and space heating. With this function, the heat in the storage tank is delivered to the heat source by means of charging pump Q3/source pump, the heating circuit pump is activated and the mixing valve opened.

Caution!
To enable forced switching on of the heating circuits, the *Recooling storage tank* function must be activated (can be set for each heating circuit).
Heating circuits that are already in operation draw more heat.
If there is no sensor B3/B4, the function is not performed.

If the upper storage tank temperature at sensor B3/B4 lies 2 K above the recooling temperature and if the heat source temperature lies at least *SdRü* below the storage tank temperature, the DHW charging pump/source pump is activated (storage tank temperature > recooling temperature and storage tank temperature > heat source temperature + SdRü).

If the storage tank temperature only lies by the switching differential above the heat source temperature, the DHW charging pump/source pump is deactivated (storage tank temperature > heat source temperature + switching differential).

If the storage tank temperature falls below the recooling temperature, the function is ended (storage tank temperature < recooling temperature).

Additional parameters

Line no.	*Operating line*
Menu: DHW storage tank	
5024	**Switching diff** (DHW storage tank)
5055	**Recooling temp** (DHW storage tank)
5056	**Recooling heat gen/HCs** (DHW storage tank)
Menu: Buffer storage tank	
4755	**Recooling temp** (buffer storage tank)
4756	**Recooling DHW/HCs** (buffer storage tank)

Key

Line no.	*Meaning*	
	SdRü	Switching differential for recooling

6.15.10 Evaporation temperature of medium

Evaporation heat carrier

Line no.	*Operating line*
3860	**Evaporation heat carrier**

If there is a risk of evaporation of the heat conducting medium due to high collector temperatures, the collector pump is deactivated to prevent the medium from reaching excessive temperatures. This is a protective pump function.

When, due to high collector temperatures, there is a risk of evaporation of the heat conducting medium, the collector pump is deactivated to prevent it from running hot. This is a protective pump function.

If the collector temperature exceeds the evaporation temperature of the heat conducting medium (collector temperature > evaporation temperature), the collector pump is deactivated to prevent overtemperatures.

If the collector temperature falls one switching differential (15 K) below the evaporation temperature, the collector pump is activated again (collector temperature < evaporation temperature – switching differential evaporation temperature).

The function can be deactivated.

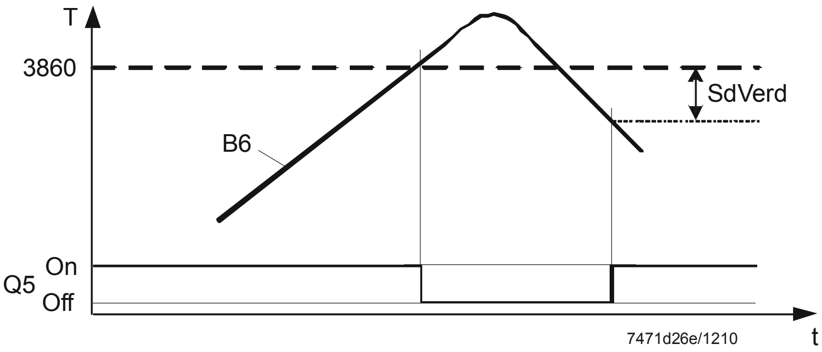


Figure 62: Evaporation temperature of medium

Key

Line no.	*Meaning*	
3860	Tverd	Evaporation temperature
	B6	Collector sensor
	Q5	Collector pump (On/Off)
	SdVerd	Switching differential evaporation temperature (15 K)
	t	Time
	T	Temperature

Caution!
Evaporation protection for the medium (pump Off) is given priority over overtemperature protection, which wants to activate the pump.

6.15.11 Speed control

Starting speed coll pump 1

Line no.	*Operating line*
3865	**Starting speed coll pump 1**

Starting speed of the collector pump.

Starting speed exch pump

Line no.	*Operating line*
3867	**Starting speed exch pump**

Starting speed of the solar heat exchanger pump.

Starting speed buffer pump

Line no.	*Operating line*
3868	**Starting speed buffer pump**

Starting speed of the solar buffer storage tank charging pump.

Starting speed swi pool pump

Line no.	*Operating line*
3869	**Starting speed swi pool pump**

Starting speed of the solar swimming pool charging pump.

Pump speed min/max

Line no.	*Operating line*
3870	**Pump speed min**
3871	**Pump speed max**

The speed of the solar pump motor is limited (minimum and maximum permissible speed).

Speed Xp/Tn

Line no.	*Operating line*
3872	**Speed Xp**
3873	**Speed Tn**

The charging setpoint for the storage tank with the first charging priority and the collector temperature are used for speed control. The PI controller calculates the speed such that the collector temperature lies 2 K below the switch-on temperature. If, due to strong solar radiation, the collector temperature rises, the speed is increased. If the collector temperature drops below this setpoint, the speed is decreased. A parameter is available to select minimum and maximum limitation of pump speed. The PI controller can be adjusted via parameters *Proportional band* (Xp) and *Integral action time* (Tn). It has a neutral zone of ±1 K.

The resulting speed is delivered via P1 function output (PWM output) as configured. With charging priority changeover, the speed is controlled by the controller according to the new charging setpoint.

Pump speed min/max OEM

Line no.	*Operating line*
3875	**Pump speed min OEM**
3876	**Pump speed max OEM**

These are the limits of the speed range for control of the solar pump at the *OEM* level. These limits confine the setting range at the *Heating engineer* level.

6.15.12 Yield measurement

The 24-hour and total solar energy yield (*24-hour yield solar energy* (8526) and *Total yield solar energy* (8527)) are calculated based on these data.

Antifreeze

Line no.	*Operating line*
3880	**Antifreeze** None Ethylene glycol Propylene glycol Ethyl and propyl glycol

Since the mixing ratio of the collector medium has an impact on heat transmission, the type of antifreeze used and its concentration must be entered, thus allowing calculation of the energy yield.

Antifreeze concentration

Line no.	*Operating line*
3881	**Antifreeze concentration**

Since the mixing ratio of the collector medium has an impact on heat transmission, the type of antifreeze used and its concentration must be entered, thus allowing calculation of the energy yield.

Pump capacity

Line no.	*Operating line*
3884	**Pump capacity**

The pump's flow rate in l/h must be determined and serves for calculating the volumetric flow.

Pulse unit yield

Line no.	*Operating line*
3887	**Pulse unit yield**

Defines the flow rate per pulse for the selected input Hx. For that purpose, the respective input Hx must be configured for counting pulses.

6.15.13 Hours run

The number of operating hours of the collector pump are added up by counters.

Hours run solar yield only includes the periods of time during which heat is supplied from the collector to the storage tank.

The *Hours run collect overtemp* is the sum of operating hours during which the *Overtemperature protection* function has been active.

Note!
The hours run can be reset.

Additional parameters

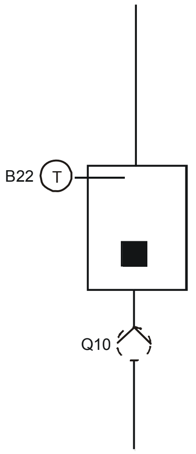
Line no.	*Operating line*
8530	**Hours run solar yield**
8531	**Hours run collect overtemp**
8532	**Hours run collector pump**

6.16 Solid fuel boiler

6.16.1 General

The basic unit permits straightforward dT control of an uncontrolled solid fuel boiler with boiler sensor, boiler pump and a selectable comparative temperature (DHW storage tank, buffer storage tank, flow temperature setpoint, minimum setpoint).

The following functions are available:
- dT controller with selectable comparative temperature
- Minimum setpoint
- Locking another heat source
- Excess heat discharge
- Boiler pump overrun
- DHW charging priority
- Hours run counter
- Status display (operating state)



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When configuring the solid fuel boiler diagram, sensor B22 and solid fuel boiler pump Q10 must be parameterized at the multifunctional inputs/outputs (BX, QX).

For the solid fuel boiler diagram to be activated and the associated parameters to be displayed, the boiler sensor must be connected.

6.16.2 Operating mode

Locks other heat sources

Line no.	*Operating line*
4102	**Locks other heat sources** Off On

When the solid fuel boiler is put into operation, other heat sources, such as oil/gas boilers, are locked. Locking takes place whenever the boiler temperature rises to such a level that crossing of the comparative temperature can be expected. This anticipation function enables the locked heat sources to end any pump overrun before the solid fuel boiler pump is activated. Also, in the case of a common stack, it can be made certain that only one boiler is in operation at a time.

Note!
Due to locking of the other heat sources (*Locks other heat sources* (4102) set to *On*), an installed system pump is also locked when *System pump on heat gen lock* (2121) is set to *Off*.
In that case, consumers downstream from the system pump do not receive any heat.

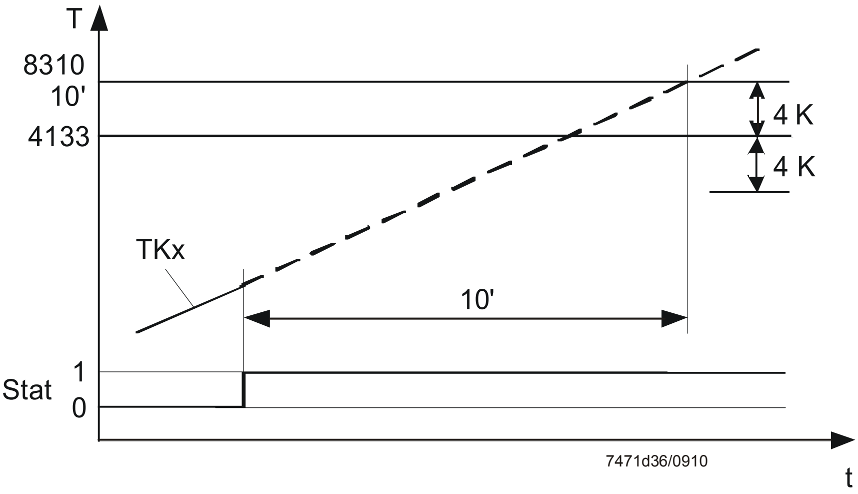


Figure 63: Operating mode

Key

Line no.	*Meaning*	
4133	TVgl	Comparative temperature
8310	TKx	Current boiler temperature
8560	TFx	Solid fuel boiler temperature
	10´	Actual value of boiler temperature anticipated in 10 minutes
	dt	Progression of time
	dTF	Temperature rise of solid fuel boiler
	Stat	State of heat generation lock (0 = not locked, 1 = locked)

The heat generation lock is activated if – based on the current temperature rise – the boiler temperature will exceed the comparative temperature by 4 K in 10 minutes. Heat generation lock remains active for as long as the boiler pump is running.

Active when:
Temperature of solid fuel boiler + dTFx/dt *10’ > comparative temperature + 4 K or boiler pump Q10 = On

The heat generation lock is deactivated if the boiler pump is switched off again (at the end of pump overrun), or if the boiler temperature does not exceed the required comparative temperature by more than 4 K in 10 minutes so that the boiler pump would not be switched on at all.

The function can be activated/deactivated.

Note!
The function is only active with device address 0 or 1.

Off
Function is deactivated.

On
Function is activated.

6.16.3 Setpoints

Setpoint min

Line no.	*Operating line*
4110	**Setpoint min**

The boiler pump is put into operation only when the boiler temperature reaches a minimum level, in addition to the required temperature differential.

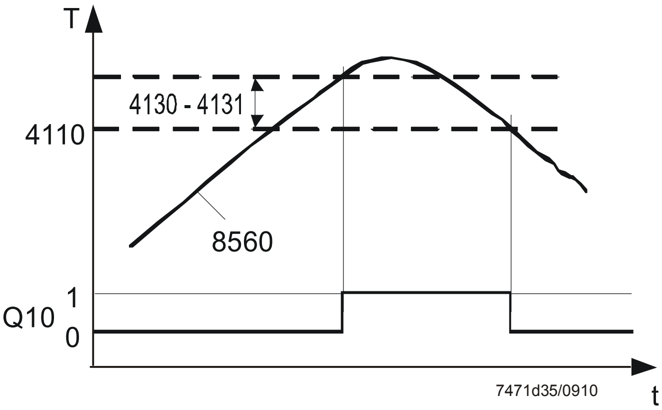


Figure 64: Setpoints

Key

Line no.	*Meaning*	
4110	TFsMin	Minimum setpoint
4130	SdTFEin	Temperature differential On
4131	SdTFAus	Temperature differential Off
8560	TFx	Solid fuel boiler temperature
	Q10	Solid fuel boiler pump
	t	Time
	T	Temperature

The boiler pump is deactivated if the boiler temperature lies below the minimum setpoint: Temperature of solid fuel boiler < temperature differential Off.

The boiler pump is activated if the boiler temperature exceeds the minimum setpoint by the switching differential (temperature differential On – temperature differential Off): (Temperature of solid fuel boiler > minimum setpoint + (temperature differential On – temperature differential Off).

The criterion of the minimum setpoint is always taken into account, which means that the function cannot be deactivated.

Note!
If pump overrun is parameterized, the boiler pump will not be deactivated until the *Pump overrun time* (4140) has elapsed.

Additional parameters

Line no.	*Operating line*
4110	**Setpoint min**
4130	**Temp diff on**
4131	**Temp diff off**

6.16.4 Control of the boiler/burner

Delta T-controller

For the boiler pump to be put into operation, a sufficiently great temperature differential between boiler temperature and comparative temperature is required.

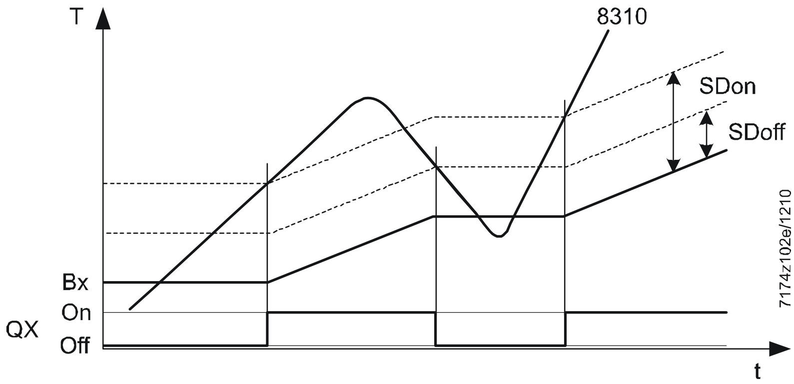


Figure 65: Control of the boiler /burner – delta T controller

Key

Line no.	*Meaning*	
8310	TKx	Boiler temperature
	Bx	Current comparative temperature
	On/Off	Boiler pump (On/Off)
	QX	Relay output
	SDoff	Switching differential Off
	SDon	Switching differential On
	t	Time
	T	Temperature

If the boiler temperature exceeds the comparative temperature by the switch-on differential, the boiler pump is activated:
Current boiler temperature > comparative temperature + temperature differential On.

If the boiler temperature drops by the switch-off differential below the comparative temperature, the boiler pump is deactivated:
Current boiler temperature < comparative temperature + temperature differential Off.

For the boiler pump to be activated, the boiler temperature must have reached not only the necessary temperature differential, but also *Setpoint min* (4110).

Note!
If pump overrun is parameterized, the boiler pump will not be deactivated until the overrun time has elapsed.

Temp diff on

Line no.	*Operating line*
4130	**Temp diff on**

Switch-on temperature differential for control of the solid fuel boiler.

Temp diff off

Line no.	*Operating line*
4131	**Temp diff off**

Switch-off temperature differential for control of the solid fuel boiler.

Comparative temp

Line no.	*Operating line*
4133	**Comparative temp** DHW sensor B3 DHW sensor B31 Buffer sensor B4 Buffer sensor B41 Flow temp setpoint Setpoint min

The comparative temperature for generating the temperature differential to sensor B22 can be selected via parameter:

- DHW storage tank (sensor B3 or B31)
- Buffer storage tank (sensor B4 or B41)
- Flow temperature setpoint (common)
- Minimum setpoint (fixed value)

The selection of the comparative temperature also defines the way the solid fuel boiler is integrated into the hydraulic system and the available choice of functions.

Note!
If sensor B3, B31, B4, B41 or the flow temperature setpoint is used for the comparative temperature, it is also possible to parameterize the minimum setpoint for the pump's switch-on criterion.

DHW storage tank

If sensor B3 or B31 is selected for the comparative temperature, this is the equivalent of integrating the solid fuel boiler directly into the DHW storage tank. *Setpoint min* (4110) is taken into account.

With this kind of integration, DHW charging pump Q3 is only used for DHW heating with a heat source that has open-loop control and is not influenced by the temperature of the wood-fired boiler.

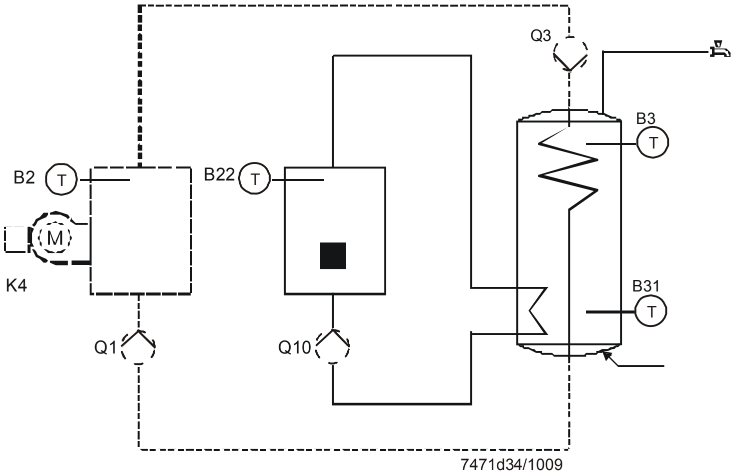


Figure 66: Boiler/burner control – DHW storage tank

Note!
Functions *Excess heat discharge* (forced signal to consumers) and *Locks other heat sources* are active and must be deactivated, if necessary (*Locks other heat sources* (4102), *Excess heat discharge* (4141)).

Buffer storage tank

Sensor B4 or B41 is selected for the comparative temperature. *Setpoint min* (4110) is taken into account.

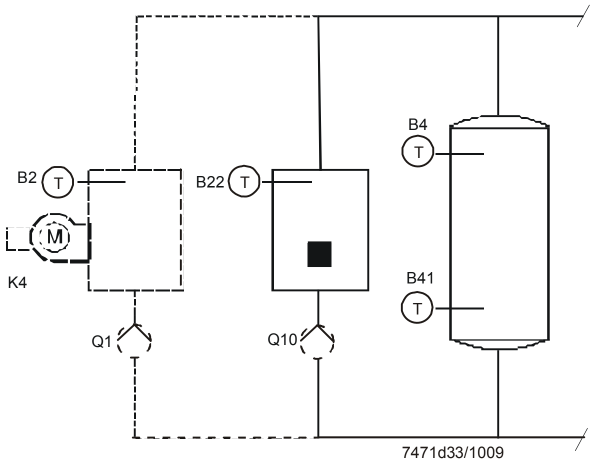
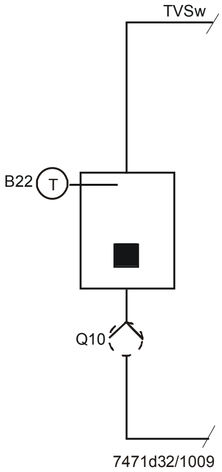


Figure 67: Control of boiler/burner – buffer storage tank

Note!
The function of a buffer storage tank is only available with LPB device address 0 or 1.

Flow temperature setpoint

The common flow temperature setpoint (request for heat from all consumers) is selected as the comparative temperature.
Setpoint min (4110) is taken into account.



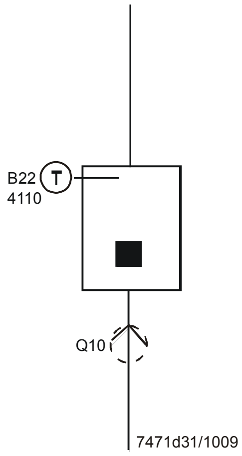
Key

Line no.	*Meaning*
	TVSw Common flow temperature setpoint

Note!
If there is no valid request for heat, *Setpoint min* (4110) applies. The function is only available with LPB device address 0 or 1.

Minimum setpoint

Setpoint min (4110) is selected as the comparative temperature. This means that activation of the boiler pump is solely dependent on the temperature of its boiler.



6.16.5 Overtemperature protection

Pump overrun time

Line no.	*Operating line*
4140	**Pump overrun time**

If the temperature of the solid fuel boiler drops below the minimum temperature differential or the minimum setpoint, the boiler pump remains activated for the parameterized overrun time.

There is no pump overrun, if the pump was activated due to frost protection for the boiler, frost protection for the plant, or overtemperature.

Excess heat discharge

Line no.	*Operating line*
4141	**Excess heat discharge**

If the boiler temperature reaches the set maximum value, excess heat discharge becomes active. This forces the connected consumers to draw heat from the solid fuel boiler. At the same time, the boiler pump is activated.

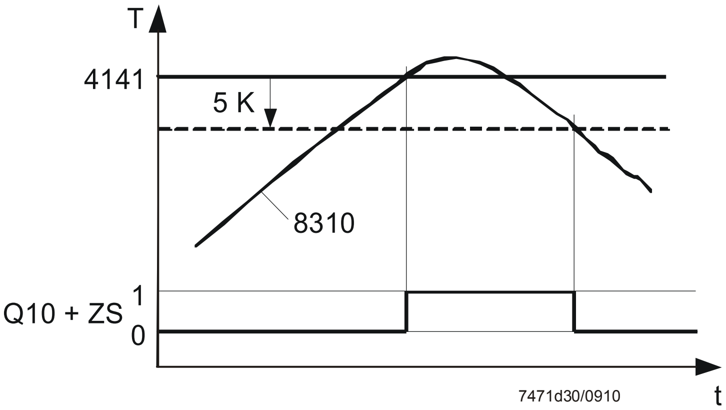


Figure 68: Overtemperature protection

Key

Line no.	*Meaning*	
4141		Excess heat discharge
8310	TKx	Current boiler temperature
	Q10	Solid fuel boiler pump
	ZS	Forced signal

Excess heat discharge is stopped when the boiler temperature lies 5 K below the set *Excess heat discharge* (4141).

Using parameter *Excess heat draw* (e.g. (861) for heating circuit 1), it is possible to select for every consumer whether or not the forced signal shall be considered, thus deciding whether or not the consumer shall contribute to the dissipation of heat.

The discharge of excess heat in the system always takes place segment by segment. System-wide distribution of excess heat discharge starting from segment 0 is not possible.

The consumers give consideration to the forced signal only if demanded by parameter *Excess heat draw* (e.g. (861) for heating circuit 1).

Note!
RVA... devices do not understand the forced signal and do not therefore take part in the discharge of heat.

6.16.6 Frost protection

Frost prot plant boiler pump

Line no.	*Operating line*
4170	**Frost prot plant boiler pump** On Off

The boiler pump is activated, depending on the **current** outside temperature, although there is no request for heat.

Note!
Frost protection for the solid fuel boiler works only if *Frost protection plant* (6120) for the plant is activated.

Outside temperature	Boiler pump	Graph
...-4 °C	Continuously On	ON
-5...1.5 °C	Every 6 hours On for 10 minutes	Takt
1.5 °C...	Continuously Off	OFF

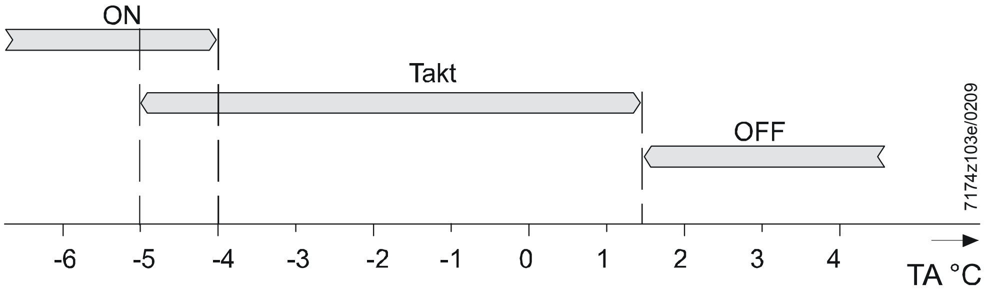


Figure 69: Frost protection

Off
Function is deactivated.

On
Function is activated.

6.16.7 Frost protection for the solid fuel boiler

Function *Frost protection for the boiler* ensures that the pump of the solid fuel boiler is activated when the boiler temperature drops below its *Frost protection* level (4 °C). The function cannot be deactivated.

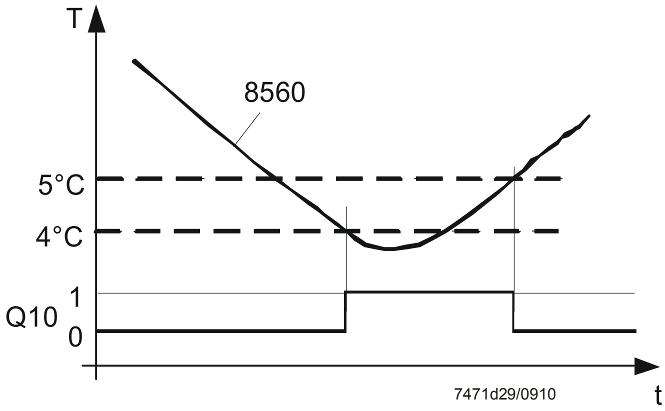


Figure 70: Frost protection for the solid fuel boiler

Key

Line no.	*Meaning*	
8560	TFx	Solid fuel boiler temperature
	Q10	Solid fuel boiler pump
	t	Time
	T	Temperature

6.16.8 Configuration errors

A configuration error (error 146) is generated if sensor B22 is connected and boiler pump Q10 is not parameterized.

A configuration error is generated if a solid fuel boiler diagram is active and *DHW storage tank* or *Buffer storage tank* is selected as the comparative temperature but the respective diagram is missing.

A configuration error is generated if a solid fuel boiler diagram is active and *Flow temperature setpoint* is selected as the comparative temperature and the device address is >1.

6.16.9 Sensor error

Boiler sensor

If sensor B22 is not available (short-circuit or interruption), an error message is generated and the boiler pump is forced to switch on.

Comparative sensor

If the selected comparative sensor B3, B31, B4 or B41 is not available (short-circuit or interruption), the minimum setpoint set in the parameters is used for the calculation.

No specific error message is generated when the comparative sensor is unavailable. An error message might be generated by the comparative sensor itself.

6.17 Buffer storage tank

6.17.1 Release/control of heat source

Release/control of the heat source with a buffer storage tank is described in the following chapters:

Oil- or gas-fired boiler:	Chapter *Automatic heat generation lock*
Solid fuel boiler:	Chapter *Solid fuel boiler*

6.17.2 Automatic locks

Automatic heat generation lock brings about a temporary hydraulic separation of heat source and buffer storage tank. The heat source is put into operation only when the buffer storage tank is no longer able to satisfy the current demand for heat.

Auto generation lock

Line no.	*Operating line*
4720	**Auto generation lock** None With B4 With B4 and B42/B41

None
Function is deactivated.

With B4
Sensor B4 is used to lock or release the heat source.

With B4 and B42/B41
Sensor B4 is used to release the heat source. For the heat generation lock, sensor B42 is used, and if that sensor is not available, sensor B41.

Auto heat gen lock SD

Line no.	*Operating line*
4721	**Auto heat gen lock SD**

The switching differential is adjustable.

Temp diff buffer/HC

Line no.	*Operating line*
4722	**Temp diff buffer/HC**

If the temperature differential ∆T between buffer storage tank and heat request from the heating circuit is sufficiently great, the amount of heat required by the heating circuit is drawn from the buffer storage tank. The heat source is locked.

Note!
When using *Temp diff buffer/HC* (4722), the mixing valve boost of the heat request from the heating circuit can be compensated.

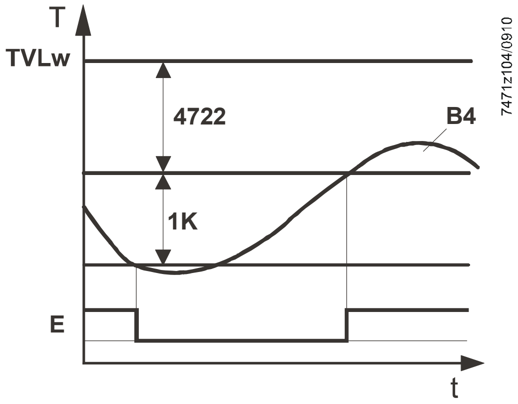


Figure 71: Automatic locks

Key

Line no.	*Meaning*	
4722		Temperature differential of buffer and heating circuit
	B4	Buffer sensor
	E	Heat generation lock
	t	Time
	T	Temperature
	TVLw	Flow temperature setpoint

Min st tank temp heat mode

Line no.	*Operating line*
4724	**Min st tank temp heat mode**

A minimum buffer storage tank temperature can be set in the parameters for heat consumers (mixing valves or pump circuits and heat consumers connected via H1/H2). If the heat source is malfunctioning or locked (or not present), the consumers can be switched off if the buffer storage tank is too cold.
This function prevents heat consumers from letting their pumps run although no heat is available.

The heat consumers are locked if the temperature at the warmest sensor in the buffer storage tank drops by more than 1 K below the minimum level and – at the same time – no heat source is available. The consumers are released again when the buffer storage tank temperature returns to the minimum level (or a heat source becomes available).

Note!
Consumers that do not draw their heat from the buffer storage tank are not affected by this switching off action.

6.17.3 Charging solar/solid fuel boiler

Charging temp max

Line no.	*Operating line*
4750	**Charging temp max**

Solar energy charges the buffer storage tank until the preset maximum charging temperature is reached.

Note!
Function *Protective collector overtemperature* can reactivate the collector pump until the maximum storage tank temperature is reached.

Storage tank temp max

Line no.	*Operating line*
4751	**Storage tank temp max**

When the storage tank reaches the maximum storage tank temperature set here, the collector pump is deactivated. It will be released again when the storage tank temperature drops 1 K below the maximum.

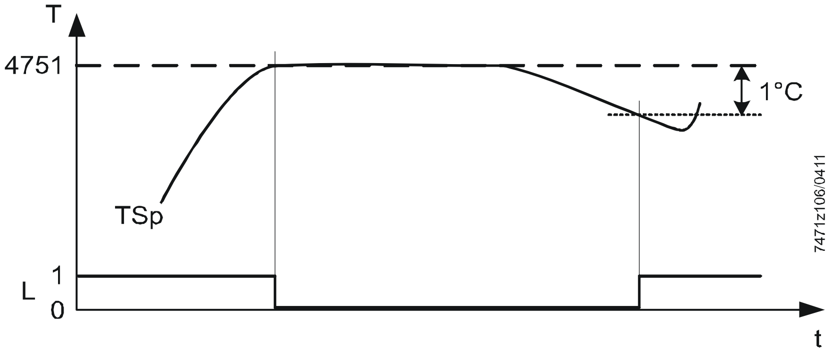


Figure 72: Charging solar/solid fuel boiler

Key

Line no.	*Meaning*	
4751	TSpMax	Maximum storage tank temperature
	L	Storage tank charging (1 = On, 0 = Off)
	t	Time
	T	Temperature
	TSp	Actual value of storage tank temperature

6.17.4 Recooling

Recooling temp

Line no.	*Operating line*
4755	**Recooling temp**

2 functions are available for recooling the buffer storage tank down to the recooling temperature.

Recooling DHW/HCs

Line no.	*Operating line*
4756	**Recooling DHW/HCs** Off On

Heating energy can be drawn off either by space heating or the DHW storage tank. This can be selected separately for each heating circuit (operating page for heating circuit 1…).

Off
Function is deactivated.

On
Function is activated.

Recooling collector

Line no.	*Operating line*
4757	**Recooling collector** Off Summer Always

When the collector is cold, heat can be released to the environment via the collector's surfaces.

Off
Recooling via the collector is deactivated.

Summer
Recooling via the collector is permitted in summer only.

Summertime is when, at midnight, all available heating circuits switch to summer operation according to the summer/winter heating limit.

Always
Recooling via the collector is activated throughout the year.

6.17.5 Plant hydraulics

With solar integration

Line no.	*Operating line*
4783	**With solar integration** No Yes

Select here whether the buffer storage tank can be charged by solar energy.

6.17.6 Return diversion

When there is a certain temperature differential between sensor B73 and the selectable comparative temperature, the return flow is diverted through the lower section of the buffer storage tank. The function can be used for *Return temperature increase* or *Return temperature decrease*. The selection is made via *Optg action return diversion* (4796).

In addition, the setting of the respective relay output is to be made as *Buffer return valve Y15* in configuration *Relay output QX1, 2, 3, 4* (*Relay output QX1*(5890), *Relay output QX2* (5891), *Relay output QX3* (5892), *Relay output QX4* (5894)) and sensor B73 at BX.

Temp diff on/off return div

Line no.	*Operating line*
4790	**Temp diff on return div**
4791	**Temp diff off return div**

The selected temperature differential defines the switch-on/off point of return diversion.

Compar temp return div

Line no.	*Operating line*
4795	**Compar temp return div** With B4 With B41 With B42

Selection of the buffer sensor with which the return temperature is compared to switch the return diversion based on the selected temperature differential.

Optg action return diversion

Line no.	*Operating line*
4796	**Optg action return diversion** Temp decrease Temp increase

Temp decrease
If the consumers’ return temperature is higher than the temperature at the selected sensor (*Compar temp return div* (4795)), the return can be used to preheat the lower storage tank section. As a result, the return temperature drops further which, in the case of a condensing boiler, leads to higher efficiency.

Temp increase
If the consumers’ return temperature is lower than the temperature at the selected sensor (*Compar temp return div* (4795)), the return temperature can be raised by diverting the return through the lower storage tank section. As a result, the return temperature increases.

6.17.7 Partial charging

Partial charging setpoint

Line no.	*Operating line*
4800	**Partial charging setpoint**

By hydraulically decoupling the lower buffer storage tank section, the chargeable storage volume is reduced. As a result, the upper storage tank section is charged in a shorter period of time. The lower storage tank section is charged only when charging of the upper section is completed.

As soon as the temperature acquired by sensor B4/B42 reaches the setpoint of partial charging, the diverting valve switches over to *through-port* and the rest of the storage tank is charged also. For switching over, a fixed switching differential of ¼ °C is used.

Note!
If the slave pointer is higher than the adjusted setpoint of partial charging, charging to the slave pointer value takes place.

Configuration:

Extra function QX… (*Relay output QX1*(5890), *Relay output QX2* (5891), *Relay output QX3* (5892), *Relay output QX4* (5894))	Buffer return valve Y15 in the buffer storage tank
Sensor input BX… (*Sensor input BX1* (5930), *Sensor input BX2* (5931), *Sensor input* BX3 (5932)	Sensor B4 or B42

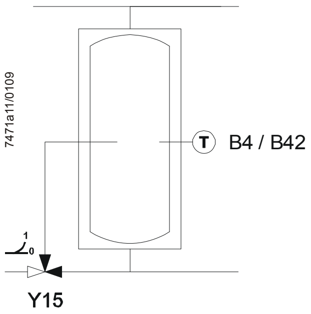


Figure 73: Partial charging

6.17.8 Full charging

Full charging

Line no.	*Operating line*
4810	**Full charging** Off Current heat request Buffer setpoint

Function *Full charging buffer* enables released heat sources to switch off only when the buffer storage tank is fully charged, in spite of automatic heat generation lock. To perform full charging, function *Full charging buffer* (2208) must be activated on the heat sources selected for this purpose. When the function is active, the heat sources parameterized for *Full charging* are switched off only when the full charging setpoint is reached, or when the boilers must be shut down due to burner control.

Off
Function is deactivated.

Current heat request
Full charging becomes active when – due to the buffer storage tank temperature – automatic heat generation locks the heat sources while the heat request is valid. The function is ended when the buffer storage tank's sensor parameterized for the function reaches the required temperature.

Buffer setpoint
Full charging becomes active when – due to the buffer storage tank temperature – automatic heat generation locks the heat sources while the request for heat is valid, or when it becomes invalid. The function is ended when the buffer storage tank's sensor parameterized for the function reaches the required temperature.

Full charging temp min

Line no.	*Operating line*
4811	**Full charging temp min**

The buffer storage tank is charged to at least the set level.

Full charging sensor

Line no.	*Operating line*
4813	**Full charging sensor** With B4 With B42/B41

With B4
The *Full charging* function uses sensor B4.

With B42/B41
The *Full charging* function uses sensor B42 or, if not available, sensor B41.

6.17.9 Frost protection for the buffer in *Heating* mode

Frost protection for the buffer storage tank is always active. If one of the 2 storage tank temperatures at terminal B4 and B41 drops below 5 °C, the storage tank generates a valid request for heat until both storage tank temperatures have exceeded 10 °C.

6.17.10 Heat transfer to the DHW storage tank

The DHW storage tank can be charged by the buffer storage tank, provided the latter's temperature level is high enough. Depending on the type of hydraulic circuit, the transfer of heat can be effected either via charging pump Q3 or transfer pump Q11, which can be configured for this function.

The parameter settings for the point in time heat transfer shall take place, the transfer sensor and the transfer boost apply to both plant configurations.

Heat transfer via charging pump Q3

The sufficiently hot buffer storage tank charges the DHW storage tank via charging pump Q3, provided *DHW storage tank with buffer* has been parameterized.
If Q3 is configured as a diverting valve, or a transfer pump Q11 is configured, there will be no transfer of heat via Q3. Also, it is possible to parameterize the point in time charging by the buffer storage tank shall take place, if required. The minimum boost for the transfer can be set.

Special feature: If a manual push is triggered during heat transfer, the transfer is aborted and normal charging by the heat source is initiated, unless the buffer storage tank is able to satisfy the higher request for heat (function *Automatic heat generation lock*).

Heat transfer via transfer pump Q11

If a transfer pump Q11 is configured – used specifically for this purpose – the transfer of heat is effected via this pump. In that case, the transfer of heat takes place independently of parameter setting *DHW storage tank with buffer*. And charging pump Q3 is only used for charging by the heat source.

Time of heat transfer

In *DHW* mode Off, there is no transfer of heat.
When using parameter *Transfer strategy* (5130)*,* the transfer can be scheduled to impose time limits.

If a transfer pump Q11 is configured– used specifically for this purpose – the transfer of heat is effected via this pump. In that case, the transfer takes place independently of parameter setting DHW storage tank *With buffer* (5090). And charging pump Q3 is only used for charging by the heat source.

Additional parameters

Line no.	*Operating line*
5090	**With buffer**

Transfer sensors and temperature level

For heat transfer to start, the temperature acquired by sensor B4 at the top must lie by at least the parameterized boost above the temperature acquired by sensor B3 or B31 in the DHW storage tank.
If the buffer storage tank temperature drops by more than 2 K below the demanded boost, the transfer of heat is ended.
When there is a valid request for heat from the DHW storage tank, the heat source is released if the buffer storage tank temperature falls below the transfer temperature level currently required. To be able to switch a released heat source off again, the buffer storage tank must lock the release via function *Automatic heat generation lock*.
This approach ensures that a heat source in operation can end DHW charging also when the buffer storage tank temperature increases again due to DHW charging. This means that the heat source is locked again only if the buffer storage tank is able to satisfy the current request for heat.

If sensor B31 is intended for the transfer of heat, and sensor B31 is not available, sensor B3 is automatically used. If, according to parameterization, sensor B3 shall be used for the transfer of heat, but sensor B3 is faulty, there will be no more heat transfer.
If a thermostat is installed in the DHW storage tank, there will be no heat transfer.
If no sensor B4 is connected, sensor B41 will be used, if available.

Additional parameters

Line no.	*Operating line*
5130	**Transfer strategy**

Heat transfer in connection with combi storage tanks

If a transfer pump Q11 is configured, the function is also performed when a combi storage tank is used.
Without Q11, the heat sources receive no request during heat transfer and charging pump Q3 is not activated. After a certain waiting time, the upper part of the storage tank will automatically have assumed a higher temperature. If this waiting time is not desired, the *Transfer* function can be deactivated.

Additional parameters

Line no.	*Operating line*
5021	**Transfer boost**
5131	**Comparison temp transfer**

6.18 DHW storage tank

6.18.1 Types of heat request

When a DHW charging request to the boiler, the electric immersion heater is made, a sensor or thermostat must be connected to terminal B3.

Available sensors		**Type of heat request to the boiler/electric immersion heater**
B3	**B31**	
--	●	No DHW request
Sensor	--	B3/SD
Sensor	Sensor	B3/SD or B3 start/B31 stop
Thermostat	●	Contact start/stop

Key

--	No sensor connected
●	With or without sensor
SD	Switching differential

6.18.2 DHW charging with one sensor

In the case of DHW heating with one sensor (B3), the charging request is made via a 2-position controller.

If the DHW temperature is lower than the current setpoint minus the set switching differential, DHW charging is started.
DHW charging is ended when the temperature reaches the current setpoint.

When DHW heating is released for the first time in the morning, forced charging takes place, which means that DHW charging is also started when the DHW temperature lies within the switching differential. But if the temperature lies less than 1 K below the setpoint, charging will not take place.

Note!
If a sensor is connected to terminal B31, it can be used for solar integration.

Additional parameters

Line no.	*Operating line*
5012	**Forced charging**
5022	**Type of charging**
5024	**Switching diff**

6.18.3 DHW charging with 2 sensors

In the case of DHW heating with 2 sensors (B3 and B31), the charging request is also made via a 2-position controller.

If both DHW temperatures are lower than the current setpoint minus the set switching differential, DHW charging is started.
DHW charging is ended when both temperatures reach the current setpoint.

When DHW heating is released for the first time in the morning, forced charging takes place, which means that DHW charging will also be started when only one of the DHW temperatures lies below the current setpoint. But if the temperature lies less than 1 K below the setpoint, charging will not take place.

Note!
In the case of charging with 2 sensors, the switching differential can be set to *0* K.

Additional parameters

Line no.	*Operating line*
5012	**Forced charging**
5022	**Type of charging**
5024	**Switching diff**

6.18.4 DHW charging with thermostat

In place of a temperature sensor, it is also possible to use a thermostat.
With this application, DHW heating is only dependent on the thermostat's contact position and the release of DHW heating.

DHW charging is started when the thermostat's contact indicates *cold* (contact closed) and the current DHW setpoint is the *Nominal* setpoint.
DHW charging is ended when the thermostat's contact opens. If the current DHW setpoint changes to *Reduced* or the *Frost protection* level, DHW charging is aborted.

The adjusted setpoints are of no importance since temperatures cannot be acquired.
The thermostat must be connected to terminal B3. A sensor connected to terminal B31 can only be used for solar integration.

When using DHW heating with a thermostat, the *Legionella* function is never activated because there is no sensor.
If DHW heating is switching off, even the *cold* thermostat triggers no request. This means that when DHW heating is switched off, frost protection cannot be ensured either.

6.18.5 Release

Charging

Line no.	*Operating line*
5010	**Charging** Once/day Several times/day

Setting *Once/day* or *Several times/day* is active only when DHW release is set in accordance with the heating circuits' time programs.

Once/day

DHW heating is released for the set *Forward shift charging* (5011) before the **first** request from the heating circuit is received.
Then, the reduced DHW setpoint applies the whole day.

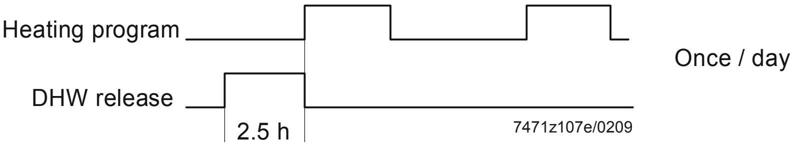


Figure 74: Release – Once/day

Note!
In the case of continuous heating (no setback periods), DHW charging is released at 00:00.
This is also the case if the first request from the heating circuit is received before the set forward shift for charging after midnight.
If the heat request is received exactly at midnight, DHW heating is released after the last setback period, but at the earliest for the set forward shift for charging before midnight.

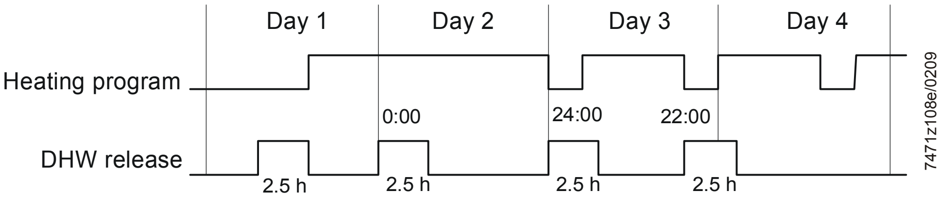


Figure 75: Release – Once/day

Several times/day

With setting *Several times/day,* release of DHW heating is shifted forward in time by the set *Forward shift charging* (5011) against **any** request from the heating circuit and is maintained during the request.

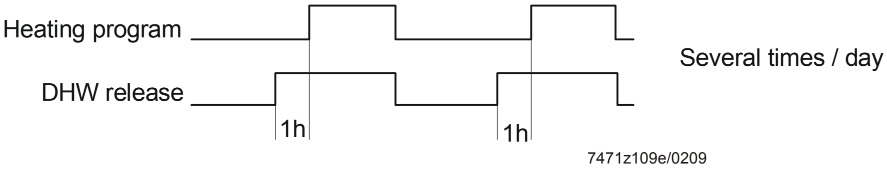


Figure 76: Release – Several times/day

Forward shift charging

Line no.	*Operating line*
5011	**Forward shift charging**

Forward shift to be set for charging.

Forced charging

Line no.	*Operating line*
5012	**Forced charging** Off On

If forced charging is active, the switching differential is reduced to 1 K when charging is effected for the first time during a 24-hour period. There is no influence if the switching differential is set to *1 K* or lower.

Off
Function is deactivated.

On
Function is activated.

6.18.6 Charging control

Flow setpoint boost

Line no.	*Operating line*
5020	**Flow setpoint boost**

The DHW request to the boiler is made up of the current DHW setpoint plus the adjustable charging boost.
The setpoint boost ensures that the required DHW setpoint can be reached within a reasonable period of time. Charging boost can be parameterized.

Transfer boost

Line no.	*Operating line*
5021	**Transfer boost**

Heat transfer makes it possible to transport energy from the buffer storage tank to the DHW storage tank. In that case, the current buffer storage tank temperature must be higher than the current DHW storage tank temperature. The temperature differential can be set here.

Type of charging

Line no.	*Operating line*
5022	**Type of charging** Recharging Full charging Full charging legio Full charg 1st time day Full charg 1st time legio

The storage tank can be charged using up to 2 sensors. It is also possible to combine partial charging with one sensor and the *Legionella* function with 2 sensors (setting 3).

Recharging
The DHW request is always controlled by sensor B3 at the top.

Full charging
The DHW request is always controlled by both sensors B3 and B31.

Full charging legio
When the *Legionella* function is activated, the DHW request is always controlled by both sensors B3 und B31, otherwise only by sensor B3 at the top.

Full charg 1st time day
When charging is effected for the first time in the morning, the DHW request is controlled by both sensors B3 and B31, otherwise only by sensor B3 at the top.

Full charg 1st time legio
When charging is effected for the first time in the morning and the *Legionella* function is activated, the DHW request is controlled by both storage tank sensors B3 and B31, otherwise only by sensor B3 at the top.

Switching diff

Line no.	*Operating line*
5024	**Switching diff**

If the DHW temperature is lower than the current setpoint minus the switching differential set here, DHW charging is started. DHW charging is ended when the temperature reaches the current setpoint.

Note!
When DHW heating is released for the first time in the morning, forced charging is performed. DHW charging is also started when the DHW temperature lies within the switching differential – if it does not lie less than 1 K below the setpoint.

6.18.7 Limitation of charging time

Charging time limitation

Line no.	*Operating line*
5030	**Charging time limitation**

During DHW charging, there may be no heat or not sufficient heat for space heating, depending on the selected *Charging priority* (1630) and the hydraulic circuit. For this reason, it is often practical to have a temporal limitation of DHW charging.

Note!
When space heating is switched off (summer operation, *ECO* function, etc.), DHW charging will not be interrupted, independent of the selected setting.

6.18.8 Charging pump/diverting valve

DHW charging can take place with a charging pump or diverting valve and heat source pump.

Note!
Functions *DHW priority* and *Discharging protection* can only be provided in connection with a charging pump.

If there is demand for heat from space heating, the diverting valve is driven back to the *Space heating* position when DHW charging is ended.
If there is no demand for heat from space heating (summer operation, ECO functions, holidays), it can be selected whether the diverting valve shall wait in the *DHW* position for the next DHW charging cycle or whether it shall return to the *Space heating* position.

Additional parameters

Line no.	*Operating line*
5731	**DHW controlling element**
5734	**Basic pos DHW div valve**

6.18.9 Discharging protection

Discharging protection

Line no.	*Operating line*
5040	**Discharging protection** Off Always Automatically

This function ensures that the DHW charging pump (Q3) is activated only when the heat source temperature is high enough.

- Application with sensor:
  The charging pump is activated only when the heat source temperature lies at a level half the charging boost above the DHW temperature. When, during the charging process, the boiler temperature drops to a level below the DHW temperature plus 1/8 the charging boost, the charging pump is deactivated again. If 2 DHW sensors are parameterized for DHW charging, the lower temperature is considered for the *Discharging protection* function (usually sensor B31).

- Application with thermostat:
  The charging pump is activated only when the boiler temperature lies above the *Nominal* DHW setpoint. When, during the charging process, the boiler temperature drops to a level below the *Nominal* DHW temperature setpoint minus the DHW switching differential, the charging pump is deactivated again.

Off
Function is deactivated.

Always
Function is always active.

Automatically
The function is active only if the heat source is not able to supply heat or if it is not available (fault, heat generation lock).

After charging
When the DHW setpoint is reached, pump overrun starts. If the boiler temperature or the common flow temperature falls below the DHW storage tank temperature during the pump overrun time, pump overrun is ended. If 2 DHW sensors are used, the higher sensor value is taken into consideration.

6.18.10 Overtemperature protection

Charging temp max

Line no.	*Operating line*
5050	**Charging temp max**

Solar energy charges the DHW storage tank to the set maximum DHW charging level.

Note!
Function *Protective collector overtemperature* can reactivate the collector pump until the maximum storage tank temperature is reached.

Storage tank temp max

Line no.	*Operating line*
5051	**Storage tank temp max**

If the storage tank temperature reaches the maximum set here, the charging process is aborted. It is released again when the storage tank temperature drops 1 K below its maximum.

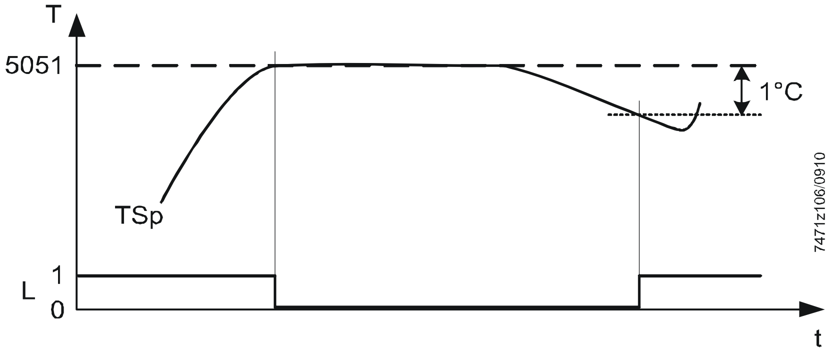


Figure 77: Overtemperature protection

Key

Line no.	*Meaning*	
5051		Maximum storage tank temperature
	L	Storage tank charging (1 = On, 0 = Off)
	t	Time
	T	Temperature
	TSp	Actual value of storage tank temperature

6.18.11 Frost protection for the DHW storage tank

If the DHW temperature drops below the *Frost protection* level of 7 °C, the electric immersion heater is released, independent of the operating mode. When the DHW storage tank temperature returns to a level of 10 °C, the electric immersion heater is locked again.

If there is no electric immersion heater, the heat source is released whenever the DHW temperature falls below 5 °C. When the DHW storage tank temperature returns to a level of 10 °C, the heat source is locked again.

Note!
This function cannot be deactivated.

6.18.12 Recooling

To recool the DHW storage tank, 2 functions are available:

Recooling temp

Line no.	*Operating line*
5055	**Recooling temp**

If activated, the *Recooling* function remains in operation until the set recooling temperature in the DHW storage tank is reached.

Recooling heat gen/HCs

Line no.	*Operating line*
5056	**Recooling heat gen/HCs** Off On

The excess heat contained in the DHW storage tank can be drawn by space heating. This can be selected separately for each heating circuit (e.g. *Excess heat draw* (861) for heating circuit 1).

Off
Function is deactivated.

On
Function is activated.

Recooling collector

Line no.	*Operating line*
5057	**Recooling collector** Off Summer Always

When the collector is cold, the excess heat can be released to the environment via the collector's surface.

Off
Recooling via the collector is deactivated.

Summer
Recooling via the collector is only permitted in the summer. Summer is when, since midnight, all available heating circuits switch to summer operation due to the summer/winter heating limit.

Always
Recooling via the collector is activated throughout the year.

6.18.13 Electric immersion heater

El imm heater optg mode

Line no.	*Operating line*
5060	**El imm heater optg mode** Substitute Summer Always

In place of a boiler, DHW can also be heated with an electric immersion heater. If DHW heating is provided by an electric immersion heater, no request for heat is sent to the boiler. Changeover between boiler and electric immersion heater takes place on the basis of the following criteria:

Warning!
The electric immersion heater is used for the storage tank's *Frost protection* function, independent of the parameter settings for the release, the DHW setpoint or any other settings (refer to chapter *Frost protection for the DHW storage tank*).

Note!
The DHW operating mode button 🚰 also acts on the electric immersion heater. To heat the DHW, the DHW operating mode button must be pressed.

Substitute
The electric immersion heater is only used if the boiler delivers a fault status message or has been shut down via boiler lock. This means that in normal situations the DHW is always heated by the boiler.

Summer
The electric immersion heater is used when all connected heating circuits have switched to summer operation. DHW heating is again ensured by the boiler when at least one of the heating circuits is no longer in summer operation. But the electric immersion heater is also used if the boiler delivers a fault status message or has been shut down via boiler lock.

Always
DHW is heated with the electric immersion heater throughout the year. This means that with this application, the boiler is never used for DHW heating.

El immersion heater release

Line no.	*Operating line*
5061	**El immersion heater release** 24h/day DHW release Time program 4/DHW

A release parameter is available for DHW charging with an electric immersion heater. If, according to the parameterized operating mode, the electric immersion heater is used for DHW heating, the release parameter can be used to select when DHW charging shall be effected within the 24-hour period.

24h/day

If used for that purpose, DHW charging with the electric immersion heater is continuously released to keep the DHW temperature at the *Nominal* setpoint. When the *Legionella* function is activated, charging to the *Legionella* setpoint takes place.

When DHW heating is Off, the storage tank temperature is maintained at the *Frost protection* level (refer to chapter *Frost protection for the DHW storage tank*).
Manual push can be activated.

Example:

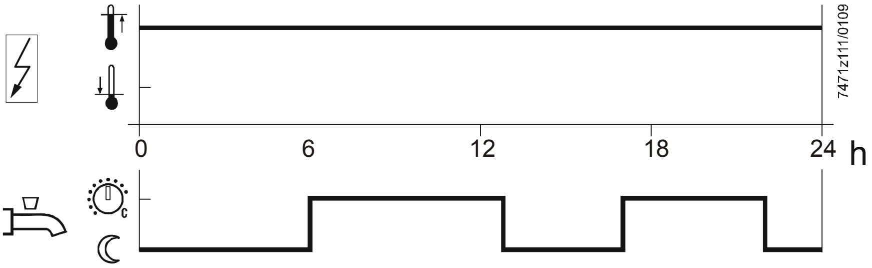


Figure 78: Electrode immersion heater – 24h / day

DHW release

If used for that purpose, DHW charging with the electric immersion heater is released within the DHW release period to keep the DHW temperature at the *Nominal* setpoint. When the *Legionella* function is activated, charging to the *Legionella* setpoint takes place. Outside the DHW release time, charging to the *Reduced* setpoint is ensured.

If required, the automatic DHW push can also switch to the *Nominal* setpoint outside the release period. When DHW heating is Off, the temperature of the storage tank is maintained at the *Frost protection* level (refer to chapter *Frost protection for the DHW storage tank*). Manual push can be activated.

Example:

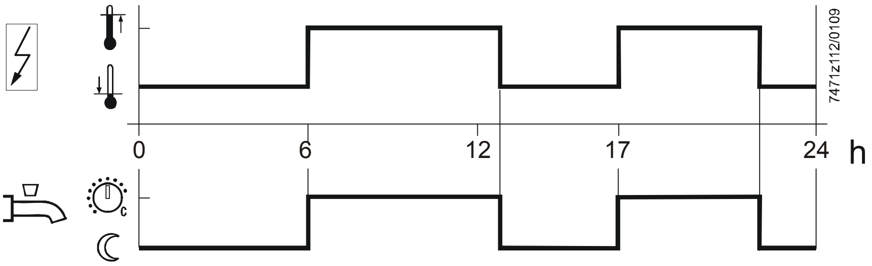


Figure 79: Electrode immersion heater – DHW release

Time program 4/DHW

If used for that purpose, DHW charging with the electric immersion heater is released within time program 4 to keep the DHW temperature at the *Nominal* setpoint. When the *Legionella* function is activated, charging to the *Legionella* setpoint takes place. Outside the release times of the time program, charging to the *Reduced* setpoint is ensured.

If required, the automatic DHW push can also switch to the *Nominal* setpoint outside the release period. When DHW heating is Off, the storage tank temperature is maintained at the *Frost protection* level (refer to chapter *Frost protection for the DHW storage tank*). Manual push can be activated.

Example:

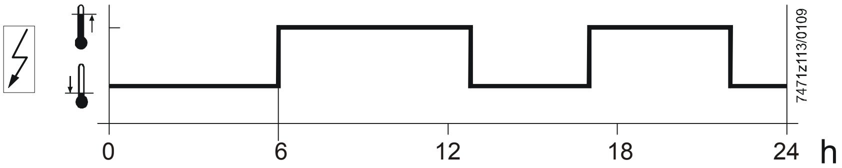


Figure 80: Electrode immersion heater – Time program 4/DHW

Note!

Release of DHW heating takes place only if setting *El imm heater optg mode* (5060) allows the electric immersion heater to be in operation.

El immersion heater control

Line no.	*Operating line*
5062	**El immersion heater control** External thermostat DHW sensor

In the case of DHW heating with an electric immersion heater, the storage tank temperature can be monitored using either an external thermostat in the heater or the controller's sensors.

External thermostat

The electric immersion heater is enabled during the release time, independent of the DHW storage tank temperature. The required storage tank temperature is to be set at the external thermostat.

DHW sensor

During the release time, the electric immersion heater is enabled depending on the storage tank temperature. The current DHW setpoint is maintained. If sensor B3 is a thermostat, temperature control is ensured by that thermostat.

Note!

To ensure that the control with the sensor works, the external thermostat must be set to the minimum storage temperature.

6.18.14 DHW push

The DHW push can be triggered either manually or automatically. It ensures one-time DHW charging to the *Nominal* setpoint.

The manual DHW push is triggered by pressing the DHW operating mode button for at least 3 seconds.
The DHW push is active until the *Nominal* DHW setpoint is reached. If, at the time of the manual push, the *Legionella* function is due, the push is made until the *Legionella* setpoint is reached.

Note!
Once triggered, the DHW push cannot be canceled via the operator unit.

Note!
Manual push is also triggered in *Off* mode when operating mode changeover is active via input Hx or LPB, or when all heating circuits are in *Holiday* mode.

Automatic push

Line no.	*Operating line*
5070	**Automatic push** Off On

Note!
This function is only active when DHW heating is On.

Example

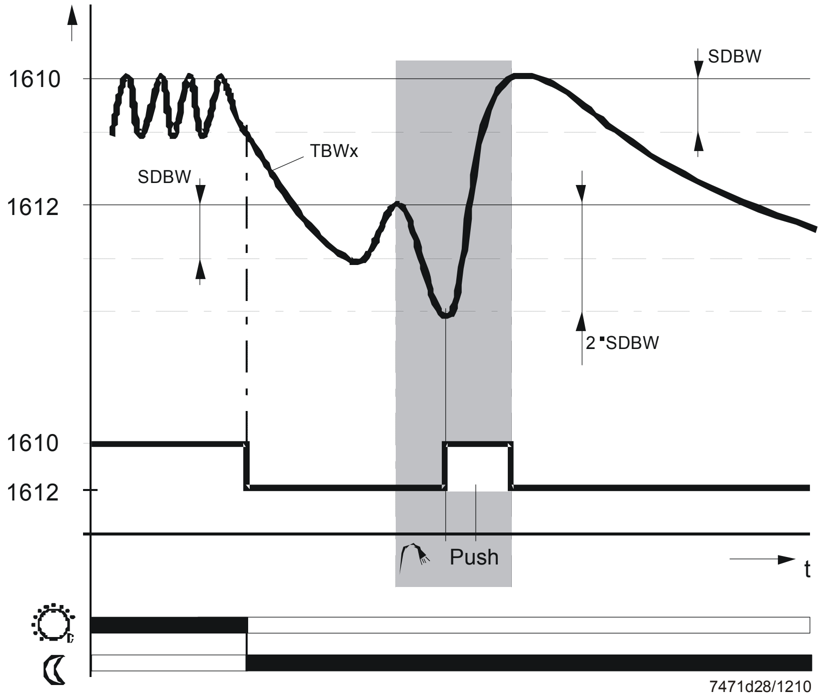


Figure 81: DHW push

Key

Line no.	*Meaning*	
1610	TBWw	Nominal setpoint of DHW temperature
1612	TBWR	Reduced setpoint of DHW temperature
5024	SDBW	Switching difference
	TBWx	DHW temperature actual value

Off

The DHW push can only be triggered manually.

On

If the DHW temperature drops by more than 2 switching differentials (Switching diff (5024)) below the *Reduced setpoint* (1612), one-time charging to the *Nominal setpoint* (1610) is effected again.

Charging prio time push

Line no.	*Operating line*
5071	**Charging prio time push**

With the manual DHW push, the DHW storage tank is charged with absolute priority during the set period of time.

6.18.15 Excess heat draw

Excess heat draw

Line no.	*Operating line*
5085	**Excess heat draw** Off On

Excess heat draw can be triggered by the following functions:

- Inputs Hx
- Storage tank recooling
- Solid fuel boiler with excess heat draw

When excess heat draw is activated, surplus heat can be fed to the DHW storage tank.

Off
Function is deactivated.

On
Function is activated.

6.18.16 Plant hydraulics

With buffer

Line no.	*Operating line*
5090	**With buffer** No Yes

If a buffer storage tank is installed, select whether the DHW storage tank can draw heat from it. When using alternative heat sources, the buffer storage tank temperature is used as a control criterion for the release of additional heat sources.

No
Hydraulically speaking, the DHW storage tank is not connected to the buffer storage tank.

Yes
The DHW storage tank is hydraulically connected to the buffer storage tank. This means that the transfer of heat via Q3 is always possible.

With prim contr/system pump

Line no.	*Operating line*
5092	**With prim contr/system pump** No Yes

Enter whether the DHW storage tank receives its heat via the primary controller or with the help of the system pump (depending on the type of plant).

With solar integration

Line no.	*Operating line*
5093	**With solar integration** No Yes

Enter whether the DHW storage tank receives its heat from the solar collectors.

6.18.17 Speed-controlled pump

Pump speed min

Line no.	*Operating line*
5101	**Pump speed min**

Pump speed max

Line no.	*Operating line*
5102	**Pump speed max**

Speed control of charging pump

The speed of the charging pump motor is limited by a minimum and maximum permissible speed.
To ensure reliable startup, the pump is started running at the parameterized starting speed for 10 seconds.

Speed Xp

Line no.	*Operating line*
5103	**Speed Xp**

The proportional band Xp defines the controller's gain. A smaller proportional band leads to higher speeds of the charging pump while maintaining the same proportional offset.

Speed Tn

Line no.	*Operating line*
5104	**Speed Tn**

The integral action time Tn determines the controller's rate of response when correcting proportional offsets. Shorter integral action time's lead to faster correcting actions.

Speed Tv

Line no.	*Operating line*
5105	**Speed Tv**

The derivative action time Tv defines the time a spontaneous change of the control deviation continues to be felt. Shorter derivative action times only have a short-time impact on the manipulated variable.

Pump speed min OEM

Line no.	*Operating line*
5106	**Pump speed min OEM**

Here, you can set the minimum speed (OEM) of the DHW pump.

Pump speed max OEM

Line no.	*Operating line*
5107	**Pump speed max OEM**

Here, you can set the maximum speed (OEM) of the DHW pump.

Starting speed charg pump

Line no.	*Operating line*
5108	**Starting speed charg pump**

Here, you can set the speed of the charging pump for the start kick.

St speed interm circ pump

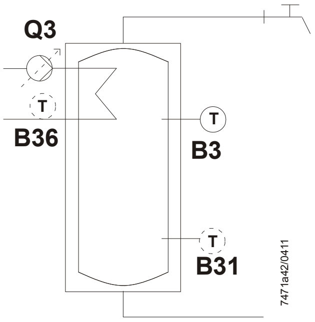
Line no.	*Operating line*
5109	**St speed interm circ pump**

Here, you can set the speed of the intermediate circuit pump for the start kick.

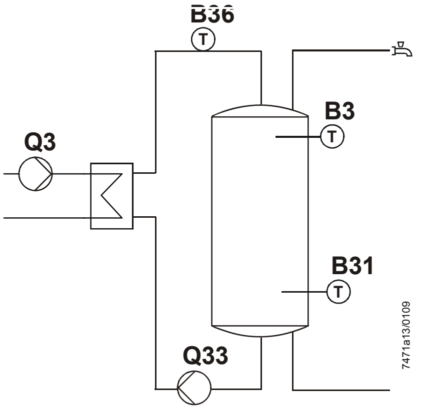
Speed control

Speed control of DHW charging pump Q3

Storage tank with built-in heat exchanger and sensor B36 in the return. The control calculates the speed of the charging pump such that the temperature at sensor B36 lies 2 K above the storage tank temperature at sensor B3.
If the return temperature is higher, the speed is increased, otherwise it is reduced.



Storage tank with external heat exchanger and sensor B36 in the flow (partial diagrams 22 and 23).



When setpoint compensation is active (*Flow setp compensation delay* (5142) not OSV): The control calculates the speed of the charging pump such that the charging temperature at sensor B36 exceeds the DHW setpoint by the parameterized *Intermediate circuit boost* (5140). If the charging temperature is higher, the speed is reduced.

When setpoint compensation is deactivated (*Flow setp compensation delay* (5142) OSV): In the case of full charging, the charging pump is controlled to the parameterized minimum speed, and in the case of recharging to the parameterized maximum speed.

The control calculates the speed of the intermediate circuit pump such that the charging temperature at sensor B36 exceeds the DHW setpoint by the parameterized *Intermediate circuit boost* (5140). If the charging temperature is higher, the speed of the intermediate circuit pump is increased. If no valid sensor B36 is connected, the pump is controlled to the parameterized maximum speed.

6.18.18 Heat transfer

Transfer strategy

Line no.	*Operating line*
5130	**Transfer strategy** Off Always DHW release

Heat transfer is permitted at all times or at the set release times (*Release* (1620)).

Off
Charging pump Q3 effects no transfer of heat. For the transfer of heat with transfer pump Q11, the procedure with this setting is the same as that with setting *TDHW release*.

Always
The transfer of heat (with Q3 or Q11) can take place at any time, provided the DHW storage tank temperature lies below the nominal level. When the *Legionella* function is active, the transfer is effected until the legionella setpoint is reached.

DHW release
The transfer of heat (with Q3 or Q11) is made only if the DHW storage tank delivers a valid heat request. The transfer is effected until the DHW storage tank temperature reaches the current setpoint.

Comparison temp transfer

Line no.	*Operating line*
5131	**Comparison temp transfer** DHW sensor B3 DHW sensor B31

For heat transfer purposes, the respective DHW sensor can be used for the comparison temperature.

6.18.19 Stratification storage tank/intermediate circuit

Identification stratification storage tank

The LMS14... identifies a DHW storage tank as a stratification tank (with external heat exchanger) if an intermediate circuit pump (Q33) was configured.

Variant:

Note!
To be able to make use of this variant, it must be enabled by Siemens.

If a DHW system with intermediate circuit pump (Q33) is configured, a partial diagram *Stratification storage tank* is identified only when …
- a sensor input for a sensor (B36) was configured, and
- a valid sensor value is acquired at this sensor input.

Otherwise, a partial diagram *Storage tank* (with built-in heat exchanger) is identified. In that case, the output configured for the control of the intermediate circuit pump (Q33) is not controlled.

Interm circ boost recharging

Line no.	*Operating line*
5139	**Interm circ boost recharging**

Setpoint increase for the charging setpoint at sensor B36 in the case of recharging.

Intermediate circuit boost

Line no.	*Operating line*
5140	**Intermediate circuit boost**

Setpoint increase for the charging setpoint at sensor B36 in the case of full charging.

Excess interm circ temp max

Line no.	*Operating line*
5141	**Excess interm circ temp max**

This parameter is used to define the final criterion for full charging in the case of control according to sensor B36. When the stratification storage tank is fully charged right down to the bottom, the temperature at the charging sensor rises.

Flow setp compensation delay

Line no.	*Operating line*
5142	**Flow setp compensation delay**

Here, set the filter time for setpoint compensation.
Setting *OSV* means that the burner’s output is controlled directly according to the temperature acquired by sensor B36.

Flow setp compensation Xp

Line no.	*Operating line*
5143	**Flow setp compensation Xp**

The proportional band Xp defines the controller’s gain. A smaller proportional band leads to a higher flow temperature setpoint while maintaining the same offset.

Flow setp compensation Tn

Line no.	*Operating line*
5144	**Flow setp compensation Tn**

The integral action time Tn determines the controller’s rate of response when correcting proportional offsets. Shorter integral action time's lead to faster correcting actions.

Flow setp compensation Tv

Line no.	*Operating line*
5145	**Flow setp compensation Tv**

The derivative action time Tv defines the time a spontaneous change of the control deviation continues to be felt. A short derivative action times only has a short-time impact on the manipulated variable.

Full charging with B36

Line no.	*Operating line*
5146	**Full charging with B36** No Yes

Here, you can select whether the end of full charging shall be detected by sensor B36.

No
The end of full charging is detected by sensors B3 and sensor B31 at the top and bottom of the storage tank.

Yes
The end of full charging is detected by sensor B3 at the top of the storage tank and by sensor B36.

Foresee time DHW prio

Line no.	*Operating line*
[2385.1]	**Foresee time DHW prio**

This parameter determines the rate at which the locking signal increases with shifting priority. The longer the set time, the more slowly the locking signal increases.

Note!
In general, this parameter is used in connection with the DHW storage tank.

Tn boiler temp DHW prio

Line no.	*Operating line*
[3196.1]	**Tn boiler temp DHW prio**

This parameter determines the rate at which the locking signal decreases with shifting priority. The longer the set time, the more slowly the locking signal decreases.

Note!
In general, this parameter is used in connection with the DHW storage tank.

Min start temp diff Q33

Line no.	*Operating line*
5148	**Min start temp diff Q33**

This parameter determines the switch-on delay of the intermediate circuit pump depending on the boiler temperature. The intermediate circuit pump is activated whenever the boiler temperature reaches the level of DHW setpoint plus the value set here. When setting this parameter to -5 °C, for instance, the intermediate circuit pump is activated as soon as the boiler temperature reaches a level 5 K below the DHW setpoint. Setting *OSV* means that the intermediate circuit pump is activated with no delay.

Excess interm circ temp del

Line no.	*Operating line*
5151	**Excess interm circ temp del**

Control of the burner output according to the charging temperature is activated when – since the start of the intermediate circuit pump – the time set here has elapsed.

6.19 Storage tank systems

6.19.1 Control of storage tank with sensor

For storage tank control with sensor, at least one sensor is required: Sensor B3 at the top of the tank. Optionally, temperature sensor B31 at the bottom can be used. If *Full charging* is selected as the *Type of charging* (5022), the sensor at the bottom is also used for starting or ending the storage tank charging process. If only sensor B3 at the top is installed and *Full charging* is selected as the *Type of charging* (5022), the unit behaves as if *Recharging* was selected as the *Type of charging* (5022).

***Legionella* function active:**
When the *Legionella* function is active, the parameterized *Legionella funct setpoint* (1645) is used as the DHW temperature setpoint.

Triggering a DHW request:
In the case of recharging, storage tank charging is triggered when the temperature acquired by the sensor at the top lies by at least the parameterized *Switching diff (5024)* below the DHW temperature setpoint.

ON
DHW temp 1 (8830) < DHW temp setpoint (8831) – Switching diff (5024)

In the case of full charging, storage tank charging is triggered when the temperature acquired by both sensors lies by at least the parameterized *Switching diff (5024)* below the DHW temperature setpoint.

ON
DHW temp 1 (8830) < DHW temp setpoint (8831) – Switching diff (5024)
and
DHW temp 2 (8832) < DHW temp setpoint (8831) – Switching diff (5024)

Ending a DHW request:
In the case of recharging, storage tank charging is ended when the temperature acquired by the sensor at the top reaches the current *DHW* setpoint.

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831*)*

In the case of full charging, storage tank charging is ended when the temperature acquired by both sensors reaches the current *DHW* setpoint.

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)
and
DHW temp 2 (8832) > *DHW temp setpoint* (8831)

The burner is switched on when the boiler temperature lies by at least the parameterized *Switching diff on DHW* (2460) below the *Boiler setpoint* (8311). It is switched off when the boiler temperature lies by at least the parameterized *Switching diff off min DHW* (2461)/*Switching diff off max DHW* (2462) above the *Boiler setpoint* (8311).
The output request to the burner is controlled between *Required speed LF* (9524) and *Required speed HF* (9529).

Note!
Depending on *Enable QAA fan para* [4337.1], the required fan speeds to be applied differ:
If *Enable QAA fan para* [4337.1] is set to *On*, the *Required speed LF* (9524) or *Required speed HF* (9529) applies to low-fire; if set to *Off*, the *Required speed LF min* (9525) or *Required speed HF max* (9530) applies to high-fire.

If a modulating pump is used, the parameterized maximum pump control ensures DHW charging:

Degree of modulation of pump = *Pump speed max* (5102)

At the end of the DHW request, the pump starts to overrun. The overrun time can be set via *Pump overr time after DHW* (2253).

Info/diagnostics

Line no.	*Operating line*
8311	**Boiler setpoint**
8830	**DHW temp 1**
8831	**DHW temp setpoint**
8832	**DHW temp 2**

Additional parameters

Line no.	*Operating line*
1645	**Legionella funct setpoint**
2253	**Pump overr time after DHW**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
5022	**Type of charging**
5024	**Switching diff**
5102	**Pump speed max**
9524	**Required speed LF**
9525	**Required speed LF min**
9529	**Required speed HF**
9530	**Required speed HF max**

6.20 Stratification storage tank

The stratification storage tank is characterized by an external heat exchanger. To charge the tank, (cold) water is fed from the lower section of the tank to an external heat exchanger where it is heated. The hot water then returns to the upper section of the storage tank.
The benefit offered by this type of storage tank charging is that DHW is available after a short period of time. In addition – depending on demand – only the upper section of the storage tank will have to be charged. The lower section can be charged by a solar plant, for example.

With stratification storage tank systems, either the pump in the primary circuit (DHW charging pump (Q3) or, in the case of a diverting valve, the boiler pump (Q1)) or the intermediate circuit pump can be a modulating pump.

Minimum and maximum limitation of the pump's modulation range can be set via parameters *Pump speed min* (5101) and *Pump speed max* (5102) respectively.

With stratification storage tanks, a distinction is made between 2 different types of DHW charging:
1. Full charging.
2. Recharging.

The type of stratification storage tank charging depends primarily on parameter *Type of charging* (5022).

The parameter offers the following setting choices:

Recharging:
The only type of stratification storage tank charging used is *Recharging*.

Full charging:
The only type of stratification storage tank charging used is *Full charging*.

Full charging legio:
When the *Legionella* function is due, the stratification storage tank is fully charged, otherwise only recharged.

Full charg 1st time day:
The first charging cycle of the day is in the form of *Full charging*. If additional charging cycles are required, *Recharging* is used.

Full charg 1st time legio:
The first charging cycle of the day and the *Legionella* function are in the form of *Full charging*. If additional charging cycles are required, *Recharging* is used.

If the full charging criterion does not apply, *Recharging* is used.

Also, in the case of a stratification storage tank, the type of sensor used for controlling the burner's output during charging can be selected.

During storage tank charging (*Recharging* or *Full charging*), the control can be effected either to the boiler flow temperature or the storage tank charging temperature. The control to the storage tank charging temperature can take place either directly or indirectly by adequately influencing the boiler temperature setpoint (setpoint compensation).

Additional parameters

Line no.	*Operating line*
5022	**Type of charging**
5101	**Pump speed min**
5102	**Pump speed max**

6.20.1 Stratification storage tank with control to the boiler temperature flow

In the case of control to the boiler temperature setpoint, full charging requires a sensor at the top (B3) and at the bottom (B31) of the storage tank. If the sensor at the bottom is not installed, only recharging is possible, regardless of the parameterized *Type of charging* (5022). When using control to the boiler temperature setpoint, sensor B36 must not be connected.

The boiler temperature setpoint is calculated from the current DHW temperature setpoint and the parameterized *Flow setpoint boost* (5020):

Boiler temperature setpoint = *DHW temp setpoint* (8831) + *Flow setpoint boost* (5020)

The burner is switched on when the boiler temperature lies by at least the parameterized *Switching diff on DHW* (2460) below the *Boiler setpoint* (8311). It is switched off when the boiler temperature lies by at least the parameterized *Switching diff off min DHW* (2461)/*Switching diff off max DHW* (2462) above the *Boiler setpoint* (8311).

The output request to the burner is controlled between the parameterized *Required speed LF min* (9525) and the maximum output in *DHW* mode *Fan speed DHW max* (2444). If no maximum output for *DHW* mode is parameterized (OSV), the burner's maximum output *Required speed HF max* (9530) is available.

The DHW intermediate circuit pump (Q33) can be activated with a delay in relation to the pump in the primary circuit. The delay is dependent on the rate of boiler temperature increase. For this, *Min start temp diff Q33* (5148) can be used to set a temperature differential. The intermediate circuit pump is activated when the boiler temperature reaches the level of current *DHW* setpoint minus the value set here (in the case of a negative value), or when the boiler temperature exceeds the current *DHW* setpoint by the value set here (in the case of a positive value).

ON
Boiler temp (8310) > *DHW temp setpoint* (8831) + *Min start temp diff Q33* (5148)

If, subsequently, the boiler temperature drops below this limit, the intermediate circuit pump still remains activated.
The temperature differential can be parameterized in the range from -20 K to +20 K. If the temperature differential is set to OSV (---), the intermediate circuit pump is activated with no delay in relation to the pump in the primary circuit.

If the pump in the primary circuit (boiler pump (Q1) or DHW charging pump (Q3)) is configured as a modulating pump, it is constantly controlled with the parameterized *Pump speed max* (5102)) with both types of charging.

When the *Legionella* function is active, the parameterized *Legionella funct setpoint* (1645) is used as the *DHW* setpoint.

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8311	**Boiler setpoint**
8831	**DHW temp setpoint**

Additional parameters

Line no.	*Operating line*
1645	**Legionella funct setpoint**
2444	**Fan speed DHW max**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
5020	**Flow setpoint boost**
5022	**Type of charging**
5102	**Pump speed max**
5148	**Min start temp diff Q33**
9525	**Required speed LF min**
9530	**Required speed HF max**

6.20.1.1. Full charging of stratification storage tank

With full charging, the entire content of the stratification storage tank is charged to the current *DHW* setpoint.

Full charging requires both sensors (B3 and B31). If sensor B31 at the bottom is not installed, *Full charging* means *Recharging*.

Charging is aborted if the water temperature at one of the storage tank sensors exceeds the *Charging temp max* (5050). Charging is continued as soon as the water temperature at that sensor drops by at least 1 K below the maximum storage tank charging temperature and the water temperature at the other sensor has not yet reached the *DHW* setpoint.

Triggering a DHW request:
Full charging is started when the water temperature at both storage tank sensors lies by at least the parameterized *Switching diff* (5024) below the *DHW* setpoint.

ON
DHW temp 1 (8830) < *DHW temp setpoint* (8831) – *Switching diff* (5024)
and
DHW temp 2 (8832) < *DHW temp setpoint* (8831) – *Switching diff* (5024)

Ending a DHW request:
Full charging is ended when the entire content of the storage tank reaches the current *DHW* setpoint. This means that the final criterion is met when the water temperature at both storage tank sensors reaches the *DHW* setpoint.

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)
and
DHW temp 2 (8832) > *DHW temp setpoint* (8831)

If, during the time full charging is active, the release criterion for full charging does not apply anymore, the DHW request is ended according to the criteria for recharging.

Info/diagnostics

Line no.	*Operating line*
8830	**DHW temp 1**
8831	**DHW temp setpoint**
8832	**DHW temp 2**

Additional parameters

Line no.	*Operating line*
5024	**Switching diff**
5050	**Charging temp max**

6.20.1.2. Recharging the stratification storage tank

When recharging, only the upper section of the storage tank is charged to the current *DHW* setpoint.

Triggering a DHW request:
Recharging is triggered when the temperature acquired by sensor B3 at the top lies by at least the parameterized *Switching diff* (5024) below the current *DHW* setpoint.

ON
DHW temp 1 (8830) < *DHW temp setpoint* (8831) – *Switching diff* (5024)

The *Boiler setpoint* (8311) for recharging is calculated from the *DHW* setpoint plus the parameterized *Flow setpoint boost* (5020).

Ending a DHW request:
Recharging is ended when the temperature acquired by sensor B3 at the top reaches the current *DHW* setpoint.

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)

If, during the time recharging is active, the enable criterion for full charging is met, the DHW request is ended according to the criteria for full charging.

Info/diagnostics

Line no.	*Operating line*
8311	**Boiler setpoint**
8830	**DHW temp 1**
8831	**DHW temp setpoint**

Additional parameters

Line no.	*Operating line*
5020	**Flow setpoint boost**
5024	**Switching diff**

6.20.2 Stratification storage tank with control to the DHW charging temperature via setpoint compensation

Control to the charging temperature allows the entire content of the storage tank to be charged to the required *DHW* setpoint.

This type of control requires a sensor B36 to be configured and connected to one of the multifunctional sensor inputs. In addition, setpoint compensation for DHW charging is to be activated via parameter *Flow setp compensation delay* (5142), which means that the parameter is not allowed to be OSV (---).

Full charging with B36 (5146) can be used to define whether full charging shall be ended when the DHW charging temperature rises. Otherwise, full charging is ended via sensor B31 at the bottom.

If the pump in the primary circuit (boiler pump (Q1) or DHW charging pump (Q3)) is configured as a modulating pump, the speed of that pump is modulated in a way that the temperature maintained at sensor B36 is the charging setpoint. The pump's speed is increased as long as the temperature acquired by sensor B36 lies below the charging setpoint; otherwise, the pump's speed is reduced.

If the DHW intermediate circuit pump (Q33) is configured as a modulating pump, the speed of that pump is modulated in a way that the temperature maintained at sensor B36 is the charging setpoint. The speed of the intermediate circuit pump is reduced until the temperature acquired by sensor B36 lies below the charging setpoint; otherwise, the pump's speed is increased.

The speed of the pump is modulated between the parameterized minimum *Pump speed min* (5101) and the parameterized maximum *Pump speed max* (5102). The pump's speed is controlled via the controller coefficient for the DHW pump (*Speed Xp* (5103), *Speed Tn* (5104), and *Speed Tv* (5105)).

The DHW intermediate circuit pump (Q33) can be activated with a delay in relation to the pump in the primary circuit. The delay depends on the rate of boiler temperature increase. For this, *Min start temp diff Q33* (5148) can be used to set a temperature differential. The intermediate circuit pump is activated when the boiler temperature reaches the level of current *DHW* setpoint minus the value set here (in the case of a negative value), or when the boiler temperature exceeds the current *DHW* setpoint by the value set here (in the case of a positive value).

ON
Boiler temp (8310) > *DHW temp setpoint* (8831) + *Min start temp diff Q33* (5148)

If, subsequently, the boiler temperature drops below this limit, the intermediate circuit pump still remains activated.
The temperature differential can be parameterized in the range from -20 K to +20 K. If the temperature differential is set to OSV (---), the intermediate circuit pump is switched on with no delay in relation to the pump in the primary circuit.

When the *Legionella* function is active, the parameterized *Legionella funct setpoint* (1645) is used as the *DHW* setpoint.

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8831	**DHW temp setpoint**

Additional parameters

Line no.	*Operating line*
1645	**Legionella funct setpoint**
5101	**Pump speed min**
5102	**Pump speed max**
5103	**Speed Xp**
5104	**Speed Tn**
5105	**Speed Tv**
5142	**Flow setp compensation delay**
5146	**Full charging with B36**
5148	**Min start temp diff Q33**

6.20.2.1. Full charging of stratification storage tank

With full charging, the entire content of the stratification storage tank is charged to the current *DHW* setpoint.

Full charging with B36 (5146) can be used to define whether full charging shall be ended when the DHW charging temperature rises. This setting makes sense when sensor B31 at the bottom is used for a solar application. Otherwise, full charging is ended via sensor B31 at the bottom.

Triggering a DHW request:
If sensor B31 is used for solar (*Full charging with B36 = Yes*) or is not installed, full charging is started when the temperature acquired by sensor B3 at the top lies by at least the parameterized *Switching diff* (5024) below the current *DHW temp setpoint* (8831):

ON
DHW temp 1 (8830) < *DHW temp setpoint* (8831) – *Switching diff* (5024)

If sensor B31 is installed and not used for solar (*Full charging with B36 = No*), full charging is started when the temperature at both storage tank sensors lies by at least the parameterized *Switching diff* (5024) below the *DHW temp setpoint* (8831):

ON
DHW temp 1 (8830) < *DHW temp setpoint* (8831) – *Switching diff* (5024)
and
DHW temp 2 (8832) < *DHW temp setpoint* (8831) – *Switching diff* (5024)

The setpoint for the charging temperature at sensor B36 is calculated from the *DHW* setpoint plus the parameterized *Intermediate circuit boost* (5140):

Temperature charging setpoint = *DHW temp setpoint* (8831) + *Intermediate circuit boost* (5140)

First, the *Boiler setpoint* (8311) results from the *DHW temp setpoint* (8831) plus the parameterized *Flow setpoint boost* (5020).

Internal boiler temperature setpoint = *DHW temp setpoint* (8831) + *Flow setpoint boost* (5020)

Setpoint compensation becomes active when the parameterized *Flow setp compensation delay* (5142) has elapsed. The delay starts when the DHW intermediate circuit pump (Q33) is switched on.

Setpoint compensation readjusts the initial boiler temperature setpoint (internally) in a way that the temperature maintained at sensor B36 is the charging setpoint.
If the temperature acquired by sensor B36 remains below the charging setpoint, setpoint compensation raises the *Boiler setpoint* (8311). If the temperature at sensor B36 exceeds the charging setpoint, the *Boiler setpoint* (8311) is reduced.

Setpoint compensation is implemented in the form of a PID controller. Parameters *Flow setp compensation Xp* (5143), *Flow setp compensation Tn* (5144), and *Flow setp compensation Tv* (5145) are used as the controller coefficients. The temperature acquired by sensor B36 serves as the control variable.

The *Boiler setpoint* (8311) is thus the result of the initial boiler temperature setpoint (internally) plus the readjustment calculated by setpoint compensation:

Boiler setpoint (8311) = internal boiler temperature setpoint + correction value

Setpoint compensation has a control range from -100% to +50% and is applied to the parameterized *Flow setpoint boost* (5020).

This means that setpoint compensation can readjust the *Boiler setpoint* (8311) downward to the *DHW temp setpoint* (8831) and upward to the *DHW temp setpoint* (8831) plus 1.5 times the *Flow setpoint boost* (5020).

Ending the DHW request:
If sensor B36 is parameterized for detecting the end of full charging (*Full charging with B36* = *Yes*), full charging is ended when the temperature at sensor B36 exceeds the charging setpoint by the value of *Excess interm circ temp max* (5141), and the temperature acquired by the storage tank sensor at the top reaches the *DHW* setpoint:

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)
and
DHW charging temp (8836) > Temperature charging setpoint + *Excess interm circ temp max* (5141)

If sensor B31 at the bottom is installed and sensor B36 is not parameterized for detecting the end of full charging (*Full charging with B36* = *No*), full charging is ended when the temperature at both storage tank sensors reaches the *DHW* setpoint:

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)
and
DHW temp 2 (8832) > *DHW temp setpoint* (8831)

The burner is switched on when the *Boiler temp* (8310) lies by at least the parameterized *Switching diff on DHW* (2460) below the *Boiler setpoint* (8311). It is switched off when the boiler temperature lies by at least the parameterized *Switching diff off min DHW* (2461)/*Switching diff off max DHW* (2462) above the *Boiler setpoint* (8311).

The output request to the burner is controlled between the parameterized *Required speed LF min* (9525) and the maximum output in *DHW* mode *Fan speed DHW max* (2444). If no maximum output for *DHW* mode is parameterized (OSV), the burner's maximum output, *Required speed HF max* (9530), will be available.

If, during the time full charging is active, the enable criterion for full charging does not apply anymore, the DHW request is ended according to the criteria for recharging.

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8311	**Boiler setpoint**
8830	**DHW temp 1**
8831	**DHW temp setpoint**
8832	**DHW temp 2**
8836	**DHW charging temp**

Additional parameters

Line no.	*Operating line*
2444	**Fan speed DHW max**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
5020	**Flow setpoint boost**
5024	**Switching diff**
5140	**Intermediate circuit boost**
5141	**Excess interm circ temp max**
5142	**Flow setp compensation delay**
5143	**Flow setp compensation Xp**
5144	**Flow setp compensation Tn**
5145	**Flow setp compensation Tv**
5146	**Full charging with B36**
9525	**Flow setp compensation Tv**
9530	**Required speed HF max**

6.20.2.2. Recharging the stratification storage tank

When recharging the stratification storage tank, only the upper section of the tank is charged to the current *DHW* setpoint.

Recharging is started when the temperature acquired by sensor B3 at the top lies by at least the parameterized *Switching diff* (5024) below the current *DHW* setpoint:

ON
DHW temp 1 (8830) < *DHW temp setpoint* (8831) – *Switching diff* (5024)

Recharging is ended when the temperature acquired by sensor B3 at the top exceeds the *DHW* setpoint:

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)

The setpoint for the *DHW charging temp* (8836) at sensor B36 is calculated from the *DHW* setpoint plus the parameterized *Intermediate circuit boost* (5140):

Temperature charging setpoint = *DHW temp setpoint* (8831) + *Intermediate circuit boost* (5140)

The *Boiler setpoint* (8311) is calculated via setpoint compensation. The mode of operation of setpoint compensation is identical to that with full charging.

The burner is switched on when the *Boiler temp* (8310) lies by at least the parameterized *Switching diff on DHW* (2460) below the *Boiler setpoint* (8311). It is switched off when the *Boiler temp (8310)* lies by at least the parameterized *Switching diff off min DHW* (2461)/*Switching diff off max DHW* (2462) above the *Boiler setpoint* (8311).

The output request to the burner is controlled between the parameterized *Required speed LF min* (9525) and the maximum output in *DHW* mode, *Fan speed DHW max* (2444). If no maximum output for *DHW* mode is parameterized (OSV), the burner's maximum output, *Required speed HF max* (9530), will be available.

If, during the time recharging is active, the enable criterion for full charging does not apply anymore, the DHW request is ended according to the criteria for full charging.

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8311	**Boiler setpoint**
8830	**DHW temp 1**
8831	**DHW temp setpoint**
8836	**DHW charging temp**

Additional parameters

Line no.	*Operating line*
2444	**Fan speed DHW max**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
5024	**Switching diff**
5140	**Intermediate circuit boost**
9525	**Required speed LF min**
9530	**Required speed HF max**

6.20.3 Stratification storage tank with direct control to the DHW charging temperature

This variant is activated by switching the setpoint compensation off. For this, parameter *Flow setp compensation delay* (5142) is used to set the delay for setpoint compensation to OSV (---).

Control to the charging temperature allows the storage tank to be charged to the required *DHW* setpoint.
This type of control requires a sensor B36 to be configured and connected to one of the multifunctional sensor inputs.
Full charging with B36 (5146) can be used to define whether full charging shall be ended when the DHW charging temperature rises. Otherwise, full charging is ended via sensor B31 at the bottom.

The pump in the primary circuit (boiler pump (Q1) or DHW charging pump (Q3)) can be a PWM pump. During full charging, this pump is constantly controlled with the parameterized *Pump speed min* (5101), during recharging, with the parameterized *Pump speed max* (5102).

Note!
If the DHW intermediate circuit pump (Q33) is configured as a modulating pump, it is always controlled with the parameterized minimum speed, regardless of the type of charging.

The DHW intermediate circuit pump (Q33) can be activated with a delay in relation to the pump in the primary circuit. The delay is dependent on the rate of boiler temperature increase. For this, *Min start temp diff Q33* (5148) can be used to set a temperature differential. The DHW intermediate circuit pump (Q33) is activated when the boiler temperature reaches the level of current *DHW* setpoint minus the value set here (in the case of a negative value), or when the boiler temperature exceeds the current *DHW* setpoint by the value set here (in the case of a positive value).

ON
Boiler temp (8310) > *DHW temp setpoint* (8831) + *Min start temp diff Q33* (5148)

If, subsequently, the boiler temperature drops below this limit, the intermediate circuit pump still remains activated.
The temperature differential can be parameterized in the range from -20 K to +20 K. If the temperature differential is set to OSV (---), the intermediate circuit pump is activated with no delay in relation to the pump in the primary circuit.

When the *Legionella* function is active, the parameterized *Legionella funct setpoint* (1645) is used as the *DHW* setpoint.

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8831	**DHW temp setpoint**

Additional parameters

Line no.	*Operating line*
1645	**Legionella funct setpoint**
5101	**Pump speed min**
5102	**Pump speed max**
5142	**Flow setp compensation delay**
5146	**Full charging with B36**
5148	**Min start temp diff Q33**

6.20.3.1. Full charging of stratification storage tank

With full charging, the entire content of the stratification storage tank is charged to the current *DHW* setpoint.

Full charging requires at least 2 sensors. These are sensor B3 at the top of the storage tank and sensor B36. Sensor B31 at the bottom can be used as an option. But this sensor can also be used for a solar application only. In that case, sensor B36 must be selected for full charging and parameter *Full charging with B36* (5146) is to be set to *Yes*.

Triggering a DHW request:
If sensor B31 is used for solar (*Full charging with B36* = *Yes*) or is not installed, full charging is started when the temperature acquired by the sensor at the top lies below the switch-on threshold:

ON
DHW temp 1 (8830) < *DHW temp setpoint* (8831) – *Switching diff* (5024)

If sensor B31 is installed and not used for solar (*Full charging with B36* = *No*), full charging is started when the temperature at both storage tank sensors lies below the switch-on threshold:

ON
DHW temp 1 (8830) < *DHW temp setpoint* (8831) – *Switching diff* (5024)
and
DHW temp 2 (8832) < *DHW temp setpoint* (8831) – *Switching diff* (5024)

During full charging, the burner's output is controlled to the temperature at sensor B36. The charging setpoint is calculated from the *DHW* setpoint plus the parameterized *Intermediate circuit boost* (5140):

Temperature charging setpoint = *DHW temp setpoint* (8831) + *Intermediate circuit boost* (5140)

During full charging, the pump in the primary circuit (boiler pump (Q1) or DHW charging pump (Q3)) is constantly controlled with the parameterized *Pump speed min* (5101).

Ending a DHW request:
If sensor B36 is parameterized for detecting the end of full charging (*Full charging with B36* = *Yes*), full charging is ended when the temperature at sensor B36 exceeds the charging setpoint by *Excess interm circ temp max* (5141), and the temperature acquired by the sensor at the top reaches the *DHW* setpoint:

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)
and
DHW charging temp (8836) > Temperature charging setpoint + *Excess interm circ temp max* (5141)

If sensor B31 at the bottom is installed and sensor B36 is not parameterized for detecting the end of full charging (*Full charging with B36* = *No*), full charging is ended when the temperature at both storage tank sensors reaches the *DHW* setpoint:

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)
and
DHW temp 2 (8832) > *DHW temp setpoint* (8831)

If, during charging, the temperature at sensor B36 (*DHW charging temp* (8836)) exceeds the charging setpoint by the current *Switching diff off min DHW* (2461)/*Switching diff off max DHW* (2462), the burner is switched off. It is switched on again as soon as the temperature at sensor B36 drops by the parameterized *Switching diff on DHW* (2460) below the charging temperature setpoint. The setting range for the switch-on differential starts at 0 K.

The output request to the burner is controlled between the parameterized *Required speed LF min* (9525) and the maximum output for *Fan speed full charging max* (2442).

If, during the time full charging is active, the enable criterion for full charging does not apply anymore, the DHW request is ended according to the criteria for recharging.

Info/diagnostics

Line no.	*Operating line*
8830	**DHW temp 1**
8831	**DHW temp setpoint**
8832	**DHW temp 2**
8836	**DHW charging temp**

Additional parameters

Line no.	*Operating line*
2442	**Fan speed full charging max**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
5024	**Switching diff**
5101	**Pump speed min**
5140	**Intermediate circuit boost**
5141	**Excess interm circ temp max**
5146	**Full charging with B36**
9525	**Required speed LF min**

6.20.3.2. Recharging the stratification storage tank

When recharging the stratification storage tank, only the upper section of the tank is charged to the current DHW temperature setpoint.

Recharging is started when the temperature acquired by sensor B3 at the top lies below the switch-on threshold:

ON
DHW temp 1 (8830) < *DHW temp setpoint* (8831) – *Switching diff* (5024)

During recharging, the burner's output is controlled to the temperature acquired by sensor B36. The charging setpoint is calculated from the DHW setpoint plus the parameterized *Interm circ boost recharging* (5139):

Temperature charging setpoint = *DHW temp setpoint* (8831) + *Interm circ boost recharging* (5139)

During recharging, the pump in the primary circuit (boiler pump (Q1) or DHW charging pump (Q3)) is constantly controlled with the parameterized *Pump speed max* (5102).

Recharging is ended when the temperature acquired by sensor B3 at the top exceeds the *DHW* setpoint:

OFF
DHW temp 1 (8830) > *DHW temp setpoint* (8831)

If, during charging, the temperature at sensor B36 (*DHW charging temp* (8836)) exceeds the charging setpoint by the current *Switching diff off min DHW* (2461)/*Switching diff off max DHW* (2462), the burner is switched off. It is switched on again as soon as the temperature at sensor B36 drops by the parameterized *Switching diff on DHW* (2460) below the charging temperature setpoint.
The setting range for the switch-on differential starts at 0 K.

The output request to the burner is controlled between the parameterized *Required speed LF min* (9525) and the maximum output for *DHW* mode, *Fan speed DHW max* (2444). If no maximum output for *DHW* mode is parameterized (OSV), the maximum burner output, *Required speed HF max* (9530), is available for recharging.

If, during the time recharging is active, the enable criterion for full charging is met, the DHW request is ended according to the criteria for full charging.

Info/diagnostics

Line no.	*Operating line*
8830	**DHW temp 1**
8831	**DHW temp setpoint**
8836	**DHW charging temp**

Additional parameters

Line no.	*Operating line*
2444	**Fan speed DHW max**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
5024	**Switching diff**
5102	**Pump speed max**
5139	**Interm circ boost recharging**
9525	**Required speed LF min**
9530	**Required speed HF max**

6.21 Instantaneous water heater

Behavior in the event of sensor failure

To prevent scalding in the event sensor B38 is faulty (sensor B39 also, depending on the type of system), both consumption and keeping hot operation are suppressed. Any request from space heating is immediately satisfied, even if the DHW flow switch is active.

To ensure protection against scalding, DHW consumption via the tap must be accepted only in the case of instantaneous water heaters with primary heat exchanger (partial diagram BwDl2). Burner startup is prevented in this case. During the time DHW is consumed, a pending request from space heating cannot be satisfied, since this would affect the water temperature at the tap as well.

6.21.1 Control

Flow setpoint boost

Line no.	*Operating line*
5420	**Flow setpoint boost**

Here, set the boost of the flow temperature setpoint for instantaneous water heater operation. The boost acts only if control is not dependent on sensor B38 and only applies to consumption and *Keep hot* operation.

Switching diff

Line no.	*Operating line*
5429	**Switching diff**

Here, set the switching differential for the instantaneous water heater. It applies to consumption and *Keep hot* operation.

6.21.2 DHW consumption (flow)

Threshold flow detection

Line no.	*Operating line*
5444	**Threshold flow detection**

DHW consumption is detected when:
DHW flow > threshold flow detection.

Switching diff flow detection

Line no.	*Operating line*
5445	**Switching diff flow detection**

DHW consumption is no longer detected when:
DHW flow < threshold flow detection minus switching differential flow detection.

The measured DHW flow can be read via parameter *DHW flow* (8860).

Info/diagnostics

Line no.	*Operating line*
8860	**DHW flow**

6.21.3 DHW consumption (gradient)

Gradient end cons

Line no.	*Operating line*
5450	**Gradient end cons**

This parameter is used to define the temperature gradient at sensor B38 with which – in the case of aqua booster operation – the end of consumption is detected. With *Aqua booster Ge* [4765.1], sensor B39 is used for detection (in place of B38).

Gradient start cons keep hot

Line no.	*Operating line*
5451	**Gradient start cons keep hot**

This parameter is used to define the temperature gradient at sensor B38 from which – in the case of aqua booster operation – consumption is detected when the *Keep hot* function is activated. With *Aqua booster Ge* [4765.1], sensor B39 is used for detection (in place of B38).

Gradient start cons

Line no.	*Operating line*
5452	**Gradient start cons**

This parameter is used to define the temperature gradient at sensor B38 from which – in the case of aqua booster operation – consumption is detected. With *Aqua booster Ge* [4765.1], sensor B39 is used for detection (in place of B38).

Setp readj cons 40°C

Line no.	*Operating line*
5455	**Setp readj cons 40°C**

Correction value for the setpoint on the LMS14... with a consumption setpoint of 40 °C.

Setp readj cons 60°C

Line no.	*Operating line*
5456	**Setp readj cons 60°C**

Correction value for the setpoint on the LMS14... with a consumption setpoint of 60 °C.

6.21.4 *Keep hot* function

Setpoint keep hot

Line no.	*Operating line*
5460	**Setpoint keep hot**

Temperature setpoint of the *Keep hot* function.

Readj setp keep hot 40°C

Line no.	*Operating line*
5461	**Readj setp keep hot 40°C**

Correction value for the setpoint on the 2-position controller with a keep-hot setpoint of 40 °C.

Readj setp keep hot 60°C

Line no.	*Operating line*
5462	**Readj setp keep hot 60°C**

Correction value for the setpoint on the 2-position controller with a keep-hot setpoint of 60 °C.

Keep hot release

Line no.	*Operating line*
5464	**Keep hot release** 24h/day DHW release Time program 3/HC3 Time program 4/DHW Time program 5

Release of *Keep hot* function.

Min cons time for keep hot

Line no.	*Operating line*
5468	**Min cons time for keep hot**

Here, set the minimum consumption time activating the *Keep hot* function.

Keep hot time wo heating

Line no.	*Operating line*
5470	**Keep hot time wo heating**

Duration of *Keep hot* function when there is no request for space heating.

Keep hot time with heating

Line no.	*Operating line*
5471	**Keep hot time with heating**

Duration of *Keep hot* function when, at the same time, there is a request for space heating.

Pump overrun time keep hot (in minutes)

Line no.	*Operating line*
5472	**Pump overrun time keep hot**

Here, set the period of time (in minutes) the pump still runs on burner shutdown during the *Keep hot* function.

Pump overrun time keep hot (in seconds)

Line no.	*Operating line*
5473	**Pump overrun time keep hot**

Here, set the period of time (in seconds) the pump still runs on burner shutdown during the *Keep hot* function.

Note!
The effective pump overrun time is obtained by adding up *Pump overrun time keep hot* (5472) and *Pump overrun time keep hot* (5473).

Control sensor keep hot

Line no.	*Operating line*
5475	**Control sensor keep hot** Boiler sensor B2 Return sensor B7 DHW outlet sensor B38

Select the control sensor (2-position controller) for the *Keep hot* function.

Boiler sensor B2
The burner is switched on and off based on a temperature comparison with the boiler temperature.

Return sensor B7
The burner is switched on and off based on a temperature comparison with the boiler return temperature.

DHW outlet sensor B38
The burner is switched on and off based on a temperature comparison with the DHW outlet temperature.

6.21.5 Times

Flow switch time cons

Line no.	*Operating line*
5482	**Flow switch time cons**

This parameter is used to define the minimum response time of the flow switch for detecting consumption.

6.21.6 Overrun

Overrun via inst WH

Line no.	*Operating line*
5489	**Overrun via inst WH** No Yes

No
The boiler’s residual heat is supplied to the heating circuit.

Yes
The boiler’s residual heat is supplied to the heat exchanger of the instantaneous water heater.

6.21.7 Speed-controlled pump

Pump Q34 of the instantaneous water heater can be a speed-controlled pump.
When DHW is consumed, speed control of Q34 is ensured by a PID controller. The speed of this pump is calculated such that the water temperature reached at sensor B38 represents the setpoint at the tap. If the temperature acquired by B38 exceeds the setpoint required at the tap, the speed is reduced, otherwise it is increased.

The controller coefficients are ready set. The neutral zone is ±0.4 K.

In *Keep hot* operation, the speed of the instantaneous water heater pump is maintained at the parameterized minimum level.

The resulting speed is delivered according to the configuration made at PWM output P1 (*Function output P1* (6085)).

In the case of hydraulic systems with diverting valve and speed-controlled boiler pump, the speed calculated for the instantaneous water heater pump can be used for controlling the boiler pump. For that, modulation mode *Demand* must be selected for the boiler pump (refer to *Pump modulation* (2320)) and PWM output P1 (*Function output P1* (6085)) must be configured for use with the boiler pump.
Also, in that case, the speed limitations for the instantaneous water heater pump are used for the control of the boiler pump.

Pump speed min

Line no.	*Operating line*
5530	**Pump speed min**

Minimum speed limit for the pump of the instantaneous water heater (heating expert).

Pump speed max

Line no.	*Operating line*
5531	**Pump speed max**

Maximum speed for the instantaneous water heater pump (heating expert).

Pump speed min OEM

Line no.	*Operating line*
5535	**Pump speed min OEM**

Lower speed limit for the pump of the instantaneous water heater (OEM).

Pump speed max OEM

Line no.	*Operating line*
5536	**Pump speed max OEM**

Upper speed limit for the pump of the instantaneous water heater (OEM).

Starting speed

Line no.	*Operating line*
5537	**Starting speed**

Speed of pump of the instantaneous water heater for the start kick.

6.21.8 Configuration

Basics of instantaneous water heater (function)

Configuration of instantaneous water heater

To configure an instantaneous water heater, the DHW sensor connected to terminal B3/B38 must be parameterized as sensor B38. For that, use parameter *DHW sensor* (5730) and select *DHW outlet sensor B38*.

Parameter *DHW controlling element* (5731) is used to select the type of controlling element (diverting valve or charging pump). Control of this controlling element must be assigned to at least one output (QX1, QX2, QX3, QX4/WX1) (parameters *Relay output QX1* (5890), *Relay output QX2* (5891), *Relay output QX3* (5892), *Relay output QX4 (*5894)). Here, select *Instant WH ctrl element Q34*. For the control of a diverting valve, output QX3 has a changeover contact.

Parameter *Aqua booster* (5550) is used to determine whether there is an aqua booster.

Aqua booster

Line no.	*Operating line*
5550	**Aqua booster** No Yes Yes, wo gradient detection

Aqua booster setting.

No
No aqua booster configured.

Yes
Aqua booster configured.

Yes, wo gradient detection
Aqua booster configured, but detection of consumption via gradient is not activated. Consumption is detected via flow switch or flow.

Parameter *Overrun via inst WH* (5489) is used to select whether the boiler's residual heat shall be fed to the heat exchanger of the instantaneous water heater or to the heating circuit.

Additional parameters

Line no.	*Operating line*
5489	**Overrun via inst WH**
5530	**Pump speed min**
5531	**Pump speed max**
5535	**Pump speed min OEM**
5536	**Pump speed max OEM**
5537	**Starting speed**
5730	**DHW sensor**
5731	**DHW controlling element**
5890	**Relay output QX1**
5891	**Relay output QX2**
5892	**Relay output QX3**

Diverting valve

The diverting valve is driven to the position demanded by the current heat request: DHW or space heating (heating circuit). If there is no request for heat, the diverting valve assumes its basic position. This can be selected via parameter *Basic pos DHW div valve* (5734).

The following choices are available:

- Last request (0): Diverting valve maintains the position resulting from the last heat request
- Heating (1): Diverting valve is driven to the position for space heating
- DHW (2): Diverting valve is driven to the position for DHW heating

Note!
Thus far, with the instantaneous water heater (Build 43), only the options *Last request* and *DHW* have been implemented. In the case of space heating, the diverting valve behaves the same like with option *Last request*.

During the time the diverting valve is driven to the other position, it may be necessary to temporarily deactivate the pump. Using parameter *Pump off change div valve* (5732), the period of time the pump shall be deactivated can be set. Parameter *Delay pump off* (5733) can be used to parameterize a temporal offset of pump shutdown against the control of the diverting valve.

Additional parameters

Line no.	*Operating line*
5732	**Pump off change div valve**
5733	**Delay pump off**
5734	**Basic pos DHW div valve**

Flow switch

To detect DHW consumption in the case of the instantaneous water heater, a flow switch can be connected. To ensure that DHW consumption is reliably detected, it may be necessary for the flow switch to respond for a certain minimum time, which can be parameterized. For this purpose, parameter *Flow switch time cons* (5482) is available. Setting *0* means that DHW consumption is detected the very same moment a change of state occurs.

The flow switch can be in the form of a switching contact or rate-of-flow meter.

Additional parameters

Line no.	*Operating line*
5482	**Flow switch time cons**

Switching contact

A flow switch in the form of a switching contact can be connected to input H1, H3, H4, H5, H6 or H7. Due to their long response time, inputs H2 on the extension modules are not suited as inputs for a DHW flow switch. For this purpose, this input is to be configured as a DHW flow switch via one of the function inputs Hx (*Function input H1* (5950), *Function input H3* (5960), *Function input* H4 (5970), *Function input H5* (5977), *Function input H6* (6008) and *Function input H7* (6011)).

Additional parameters

Line no.	*Operating line*
5950	**Function input H1**
5960	**Function input H3**
5970	**Function input H4**
5977	**Function input H5**
6008	**Function input H6**
6011	**Function input H7**

Rate-of-flow meter

A flow switch in the form of a rate-of-flow meter can be connected to input H4 (frequency input). For that, the input is to be configured via parameter *Function input H4* (5970) as *DHW flow switch*. Also, the characteristics of the rate-of-flow meter are to be defined via 2 pairs of value consisting of a frequency value and a function value. The resolution for the function value is 100 ml/min. This means that for a flow rate of 2 l/min, the function value to be set is *20*. Menu **DHW flow heater** (instantaneous water heater) contains parameter *Threshold flow detection* (5444) which is used to enter the threshold above which the flow rate indicates DHW consumption. In addition, parameter *Switching diff flow detection* (5445) is to be used to enter the hysteresis as a switching differential. The rate-of-flow meter is to be selected as flow switch via parameter *Flow supervision* [4196.1] of the **Boiler** menu.

Additional parameters

Line no.	*Operating line*
5444	**Threshold flow detection**
5445	**Switching diff flow detection**
5970	**Function input H4**
5973	**Frequency value 1 H4**
5974	**Function value 1 H4**
5975	**Frequency value 2 H4**
5976	**Function value 2 H4**
[4196.1]	**Flow supervision**

Combination of switching contact and rate-of-flow meter

Both types of flow switch can be used simultaneously. In that case, DHW consumption is detected via an OR operation of both inputs. For detection, it is sufficient if one of the 2 inputs indicates consumption. When the end of DHW consumption is reached, none of the 2 inputs must indicate consumption.

DHW operating modes

In the case of DHW systems with instantaneous water heater, the following operating modes can be selected via operating mode changeover (operator terminal/room unit):

- *DHW* mode Off (no bar on the display)
- *DHW* mode *ECO* On (single bar on the display)
- *DHW* mode On (double bar on the display)

When selecting *DHW* mode Off, frost protection for DHW remains activated. With *DHW* mode *ECO* On, DHW heating is activated, but *Keep hot* operation is deactivated. In general, *Keep hot* operation is only enabled with *DHW* mode On.

Frost protection

In operating mode Off, frost protection for DHW remains active.
Frost protection becomes active as soon as the temperature acquired by sensor B38 drops below 5 °C.
In that case, a heat request is sent to the burner.
The temperature setpoint for the burner is generated by adding the parameterized *Flow setpoint boost* (5420) to the *Setpoint keep hot* (5460).
Frost protection is ended when the temperature acquired by sensor B38 reaches a level of least 7 °C.
When frost protection is ended, pump overrun starts.

Operating modes of instantaneous water heater

With instantaneous water heaters, a distinction between 2 operating modes is made. An open tap means DHW consumption. When the tap is opened, DHW should be supplied at the preselected temperature as quickly as possible. In addition, the *Keep hot* function is used. This function ensures that the water contained in the heat exchanger is preheated. This means that next time DHW is drawn, it will be available more quickly. The disadvantage in terms of convenience in comparison with a DHW storage tank can thus be minimized.

DHW consumption

DHW consumption is detected either via a flow switch or via the water temperature gradient in the heat exchanger (aqua booster). During DHW consumption, requests from space heating are generally ignored. This means that the burner’s output is solely used for DHW heating. During DHW consumption, the burner’s output is modulated in a way that the water temperature at the outlet reaches the setpoint as quickly as possible, even if the amount of water drawn varies.

Keep hot function

If the heat exchanger is kept at a certain temperature level, comfort of instantaneous water heating systems is enhanced. The water in the heat exchanger is heated up to the *Keep hot* setpoint. This means that next time DHW is drawn, it will be available more quickly.

The *Keep hot* function can be activated to have it either permanently On, or only for a limited period of time after consumption. If confined to the point in time after consumption, the minimum consumption time on completion of which the *Keep hot* function shall be started can be set.

In the case of plants with diverting valve, the valve maintains the *DHW* position during the *Keep hot* function, even if the heat exchanger reaches the *Keep hot* setpoint. If DHW consumption follows, there is no need for the diverting valve to first travel to the required position. As a result, requests from space heating cannot be fulfilled during the time the *Keep hot* function is active. Nevertheless, to make certain that this situation will not lead to a considerable reduction in room comfort, 2 values can be parameterized for the period of time the *Keep hot* function is active: One value for the situation when there is no request for heat from the space, and one value when the space calls for heat also.

Instantaneous water heater with primary heat exchanger

In the case of instantaneous water heaters with primary heat exchanger, the heat exchanger is heated up directly by the burner’s flame. Hence, there is no heat transfer from the boiler water to the DHW.

DHW consumption

When DHW is consumed, the burner is controlled depending on the DHW outlet temperature (sensor B38). The burner is switched on when the DHW outlet temperature lies one switching differential below the setpoint of consumption. The burner is switched off again when the DHW outlet temperature exceeds the setpoint by the current switch-off differential. The switch-off differential is calculated dynamically, based on the parameterized minimum and maximum switch-off differential.

When DHW is consumed, the burner’s output is controlled depending on the DHW outlet temperature (sensor B38), but the boiler temperature is limited. Parameter *Boiler temp output reduction* (2527) is used to set the temperature limit. The associated switching differential is set via parameter *Swi diff output reduction* (2528).

Additional parameters

Line no.	*Operating line*
1610	**Nominal setpoint**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
2463	**Settling time DHW**
5020	**Flow setpoint boost**
2527	**Boiler temp output reduction**
2528	**Swi diff output reduction**

Info/diagnostics

Line no.	*Operating line*
8003	**State DHW**
8852	**DHW consumption temp**
8853	**Instant WH setpoint**

Keep hot function

The *Keep hot* function is not available with instantaneous water heaters equipped with a primary heat exchanger.

Instantaneous water heater with secondary heat exchanger and water outlet sensor

In the case of instantaneous water heaters equipped with a secondary heat exchanger, the boiler water is always heated up by the flame. The secondary heat exchanger transfers the heat from the boiler water to the DHW.

DHW consumption

When DHW is consumed, the burner is controlled depending on the DHW outlet temperature (sensor B38). The burner is switched on when the DHW outlet temperature lies one switching differential below the setpoint of consumption. The burner is switched off again when the DHW outlet temperature exceeds the setpoint by the current switch-off differential. The switch-off differential is calculated dynamically, based on the parameterized minimum and maximum switch-off differential.

When DHW is consumed, the burner's output is controlled depending on the DHW outlet temperature (sensor B38), but the boiler temperature is limited. Parameter *Boiler temp output reduction* (2527) is used to set the temperature limit. The associated switching differential is set via parameter *Swi diff output reduction* (2528).

Additional parameters

Line no.	*Operating line*
1610	**Nominal setpoint**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
2463	**Settling time DHW**
5020	**Flow setpoint boost**
2527	**Boiler temp output reduction**
2528	**Swi diff output reduction**

Info/diagnostics

Line no.	*Operating line*
8003	**State DHW**
8852	**DHW consumption temp**
8853	**Instant WH setpoint**

Keep hot function

When the *Keep hot* function is activated, the burner is controlled via the selected control sensor.

The following sensors are available as control sensors:

- Boiler flow (sensor B2)
- Boiler return (sensor B7)
- Sensor B38

The control sensor for the *Keep hot* function is selected via parameter *Control sensor keep hot* (5475).

The temperature setpoint for the *Keep hot* function is adjusted via parameter *Setpoint keep hot* (5460). If this parameter is set to *OSV* (---), the current DHW setpoint is also used for the *Keep hot* function.

When the *Keep hot* function is activated, the burner's output is not modulated. Also, the burner operates at minimum output. It is switched on when the temperature acquired by the keep hot sensor lies at least one switching differential (*Switching diff on DHW* (2460)) below the setpoint of the *Keep hot* function. The burner is switched off again when the temperature at the keep hot sensor exceeds the setpoint of the *Keep hot* function by the minimum switch-off differential (*Switching diff off min DHW* (2461)). When the burner has shut down, it may be practical to also deactivate the pump (charging pump or boiler pump). The 2 parameters *Pump overrun time keep hot* (5072) and *Pump overrun time keep hot* (5473) can be used to set the period of time the pump shall overrun when – in the case of the *Keep hot* function – the burner has shut down. The first parameter is used for setting the minutes (0…255 minutes), the second for setting the seconds (0…240 seconds). The resulting pump overrun time is then the sum of both parameters. If set to *255 minutes*, the pump is not switched off during the time the *Keep hot* function is active, even if the burner is not in operation.

On applications with diverting valve, the valve maintains the *DHW* position during the time the *Keep hot* function is active. If there is no diverting valve, requests from space heating can be considered – in addition to the *Keep hot* function. In that case, burner modulation is enabled. The burner's output is controlled according to the control sensor parameterized for the *Keep hot* function.

Additional parameters

Line no.	*Operating line*
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
5460	**Setpoint keep hot**
5464	**Keep hot release**
5468	**Min cons time for keep hot**
5470	**Keep hot time wo heating**
5471	**Keep hot time with heating**
5472	**Pump overrun time keep hot**
5473	**Pump overrun time keep hot**
5475	**Control sensor keep hot**
5482	**Flow switch time cons**

Info/diagnostics

Line no.	*Operating line*
8003	**State DHW**
8852	**DHW consumption temp**
8853	**Instant WH setpoint**

Keep hot **function after consumption (time limited)**

After DHW consumption, activation of the heat exchanger’s *Keep hot* function can be parameterized for a certain period of time. Parameter *Min cons time for keep hot* (5468) allows the *Keep hot* function to be activated only when the consumption time reaches this minimum time period.

If, during the time the *Keep hot* function is active, there is a request for space heating, the time the *Keep hot* function shall be active can be set between *0* and *30 minutes*, using parameter *Keep hot time with heating* (5471). If there is no request for space heating, the period of time the *Keep hot* function shall be active can be set between *0* and *140 minutes* using parameter *Keep hot time wo heating* (5470). If set to *1,440 minutes*, continuous operation starts (see below).

If, during the time the *Keep hot* function is active, there is a request for space heating, the function is stopped or aborted, if the parameterized time (space heating request active (*Keep hot time with heating* (5471)) has already elapsed. If there is no more request from space heating and the parameterized time (space heating request inactive (*Keep hot time wo heating* (5470)) has not yet elapsed, the *Keep hot* function is resumed.

Keep hot **function continuous operation**

Another option to keep the heat exchanger at the required temperature level is continuous operation. To ensure that the heat exchanger is brought to the *Keep hot* setpoint not only after DHW consumption – to be kept at that level for a limited period of time –, but always when the heat exchanger’s temperature drops by one switching differential below the *Keep hot* setpoint, the heat exchanger is recharged.

Instantaneous water heater with secondary heat exchanger without water outlet sensor (aqua booster)

When using an aqua booster, sensor B38 is not installed by the water outlet, but in the heat exchanger itself, close to the cold water inlet. Configuration of an aqua booster requires option *Yes,* using parameter *Aqua booster* (5550).

Special features of aqua boosters:

- DHW consumption is detected by sensor B38, based on the heat exchanger's temperature gradient
- When DHW is consumed, the burner's output is controlled depending on the boiler return temperature (from the heat exchanger to the boiler)
- To ensure that DHW consumption can be detected via the heat exchanger's temperature gradient, the heat exchanger must always be kept at a certain temperature level. For this reason, the *Keep hot* function for the aqua booster is always enabled

DHW consumption

Detection of DHW consumption with the aqua booster is performed via the temperature gradient at sensor B38. With the aqua booster, that sensor in located in the heat exchanger itself, close to the cold water inlet. When DHW is consumed, the temperature acquired by that sensor drops when cold water enters the heat exchanger. If a flow switch is connected and configured, DHW consumption can also be detected by the flow switch. DHW consumption is detected when either the flow switch or the temperature gradient indicates consumption. The end of consumption is detected when neither the flow switch nor the gradient indicates consumption. If DHW consumption shall be indicated by the flow switch only, parameter *Aqua booster* (5550)offers option *Yes, wo gradient detection.*

When DHW is consumed, the burner is controlled depending on the boiler return temperature (sensor B7). The boiler return temperature represents a good indication of the DHW outlet temperature. The burner is switched on when the boiler return temperature drops one switching differential below the setpoint of consumption. The burner is switched off again when the boiler return temperature exceeds the setpoint of consumption by the current switch-off differential. The switch-off differential is calculated dynamically, based on the parameterized minimum and maximum switch-off differential.

When DHW is consumed, the burner is controlled depending on the boiler return temperature (sensor B7), but the boiler temperature is limited. Parameter *Boiler temp output reduction* (2527) is used to set the temperature limit. The associated switching differential is set via parameter *Swi diff output reduction* (2528).

Additional parameters

Line no.	*Operating line*
1610	**Nominal setpoint**
2460	**Switching diff on DHW**
2461	**Switching diff off min DHW**
2462	**Switching diff off max DHW**
2463	**Settling time DHW**
5020	**Flow setpoint boost**
5550	**Aqua booster**
2527	**Boiler temp output reduction**
2528	**Swi diff output reduction**

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8313	**Switch point DHW operation**
8314	**Boiler return temp**
8831	**DHW temp setpoint**
8852	**DHW consumption temp**
8853	**Instant WH setpoint**

***Keep hot* function**

With the aqua booster, the *Keep hot* function is always enabled. *ECO* mode for DHW is not available here.

***Keep hot* function after DHW consumption**

After DHW consumption, the *Keep hot* function is always activated.

Instantaneous water heater with secondary heat exchanger, DHW outlet and inlet sensor (aqua-booster)

This type of aqua booster always requires 2 DHW sensors (sensor B38 and B39) and does not use a flow switch.
The configuration of this type of aqua booster is made via parameter *Aqua booster Ge* [4765.1].

Aqua booster Ge

Line no.	*Operating line*
[4765.1]	**Aqua booster Ge** Off On

Off
This setting is used to configure the variant *Aqua booster without outlet sensor and with optional flow switch.*

On
This setting is used to configure the variant *Aqua booster with B38 and B39, but without flow switch*.

Sensor B39, which acquires the DHW inlet temperature, is screwed into the DHW inlet of the secondary plate heat exchanger. Sensor B38, which controls the DHW outlet temperature, is fitted to the pipe directly downstream from the secondary plate heat exchanger at the DHW outlet.
To be able to detect a DHW request, a fast temperature drop in the secondary plate heat exchanger is required. For this reason, the secondary heat exchanger must always be kept at a certain temperature level. This is ensured by the *Keep hot* DHW comfort function.
The *Keep hot* function is always started at the end of a DHW request. When operating mode *Keep hot is* active, the burner operates at minimum output. The 3-port valve is in the DHW position.

Note!
If *Aqua Booster Ge* [4765.1] is set to *On*, sensor B39 must be connected and *Aqua booster* (5500) must not be set to *No*.

Keep hot function

The *Keep hot* function is also activated and deactivated by the DHW inlet temperature acquired by sensor B39, provided no operating mode of higher priority is active.

The setpoint for the sensor B39 is determined by the adjusted *Setpoint keep hot* (5460). If this parameter is set to *OSV*, the current setpoint for DHW consumption is used as the *Keep hot* setpoint.

If, on completion of DHW consumption, a change to *Comfort* mode *Keep hot* is made, a timer is started, running for the period of time *ParTimeMinWarmhaltungEin*. The *Keep hot* function remains active as long as the timer runs. This ensures that the *Comfort* function is active for a minimum period of time.
The reason for the minimum on time is to make certain that – at the end of DHW consumption – the plate heat exchanger is maintained at the *Keep hot* setpoint for a certain period of time, in case DHW consumption is interrupted for a moment (when taking a shower: water consumption - end of consumption - soaping - water consumption; when opening the tap the second time, cold water is not wanted; the boiler water may cool down the DHW storage tank, the reason being the low setpoint of the heating circuit). To force the burner to shut down on completion of DHW consumption when changing to *Comfort* mode (preventing scalding if consumption is interrupted for a moment), a timer can be parameterized, running for the period of time *ParTimeBurnerOffAquaBoost*. When changing from DHW heating to the *Keep hot* function, the burner remains Off for the parameterized period of time.

Detection of DHW consumption via sensor B39
To keep the plate heat exchanger at a certain temperature level, the *Keep hot* function is used. It maintains the DHW inlet temperature at a high level, thus ensuring a sufficiently high temperature differential (falling ΔT/Δt gradient) to trigger *DHW* mode. To detect the end of DHW consumption, the gradient must be rising (slope must be sufficiently steep).
On completion of DHW consumption, a change to the *Keep hot* function can be made, thus enabling the DHW inlet temperature acquired by sensor B39 to return to a higher level. This takes place when the above described switch-on condition for the *Keep hot* function is satisfied.

The burner is started up by the 2-position controller. When DHW consumption is detected via a sufficiently steep negative temperature gradient of the DHW inlet temperature, the 2-position controller puts the burner into operation. If the temperature acquired by sensor B38 (*DhwOut*) lies below the DHW setpoint, the switch-on condition for the burner is satisfied. If the actual value were above the setpoint plus the switch-off threshold, the burner would not be put into operation by the 2-position controller.

Deactivating the *DHW* mode via comparison of the absolute temperature values (aqua booster)
In addition to the positive gradient which – if the slope suffices – ends the *DHW* mode, a second criterion can be activated, ending the *DHW* mode. Here, the 2 absolute temperature values of sensor B38 (*DHWOut*) and sensor B39 (*DHWIn*) are compared. If the differential is smaller than threshold *Abs TempSwiOffThresh [°C]* [4772.1], the *DHW* mode is ended. If the 2 temperatures approach one another, it can be assumed that there is no DHW consumption. Comparison of the absolute temperatures can be activated or deactivated via *Abs SwiOffCondAquaB* [4766.1].

Abs SwiOffCondAquaB

Line no.	*Operating line*
[4766.1]	**Abs SwiOffCondAquaB** Off On

Activation of comparison of absolute temperature values as the final criterion of DHW consumption.

Increased output with the *Keep hot* function (aqua booster)
If the minimum burner output is not able to deactivate the *Keep hot* function, parameter *Interv outp increase* [4771.1] can be used to set a period of time on completion of which the burner's output is increased. The timer is reloaded after the burner's output has been increased. The output is increased until the maximum is reached. The minimum output is summed up with each additional stage.
The function of multistage output increase in the *Keep hot* mode can be activated via parameter *Output increase AquaB* [4767.1].

Output increase AquaB

Line no.	*Operating line*
[4767.1]	**Output increase AquaB**

Activation of multistage increase of output to end the *Keep hot* function.

Min KeepHotTime AquaB

Line no.	*Operating line*
[4768.1]	Min KeepHotTime AquaB

Minimum on time of *Keep hot* function on completion of DHW consumption.

Interv burner off time

Line no.	*Operating line*
[4769.1]	Interv burner off time

Interval for *Burner off* when changing from DHW consumption to the *Keep hot* function.

Interv burner on time

Line no.	*Operating line*
[4770.1]	**Interv burner on time**

Not in use, not implemented.

Interv outp increase

Line no.	*Operating line*
[4771.1]	**Interv outp increase**

Period of time on completion of which a change to the next stage of output increase is made.

Abs TempSwiOffThresh

Line no.	*Operating line*
[4772.1]	**Abs TempSwiOffThresh**

Absolute temperature threshold for absolute temperature comparison of outlet temperature at sensor B38 and inlet temperature at sensor B39 to end the *Keep hot* function, if required.

Pump overrun AquaB

Line no.	*Operating line*
[4773.1]	Pump overrun AquaB

Not in use, not implemented.

Pump overr KeepHotEnd

Line no.	*Operating line*
[4774.1]	**Pump overr KeepHotEnd**

Not in use, not implemented.

OnDiff KeepHot AquaB

Line no.	*Operating line*
[4775.1]	**OnDiff KeepHot AquaB**

Switch-on differential for the *Keep hot* function.

OffDiff KeepHot AquaB

Line no.	*Operating line*
[4776.1]	**OffDiff KeepHot AquaB**

Switch-off differential for the *Keep hot* function.

6.21.9 Setpoint readjustment

Basics of setpoint readjustment

To be able to compensate for temperature deviations resulting from unfavorable sensor locations, for instance, the setpoint can be readjusted. For setpoint readjustments, 2 correction values must be parameterized: One for the setpoint of 40 °C, and one for the setpoint of 60 °C. These 2 values define a straight line which delivers the correction values for all other setpoints.

Setpoint readjustments can be made separately for DHW consumption and the *Keep hot* function.

Keep-hot setpoint dependent on consumption setpoint

If the consumption setpoint is changed, the LMS14... can automatically change the keep-hot setpoint as well, if required.

➔ For that, the keep-hot setpoint on *Setpoint keep hot* (5460) must be set to *OSV* (---)

Using the setpoint readjustment, correction values can be parameterized for the setpoints of 40 °C and 60 °C. These 2 points define a linear readjustment of any keep-hot setpoints.

Info/diagnostics

Line no.	*Operating line*
8852	**DHW consumption temp**
8853	**Instant WH setpoint**

DHW consumption

For setpoint readjustments during DHW consumption, the 2 correction values for the consumption setpoints of 40 °C and 60 °C must be parameterized. If both are set to *0*, there will be no readjustment of the consumption setpoint.

Additional parameters

Line no.	*Operating line*
5455	**Setp readj cons 40°C**
5456	**Setp readj cons 60°C**

***Keep hot* function**

For setpoint readjustments in connection with the *Keep hot* function, the 2 correction values for the *Keep hot* setpoints of 40 °C and 60 °C must be parameterized. If both are set to *0*, there will be no readjustment of the *Keep hot* setpoint.

Additional parameters

Line no.	*Operating line*
5461	**Readj setp keep hot 40°C**
5462	**Readj setp keep hot 60°C**

6.22 Configuration

ℹ Note!
During the reconfiguration of the LMS14..., following might occur:

- Errors that have already been identified continue to be present.
  Such errors can be canceled via power OFF or by making a reset, depending on the kind of response to the error.
  Example:
  A water pressure error is pending and, in this error state, the error is rectified through parameterization
- Errors are identified and the LMS14... goes to lockout, depending on the type of error.
  Example:
  A water pressure sensor is configured with *Lockout* as a response to the error, but no sensor is connected, or the selection was not wanted.
  In that case, the selected sensor is to be connected or the configuration must be matched to the connected type of sensor.
  Then, a reset must be made or power OFF is required.

Presetting

Line no.	*Operating line*
5700	**Presetting** Changed Unchanged

The plant diagrams shown in chapter *Applications* can be preselected by entering the diagram number. The plant diagram obtained is the result of preselection and connected sensors.

ℹ Note!
The sensors shown on the desired plant diagram must be connected, thus ensuring that automatic sensor identification does not detect some other plant diagram.

By making the preselection, the following parameter values are set:

Line no.	**Function**	**1 (No DHW)**	**2 (DHW storage tank)**	**3 (Instantaneous water heater)**	**4 (DHW stratification storage tank)**
870	With buffer	Yes	Yes	Yes	Yes
872	With primary controller/system pump (HC1)	Yes	Yes	Yes	Yes
1170	With buffer storage tank (HC2)	Yes	Yes	Yes	Yes
1172	With primary controller/system pump (HC2)	Yes	Yes	Yes	Yes
1470	With buffer storage tank (HC3)	Yes	Yes	Yes	Yes
1472	With primary controller/system pump (HC3)	Yes	Yes	Yes	Yes
1600	Operating mode DHW	On	On	On	On
1610	Nominal DHW setpoint	55 °C	60 °C	45 °C	60 °C
1640	Legionella function	Fixed weekday	Periodically	Off	Periodically
1878	With buffer storage tank (VK1)	Yes	Yes	Yes	Yes
1880	With primary controller/system pump (VK1)	Yes	Yes	Yes	Yes
1928	With buffer storage tank (VK2)	Yes	Yes	Yes	Yes
1930	With primary controller/system pump (VK2)	Yes	Yes	Yes	Yes
1978	With buffer storage tank (swimming pool)	Yes	Yes	Yes	Yes
1980	With primary controller/system pump (swimming pool)	Yes	Yes	Yes	Yes
2080	With solar integration (swimming pool)	Yes	Yes	Yes	Yes
2150	Primary controller/system pump	After buffer	After buffer	After buffer storage	After buffer storage

Line no.	Function	1 (No DHW)	2 (DHW storage tank)	3 (Instantaneous water heater)	4 (DHW stratification storage tank)
		storage tank	storage tank	tank	tank
2236	P-band Xp DHW	34 °C	34 °C	34 °C	34 °C
2237	Integral action time Tn DHW	25 s	25 s	25 s	25 s
2238	Derivative action time Tv DHW	8 s	8 s	8 s	8 s
2460	Switching differential boiler DHW On	5 °C	5 °C	5 °C	5 °C
2461	Switching differential boiler DHW Off minimum	6 °C	6 °C	6 °C	6 °C
2462	Switching differential boiler DHW Off maximum	8 °C	8 °C	8 °C	8 °C
2463	Settling time DHW maximum	10 s	10 s	10 s	10 s
2527	Boiler temperature load reduction	80 °C	80 °C	80 °C	80 °C
2528	Switching difference load reduction	5 °C	5 °C	5 °C	5 °C
4133	Comparative temperature	Sensor B31	Sensor B31	Sensor B31	Sensor B31
4724	Minimum buffer storage tank temperature heating mode	8 °C	8 °C	8 °C	8 °C
4783	Buffer storage tank with solar integration	Yes	Yes	Yes	Yes
4795	Buffer storage tank comparative temperature return diversion	Sensor B42	Sensor B42	Sensor B42	Sensor B42
4796	Buffer storage tank operating action return diversion	Temperature increase	Temperature increase	Temperature increase	Temperature increase
5020	DHW storage tank flow setpoint boost	16 °C	16 °C	16 °C	16 °C
5022	Type of charging	Full charging	Full charging	Full charging	Full charging
5024	DHW storage tank switching differential	5 °C	5 °C	5 °C	5 °C
5090	With buffer storage tank (DHW storage tank)	No	No	No	No
5092	With primary controller/system pump (DHW storage tank)	No	No	No	No
5093	DHW storage tank with solar integration	Yes	Yes	Yes	Yes
5148	Minimum start temperature differential Q33	0 °C	0 °C	0 °C	0 °C
5550	Aqua booster	No	No	No	No
5710	Heating circuit 1	On	On	On	On
5711	Cooling circuit 1	Off	Off	Off	Off
5715	Heating circuit 2	Off	Off	Off	Off
5721	Heating circuit 3	Off	Off	Off	Off
5730	DHW sensor		Sensor B3	Sensor B38	Sensor B3
5731	DHW controlling element	Charging pump	Charging pump	Diverting valve	Diverting valve
5736	DHW separate circuit	Off	Off	Off	Off
5774	Controlling boiler pump/ DHW diverting valve	All requests	All requests	All requests	All requests
5840	Solar controlling element	Charging pump	Charging pump	Charging pump	Charging pump
5841	External solar exchanger	Jointly	Jointly	Jointly	Jointly
5870	Combi storage tank	No	No	No	No
5890	Relay output QX1	Boiler pump Q1	Boiler pump Q1	Boiler pump Q1	Boiler pump Q1
5891	Relay output QX2	None	None	None	DHW intermediate circuit pump Q33
5892	Relay output QX3	None	DHW controlling element Q3	Instantaneous water heater controlling element Q34	DHW controlling element Q3
5894	Relay output QX4	None	None	None	None
5930	Sensor input BX1	None	Sensor B31	None	Sensor B31
5931	Sensor input BX2	None	None	None	Sensor B36
5932	Sensor input BX3	None	None	None	None
5950	Function input H1	None	None	DHW flow switch	None
5960	Function input H3	None	None	None	None
5970	Function input H4	None	None	None	None
5977	Function input H5	Room thermostat HC1	Room thermostat HC1	Room thermostat HC1	Room thermostat HC1
6008	Function input H6	None	None	None	None
6011	Function input H7	None	None	None	None

Line no.	Function	1 (No DHW)	2 (DHW storage tank)	3 (Instantaneous water heater)	4 (DHW stratification storage tank)
6020	Function extension module 1	None	None	None	Multifunctional
6021	Function extension module 2	None	None	None	None
6022	Function extension module 3	None	None	None	None
6030	Relay output QX21 module 1	None	None	None	Collector pump Q5
6031	Relay output QX22 module 1	None	None	None	None
6032	Relay output QX23 module 1	None	None	None	None
6033	Relay output QX21 module 2	None	None	None	None
6034	Relay output QX22 module 2	None	None	None	None
6035	Relay output QX23 module 2	None	None	None	None
6036	Relay output QX21 module 3	None	None	None	None
6037	Relay output QX22 module 3	None	None	None	None
6038	Relay output QX23 module 3	None	None	None	None
6040	Sensor input BX21 module 1	None	None	None	Sensor B6
6041	Sensor input BX22 module 1	None	None	None	None
6042	Sensor input BX21 module 2	None	None	None	None
6043	Sensor input BX22 module 2	None	None	None	None
6044	Sensor input BX21 module 3	None	None	None	None
6045	Sensor input BX22 module 3	None	None	None	None
6046	Function input H2 module 1	None	None	None	None
6054	Function input H2 module 2	None	None	None	None
6062	Function input H2 module 3	None	None	None	None
6085	Function output P1	None	None	None	None
6600	Device address	1	1	1	1
6601	Segment address	0	0	0	0

With operator terminals having a double display, the display also shows whether the preselection is still the same or whether it has already been adapted (that is, if at least one parameter has been changed).
When using operator terminals without double display, it may be necessary to switch to the next parameter to see the required display.

Changed
At least one parameter of the preselection has been changed.

Unchanged
Parameters of the preselection have not yet been changed.

6.22.1 Manual setting/adaption of partial diagrams

A plant diagram is composed of several partial diagrams. The desired plant diagram can be manually created by using the required partial diagrams.
But it is also possible to adapt partial diagrams that were generated via *Presetting* (5700).
The catalog with the partial diagrams, which is available as a separate document, contains all partial diagrams implemented in the controller – assigned in the form of groups. In addition, the line no. required for creating the respective partial diagrams and the associated sensors are listed.

Note!
Check no. heat source 1 (6212), *Check no. heat source 2* (6213), *Check no. storage tank* (6215), and *Check no. heating circuits* (6217) can be used to check whether the settings led to the correct partial diagram. The check no. shown there must accord with the partial diagram no. of the respective component group.

6.22.2 Heating circuits/cooling circuit

Heating circuit 1, 2, 3

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
5710	**5715**	**5721**	**Heating circuit 1, 2, 3** Off On

Using this setting, the heating circuits can be switched on and off.

Off
Function is deactivated.

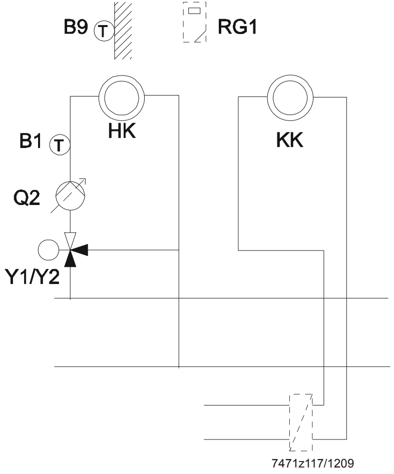
On
Function is activated.

Cooling circuit 1

Line no.	*Operating line*
5711	**Cooling circuit 1** Off 4-pipe system

Off
The cooling circuit is switched off.

4-pipe system



Cooling and heating circuit draw their cooling/heating energy from separate primary circuits.

6.22.3 DHW storage tank

DHW sensor

Line no.	*Operating line*
5730	**DHW sensor** DHW sensor B3 Thermostat DHW outlet sensor B38

This parameter is used to select the sensor to be connected to input B3/B38.

DHW sensor B3
DHW storage tank sensor present. The collector calculates the switching points including the switching differential from the DHW setpoint and the acquired DHW storage tank temperature.

Thermostat
The DHW temperature is controlled according to the switching state of a thermostat connected in place of sensor B3.

Note!
When using a DHW thermostat, *Reduced* mode is not possible. This means that when *Reduced* mode is active, DHW heating with the thermostat is locked.

Note!

- The adjustment of the *Nominal* DHW setpoint must be equal to or higher than the setpoint adjustment on the thermostat (thermostat calibrated at switch-off point)
- The flow temperature setpoint for DHW must be set to a minimum of *10 °C* (affects the charging time)
- In that case, the DHW is not protected against frost

DHW outlet sensor B38
Instantaneous water heater outlet sensor present. The controller calculates the switching points and the respective switching differential from the setpoint of the instantaneous water heater and the acquired DHW outlet temperature.

DHW controlling element

Line no.	*Operating line*
5731	**DHW controlling element** No charging request Charging pump Diverting valve

DHW charging can take place with a charging pump or diverting valve and heat source pump.

Note!
Functions *DHW priority* and *Discharging protection* are possible only when a charging pump is used.

If there is demand for heat from the space, the valve is always driven to the *Heating* position. If there is no demand for heat from the space (summer operation, *ECO* functions, holidays), it is possible to select whether the valve in the *DHW* position shall wait for the next DHW charging cycle, or whether it shall also be driven to the *Heating* position.

No charging request
No DHW charging via DHW charging pump Q3/instantaneous water heater pump Q34.

Charging pump
DHW is charged via a pump.

Diverting valve
DHW is charged via a diverting valve.

Pump off change div valve

Line no.	*Operating line*
5732	**Pump off change div valve**

Pump off time: Set the time the pumps are deactivated when the diverting valve switches over.

In the case of systems using a diverting valve (UV), the pumps can be deactivated when changing from *Heating* mode to *DHW* mode, and vice versa. The pump off times can be parameterized. Deactivation of the pumps can coincide with the actuation of the diverting valve, or with a delay. The number of pumps affected by deactivation depends on the type of hydraulic system.

Note!
Modulation and control of the burner are not affected!

Delay pump off

Line no.	*Operating line*
5733	**Delay pump off**

Delay with which the pumps are deactivated: Set the delay time for the pumps to be deactivated after the diverting valve has switched over.

Basic pos DHW div valve

Line no.	*Operating line*
5734	**Basic pos DHW div valve** Last request Heating circuit DHW

The basic position of the diverting valve is the position the valve maintains when there is no request for heat.

Last request
At the end of the last heat request, the diverting valve maintains the position it held last.

Heating circuit
At the end of the last heat request, the diverting valve is driven to the *Heating* position.

DHW
At the end of the last heat request, the diverting valve is driven to the *DHW* position.

6.22.4 DHW separate circuit

In multiple boiler systems, one of the boilers can be assigned to DHW charging. During the time DHW charging is active, that boiler disconnects itself hydraulically from the cascaded system and later rejoins the system when DHW heating is completed.

DHW separate circuit

Line no.	*Operating line*
5736	**DHW separate circuit** Off On

The DHW separate circuit can only be employed in a cascaded system.

Off

The DHW separate circuit is Off. Any of the boilers can charge the DHW storage tank.

On

The DHW separate circuit is On. The DHW is always heated by the boiler defined for that purpose.

Note!

For a DHW separate circuit, DHW controlling element Q3 must be set to *Diverting valve*.

Optg action DHW div valve

Line no.	*Operating line*
5737	**Optg action DHW div valve** Position on DHW Position on heating circuit

The diverting valve position selected here is the position used when the output is active:

Position on DHW

When the output is active, the diverting valve is in the *DHW* position.

Position on heating circuit

When the output is active, the diverting valve is in the *Heating* position.

Midposition DHW div valve

Line no.	*Operating line*
5738	**Midposition DHW div valve** Off On

Here, the DHW diverting valve can be driven to the mid-position. This serves for filling or draining both heating circuits. This action must be reset manually.

Off

The diverting valve is driven to the position currently demanded, depending on the request for heat and the basic position.

On

The diverting valve is driven to the mid-position.

DV DHW steps ph1

Line no.	*Operating line*
[4486.1]	**DV DHW steps ph1**

DV DHW steps ph2

Line no.	*Operating line*
[4487.1]	**DV DHW steps ph2**

DV DHW steps ph3

Line no.	*Operating line*
[4488.1]	**DV DHW steps ph3**

The diverting valve switches from the *DHW* position to the *Heating* position, and vice versa, in 3 phases: The start phase (phase 1), where the valve is slowly and powerfully started, the adjusting phase (phase 2), which should cover most of the valve's travel, and the stop phase (phase 3), where the valve is slowly driven against its mechanical stop.
This parameter is used to set the number of steps for the respective phase.

DV DHW step time ph1

Line no.	*Operating line*
[4489.1]	**DV DHW step time ph1**

DV DHW step time ph2

Line no.	*Operating line*
[4490.1]	**DV DHW step time ph2**

DV DHW step time ph3

Line no.	*Operating line*
[4491.1]	**DV DHW step time ph3**

This parameter is used to set the time for a step pulse in the respective phase. Note that a full step consists of 8 partial steps. Thus, for a full step in *Full-step* mode, one pulse is required, for a full step in *Eighth-step* mode, 8 pulses (8 times the amount of time).

DV DHW st length ph1

Line no.	*Operating line*
[4483.1]	**DV DHW st length ph1** Full step Half step Quarter-step Eighth-step

DV DHW st length ph2

Line no.	*Operating line*
[4484.1]	**DV DHW st length ph2** Full step Half step Quarter-step Eighth-step

DV DHW st length ph3

Line no.	*Operating line*
[4485.1]	**DV DHW st length ph3** Full step Half step Quarter-step Eighth-step

This parameters are used to set the step size for one step pulse in the respective phase.

Full step
One step pulse causes the stepper motor to travel one full step. Note the time required per step pulse.

Half step
One step pulse causes the stepper motor to travel half a step. Note the time required per step pulse (2 pulses for one full step).

Quarter-step
One step pulse causes the stepper motor to travel one quarter of a step. Note the time required per step pulse (4 pulses for one full step).

Eighth-step
One step pulse causes the stepper motor to travel one eighth of a step. Note the time required per step pulse (8 pulses for one full step).

6.22.5 Boiler

Ctrl boiler pump/ DHW valve

Line no.	*Operating line*
5774	**Ctrl boiler pump/DHW valve** All requests Request HC1/DHW only

This parameter is for use with special hydraulic diagrams to define that boiler pump Q1 and diverting valve Q3 are only in charge of DHW heating and heating circuit 1, but not of heating circuits 2 and 3 and of external consumer circuits.

All requests
Hydraulically speaking, the diverting valve is used with all heat requests and switches between *DHW* mode and the other heat requests. The boiler pump runs whenever there is a request for heat.

Request HC1/DHW only
Hydraulically speaking, the diverting valve is only used with heating circuit 1 and *DHW* mode and switches between *DHW* mode and heating circuit 1. In the case of all other heat requests, the diverting valve (UV) and the boiler pump are not hydraulically involved; they go directly to the boiler.

6.22.6 Boiler pump

The boiler pump is activated whenever the boiler is released or the burner is running.

Note!
The boiler pump can also be activated via the following functions:
- Frost protection for the plant
- Boiler protection
- Chimney sweep (via release)/special operating modes
- Forced signals (storage tank recooling)

To give consideration to special hydraulic configurations, assignment of the boiler pump to heat requests can be changed. If the following parameter was set to *On*, a request for heat from heating circuits 2 and 3 would not lead to an activation of the boiler pump.

Basics of boiler pump

Speed according to DHW pump/heating circuit pumps

Control of the boiler pump is performed based on the speed calculated for the DHW pump (charging pump Q3 or instantaneous water heater pump Q34) for *DHW* mode, or based on the highest speed calculated for the 3 heating circuit pumps for *Heating* mode only. The calculated pump speed for heating circuits 2 and 3 is evaluated only if these heating circuits also are hydraulically dependent on the position of the diverting valve (parameters *Ctrl boiler pump/DHW valve* (5774)).

The speed of the boiler pump is fully adopted from the DHW or heating circuit pump. Hence, only the PWM limits of the respective DHW or heating circuit pump are valid. In that case, no consideration is given to the PWM limits of the boiler pump.

Note!
This function is only used in connection with single-boiler plants.
For cascaded systems, one of the other functions must be selected.

The function is selected via enumeration *Demand* of parameter *Pump modulation* (2320).

Additional parameters

Line no.	*Operating line*
881	**Starting speed**
2320	**Pump modulation**
5101	**Pump speed min**
5530	**Pump speed min**
882	**Pump speed min**
5102	**Pump speed max**
5531	**Pump speed max**
885	**Pump speed min OEM**
5106	**Pump speed min OEM**
5535	**Pump speed min OEM**
886	**Pump speed max OEM**
5107	**Pump speed max OEM**
5536	**Pump speed max OEM**

Info/diagnostics

Line no.	*Operating line*
8308	**Boiler pump speed**
8310	**Boiler temp**

Speed control depending on the boiler temperature setpoint

Objective:
The boiler shall be enabled to supply as much heat as possible to the storage tank.

The boiler pump shall modulate its speed in a way that the current setpoint (DHW or buffer storage tank) is reached at the boiler flow. The boiler pump's speed shall be increased within predefined limits until the burner reaches its upper capacity limit. For modulation of the boiler pump in *DHW* mode, the PWM limits of the DHW charging pump apply, in *Heating* mode, the PWM limits of the boiler pump. Speed control of the boiler pump reduces the boiler's water throughput (pump speed) to such an extent that the required boiler flow temperature setpoint will be reached. For that, the setpoint fed to speed control is not the same as that forwarded to the LMS14...; the setpoint used for speed control is lower. This ensures that the pump's speed is increased before the flow temperature setpoint is reached.

This prevents the boiler from reaching its setpoint at reduced output only because the pump runs at a lower speed. In that case, only part of the boiler's output would be used. The speed is calculated by a PID controller.

At low boiler output (current output below 66%), the setpoint for speed control is reduced by an adjustable value. If the relative boiler output exceeds 66%, the setpoint for speed control is increased in such a way that the setpoint for speed calculation at 100% boiler output corresponds to the request for heat.

The function is selected via enumeration *Boiler setpoint* of parameter *Pump modulation* (2320).

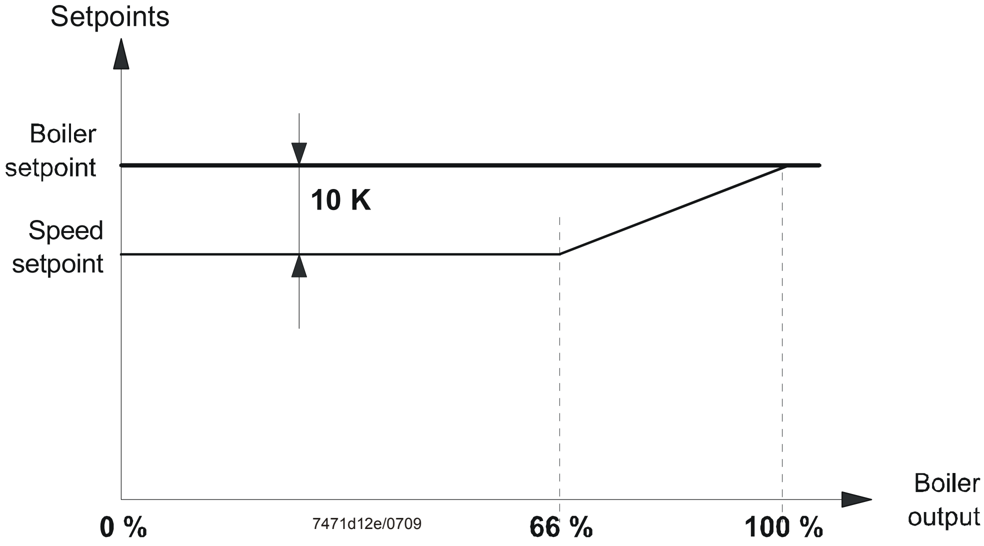


Figure 82: Boiler pump – Speed control depending on the boiler temperature setpoint

The diagram shows a setpoint reduction of 10 K. It can be parameterized.

Additional parameters

Line no.	*Operating line*
2320	**Pump modulation**
2322	**Pump speed min**
2323	**Pump speed max**
2327	**Pump speed min OEM**
2328	**Pump speed max OEM**
2329	**Pump setpoint reduction**
5101	**Pump speed min**
5102	**Pump speed max**
5106	**Pump speed min OEM**
5107	**Pump speed max OEM**

Info/diagnostics

Line no.	*Operating line*
8308	**Boiler pump speed**
8310	**Boiler temp**
8311	**Boiler setpoint**

Control according to boiler temperature differential

The LMS14... keeps controlling the boiler's output by maintaining the boiler temperature setpoint. Pump speed control ensures control of the boiler pump speed such that the parameterized boiler temperature differential between boiler return and boiler flow is maintained.

If the current boiler temperature increase exceeds the nominal differential, the pump speed is increased or, otherwise, decreased.

The pump's speed is limited by the parameterized minimum and maximum speeds.

In DHW heating mode, the boiler pump's speed is not controlled to the parameterized nominal boiler temperature increase.
The speed of the boiler pump in DHW heating mode is calculated based on the *Demand* function (see above).

For all other operating modes – with the exception of DHW heating mode – following applies:
If the boiler return temperature is not available (sensor defective or not configured), or if no valid boiler temperature increase is configured, the speed of the boiler pump is calculated based on the *Boiler temperature setpoint* function.

The function is selected via enumeration *Temp differential nominal* of parameter *Pump modulation* (2320).

Additional parameters

Line no.	*Operating line*
2317	**Temp differential nominal**
2320	**Pump modulation**
2322	**Pump speed min**
2323	**Pump speed max**
2324	**Speed Xp**
2325	**Speed Tn**
2326	**Speed Tv**
2327	**Pump speed min OEM**
2328	**Pump speed max OEM**

Info/diagnostics

Line no.	*Operating line*
8308	**Boiler pump speed**
8310	**Boiler temp**
8314	**Boiler return temp**

Modulation depending on boiler output

This function is suited for both single-boiler plants and cascaded systems with or without pressureless header. If the burner is operated at low output, the boiler pump should also run at low speed. And if the boiler operates at high output, the boiler pump should run at high speed. The boiler pump's speed is calculated based on the current boiler output. The boiler pump is operated at minimum speed up to a certain boiler output that can be parameterized (minimum output). Above another boiler output that can be parameterized (maximum output), the boiler pump is operated at maximum speed. Between minimum output (Ynmin) and maximum output, the pump's speed is continually increased.

For calculation of the pump speed, a filtered boiler output value is used.
In the case the boiler's output changes abruptly, it may therefore take up to 3 minutes for the pump speed to adapt to the new burner output.

The function is selected via enumeration *Burner output* of parameter *Pump modulation* (2320).

Additional parameters

Line no.	*Operating line*
2320	**Pump modulation**
2322	**Pump speed min**
2323	**Pump speed max**
2327	**Pump speed min OEM**
2328	**Pump speed max OEM**
2334	**Output at pump speed min**
2335	**Output at pump speed max**

Info/diagnostics

Line no.	*Operating line*
8308	**Boiler pump speed**
8323	**Fan speed**

Relative and absolute PWM limits

The PWM limits for pumps at the *Heating engineer* level are either relative or absolute. The selection is made via factory settings at the *Heating engineer* level. With absolute PWM limits, the setting range for the heating engineer is restricted by the OEM limits. The heating engineer can vary the minimum speed only above the minimum set by the OEM, and the maximum speed only below the maximum set by the OEM. With relative PWM limits, the speed range restricted by the OEM forms the basis for the setting range available to the heating engineer, which always reaches from 0% to 100%. This means that 0% corresponds to the OEM's minimum value, and 100% to the OEM's maximum value. Values between 0% and 100% naturally restrict the speed range limited by the OEM. Here, the values displayed for the pump speed are not identical with the control value for the pump. For speed limitation, a set of 6 parameters are available for every pump. It consists of the absolute min./max. values at the *Heating engineer* level, the relative min./max. values at the *Heating engineer* level, and the min./max. values at the *OEM* level. The parameters for the relative speed limits are not interlocked with the limits at the *OEM* level. There is only a reciprocal limitation of min. and max. value active (min. cannot be set above max., and vice versa).

ℹ Note!
The setting limits at the *OEM* level are also restricted by the parameters for the absolute speed limits at the *Heating engineer* level. This means that the upper speed limit at the *OEM* level cannot be set below the max. value at the *Heating engineer* level. When using the relative PWM limits, it is therefore recommended to set the lower and upper speed limit at the *Heating engineer* level to *50%*. This means that the range from 0% to 50% is available for the lower OEM limit, and the range from 50% to 100% for the upper OEM limit.

6.22.7 Solar

Solar controlling element

Line no.	*Operating line*
5840	**Solar controlling element** Charging pump Diverting valve

In place of a collector pump and diverting valves for integrating the storage tanks, the solar plant can also be operated with charging pumps.

Charging pump
When using a charging pump, all heat exchangers can be used simultaneously. Parallel or alternative operation is possible.

Diverting valve
When using a diverting valve, it is only one heat exchanger that can be used at a time. Only alternative operation is possible.

External solar exchanger

Line no.	*Operating line*
5841	**External solar exchanger** Commonly DHW storage tank Buffer storage tank

In the case of solar plant diagrams with 2 storage tanks, it must be selected whether there is an external heat exchanger for both the DHW and the buffer storage tank or for only one of them.

6.22.8 Combi storage tanks

Combi storage tank

Line no.	*Operating line*
5870	**Combi storage tank** No Yes

Functions specific to combi storage tanks are activated via this setting. For example, the electric immersion heater installed in the buffer storage tank can be used for both space heating and DHW heating.

No
No combi storage tank available.

Yes
Combi storage tank available.

Note!
In the case of a combi storage tank, electric immersion heater K16 is switched on to satisfy both space heating and DHW requests.

6.22.9 Relay outputs QX

Note!
Output QX4 is a stepper motor output and is referred to as WX1 in the illustration of chapter *Terminals of LMS14… complete (Basic)*.

Relay output QX1, 2, 3

Line no.	*Operating line*
5890 **5891** **5892**	**Relay output QX1, 2, 3** None Circulating pump Q4 El imm heater DHW K6 Collector pump Q5 Cons circuit pump VK1 Q15 Boiler pump Q1 Bypass pump Q12 Alarm output K10 2nd pump speed HC1 Q21 2nd pump speed HC2 Q22 2nd pump speed HC3 Q23 Heat circuit pump HC3 Q20 Cons circuit pump VK2 Q18 System pump Q14 Heat gen shutoff valve Y4 Solid fuel boiler pump Q10 Time program 5 K13 Buffer return valve Y15 Solar pump ext exch K9 Solar ctrl elem buffer K8 Solar ctrl elem swi pool K18 Swimming pool pump Q19 Cascade pump Q25 St tank transfer pump Q11 DHW mixing pump Q35 DHW interm circ pump Q33 Heat request K27 Refrigeration request K28 Heat circuit pump HC1 Q2 Heat circuit pump HC2 Q6 DHW ctrl elem Q3 Instant heater ctrl elem Q34 Water filling K34 2nd boiler pump speed Q27 Status output K35 Status information K36 Flue gas damper K37 Fan shutdown K38

The relay output settings assign the appropriate functions.

None
Relay output with no function.

Circulating pump Q4
The connected pump serves as a DHW circulating pump. Operation of the pump can be scheduled as required on operating page *DHW*, operating line *Circulating pump release* (1660).

El imm heater DHW K6
Using the connected electric immersion heater, the DHW can be heated up according to *DHW storage tank* (*El imm heater optg mode* (5060), *El immersion heater release* (5061) and *El immersion heater control* (5062)).

Warning!
The electric immersion heater must be equipped with a safety limit thermostat!

Note!
El imm heater optg mode (5060) of the electric immersion heater's operating mode must be appropriately set.

Collector pump Q5
When using a solar collector, a circulating pump for the collector circuit is required.

Cons circuit pump VK1 Q15
Consumer circuit pump VK1 can be used for an additional consumer. Together with an external request for heat at input H and configuration *Consumer request VK1*, an air heater or a similar piece of equipment can be operated.

Boiler pump Q1
The connected pump is used for circulating the boiler water.

Bypass pump Q12
Function is not implemented.

Alarm output K10
In the case of an error message, this output is switched with LPB priority ≥ 6, provided the alarm output is selected for use with one of the relay outputs QX1…3.

The alarm relay signals faults, should they occur. In the event of fault, the relay's contact closes after an adjustable *Alarm delay* (6612). When the fault is corrected, that is, when the fault status is no longer present, the relay is deenergized with no delay.

Note!
If the fault cannot immediately be corrected, it is still possible to reset the alarm relay. This is made on operating page *Faults*.

2nd pump speed HC1 Q21
Pump speed 2 for heating circuit 1 is activated.

2nd pump speed HC2 Q22
Pump speed 2 for heating circuit 2 is activated.

2nd pump speed HC3 Q23
Pump speed 2 for heating circuit 3 is activated.

Heat circuit pump HC3 Q20
Pump heating circuit HC3 is activated.

Cons circuit pump VK2 Q18
Consumer circuit pump VK2 can be used for an additional consumer. Together with an external request for heat at input H and configuration *Consumer request VK2*, an air heater or similar piece of equipment can be operated.

System pump Q14
The connected pump serves as a system pump, which can be used to supply heat to additional consumers. It is put into operation when there is a request for heat from one of the consumers. If there is no request, the pump is deactivated on completion of the overrun time.

Heat gen shutoff valve Y4
If the buffer storage tank holds a sufficient amount of heat, the consumers can draw their heat from it, and the heat sources need not be put into operation. The automatic heat generation lock locks the heat sources and hydraulically disconnects them from the rest of the plant via heat source shutoff valve Y4. This means that the consumers draw their heat from the buffer storage tank and wrong circulation through the heat sources will be prevented.

Solid fuel boiler pump Q10
For the connection of a solid fuel boiler, a circulating pump for the boiler circuit is required.

Time program 5 K13
The relay is controlled according to the settings made in *Time program 5*.

Buffer return valve Y15
This valve must be configured for return temperature increase/decrease or partial charging of the buffer storage tank.

Solar pump ext exch K9
For the external heat exchanger, *Solar pump ext exch K9* must be set at the multifunctional relay output QX or PWM output P1. If both a DHW and a buffer storage tank are available, *External solar exchanger* (5841) must also be set.

Solar ctrl elem buffer K8
If several heat exchangers are used, the buffer storage tank must be set at the respective relay output and, in addition, the type of solar controlling element must be defined on *Solar controlling element* (5840).

Solar ctrl elem swi pool K18
If several heat exchangers are used, the swimming pool must be set at the respective relay output and, in addition, the type of solar controlling element must be defined on *Solar controlling element* (5840).

Swimming pool pump Q19
Using the swimming pool pump, the swimming pool can also be heated by the heat source.

Cascade pump Q25
Common boiler pump for all boilers in a cascaded system.

St tank transfer pump Q11
If the temperature level of the buffer storage tank is high enough, the DHW storage tank can be charged by the buffer. This transfer can be made via storage tank transfer pump Q11.

DHW mixing pump Q35
Separate pump for storage tank circulation during the time the *Legionella* function is active.

DHW intern circ pump Q33
Charging pump with DHW storage tank using an external heat exchanger.

Heat request K27
Contact makes to inform an external heat source that a request for heat is pending.

ℹ Note!
In the case of compensation variants without room thermostat, a minimum request for heat may be constantly present – and thus a request to the external heat source.

ℹ Note!
With cascade operation, this function can only be used via the master.

Refrigeration request K28
When cooling circuit 1 sends a refrigeration request, output *Refrigeration request* (K28) is activated.

Heat circuit pump HC1 Q2
Pump heating circuit HC1 is activated.

Heat circuit pump HC2 Q6
Pump heating circuit HC2 is activated.

DHW ctrl elem Q3
Controlling element for DHW storage tank.

Instant heater ctrl elem Q34
Controlling element for instantaneous water heater.

Water filling K34
Function is not implemented.

2nd pump speed boiler Q27
Speed 2 of the boiler pump is activated.

Status output K35
The status output is activated:

- When, from standby, a request from the controller to the burner control is active
- When startup is initiated in the phase
- In the operation phase
- When a request from the controller is pending

When one of the above mentioned preconditions is fulfilled, the status output is set, even if start prevention – caused by an open gas pressure switch – is demanded.

In all other cases, the status output is deactivated.

The status output is also used if power supply for an additional gas valve (e.g. for liquefied gas in an external tank) is required.
With these types of application, output K35 remains **activated** if an open gas pressure switch causes start prevention, and the burner control quits start prevention again when gas pressure returns (gas pressure switch closes) and a heat request is pending.

If the gas pressure switch switches off during operation, output K35 is only deactivated during postpurging. If the request for heat continues to exist and the burner control goes to start prevention, output K35 is activated again to remain activated.

Status information K36
The output is switched when *Operation* phase (modulation) is active and when *Status output* is selected for one of the relay outputs QX1…3.

Flue gas damper K37
Control of flue gas damper (refer to chapter *Control of flue gas damper*).

Fan shutdown K38
Function *Fan shutdown* to turn off power when the fan is not needed.

Stepper motor output QX4 (WX1)

Relay output QX4

Line no.	*Operating line*
5894	**Relay output QX4** None Heat gen shutoff valve Y4 Buffer return valve Y15 Solar ctrl elem buffer K8 Solar ctrl elem swi pool K18 DHW ctrl elem Q3 Instant heater ctrl elem Q34

The relay output settings assign the appropriate functions.

None
Relay output with no function.

Heat gen shutoff valve Y4
If the buffer storage tank holds a sufficient amount of heat, the consumers can draw their heat from it, and the heat sources need not be put into operation. Automatic heat generation lock locks the heat sources and hydraulically disconnects them from the rest of the plant via heat source shutoff valve Y4. This means that the consumers draw their heat from the buffer storage tank and wrong circulation through the heat sources will be prevented.

Buffer return valve Y15
This valve must be configured for return temperature increase/decrease or partial charging of the buffer storage tank.

Solar ctrl elem buffer K8
If several heat exchangers are used, the buffer storage tank must be set at the respective relay output and, in addition, the type of solar controlling element must be defined on *Solar controlling element* (5840).

Solar ctrl elem swi pool K18
If several heat exchangers are used, the swimming pool must be set at the respective relay output and, in addition, the type of solar controlling element must be defined on *Solar controlling element* (5840).

DHW ctrl elem Q3
Controlling element for DHW storage tank.

Instant heater ctrl elem Q34
Controlling element for instantaneous water heater.

6.22.10 Sensor inputs BX

Sensor input BX

Line no.	*Operating line*
5930 **5931** **5932**	**Sensor input BX1, 2, 3, 4** None DHW sensor B31 Collector sensor B6 DHW circulation sensor B39 Buffer sensor B4 Buffer sensor B41 Flue gas temp sensor B8 Common flow sensor B10 Solid fuel boiler sensor B22 DHW charging sensor B36 Buffer sensor B42 Common return sensor B73 Cascade return sensor B70 Swimming pool sensor B13 Solar flow sensor B63 Solar return sensor B64 Primary exch sensor B26

The sensor input settings assign the appropriate functions.

ℹ Note!
Sensor input BX4 is ready assigned to sensor B7. Reading in sensor B7 is safety-related.

None
Sensor input with no function.

DHW sensor B31
DHW storage tank sensor at the bottom.

Collector sensor B6
This sensor is required for the *Solar* function.

DHW circulation sensor B39
DHW circulation sensor/standby sensor.

Buffer sensor B4
Buffer storage tank sensor at the top.

Buffer sensor B41
Buffer storage tank sensor at the bottom.

Flue gas temp sensor B8
This sensor is required for flue gas supervision.

Common flow sensor B10
This sensor is required for the common flow.

Solid fuel boiler sensor B22
This sensor is required for the solid fuel boiler.

DHW charging sensor B36
This sensor is required for DHW charging.

Buffer sensor B42
Third buffer storage tank sensor (in the middle).

Common return sensor B73
This sensor is required for the common return.

Cascade return sensor B70
This sensor is required for the cascade return.

Swimming pool sensor B13
This sensor is required for the swimming pool.

Solar flow sensor B63
Solar flow sensor for yield measurement.

Solar return sensor B64
Solar return sensor for yield measurement.

Primary exch sensor B26
Customer-specific sensor.

6.22.11 Inputs H1/H3/H4/H5/H6/H7

Warning!
If, with the safety-related *GP configuration* (9612), function *Gas pressure switch* is selected, *Function input H6* (6008) only allows the selection of *None*. *Function input H6* (6008) is evaluated only when the safety-related *GP configuration* (9612) is set to *GP not connected*.
If, then, *Function input H6* (6008) is used to select function *Gas pressure switch*, the latter is not safety-related.

Warning!
If, for input H7 with the safety-related *LP configuration* (9611), a safety-related function *Air pressure switch* is parameterized, *Function input H7* (6011) only allows the selection of *None*.

Function of input H1, H3, H4, H5, H6, H7

Line no. ¹)	*Operating line*
5950 **5960** **5970** **5977** **6008** **6011**	**Function of input Hx** None Optg mode change HCs+DHW Optg mode changeover DHW Optg mode changeover HCs Optg mode changeover HC1 Optg mode changeover HC2 Optg mode changeover HC3 Heat generation lock Error/alarm message Consumer request VK1 Consumer request VK2 Release swi pool generator Excess heat discharge Release swi pool solar Operating level DHW Operating level HC1 Operating level HC2 Operating level HC3 Room thermostat HC1 Room thermostat HC2 Room thermostat HC3 DHW flow switch DHW thermostat Pulse count Checkb sign flue gas damper Start prevention Boiler flow switch Boiler pressure switch Consumer request VK1 10V Consumer request VK2 10V Pressure measurement 10V Output request 10V

	Function	**H1**	**H3**	**H4**	**H5**	**H6**	**H7**
0	None	●	●	●	●	●	●
1	Optg mode changeover HCs+DHW	●	●	●	●	●	●
2	Optg mode changeover DHW	●	●	●	●	●	●
3	Optg mode changeover HCs	●	●	●	●	●	●
4	Optg mode changeover HC1	●	●	●	●	●	●
5	Optg mode changeover HC2	●	●	●	●	●	●
6	Optg mode changeover HC3	●	●	●	●	●	●
7	Heat generation lock	●	●	●	●	●	●
8	Error/alarm message	●	●	●	●	●	●
9	Consumer request VK1	●	●	●	●	●	●
10	Consumer request VK2	●	●	●	●	●	●
11	Release swi'pool consumer	●	●	●	●	●	●
12	Excess heat discharge	●	●	●	●	●	●
13	Release swi pool solar	●	●	●	●	●	●
14	Operating level DHW	●	●	●	●	●	●
15	Operating level HC1	●	●	●	●	●	●
16	Operating level HC2	●	●	●	●	●	●
17	Operating level HC3	●	●	●	●	●	●
18	Room thermostat HC1	●	●	●	●	●	●
19	Room thermostat HC2	●	●	●	●	●	●
20	Room thermostat HC3	●	●	●	●	●	●
21	DHW flow switch	●	●	●	●	●	●
22	DHW thermostat	●	●	●	●	●	●
24	Pulse count	●	●	●	●	●	●
28	Checkback signal flue gas damper	●	●	●	●	●	●
29	Start prevention						
31	Boiler flow switch	●	●	●	●	●	●
32	Boiler pressure switch	●	●	●	●	●	●
34	Gas pressure switch					●	
50	Flow measurement Hz			●			
51	Consumer request VK1 10V	●	●				
52	Consumer request VK2 10V	●	●				
54	Pressure measurement 10V	●	●				
58	Output request 10V	●	●				

Assignment of line numbers to the individual parameters of inputs Hx:

	Function	Type	U1	F1	U2	F2
H1	5950	5951	5953	5954	5955	5956
H3	5960	5961	5963	5964	5965	5966
H4 ¹)	5970	5971	5973	5974	5975	5976
H5	5977	5978	---	---	---	---
H6	6008	6009	---	---	---	---
H7	6011	6012	---	---	---	---

¹) At H4, a frequency value is to be entered for U1 and U2 – not a voltage value

None
Input with no function.

Optg mode changeover

- Heating circuit:
  The operating modes of the heating circuits are switched to *Protection* mode via input Hx (e.g. using a remote telephone switch) (*Optg mode changeover* (900/1200/1500))
- DHW:
  DHW heating is locked only when using setting *HCs + DHW* or *DHW*.

Heat generation lock
The heat source is locked via terminals Hx. All requests for heat from the heating circuits and from DHW are ignored. Frost protection for the boiler is maintained.

Note!
The *Chimney sweep* function can be activated although heat generation lock is active.

Error/alarm message
Input H1 generates a controller-internal error message. If the *Alarm* output (*Relay output QX2* (5891), *Relay output QX3* (5892), *Relay output QX4* (5894)) is appropriately configured, the error message is forwarded or displayed by an additional contact (e.g. an external lamp or horn).

Consumer request VKx
The adjusted flow temperature setpoint is activated via the terminals (e.g. air heater function for a warm air curtain).

Note!
The setpoint is to be set via *Flow temp setp cons request* (1859/1909).

Release swi pool heat source
This function enables swimming pool heating to be released by the heat source.

Note!
The setpoint is to be set via *Flow temp setp swi pool* (1959).

Excess heat discharge
Active dissipation of excess heat enables an external heat source to force consumers (heating circuit, DHW storage tank, Hx pump) to draw excess heat by delivering a forced signal. Parameter *Excess heat draw* (e.g. (861) for heating circuit 1) can be used to determine for every consumer whether or not it shall take account of the forced signal and, hence, whether or not it shall draw heat.

- Local effect:
  When using LPB device address 0 or >1, excess heat discharge only acts on the local consumers connected to the controller.
- Central effect (LPB):
  When using LPB device address = 1, excess heat discharge also acts on the consumers connected to the other controllers in the same segment. The distribution of excess heat from segment 0 across other segments of the system is not possible.

Release swi pool solar
This function can be used to enable **solar heating of the swimming pool** from externally (e.g. with a manual switch), or to define solar charging priority against the storage tanks.

Configuration:
Set function *Input Hx* to *Release swimming pool*. For details, refer to *Charging priority solar* (2065).

Operating level HCs/DHW
The operating level can be set via the contact in place of using the internal time program (external time program).

Room thermostat HCx
The input can be used to generate a room thermostat request for the selected heating circuit.

If several inputs Hx are configured for the room thermostat to be used with the same heating circuit, only input Hx with the highest number is used. The other inputs are not taken into consideration (no configuration error).

Order of inputs Hx with the same room thermostat configuration:
H7, H6, H5, H4, H3, H2-EM3, H2-EM2, H2-EM1, H1.

DHW flow switch
Here, the flow switch of the instantaneous water heater is connected.

DHW thermostat
Here, the DHW storage tank thermostat is connected.

In addition, *DHW sensor* (5730) on the **Configuration** menu is to be set to *Thermostat* and no connection is allowed at input B3/B38.

Pulse count
Low-frequency pulses (e.g. for flow measurement) can be acquired by querying the input.

Feedback flue gas damper
This feedback is required for function *Control of flue gas damper* (refer to chapter *Control of flue gas damper*.

Start prevention
Function *Start prevention* is not yet implemented. If this function is configured to an input Hx, configuration error 152 is displayed.

Boiler flow switch

The contacts of the boiler flow switch make when there is flow, or sufficient flow, through the boiler’s heat exchanger. If the contacts do not make, startup is prevented.

Warning!

- **If the function is activated simultaneously at several inputs, it automatically acts on the input with the highest number.**
  Example:
  If the boiler flow switch is activated simultaneously at inputs H1 and H3, it only becomes active at H3 (no configuration error)
- **With the BwDI2 instantaneous water heater system, the boiler flow switch is not checked**

Boiler pressure switch

When the contacts of the pressure switch close, burner control startup and control of the pumps are immediately released. When the contacts open, start prevention or lockout is triggered.

Warning!

If the function is activated simultaneously at several inputs, it automatically acts on the input with the highest number.

Example:

If the boiler pressure switch is activated simultaneously at inputs H1 and H3, it only becomes active at H3 (no configuration error).

Gas pressure switch

The gas pressure switch responds when the gas pressure is too low.
When it responds, the LMS14... always goes to the *Start prevention* phase.
If the burner is in operation when the gas pressure switch responds, safety shutdown is triggered, followed by a change to the *Start prevention* phase.
The LMS14... is again ready to operate when the gas pressure switch no longer indicates low gas pressure.

The system behaves differently when the gas pressure switch responds during the safety time (establishment of flame).
Here too, safety shutdown is triggered first, followed by a change to the *Start prevention* phase.
If the gas pressure switch responds several times during the safety time, startup will be locked for 2 hours.
When this time has elapsed, the LMS14... is again ready to operate, provided the gas pressure switch no longer indicates low gas pressure.

The number of times the gas pressure switch may respond during the safety time until startup is locked depends on parameter *RepCounter flame TSA* [3633.1].
If this parameter is set to 1, startup lock is activated the first time the gas pressure switch responds during the safety time.
If this parameter is set to 3, the unit is again ready to operate after the first and second time the gas pressure switch responds during the safety time, provided the gas pressure switch no longer indicates low gas pressure.
If the gas pressure switch responds a third time during the safety time, the 2-hour startup lock takes effect.

Warning!
If, with the safety-related *GP configuration* (9612), function *Gas pressure switch* is selected, *Function input H6* (6008) only allows the selection of *None*. *Function input H6* (6008) is evaluated only when the safety-related *GP configuration* (9612) is set to *GP not connected*.
If, then, *Function input H6* (6008) is used to select function *Gas pressure switch*, the latter is not safety-related.
In that case, function *Gas pressure switch* is active as a non-safety-related function because it can be activated and deactivated from a non-safety-related operating section.
Also refer to chapters *Configuration* and *Program sequence of burner control* (function).

Flow measurement Hz (frequency measurement)
Here, a flow sensor can be connected, which indicates the flow rate in the form of a frequency value.

Consumer request VKx 10V
The heat source receives a voltage signal (DC 0...10 V) as the preselected output. A linear characteristic converts the applied voltage to a heat request. This ~~linear~~ characteristic is defined with the help of 2 fixed points (voltage value 1/function value 1, and voltage value 2/function value 2).
The function value’s resolution is 0.1 °C. This means that the function value to be parameterized for a setpoint of 80 °C, for example, is 800.
The request becomes active when – via the characteristic – the applied voltage leads to a flow temperature setpoint of at least 6 °C. The request for heat remains active as long as the applied voltage demands a flow temperature setpoint of at least 4 °C.
The flow temperature setpoint is limited to the boiler’s maximum setpoint (*Setpoint max* (2212)). In addition, the flow temperature setpoint is limited to the limit thermostat’s *Cutout temp LT* (2531) – minimum switch-off differential in *Heating* mode (*Switching diff off min HCs* (2455)) – 3 K.

Pressure measurement DC 10 V
The voltage signal present at input Hx is converted to a pressure value (linear conversion). The linear characteristic is defined by 2 fixed points (voltage value 1/function value 1, and voltage value 2/function value 2).

Output request 10V
The heat source receives a voltage signal (DC 0...10 V) as a heat request. A linear characteristic converts the applied voltage to an output request. This characteristic is defined with the help of 2 fixed points (voltage value 1/function value 1, and voltage value 2/function value 2).
The function value’s resolution is 0.1%. This means that the function value to be parameterized for an output request of 50%, for example, is 500.
The request becomes active when the applied voltage is a minimum of 200 mV. It remains active as long as the voltage at input H is a minimum of 150 mV.
The switch-off point for the burner lies 3 K below the limit thermostat’s *Cutout temp LT* (2531). The burner’s switch-on point lies by the switch-on differential in *Heating* mode (*Switching diff on HCs* (2454)) below the switch-off point. There is no valid *Boiler setpoint* (8311).

Note!
In the case of an externally preselected output, forced signals are sent to the consumers. As a result, the setpoints of all heating circuits (pump and mixing circuits) are set to their maximum.

Frequency value 1
Function value 1
Frequency value 2
Function value 2

The linear characteristic is defined by 2 fixed points. The setting uses 2 pairs of parameters for function value and voltage value (F1/U1 and F2/U2).

Example of 2 different sensor characteristics:

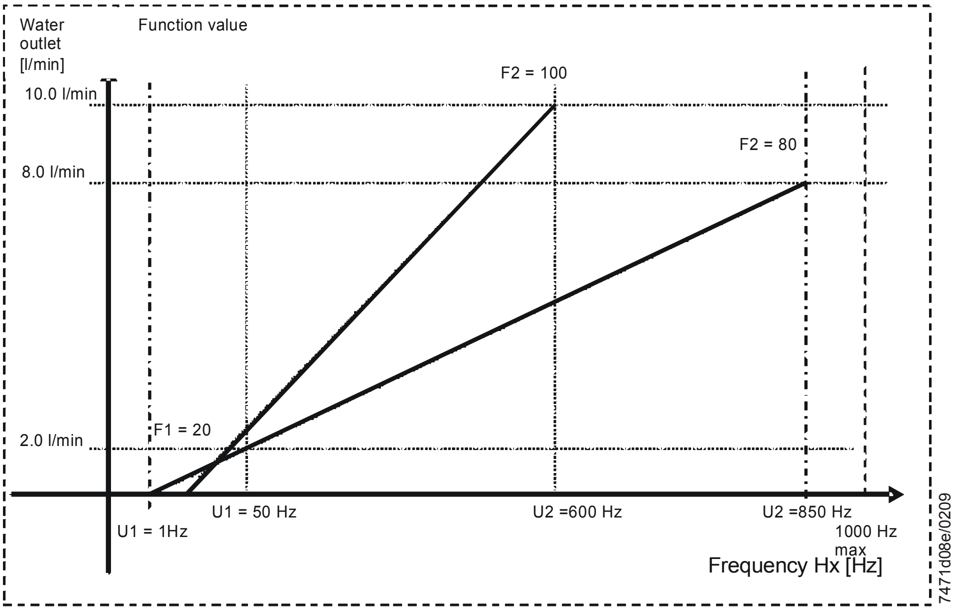


Figure 83: Inputs Hx - Flow measurement Hz

Key

F1	Function value 1
F2	Function value 2
U1	Frequency value 1
U2	Frequency value 2

Info/diagnostics

Line no.	*Operating line*
7862	**Frequency H4**

- Flow detection DHW (DHW flow switch):
  With instantaneous water heater systems, the flow entering the cold water inlet can be measured with a flow sensor.

  A DHW request is identified when the measured flow rate satisfies the following condition: *DHW flow > threshold Tww-FlowSwitch*

  A DHW request is not identified when the measured flow rate satisfies the following condition: *DHW flow > threshold Tww-FlowSwitch – switching diff.Tww-FlowSwitch*

Additional parameters

Line no.	*Operating line*
5444	**Threshold flow detection**
5445	**Switching diff flow detection**

Info/diagnostics

Line no.	*Operating line*
8860	**DHW flow**

Contact type H1, H3, H4, H5, H6, H7

Line no. ¹)	*Operating line*
5951 **5961** **5971** **5978** **6009** **6012**	**Contact type Hx** NC NO

The type of contact of Hx can be selected (NO or NC).

Parameters Type of contact Hx	**Contact state at terminal Hx**	**Functional state/impact**
Normally open contact (NO)	Open	Not active
	Closed	Active
Normally closed contact (NC)	Open	Active
	Closed	Not active

NC
The contact is normally closed and must open to activate the selected function.

NO
The contact is normally open and must close to activate the selected function.

Voltage value 1 H1

Line no. ¹)	*Operating line*
5953	**Voltage value 1 H1**

Function value 1 H1

Line no. ¹)	*Operating line*
5954	**Function value 1 H1**

Voltage value 2 H1

Line no. ¹)	*Operating line*
5955	**Voltage value 2 H1**

Function value 2 H1

Line no. ¹)	*Operating line*
5956	**Function value 2 H1**

Voltage value 1 H3

Line no. ¹)	*Operating line*
5963	**Voltage value 1 H3**

Function value 1 H3

Line no. ¹)	*Operating line*
5964	**Function value 1 H3**

Voltage value 2 H3

Line no. ¹)	*Operating line*
5965	**Voltage value 2 H3**

Function value 2 H3

Line no. ¹)	*Operating line*
5966	**Function value 2 H3**

Frequency value 1 H4

Line no. ¹)	*Operating line*
5973	**Frequency value 1 H4**

Function value 1 H4

Line no. ¹)	*Operating line*
5974	**Function value 1 H4**

Frequency value 2 H4

Line no. ¹)	*Operating line*
5975	**Frequency value 2 H4**

Function value 2 H4

Line no. ¹)	*Operating line*
5976	**Function value 2 H4**

The linear characteristic is defined by 2 fixed points. The setting uses 2 pairs of parameters for function value and voltage value (F1/U1 and F2/U2). At input H4 (frequency input), a frequency value is assigned to the function value – and not a voltage value.

- Example of heat request DC 10 V

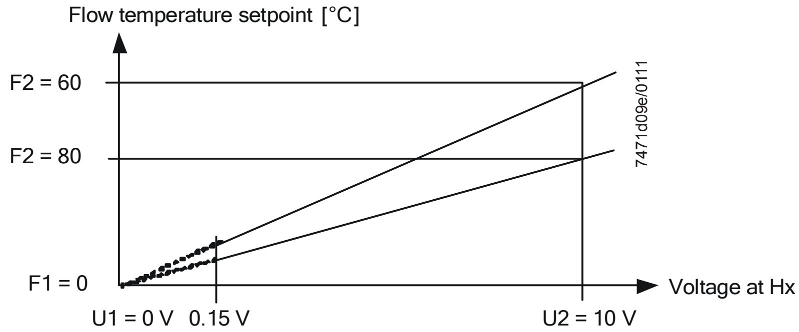


Figure 84: Inputs Hx – heat request

Key

F1	Function value 1
F2	Function value 2
U1	Frequency value 1
U2	Frequency value 2

If the input signal drops below the limit value of 0.15 V, the request for heat becomes invalid, which means it has no impact.

The function value to be set is calculated as follows:

Function value = pressure value [bar]/0.1 bar

- Example of pressure measurement DC 10 V:

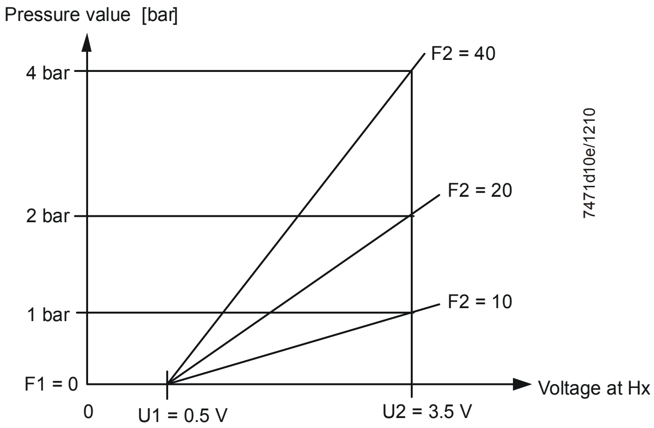


Figure 85: Inputs Hx – pressure measurement

Key

F1	Function value 1
F2	Function value 2
U1	Frequency value 1
U2	Frequency value 2

6.22.12 Extension modules

⚠ **Caution!**
Under the most unfavorable conditions, the signals from the extension modules to the LMS14..., and vice versa, may take up to 40 seconds to be refreshed via the BSB.
This can lead to functional restrictions and detrimental effects on the limit thermostat functions.
For such functions, use BX1, BX2, BX3, BX4/QX1, QX2, QX3, QX4 (only valves) /P1/H1, H3, H4, H5, H6 or H7.

Note!
Sensor input BX4 is firmly assigned to sensor B7.

Function extension module 1, 2, 3

Line no.	*Operating line*
6020 **6021** **6022**	**Function extension module x** None Multifunctional Heating circuit 1 Heating circuit 2 Heating circuit 3 Return temp controller Solar DHW Prim contr/system pump

None
Function is deactivated.

Multifunctional
The choice of functions that can be assigned to the multifunctional inputs/outputs appear as …
Relay output QX21 module 1 (6030),
Relay output QX22 module 1 (6031),
Relay output QX23 module 1 (6032),
Relay output QX21 module 2 (6033),
Relay output QX22 module 2 (6034),
Relay output QX23 module 2 (6035),
Relay output QX21 module 3 (6036),
Relay output QX22 module 3 (6037),
Relay output QX23 module 3 (6038),
Sensor input BX21 module 1 (6040),
Sensor input BX22 module 1 (6041),
Sensor input BX21 module 2 (6042),
Sensor input BX22 module 2 (6043),
Sensor input BX21 module 3 (6044), and
Sensor input BX22 module 3 (6045).

Heating circuit 1
For this application, the respective settings of operating page *Heating circuit 1* can be adapted.

Heating circuit 2
For this application, the respective settings of operating page *Heating circuit 2* can be adapted.

Heating circuit 3
For this application, the respective settings of operating page *Heating circuit 3* can be adapted.

Return temp controller
This function is not implemented and leads to fault status message *Parameterization*.

Solar DHW
The relevant settings of operating page *Solar* can be matched to meet the requirements of this application.

Prim contr/system pump
For this application, the respective settings of operating page *Primary controller/system pump* can be adapted.

Connections:

	QX21	QX22	QX23	BX21	BX22	H2	Chapter
Multifunctional	*	*	*	*	*	*	---
Heating circuit 1	Y1	Y2	Q2	B1	*	*	---
Heating circuit 2	Y5	Y6	Q6	B12	*	*	¹)
Heating circuit 3	Y11	Y12	Q20	B14	*	*	---
Return temperature controller	---	---	---	---	---	---	---
Solar DHW	*	*	Q5	B6	B31	*	¹)
Primary controller	Y19	Y20	Q14	B15	*	*	¹)

* Can be freely selected, refer to QX…/BX... extension module

¹) Refer to chapter *Extra functions with extension module AVS75.390*

6.22.13 EX extension modules 1/2/3

Funct input EX21 module 1, 2, 3

Line no.	*Operating line*
6024 **6026** **6028**	**Funct input EX21 module x** None Limit thermostat HC

	Function	**Module 1**	**Module 2**	**Module 3**
0	None	●	●	●
25	Limit thermostat HC	●	●	●

Note!
Software versions 3.3, 3.4 and 3.5 of the operator terminal offer more functions than the number of functions available. The only functions that can be selected are *None* and *Limit thermostat HC*. With software version 3.6 and higher, these are the only 2 selectable functions.

None
Input Hx with no function.

Limit thermostat HC
If the extension module is used for the heating circuit, an external limit thermostat (e.g. for floor heating) can be connected to input EX21 (AC 230 V).

If the limit thermostat cuts out, …

- the mixing valve is closed and the pump deactivated,
- an error message *Limit thermostat HCx* is delivered,
- status *Limit thermostat cut out* is generated.

If the function of the extension module is set to *Heating circuits 1…3* or *Heating circuit/cooling circuit 1*, and the function of input EX21 for the same module to *Limit thermostat HC*, the module gives consideration to the state at input EX21 in that case, for control of the relay outputs (pump and mixing valve opening/closing).

Wiring example:

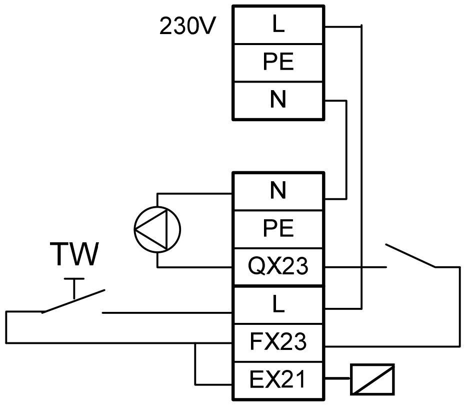


Figure 86: Extensions module – limit thermostat HC

Key

TW	Limit thermostat

The state of 0 V is always interpreted as *Limit thermostat cut out*.

The state at input EX21 is transmitted to the basic unit where it is evaluated for the generation of error messages. The input test also shows the state (0 V/230 V).
Since inside the module input EX21 acts on the states of the relays, the limit thermostat continues to be active even if communication with the basic unit is interrupted.

If the *Limit thermostat* function is not desired, the parameter settings for input EX21 must be appropriately changed.

Info/diagnostics

Line no.	*Operating line*
7950	**Input EX21 module 1**
7951	**Input EX21 module 2**
7952	**Input EX21 module 3**

Signal state: 0 V/230 V

Operating state

The current operating state can be verified on operating page *Status*.

Start prevention

This input can be used to prevent burner starts.

ℹ Note!
Start prevention via this input is not safety-related.

6.22.14 QX extension modules 1/2/3

Caution!
Under the most unfavorable conditions, the signals from the extension modules to the LMS14..., and vice versa, may take up to 40 seconds to be refreshed in the extension module via the BSB.
This can lead to functional restrictions and detrimental effects on the limit thermostat functions. For such functions, use BX1, BX2, BX3 or BX4 (only valves).

Relay output QX... module 1, 2, 3

Line no.	*Operating line*
6030	**Relay output QX21 module 1**
6031	**Relay output QX22 module 1**
6032	**Relay output QX23 module 1**
6033	**Relay output QX21 module 2**
6034	**Relay output QX22 module 2**
6035	**Relay output QX23 module 2**
6036	**Relay output QX21 module 3**
6037	**Relay output QX22 module 3**
6038	**Relay output QX23 module 3**
	None
	Circulating pump Q4
	El imm heater DHW K6
	Collector pump Q5
	Cons circuit pump VK1 Q15
	Boiler pump Q1
	Bypass pump Q12
	Alarm output K10
	2nd pump speed HC1 Q21
	2nd pump speed HC2 Q22
	2nd pump speed HC3 Q23
	Heat circuit pump HC3 Q20
	Cons circuit pump VK2 Q1
	System pump Q14
	Heat gen shutoff valve Y4
	Solid fuel boiler pump Q10
	Time program 5 K13
	Buffer return valve Y15
	Solar pump ext exch K9
	Solar ctrl elem buffer K8
	Solar ctrl elem swi pool K18
	Swimming pool pump Q19
	Cascade pump Q25
	St tank transfer pump Q11
	DHW mixing pump Q35
	DHW interm circ pump Q33
	Heat request K27
	Refrigeration request K28
	Heat circuit pump HC1 Q2
	Heat circuit pump HC2 Q6
	DHW ctrl elem Q3
	Instant heater ctrl elem Q34
	Water filling K34
	2nd boiler pump speed Q27
	Status output K35
	Status information K36
	Fan shutdown K38

The relay output settings assign the appropriate functions.

None
Relay output with no function.

Circulating pump Q4
The connected pump serves as a DHW circulating pump. Operation of the pump can be scheduled as required on operating page *DHW*, operating line *Circulating pump release* (1660).

DHW **El imm heater DHW K6**
Using the connected electric immersion heater, the DHW can be heated according to operating page *DHW storage tank* (*El imm heater optg mode* (5060), *El immersion heater release* (5061) and *El immersion heater control* (5062)).

Warning!
The electric immersion heater must be equipped with a safety limit thermostat!

Note!
El imm heater optg mode (5060) of the electric immersion heater's operating mode must be appropriately set.

Collector pump Q5
When using a solar collector, a circulating pump for the collector circuit is required.

Cons circuit pump VK1 Q15
Consumer circuit pump VK1 can be used for an additional consumer. Together with an external request for heat at input H and configuration *Consumer request VK1*, an air heater or similar piece of equipment can be operated.

Boiler pump Q1
The connected pump is used for circulating the boiler water.

Bypass pump Q12
Function is not implemented.

Alarm output K10
The alarm relay signals faults, should they occur. In the event of fault, the relay's contact closes after an adjustable *Alarm delay* (6612). When the fault is corrected, that is, when the fault status is no longer present, the relay is deenergized with no delay.

Note!
If the fault cannot immediately be corrected, it is still possible to reset the alarm relay. This is made on operating page *Faults*.

2nd pump speed HC1 Q21
Pump speed 2 for heating circuit 1 is activated.

2nd pump speed HC2 Q22
Pump speed 2 for heating circuit 2 is activated.

2nd pump speed HC3 Q23
Pump speed 2 for heating circuit 3 is activated.

Heat circuit pump HC3 Q20
Pump heating circuit HC3 is activated.

Cons circuit pump VK2 Q18
Consumer circuit pump VK2 can be used for an additional consumer. Together with an external request for heat at input H and configuration *Consumer request VK2*, an air heater or similar piece of equipment can be operated.

System pump Q14
The connected pump serves as a system pump, which can be used to supply heat to additional consumers. It is put into operation when there is a request for heat from one of the consumers. If there is no request, the pump is deactivated on completion of the overrun time.

Heat gen shutoff valve Y4
If the buffer storage tank holds a sufficient amount of heat, the consumers can draw their heat from it, and the heat sources need not be put into operation. The automatic heat generation lock locks the heat sources and hydraulically disconnects them from the rest of the plant via heat source shutoff valve Y4. This means that the consumers draw their heating energy from the buffer storage tank and wrong circulation through the heat sources will be prevented.

Solid fuel boiler pump Q10
For the connection of a solid fuel boiler, a circulating pump for the boiler circuit is required.

Time program 5 K13
The relay is controlled according to the settings made in *Time program 5*.

Buffer return valve Y15
This valve must be configured for return temperature increase/decrease or partial charging of the buffer storage tank.

Solar pump ext exch K9
For the external heat exchanger, solar pump external exchanger K9 must be set at the multifunctional relay output QX or PWM output P1. If a DHW and a buffer storage tank are available, *External solar exchanger* (5841) must be set also.

Solar ctrl elem buffer K8
If several heat exchangers are used, the buffer storage tank must be set at the respective relay output and, in addition, the type of solar controlling element must be defined on *Solar controlling element* (5840).

Solar ctrl elem swi pool K18
If several heat exchangers are used, the swimming pool must be set at the respective relay output and, in addition, the type of solar controlling element must be defined on *Solar controlling element* (5840).

Swimming pool pump Q19
This function enables swimming pool heating to be released by the heat source.

Cascade pump Q25
Common boiler pump for all boilers in a cascaded system.

St tank transfer pump Q11
If the temperature level of the buffer storage tank is high enough, the DHW storage tank can be charged by the buffer. This transfer can be made via storage tank transfer pump Q11.

DHW mixing pump Q35
Separate pump for storage tank circulation during the time the *Legionella* function is active.

DHW intern circ pump Q33
Charging pump with DHW storage tank using an external heat exchanger.

Heat request K27
Contact makes to inform an external heat source that a request for heat is pending.

Note!
With compensation variants without room thermostat, a minimum demand for heat may constantly be present, leading to a heat request to the external heat source.

Note!
With cascade operation, this function can only be used via the master.

Refrigeration request K28
Output K28 is activated when there is a request for cooling energy in cooling circuit 1.

Heat circuit pump HC1 Q2
Pump heating circuit HC1 is activated.

Heat circuit pump HC2 Q6
Pump heating circuit HC2 is activated.

DHW ctrl elem Q3
Controlling element for DHW storage tank.

Instant heater ctrl elem Q34
Controlling element for instantaneous water heater.

Water filling K34
Function is not implemented.

2nd boiler pump speed Q27
Speed 2 of the boiler pump is activated.

Status output K35

The status output is activated:

- When, from standby, a request from the controller to the burner control is active
- When startup is initiated in the phase
- In the operation phase
- When a request from the controller is pending

When one of the above mentioned preconditions is fulfilled, the status output is set, even if start prevention – caused by an open gas pressure switch – is demanded.

In all other cases, the status output is deactivated.

The status output is also used if power supply for an additional gas valve (e.g. for liquefied gas in an external tank) is required.
With these types of application, output K35 remains **activated** if an open gas pressure switch causes start prevention, and the burner control quits start prevention again when gas pressure returns (gas pressure switch closes) and a heat request is pending.

If the gas pressure switch switches off during operation, output K35 is only deactivated during postpurging. If the request for heat continues to exist and the burner control goes to start prevention, output K35 is activated again and remains activated.

Status information K36

The output is switched when the *Operation* phase (modulation) is active and when the status output is selected for use with one of the relay outputs QX1…3.

Fan shutdown K38

Function *Fan shutdown* to turn off power when the fan is not needed.

6.22.15 BX extension modules

⚠ **Caution!**
Under the most unfavorable conditions, the signals from the extension modules to the LMS14..., and vice versa, may take up to 40 seconds to be refreshed in the LMS14… via the BSB.
This can lead to functional restrictions and detrimental effects on the limit thermostat functions. For such functions, use BX1, BX2, BX3 or BX4.

Note!
Sensor input BX4 is firmly assigned to sensor B7.

Sensor input BX...
module 1, 2, 3

Line no.	*Operating line*
6040	**Sensor input BX21 module 1**
6041	**Sensor input BX22 module 1**
6042	**Sensor input BX21 module 2**
6043	**Sensor input BX22 module 2**
6044	**Sensor input BX21 module 3**
6045	**Sensor input BX22 module 3**
	None DHW sensor B31 Collector sensor B6 DHW circulation sensor B39 Buffer sensor B4 Buffer sensor B41 Flue gas temp sensor B8 Common flow sensor B10 Solid fuel boiler sensor B22 DHW charging sensor B36 Buffer sensor B42 Common return sensor B73 Cascade return sensor B70 Swimming pool sensor B13 Solar flow sensor B63 Solar return sensor B64 Primary exch sensor B26

The relay output settings assign the appropriate functions.

None
Sensor input with no function.

DHW sensor B31
DHW storage tank sensor at the bottom.

Collector sensor B6
This sensor is required for the solar function.

DHW circulation sensor B39
DHW circulation sensor/standby sensor.

Buffer sensor B4
Buffer storage tank sensor at the top.

Buffer sensor B41
Buffer storage tank sensor at the bottom.

Flue gas temperature sensor B8
This sensor is required for flue gas supervision.

Common flow sensor B10
This sensor is required for the common flow.

Solid fuel boiler sensor B22
This sensor is required for the solid fuel boiler.

DHW charging sensor B36
This sensor is required for DHW charging.

Buffer sensor B42
Third buffer storage tank sensor (in the middle).

Common return sensor B73
This sensor is required for the common return.

Cascade return sensor B70
This sensor is required for the cascade return.

Swimming pool sensor B13
This sensor is required for the swimming pool.

Solar flow sensor B63
Solar flow sensor for yield measurement.

Solar return sensor B64
Solar return sensor for yield measurement.

Primary exch sensor B26
Customer-specific sensor.

6.22.16 H2 extension modules 1/2/3

Warning!
Under the most unfavorable conditions, the signals from the extension modules to the LMS14..., and vice versa, may take up to 40 seconds to be refreshed in the LMS14… via the BSB.
This can lead to functional restrictions and detrimental effects on the limit thermostat functions. For such functions, use H1, H3, H4, H5, H6 or H7.

Function of input H2 module 1, 2, 3

Line no.	*Operating line*
6046	**Function of input H2 module 1**
6054	**Function of input H2 module 2**
6062	**Function of input H2 module 3**
	None
	Optg mode change HCs+DHW
	Optg mode changeover DHW
	Optg mode changeover HCs
	Optg mode changeover HC1
	Optg mode changeover HC2
	Optg mode changeover HC3
	Heat generation lock
	Error/alarm message
	Consumer request VK1
	Consumer request VK2
	Release swi pool generator
	Excess heat discharge
	Release swi pool solar
	Operating level DHW
	Operating level HC1
	Operating level HC2
	Operating level HC3
	Room thermostat HC1
	Room thermostat HC2
	Room thermostat HC3
	DHW flow switch
	DHW thermostat
	Limit thermostat HC
	Start prevention
	Boiler flow switch
	Boiler pressure switch
	Consumer request VK1 10V
	Consumer request VK2 10V
	Pressure measurement 10V
	Output request 10V

Assignment of line numbers to the parameter of inputs H2-EMx:

	Function	Type	Value K	U1	F1	U2	F2
H2 EM1	6046	6047	6048	6049	6050	6051	6052
H2 EM2	6054	6055	6056	6057	6058	6059	6060
H2 EM3	6062	6063	6064	6065	6066	6067	6068

	Function	**H2 EMx**
0	None	●
1	Optg mode change HCs + DHW	●
2	Optg mode changeover DHW	●
3	Optg mode changeover HCs	●
4	Optg mode changeover HC1	●
5	Optg mode changeover HC2	●
6	Optg mode changeover HC3	●
7	Heat generation lock	●
8	Error/alarm message	●
9	Consumer request VK1	●
10	Consumer request VK2	●
11	Release swi pool heat source	●
12	Excess heat discharge	●
13	Release swi pool solar	●
14	Operating level DHW	●
15	Operating level HC1	●
16	Operating level HC2	●
17	Operating level HC3	●
18	Room thermostat HC1	●
19	Room thermostat HC2	●
20	Room thermostat HC3	●
21	DHW flow switch	●
22	DHW thermostat	●
25	Limit thermostat HC	●
29	Start prevention	
31	Boiler flow switch	●
32	Boiler pressure switch	●
51	Consumer request VK1 10 V	●
52	Consumer request VK2 10 V	●
54	Pressure measurement 10 V	●
58	Output request 10V	●

None
Input Hx with no function.

Optg mode changeover

- Heating circuit:
  The operating modes of the heating circuits are changed to the parameterized operating mode (*Optg mode changeover* (900/1200/1500)) via terminals Hx (e.g. remote telephone switch).
- DHW:
  DHW heating is locked only when using setting *HCs + DHW* or *DHW*.

Heat generation lock
The heat source is locked via terminals Hx. All requests for heat from the heating circuits and DHW are ignored. Frost protection for the boiler is maintained.

Note!
The *Chimney sweep* function can be activated although the heat generation lock is active.

Error/alarm message
Input H1 generates a controller-internal error message. If the *Alarm output* (*Relay output QX2* (5891), *Relay output QX3* (5892), *Relay output QX4* (5894)) is appropriately configured, the error message is forwarded or displayed by an additional contact (e.g. external lamp or horn).

Consumer request VKx
The adjusted flow temperature setpoint is activated via the terminals (e.g. an *Air heater* function for a warm air curtain).

Note!
The setpoint is to be adjusted on *Flow temp setp cons request* (1859/1909)

Release swi pool heat source Q19
This function enables swimming pool heating to be released by the heat source.

Note!
The setpoint is to be adjusted on *Flow temp setp swi pool* (1959)

Excess heat discharge
Active dissipation of excess heat enables an external heat source to force consumers (heating circuit, DHW storage tank, Hx pump) to draw excess heat by delivering a forced signal. Parameter *Excess heat draw* (e.g. (861) for heating circuit 1) can be used to determine for every consumer whether or not it should take account of the forced signal and, hence, whether or not that consumer should participate in the dissipation of heat.

- Local effect:
  When using LPB device address 0 or >1, excess heat discharge only acts on the local consumers connected to the controller.
- Central effect (LPB):
  When using LPB device address = 1, excess heat discharge also acts on the consumers connected to the other controllers in the same segment. The distribution of excess heat from segment 0 across other segments of the system is not possible.

Release swi pool solar
This function can be used to enable **solar heating of the swimming pool** from externally (e.g. via a manual switch) or to define solar charging priority against the storage tanks.

Configuration:
Set function *Input Hx* to *Release swimming pool*. For a description of function *Solar charging priority*, refer to *Charging priority solar* (2065).

Operating level HCs/DHW
The operating level can be set via the contact in place of using the internal time program (external time program).

Room thermostat HCx
The input can be used to generate a room thermostat request for the selected heating circuit.

If several inputs Hx are configured for the room thermostat to be used with the same heating circuit, only input Hx with the highest number is used. The other inputs are not taken into consideration (no configuration error).

Order of inputs Hx with the same room thermostat configuration:
H7, H6, H5, H4, H3, H2-EM3, H2-EM2, H2-EM1, H1.

DHW flow switch
Here, connect the flow switch of the instantaneous water heater.

DHW thermostat
Here, the DHW storage tank thermostat is connected.

In addition, the *DHW sensor* (5730) of the **Configuration** menu is to be set to *Thermostat* and no connections are allowed at input B3/B38.

Limit thermostat HC
If the extension module for the heating circuit is used, an external limit thermostat (e.g. for floor heating) can be connected to input H2 (low-voltage).

If the limit thermostat cuts out, …
- the mixing valve is closed and the pump is deactivated,
- an error message *Limit thermostat HCx* is delivered,
- state *Limit thermostat cut out* is generated.

If the function of the extension module is set to *Heating circuits 1…3*, and the function of input H2 for the same module to *Limit thermostat HC*, the module gives consideration to the state at input H2 in that case, for control of the relay outputs (pump and mixing valve opening/closing).

Wiring example:

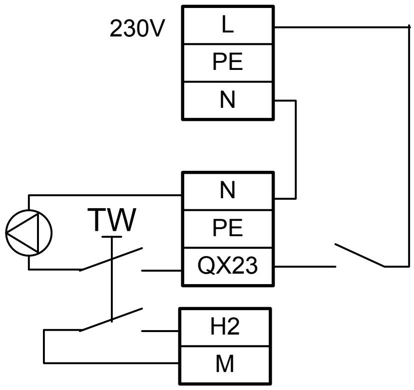


Figure 87: H2 extension module

When used as a limit thermostat input, the contact type of input H2 cannot be selected. The interpretation of *Open* is always *Limit thermostat cut out*.

The state at input H2 is transmitted to the basic unit where it is evaluated for the generation of error messages. The input test also shows the state (*Open/Closed*).

Since input H2 inside the module acts on the states of the relays, the limit thermostat continues to be active even if communication with the basic unit is interrupted.

If the *Limit thermostat* function is not desired, the parameter settings for input H2 must be appropriately changed.

Info/diagnostics

Line no.	*Operating line*
7846	**Contact state H2 module 1**
7849	**Contact state H2 module 2**
7852	**Contact state H2 module 3**

Signal states: Open/Closed.

Operating state

The current operating state can be verified on operating page *Status*.

Start prevention

Function *Start prevention* is not yet implemented. If this function was configured to an input Hx, configuration error 152 is displayed.

Boiler flow switch

The contacts of the boiler flow switch make when there is flow, or sufficient flow, through the boiler’s heat exchanger. If the contacts do not close, startup is prevented.

Warning!

- **If the function is activated simultaneously at several inputs, it automatically acts on the input with the highest number.**
  Example:
  If the boiler flow switch is activated simultaneously at inputs H1 and H3, it only becomes active at H3 (no configuration error)
- **With the BwDI2 instantaneous water heater system, the boiler flow switch is not checked**

Boiler pressure switch

When the contacts of the pressure switch make, burner control startup and control of the pumps are immediately released. When the contacts break, start prevention or lockout is triggered.

Warning!
If the function is activated simultaneously at several inputs, it automatically acts on the input with the highest number.
Example:
If the boiler pressure switch is activated simultaneously at inputs H1 and H3, it only becomes active at H3 (no configuration error).

Consumer request VKx 10V
Application node *External load x* receives requests for heat in the form of voltage signals (DC 0...10 V). A linear characteristic converts the applied voltage to a heat request. This characteristic is defined via 2 fixed points (voltage value 1/function value 1, and voltage value 2/function value 2).
The function value's resolution is 0.1 °C. This means that the function value to be parameterized for a setpoint of 80 °C, for example, is 800.
The request becomes active when – via the characteristic – the applied voltage leads to a flow temperature setpoint of at least 6 °C. The request for heat remains active as long as the applied voltage demands a flow temperature setpoint of at least 4 °C.
The flow temperature setpoint is limited to the boiler's maximum setpoint (*Setpoint max* (2212)). In addition, the flow temperature setpoint is limited to the *Cutout temp LT* (2531) – minimum switch-off differential in heating mode (Switching diff off min HCs (2455)) – 3 K.

Pressure measurement DC 10 V
The voltage signal at input Hx is converted to a pressure value (linear conversion). The linear characteristic is defined by 2 fixed points (voltage value 1/function value 1, and voltage value 2/function value 2).

Output request 10V
The heat source receives a voltage signal (DC 0...10 V) as a preselected output. A linear characteristic converts the applied voltage to an output request. This characteristic is defined via 2 fixed points (voltage value 1/function value 1, and voltage value 2/ function value 2).
The function value's resolution is 0.1%. This means that the function value to be parameterized for an output request of 50%, for example, is 500.
The request becomes active when the applied voltage is a minimum of 200 mV. It remains active as long as the voltage at input H is a minimum of 150 mV.
The switch-off point for the burner lies 3 K below the *Cutout temp LT* (2531). The burner's switch-on point lies by the switch-on differential in heating mode (*Switching diff on HCs* (2454)) below the switch-off point. There is no valid *Boiler setpoint* (8311).

Note!
In the case of an externally preselected output, forced signals are sent to the consumers. As a result, the setpoints of all heating circuits (pump and mixing circuits) are set to their maximum.

Contact type H2 module 1, 2, 3

Line no. ¹)	*Operating line*
6047 **6055** **6063**	**Contact type H2 module 1** **Contact typeH2 module 2** **Contact type H2 module 3** NC NO

The settings for input H2 on the extension module are the same as those for inputs H… on the basic unit. They are described under operating line *Function of input Hx*.

NC
The contact is normally closed and must be opened to activate the selected function.

NO
The contact is normally open and must be closed to activate the selected function.

Voltage value 1 H2 module 1, 2, 3

Line no.	*Operating line*
6049 **6057** **6065**	**Voltage value 1 H2 module 1** **Voltage value 1 H2 module 2** **Voltage value 1 H2 module 3**

Funct value 1 H2 module 1, 2, 3

Line no.	*Operating line*
6050 **6058** **6066**	**Funct value 1 H2 module 1** **Funct value 1 H2 module 2** **Funct value 1 H2 module 3**

Voltage value 2 H2 module 1, 2, 3

Line no.	*Operating line*
6051 **6059** **6067**	**Voltage value 2 H2 module 1** **Voltage value 2 H2 module 2** **Voltage value 2 H2 module 3**

Function value 2 H2 module 1, 2, 3

Line no.	*Operating line*
6052 **6060** **6068**	**Funct value 2 H2 module 1** **Funct value 2 H2 module 2** **Funct value 2 H2 module 3**

The linear characteristic is defined via 2 fixed points. The setting uses 2 pairs of parameters for function value and voltage value (F1/U1 and F2/U2).

- Example of heating demand DC 10 V

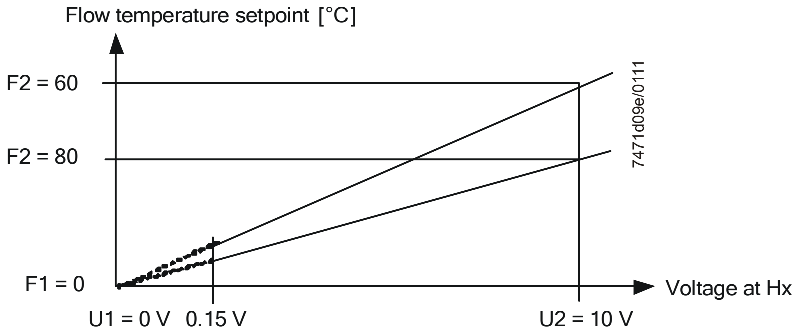


Figure 88: H2 extension module – heating demand

Key

F1	Function value 1
F2	Function value 2
U1	Frequency value 1
U2	Frequency value 2

If the input signal drops below the limit value of 0.15 V, the request for heat becomes invalid, which means that it has no impact.

- Example of pressure measurement at DC 10 V

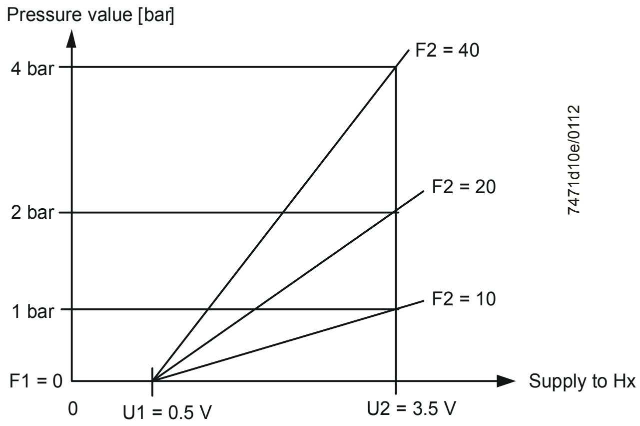


Figure 89: Input Hx H2 extension module – NO contact

Key

F1	Function value 1
F2	Function value 2
U1	Frequency value 1
U2	Frequency value 2

6.22.17 PWM output P1

Function output P1

Line no.	*Operating line*
6085	**Function output P1** None Boiler pump Q1 DHW pump Q3 DHW interm circ pump Q33 Heat circuit pump HC1 Q2 Heat circuit pump HC2 Q6 Heat circuit pump HC3 Q20 Collector pump Q5 Solar pump ext exch K9 Solar pump buffer K8 Solar pump swi pool K18 Instant WH pump Q34

This parameter defines the function for the modulating pump. If, due to this function, no modulating signal is internally calculated, 0% is output for Off and 100% for On.

None
Output P1 is not available.

Boiler pump Q1
The connected pump is used for circulating the boiler water.

DHW ctrl elem Q3
Controlling element for the DHW storage tank.

DHW intern circ pump Q33
Charging pump for DHW storage tank with external heat exchanger.

Heat circ pump HC1 Q2
Pump heating circuit HC1 is activated.

Heat circ pump HC2 Q6
Pump heating circuit HC2 is activated.

Heat circ pump HC3 Q20
Pump heating circuit HC3 is activated.

Collector pump Q5
When using a solar collector, a circulating pump for the collector circuit is required.

Solar pump ext exch K9
For the external heat exchanger, *Solar pump ext exch K9* must be set at the multifunctional relay output QX or PWM output P1. If both a DHW and buffer storage tank are available, *External solar exchanger* (5841) must also be set.

Solar ctrl elem buffer K8
When using several heat exchangers, the buffer storage tank needs to be set at the respective relay output and, in addition, the type of solar controlling element must be defined on *Solar controlling element* (5840).

Solar pump swi pool K18
When using several heat exchangers, the swimming pool needs to be set at the respective relay output and, in addition, the type of solar controlling element must be defined on *Solar controlling element* (5840).

Instant WH pump Q34
Controlling element for instantaneous water heater.

6.22.18 Types of sensors/readjustments

Sensor type collector

Line no.	*Operating line*
6097	**Sensor type collector** NTC Pt 1000

If a wider temperature range is required, a sensor with a platinum characteristic (-28…350 °C) can be used as sensor B6 in place of an NTC sensor (-28…200 °C). The type of sensor can be selected independent of multifunctional sensor input BX (basic unit and extension module) at which sensor B6 is set and connected to. The respective input uses automatically the correct characteristic, provided it is configured accordingly.

Setting the type of sensor used. The controller uses the respective temperature characteristic.

Readjustm collector sensor

Line no.	*Operating line*
6098	**Readjustm collector sensor**

The measured value can be readjusted.

Readjustm outside sensor

Line no.	*Operating line*
6100	**Readjustm outside sensor**

The measured value of the outside temperature can be shifted by +/- 3 K.

Sensor type flue gas temp

Line no.	*Operating line*
6101	**Sensor type flue gas temp** NTC Pt 1000 NTC 20k

Readjustm flue gas sensor

Line no.	*Operating line*
6102	**Readjustm flue gas sensor**

The measured value can be readjusted.

6.22.19 Building model

Time constant building

Line no.	*Operating line*
6110	**Time constant building**

When the outside temperature varies, the room temperature changes at different rates, depending on the building's thermal storage capacity. The above setting is used to adjust the response of the flow temperature setpoint when the outside temperature varies.

- Example:
  >20 hours
  The room temperature responds *more slowly* to outside temperature variations.

  10...20 hours
  This setting is suited for most types of buildings.

  <10 hours
  The room temperature responds *more quickly* to outside temperature variations.

Current, composite and attenuated outside temperature

Current outside temperature

The outside temperature is used primarily for calculating the flow temperature setpoint. The building's thermal inertia is simulated by making use of an adjustable building time constant.

The current outside temperature is acquired at sensor input B9 or via RF link. If the outside temperature is not available, a substitute value of 0 °C is used.

Composite outside temperature

The composite outside temperature is calculated by means of the filtered outside temperature, the building time constant and the current outside temperature. The proportion of the current outside temperature is 50% (constant).

Attenuated outside temperature

To obtain the attenuated outside temperature, the same time constant is used to delay the filtered outside temperature a second time.

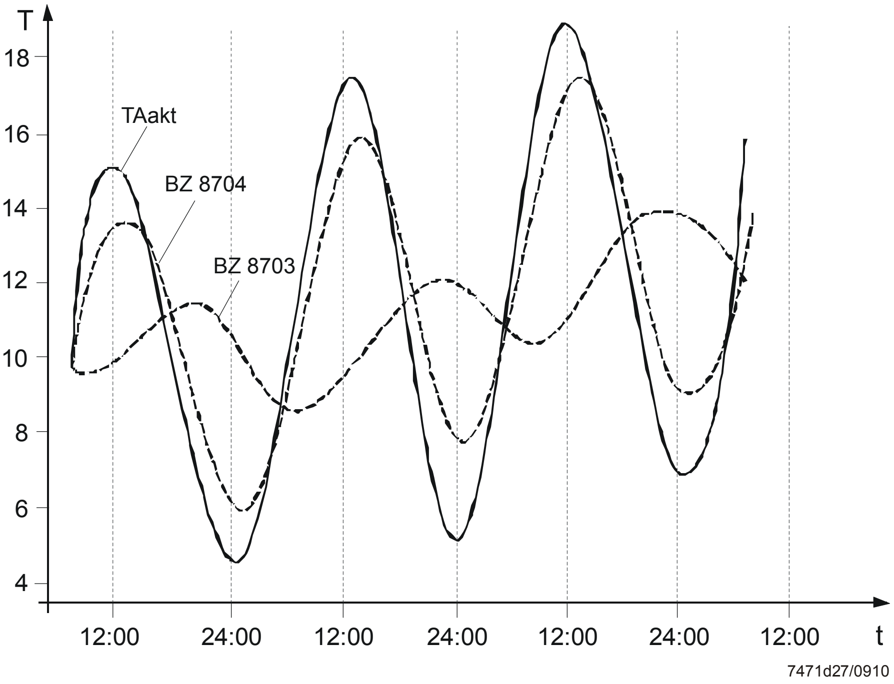


Figure 90: Building room model – attenuated outside temperature

Key

Line no.	*Meaning*	
8700	TAakt	Current outside temperature
8703	TAged	Attenuated outside temperature
8704	TAgem	Composite outside temperature

Use of the different outside temperatures:

• Current outside temperature:	Frost protection and 24-hour heating limit
• Composite outside temperature:	Heating curve and 24-hour heating limit
• Attenuated outside temperature:	Summer/winter changeover

Note!
The composite and the attenuated outside temperature are reset to the current outside temperature via the operator unit, when binding a wireless outside sensor or when connecting a sensor to terminal B9 for the first time.

6.22.20 Setpoint compensation

Time constant setp compens

Line no.	*Operating line*
6116	**Time constant setp compens**

Here, the time constant for central setpoint compensation can be set.

ℹ Note!
In the case of fast-acting boilers, this time constant should always be set to *0 min*.

Central setp compensation

Line no.	*Operating line*
6117	**Central setp compensation**

Central setp compensation matches the setpoint of the heat source to the required central flow temperature. The setting limits the maximum readjustment, even in cases where greater adaption would be required.

ℹ Note!
This function can be implemented only when using sensor B10.

Setpoint compensation

Setpoint drop delay

Line no.	*Operating line*
6118	**Setpoint drop delay**

A negative change of setpoint at the common flow is forwarded to the heat sources according to a ramp.
This prevents multistage heat sources from shutting down prematurely, or freely modulating heat sources from shutting down immediately due to their load control.
Since the demand for heat continues to exist, the heat sources would resume operation soon after cooling down.

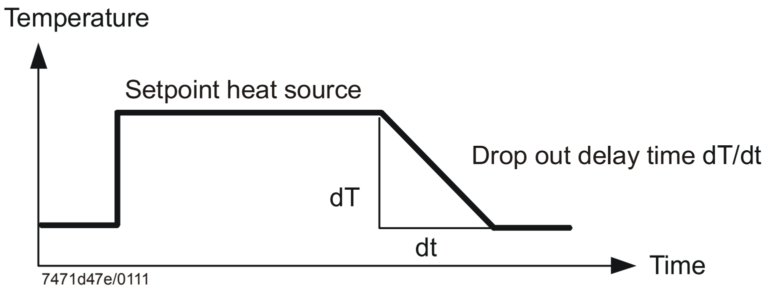


Figure 91: Building room model – setpoint compensation

ℹ Note!
The drop out delay time is only active in the event of setpoint changes, but not when there is no more request for heat.

6.22.21 Frost protection for the plant

Frost protection plant

Line no.	*Operating line*
6120	**Frost protection plant** Off On

The controller activates all released plant pumps, depending on the current outside temperature, thus protecting the heating installation against freeze-ups. In this case, the heat sources are not put into operation.

Warning!
Prerequisite for proper functioning is a fully operational plant. Frost protection for the plant necessitates an outside sensor. If that sensor is not available, the function is ensured by simulating an outside temperature of 0 °C and by delivering an error message.

Outside temperature	Pump	Diagram
...-4 °C	Continuously On	ON
-5...1.5 °C	On for 10 minutes at 6 hours intervals	Cycle (Takt)
1.5 °C...	Continuously Off	OFF

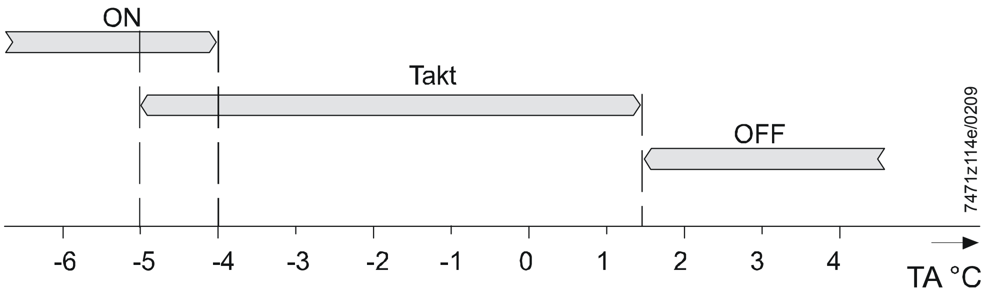


Figure 92: Frost protection for the plant

Note!
Different states can occur between -4 and -5 °C. Within this temperature range, the previous situation is decisive:
If the temperature was higher (in the range of *Takt*), the pump also cycles in the temperature range from -4 to -5 °C, and is continuously On only when the temperature drops further.
If the temperature was previously lower (in the range of ON), the pump is continuously running in the range up to -4 °C also and cycles only when the outside temperature is higher.

Off
Function is deactivated.

On
Function is activated.

Minimum pump speed during frost protection for the plant

If the modulating boiler pump or the modulating heating circuit pump only runs because frost protection for the plant is active, pump control ensures operation at the parameterized minimum speed.

6.22.22 Control of flue gas damper

For function *Control of flue gas damper*, it is mandatory to parameterize an input Hx *Feedback flue gas damper* and an output Qx *Control flue gas damper*.

The function can only be parameterized once in a system. If parameterized several times, or if only partly parameterized, error message *Parameterization flue gas damper* is delivered.

If correctly parameterized, the function is automatically activated.

When there is a request for heat from the controller, the LMS14... controls the output or causes the actuator of the flue gas damper to open the damper and waits for the feedback signal (*Opening*) via the parameterized input.
The feedback signal must be delivered within 50 seconds after control of the actuator. Otherwise, error message *Feedback flue gas damper* is generated.
While waiting for the feedback signal, the burner maintains the *Start prevention* state. When the flue gas damper reaches the *Open* position, the burner is released.
Feedback from the flue gas damper is also monitored during operation. If an end switch becomes faulty, or if the flue gas damper closes unexpectedly, error message *Feedback flue gas damper* is generated.

If the controller cancels the request for heat, the flue gas damper closes and feedback signal *Closed* must be delivered. Here too, the damper must reach the new position within 50 seconds.
If that time is not observed, error message *Feedback flue gas damper* is delivered.

6.22.23 Pump/valve kick

Pump/valve kick duration

Line no.	*Operating line*
6127	**Pump/valve kick duration**

Pump and valve kick is a protective function aimed at preventing the pumps and valves from seizing. When the pumps are switched on, the water in the system starts to circulate. The mechanical parts of the pumps and the valve seats are purged, thus preventing the pumps and valves from seizing.

Every Friday at 10:00, the pumps connected directly to the basic unit are activated for the set kick time, one by one, at an interval of 1 minute.
The valve kick is activated only when there is no request for heat.

Pump kick with modulating pumps:

During pump kicks, the PWM value is always 100%.
An exception are pumps whose start kick can be parameterized.
When using these types of pumps, the parameterized start kick value is also used as the PWM value for the weekly kick.

6.22.24 Pressure measurements H1, H2 and H3

For a detailed description of static water pressure supervision, refer to chapter *Static pressure supervision*.

Water pressure max

Line no.	*Operating line*
6140	**Water pressure max**

Water pressure 2 max

Line no.	*Operating line*
6150	**Water pressure 2 max**

Water pressure 3 max

Line no.	*Operating line*
6180	**Water pressure 3 max**

If the pressure acquired at input H1, H2 (EM1…EM3) or H3 exceeds the limit value set here, the appropriate error message is delivered and the burner is immediately shut down.

117: Water pressure too high
176: Water pressure 2 too high
322: Water pressure 3 too high

When the pressure drops one switching differential below the limit value, the error message is canceled.

Water pressure min

Line no.	*Operating line*
6141	**Water pressure min**

Water pressure 2 min

Line no.	*Operating line*
6151	**Water pressure 2 min**

Water pressure 3 min

Line no.	*Operating line*
6181	**Water pressure 3 min**

If the pressure acquired at input H1, H2 (EM…EM3) or H3 drops below the set limit value *Water pressure min* (6141), *Water pressure 2 min* (6151), *Water pressure 3 min* (6181), the appropriate maintenance message is delivered.

5: Water pressure too low
18: Water pressure 2 too low
22: Water pressure 3 too low

When the pressure exceeds the limit value by one switching differential, the message is canceled.

Water pressure critical min

Line no.	*Operating line*
6142	**Water pressure critical min**

Water press 2 critical min

Line no.	*Operating line*
6152	**Water press 2 critical min**

Water press 3 critical min

Line no.	*Operating line*
6182	**Water press 3 critical min**

If the pressure acquired via input H1, H2 (EM1...EM3) or H3 drops below the limit value set here, the respective error message is delivered and the burner is immediately shut down.

118: Water pressure too low
177: Water pressure 2 too low
323: Water pressure 3 too low

Water pressure SD

Line no.	*Operating line*
6143	**Water pressure SD**

Water pressure 2 SD

Line no.	*Operating line*
6153	**Water pressure 2 SD**

Water pressure 3 SD

Line no.	*Operating line*
6183	**Water pressure 3 SD**

Water pressure max

When the water pressure drops, falling below the limit value by the switching differential, the error message is canceled.

Water pressure min

If the water pressure rises, exceeding the limit value by the switching differential, the error message is canceled.

Water pressure critical min

If the water pressure rises, exceeding the limit value by the switching differential, the error message is canceled.

Note!
If, with 2 or 3 extension modules, water pressure supervision at H2 is activated, all inputs H2 use the same parameter values. The error message with the highest priority is displayed.

6.22.25 Saving the sensors

To ensure that after commissioning, missing sensors are detected and not accepted as correct plant states, as this would be the case with automatic sensor detection, the *Commissioning state* function has been implemented.
This function *learns* the connected sensors and, in the event of loss, generates an error message and also prevents the plant diagram from being exchanged.

Save sensor

Line no.	*Operating line*
6200	**Save sensor** No Yes

At midnight, the basic unit saves the current states at the sensor terminals, provided the controller has been in operation for at least 2 hours.
If, after saving, a sensor fails, the basic unit generates an error message. This setting is used to ensure immediate saving of the sensors. This becomes a requirement when, for instance, a sensor is removed because it is no longer needed.

Save parameters

Line no.	*Operating line*
6204	**Save parameters** No Yes

The factory settings are overwritten with the current parameter settings, enabling the factory settings to be configured. Using *Reset to default parameters* (6205), the parameters can thus be set to the factory settings saved this way.

Warning!
Only the resettable parameters are saved!

The following table shows the resettable parameters:

Line no.	Operating line
Heating circuit 1	
710	Comfort setpoint
712	Reduced setpoint
714	Frost protection setpoint
716	Comfort setpoint max
720	Heating curve slope
721	Heating curve displacement
726	Heating curve adaption Off ¦ On
730	Summer/winter heating limit
732	24-hour heating limit
740	Flow temp setpoint min
741	Flow temp setpoint max
742	Flow temp setpoint room stat
750	Room influence
760	Room temp limitation
770	Boost heating
780	Quick setback Off ¦ Down to reduced setpoint ¦ Down to frost prot setpoint
790	Optimum start control max
791	Optimum top control max
800	Reduced setp increase start
801	Reduced setp increase end
820	Overtemp prot pump circuit Off ¦ On
830	Mixing valve boost
832	Actuator type 2-positioin ¦ 3-position
833	Switching differential 2-pos
834	Actuator running time
850	Floor curing function Off ¦ Functional heating ¦ Curing heating ¦ Functional/curing heating ¦ Curing/functional heating ¦ Manually
851	Floor curing setp manually
861	Excess heat draw Off ¦ Heating mode ¦ Always
870	With buffer No ¦ Yes
872	With prim contr/system pump No ¦ Yes

Line no.	Operating line
880	Pump speed reduction Operating level ¦ Characteristic
882	Pump speed min
883	Pump speed max
888	Curve readj at 50% speed
889	Filter time const speed ctrl
890	Flow setp readj speed ctrl No ¦ Yes
898	Operating level changeover Frost protection ¦ Reduced ¦ Comfort
900	Optg mode changeover None ¦ Protection ¦ Reduced ¦ Comfort ¦ Automatic
Cooling circuit 1	
904	Protection setpoint cooling circuit 1
932	Room temp limitation cooling circuit 1
Heating circuit 2	
1010	Comfort setpoint
1012	Reduced setpoint
1014	Frost protection setpoint
1016	Comfort setpoint max
1020	Heating curve slope
1021	Heating curve displacement
1026	Heating curve adaption Off ¦ On
1030	Summer/winter heating limit
1032	24-hour heating limit
1040	Flow temp setpoint min
1041	Flow temp setpoint max
1042	Flow temp setpoint room stat
1050	Room influence
1060	Room temp limitation
1070	Boost heating
1080	Quick setback Off ¦ Down to reduced setpoint ¦ Down to frost prot setpoint
1090	Optimum start control max
1091	Optimum top control max
1100	Reduced setp increase start
1101	Reduced setp increase end
1120	Opertemp prot pump circuit Off ¦ On
1130	Mixing valve boost
1132	Actuator type 2-position ¦ 3-position
1133	Switching differential 2-pos
1134	Actuator running time
1150	Floor curing function Off ¦ Functional heating ¦ Curing heating ¦ Functional/curing heating ¦ Curing/functional heating ¦ Manually
1151	Floor curing setp manually
1161	Excess heat draw Off ¦ Heating mode ¦ Always
1170	With buffer storage tank No ¦ Yes

Line no.	Operating line
1172	With primary contr/system pump No ¦ Yes
1180	Pump speed reduction Operating level ¦ Characteristic
1182	Pump speed min
1183	Pump speed max
1188	Curve readj at 50% speed
1189	Filter time constant speed ctrl
1190	Flow setp readj speed ctrl No ¦ Yes
1198	Operating level changeover Frost protection ¦ Reduced ¦ Comfort
1200	Optg mode changeover None ¦ Protection ¦ Reduced¦ Comfort ¦ Automatic
Heating circuit 3	
1310	Comfort setpoint
1312	Reduced setpoint
1314	Frost protection setpoint
1316	Comfort setpoint max
1320	Heating curve slope
1321	Heating curve displacement
1326	Heating curve adaption Off ¦ On
1330	Summer/winter heating limit
1332	24-hour heating limit
1340	Flow temp setpoint min
1341	Flow temp setpoint max
1342	Flow temp setpoint room stat
1350	Room influence
1360	Room temp limitation
1370	Boost heating
1380	Quick setback Off ¦ Down to reduced setpoint ¦ Down to frost prot setpoint
1390	Optimum start control max
1391	Optimum top control max
1400	Reduced setp increase start
1401	Reduced setp increase end
1420	Overtemp prot pump circuit Off ¦ On
1430	Mixing valve boost
1432	Actuator type 2-position ¦ 3-position
1433	Switching differential 2-pos
1434	Actuator running time
1450	Floor curing function Off ¦ Functional heating ¦ Curing heating ¦ Functional/curing heating ¦ Curing/functional heating ¦ Manually
1451	Floor curing setp manually
1461	Excess heat draw Off ¦ Heating mode ¦ Always
1470	With buffer storage tank No ¦ Yes
1472	With primary controller/system pump No ¦ Yes
1480	Pump speed reduction

Line no.	Operating line
	Operating level ¦ Characteristic
1482	Pump speed min
1483	Pump speed max
1488	Curve readj at 50% speed
1489	Filter time const speed ctrl
1490	Flow setp readj speed ctrl No ¦ Yes
1498	Operating level changeover Frost protection ¦ Reduced ¦ Comfort
1500	Optg mode changeover None ¦ Protection ¦ Reduced ¦ Comfort ¦ Automatic
DHW	
1610	Nominal setpoint
1612	Reduced setpoint
1620	Release 24h/day ¦ Time programs HCs ¦ Time program 4/DHW
1630	Charging priority Absolute ¦ Shifting ¦ None ¦ MC shifting, PC absolute
1640	Legionella function Off ¦ Periodically ¦ Fixed weekday
1641	Legionella funct periodically
1642	Legionella funct weekday Monday ¦ Tuesday ¦ Wednesday ¦ Thursday ¦ Friday ¦ Saturday ¦ Sunday
1644	Legionella function time
1645	Legionella funct setpoint
1646	Legionella funct duration
1647	Legionella funct circ pump Off ¦ On
1660	Circulating pump release Time program 3/HC3 ¦ DHW release ¦ Time program 4/DHW ¦ Time program 5
1661	Circulating pump cycling Off ¦ On
1663	Circulation setpoint
1680	Optg mode changeover None ¦ Off ¦ On ¦ Eco
Consumer circuit 1	
1859	Flow temp setp cons request
1875	Excess heat draw Off ¦ On
1878	With buffer No ¦ Yes
1880	With prim contr/system pump No ¦ Yes
Consumer circuit 2	
1909	Flow temp setp cons request
1925	Excess heat draw Off ¦ On
1928	With buffer No ¦ Yes
1930	With prim contr/system pump No ¦ Yes
Swimming pool circuit	
1959	Flow temp setp swi pool

Line no.	Operating line
1975	Excess heat draw Off ¦ On
1978	With buffer No ¦ Yes
1980	With prim contr/system pump No ¦ Yes
Swimming pool	
2055	Setpoint solar heating
2056	Setpoint source heating
2065	Charging priority solar Priority 1 ¦ Priority 2 ¦ Priority 3
2080	With solar integration No ¦ Yes
Primary controller/system pump	
2150	Primary contr/system pump Before buffer ¦ After buffer
Boiler	
2210	Setpoint min
2212	Setpoint max
2243	Burner off time min
2245	SD burner off time
2270	Return setpoint min
2316	Temp differential max
2317	Temp differential nominal
2322	Pump speed min
2323	Pump speed max
2330	Output nominal
2331	Output basic stage
2441	Fan speed heating max
2442	Fan speed full charging max
2443	Fan sp start value inst WH
2445	Fan shutdown heating mode Off ¦ On
2446	Fan shutdown delay
2450	Controller delay Off ¦ Heating mode only ¦ DHW mode only ¦ Heating and DHW mode
2452	Controller delay speed
2453	Controller delay duration
2454	Switching diff on HCs
2455	Switching diff off min HCs
2456	Switching diff off max HCs
2457	Settling time HCs
2460	Switching diff on DHW
2461	Switching diff off min DHW
2462	Switching diff off max DHW
2463	Settling time DHW
2511	Quick shutdown superv time
2512	Quick shutdown superv RT Off ¦ On
Cascade	
3532	Restart lock
3533	Switch on delay
3540	Auto source seq ch'over

Line no.	Operating line
3541	Auto source seq excluding None ¦ First ¦ Last ¦ First and last
3544	Leading source Source 1 ¦ Source 2 ¦ Source 3 ¦ Source 4 ¦ Source 5 ¦ Source 6 ¦ Source 7 ¦ Source 8 ¦ Source 9 ¦ Source 10 ¦ Source 11 ¦ Source 12 ¦ Source 13 ¦ Source 14 ¦ Source 15 ¦ Source 16
3560	Return setpoint min
Solar	
3810	Temp diff on
3811	Temp diff off
3812	Charg temp min DHW st tank
3815	Charging temp min buffer
3818	Charging temp min swi pool
3822	Charging prio storage tank None ¦ DHW storage tank ¦ Buffer storage tank
3825	Charging time relative prio
3826	Waiting time relative prio
3827	Waiting time parallel op
3828	Delay secondary pump
3830	Collector start function
3831	Min run time collector pump
3840	Collector frost protection
3850	Collector overtemp prot
3860	Evaporation heat carrier
3870	Pump speed min
3871	Pump speed max
3880	Antifreeze None ¦ Ethylene glycol ¦ Propylene glycol ¦ Etyl and propyl glycol
3881	Antifreeze concentration
3884	Pump capacity
3887	Pulse unit yield
Solid fuel boiler	
4102	Locks other heat sources Off ¦ On
4110	Setpoint min
4130	Temp diff on
4131	Temp diff off
4133	Comparative temp DHW sensor B3 ¦ DHW sensor B31 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flow temp setpoint ¦ Setpoint min
Buffer storage tank	
4720	Auto generation lock None ¦ With B4 ¦ With B4 and B42/B41
4722	Temp diff buffer/HC
4724	Min st tank temp heat mode
4750	Charging temp max
4755	Recooling temp
4756	Recooling DHW/HCs Off ¦ On
4757	Recooling collector Off ¦ Summer ¦ Always
4783	With solar integration No ¦ Yes
4790	Temp diff on return div
4791	Temp diff off return div

Line no.	Operating line
4795	Compar temp return div With B4 ¦ With B41 ¦ With B42
4796	Optg action return diversion Temp decrease ¦ Temp increase
4800	Partial charging setpoint
4810	Full charging Off ¦ Current heat request ¦ Buffer setpoint
4811	Full charging temp min
4813	Full charging sensor With B4 ¦ With B42/B41
DHW storage tank	
5020	Flow setpoint boost
5021	Transfer boost
5022	Type of charging Recharging ¦ Full charging ¦ Full charging legio ¦ Full charg 1st time day ¦ Full charg 1st time legio
5050	Charging temp max
5055	Recooling temp
5056	Recooling heat gen/HCs Off ¦ On
5057	Recooling collector Off ¦ Summer ¦ Always
5060	El imm heater optg mode Substitute ¦ Summer ¦ Always
5061	El immersion heater release 24h/day ¦ DHW release¦ Time program4/ DHW
5062	El immersion heater control External thermostat ¦ DHW sensor
5085	Excess heat draw Off ¦ On
5090	With buffer No ¦ Yes
5092	With prim contr/system pump No ¦ Yes
5093	With solar integration No ¦ Yes
5101	Pump speed min
5102	Pump speed max
Instantaneous DHW heater	
5420	Flow setpoint boost
5444	Threshold flow detection
5445	Switching diff flow detection
5450	Gradient end cons
5451	Gradient start cons keep hot
5452	Gradient start cons
5455	Setp readj cons 40°C
5456	Setp readj cons 60°C
5460	Setpoint keep hot
5461	Readj setp keep hot 40°C
5462	Readj setp keep hot 60°C
5464	Keep hot release 24h/day ¦ DHW release ¦ Time program 3/HC3 ¦ Time program 4/DHW ¦ Time program 5
5468	Min cons time for keep hot
5470	Keep hot time wo heating
5471	Keep hot time with heating

Line no.	Operating line
5472	Pump overrun time keep hot
5473	Pump overrun time keep hot
5475	Control sensor keep hot Boiler sensor B2 ¦ Return sensor B7 ¦ DHW outlet sensor B38
5482	Flow switch time cons
5530	Pump speed min
5531	Pump speed max
5550	Aqua booster No ¦ Yes ¦ Yes, wo gradient detection
Configuration	
5710	Heating circuit 1 Off ¦ On
5711	Cooling circuit 1 Off ¦ 4-pipe system
5715	Heating circuit 2 Off ¦ On
5721	Heating circuit 3 Off ¦ On
5730	DHW sensor DHW sensor B3 ¦ Thermostat | DHW outlet sensor B38
5731	DHW controlling element None ¦ Charging pump ¦ Diverting valve
5732	Pump off change div valve
5733	Delay pump off
5734	Basic pos DHW div valve Last request ¦ Heating circuit ¦ DHW
5736	DHW separate circuit Off ¦ On
5737	Optg action DHW div valve Position on DHW ¦ Position on heating circuit
5774	Ctrl boiler pump/DHW valve All requests ¦ Request HC1/DHW only
5840	Solar controlling element Charging pump ¦ Diverting valve
5841	External solar exchanger Commonly ¦ DHW storage tank ¦ Buffer storage tank
5870	Combi storage tank Yes ¦ No
5890	Relay output QX1 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Flue gas damper K37 ¦ Fan shutdown K38
5891	Relay output QX2 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ

Line no.	Operating line
	pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Flue gas damper K37 ¦ Fan shutdown K38
5892	Relay output QX3 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Flue gas damper K37 ¦ Fan shutdown K38
5894	Relay output QX4 None ¦ Heat gen shutoff valve Y4 ¦ Buffer return valve Y15 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34
5930	Sensor input BX1 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26
5931	Sensor input BX2 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26
5932	Sensor input BX3 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26
5950	Function of input H1 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure measurement 10V ¦ Output request 10V
5951	Contact type H1 NC ¦ NO
5953	Voltage value 1 H1
5954	Function value 1 H1
5955	Voltage value 2 H1
5956	Function value 2 H1
5960	Function input H3 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦Pressure measurement 10V ¦ Output request 10V
5961	Contact type H3 NC ¦ NO
5963	Voltage value 1 H3

Line no.	Operating line
5964	Function value 1 H3
5965	Voltage value 2 H3
5966	Function value 2 H3
5970	Function input H4 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Flow measurement Hz
5971	Contact type H4 NC ¦ NO
5973	Frequency value 1 H4
5974	Function value 1 H4
5975	Frequency value 2 H4
5976	Function value 2 H4
5977	Function input H5 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch
5978	Contact type H5 NC ¦ NO
6008	Function input H6 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Gas pressure switch
6009	Contact type H6 NC ¦ NO
6011	Function input H7 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Pulse count ¦ Checkb sign flue gas damper ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch
6012	Contact type H7 NC ¦ NO
6020	Function extension module 1 None ¦ Multifunctional ¦ Heating circuit 1 ¦ Heating circuit 2 ¦ Heating circuit 3 ¦ Return temp controller ¦ Solar DHW ¦ Primary contr/system pump
6021	Function extension module 2 None ¦ Multifunctional ¦ Heating circuit 1 ¦ Heating circuit 2 ¦ Heating circuit 3 ¦ Return temp controller ¦ Solar DHW ¦ Primary contr/system pump
6022	Function extension module 3 None ¦ Multifunctional ¦ Heating circuit 1 ¦ Heating circuit 2 ¦ Heating circuit 3 ¦ Return temp controller ¦ Solar DHW ¦ Primary contr/system pump
6024	Funct input EX21 module 1 None ¦ Limit thermostat HC

Line no.	Operating line
6026	Funct input EX21 module 2 None ¦ Limit thermostat HC
6028	Funct input EX21 module 3 None ¦ Limit thermostat HC
6030	Relay output QX21 module 1 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38
6031	Relay output QX22 module 1 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38
6032	Relay output QX23 module 1 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38
6033	Relay output QX21 module 2 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38
6034	Relay output QX22 module 2 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38
6035	Relay output QX23 module 2 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ

Line no.	Operating line
	pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38
6036	Relay output QX21 module 3 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38
6037	Relay output QX22 module 3 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Fan shutdown K38
6038	Relay output QX23 module 3 None ¦ Circulating pump Q4 ¦ El imm heater DHW K6 ¦ Collector pump Q5 ¦ Cons circuit pump VK1 Q15 ¦ Boiler pump Q1 ¦ Bypass pump Q12 ¦ Alarm output K10 ¦ 2nd pump speed HC1 Q21 ¦ 2nd pump speed HC2 Q22 ¦ 2nd pump speed HC3 Q23 ¦ Heat circuit pump HC3 Q20 ¦ Cons circuit pump VK2 Q18 ¦ System pump Q14 ¦ Heat gen shutoff valve Y4 ¦ Solid fuel boiler pump Q10 ¦ Time program 5 K13 ¦ Buffer return valve Y15 ¦ Solar pump ext exch K9 ¦ Solar ctrl elem buffer K8 ¦ Solar ctrl elem swi pool K18 ¦ Swimming pool pump Q19 ¦ Cascade pump Q25 ¦ St tank transfer pump Q11 ¦ DHW mixing pump Q35 ¦ DHW interm circ pump Q33 ¦ Heat request K27 ¦ Refrigeration request K28 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ DHW ctrl elem Q3 ¦ Instant heater ctrl elem Q34 ¦ Water filling K34 ¦ 2nd boiler pump speed Q27 ¦ Status output K35 ¦ Status information K36 ¦ Flue gas damper K37 ¦ Fan shutdown K38
6040	Sensor input BX21 module 1 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26
6041	Sensor input BX22 module 1 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26
6042	Sensor input BX21 module 2 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26
6043	Sensor input BX22 module 2 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26
6044	Sensor input BX21 module 3 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return

Line no.	Operating line
	sensor B64 ¦ Primary exch sensor B26
6045	Sensor input BX22 module 3 None ¦ DHW sensor B31 ¦ Collector sensor B6 ¦ DHW circulation sensor B39 ¦ Buffer sensor B4 ¦ Buffer sensor B41 ¦ Flue gas temp sensor B8 ¦ Common flow sensor B10 ¦ Solid fuel boiler sensor B22 ¦ DHW charging sensor B36 ¦ Buffer sensor B42 ¦ Common return sensor B73 ¦ Cascade return sensor B70 ¦ Swimming pool sensor B13 ¦ Solar flow sensor B63 ¦ Solar return sensor B64 ¦ Primary exch sensor B26
6046	Function of input H2 module 1 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Limit thermostat HC ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure measurement 10V ¦ Output request 10V
6047	Contact type H2 module 1 NC ¦ NO
6049	Voltage value 1 H2 module 1
6050	Function value 1 H2 module 1
6051	Voltage value 2 H2 module 1
6052	Function value 2 H2 module 1
6054	Function of input H2 module 2 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Limit thermostat HC ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure measurement 10V ¦ Output request 10V
6055	Contact type H2 module 2 NC ¦ NO
6057	Voltage value 1 H2 module 2
6058	Funct value 1 H2 module 2
6059	Voltage value 2 H2 module 2
6060	Funct value 2 H2 module 2
6062	Function of input H2 module 3 None ¦ Optg mode change HCs+DHW ¦ Optg mode changeover DHW ¦ Optg mode changeover HCs ¦ Optg mode changeover HC1 ¦ Optg mode changeover HC2 ¦ Optg mode changeover HC3 ¦ Heat generation lock ¦ Error/alarm message ¦ Consumer request VK1 ¦ Consumer request VK2 ¦ Release swi pool heat source ¦ Excess heat discharge ¦ Release swi pool solar ¦ Operating level DHW ¦ Operating level HC1 ¦ Operating level HC2 ¦ Operating level HC3 ¦ Room thermostat HC1 ¦ Room thermostat HC2 ¦ Room thermostat HC3 ¦ DHW flow switch ¦ DHW thermostat ¦ Limit thermostat HC ¦ Start prevention ¦ Boiler flow switch ¦ Boiler pressure switch ¦ Consumer request VK1 10V ¦ Consumer request VK2 10V ¦ Pressure measurement 10V ¦ Output request 10V
6063	Contact type H2 module 3 NC ¦ NO
6065	Voltage value 1 H2 module 3
6066	Function value 1 H2 module 3
6067	Voltage value 2 H2 module 3
6068	Function value 2 H2 module 3
6085	Function output P1 None ¦ Boiler pump Q1 ¦ DHW pump Q3 ¦ DHW interm circ pump Q33 ¦ Heat circuit pump HC1 Q2 ¦ Heat circuit pump HC2 Q6 ¦ Heat circuit pump HC3 Q20 ¦ Collector pump Q5 ¦ Solar pump ext exch K9 ¦ Solar pump buffer K8 ¦ Solar pump swi pool K18 ¦ Instant WH pump Q34
6097	Sensor type collector NTC ¦ Pt 1000

Line no.	Operating line
6098	Readjustm collector sensor
6100	Readjustm outside sensor
6101	Sensor type flue gas temp NTC ¦ Pt 1000 ¦ NTC 20k
6102	Readjustm flue gas sensor
6110	Time constant building
6120	Frost protection plant Off ¦ On
6127	Pump/valve kick duration
LPB	
6604	Bus power supply function Off ¦ Automatically
6620	Action changeover functions Segment ¦ System
6621	Summer changeover Locally¦ Centrally
6623	Optg mode changeover Locally ¦ Centrally
6624	Manual source lock Locally ¦ Segment
6625	DHW assignment Local HCs ¦ All HCs in segment ¦ All HCs in system
6631	Ext source with eco mode Off ¦ On DHW ¦ On
6640	Clock mode Autonomously ¦ Slave without remote ¦ Slave with remote setting ¦ Master
Fault	
6740	Flow temp 1 alarm
6741	Flow temp 2 alarm
6742	Flow temp 3 alarm
6743	Boiler temp alarm
6745	DHW charging alarm
Maintenance/special operation	
7040	Burner hours interval
7042	Burner start interval
7044	Maintenance interval
7050	Fan speed ionization current
7051	Message ionization current No ¦ Yes
7140	Manual control Off ¦ On
Burner control	
9500	Prepurge time
9504	Required speed prepurging
9512	Required speed ignition
9524	Required speed LF
9529	Required speed HF
9540	Postpurge time
9650	Chimney drying Off ¦ Temporarily ¦ Permanently
9651	Req speed chimney drying
9652	Duration chimney drying

Line no.	Operating line
[4269.1]	Ionization current limitation lower limit

Reset to default parameters

Line no.	*Operating line*
6205	**Reset to default parameters** No Yes

All resettable parameters can be reset to their default values.

Exempted from this are the following operating pages:

- *Time of day and date*
- *Operator section*
- *Wireless* and all *Time programs*
- *Setpoint – Manual control*

ℹ

Note!
In the LMS14..., the memory area with the factory settings is only overwritten by

- function *Save parameters* (6204),
- the ACS435 PC software together with the OCI431 interface,
- the AGU2.56... parameter stick.

When the LMS14... is parameterized with ACS420 or ACS700/ACS790, only the operating area of the parameter storage is overwritten, not the area with the factory settings.
If, in this case, function *Reset to default parameters* (6205) is used, the factory settings made by Siemens are reloaded.
If, after storing parameters with ACS420 and OCI430, the parameters shall be used as factory settings, use function *Save parameters* (6204).

6.22.26 Plant diagrams

To identify the current plant diagram, the basic unit generates a check number. This check number is made up of the successive partial diagram numbers.

Structure of check number

Every check number consists of 3 columns, each representing the application of a plant component. Every column shows a number with a maximum of 2 digits. Exception is the first column. If the first digit in the first column reads 0, the 0 is hidden.

	1st column 2 digits	2nd column 2 digits	3rd column 2 digits
Check no. heat source 1 (6212)	---	Solar	Oil/gas boiler
Check no. heat source 2 (6213)	---	Solid fuel boiler	---
Check no. storage tank (6215)	---	Buffer storage tank	DHW storage tank
Check no. heating circuits (6217)	Heating circuit 3	Heating circuit 2	Heating circuit 1

Check no. heat source 1

Line no.	*Operating line*
6212	**Check no. heat source 1**

Solar					
One collector field with sensor **B6** and collector pump **Q5**	Storage tank charging pump, solar controlling element buffer **K8**	Solar diverting valve, solar controlling element buffer **K8**	Solar charging pump, solar controlling element swimming pool **K 18**	Solar diverting valve Solar controlling element swimming pool **K18**	Solar pump external exchanger **K9** 1)
0	No solar				
1					*
3					DHW/B
5	●				
6		●			
8	●				DHW/B
9		●			DHW/B
10	●				DHW
11		●			DHW
12	●				B
13		●			B
14			●		
15				●	
17			●		DHW/B
18				●	DHW/B
19	●		●		
20		●		●	
22	●				DHW/B
23		●		●	DHW/B
24	●		●		DHW
25		●		●	DHW
26	●		●		B
27		●		●	B

Gas boiler modulating		
Check number	Boiler pump	Bypass pump
11		
12	●	
13		●
14	●	●

* DHW storage tank is charged via collector pump Q5

1) DHW = domestic hot water, B = buffer

Check no. heat source 2

Line no.	*Operating line*
6213	**Check no. heat source 2**

	Solid fuel boiler	
	0	No solid fuel boiler
	1	Solid fuel boiler, boiler pump
	2	Solid fuel boiler, boiler pump, integration DHW storage tank

Check no. storage tank

Line no.	*Operating line*
6215	**Check no. storage tank**

	Buffer storage tank		**DHW storage tank**	
	0	No buffer storage tank	0	No DHW storage tank
	1	Buffer storage tank	1	Electric immersion heater
	2	Buffer storage tank, solar connection	2	Solar connection
			4	Charging pump
	4	Buffer storage tank, heat source valve	5	Charging pump, solar connection
	5	Buffer storage tank, solar connection, heat source valve	13	Diverting valve
			14	Diverting valve, solar connection
			16	Primary controller, without heat exchanger
			17	Primary controller, 1 heat exchanger
			19	Intermediate circuit, without heat exchanger
			20	Intermediate circuit, 1 heat exchanger
			22	Charging pump/ intermediate circuit, without heat exchanger
			23	Charging pump/ intermediate circuit, 1 heat exchanger
			25	Diverting valve/ intermediate circuit, without heat exchanger
			26	Diverting valve/ intermediate circuit, 1 heat exchanger

Check no. heating circuits

Line no.	*Operating line*
6217	**Check no. heating circuits**

Heating circuit 3		**Heating circuit 2**		**Heating circuit 1**	
0	No heating circuit	0	No heating circuit	0	No heating circuit
1	Circulation via boiler pump	1	Circulation via boiler pump	1	Circulation via boiler pump
2	Heating circuit pump	2	Heating circuit pump	2	Heating circuit pump
3	Heating circuit pump, mixing valve	3	Heating circuit pump, mixing valve	3	Heating circuit pump, mixing valve
				30, 33, 36	Heating/cooling, 4-pipe, separate distribution
				40	Cooling only, 4-pipe

Example:

Heat source:	Solar with collector sensor and pump, 1-stage burner and boiler pump
Storage tank:	Charging pump and solar connection
Heating circuit 1:	Heating circuit pump and mixing valve

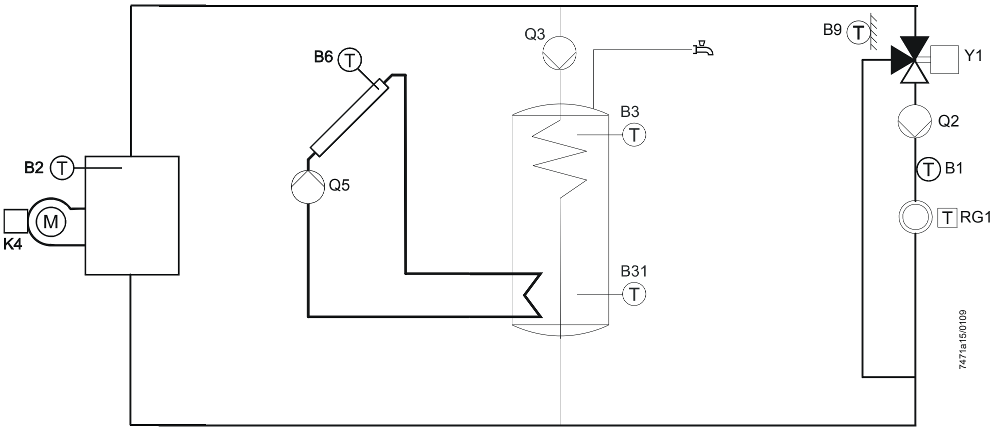


Figure 93: Plant diagrams – check no. heating circuits

Key

B1	Flow sensor heating circuit 1
B2	Boiler sensor
B3	DHW sensor
B6	Collector sensor
B9	Outside sensor
B31	DHW sensor
K4	Release of burner (in the LMS14...)
Q3	DHW charging pump/diverting pump
Q2	Heating circuit pump HC1
Q5	Collector pump
RG1	Room unit 1
T	Temperature
Y1	1st heating circuit mixing valve opening

Display of check no. on the operator unit:

Check no. heat source 1				1	0	1
Check no. storage tank						5
Check no. heating circuit						3

6.22.27 Device data

Software version

Line no.	*Operating line*
6220	**Software version**

Development index

Line no.	*Operating line*
6221	**Development index**

Device identification

Line no.	*Operating line*
6224	**Device identification**

Device family

Line no.	*Operating line*
6225	**Device family**

Device variant

Line no.	*Operating line*
6226	**Device variant**

Object directory version

Line no.	*Operating line*
6227	**Object directory version**

Info 1 OEM

Line no.	*Operating line*
6230	**Info 1 OEM**

This parameter shows the EEPROM storage capacity of the basic unit, which can be freely used by the OEM by writing a numeric value for its own use. The parameter can be displayed on the operator terminals and on tools/PC software.

Info 2 OEM

Line no.	*Operating line*
6231	**Info 2 OEM**

This parameter shows the EEPROM storage capacity of the basic unit, which can be freely used by the OEM by writing a numeric value for its own use. The parameter can be displayed on the operator terminals and on tools/PC software.

Parameter version

Line no.	*Operating line*
6232	**Parameter version**

Parameter set number

Line no.	*Operating line*
6233	**Parameter set number**

Boiler type number OEM

Line no.	*Operating line*
6234	**Boiler type number OEM**

Freely selectable boiler type number for OEM.

Parameter set group OEM

Line no.	*Operating line*
6235	**Parameter set group OEM**

Administration number from ACS435.

Parameter set number OEM

Line no.	*Operating line*
6236	**Parameter set number OEM**

Administration number from ACS435.

PartDiagram oil/gas

Line no.	*Operating line*
[1564.1]	**PartDiagram oil/gas**

PartDiagram solar

Line no.	*Operating line*
[1565.1]	**PartDiagram solar**

PartDiagram HCx

Line no.			*Operating line*
HC1	*HC2*	*HC3*	
[1566.1]	**[1566.2]**	**[1566.3]**	**PartDiagram HCx**

PartDiagram buffer

Line no.	*Operating line*
[1567.1]	**PartDiagram buffer**

PartDiagram DHW

Line no.	*Operating line*
[1568.1]	**PartDiagram DHW**

PartDiagram HeatExch

Line no.	*Operating line*
[1984.1]	**PartDiagram HeatExch**

PartDiagram SolidFuel

Line no.	*Operating line*
[1563.1]	**PartDiagram SolidFuel**

PartialDiagram SwiPool

Line no.	*Operating line*
[2090.1]	**PartDiagram SwiPool**

PartDiagramHydrBalanc

Line no.	*Operating line*
[2835.1]	**PartDiagramHydrBalanc**

PartDiagram instWH

Line no.	*Operating line*
[2836.1]	**PartDiagram instWH**

PartDiagram ConsC1

Line no.	*Operating line*
[4365.1]	**PartDiagram ConsC1**

PartDiagram ConsC2

Line no.	*Operating line*
[4365.2]	**PartDiagram ConsC2**

PartDiagram SwiPool

Line no.	*Operating line*
[4365.3]	**PartDiagram SwiPool**

Cascade status

Line no.	*Operating line*
[2748.1]	**Cascade status** Inactive Active

6.23 LPB system

The LPB (local process bus) is used as a communication basis for generating a system with additional ALBATROS^2 controllers or controllers of other manufacture. The system can be extended at any time.

6.23.1 Address/power supply

Device address and segment address are used as destinations in the bus system (similar to a postal address). To ensure communication, each device must be correctly addressed.

Note!
Depending on the type of operator terminal, there is only one *LPB address* (6600) or 2 separate *Device address* (6600) and *Segment address* (6601).

LPB address

Line no.	*Operating line*
6600	**LPB address** S0/G1 … S14/G16

Device address and segment address

Line no.	*Operating line*
6600	**Device address**
6601	**Segment address**

The controller’s LPB address is divided into 2 parts each consisting of two 2-digit numerals.

Example:

14	.	16
Segment number		Device number

Note!
Each segment in a system must have a device as a master (device address 1).

In terms of segment address, a differentiation is made between heat source segment and consumer segments:

0	Heat source segment
1...14	Heat consumer segment

Bus power supply function

Line no.	*Operating line*
6604	**Bus power supply function** Off Automatically

The bus power supply enables the bus system to be powered directly by the individual controllers (no central bus power supply). The type of bus power supply can be selected.

Off
No bus power supply via the controller.

Automatically
The bus power supply (LPB) via the controller is automatically switched on and off depending on the requirements of the LPB.

Bus power supply state

Line no.	*Operating line*
6605	**Bus power supply state** Off On

The display shows whether the controller currently powers to the bus.

Off
The bus power supply via controller is currently inactive.

On
The bus power supply via controller is currently active. At the moment, the controller supplies some of the power required by the bus.

6.23.2 Errors/maintenance/alarm

Display system messages

Line no.	*Operating line*
6610	**Display system messages** No Yes

This setting allows system messages sent via LPB to be suppressed on the connected operator terminal.

No
Error messages are not displayed on the controller’s operator terminal.

Yes
Error messages are displayed on the controller’s operator terminal.

Alarm delay

Line no.	*Operating line*
6612	**Alarm delay**

On the basic unit, the delivery of alarms to the OCI… can be delayed by an adjustable period of time. This makes it possible to avoid unnecessary notification of the service center in the case of errors of short duration (e.g. TW has cut out, communication errors). It should be noted, however, that quickly reoccurring errors of short duration are filtered.

6.23.3 Central functions

Note!
These settings are only relevant for device address 1.

Central summer changeover (LPB)

With LPB-capable devices, the basic unit with LPB device address = 1 can provide the function of *Central summer operation changeover*.

To do this, the basic unit distributes the state of its own summer/winter heating limit of **heating circuit 1** to the other devices on the LPB and forces their heating circuits into *ECO* mode, unless they operate in *Comfort* mode.

Note!
Central changeover is mandatory only when changing to *Summer* operation. When the central basic unit changes back to *Winter* mode, the local state applies again to all the other devices and this state might be *Summer* operation, for example.

Distribution is controlled in the central basic unit via 2 parameters:

1. *Summer/winter heating limit* (730/1030/1330)*:*
   - Local: The summer heating limit is not distributed
   - Central: The summer heating limit is distributed to all heating circuits according to the set range of action

1. The range of action on the LPB depends on the segment address and *Action changeover functions* (6620):
   - Segment address = 0 and range of action = segment:
     Summer changeover only acts on the basic units in their own segment 0
   - Segment address = 0 and range of action = system:
     Summer changeover acts on all basic units in all segments (0...14)
   - Segment address > 0:
     The parameter has no significance. Summer changeover only acts on the basic units in their own segment

Note!
Action changeover functions (6620) also influences the distribution of the other *Central changeover* functions such as *Optg mode changeover*.

Central operating mode changeover via LPB

With LPB-capable devices, the basic unit with LPB device address = 1 can provide the function of *Central optg mode changeover*. Then, the changeover actions on the central basic unit (via input Hx) also act on the heating circuits and DHW of the other basic units on the LPB.

Action changeover functions

Line no.	*Operating line*
6620	**Action changeover functions** Segment System

The range of action of central changeover can be defined.

This applies to the following types of limitation:
- *Optg mode changeover* (6623) via input H (when selecting *Centrally*)
- *Summer changeover* (6621) (when selecting *Centrally*)

Entries:

Segment
Changeover takes place with all controllers in the same segment.

System
Changeover takes place with all controllers in the entire system (in all segments). The controller must be located in segment 0!

Summer changeover

Line no.	*Operating line*
6621	**Summer changeover** Locally Centrally

The controller can only use summer changeover on local heating circuits or – via LPB – on other controllers in the same segment or system.

The scope of summer changeover is as follows:

Locally
Local action: The local heating circuit is switched on and off according *Summer/winter heating limit* (730, 1030, 1330).

Centrally
Central action: Depending on the setting made on *Summer/winter heating limit* (730), either the heating circuits in the segment or those of the entire system are switched on and off.

Optg mode changeover

Line no.	*Operating line*
6623	**Optg mode changeover** Locally Centrally

With LPB-capable devices, the basic unit with LPB device address = 1 can provide the function of *Central optg mode changeover*. Then, the changeover actions on the central basic unit (via Hx) or parameter *HC optg mode changeover*) also act on the heating circuits and DHW of the other basic units on the LPB.

The effect of switched on and activated central operating mode changeover depends on the type of unit used:

Version 1

With devices of version 1, the heating circuits change to *Protection* mode.

Version 2

With devices of version 2, the heating circuits change to a selectable operating mode (*Protection* or *Reduced*). The operating mode can be defined for each heating circuit (parameter *Optg mode changeover* (e.g. (900) for heating circuit 1).

Note!
With all devices, local selection of the operating mode is disabled during active central operating mode changeover.

The scope of operating mode changeover via input H is as follows:

Locally
Local action: The local heating circuit is switched on and off.

Centrally
Central action: Depending on the setting made on *Summer/winter heating limit* (730), either the heating circuits in the segment or those of the entire system are switched on and off.

Manual source lock

Line no.	*Operating line*
6624	**Manual source lock** Locally Segment

The range of action of the heat source lock via input H is as follows:

Locally
Local action: The local heat source is locked.

Segment
Central action: All heat sources in the cascaded system are locked.

DHW assignment

Line no.	*Operating line*
6625	**DHW assignment** Local HCs All HCs in segment All HCs in system

Assignment of DHW is required only if DHW heating is controlled by a heating circuit program (compare *Release* (1620) or *El immersion heater release* (5061)).

Settings:

Local HCs
DHW is only heated for the local heating circuit.

All HCs in segment
DHW is heated for all heating circuits in the segment.

All HCs in system
DHW is heated for all heating circuits in the system.

With all settings, controllers operating in *Holiday* mode are also considered for DHW heating.

Cascade master

Line no.	*Operating line*
6630	**Cascade master** Always Automatically

When there is more than one heat source, the unit with device address 1 assumes the role of the cascade master. It activates the required functions and shows the additional operating menus with the cascade-related parameters.

Detection of the master role can be automatic (*Auto*) or can be switched as fix (*Always*).

Ext source with eco mode

Line no.	*Operating line*
6631	**Ext source with eco mode** Off On DHW On

In *ECO* mode, external heat sources on the LPB are operated as follows:

Off
Remains locked.

On DHW
Released for DHW charging.

On
Always released.

Note OT limit ext source

Line no.	*Operating line*
6632	**Note OT limit ext source** No Yes

Additional heat sources connected via LPB can be locked or released according to their own parameters, based on the outside temperature (e.g. air-water heat pump). This state is distributed via LPB. In a cascaded system, the master therefore knows whether or not an additional heat source (slave) is available according to its usage limits (outside temperature) so that it can be switched on, if required.

No

No consideration is given to the Ecobit from the external heat source.

⚠ **Caution!**
If LMS14... control (slave) is connected as a further heat source, this parameter must be set to *No*!

Yes

Consideration is given to the Ecobit from the external heat source and the cascaded system is controlled according to the available heat sources.

6.23.4 Clock

Clock mode

Line no.	*Operating line*
6640	**Clock mode** Autonomously Slave without remote setting Slave with remote setting Master

This setting defines the impact of the system time on the controller’s time setting.

The impact is as follows:

Autonomously
The time of day on the controller can be readjusted. The controller's time of day is not matched to the system time.

Slave without remote setting
The time of day on the controller cannot be readjusted. The controller's time of day is constantly and automatically matched to the system time.

Slave with remote setting
The time of day on the controller can be readjusted; at the same time, the system time is readjusted since the change is adopted from the master. The controller's time of day is still automatically and constantly matched to the system time.

Master
The time of day on the controller can be readjusted. The controller’s time of day is used for the system. The system time is adjusted.

6.23.5 Outside temperature

Outside temp source

Line no.	*Operating line*
6650	**Outside temp source**

Only one outside sensor is required in LPB plant. This sensor is connected to a freely selectable controller and delivers via LPB the signal to the controllers without sensor. The first numeral to appear on the display is the segment number followed by the device number.

– – . – –	No outside sensor readable
01.02	Address of outside sensor The first numeral corresponds to the segment number (01.) The second numeral corresponds to the device number (.02)

Note!
If required (e.g. due to different exposure of certain buildings to solar radiation), the different sections of the system can be equipped with their individual outside sensors.

6.24 Faults

When a fault 🔔 is pending, the respective error message can be displayed on the info level by pressing the **Info** button. The display provides information on the cause of fault.

6.24.1 Message

Message

Line no.	*Operating line*
6700	**Message**

A fault currently pending is displayed here together with the Albatros code indicating where the fault occurred.

SW diagnostic code

Line no.	*Operating line*
6705	**SW diagnostic code**

An internal software error currently pending is displayed here together with the diagnostic code indicating where the error occurred.

Burn ctrl phase lockout pos

Line no.	*Operating line*
6706	**Burn ctrl phase lockout pos**

A fault currently pending is displayed here together with the lockout phase indicating where the fault occurred.

6.24.2 Acknowledgements

Reset alarm relay

Line no.	*Operating line*
6710	**Reset alarm relay** No Yes

If a fault is pending, an alarm can be triggered via relay QX... This relay must be appropriately configured. The setting can be used to reset the alarm relay.

6.24.3 *Error message* functions

These functions can be used to maintain the required flow temperature. If the flow temperature deviates constantly from the required level for more than the set period of time, an error message is delivered. If, during an active alarm, the setpoint is maintained again, the error message is canceled. If, during a DHW charging cycle and within a parameterized time, the DHW storage tank cannot be charged to at least the level of the switching differential, an alarm can be set off.

Flow temp 1 alarm

Line no.	*Operating line*
6740	**Flow temp 1 alarm**

Setting the monitoring time until the error message for heating circuit 1 is delivered.

Error message for heating circuit 1:
Error code 121 *Flow temperature heating circuit 1 not reached*.

Flow temp 2 alarm

Line no.	*Operating line*
6741	**Flow temp 2 alarm**

Setting the monitoring time until the error message for heating circuit 2 is delivered.

Error message for heating circuit 2:
Error code 122 *Flow temperature heating circuit 2 not reached*.

Flow temp 3 alarm

Line no.	*Operating line*
6742	**Flow temp 3 alarm**

Setting the monitoring time until the error message for heating circuit 3 is delivered.

Error message for heating circuit 3:
Error code 371 *Flow temperature heating circuit 3*.

DHW charging alarm

Line no.	*Operating line*
6745	**DHW charging alarm**

Setting the monitoring time until the error message for DHW is delivered.

Error message for DHW:
Error code 126 *DHW charging temperature not reached*.

The flow temperature is regarded as having been maintained if the deviation from the setpoint is less than 1 K. If the flow temperature setpoint is reduced by more than 4 K, the monitoring function is deactivated until the flow temperature drops to the new setpoint. The function is also passive if – due to an ECO function or quick setback – the heating circuit pump is deactivated.

Boiler temp alarm

Line no.	*Operating line*
6743	**Boiler temp alarm**

This function monitors the boiler temperature when the burner is in operation and – in the event of fault – sets off an alarm.

When the burner is switched on, or when the boiler load increases while the burner is running, the boiler temperature might continue to drop somewhat further. From this lowest temperature level, the boiler temperature must increase by the minimum amount of (y) within the parameterized alarm time. Otherwise, a boiler alarm is triggered.

If no request for heat is active, or if the current setpoint is reached, no alarm is delivered.

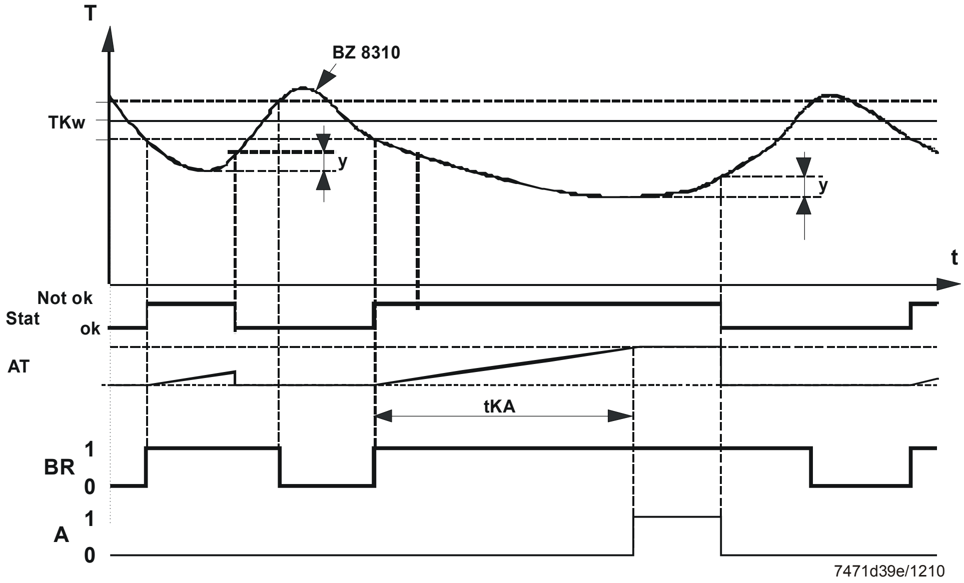


Figure 94: Error message functions – boiler temperature alarm

Key

Line no.	*Meaning*	
8310		Current boiler temperature
	A	Alarm (0 = Off, 1 = On)
	AT	Alarm timer
	BR	Burner (0 = Off, 1 = On)
	Stat	State (not ok/ok)
	T	Temperature
	t	Time
	tKA	Time boiler alarm
	TKw	Boiler temperature setpoint
	y	Minimum increase after burner On

6.24.4 History

History …

Line no.	*Operating line*
6800, 6810, 6820, 6830, 6840, 6850, 6860, 6870, 6880, 6890, 6900, 6910, 6920, 6930, 6940, 6950, 6960, 6970, 6980, 6990	**History …**

The basic unit stores the last 20 errors in non-volatile memory. Every new entry cancels the entry made last. For every error entry, error code, time, internal SW diagnostic code and fault phase of the burner control are stored.

Error code …

Line no.	*Operating line*
6803, 6813, 6823, 6833, 6843, 6853, 6863, 6873, 6883, 6893, 6903, 6913, 6923, 6933, 6943, 6953, 6963, 6973, 6983, 6993	**Error code …**

SW diagnostic code …

Line no.	*Operating line*
6805, 6815, 6825, 6835, 6845, 6855, 6865, 6875, 6885, 6895, 6905, 6915, 6925, 6935, 6945, 6955, 6965, 7975, 6985, 6995	**SW diagnostic code …**

Burner control phase …

Line no.	*Operating line*
6806, 6816, 6826, 6836, 6846, 6856, 6866, 7876, 6886, 6896, 6906, 6916, 6926, 6936, 6946, 6956, 6966, 7976, 6986, 6996	**Burner control phase …**

Reset history

Line no.	*Operating line*
6999	**Reset history** No Yes

The error history with the last 20 errors is canceled.

6.25 Maintenance/special mode

6.25.1 Maintenance functions

Burner hour's interval

Line no.	*Operating line*
7040	**Burner hours interval**

When the set number of burner operating hours or burner starts have elapsed, a maintenance message is displayed. For this message, the number of operating hours of the burner are counted.

Burner hrs since maintenance

Line no.	*Operating line*
7041	**Burner hrs since maintenance**

The current value is added up and displayed. On this operating line, the value can be reset to *0*.

Burner start interval

Line no.	*Operating line*
7042	**Burner start interval**

When the set burner start numbers are reached, a maintenance message is displayed. For this message, the number of starts of the burner are counted.

Burner starts since maint

Line no.	*Operating line*
7043	**Burner starts since maint**

The current value is added up and displayed. On this operating line, the value can be reset to *0*.

Maintenance interval

Line no.	*Operating line*
7044	**Maintenance interval**

Time since maintenance

Line no.	*Operating line*
7045	**Time since maintenance**

Fan speed ionization current

Line no.	*Operating line*
7050	**Fan speed ionization current**

This is the fan speed limit from which the burner ionization current maintenance message should be set if – due to too low ionization current – ionization current supervision and thus increased speed are activated (only with LMS14...).

Message ionization current

Line no.	*Operating line*
7051	**Message ionization current**

Flag to indicate and reset the burner ionization current maintenance message of the LMS14... The maintenance message can be reset only if the cause of the message has been rectified.

6.26 Special operating modes

The unit offers a number of special operating modes that can be triggered via an operator terminal. They are used primarily to make diagnostics or to support specific measurements on the system.

Note!
If the unit has locked out, only manual control and the relay test (output test) can be started. Due to lockout, the burner cannot be put into operation, but the outputs (valves and pumps) can be driven to a predefined position as required for the respective special operating modes.

The other special operating modes cannot be started during lockout. This means that lockout forces the *Chimney sweep* and *Controller stop* functions to be aborted.

Chimney sweep function

Line no.	*Operating line*
7130	**Chimney sweep function** Off On

Off
Function is deactivated.

On
Function is activated.

The burner is started up. To ensure that operation of the burner is as steady as possible, only maximum limitation of the boiler temperature is active as the switch-off point.

Note!
The function is deactivated by setting -.- on this operating line, or automatically when the maximum boiler temperature is reached.

Note!
In the case of a cascaded system, all other boilers are locked as soon as the *Chimney sweep* function is started on one of the boilers.
Locking is canceled again when the *Chimney sweep* function is ended.

The *Chimney sweep* function is activated and deactivated via a button on the operator unit or via menu item **Maintenance/Diagnostics**. The operator unit displays the activated function in the form of a special mode symbol.
The *Chimney sweep* function generates the operating state required for making emission measurements (flue gas measurements).

The switching thresholds are thus as follows:

Switch-off threshold:
Switch-off threshold boiler = 2212

Boiler temperature setpoint:
Boiler temperature setpoint = switch-off threshold boiler

Switch-on threshold:
Switch-on threshold boiler = boiler temperature setpoint – 2454

When the *Chimney sweep* function is active, forced signals force all heating circuits to draw heat.

The *Chimney sweep* function is automatically deactivated when the boiler temperature reaches the switch-off point.

Note!
If dynamic switching limits are activated (*Dyn SD on setpoint change* (2464), *Min setpoint change dyn SD* (2465), *Dyn SD with HC/DHW change* (2466) and *Dyn SD when burner on* (2467)), they also apply to the *Chimney sweep* function .

The burner's output during the time the *Chimney sweep* function is active can be set:

- Low-fire: *Chimney sweep* function with minimum boiler output
- High-fire: *Chimney sweep* function with maximum boiler output
- Maximum heating load: *Chimney sweep* function with parameterized maximum boiler output

Note!
When pressing the manual control button during the time the *Chimney sweep* function is active, the function is aborted and a change to manual control is made.

The function is automatically aborted after a timeout of 1 hour, provided the switch-off point for automatic shutdown is not reached during that period of time.

Key

Line no.	*Meaning*
2212	Maximum setpoint
2454	Switching differential when heating circuits On
2455	Minimum switching differential when heating circuits Off
2456	Maximum switching differential when heating circuits Off

Burner output

Line no.	*Operating line*
7131	**Burner output** Partial load Full load Max heating load

Preset burner output for performing the *Chimney sweep* function.

Partial load
Operation of boiler at minimum output when the *Chimney sweep* function is activated.

Full load
Operation of boiler at maximum output when the *Chimney sweep* function is activated.

Max heating load
Operation of boiler at the parameterized maximum heating load when the *Chimney sweep* function is activated.

Manual control

Line no.	*Operating line*
7140	**Manual control** Off On

Off
Function is deactivated.

On
Function is activated.

When manual control is activated, the relays are no longer energized and deenergized according to the control state, but are set to a predefined manual control state in accordance with their functions (see table below). The relay outputs are set to a state where heat is provided, independent of their hydraulic function. The solar plant remains Off since there is a possibility of storage tank recooling via the collector. A relay energized with manual control can be deenergized by an electronic control thermostat (TR) or limit thermostat (LT).

Note!
In the case of manual control, mixing valve outputs Open/Close are not controlled. The mixing valves should be manually driven to a suitable position.

Designation		Relay	State
Oil/gas boiler	Boiler pump	Q1	On
	2nd stage boiler pump	Q27	On
Solid fuel boiler	Solid fuel boiler pump	Q10	On
Solar	Collector pump	Q5	Off
	External heat exchanger pump	K9	Off
	Controlling element buffer storage tank	K8	Off
	Controlling element swimming pool	K18	Off
DHW	Charging pump	Q3	On
	Diverting valve	Q3	Off
	DHW intermediate circuit pump	Q33	On
	DHW mixing pump	Q35	Off
	Circulating pump	Q4	On
	Electric immersion heater	K6	On
Instantaneous water heater	Charging pump	Q34	Off
	Diverting valve	Q34	Off
Buffer storage tank	Heat generation shutoff valve	Y4	On
	Return valve	Y15	Off
Heating circuit 1..3	Heating circuit pump	Q2 Q6 Q20	On
	Heating circuit mixing valve open/ closed	Y1/Y2 Y5/Y6 Y11/Y12	Off
	Heating circuit pump 2nd stage	Q21 Q22 Q23	On
Primary controller	System pump	Q14	On
	Primary controller mixing valve open/ closed	Y19/Y20	Off
External consumer group 1..3	Consumer group heating circuit pump Swimming pool pump	Q15 Q18 Q19	On
Extra function	Alarm output	K10	Off
	Time program 5	K13	Off
	Heat demand	K27	On
	Cooling demand	K28	Off
	Water filling	K34	Off
	Status output	K35	On
	Status information	K36	On
	Flue gas damper	K37	On
	Fan shutdown	K38	On
	Storage tank diverting pump	Q11	Off
Cascaded system	Cascade pump	Q25	On

Setpoint adjustment with manual control

When manual control is activated, a change to the basic display must be made where the service/special mode symbol 🔧 appears. When pressing the **Info** button, info display **Manual control** appears where the setpoint can be adjusted.

If the *Chimney sweep* function is triggered while manual control is active, manual control is switched off and a change to the *Chimney sweep* function is made. Manual control remains active as long as it is selected.

⚠ **Warning!**
This function is not monitored in terms of time. The selection of manual control is maintained beyond a restart.

Controller stop function

Line no.	*Operating line*
7143	**Controller stop function** Off On

Off
Function is deactivated.

On
Function is activated.

When the *Controller stop* function is activated, the burner's output set via the *Controller setpoint* is immediately demanded from the boiler.

The burner can be controlled manually via the *Controller stop* function. The control algorithm of the LMS14... is overridden by the output preselected by the operator. But the 2-position controller remains active because the burner is put out of operation if the flow temperature reaches the maximum boiler temperature (*Setpoint max* (2212)).

When the boiler temperature reaches the switch-off point, the *Controller stop* function is automatically deactivated. The function can be activated again as soon as the boiler temperature drops below the switch-off point.
In that case, the burner is put into operation only when the boiler temperature drops by the *Switching differential on heating circuits* (Switching diff on HCs (2454)) below the switch-off point.

ℹ Note!
The preselected output [%] refers to the modulation range in *Heating* mode. A preselected output of 0% corresponds to the minimum heat output.

During the time the *Controller stop* function is active, the boiler pump keeps running to ensure the produced heat is carried to the consumers' heating circuits. DHW heating equipment is not being served during the periods of time the *Controller stop* function is active.

ℹ Note!
The *Controller stop* function is automatically ended after 4 hours.

Controller stop setpoint

Line no.	*Operating line*
7145	**Controller stop setpoint**

When the *Controller stop* function is activated, the output set here is demanded from the boiler.

Deaeration function

Line no.	*Operating line*
7146	**Deaeration function** Off On

This parameter serves for triggering the function manually, e.g. via hotkey or menu **Maintenance/special operation.** On completion of deaeration, the parameter is reset to *Off*. Deaeration can also be aborted any time by setting the parameter to *Off*.

Off
Function is deactivated.

On
Function is activated.

Type of venting

Line no.	*Operating line*
7147	**Type of venting** None Heating circuit continuous Heating circuit cycled DHW continuous DHW cycled

This parameter can be used to preselect the phases of the *Deaeration* function (for more detailed information, refer to chapter *Deaeration function*).
Once the function is started, the value serves for information purposes and shows the phase currently handled.

None
Function as a parameter: Default, that is, the *Deaeration* function runs through phase 1 (heating circuit continuous), phase 2 (heating circuit cycled), phase 3 (DHW continuous) and phase 4 (DHW cycled).

Function as an info value: Function is ended.

Heating circuit continuous
Function as a parameter: The *Deaeration* function runs through phase 1 (heating circuit continuous), phase 2 (heating circuit cycled), phase 3 (DHW continuous) and phase 4 (DHW cycled).

Function as an info value: Function is in phase 1 (heating circuit continuous).

Heating circuit cycled
Function as a parameter: The *Deaeration* function only runs through phase 2 (heating circuit cycled), phase 3 (DHW continuous) and phase 4 (DHW cycled).

Function as an info value: Function is in phase 2 (heating circuit cycled).

DHW continuous
Function as a parameter: The *Deaeration* function only runs through phase 3 (DHW continuous) and phase 4 (DHW cycled).

Function as an info value: Function is in phase 3 (DHW continuous).

DHW cycled
Function as a parameter: The *Deaeration* function runs through phase 4 (DHW cycled).

Function as an info value: Function is in phase 4 (DHW cycled).

Telephone customer service

Line no.	*Operating line*
7170	**Telephone customer service**

Setting the phone number that appears on the info display.

6.27 Parameter stick AGU2.56...

6.27.1 Wrong use and risks

Introduction

The parameter settings of units installed in the field can be changed with the help of the parameter stick. Using the stick, the heating engineer can create a spare LMS14... and set basic parameters. This means that he can use an LMS14... with factory-set parameters and replace these parameters by any parameters defined by the OEM. The LMS14... is supplied with a number of safety mechanisms and checks that prevent inadvertent parameter settings. For practical reasons, some of these checks can be deactivated. This chapter contains notes to be observed when creating data sets, aimed at preventing any inadvertent parameter settings.

6.27.2 Checks made by the LMS14...

Before a data set is transferred to the LMS14..., the unit checks and evaluates the following features (among other things):

- Parameter version
- Parameter set number
- OEM parameter set number
- OEM parameter set group number
- OEM boiler type

If the data set contains an online DD, the online DD group number is checked also.

When creating a data set, the person producing it can define the criteria to be checked or not checked.
If checks are canceled here, it might be possible to transfer the data set to a larger group of devices.

The following checks can be canceled:

- Parameter set number
- OEM parameter set number
- OEM parameter set group number
- OEM boiler type

Warning!
Before canceling checks, identify the units to which the data set shall be transferred and find out what consequences this will have for the respective unit. In the worst case, the parameter settings of the unit will be wrong!

6.27.3 Examples of potential risks

All possible checks canceled

This means that …
- the parameter set number,
- the OEM parameter set number,
- the OEM parameter set group number, and
- the OEM boiler type

will not be checked.

In that case, the LMS14... only checks …
- the software type number,
- the parameter version, and
- the customer number.

Note!
Such a data set can be transferred to all LMS14... Please check whether inconsistent parameter settings can occur. Note that a low-cost unit might become a high-end unit or a low-capacity unit might be turned into a higher capacity unit. No detail checks are made.

Exempted are complete parameter sets that are used to set the LMS14... to a defined initial state. In the case of partial parameter sets (e.g. changes in connection with the controller itself), it must be thoroughly checked whether this function might lead to inconsistent parameter settings.

6.27.4 Reducing potential risks

OEM parameter set group number and OEM boiler type

The stick contains 2 parameters, which enable every OEM to group the company's devices:

- OEM parameter set group number
- OEM boiler type

If correctly used, sensible assignment and combination enable the number of units for which the data set is intended to be exactly defined.
When supplied, they are set to *0* and are therefore not preassigned. Possible usage would be grouping based on capacity (boiler type) and controller system (parameter set group number). When creating the data set, the restrictions to be considered can be defined. In the process, the initial parameter set number might be neglected. For more detailed information, refer to ACS435 Software Documentation J7471.

This means that the risk of transferring the data set to a wrong unit will be reduced. This requires precise planning of grouping the different types of boilers right from the start.

6.27.5 Spare part business

The OEM sets the parameters of the units on the production line, based on the parameter sets defined by him. The parameter sets contain unambiguous settings of the parameter set numbers and OEM parameter set numbers. Here, the groupings according to OEM parameter set group numbers and OEM boiler type should also be made.

If replacement units were programmed with a Siemens data set and an OEM-specific data set shall be transferred, the compatibility checks for the data set must be deactivated. This means that neither the parameter version number nor the OEM parameter version number are checked before the data set is transferred to the LMS14... As a result, there is a risk that this data set is inadvertently transferred to other units as well. Also refer to the description given in chapter *Examples of potential risks*.

To reduce potential risk, the OEM must also supply replacement units with company-specific basic parameter settings. This parameter set is then used to generate the stick data sets.
If required, it is possible to deactivate checking of certain parameters in the data sets and to set these data to new values.

6.27.6 General notes on risks and problems

Restrictions

These are not arbitrary data, but parameter values created for a specific type of boiler.

The following errors can occur:
1. The parameter set written to a boiler does not match.
2. A boiler receives a partial parameter set that does not match and now receives a mixture of parameters.

The resulting malfunctions and risks are unpredictable.

Human failure

If selecting a wrong data set which – due to lacking checking criteria – is nonetheless compatible, the LMS14... can be parameterized for a completely different (unsuitable) type of boiler. Here, the persons creating the data sets must define the compatibility conditions as accurately as possible. The name assigned to the data set should be a practical one (maximum 16 characters). This name appears on the unit's operator section before parameter reading into the LMS14... can be started. The heating engineer can compare the displayed text (name of data set) with the type of boiler, thus preventing the transfer of wrong data sets. Data set name and boiler type should match.

Safety-related parameters

If using a parameter set whose possible checks have been completely canceled (refer to chapter *All possible checks canceled*), a wrong parameter set might be transferred to the (replacement) LMS14... – due to a mistake made by the heating engineer. This could lead to wrong safety times, wrong speed limits or wrong switch-off thresholds. This can result in excessive boiler temperatures. In the case of a boiler operating with Sitherm Pro, this could lead to an unfavorable control curve, causing the boiler to produce high emission levels.

6.27.7 Operation via the boiler

The parameter stick can only be used in connection with a full-text operator terminal. If this type of operator terminal is not available, a service room unit can be connected for temporary use.
When the parameter stick is plugged into the LMS14…, it is identified and the information for auto-backup or auto-restore is evaluated.
Stored on the parameter stick are several data sets (parameters and online DD), which can be selected via full text operating unit or PC software ACS700/ACS790. The number of data sets on a stick depend on the type of stick and the size of the individual data sets (from about 8 (write and read/write) to 80 (read only) data sets per stick). Using these numbers, data sets can be copied to the LMS14… or written from the LMS14… to the stick. To make a selection, all that is required is the storage location number (0…250). The user must record the content of the storage locations on a list.

Note!
The stick must not be operated via the ACS420. If it is, the LMS14… will change to the parameter setting state and then goes to lockout.

To ensure that the correct data set was selected when copying a data set to the LMS14…, the operator terminal displays automatically a parameter by making use of the data set description (maximum 16 characters) after selecting the number and before transferring the parameters (and/or the online DD) to the operator terminal. If the data set is incompatible, the designation is preceded by *XX*. If invalid or empty, the display shows «-». If, with write or read sticks, the data set address is invalid, **Error** is displayed. When the correct data set is selected, the user can choose the required action (writing to the stick/reading from the stick).
When transferring data to the LMS14…, another compatibility check is made before starting the transfer to the basic unit. If the data set is incompatible, an error message is delivered.
During backup, it is checked if a write or read stick is plugged in, if the customer number is correct, and if the block size on the stick is sufficient. When selecting a storage location, the data set designation (16 characters) is displayed. When making the backup, the data at the selected storage location are overwritten without further querying.

Selecting a data set

PStick storage pos

Line no.	*Operating line*
7250	**PStick storage pos**

Pstick data description

Line no.	*Operating line*
7251	**Pstick data description**

Using data point *PStick storage pos,* the data set (data set number on the stick) to be written or read can be selected. When a data set was selected, a second data point *PStick of data set* shows the data set's name. It is only via the PC software that this name can be assigned to the sticks generated by the PC software. In the case of write sticks, the data set name is *BU JJMMTTSSMM*, where BU stands for backup, followed by the date on which the backup was made, using the format year, month, day, hour and minute (2 digits). These 2 data points are shown in the form of a double display. When a data set number is selected, the text for the data set description is displayed.

Selecting stick operations

PStick command

Line no.	*Operating line*
7252	**PStick command** No operation Reading from stick Writing on stick

Depending on the selection made, the following actions are performed:

No operation
This is the basic state. This command is displayed as long as no operation on the stick is active.

Reading from stick
Starts reading data from the stick. This operation is only possible with read sticks. The data of the selected data set are copied to the LMS14… Before the transfer takes place, a check is made to see if the data set may be copied. If incompatible, the data set must not be copied. In that case, the display returns to *No operation*, and an error message appears.
Reading from stick is displayed until the operation is completed, or until an error occurs. When the transfer of data is started, the LMS14… assumes a parameter setting state. If only an online DD is transferred, the LMS14… resumes operation after the transfer. If parameters are transferred, the LMS14… must be reset when the transfer is completed. Error *183 Parameterization* is displayed.

Writing on stick
Starts writing data from the LMS14… to the stick. This operation is only possible with read sticks. The data are written to the previously selected data set. Before starting writing data, a check is made to see whether the stick can accommodate the data and whether the associated customer number is correct. *Writing on stick* is displayed until the operation is completed, or until an error occurs.

PStick progress

Line no.	*Operating line*
7253	**PStick progress**

PStick status

Line no.	*Operating line*
7254	**PStick status** No stick No operation Writing on stick Reading from stick EMC test active Writing error Reading error Incompatible data set Wrong stick type Stick format error Check data set Data set disabled Reading disabled

The progress made appears as a percentage which, when stick operation is active (reading or writing) shows the percentage already completed. If no operation is active, or if an error occurs, the display reads 0%.
In the second box of the double display, the state is shown. Among other things, it serves as information about errors should problems occur.

No stick
LMS14… did not detect any stick. No stick plugged in.

Stick ready
Basic state: Stick detected, no action in progress, no error.

Writing on stick
Data are copied from the LMS14… to the stick (backup).

Reading from stick
Data are transferred from the stick to the LMS14….

EMC test active
Only with special software for EMC tests in the laboratory. A special compile switch must be set.

Writing error
An error occurred while copying data from the LMS14… to the stick. Operation was aborted.

Reading error
An error occurred while copying data from the stick to the LMS14… Operation was aborted. The LMS14… initiated lockout. Change to *Reading disabled*.

Incompatible data set
Data set is not compatible with the LMS14... Compatibility conditions are not met. Data set cannot be transferred.

Wrong stick type
Stick type not suited for the selected action. For example, reading from the write stick or writing to the read stick not possible.

Stick format error
Wrong customer number on the stick, or data format on the stick unknown and cannot be evaluated by the LMS14…

Check data set
When reading a data set from the stick to the LMS14…, a problem occurred, causing no abortion, however. For example, a data point in the LMS14… is write-protected or not available, but shall be changed.

Data set disabled
Data set may not be transferred to the LMS14… (read protection). For example, data set is the backup.

Reading disabled
Parameter setting state is in the *ABORT* state. To cancel the parameter setting state, only limited actions are available.

PStick series number

Line no.	*Operating line*
[4566.1]	**PStick series number**

This data point shows the series number of the parameter stick with which the LMS14... was parameterized last.
If an error occurs while setting parameters with the stick, the LMS14... switches to the parameter setting state.
To reset the parameter setting state with the stick, a stick with this series number is required.

PStick storage location

Line no.	*Operating line*
[4693.1]	**PStick storage location**

If the LMS14... is parameterized with the stick, the position of the data set is stored in EEPROM here.
If an error occurs while setting parameters with the stick, the LMS14... switches to the parameter setting state.
To reset the parameter setting state with the stick, the data set is exactly this location.

OEM PStickDataSetNo

Line no.	*Operating line*
[4733.1]	**OEM PStickDataSetNo**

When the OEM creates a data set, the ACS435 setup manager assigns automatically an OEM data set number. During parameterization, the stick downloads this number to the LMS14... where it is stored in this data point.

HQ PStickDataSetNo

Line no.	*Operating line*
[4734.1]	**HQ PStickDataSetNo**

When Siemens headquarters creates a data set, the ACS435 setup manager assigns automatically a headquarters data set number. During parameterization, the stick downloads this number to the LMS14... where it is stored in this data point.

6.27.8 Parameter setting state

The parameter setting state is not safety-related, but might lead to availability problems. When transferring parameters from the stick to the LMS14…, lockout is triggered. When changing the online DD, only start prevention is activated. The user level for the parameter setting state is filed in the header of the data set.
Stick series number and data set number are stored in the LMS14… for information.

The LMS14… can be reset upon successful and error-free completion of parameterization.

When setting the parameters, following must be prevented to avoid lockout:

State	Action
Removal of parameter stick	Repeat parameterization with the same stick and the same data set
LMS14... with power failure	Repeat parameterization with the same stick and the same data set
Reset of LMS14...	Repeat parameterization with the same stick and the same data set
Parameterization aborted (manually or automatically)	Repeat parameterization with the same stick and the same data set
Faulty data set	Store data set again on the stick

Parameterization of the LMS14... is incomplete and invalid and, for this reason, the unit must not be reset. With the help of the ACS432, you can try to replace the data set on the stick by a correctly working data set (complete and matching).

Note!
The LMS14... checks the stick series number and the data set number. This means that the new data set must be located in the identical storage position on the same stick. The repaired stick can now be used to repeat the parameter setting procedure.

An error resulting from parameter changes can also be corrected by setting the parameters via the ACS420 PC software from the same or a higher user level.
Errors resulting from the transfer of the online DD cannot be rectified via the ACS420 PC software.

If the parameter setting state cannot be canceled, the complete EEPROM must be reprogrammed (e.g. CAPSY) and the unit must be replaced.

It is possible to write a completely new EEPROM file to the LMS14…

Caution!
During read or write processes, do not remove the parameter stick from the unit.

Note!
During read or write processes with the stick, parameters must not be changed with some other tool to prevent inconsistent data sets.

6.27.9 Conditions for the transfer of data between LMS14... and parameter stick

Line no.	Data point name	Origin	Checks made before data transfer parameter stick ↔ LMS14...
6234	Boiler type number OEM	Freely selectable for OEMs	Equality or 0 in data set or LMS14... *
6235	Parameter set group OEM	Depending on classification in a group when assigning the parameter set	Equality or 0 in data set or LMS14... *
6236	Parameter set number OEM	Automatically assigned (incremented)	Equality or 0 in data set or LMS14... *
[4762.1]	OnlineDD group number	Version of online DD, assigned by Siemens, for OEM connected with selection of online DD	Equality or 0 in LMS14...*, provided online DD is available in the data set
[4689.1]	CustomerNo_ParaSet	Administration of various OEMs, assigned by Siemens, for OEM fix	Equality or Siemens standard in LMS14... (during programming via parameter stick, Siemens standard is overwritten by customer no.)
6232	Parameter version	Assignment to software version of LMS14..., assigned by Siemens, for OEM fix	Equality
6233	Parameter set number	= *master set no.* In setup manager, assigned by Siemens, for OEM fix	Equality or 0 in the data set

Note!
If a Siemens standard LMS14... shall be converted to a customized version, a number of checks must be omitted, or the LMS14... must be identified by entering *0* in the initial parameterization.

OnlineDDGroupNo
In the case of a replacement unit, this number should be *0*; otherwise, only online DDs can be transferred from the same group.

ParaSatzNr
If the data set has a parameter set number entered, this number must accord with the number in the LMS14... However, most customized versions have a parameter set number which differs from Siemens' parameter set number. In that case, a *0* can be entered in the data set. This is risky, however, since in that case, no consideration is given to the basic parameter set when checking. This should only be done in connection with complete parameter settings. In such a case, the OEM parameter set number should not be set to *0*, thus ensuring that a unit whose parameters have already been set will not be overwritten.

Here, 2 alternatives are available:

1. The customer **prepares** its replacement unit with its own basic parameter set (CAPSY gap hex file) and derives the stick data sets from that basic parameter set.
2. The customer derives its stick data sets from Siemens' basic data set.

Display name

When selecting the data set, the display of the operator terminal shows a freely selectable **display name** with a maximum of 16 characters (before the data set is sent) (Pstick data description (7251)). The **display name** is assigned by the setup manager (ACS435). The ACS432 PC software used for the transfer of data to the parameter stick via the OCI432 docking station ensures that no more than one data set with the same **display name** (e.g. XYZ123) will be stored on one and the same parameter stick. This is to prevent confusion on the boiler since this information on the display is the only information available.

6.28 Input/output test

The input/output test is made to check the correct functioning of the connected plant components.

Note!
Selected sensor values are refreshed within a maximum of 5 seconds. The display is made without measured value correction.

Note!
The relay test can be activated either via the diagnostics software or the operator terminal. It remains active for maximum 8 minutes and is then ended automatically.

The respective output can be selected according to the following table.

Table showing the choice of relay tests that can be made with the LMS14…:

No test
Everything off
Relay output QX1
Relay output QX2
Relay output QX3
Relay output QX4
Relay output QX21 module 1
Relay output QX22 module 1
Relay output QX23 module 1
Relay output QX21 module 2
Relay output QX22 module 2
Relay output QX23 module 2
Relay output QX21 module 3
Relay output QX22 module 3
Relay output QX23 module 3

6.28.1 Output test relay

Relay test

Line no.	*Operating line*
7700	**Relay test** No test Everything off Relay output QX1 Relay output QX2 Relay output QX3 Relay output QX4 Relay output QX21 module 1 Relay output QX22 module 1 Relay output QX23 module 1 Relay output QX21 module 2 Relay output QX22 module 2 Relay output QX23 module 2 Relay output QX21 module 3 Relay output QX22 module 3 Relay output QX23 module 3

The relay test is used to energize and deenergize all relays (burner, heat pump, pumps, etc.), independent of the control state. This facilitates straightforward checking of wiring.

For that purpose, a parameter is available with which each relay can be individually energized. The set state remains active, even if the parameter is quit.

The test must be switched off, otherwise is automatically deactivated by the basic unit after 1 hour.

No test
Output test is deactivated.

Everything off
All outputs are switched off.

Relay output QX1
Only QX1 is switched on.

Relay output QX2
Only QX2 is switched on.

Relay output QX3
Only QX3 is switched on.

Relay output QX4
Only QX4 is switched on.

Relay output QX21 module 1
Only QX21 of extension module 1 is switched on.

Relay output QX22 module 1
Only QX22 of extension module 1 is switched on.

Relay output QX23 module 1
Only QX23 of extension module 1 is switched on.

Relay output QX21 module 2
Only QX21 of extension module 2 is switched on.

Relay output QX22 module 2
Only QX22 of extension module 2 is switched on.

Relay output QX23 module 2
Only QX23 of extension module 2 is switched on.

Relay output QX21 module 3
Only QX21 of extension module 3 is switched on.

Relay output QX22 module 3
Only QX22 of extension module 3 is switched on.

Relay output QX23 module 3
Only QX23 of extension module 3 is switched on.

Output test P1

Line no.	*Operating line*
7713	**Output test P1**

Here, a PWM signal for test purposes can be predefined, to be delivered via output P1.

Note!
The PWM signal can also be preset when the burner is in operation.
When using small values for the PWM signal, it should be noted that these can lead to fast boiler temperature increases and overheating due to low flow rates.

PWM output P1

Line no.	*Operating line*
7714	**PWM output P1**

Display of the current PWM output via output P1.

6.28.2 Input test sensors

Outside temp B9

Line no.	*Operating line*
7730	**Outside temp B9**

DHW temp B3/B38

Line no.	*Operating line*
7750	**DHW temp B3/B38**

Boiler temp B2

Line no.	*Operating line*
7760	**Boiler temp B2**

Sensor temp BX1

Line no.	*Operating line*
7820	**Sensor temp BX1**

Sensor temp BX2

Line no.	*Operating line*
7821	**Sensor temp BX2**

Sensor temp BX3

Line no.	*Operating line*
7822	**Sensor temp BX3**

Sensor temp BX4

Line no.	*Operating line*
7823	**Sensor temp BX4**

Sensor temp BX21 module 1

Line no.	*Operating line*
7830	**Sensor temp BX21 module 1**

Sensor temp BX22 module 1

Line no.	*Operating line*
7831	**Sensor temp BX22 module 1**

Sensor temp BX21 module 2

Line no.	*Operating line*
7832	**Sensor temp BX21 module 2**

Sensor temp BX22 module 2

Line no.	*Operating line*
7833	**Sensor temp BX22 module 2**

Sensor temp BX21 module 3

Line no.	*Operating line*
7834	**Sensor temp BX21 module 3**

Sensor temp BX22 module 3

Line no.	*Operating line*
7835	**Sensor temp BX22 module 3**

The input test is made to read the current measured values at the controller’s input terminals. This facilitates straightforward checking of wiring.

6.28.3 Input test H1/H2/H3/H4/H5/H6/H7

Voltage signal Hx

Line no.	*Operating line*
7840 **7854**	**Voltage signal H1** **Voltage signal H3**

Contact state Hx

Line no.	*Operating line*
7841 **7855** **7860** **7865** **7872** **7874**	**Contact state H1** **Contact state H3** **Contact state H4** **Contact state H5** **Contact state H6** **Contact state H7** Open Closed

Voltage signal H2 module 1, 2, 3

Line no.	*Operating line*
7845 **7848** **7851**	**Voltage signal H2 module 1** **Voltage signal H2 module 2** **Voltage signal H2 module 3**

Contact state H2 module 1, 2, 3

Line no.	*Operating line*
7846 **7849** **7842**	**Contact state H2 module 1** **Contact state H2 module 2** **Contact state H2 module 3** Open Closed

Frequency H4

Line no.	*Operating line*
7862	**Frequency H4**

6.28.4 Input test EX (extension modules)

Input EX21 module 1, 2, 3

Line no.	*Operating line*
7950 **7951** **7952**	**Input EX21 module 1** **Input EX21 module 2** **Input EX21 module 3** 0V 230V

The input test is made to read the current measured values at the controller’s input terminals. This facilitates straightforward checking of wiring.

6.29 Operating state

The current operating state of the plant is visualized by means of status displays.

6.29.1 Messages

State heating circuit 1, 2, 3

Line no.	*Operating line*
8000	**State heating circuit 1**
8001	**State heating circuit 2**
8002	**State heating circuit 3**

Enduser (info level)	*Commissioning, heating engineer*	*State number*
Limit thermostat hat cut out	Limit thermostat has cut out	3
Controller stop active	Controller stop active	**220**
Manual control active	Manual control active	4
	Chimney sweep function, high-fire	**5**
	Chimney sweep function, low-fire	**6**
Chimney sweep function active		**7**
Floor curing function active	Floor curing function active	102
	Overtemperature protection active	56
	Restricted, boiler protection	103
	Restricted, DHW priority	104
	Restricted, buffer priority	105
Heating mode restricted		106
	Forced discharging buffer storage tank	107
	Forced discharging DHW	108
	Forced discharging heat source	109
	Forced heat release	110
	Overrun active	17
Forced heat release		110
	Optimum start control + boost heating	111
	Optimum start control	112
	Boost heating	113
Heating mode *Comfort*	*Heating* mode *Comfort*	114
	Optimum stop control	115
Heating mode *Reduced*	*Heating* mode *Reduced*	116
	Frost protection room active	101
	Frost protection flow active	117
	Frost protection plant active	23
Frost protection active		24
Summer operation	Summer operation	118
	24-hour ECO active	119
	Setback reduced	120
	Setback frost protection	121
	Room temperature limit	122
Off	Off	25

State DHW

Line no.	*Operating line*
8003	**State DHW**

Enduser (info level)	*Commissioning, heating engineer*	*State number*
Limit thermostat has cut out	Limit thermostat has cut out	3
Manual control active	Manual control active	4
Draw-off mode	*Draw-off* mode	199
	Keep hot mode active	222
	Keep hot mode On	221
Keep hot mode On		221
	Recooling via collector	77
	Recooling via DHW/HCs	78
Recooling active		53
	Discharging protection active	79
	Charging time limitation active	80
	DHW charging locked	81
Charging lock active		82
	Forced, max stor tank temp	83
	Forced, max charging temp	84
	Forced, *Legionella* setpoint	85
	Forced, *Nominal* setpoint	86
Forced charging active		67
	Charging electric, *Legionella* setpoint	87
	Charging electric, *Nominal* setpoint	88
	Charging electric, *Reduced* setpoint	89
	Charging electric, *Frost Protection* setpoint	90
	El imm heater released	91
Charging el im heater		66
	Push, *Legionella* setpoint	92
	Push, *Nominal* setpoint	93
Push active		94
	Charging, *Legion*ella setpoint	95
	Charging, *Nominal* setpoint	96
	Charging, *Reduced* setpoint	97
Charging active		69
	Frost protection active	24
	Frost protection instantaneous water heater	223
Frost protection active		24
Overrun active	Overrun active	17
Standby charging	Standby charging	201
	Charged, max stor temp	70
	Charged, max charg temp	71
	Forced, legionella temp	98
	Charged, nominal temp	99
	Forced, reduced temp	100
Charged		75
Off	Off	25
Ready	Ready	200

State boiler

Line no.	*Operating line*
8005	**State boiler**

Enduser (info level)	***Commissioning, heating engineer***	***State number***
SLT has cut out	SLT has cut out	1
SLT test active	SLT test active	123
Fault	Fault	2
	Flue gas temperature, shutdown	232
	Flue gas temperature, load limitation	233
Flue gas temperature to high		234
Limit thermostat has cut out	Limit thermostat has cut out	3
Manual control active	Manual control active	4
	Chimney sweep function, high-fire	5
	Chimney sweep function, low-fire	6
Chimney sweep function active		7
	Locked, manually	8
	Locked, solid fuel boiler	172
	Locked, automatically	9
	Locked, outside temperature	176
	Locked, *Economy* mode	198
Locked		10
	Minimum limitation	20
	Minimum limitation, low-fire	21
Minimum limitation active	Minimum limitation active	22
	Protective startup	11
	Protective startup, low-fire	12
	Return limitation	13
	Return temperature limitation, low-fire	14
In operation		18
Charging buffer storage tank	Charging buffer storage tank	59
In operation for HC, DHW	In operation for HC, DHW	170
In low-fire operation for HC, DHW	In low-fire operation for HC, DHW	171
Released for HC, DHW	Released for HC, DHW	173
In operation for DHW	In operation for DHW	168
In low-fire operation for DHW	In low-fire operation for DHW	169
Released for DHW	Released for DHW	174
In operation for heating circuit	In operation for heating circuit	166
In low-fire operation for HC	In low-fire operation for HC	167
Released for HC	Released for HC	175
Overrun active	Overrun active	17
Released	Released	19
	Frost protection plant active	23
Frost protection active		24
Off	Off	25

State solar

Line no.	*Operating line*
8007	**State solar**

Enduser (info level)	*Commissioning, heating engineer*	*State number*
Manual control active	Manual control active	4
Fault	Fault	2
Frost protection collector active	Frost protection collector active	52
Recooling active	Recooling active	53
Max stor tank temp reached	Max stor tank temp reached	54
Evaporation protection active	Evaporation protection active	55
Overtemp protection active	Overtemp protection active	56
Max charg temp reached	Max charg temp reached	57
Charging DHW + buffer+swi pool	Charging DHW + buffer + swi pool	151
Charging DHW + buffer	Charging DHW + buffer	152
Charging DHW + swi pool	Charging DHW + swi pool	153
Charging buffer + swimming pool	Charging buffer + swimming pool	154
Charging DHW	Charging DHW	58
Charging buffer storage tank	Charging buffer storage tank	59
Charg swimm pool	Charg swimm pool	60
	Min charg temp not reached	61
	Temp diff insufficient	62
Radiation insufficient	Radiation insufficient	63

State solid fuel boiler

Line no.	*Operating line*
8008	**State solid fuel boiler**

Enduser (info level)	*Commissioning, heating engineer*	*State number*
Manual control active	Manual control active	4
Fault	Fault	2
Overtemp protection active	Overtemp protection active	56
	Locked, manually	8
	Locked, automatically	9
Locked		10
	Minimum limitation	20
	Minimum limitation, low-fire	21
Minimum limitation active	Minimum limitation active	22
	Protective startup	11
	Protective startup, low-fire	12
	Return temperature limitation	13
	Return temp limitation, low-fire	14
In operation for heating circuit	In operation for heating circuit	166
In low-fire operation for HC	In low-fire operation for HC	167
In operation for DHW	In operation for DHW	168
In low-fire operation for DHW	In low-fire operation for DHW	169
In operation for HC, DHW	In operation for HC, DHW	170
In low-fire operation for HC, DHW	In low-fire operation for HC, DHW	171
Overrun active	Overrun active	17
In operation	In operation	18
Assisted firing fan active	Assisted firing fan active	163
Released	Released	19
	Frost protection plant active	23
	Frost protection boiler active	141
Frost protection active		24
Off	Off	25

State burner

Line no.	*Operating line*
8009	**State burner**

Enduser (info level)	*Commissioning, heating engineer*	*State number*
Lockout	Lockout	211
Start prevention	Start prevention	212
In operation	In operation	18
	Safety time	214
	Prepurging	218
Startup	Startup	215
	Postpurging	219
	Shutdown	213
	Home run	217
Standby	Standby	216

State buffer

Line no.	*Operating line*
8010	**State buffer**

Enduser (info level)	*Commissioning, heating engineer*	*State number*
Hot	Hot	147
Frost protection active	Frost protection active	24
	Charging electric, em operation	64
	Charging electric, source prot	65
	Charging electric, defrost	131
	Charging electric, forced	164
	Charging electric, substitute	165
Charging el im heater		66
	DHW charging locked	81
	Restricted, DHW priority	104
Charging restricted		124
	Forced charging active	67
	Partial charging active	68
Charging active	Charging active	69
	Recooling via collector	77
	Recooling via DHW/HCs	142
Recooling active		53
	Charged, max stor temp	70
	Charged, max charg temp	71
	Charged, forced charg required temp	72
	Charged, required temp	73
	Partially charged, temp setpoint	74
	Charged, min charg temp	143
Charged		75
Cold	Cold	76
No request for heat	No request for heat	51

State swimming pool

Line no.	*Operating line*
8011	**State swimming pool**

Enduser (info level)	*Commissioning, heating engineer*	*State number*
Manual control active	Manual control active	4
Fault	Fault	2
Heating mode restricted	*Heating* mode restricted	106
Forced heat release	Forced heat release	110
	Heating mode, generation	155
Heating mode		137
Heated, max. sw. pool temp	Heated, max sw pool temp	156
	Heated, solar setpoint	158
	Heated, source setpoint	157
Heated		159
	Heating mode, solar Off	160
	Heating mode, heat source Off	161
Heating Off		162
Cold	Cold	76

6.30 Diagnostics of cascaded system

For diagnostics purposes, a number of setpoints, actual values, switching states of relays and heat source priorities can be displayed.

Line no.	*Operating line*
8100...8199	

6.31 Diagnostics of heat sources

For diagnostic purposes, the various setpoints, actual values, relay switching states and meter readings can be displayed.

Line no.	*Operating line*
8300 .. 8699	

6.31.1 Process values

Using the QAA75…/AVS37… or the PC software ACS700/ACS790, process variables of the sequence of phases and speed control can be visualized. The following variables can be shown on menu *Diagnostics of heat generation*:

Fan speed

Line no.	*Operating line*
8323	**Fan speed**

Current fan speed.

Set point fan

Line no.	*Operating line*
8324	**Setpoint fan**

Fan speed currently required.

Current fan control

Line no.	*Operating line*
8325	**Current fan control**

Current fan control.

Ionization current

Line no.	*Operating line*
8329	**Ionization current**

Actual value of ionization current.

Current phase number

Line no.	*Operating line*
8390	**Current phase number**

Current phase of burner control sequence (see sequence diagram --- phase).

6.32 Diagnostics of consumers

For diagnostic purposes, the various setpoints, actual values, relay switching states and meter readings can be displayed.

Line no.	*Operating line*
8700 .. 9099	

6.33 Burner control

Note!
Due to component tolerances, the parameterized times may differ by up to 1% . This must be taken into consideration when setting the times.

6.33.1 Prepurging

Prepurge time

Line no.	*Operating line*
9500	**Prepurge time**

The prepurge time can be adjusted via the operator terminal. It can only be set to a value higher than *Prepurge time min* (9501).

Prepurge time min

Line no.	*Operating line*
9501	**Prepurge time min**

Duration of prepurging (safety-related). Limit value for the prepurge time adjustable via the operator terminal.

Required speed prepurging

Line no.	*Operating line*
9504	**Required speed prepurging**

The speed required for prepurging can be adjusted via the operator terminal. It can only be set to a value higher than *Req speed prepurging min* (9505).

Req speed prepurging min

Line no.	*Operating line*
9505	**Req speed prepurging min**

Prepurge speed (safety-related). Limit value for *Required speed prepurging*.

Speed tolerance prepurging

Line no.	*Operating line*
9506	**Speed tolerance prepurging**

Speed tolerance during the prepurge phase. Prepurge speed minus speed tolerance prepurging gives the permissible deviation of the speed during prepurging.

6.33.2 Ignition

Required speed ignition

Line no.	*Operating line*
9512	**Required speed ignition**

Required speed at the time of ignition, which can be adjusted via the operator terminal. It can not be set to a value higher than *Required speed ignition max* (9513).

Required speed ignition max

Line no.	*Operating line*
9513	**Required speed ignition max**

Required speed ignition (safety-related). Limit value for the adjustable *Required speed ignition*.

Speed tolerance ignition

Line no.	*Operating line*
9514	**Speed tolerance ignition**

Speed tolerance during the ignition phase. Required speed ignition plus/minus speed tolerance ignition gives the permissible deviation of the speed during the ignition phase.

Preignition time

Line no.	*Operating line*
9517	**Preignition time**

If the parameter is set to *0*, phase *TVZ* lasts the minimum of 0.2 s.

Safety time

Line no.	*Operating line*
9518	**Safety time**

Total safety time. The safety time can be subdivided into a phase with and a phase without ignition. Duration of safety time without ignition: Safety time minus safety time with ignition.

ℹ

Note!
The safety time (TSA) is set in increments of 200 ms. Due to the 1% tolerance of the parameterized times and the switching times of the controlling elements, the next lower value of the required maximum safety time must be parameterized.
If the maximum safety time shall be <5 seconds, the safety time to be set for the LMS14... is 4.8 seconds.

Safety time with ignition

Line no.	*Operating line*
9519	**Safety time with ignition**

Safety time with ignition On.

6.33.3 Operation

Required speed LF

Line no.	*Operating line*
9524	**Required speed LF**

Speed required at low-fire, which can be adjusted via the operator terminal. It can only be set to a value above the *Required speed LF min* (9525).

Required speed LF min

Line no.	*Operating line*
9525	**Required speed LF min**

Speed required for low-fire minimum (safety-related). Limit value for *Required speed LF* (9524).

Speed tolerance LF

Line no.	*Operating line*
9526	**Speed tolerance LF**

Speed tolerance at low-fire. *Required speed LF* (9524) minus speed tolerance low-fire gives the permissible deviation of the speed during the operating phase.

Required speed HF

Line no.	*Operating line*
9529	**Required speed HF**

Speed required at high-fire, which can be adjusted via the operator terminal. It can not be set to a value above the *Required speed HF max* (9530).

Required speed HF max

Line no.	*Operating line*
9530	**Required speed HF max**

Speed required for high-fire maximum (safety-related). Limit value for *Required speed HF* (9529).

Speed tolerance HF

Line no.	*Operating line*
9531	**Speed tolerance HF**

Speed tolerance at high-fire. *Required speed HF* (9529) plus speed tolerance high-fire gives the permissible deviation of the speed during the operating phase.

Optg time with ignition load

Line no.	*Operating line*
9534	**Optg time with ignition load**

Control with ignition load prior to change to the operating phase (interval for stabilization of flame).

6.33.4 Postpurging

Postpurge time

Line no.	*Operating line*
9540	**Postpurge time**

Duration of postpurging, which can be adjusted via the operator terminal. It can only be set to a value above the *Postpurge time min* (9542).

Postpurge time TL max

Line no.	*Operating line*
9541	**Postpurge time TL max**

Duration of postpurge time after a temperature limiter/safety limit thermostat has responded (safety-related).

Postpurge time min

Line no.	*Operating line*
9542	**Postpurge time min**

Duration of postpurging (safety-related). Limit value for the postpurge time which can be adjusted via the operator terminal.

Postpurge time 2

Line no.	*Operating line*
9544	**Postpurge time 2**

Duration of postpurging that can be interrupted. To be activated via *Home run mode* (9613).

Required speed stop max

Line no.	*Operating line*
9551	**Required speed stop max**

Speed from which the current speed is set to *0* (safety-related). When changing to *Standby*, the current speed must be lower than this speed.

Required speed stop

Line no.	*Operating line*
9552	**Required speed stop**

Fan speed required when stopped (safety-related).

6.33.5 Configuration

Capacity

Line no.	*Operating line*
9610	**Capacity** Up to 70 kW Up to 120 kW Above 120 kW

In compliance with the standards, the LMS14... supports 2 capacity ranges:

Up to 70 kW
See up to 120 kW (the LMS14... does not differentiate).

Up to 120 kW
Capacity range up to 120 kW (see sequence diagram for burner capacities <120 kW).

Above 120 kW
Capacity range above 120 kW (see sequence diagram for burner capacities >120 kW.

LP configuration

Line no.	*Operating line*
9611	**LP configuration** LP mode 1 LP mode 2 LP mode 3 LP mode 4 LP mode 5

Configuration of input for air pressure switch:

LP mode 1
No monitoring by air pressure switch (input can be used for some other function).

LP mode 2
Monitoring by air pressure switch from phase *TV* to phase *TVZ*.

LP mode 3
Monitoring by air pressure switch in phase *TV.*

LP mode 4
Monitoring by air pressure switch in phases *TW1, TW2* and *TVZ*.

LP mode 5
Monitoring by air pressure switch during *Standby*.

⚠ **Warning!**
Here, the safety-related setting for input H7 is made. *Function input H7* (6011) is of importance only if this parameter is set to *LP mode 1*.
If, with this safety-related parameter, a function other than *LP mode 1* is selected, *Function input H7* (6011) only accepts *None*.

GP configuration

Line no.	*Operating line*
9612	**GP configuration** GP not connected GP connected

Configuration of input for gas pressure switch:

GP not connected
No monitoring by gas pressure switch (input can be used for some other function).

GP connected
Monitoring by gas pressure switch (see sequence diagram).

⚠ **Warning!**
Here, the safety-related setting for input H6 is made. Parameter *Function input H6* (6008) is of importance only when set to *GP not connected.*
If, with this safety-related parameter, function *GP connected* is selected, parameter *Function input H6* (6008) only accepts *None*.

Home run mode

Line no.	*Operating line*
9613	**Home run mode** Startup with home run Startup without home run

Selection of *Postpurging* mode.

Startup with home run
At the end of postpurging TN2, the change to home run is always made.

Startup without home run
Direct startup from postpurging TN2 possible (interruptable postpurging).

Postpurging level

Line no.	*Operating line*
9614	**Postpurging level** Run Prepurge

Selection of postpurging level at the end of the operating phase.

Run
Postpurging based on last operational control.

Prepurge
Postpurging at prepurge speed.

Forced prepurging on error

Line no.	*Operating line*
9615	**Forced prepurging on error** Off On

After a reset following lockout, after power ON, or after 24 hours in *Standby* mode, forced prepurging takes place in the *TV* phase for 21 seconds or during the *Prepurge time,* if the *Prepurge time* exceeds 21 seconds. The deviations identified by *Z* in the sequence diagram cause the burner control to effect forced prepurging the next time it is started up.

Off
Function is deactivated.

On
Function is activated.

Max speed

Line no.	*Operating line*
9616	**Max speed**

Maximum speed that may never be reached.

Hall sensor pulses/rev

Line no.	*Operating line*
9617	**Hall sensor pulses/rev**

Configuration of Hall pulses per revolution of the fan:
Hall mode 1: 1 pulse per revolution
Hall mode 2: 2 pulses per revolution
Hall mode 3: 3 pulses per revolution
Hall mode 4: 4 pulses per revolution
Hall mode 5: 5 pulses per revolution
Hall mode 6: 6 pulses per revolution

⚠ **Warning!**
When selecting a suitable fan, note the maximum input frequency of the fan Hall input at the LMS14... (refer to chapter *Fan PWM/Hall connection facility*).
If the maximum input frequency is exceeded, fan speed measurements will be wrong.

Ion curr level extran light

Line no.	*Operating line*
9618	**Ion curr level extran light**

Ionization current level extraneous light. If the threshold is exceeded in phases *TLO* through *TVZ*, there will be a response from the sequence of phases (refer to *Sequence diagrams*).

Ion curr level flame exting

Line no.	*Operating line*
9619	**Ion curr level flame exting**

Ionization current level *Flame extinguished*. If the ionization current drops below this level, there will be a response from the sequence of phases in phases *Interval* (TI) and *Normal operation* (MOD) due to error (refer to *Sequence diagrams*).

6.33.6 Fan control

Fan output/speed slope

Line no.	*Operating line*
9626	**Fan output/speed slope**

Slope of linear equation for output-speed conversion.

Fan output/speed Y-section

Line no.	*Operating line*
9627	**Fan output/speed Y-section**

Y-section of axis of linear equation for output-speed conversion.

Speed Kp

Line no.	*Operating line*
9630	**Speed Kp**

Proportional coefficient of fan control.

Speed Tn

Line no.	*Operating line*
9631	**Speed Tn**

Integral action time of fan control.

Speed Tv

Line no.	*Operating line*
9632	**Speed Tv**

Derivative action time of fan control.

6.33.7 Chimney drying

Chimney drying

Line no.	*Operating line*
9650	**Chimney drying** Off Temporarily Permanently

When chimney drying is activated, the function is started after shutdown when changing to *Standby*. Chimney drying can be interrupted by any request for heat and can be restarted when the sequence of phases returns to *Standby*.

Off
Function is deactivated.

Temporarily
The duration of chimney drying is dependent on parameter *Duration chimney drying* (9652).

Permanently
Chimney drying is continuously performed in *Standby* mode.

Req speed chimney drying

Line no.	*Operating line*
9651	**Req speed chimney drying**

Predefined speed that shall be used for drying the chimney.

Duration chimney drying

Line no.	*Operating line*
9652	**Duration chimney drying**

Duration of chimney drying if temporal limitation is required.

6.33.8 Setpoint filter for fan speed control

Time const 1/2/3 falling

Line no.	*Operating line*
[3694.1]	**Time const 1 falling**
[3695.1]	**Time const 2 falling**
[3696.1]	**Time const 3 falling**

These are the filter time constants for the speed setpoint of fan control when modulating from a higher to a lower speed level. The time constants act depending on parameters *Upper speed threshold* [3698.1] and *Lower speed threshold* [3699.1] and – when modulating down – can be subdivided into 3 ranges.

Pt1TmeConst4MaxMin_1

Line no.	*Operating line*
[5283.1]	**Pt1TmeConst4MaxMin_1**

Filter time constant for the speed setpoint of fan control when modulating from a higher to a lower level.
The time constant acts in all phases, with the exception of *TI* and *MOD*, depending on the parameters *Diff SetpFiltTmeConst* [5285.1] (= Yes).
Parameter *Diff SetpFiltTmeConst* [5285.1] is deactivated when set to No.

Pt1TmeConst1MinMax_1

Line no.	*Operating line*
[5284.1]	**Pt1TmeConst1MinMax_1**

Filter time constant for the speed setpoint of fan control when modulating from a lower to a higher level.
The time constant acts in all phases, with the exception of *TI* and *MOD*, depending on the parameters *Diff SetpFiltTmeConst* [5285.1] (= Yes).
Parameter *Diff SetpFiltTmeConst* [5285.1] is deactivated when set to No.

Time const rising

Line no.	*Operating line*
[3697.1]	**Time const rising**

Filter time constant for the speed setpoint of fan control when modulating from a lower to a higher speed level.

Diff SetpFiltTmeConst

Line no.	*Operating line*
[5285.1]	**Diff SetpFiltTmeConst** No Yes

Selection parameter, which can be used to load different setpoint filter time constants to the PT1 setpoint filter, depending on the sequence of phases.
If *Diff SetpFiltTmeConst* [5285.1] is set to No) the parameters with *Time const 1 falling* [3694.1], *Time const 2 falling* [3695.1], *Time const 3 falling* [3696.1] and *Time const rising* [3697.1] are used in all phases.
If *Diff SetpFiltTmeConst* [5285.1] is set to Yes, the parameters with *Time const 1 falling* [3694.1], *Time const 2 falling* [3695.1], *Time const 3 falling* [3696.1] and *Time const rising* [3697.1] are used in phases *TI* and *MOD*.
In all other phases, *Pt1TmeConst4MaxMin_1* [5283.1] and *Pt1TmeConst1MinMax_1* [5284.1] are used.

Upper speed threshold

Line no.	*Operating line*
[3698.1]	**Upper speed threshold**

Upper speed threshold value up to which Pt1 filter time constant *Time const 1 falling* [3694.1] acts when the speed setpoint changes from a higher to a lower level. If the speed drops below this threshold value, filter time constant *Time const 2 falling* [3695.1] starts acting.

Pt1 lower speed threshold

Line no.	*Operating line*
[3699.1]	**Lower speed threshold**

Lower speed threshold value up to which Pt1 filter time constant *Time const 2 falling* [3695.1] acts when the speed setpoint changes from a higher to a lower level. If the speed drops below this threshold value, filter time constant *Time const rising* [3697.1] starts acting.

Fan PWM min

Line no.	*Operating line*
[3997.1]	**Fan PWM min**

Minimum PWM controller load value of fan control (minimum control range value).

Fan PWM max

Line no.	*Operating line*
[3998.1]	**Fan PWM max**

Maximum PWM controller load value of fan control (maximum control range value).

Ion limitn lower limit

Line no.	*Operating line*
[4269.1]	**Ion limitn low limit**

Ionization current limit from which the minimum speed is set to the current speed.

Ion limitn delta

Line no.	*Operating line*
[4270.1]	**Ion limitn delta**

Hysteresis added to the *Ion limitn low limit* [4269.1].
From *Ion limitn low limit* [4269.1] + *Ion limitn delta* [4270.1], the lower speed limit is reduced every 0.2 seconds.

IonFIGuard slope pos

Line no.	*Operating line*
[4398.1]	**IonFIGuard slope pos**

This value indicates the increase of the ionization current per second.

IonFIGuard slope neg

Line no.	*Operating line*
[4397.1]	**IonFIGuard slope neg**

This value indicates the decrease of the ionization current per second.

Ion limitn filt time

Line no.	*Operating line*
[4273.1]	**Ion limitn filt time**

Filter time constant for ionization current maintenance limit.

Enable QAA fan para

Line no.	*Operating line*
[4337.1]	**Enable QAA fan para** Off On

Under certain conditions, the fan parameters for ignition load, low-fire, high-fire, prepurging and postpurging can be set via the QAA75…/AVS37… Since these fan parameters are basically in the safety-related area and – as a general rule – safety-related values cannot be changed via the QAA75…/AVS37…, following applies:

- The respective parameters are available in 2 groups (both safety-related and non-safety-related)
- The change between the 2 parameter groups can be parameterized via the safety-related flag *Enable QAA fan para* [4337.1]

Off
Fan parameters cannot be changed via the operator terminal.

On
Fan parameters can be changed via the operator terminal.

Overview of safety-related and non-safety-related parameters:

Parameters QAA75…/ AVS37…		**Safety-related parameters**
Required speed prepurging (9504)	≥	Req speed prepurging min (9505)
Required speed ignition (9512)	≤	Required speed ignition max (9513)
Required speed LF (9524)	≥	Required speed LF min (9525)
Required speed HF (9529)	≥	Required speed HF max 9530)
Prepurge time (9500)	≥	Prepurge time min (9501)
Postpurge time (9540)	≥	Postpurge time min (9542)

Key

Line no.	*Meaning*	
9504	N_Vor_QAA	Speed required for prepurging (QAA)
9505	N_Vor	Minimum speed required for prepurging
9512	N_ZL_QAA	Speed required for ignition
9513	N_ZL	Maximum speed required for ignition
9524	N_TL_QAA	Speed required for low-fire
9525	N_TL	Minimum speed required for low-fire
9529	N_VL_QAA	Speed required for high-fire
9530	N_VL	Maximum speed required for high-fire
9500	Tv_QAA	Prepurge time
9501	Tv	Derivative action time
9540	Tn_QAA	Postpurge time
9542	Tn	Integral action time

Fan PWM min prepurg

Line no.	*Operating line*
[4352.1]	**Fan PWM min prepurg**

Minimum fan PWM during prepurging for monitoring the fan speed.

Fan PWM max prepurg

Line no.	*Operating line*
[4612.1]	**Fan PWM max prepurg**

Maximum fan PWM during prepurging for monitoring the fan speed.

Fan PWM min ignition

Line no.	*Operating line*
[4613.1]	**Fan PWM min ignition**

Minimum fan PWM at ignition for monitoring the fan speed.

Fan PWM max ignition

Line no.	*Operating line*
[4353.1]	**Fan PWM max ignition**

Maximum fan PWM at ignition for monitoring the fan speed.

Fan PWM min low-fire

Line no.	*Operating line*
[4354.1]	**Fan PWM min low-fire**

Minimum fan PWM at low-fire for monitoring the fan speed.

Fan PWM max high-fire

Line no.	*Operating line*
[4355.1]	**Fan PWM max high-fire**

Maximum fan PWM at high-fire for monitoring the fan speed.

Max speed prepurging

Line no.	*Operating line*
[4366.1]	**Max speed prepurging**

Maximum permissible fan speed during prepurging.

Config reaction LT/SLT

Line no.	*Operating line*
[4378.1]	**Config reaction LT/SLT** Start prevention Lockout position

Response if the mechanical limit thermostat (LT)/safety limit thermostat (SLT) cuts out.

In the following, every start attempt made by the burner control is counted as such.

RepCounter flame TSA

Line no.	*Operating line*
[3633.1]	**RepCounter flame TSA**

Maximum number of start attempts for establishment of flame.
Maximum number of start attempts when – at the end of the safety time – no flame is detected.
The set value indicates the total number of start attempts.

Example:

RepCounter flame TSA = 1 (maximum number of start attempts for establishment of flame = 1):
The burner control initiates lockout after the first start attempt when – with a heat request pending – there is no establishment of flame at the end of the safety time (TSA).
If a new start attempt shall be made (no repetitions), the value must be set to *2*.

RepCounter flame TSA = 4 (maximum number of start attempts for establishment of flame = 4):
The burner control initiates lockout after the fourth start attempt when – with a heat request pending – there is no establishment of flame at the end of the safety time (TSA).

Note!
This repetition counter is also an indication of the behavior of the system when the gas pressure switch responds during the safety time.

RepCounter flame

Line no.	*Operating line*
[3632.1]	**RepCounter flame**

Maximum number of start attempts in the event of loss of flame during operation.
Setting 25 means an infinite number of repetitions, and the counter has no impact.
The set value indicates the total number of start attempts.

Example:

RepCounter flame = 1 (maximum number of start attempts upon loss of flame during operation = 1):
After the first loss of flame during operation, the burner control goes to lockout.
If a new start attempt shall be made (no repetition), the value must be set to *2*.

RepCounter flame = 2 (maximum number of start attempts upon loss of flame during operation = 2):
After the second loss of flame during operation, the burner control goes to lockout.

Max StartAttempts Opt 1

Line no.	*Operating line*
[6086.1]	**Max StartAttempts Opt 1** Inactive Active

The function of the repetition counters *Flame establishment* and *Loss of flame* (*RepCounter flame TSA* [3633.1] and *RepCounter flame* [3632.1]) depends on *Max StartAttemps Opt 1* [6086.1].

Inactive
As described under *RepCounter flame TSA* [3633.1] and *RepCounter flame* [3632.1].

Active
Repetition counter *Loss of flame* (RepCounter flame [3632.1]) remains inactive.
When using this setting, errors *Loss of flame during operation* and *No flame during safety time* are handled by the repetition counter of *RepCounter flame TSA* [3633.1], which means that if one of these errors occurs, the number of remaining start attempts are reduced – starting from the maximum number *RepCounter flame TSA* [3633.1].

Examples of *Max StartAttempts Opt 1* [6086.1] = Active

RepCounter flame TSA [3633.1] = 1:
Branching out to lockout position if, during the first start attempt, no flame was established when the safety time had elapsed, or in the event o floss of flame during operation.
If another start attempt shall be allowed, *RepZähler Flam TSA* [3633.1] must be set to 2.

RepCounter flame TSA [3633.1] = 2:
Branching out to lockout position if, after the second start attempt, no flame was established before the safety time had elapsed or, when, after the first start attempt upon loss of flame during operation, no flame was established by the time the safety time had elapsed.

RepCounter flame TSA [3633.1] = 3:
Branching out to lockout position if, after the third start attempt, no flame was established before the safety time had elapsed or, when, after the second start attempt upon loss of flame during operation, no flame was established by the time the safety time had elapsed.

Remote reset SLT

Line no.	*Operating line*
[4495.1]	**Remote reset SLT**

Locking error caused by the safety limit thermostat (SLT), irrespective of electronic or mechanical safety limit thermostat.

Remote reset air

Line no.	*Operating line*
[4496.1]	**Remote reset air**

Locking error caused by the air pressure switch (LP error).

Rem res extran light

Line no.	*Operating line*
[4497.1]	**Rem res extran light**

Locking error due to detection of extraneous light.

Remote reset flame

Line no.	*Operating line*
[4498.1]	**Remote reset flame**

Locking error due to erroneous flame detection or loss of flame during operation.

Prepu outp OEM limit

Line no.	*Operating line*
[4777.1]	**Prepu outp OEM limit**

Prepurge output predefined by OEM (OEM limit).

Ign outp OEM limit

Line no.	*Operating line*
[4778.1]	**Ign outp OEM limit**

Ignition load output predefined by OEM (OEM limit).

LF outp OEM limit

Line no.	*Operating line*
[4779.1]	**LF outp OEM limit**

Low-fire output predefined by OEM (OEM limit).

HF outp OEM limit

Line no.	*Operating line*
[4780.1]	**HF outp OEM limit**

High-fire output predefined by OEM (OEM limit).

Max output OEM limit

Line no.	*Operating line*
[4781.1]	**Max output OEM limit**

Maximum output predefined by OEM (OEM limit).

Min output OEM limit

Line no.	*Operating line*
[4782.1]	**Min output OEM limit**

Minimum output predefined by OEM (OEM limit).

6.34 Program sequence of burner control (function)

6.34.1 Program selection

Certain sections of the burner control's program can be changed via parameters, thereby providing a choice of control sequences. The burner control's program sequences are distinguished mainly by their capacity ranges within which the boiler shall operate.

In accordance with the standards, 2 capacity ranges are in use:

- <120 kW
- ≥120 kW

For both capacity ranges, a number of parameter setting choices are available, enabling the OEM to match the burner control's control sequence and time characteristics to individual needs.

6.34.2 Forced intermittent operation

Forced intermittent operation ensures that the burner control shuts down after a maximum of 24 hours of continuous operation. This is to make certain the burner control performs the required startup and shutdown sequences.

6.34.3 Burner control program

The burner control program ensures orderly operation of the unit including startup, shutdown, and flame supervision. The sequence itself can be changed by setting a number of parameters. If there are deviations from the required control sequence, or after a reset, the program will respond by triggering safety lockout (home run) followed by lockout, restart or start prevention, depending on the settings made. Sequence control is phase-oriented. The individual phases of the program are summarized to groups, such as startup, operation, shutdown and home run. After a reset (power ON), the burner control starts its home run. Depending on the available (parameterized) input/output signals or program times (e.g. prepurging), the individual phases of the program are executed or skipped. The burner control's program is designed for intermittent operation. To confirm correct functioning (detection of faults); a complete operating cycle is required. In the *Standby* position, the burner control is ready to operate and waits for a request for heat from the controller, or it prevents burner startup (release missing). The burner control maintains the operation position until requests for heat from the controller are no longer present, but for no more than 24 hours. After this period of time, the burner control will automatically trigger forced intermittent operation.

6.34.4 Burner capacities

EN 676 (Nov 2003)		
	≤120 kW	**>120 kW**
Air supply failure – fan speed -- **during pre purging**	Air flow failure during prepurge shall at least proceed to safety shutdown. Safety shutdown followed by a single attempt at restart is permitted. If this restart attempt fails, then non-volatile lock-out shall occur.	Non-volatile lockout
Air supply failure – fan speed – **during ignition**	Safety shutdown followed by a single attempt at restart is permitted. If this restart attempt fails, then non-volatile lockout shall occur.	Non-volatile lockout
Air supply failure – fan speed – **in operation**	Safety shutdown followed by a single attempt at restart is permitted. If this restart attempt fails, then non-volatile lockout shall occur.	Non-volatile lockout
Air flow rate during prepurging under the demanded value – air pressure switch	Safety shutdown or the prepurge shall be continued until the required air rate is restored, provided that the total controlled prepurge time is not reduced.	
Fault during establishment of flame	Maximum 3 restart attempts, whereby each restart calls for the complete start program. After this action, the flame signal must be available at the end of the first safety time of the restart attempt permitted last. If not, the system must respond immediately by triggering safety shutdown, followed by non-volatile lockout (reached by setting the repetition counter to 4). For the restart, a value other than the forced prepurge time (T_ZWANG) can be set via the prepurge time (T_VOR). or Immediately safety shutdown followed by non-volatile lock-out (reached by setting the repetition counter to *1*).	
Loss of flame during operation	Restart with full startup sequence. After this action, the flame signal must be available after the permitted restart attempt when the burner reaches its operating position. If not, the system must respond immediately by triggering safety shutdown, followed by non-volatile lockout (reached by setting the repetition counter to 4). For the restart, a value other than the forced prepurge time (T_ZWANG) can be set via the prepurge time (T_VOR) or Immediately safety shutdown followed by non-volatile lock-out (reached by setting the repetition counter to *1*).	

Standard: DIN EN **483** (June 2000) <= 70 kW; EN **297**; EN **298**; DIN EN **656** (January 2000) >70 kW ... < 300 kW; DIN EN **13836**:2006(D) >300 kW ... 1000 kW; DIN EN **15417**:2006 >70 kW ... <= 1000 kW; DIN EN **15420** (DRAFT):2006 >70 kW ... <= 1000 kW

6.34.5 Sequence diagram for burner capacities ≤120 kW

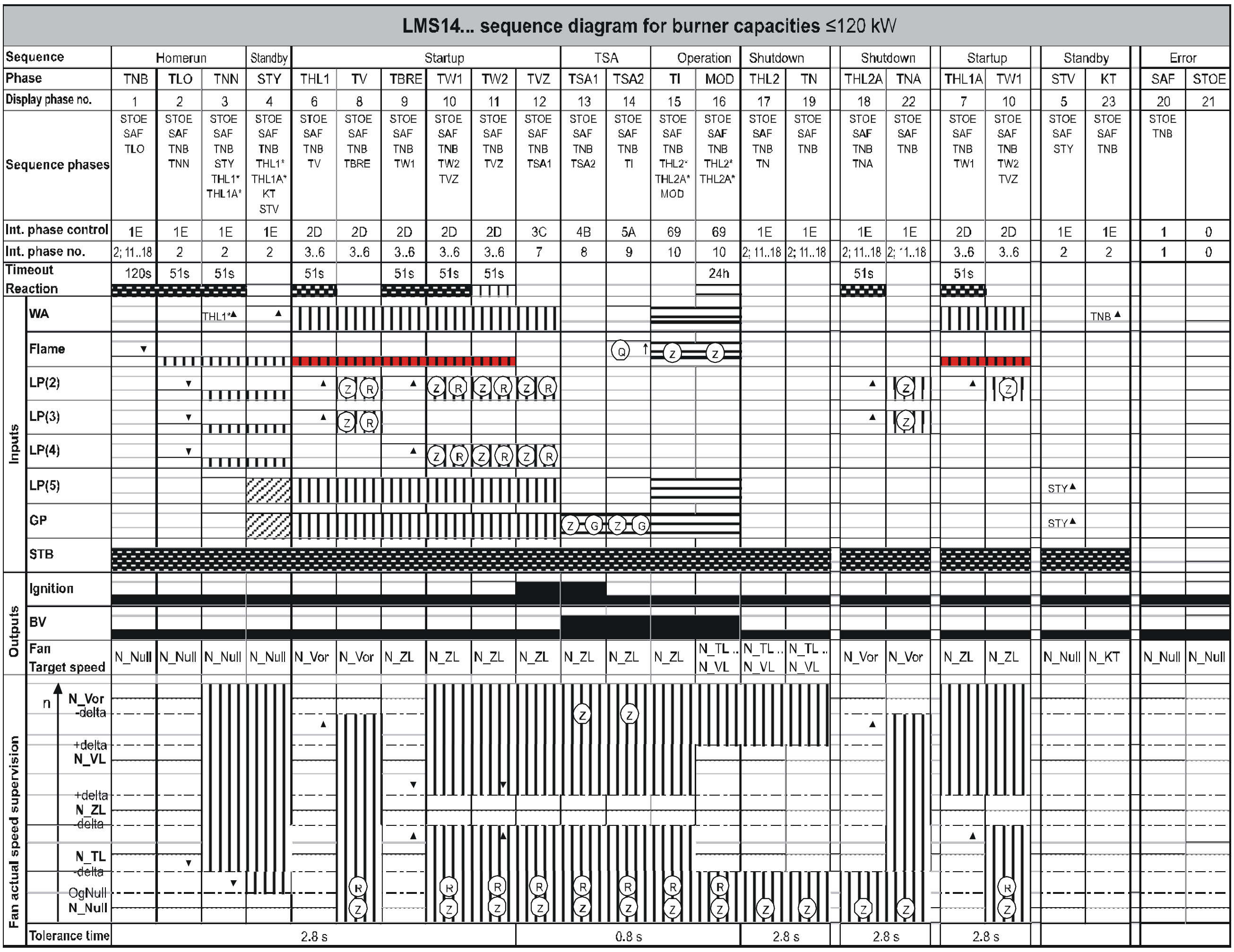


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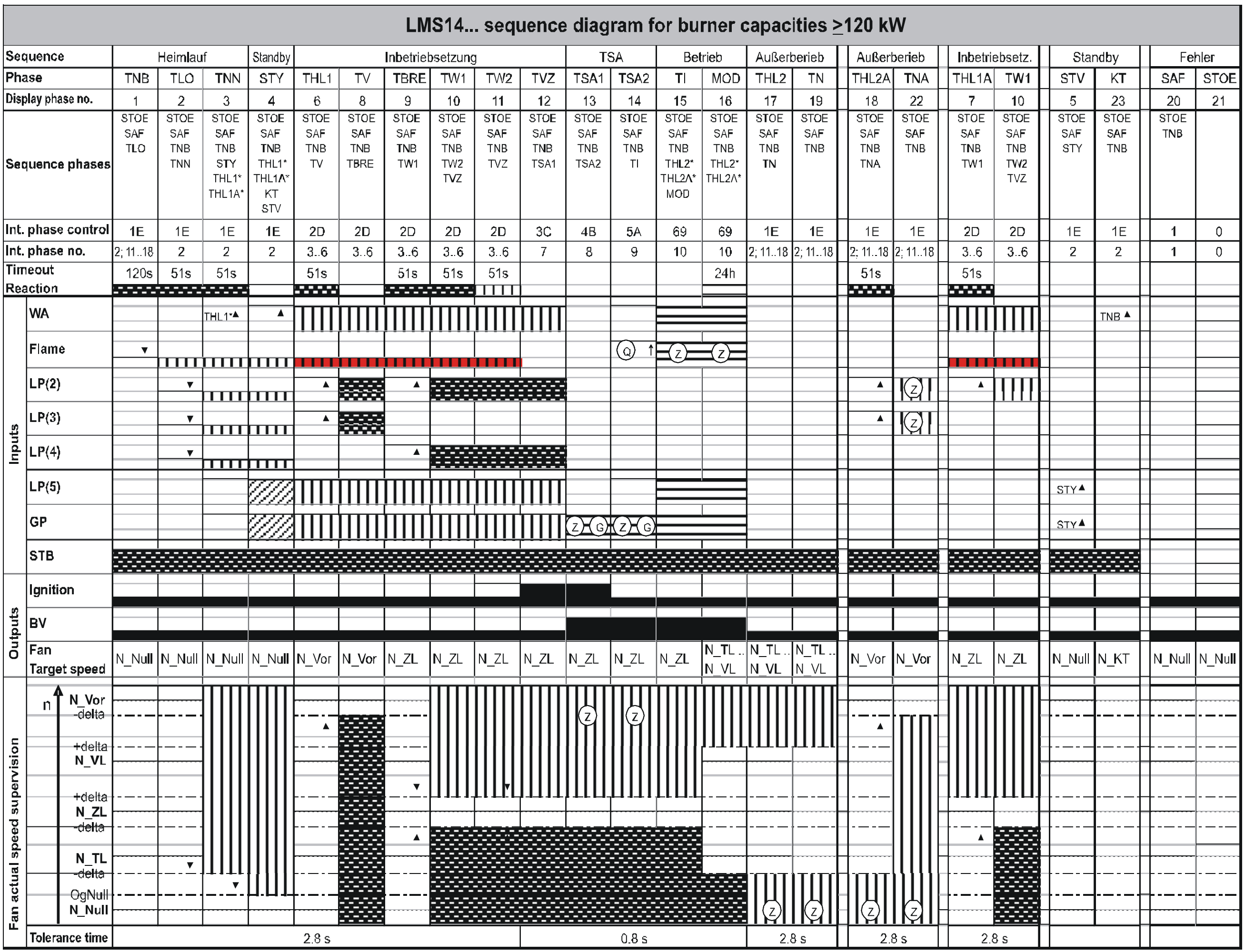
Figure 95: Sequence diagram for burner capacities ≤120 kW

6.34.6 Sequence diagram for burner capacities ≥120 kW



LMS14... sequence diagram for burner capacities ≥120 kW

Sequence	Heimlauf			Standby	Inbetriebsetzung						TSA		Betrieb		Außerberieb		Außerberieb		Inbetriebsetz.		Standby		Fehler	
Phase	TNB	TLO	TNN	STY	THL1	TV	TBRE	TW1	TW2	TVZ	TSA1	TSA2	TI	MOD	THL2	TN	THL2A	TNA	THL1A	TW1	STV	KT	SAF	STOE
Display phase no.	1	2	3	4	6	8	9	10	11	12	13	14	15	16	17	19	18	22	7	10	5	23	20	21
Sequence phases	STOE SAF TLO	STOE SAF TNB TNN	STOE SAF TNB STY THL1* THL1A*	STOE SAF TNB THL1* THL1A* KT STV	STOE SAF TNB TV	STOE SAF TNB TBRE	STOE SAF TNB TW1	STOE SAF TNB TW2 TVZ	STOE SAF TNB TVZ	STOE SAF TNB TSA1	STOE SAF TNB TSA2	STOE SAF TNB TI	STOE SAF TNB THL2* THL2A* MOD	STOE SAF TNB THL2* THL2A*	STOE SAF TNB TN	STOE SAF TNB	STOE SAF TNB TNA	STOE SAF TNB	STOE SAF TNB TW1	STOE SAF TNB TW2 TVZ	STOE SAF STY	STOE SAF TNB	STOE TNB	
Int. phase control	1E	1E	1E	1E	2D	2D	2D	2D	2D	3C	4B	5A	69	69	1E	1E	1E	1E	2D	2D	1E	1E	1	0
Int. phase no.	2; 11..18	2	2	2	3..6	3..6	3..6	3..6	3..6	7	8	9	10	10	2; 11..18	2; 11..18	2; 11..18	2; 11..18	3..6	3..6	2	2	1	0
Timeout Reaction	120s	51s	51s		51s		51s	51s	51s					24h			51s		51s					
Fan Target speed	N_Null	N_Null	N_Null	N_Null	N_Vor	N_Vor	N_ZL	N_ZL	N_ZL	N_ZL	N_ZL	N_ZL	N_ZL	N_TL .. N_VL	N_TL .. N_VL	N_TL .. N_VL	N_Vor	N_Vor	N_ZL	N_ZL	N_Null	N_KT	N_Null	N_Null
Tolerance time	2.8 s									0.8 s					2.8 s		2.8 s		2.8 s					

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Figure 96: Sequence diagram for burner capacities ≥120 kW

Key

Inputs	▲	If input is On, the change to the next phase on the right is made
	▼	If input is Off, the change to the next phase on the right is made
	XXX▲	If input is On, the change to phase XXX is made
	XXX▼	If input is Off, the change to phase XXX is made
	↑	If the input is On at the end of the phase, the change to the next phase on the right is made
	▥	Input must be Off, otherwise home run
	▥	Input must be On, otherwise home run
	▩	Input must be Off, otherwise lockout
	▩	Input must be On, otherwise lockout
	▤	Input must be Off, otherwise shutdown
	▤	Input must be On, otherwise shutdown
	▨	Input must be Off, otherwise start prevention (phase STV)
	▨	Input must be On, otherwise start prevention (phase STV)
Outputs	▬	Output Off
	█	Output On
Supervision of current fan speed	▲	If the speed is higher than the lower/upper limit, the change to the next phase on the right is made
	▼	If the speed is lower than lower/upper limit, the change to the next phase on the right is made
	▥	Speed not permitted, home run if violation exceeds the tolerated time
	▩	Speed not permitted, lockout if violation exceeds the tolerated time
	–·–·–	Lower/upper speed limit
	┈┈┈	Required speed
Response to errors	Ⓩ	In case of deviation: Forced prepurging (can be parameterized)
	Ⓠ	In case of deviation: Error counter *No flame end of TSA* is incremented. Lockout if counter reads 4. Error counter is reset in operating phase
	Ⓖ	In case of deviation: Error counter *GP errors during TSA* is incremented. Start prevention of 2 hours is triggered if counter reads 3. Error counter is reset in operating phase
	Ⓡ	In case of deviation: Error counter *Air supply* is incremented. Lockout if counter reads 2. Error counter is reset after shutdown of controller
Subsequential phase	*	Next phase depending on parameterization

Line no.	*Meaning*	
9504	N_Vor_QAA	Speed required for prepurging (QAA)
9505	N_Vor	Minimum speed required for prepurging
9513	N_ZL	Maximum speed required for ignition
9525	N_TL	Minimum speed required for low-fire
9530	N_VL	Maximum speed required for high-fire
9551		Maximum fan speed standstill
9552		Required speed standstill
9616		Maximum speed
9651		Speed required for chimney drying
	BV	Fuel valve
	GP	Gas pressure switch
	KT	Chimney drying
	LP	Air pressure switch
	MOD	Control mode
	SAF	With a certain error class, the unit jumps to this phase and all safety-related outputs are deactivated.
	STB	Safety limit thermostat (SLT)
	STOE	If detecting a system error that shall drive the unit to a safe state (lockout), the unit goes to the fault phase, which can only be quit by making a reset
	STV	Start prevention
	STY	Standby
	TBRE	Maximum time to reach ignition speed after prepurging
	THL1	Maximum fan ramp-up time to prepurge speed
	THL1A	Maximum fan ramp-up time to ignition speed
	THL2	Change to postpurging at last operating speed
	THL2A	Change to postpurging at prepurge speed
	TI	Interval
	TLO	Permitted time with air pressure switch closed or fan speed
	TN2	Interruptable postpurging
	TNA	Postpurging at prepurge speed
	TNB	Permitted afterburn time
	TN	Postpurging at last operating speed
	TNN	Permitted time with fan speed
	TVZ	Preignition time
	TW1	Maximum waiting time 1
	TW2	Maximum waiting time 2
	TSA1	1st safety time
	TSA2	2nd safety time

Description of sequence diagrams

The burner control's program is subdivided into several phases. A phase is characterized by a certain output and input configuration of the burner control. For the correct sequence and progression of signals, refer to the sequence diagrams. The progression of signals not shown in the sequence diagrams is summarized under *Special cases*.

According to the sequence diagram, there is a permitted tolerance band with a corresponding limit for each level (e.g. *Maximum speed required for ignition*). The tolerance band is defined via parameter *delta**. The limits are interrogated in the relevant sequence phases (refer to *Sequence diagrams*).

Example: Ignition load Upper limit = *N_ZL* (9513) + *delta*
Lower limit = *N_ZL* (9513) – *delta*

In addition, the limit values are complemented by *Required speed stop* (9552) and *Max speed* (9616) (refer to *Sequence diagrams*). *NoG_Max* is the maximum speed which must never be reached. *NoG_Null* is the speed that must not be exceeded when changing to the *Standby* position.

Program times of sequence diagrams

Time	**Min. (s)**	**Max. (s)**	**Response at the end**	**Designation**
TNB	0.2	120	Lockout position	Afterburn time
TLO	0.2	51.0	Lockout position	Open air pressure switch (fan overrun time)
TNN	0.2	51.0	Lockout position	Up to speed = 0 (fan overrun time)
THL1	0.2	51.0	Lockout position	1st fan ramp-up time
THL2	0.2	51.0	Lockout position	2nd fan ramp-up time
Tv (t1)	0	51	Switching	Prepurging
TBRE	0.2	51.0	Lockout position	Fan deceleration time to ignition load
TW1	0.2	51.0	Lockout position	Waiting for internal sequence, fan speed adjustment and combustion optimization
Tvz	0.2	20	Switching	Preignition time
TSA	1.8	9.8	1)	Safety time start
TSA1	0.2	9.6 2)	1)	Safety time with ignition
TSA2	0.2	*TSA-TSA1* 2)	1)	Safety time without ignition
Ti (t4)	0.2	10	Switching	Interval operation with ignition load
TKT	0	Must be defined	no	Chimney drying with N_KL

1) Lockout or repetition, depending on the flame signal and the parameters, plus a number of parameter setting choices (refer to the relevant description)

2) In the case of parameterization with abortion of safety time on detection of flame, the times for *TSA1* and *TSA2* follow from the time the flame is established.
Note: *TSA* can never be exceeded

6.34.7 Repetition counter

In the event of erroneous input signals, the repetition counters can be used to influence the sequence of phases.

Loss of flame during operation

Per default, repetition counter *Flame off during operation* is set to infinite (*25*). If the fault occurs several times, the burner control does not initiate lockout.

No flame on completion of safety time

If there is no flame on completion of the safety time, further repetitions are possible before lockout occurs.

6.34.8 Description of sequence diagrams

Standby

- **PH_STANDBY (unlimited)**

Burner control waits for a request for heat from the controller.

- **PH_STARTVER**

No external or internal release. The respective diagnostic code is delivered.

Startup

The change from *Standby* to *Operation* is termed startup – triggered by a request for heat from the controller. If startup includes prepurging, startup begins with the *THL1* phase, without prepurging with the *THL1A* phase.

- ***THL1***

Maximum fan ramp-up time to prepurge level. With prepurge phase (t1) >0 or when there is a request for forced prepurging.

- ***THL1A***

Maximum fan ramp-up time to ignition level. With prepurge phase (t1) = 0 and when there is no request for forced prepurging.

- ***TV* (t1)**

Prepurge phase.

- ***TBRE***

Maximum time required to reach the ignition level after prepurging (reaching the speed band for ignition load).

- ***TW1***

Maximum waiting time until the following functions are completely performed:
- Internal safety tests: These tests start with the beginning of the startup sequence and already run in the background during the preceding phases
- Combustion optimization: Combustion optimum switched off, or stepper motor in the start position
- Fan speed adjustment: Feedback when the required fan speed for the ignition load has been reached for the first time

- ***TVZ***

Preignition time (can be parameterized, but minimum is 0.2 seconds).

- ***TSA1*; *TSA2***

Ignition safety time. If no flame is established on completion of this period of time (including several reignition attempts), the burner control goes to lockout or makes a restart, depending on the parameter settings. If parameterized with abortion of safety time upon detection of flame, *TSA* can be shortened via flame establishment.

- ***TSA1***

First part of safety time with ignition on. Fuel valve is open.

- ***TSA2*** **(*TSA – TSA2*)**

Second part of safety time with ignition off. Fuel valve is open.

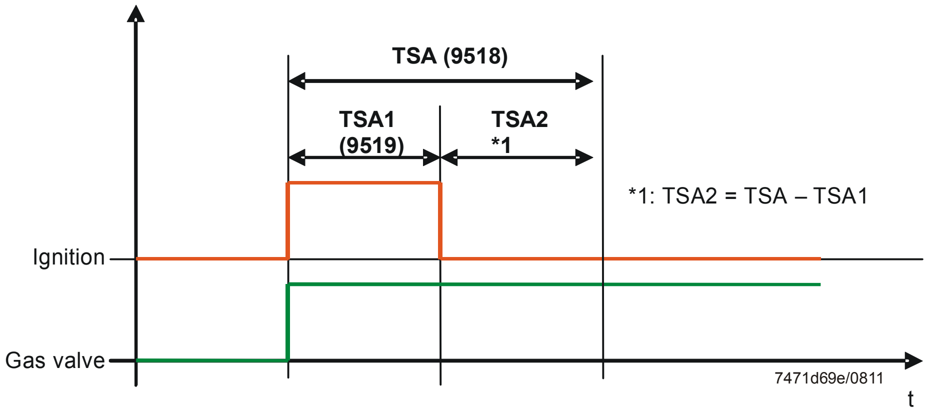


Figure 97: Safety time *TSA*

Operation

Start of the operating position is phase interval TI. If interval TI is not required, it cannot be parameterized to *0*, but only to a minimum of 0.2 seconds.

- ***TI*** **(t4)**

Interval for stabilization of flame.

- ***MODULATION*** **(unlimited)**

Controller operation. In this phase, the controller’s result is delivered.

Shutdown

The change from the operating position to *Standby* is made when there is no more request for heat and is subdivided into *Shutdown* and *Home run*. *Shutdown* consists of postpurging, which can be switched off. With postpurging, there are 2 possible modes of operation, the difference being the way the fan is controlled.

Parameter setting choice 1:

- ***THL2*** **(0.2 seconds)**
Change to postpurging with fan control used last in operation.

- ***TN1*** **(t8)**
Postpurging with fan control used last in operation.

- ***TN2***
Interruptable postpurging with fan control used last in operation. If there is a new request for heat during this postpurge time, postpurging can immediately be interrupted.

Parameter setting choice 2:

- ***THL2***
Change to postpurging with fan control used during prepurging.

- ***THL2A***
Postpurging with fan control used during prepurging.

- ***TN2***
Interruptable postpurging with fan control used last in operation. If there is a new request for heat during this postpurge time, postpurging can immediately be interrupted.

Home run

The home run serves for making the change to the *Standby* position. It is made on a regular basis after shutdown. After extraordinary events (refer to *Sequence diagram*) or after a reset, it is used to bring the unit into the basic position (*Standby*). In the case of a new request for heat, fast startup is triggered during the home run. This is accomplished by reducing *TNN* followed by a direct change from phase *TNN* to phase *THL1/THL1A*. In that case, operating state *Standby* is skipped.

- ***TNB***
Permitted afterburn time.

- ***TLO***
Permitted time with air pressure switch closed (if present) or fan speed > 9525 - *N_TL_Delta.*

- ***TNN***
Permitted time with fan speed > *NoG_Null.*

Error

If the system detects a fault, it switches to the safety or lockout phase to run the burner control to a safe state.

- ***SAF***
  When in a certain error class, a change to the *SAP* phase is made, and all safety-related outputs are deactivated. This way, lockout and a subsequent reset shall be avoided. If, for example, undervoltage is detected, which might lead to erroneous feedback signals, the system can go to this phase. When voltage returns to its normal level, this phase can be quit again with no need for making a reset.

- **STOE**
  If a system error is detected that shall run the burner control to a safe state (lockout), the unit goes to the lockout phase, which can only be quit again by making a reset.

Special cases (deviations)

- **Forced prepurging**

Forced prepurging takes place via parameter *Req speed prepurging min* (9505) after …
- an off time of more than 24 hours,
- power ON,
- shutdown due to an interruption of gas supply during the safety time.

Forced prepurging takes place in phase *TV*.
It lasts 21 seconds, or >21 seconds if the prepurge time is set to >21 seconds.

The deviations marked *Z* in the sequence diagram cause the burner control to execute forced prepurging during the next start phase.

- **Number of start attempts at the end of the ignition safety time (TSA)**

If no flame is established by the end of the safety time (TSA), the burner control …
- can go to lockout, or
- can trigger a repetition by changing to home run.

Refer to section *Maximum number of start attempts for establishment of flame*.

- **Loss of flame during operation**

If parameterized, in the event of loss of flame during operation, a change to home run with restart takes place (refer to section *Maximum number of start attempts upon loss of flame during operation*).

- **Prepurging**

Prepurging can be deactivated by setting the prepurge time to *0* seconds. In that case – as shown in the sequence diagram – a change from phase *THL1* to phase *TW1* takes place.

- **Preignition time**

If parameter *Preignition time* (9517) is set to *0* (no ignition prior to safety time (TSA)), phase *TVZ* is completed within the minimum time of 0.2 seconds.

- **Forced intermittent operation**

After a maximum of 24 hours of uninterrupted operation, the unit is forced to shut down, ensuring regular shutdown to the standby phase. The timer for forced intermittent operation will be reset in the standby phase. Fast startup with forced intermittent operation is not possible.

- **Ignition safety time (*TSA*)**

As described above, when evaluating the flame at the end of the ignition safety time, the behavior of the burner control can be influenced. Also, the second safety time (TSA2) should not be selected too short, thus making certain that there will be no erroneous evaluation of the flame due to simulation resulting from ignition.

- **Postpurging**

Postpurging can be parameterized in 2 different ways. Either postpurging at the prepurge speed or at the speed used last in operation. The postpurge time is set via the prepurge time (Tn) (see above).

- **Startup from postpurging**

Direct startup from postpurging (TN2) can take place via *Postpurging* mode, provided the mode was selected without home run and no air pressure switch is used (LP mode 1 or LP mode 5). If there is a request for heat during postpurging (TN2), the home run is skipped and startup is immediately started without driving the fan to standstill during the home run.

Note!
If monitoring of air supply is needed, interruptable postpurging is not permitted.

- **Start prevention**

Certain internal or external events can trigger start prevention. In that case, the burner control changes to phase *STARTVER*. The diagnostic code indicates the reason why burner startup was prevented.

Some of the reasons are the following (among others):

- Short-circuit or interruption of sensor
- No gas pressure switch signal (depending on parameterization)
- Open air pressure switch input (depending on parameterization)
- Triggering of *Limit thermostat* function

Some of the functions that lead to start prevention can be deactivated through parameterization.

6.34.9 Fan speed control

Fan speed control is active during startup, shutdown, home run, and the operating phase. The purpose of fan speed control is to influence the fan motor in a way that the resulting fan speed (after settling) will lie within a permissible band of the current operating phase. Fan speed control allows the compensation of external influences, such as over- or undervoltage, shortest flue gas paths or longest flue gas paths, in defined ranges. Fan speed control can be adjusted via *Speed Kp* (9630), *Speed Tn* (9631) und *Speed Tv* (9632) (refer to chapter *Fan control*). The pulses from fan speed feedback can be parameterized using *Hall sensor pulses/rev* (9617).

During adjustment of the fan speed by fan speed control, a transient response might occur. It is recommended to parameterize prepurging and ignition to the same level, thereby making use of prepurging for the settling process. If, for example, prepurging is parameterized > ignition, a second settling process will take place. This would extend the time required for startup.

Fan speed control and speed parameters

The fan control values are to be parameterized such that the values required and desired from the combustion point of view will be reached (flue way and rated voltage). Then, the associated fan speeds are to be defined based on the fan characteristics. In a first approach, the limit values for the permitted bands must be set to a high level (Speed tolerance prepurging (9506) and Speed tolerance ignition (9514) etc.). The values for fan speed control and fan speed can now be optimized. When the speed controller and the speeds in the individual phases are set, the speed bands are reduced to such a degree that in the event of unfavorable conditions, startup, operation and shutdown take place without triggering any fault status messages.

Speed limits

If readjustment of speed is desired, it should be made first. When optimization is completed, or the settings have been made, the speed limits are to be defined and set next.

The limit values for the permissible bands should be set to a level where the fan speed lies inside the band, even if conditions are most unfavorable. If, by mistake, the fan speed is higher or lower, the worst-case consideration and the speed band are violated, leading to appropriate responses in the process (refer to *Sequence diagrams*).
However, for a defined tolerance time, the sequence of phases tolerates certain deviations from the preset speed bands in the individual phases. This way, it is made certain that in the case of potential settling processes the speed controller will not immediately respond to violations of the speed bands, and that a response is triggered only if there is a lasting speed deviation in one if the phases.

6.34.10 Filter for fan speed setpoint (OEM)

The fan speed setpoint can be filtered with a Pt1 algorithm. If there is a setpoint change from a lower to a higher value, the change can be slowed down with a Pt1 filter constant. If the setpoint changes from a higher to a lower value, there a 3 Pt1 filter constants to slow down the setpoint change and thus the current fan speed. The band of the 3 Pt1 filter constants from a higher to a lower value can be selected with 2 threshold parameters for the fan speed. These fan speed threshold parameters are only valid for a change from a higher to a lower value.

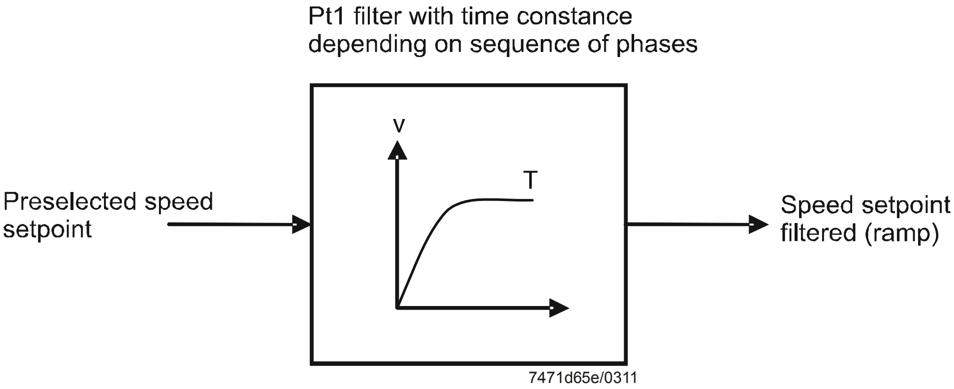


Figure 98: Block circuit diagram Pt1 speed-setpoint filter

Diff SetpFiltTmeConst [5285.1] make it possible to distinguish between different filter time constants depending on the phase.
If *Diff SetpFiltTmeConst* [5285.1] is set to *Yes*, filter time constants *Pt1TmeConst4MaxMin_1* [5283.1] and *Pt1TmeConst1MinMax_1* [5284.1] apply in phases *TI* and *MOD*.
In all other phases, the following filter time constants are used:
Time const 1 falling [3694.1],
Time const 2 falling [3695.1],
Time const 3 falling [3696.1],
Time const rising [3697.1],
Upper speed threshold [3698.1], and
Lower speed threshold [3699.1].

If *Diff SetpFiltTmeConst* [5285.1] is set to *No*, the following filter time constants are used in all phases:
Time const 1 falling [3694.1],
Time const 2 falling [3695.1],
Time const 3 falling [3696.1],
Time const rising [3697.1],
Upper speed threshold [3698.1], and
Lower speed threshold [3699.1].

In that case, *Pt1TmeConst4MaxMin_1* [5283.1] and *Pt1TmeConst1MinMax_1* [5284.1] have **no impact**.

The band of the 3 filter time constants Pt1 from a higher to a lower level can be selected with 2 threshold parameters for the fan speed.
These fan speed threshold parameters are valid only when changing from a higher to a lower level.
The setting is made via *Upper speed threshold* [3698.1] and *Lower speed threshold* [3699.1].

For modulating to a higher level, all phases have no speed thresholds that could be used to subdivide modulation into different ranges.

The subdivision of ramp slope is only possible in the operating phases when modulating to a lower level. In that case, *Diff SetpFiltTmeConst* [5285.1] must be set to *Yes*.

Modulating to a lower level upon shutdown when *Diff SetpFiltTmeConst* [5285.1] is set to *Yes.*

In the event of shutdown at the end of postpurging and a fan speed setpoint of 0 rpm, the speed controller is switched off.
This means that the fan's PWM is switched off and the fan motor coasts – depending on the fan's characteristic – until standstill is reached.
In this range, there is no control by the speed controller.
To enable the fan ramp to act when modulating to a lower level upon shutdown in phases *TNB*, *TLO* and *TNN*, the fan controller is switched off in home run only when the filtered fan speed setpoint drops below the speed threshold *2*NoGNull* (*Required speed stop max* (9551)).
Up to this threshold, the fan is controlled by the speed controller and modulates to a lower level, depending on the preselected setpoint.
In that case, the setpoint filter must be set such that – under the most unfavorable conditions – the current fan speed reaches speed threshold *2*NoGNull* within 51 seconds.
If, within 51 seconds, the speed drops below the speed threshold, the burner control goes to non-volatile lockout (Albatros code 160 *Fan speed error*).
If the burner control goes to lockout, the speed controller for the fan is still switched off.
This means that when going to lockout, time constants (*Pt1TmeConst4MaxMin_1* [5283.1] and *Pt1TmeConst1MinMax_1* [5284.1]) have no impact.

Overview of filter coefficients (*Diff SetpFiltTmeConst* [5285.1] set to *Yes*)

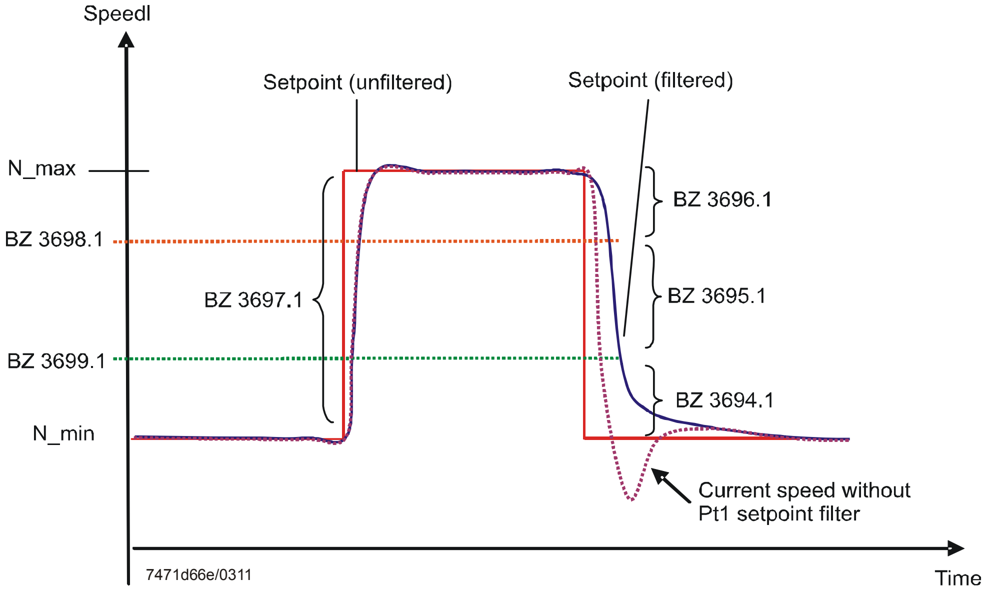


Figure 99: Setpoint filter in phases *TI* and *MOD*

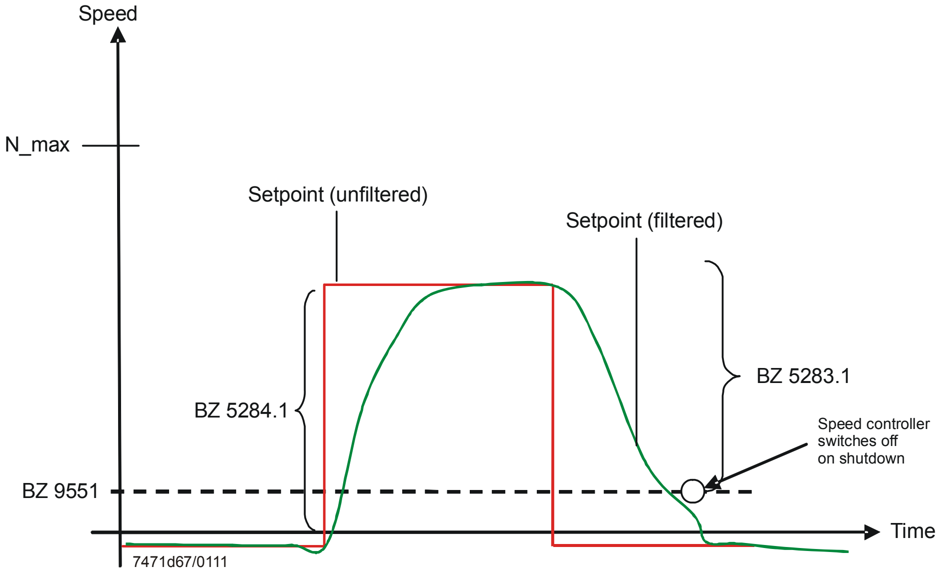


Figure 100: Setpoint filter in phases other than *TI* and *MOD*

Overview of filter coefficients (*Diff SetpFiltTmeConst* [5285.1] set to *No*)

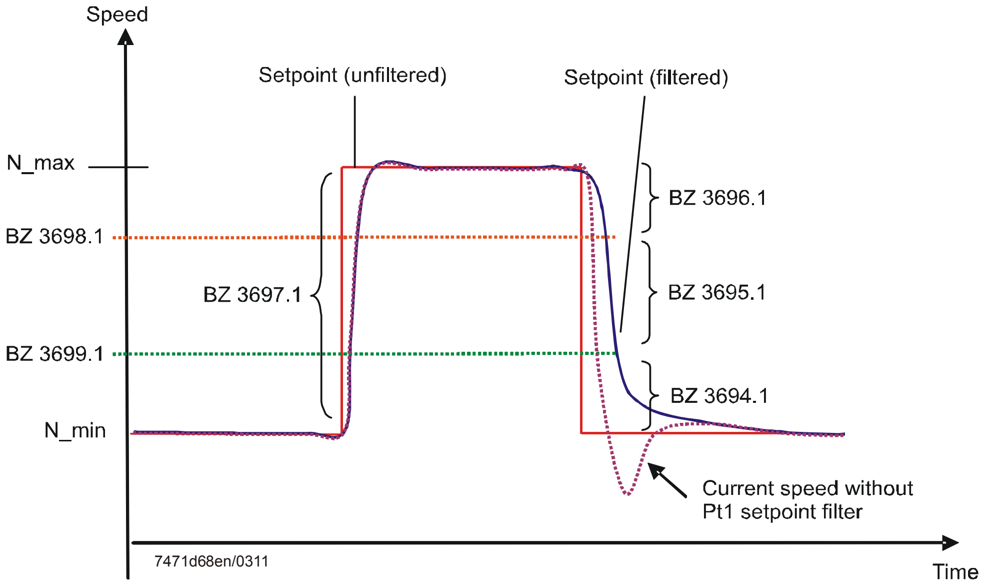


Figure 101: Setpoint filter in all phases

Key

Line no.	*Meaning*	
9530	N_Max	Maximum fan speed required for high-fire
9525	N_Min	Minimum fan speed required for low-fire
9551		Maximum fan speed stop
[3694.1]		Pt1 time constant 1 on falling speed
[3695.1]		Pt1 time constant 2 on falling speed
[3696.1]		Pt1 time constant 3 on falling speed
[3697.1]		Pt1 time constant on rising speed
[3698.1]		Pt1 upper speed threshold falling
[3699.1]		Pt1 lower speed threshold falling
[5283.1]		Pt1 time constant 4 on falling speed
[5284.1]		Pt1 time constant 1 on rising speed
[5285.1]		Different ramps in all phases

6.35 PWM limitation

The control range of the fan speed controller can be adjusted via *Fan PWM min* [3997.1] and *Fan PWM max* [3998.1] (refer to chapter *Setpoint filter for fan speed control*).

6.35.1 Supervising air supply by monitoring current fan speed

Basically, acquisition of the fan speed is not failsafe. Without extra measures, monitoring the current fan speed is not sufficient to ensure air supply to the burner. Errors in the acquisition of the fan speed or fan can be compensated by an appropriate PWM level. Then, the acquired fan speed lies again within the valid range. To enable fan speed monitoring to detect such errors, the PWM range of fan speed control must be limited. For the relevant speed ranges used for prepurging, ignition and operation, suitable parameters for PWM limitation are available.

	PWM limits		Fan speed limits	
	Min.	Max.	Min	Max
Prepurging	MinPwmPrepurge	-	9505 – N_Vor_Delta	N_Vor_Max
Ignition	-	MaxPwmIgnition	9513 – N_ZL_Delta	9513 + N_ZL_Delta
Operation	MinPwmLowLoad	MaxPwmHighLoad	9525 – N_TL_Delta	9530 + N_VL_Delta

The PWM limits must be defined for the most unfavorable conditions. With the minimum limits, the ambient conditions must be selected such that the fan reaches the minimum speed with the given PWM. If the PWM value is still reached with the minimum speed, it is used as the minimum PWM value. The procedure is the same with the maximum limits, only in the reverse sense.

Note!
Whether or not monitoring of the current fan speed is enough for supervision of the air supply must be clarified with the approval authorities and the fan manufacturer.

Limitation of PWM

The delivered manipulated variable can be limited via *Fan PWM min* [3997.1] and *Fan PWM max* [3998.1] (internal limitation of PWM).
The setting range is from 0 to 100%.

Depending on the phase, the fan speed controller receives from the phase sequence additional adjustable lower and upper limit values for PWM. Using these parameters, the output of the speed controller in phases *Prepurging* (*Fan PWM min prepurg* [4352.1] and *Fan PWM max prepurg* [4612.1]), *Ignition* (*Fan PWM min ignition* [4613.1] and *Fan PWM max ignition* [4353.1]) and *Operation* (*Fan PWM min low-fire* [4354.1] and *Fan PWM max high-fire* [4355.1]) can be limited in different ways. The *Limitation* function decides which of the PWM limitation values (internal PWM limits or external phase sequence PWM limit values) shall be used. It is always the greater value that is used with the minimum limits, and the smaller value with the maximum limits~~.~~

If the PWM limits are set to *>0%* or *<100%*, there is a condition defining that for startup or the transition phases the control is active and limitation is inactive. This is to make certain that the control will not be erroneously limited during ramp up or phase transition, which would cause the unit to initiate lockout.
The phases during which limitation is not allowed to be active are the following: *THL1/THL1A* (transition phase from *Standby* to *Prepurging*), *TBRE* (transition phase from *Prepurging* to *Ignition*) and *THL2/THL2A* (transition phase from *Operation* to *Postpurging*). During these phases, the controller must be given the possibility to correct control deviations, if necessary, to reach the monitored phases *Prepurging, Ignition* and *Postpurging*. In the event of error, the controller can correct the control deviation and the transition condition to the next phase is fulfilled, or the transition condition (speed threshold) is not reached and – after a tolerance time of 51 seconds – the phase sequence branches off to lockout. If, in the first case, the transition condition was fulfilled, PWM limitation would take effect in the next phase, possibly overriding the controller PWM (with the defined PWM limit value of the respective phase) and possibly leading to a speed violation by PWM limitation.
When changing from a *non-limited* to a *limited* phase, limitation is suppressed for 4 software cycles, permitting further settling of the speed during the transition. In phases *THL1/THL1A*, *TBRE* and *THL2/THL2A*, the maximum PWM limits are also switched to *inactive*. When changing from a higher prepurge speed to a low ignition speed, the maximum ignition PWM limit might be approached from above, leading to a wrong response caused by the erroneous limitation.

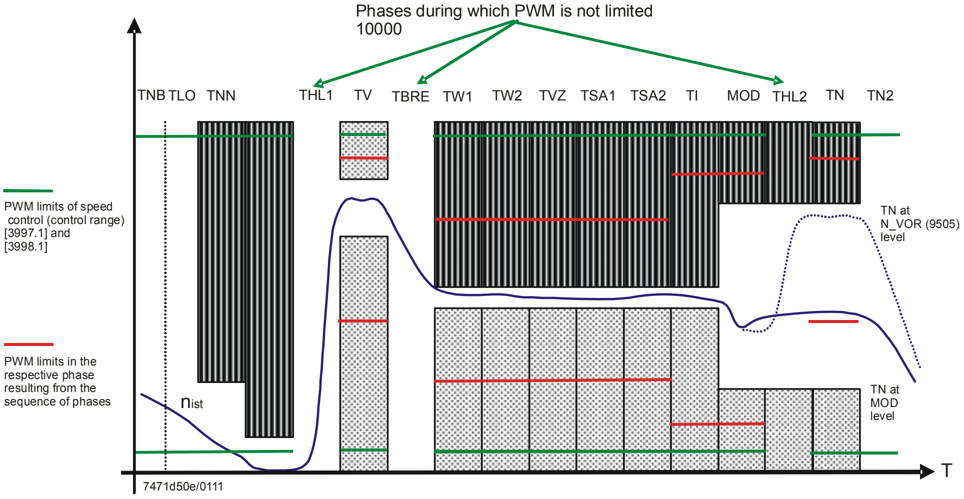


Figure 102: Supervision of air supply by monitoring the current fan speed – limitation of PWM

Key

Line no.	*Meaning*	
[3997.1]	Min. PWM	Parameter fan minimum PWM output (minimum PWM)
[3998.1]	Max. Pwm	Parameter fan maximum PWM output (maximum PWM)
9505	N_VOR	Minimum speed required for prepurging
	TNB	Permitted afterburn time
	TLO	Permitted time with air pressure switch closed or fan speed
	TNN	Permitted time with fan speed
	THL1	Maximum fan ramp-up time to prepurge speed
	TV	Prepurge phase
	TBRE	Maximum time to reach ignition level after prepurging
	TW1	Waiting phase 1
	TW2	Waiting phase 2
	TVZ	Preignition time
	TSA1	1st safety time
	TSA2	2nd safety time
	TI	Interval
	MOD	Controller mode
	THL2	Change to postpurging
	TN	Postpurging
	TN2	Interruptable postpurging
	nist	Fan speed
	t	Time

6.36 Chimney drying

Chimney drying (9650) offers 3 choices:

0: No chimney drying
1: Time-dependent chimney drying
2: Permanent chimney drying

The fan speed for chimney drying can be set via *Req speed chimney drying* (9651). For time-dependent chimney drying, the time can be set via *Duration chimney drying* (9652).

When the *Chimney drying* function is activated, it starts if the phase changes to *Standby*. In this case, the *Chimney drying* function is started. This function can be interrupted by a request for heat, to be restarted when the phase changes back to *Standby*.

6.37 Fan parameters settable as load values via QAA75…/AVS37…

Under certain conditions, the fan parameters for ignition load, low-fire, high-fire, pre- and postpurging can also be set via the QAA75…/AVS37...

Since these fan parameters lie within the safety-related area and, basically, safety-related values cannot be changed via the QAA75…/AVS37…, following applies:

- The respective parameters are copied and the new parameters filed in the non-safety-related area and must fulfill the following conditions:

Line no. QAA75…		**Safety-related parameters**
Required speed prepurging (9504)	≥	Req speed prepurging min (9505)
Required speed ignition (9512)	≤	Required speed ignition max (9513)
Required speed LF (9524)	≥	Required speed LF min (9525)
Required speed HF (9529)	≥ ≤	Required speed HF max 9530)
Prepurge time (9500)	≥	Prepurge time min (9501)
Postpurge time (9540)	≥	Postpurge time min (9542)

Key

Line no.	*Meaning*	
9504	N_Vor_QAA	Speed required for prepurging (QAA)
9505	N_Vor	Minimum speed required for prepurging
9512	N_ZL_QAA	Speed required for ignition
9513	N_ZL	Maximum speed required for ignition
9524	N_TL_QAA	Speed required for low-fire
9525	N_TL	Minimum speed required low-fire
9529	N_VL_QAA	Speed required for high-fire
9530	N_VL	Maximum speed required for high-fire
9500	Tv_QAA	Prepurge time
9501	Tv	Prepurge time minimum
9540	Tn_QAA	Postpurge time
9542	Tn	Postpurge time minimum
9551		Maximum fan speed stop
9552		Required speed stop
9616		Maximum speed

- The change between the 2 parameter groups can be parameterized via a safety-related flag *Enable QAA fan para* [4337.1]
  = Off (QAA setting parameters not enabled)
  = On (QAA setting parameters enabled)

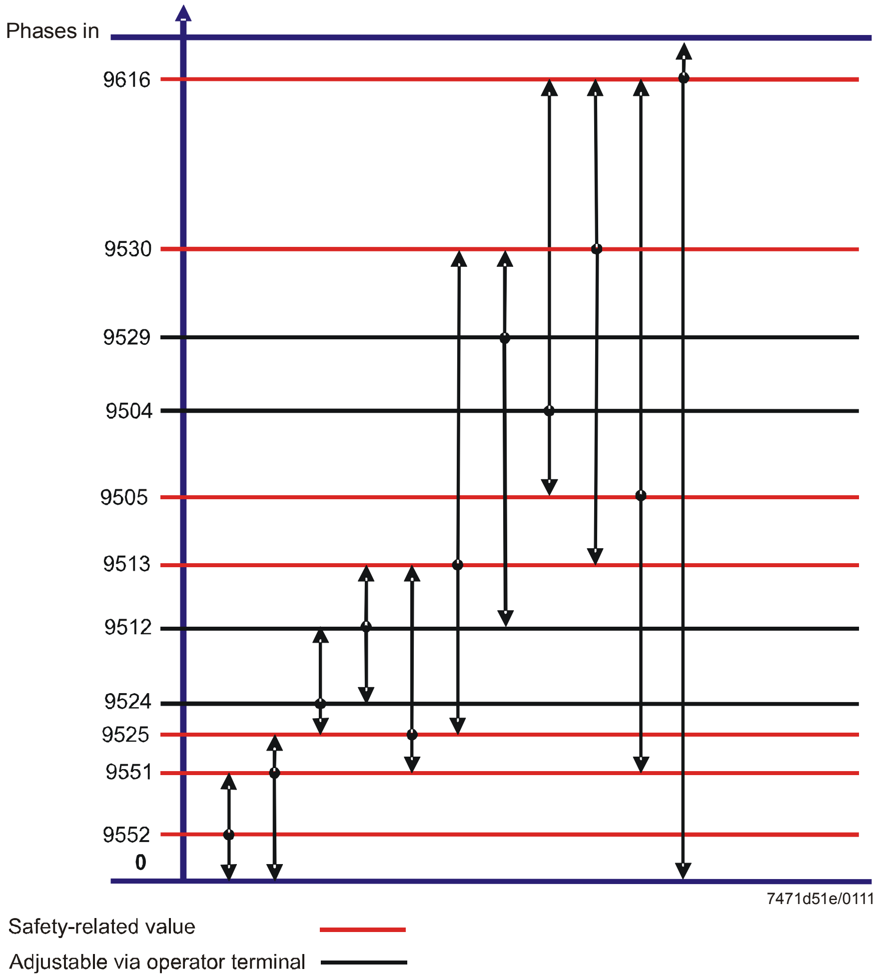


Figure 103: Fan parameters settable as load values via QAA75…/AVS37…

The values of the phase sequence to be set via the operator terminal are set as load values, either in the form of kW or as speeds in min^{-1}. For the conversion of load values to speed values, a speed-output characteristic is parameterized. The speed limits defined by the OEM (safety-related values), which limit the values via the operator terminal and which can only be set via the ACS420, are maintained as speed values and cannot be entered as load values. If the values for the sequence of phases are preset as load values in kW, they will directly be converted to speeds via the predefined linear characteristic. The QAA fan speed parameters and QAA fan output parameters use the same line numbers in the operator terminal. This means that the decision on the setting (kW or min^{-1}) must be made via the online DD which needs to be created. An online change between output and speed parameters is not possible.
The output parameters are enabled via a factory setting at headquarters level.
Also the speed tolerance limits of the LMS14... continue to be preset as speed values only.

The LMS14... merely provides a process to approximately determine the speed from a predefined load. Whether the required (set) output is reached or whether it corresponds to the setting for all operating states is not checked and is the responsibility of the user. The linear equation for the load-speed conversion is to be defined by the OEM.

Equivalent load values are available for the following speeds (non-safety-related):

Additional parameters

Line no.	*Operating line*
Menu: Boiler	
2441	**Fan speed heating max**
2442	**Fan speed full charging max**
2443	**Fan sp start value inst WH**
2444	**Fan speed DHW max**
2452	**Controller delay speed**
Menu: Burner control	
9504	**Required speed prepurging**
9512	**Required speed ignition**
9524	**Required speed LF**
9529	**Required speed HF**
9626	**Fan output/speed slope**
9627	**Fan output/speed Y-section**

Presetting speed values via the operator terminal

Presetting of speed values for the different phases of sequence control:
For that, as described in chapter *Burner control*, flag *Enable QAA fan para* [4337.1] must be set to On.

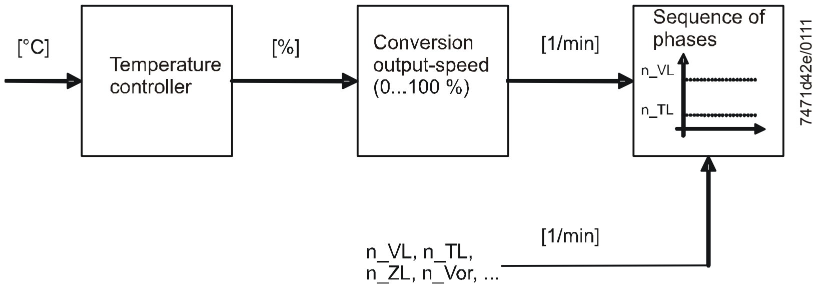


Figure 104: Fan parameters settable as load values via QAA75…/AVS37… - presetting the speed value via the operator terminal

Presetting load values via the operator terminal

For the extension to enter load variables, the sequence of phases necessitates a conversion of load values to speed values. Internally, the sequence of phases continues to make the calculation based on speed values. The load values are made available via the operator terminal to be converted to speeds based on a linear equation predefined by the OEM. The linear equation is predefined via *Fan output/speed slope* (9626) and *Fan output/speed Y-section* (9627). It must be defined by the OEM.

For that, as described in chapter *Burner control*, flag *Enable QAA fan para* [4337.1] must be set to On.

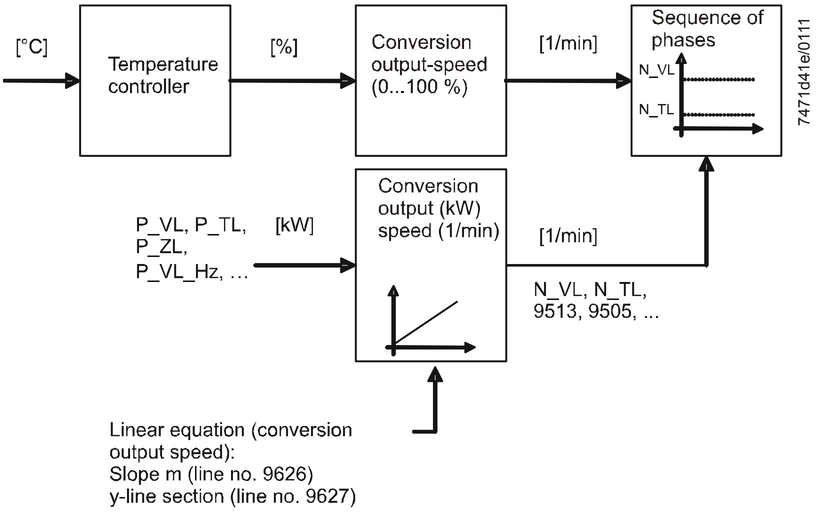


Figure 105: Fan parameters settable as load values via QAA75…/AVS37…- presetting load values via the operator terminal

Key

Line no.	*Meaning*	
9505	N_Vor	Minimum speed required for prepurging
9513	N_ZL	Maximum speed required for ignition
9525	N_TL	Minimum speed required for low-fire
9530	N_VL	Maximum speed required for high-fire
	P_TL	Output low-fire
	P_VL	Output high-fire
	P_VL_Hz	Output in heating mode
	P_ZL	Output ignition

The load parameters converted to speeds are filed in the non-safety-related area and must meet the following conditions:

Parameter		**Safety-related parameter**
Required speed prepurging (9504)	≥	*Prepu outp OEM limit* [4777.1]
Required speed ignition (9512)	≤	*Ign outp OEM limit [4778.1]*
Required speed LF (9524)	≥	*LF outp OEM limit* [4779.1]
Required speed HF (9529)	≤	*HF outp OEM limit* [4780.1]

Key

Line no.	*Meaning*	
4777.1	P_Vor	Output prepurging
4778.1	P_ZL	Ignition load output
4779.1	P_TL	Low-fire output
4780.1	P_VL	Output high-fire
9504	N_Vor_QAA	Speed required for prepurging
9512	N_ZL_QAA	Speed required for ignition
9524	N_TL_QAA	Speed required for low-fire
9529	N_VL_QAA	Speed required for high-fire

The values of fan speed (*Fan speed heating max* (2441), *Fan speed full charging max* (2442), *Fan sp start value inst WH* (2443), *Fan speed DHW max* (2444) and *Controller delay speed* (2452)) are limited to *Required speed LF* (9524) and *Required speed HF* (9529).

The linear equation y = m*x +b with m = *Fan output/speed slope* (9626) and b = *Fan output/speed Y-section* (9627) is used to calculate the required speed based on the preset output.

Example:
For a load range of 2.1…22 kW and a speed range of 1,250…6,000 min^{-1} (rpm), the resulting slope is 239 and the y-axis section 742. This means that at a load of 12 kW, for instance, the speed is 3,610 min^{-1} (rpm).

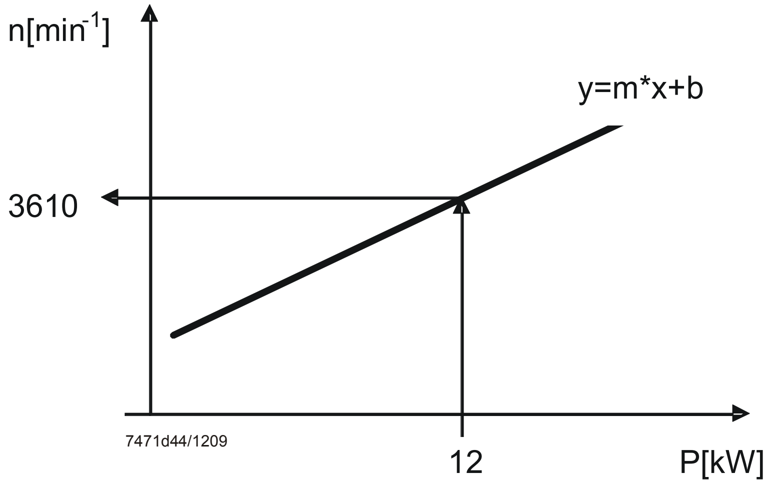


Figure 106: Fan parameters settable as load values via QAA75…/AVS37…- load range

Key

Figure	Meaning
3610	Speed value in 1/min
12	Output value in kW
y	y coordinate
x	x coordinate
m	Slope of the line
b	y-intercept of the line
P	Leistung [kW]
n	Drehzahl [1/min]

The load parameters must be limited by the OEM.
For this purpose, menu **Burner control** includes parameters that serve as limits for the following load parameters:
Fan speed heating max (2441)
Fan speed full charging max (2442)
Fan sp start value inst WH (2443)
Fan speed DHW max (2444)
Controller delay speed (2452)
Req speed prepurging min (9505)
Required speed ignition max (9513)
Required speed LF min (9525), and
Required speed HF max (9530)

The following parameters included in the **Burner control** menu are to be determined and entered by the OEM:

- *Prepu outp OEM limit* ([4777.1])
- *Ign outp OEM limit* ([4778.1])
- *LF outp OEM limit* ([4779.1])
- *HF outp OEM limit* ([4780.1])
- *Max output OEM limit* ([4781.1])
- *Min output OEM limit* ([4782.1])

The input limits are determined from the equivalent OEM speed parameters and the inverse linear equation used for the conversion from load to speed. The values determined this way are entered in the respective parameters. The limits for *Fan speed heating max* (2441), *Fan speed full charging max* (2442), *Fan speed DHW max* (2444) and *Controller delay speed* (2452) are restricted to the range of *Required speed LF* (9524) and *HF outp OEM limit* [4780.1]. *Fan sp start value inst WH* (2443) from 0 to *HF outp OEM limit* [4780.1].

On the **Burner control** menu, the limits are defined as follows:

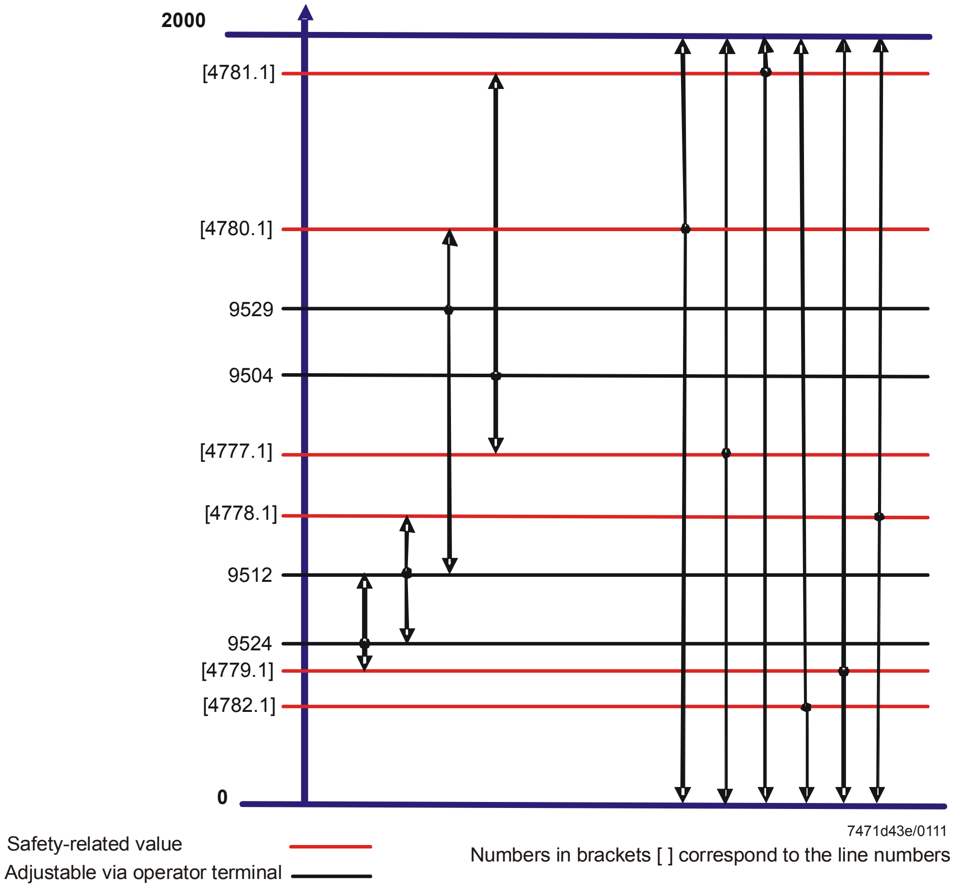


Figure 107: Fan parameters settable as load values via QAA75…/AVS37…- limits

Key

Line no.	*Meaning*	
[4777.1]		Prepurge output OEM limit
[4778.1]		Ignition load output OEM limit
[4779.1]		Low-fire output OEM limit
[4781.1]		Maximum output OEM limit
[4780.1]		High-fire output OEM limit
[4782.1]		Minimum output OEM limit
9504	N_Vor_QAA	Speed required for prepurging (QAA)
9512		Ignition output
9524		Low-fire output
9529		High-fire output

6.37.1 Limitation of ionization current

Ion limitn low limit [4269.1] is used to determine the minimum speed in a way that ionization current errors cannot lead to shutdown. If *Ion limitn low limit* [4269.1] is set to *0*, the function is deactivated. If the ionization current drops below the value of *Ion limitn low limit* [4269.1], the minimum speed is set to the current speed. If the ionization current is still too low, the lower speed limit will be increased every 0.2 seconds. The value of *IonFlGuard slope pos* [4398.1] indicates the increase per second. When the function is activated, this speed then determines the lower speed limit for a speed limitation, which will lead to higher modulation and a higher ionization current. If the ionization current exceeds the value of *Ion limitn low limit* [4269.1] plus the hysteresis *Ion limitn delta* [4270.1], (*IonLimit* + *IonLimitDelta*), the lower speed limit will be reduced every 0.2 seconds. The value of *IonFlGuard slope neg* [4397.1] indicates the drop per second.

Additional parameters

Line no.	*Operating line*
Menu: Burner control	
[4269.1]	**Ion limitn low limit**
[4398.1]	**IonFlGuard slope pos**
[4270.1]	**Ion limitn delta**
[4397.1]	**IonFlGuard slope neg**

6.37.2 Ionization current maintenance

Function *Ionization current maintenance* is only available if limitation of the ionization current is activated.
This function is to be activated by the heating expert by setting *Fan speed ionization current* (7050) to a level above *Required speed LF min* (9525).
When the minimum fan speed limit exceeds this limit, a maintenance message is delivered.
The maintenance limit for the fan speed lies between *Required speed LF min* (9525) and *Required speed HF max* (9530).
The exact value must be defined by tests on a customer-specific basis.
The purpose of maintenance *Message ionization current* (7051) is to detect a slow drift of the ionization current.
Fan speed ionization current (7050) is used for that purpose.
This parameter is greater than *Required speed LF min* (9525) and also greater than *Fan speed ionization current* (7050), which occurs in normal operation.
If, due to ionization current drift, the value of *Nmin* rises above the value of *Fan speed ionization current* (7050) (due to function → *Ionization current limitation*), a maintenance message is delivered.

Since a maintenance message shall not be delivered the very first moment the value is exceeded or, if exceeded, only once, 2 filters are used:

- The filter acquires the period of time during which the value has been exceeded
- The acquired period of time is reduced if both the current and the minimum fan speed fall again below *Fan speed ionization current* (7050)
- If this time exceeds 10 minutes, a maintenance message is output

6.38 Modulating pump

6.38.1 Modulation of heating circuit pump

The speed of the heating circuit pump can be calculated based on the operating level or the heating curve. The selection is made via parameters *Pump speed reduction* (880/1180/1480) for heating circuits 1 to 3.

Operating level

When using option *Operating level*, the speed of the heating circuit pump is calculated based on the current operating level. In the case of operating level *Reduced*, the pump is controlled to the parameterized minimum. In the case of operating level *Comfort* and activated floor curing function, the pump is controlled to the parameterized maximum.

Heating curve

When using option *Heating curve*, the speed of the heating circuit pump is calculated based on the selected compensation variant (weather- or room-compensated).

Weather-compensated

With compensation variant *Weather-compensated* (with or without room influence), the speed of the heating circuit pump is maintained at the parameterized minimum as long as the heating demand can be satisfied. To be able to also meet the heat demand with reduced speed, the flow temperature must be increased. The flow temperature increase can be parameterized.
Parameter *Curve readj at 50% speed* (888) defines the flow temperature increase in percent when the pump speed is reduced by 50%.

The speed of the heating circuit pump is calculated based on the flow temperature currently obtained and the current flow temperature setpoint. The actual value of the common flow temperature is used as the actual value. If no common flow sensor is installed, the actual value of the boiler flow is used. It is attenuated with a filter, the time constant can be parameterized (*Filter time const speed ctrl* (889)).

Additional parameters

(Example heating circuit 1)

Line no.	*Operating line*
880	**Pump speed reduction**
881	**Starting speed**
882	**Pump speed min**
883	**Pump speed max**
885	**Pump speed min OEM**
886	**Pump speed max OEM**
888	**Curve readj at 50% speed**
889	**Filter time const speed ctrl**
890	**Flow setp readj speed ctrl**
[4291.1]	**Delay speed ctrl HC1**

Info/diagnostics

Line no.	*Operating line*
8308	**Boiler pump speed**
8310	**Boiler temp**
8735	**Speed heating circuit pump 1**
8765	**Speed heating circuit pump 2**
8795	**Speed heating circuit pump 3**

Room-compensated

The speed of the heating circuit pump is calculated based on the heat request from the room controller. The greater the demand for heat, the higher the pump speed. The lowest pump speed is limited by the parameterized minimum, the highest by the parameterized maximum.
If the heat request drops below the parameterized heating limit for the room controller (*Heating limit room controller* (761)), the pump will be deactivated on completion of the parameterized overrun time.

Additional parameters

(Example heating circuit 1)

Line no.	*Operating line*
761	**Heating limit room controller**
882	**Pump speed min**
883	**Pump speed max**
885	**Pump speed min OEM**
886	**Pump speed max OEM**

6.38.2 Behavior when burner cycles

During burner off times, the system will reach a point where – after a certain period of time – the supply of heat is no longer sufficient (current flow temperature lower than the flow temperature setpoint). Speed control would respond to this situation by increasing the pump's speed, but this would lead to shorter burner off times. Also, noise problems would have to be expected due to higher pump modulation. For this reason, modulation of the heating circuit pump was matched to cycling burner operation. When the burner is shut down, pump modulation is maintained at the parameterized minimum speed.

When the burner is switched on, the speed of the heating circuit pump is kept constant for an adjustable delay time. Modulation of the heating circuit pump is again calculated and delivered only when the delay time has elapsed, based on the current common flow temperature (boiler flow temperature). This means that the speed is increased only when the filtered common flow temperature is lower than the flow temperature setpoint. Higher pump speeds lead to longer burner running times. Filtering of the common flow temperature then prevents quick speed reductions if the boiler temperature already lies above the setpoint, but the burner's switch-off point is not yet reached. When the burner is switched off, the pump's speed is reduced again to the parameterized minimum.

Additional parameters

(Example of heating circuit 1)

Line no.	*Operating line*
880	**Pump speed reduction**
882	**Pump speed min**
883	**Pump speed max**
888	**Curve readj at 50% speed**
889	**Filter time const speed ctrl**
890	**Flow setp readj speed ctrl**
[4291.1]	**Delay speed ctrl HC1**

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8735	**Speed heating circuit pump 1**
8765	**Speed heating circuit pump 2**
8795	**Speed heating circuit pump 3**

6.38.3 Limitation of boiler temperature differential

Fundamentals

When using a modulating heating circuit pump, the boiler temperature increase (that is, the temperature difference of boiler return and boiler flow) is limited. As a result, the current boiler flow temperature might not reach the flow temperature setpoint demanded by the heating circuit.

Purpose of limiting the boiler's temperature differential

Pump modulation in the heating circuit module calculates an increase of the flow temperature setpoint, thus ensuring that the heating circuit's demand for heat can also be satisfied when the pump's speed is reduced. An increase of the flow temperature setpoint also leads to a higher boiler temperature setpoint. When, for the time being, the return temperature remains at a constant level, an increase of the boiler temperature setpoint always also results in a higher boiler temperature increase or differential. To prevent thermal stress problems on the boiler due to a great boiler temperature differential, the latter is limited when operating a modulating heating circuit pump. Limitation of the boiler temperature differential is accomplished by limiting the boiler temperature setpoint. For that, the boiler temperature setpoint is limited depending on the acquired boiler return temperature. The extent of boiler temperature setpoint limitation is selected such that the boiler temperature differential reached will not be greater than the parameterized maximum (*Temp differential max*). As far as permitted by the heat demand from the heating circuit, the LMS14… strives to keep the boiler temperature differential at the level of the parameterized nominal differential (*Temp differential nominal*).

Additional parameters

Line no.	*Operating line*
883	**Pump speed max**
1183	**Pump speed max**
1483	**Pump speed max**
2316	**Temp differential max**
2317	**Temp differential nominal**

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8311	**Boiler setpoint**
8314	**Boiler return temp**

6.38.4 Conditions for limiting the boiler’s temperature differential

Limitation of the boiler’s temperature differential is possible only if a valid value of the boiler return temperature is available.

Another prerequisite is a valid value of *Temp differential max* (2316), which means that it must not be an OSV.

Limitation of the boiler’s temperature differential is only effective in connection with pure space heating. As soon as a DHW request becomes active, limitation of the boiler’s temperature differential is suppressed.
In *Heating* mode, the limitation is effective only if a request from the heating circuit with modulating pump is active.
Limitation of the boiler’s temperature differential also remains effective when additional requests from other heating circuits are pending.
In the case of systems with modulating boiler pump, limitation of the boiler’s temperature differential depends on the assignment of the boiler pump (*Ctrl boiler pump/DHW valve*) (5774). If the boiler pump is assigned to heating circuit 1 only, limitation becomes active when there is a request for heat from heating circuit 1. If the boiler pump is assigned to all heating circuits, limitation becomes active as soon as any of the heating circuits calls for heat.

Additional parameters

Line no.	*Operating line*
2316	**Temp differential max**
5774	**Ctrl boiler pump/DHW valve**
6085	**Function output P1**

6.38.5 Limitation dependent on pump modulation

Limitation of the boiler’s temperature differential is dependent on the current modulation of the heating circuit pump. Depending on the current degree of modulation, different preselected values are used for limiting the boiler’s temperature differential.

As long as the modulating heating circuit pump is not controlled to the maximum speed, the parameterized nominal boiler temperature differential is used for limiting the boiler temperature increase. If there is a deficit in the supply of heat to the heating circuit, this can be compensated for via speed control by increasing pump modulation.

The parameterized maximum value *Temp differential max* for the boiler’s temperature differential applies only when the modulating heating circuit pump is controlled with maximum PWM (*maximum pump speed heating circuit x.*

Additional parameters

Line no.	*Operating line*
2316	**Temp differential max**

Info/diagnostics

Line no.	*Operating line*
8314	**Boiler return temp**

6.38.6 Limitation to the maximum differential

If the modulating heating circuit pump is controlled to maximum speed, speed control is no longer capable of increasing the volumetric flow. In general, the heating circuit pump should be controlled at reduced speeds. For this reason, when the maximum speed is reached, adherence to the nominal boiler temperature differential is abandoned and only the parameterized maximum value *Temp differential max* (2316) is used for limiting the boiler's temperature differential.

But limitation of the boiler's temperature differential to the maximum is not raised abruptly, but rather slowly in a linear manner from the last valid limitation level to the maximum.

Raising of the boiler's temperature differential to the maximum follows a ramp. The slope of the ramp depends on the time constant used for speed control (*Filter time const speed ctrl* (889/1189/1489)) and the difference between the nominal and the maximum value of the boiler temperature increase. The ramp is defined such that the transition from the nominal to the maximum differential is made with factor 5 of the relevant time constant.

If, for instance, a time constant of 3 minutes is parameterized for speed control, a nominal value of 20 K and a maximum value of 35 K for the boiler's temperature increase, the boiler temperature differential is raised by exactly 1 K per minute until the maximum value is reached.

Additional parameters

Line no.	*Operating line*
889	**Filter time const speed ctrl**
1189	**Filter time const speed ctrl**
1489	**Filter time const speed ctrl**
2316	**Temp differential max**
2317	**Temp differential nominal**

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8311	**Boiler setpoint**

6.38.7 Limitation to the nominal differential

As long as the modulating heating circuit pump is not controlled to maximum speed, the parameterized nominal value *Temp differential nominal* (2317) applies.

Limitation of the boiler's temperature differential to the nominal value is not raised abruptly, but rather slowly in a linear manner from the last valid limitation level to the nominal value.

The reduction of the boiler's temperature differential to the nominal value follows a ramp. The slope of the ramp depends on the time constant used for speed control (*Filter time const speed ctrl x* (889/1189/1489)) and the difference between the maximum and the nominal value of the boiler's temperature differential. The ramp is defined such that the transition from the maximum to the nominal value is made with factor 5 of the relevant time constant.

If, for instance, a time constant of 3 minutes is parameterized for speed control, a nominal value of 20 K and a maximum of 35 K for the boiler's temperature differential, the latter is raised by exactly 1 K per minute until the nominal differential is reached.

If, due the boiler's temperature differential, the flow temperature remains below the flow temperature setpoint called for by the heating circuit, speed control can increase the volumetric flow by increasing pump modulation, thereby supplying more heat to the heating circuit.

Additional parameters

Line no.	*Operating line*
889	**Filter time const speed ctrl**
1189	**Filter time const speed ctrl**
1489	**Filter time const speed ctrl**
2316	**Temp differential max**
2317	**Temp differential nominal**

Info/diagnostics

Line no.	*Operating line*
8310	**Boiler temp**
8311	**Boiler setpoint**

6.39 List of displays

Pending errors are assigned priorities. From priority 6, alarm messages are delivered, which are used by remote supervision (OCI). In addition, the alarm relay is set.

6.39.1 Error code list

The LMS14... supports a 16-bit error code. Older types of operator units might display 8-bit error codes. If different from the 16-bit error code, the corresponding 8-bit error code is indicated in parentheses.

Error code	LPB code	Description of error	Priority
10		Outside temperature, sensor error	6
20		Boiler temperature 1, sensor error	6
20		Boiler temperature 1, sensor error	9
25		Boiler temperature, solid fuel, sensor error	6
26		Common flow temperature, sensor error	6
28		Flue gas temperature, sensor error	6
28		Flue gas temperature, sensor error	9
30		Flow temperature 1, sensor error	6
31		Flow temperature 1, cooling, sensor error	6
32		Flow temperature 2, sensor error	6
38		Flow temperature, primary controller, sensor error	6
40		Return temperature 1, sensor error	6
40		Return temperature 1, sensor error	9
46		Cascade return temperature, sensor error	6
47		Common return temperature, sensor error	6
50		DHW temperature 1 sensor error	6
52		DHW temperature 2 sensor error	6
54		Flow temperature DHW, sensor error	6
57		DHW, circulation sensor error	6
60		Room temperature 1, sensor error	6
65		Room temperature 2, sensor error	6
68		Room temperature 3, sensor error	6
70		Storage tank temperature 1 (top), sensor error	6
71		Storage tank temperature 2 (bottom), sensor error	6
72		Storage tank temperature 3 (center), sensor error	6
73		Collector temperature 1, sensor error	6
78		Water pressure, sensor error	6
78		Water pressure, sensor error	9
82		LPB address collision	3
83		BSB wire cross-sectional/no communication	8
84		BSB wire address collision	3
85		BSB RF communication error	8
91		Data overrun in EEPROM	3
91		Data overrun in EEPROM	6
91		Data overrun in EEPROM	9
98		Extension module 1, error	8
99		Extension module 2, error	8
100		2 clock time masters	3
102		Clock time master without backup	3
103		Communication error	8
105		Maintenance message	5
109		Supervision boiler temperature	6
109		Supervision boiler temperature	9
110		STB (SLT) lockout	6
110		STB (SLT) lockout	9

Error code	**LPB code**	**Description of error**	**Priority**
111		Temperature limiter safety shutdown	8
117		Water pressure too high	6
117		Water pressure too high	9
118		Water pressure too low	6
118		Water pressure too low	9
119		Water pressure switch has cut out	6
119		Water pressure switch has cut out	9
121		Flow temperature heating circuit 1 not reached	6
122		Flow temperature heating circuit 2 not reached	6
125		Maximum boiler temperature exceeded	9
126		DHW charging temperature not reached	6
127		DHW legionella temperature not reached	6
128		Loss of flame during operation	6
128		Loss of flame during operation	9
129		Wrong air supply	6
129		Wrong air supply	9
130		Flue gas temperature limit exceeded	6
130		Flue gas temperature limit exceeded	9
132		Gas pressure switch safety shutdown	6
133		Safety time for establishment of flame exceeded	6
133		Safety time for establishment of flame exceeded	9
146		Configuration error sensor/controlling elements	3
151		LMS14… error, internally	3
151		LMS14… error, internally	6
151		LMS14… error, internally	9
152		Parameterization error	3
152		Parameterization error	9
153		Unit manually locked	9
160		Fan speed threshold not reached	9
162		Air pressure switch does not close	9
164		Flow/pressure switch, heating circuit error	6
164		Flow/pressure switch, heating circuit error	9
166		Air pressure switch error, does not open	9
169		Sitherm Pro system error	3
169		Sitherm Pro system error	6
169		Sitherm Pro system error	9
170		Error water pressure sensor, primary side	6
170		Error water pressure sensor, primary side	9
171		Alarm contact 1 active	6
172		Alarm contact 2 active	6
173		Alarm contact 3 active	6
174		Alarm contact 4 active	6
176		Water pressure 2 too high	6
176		Water pressure 2 too high	9
177		Water pressure 2 too low	6
177		Water pressure 2 too low	9
178		Temperature limiter heating circuit 1	3
179		Temperature limiter heating circuit 2	3
183		Unit in parameterization mode	6
183		Unit in parameterization mode	9

Error code	**LPB code**	**Description of error**	**Priority**
195		Maximum duration of the refill per charging exceeded	6
195		Maximum duration of the refill per charging exceeded	9
196		Maximum duration of the refill per week exceeded	6
196		Maximum duration of the refill per week exceeded	9
209		Fault heating circuit	3
209		Fault heating circuit	6
214		Monitoring of motor	6
215		Fault fan air diverting valve	9
216		Fault boiler	6
216		Fault boiler	9
217		Sensor error	3
217		Sensor error	6
217		Sensor error	9
218		Pressure supervision	6
218		Pressure supervision	9
241		Flow sensor for yield measurement, error	6
242		Return sensor for yield measurement, error	6
243		Swimming pool sensor, error	6
260	217	Flow temperature 3, sensor error	3
270	215	Temperature difference, heat exchanger too large	9
317	214	Mains frequency outside permissible range	6
320	217	DHW charging temperature, sensor error	6
321	217	DHW outlet temperature, sensor error	6
322	218	Water pressure 3 too high	6
322	218	Water pressure 3 too high	9
323	218	Water pressure 3 too low	6
323	218	Water pressure 3 too low	9
324	146	Input BX, same sensors	3
325	146	Input BX/extension module, same sensors	3
326	146	Input BX/mixing group, same sensors	3
327	146	Extension module, same function	3
328	146	Mixing group, same function	3
329	146	Extension module/mixing group, same function	3
330	146	Sensor input BX1 without function	3
331	146	Sensor input BX2 without function	3
332	146	Sensor input BX3 without function	3
333	146	Sensor input BX4 without function	3
335	146	Sensor input BX21 without function	3
336	146	Sensor input BX22 without function	3
339	146	Collector pump Q5 missing	3
340	146	Collector pump Q16 missing	3
341	146	Sensor B6 missing	3
342	146	Solar charging sensor B31 missing	3
343	146	Solar integration missing	3
344	146	Solar controlling element buffer K8 missing	3
345	146	Solar controlling element swimming pool K18 missing	3
346	146	Solid fuel boiler pump Q10 missing	3
347	146	Solid fuel boiler comparative sensor missing	3
348	146	Solid fuel boiler address error	3
349	146	Buffer storage tank return valve Y15 missing	3
350	146	Buffer storage tank address error	3

Error code	**LPB code**	**Description of error**	**Priority**
351	146	Primary controller/system pump, address error	3
352	146	Pressureless header, address error	3
353	146	Sensor B10 missing	3
371	209	Flow temperature heating circuit 3	6
372	209	Temperature limiter heating circuit 3	3
373	103	Extension module 3	8
374	169	Sitherm Pro calculation	6
374	169	Sitherm Pro calculation	9
375	169	BV stepper motor	9
376	169	Drift test limit value	3
376	169	Drift test limit value	6
376	169	Drift test limit value	9
377	169	Drift test prevented	9
378	151	Internal repetition	9
382	129	Repetition speed	9
384	151	Extraneous light	6
384	151	Extraneous light	9
385	151	Mains undervoltage	9
386	129	Fan speed tolerance	6
386	129	Fan speed tolerance	9
387	129	Air pressure tolerance	6
387	129	Air pressure tolerance	9
388	146	DHW sensor no function	3
426	151	Feedback flue gas damper	9
427	152	Configuration flue gas damper	3
429	218	Dynamic water pressure too high	6
429	218	Dynamic water pressure too high	9
430	218	Dynamic water pressure too low	6
430	218	Dynamic water pressure too low	9
431	217	Sensor primary heat exchanger	6
431	217	Sensor primary heat exchanger	9
432	151	Function earth not connected	9
433	216	Temperature primary heat exchanger too high	6
433	216	Temperature primary heat exchanger too high	9

6.39.2 Maintenance code

Maintenance code	Description of maintenance	Priority
1	Number of burner hours run exceeded	6
2	Number of burner starts exceeded	6
3	Maintenance interval exceeded	6
5	Water pressure heating circuit too low (dropped below lower pressure limit 1)	9
10	Change batteries of outside sensor	6
18	Water pressure 2 heating circuit too low (dropped below lower pressure limit 2)	9
10	Change batteries of outside sensor	6
22	Water pressure 3 heating circuit too low (dropped below lower pressure limit 3)	9
25	Automatic filling of water activated	3

6.40 Lockout/local reset

6.40.1 Lockout

Certain errors cause the LMS14... to go to lockout, which means that the burner control is locked, thus preventing it from resuming operation. Lockout is stored in EEPROM and is maintained – even beyond power OFF – until a reset is made, independent of whether or not the error is still pending.

Certain errors causing lockout can be reset from a remote location via the operating terminals; all errors causing lockout can be reset by pressing the reset button on the unit

6.40.2 Local reset via the reset button

The reset button can be connected in 2 different ways:
- Via a separately connected pushbutton (refer to *Connection diagram*)
- Via an operator terminal/room unit with optional hardware reset button

To make a valid reset, the button must be pressed for more than about 400 ms but for no more than 10 seconds. If pressed for less than about 200...400 ms, there will be no response. If pressed for more than 10 seconds, the LMS14... will be locked and released again only after another reset.

If lockout did not occur, there will be no response to a valid reset.
In case the LMS14… has gone to lockout, a valid reset will be followed by a restart. If there is a lockout error at the time the unit is reset, resetting causes the LMS14… to instantly trigger lockout again.

6.41 Remote reset

If the LMS14... has gone to lockout (phase *STOE* in the sequence diagram), a reset with certain faults can be initiated via a suitable operator terminal (HMI/room unit). For safety reasons, not all faults leading to lockout are enabled for reset from a remote location.

The way lockout of the LMS14... can be detected and whether remote reset is permitted depend on the type of operator terminal/room unit; for details, refer to the respective documentation (refer to chapter *Handling*).

Using PC software ACS420, it is also possible to activate or deactivate the *Remote reset* function for certain errors/error classes, if authorized.

6.41.1 Additional activation of remote reset capability

The **Burner control** menu of the ACS420 offers specific parameters for each of the 4 errors/error classes, which can be used to activate or deactivate the *Remote reset* function.
Parameter setting *1* enables the *Remote reset* function, parameter setting *0* disables it for these kinds of error.

Additional parameters

Line no.	*Operating line*
[4495.1]	**Remote reset SLT**
[4496.1]	**Remote reset air**
[4497.1]	**Rem res extran light**
[4498.1]	**Remote reset flame**

6.41.2 Restrictions in connection with remote reset

The LMS14... does not permit any number of remote reset operations; the number of reset operations per unit of time are limited (5 resettings within 15 minutes). In case the permissible number of reset operations are exceeded, the function is disabled until the number of reset attempts in the last 15 minutes has been fewer than 5.
Any switching on/off of the mains network has no impact on the number of valid reset attempts.
A hardware reset produces a reset of *Temporal monitoring of attempts,* which means that after the respective reset, the number of remote reset attempts is always limited to 5.

ℹ Note!
When monitoring the reset attempts, the LMS14... measures the time between the reset operations; after power ON, this reference is no longer available so that only 4 remote reset attempts might be allowed directly after power ON.

6.42 Production

SW version number

Line no.	*Operating line*
[5000.1]	**SW version number**

Software version number used to unambiguously identify the version installed in the unit.

ParaSettingHistory

Line no.	*Operating line*
[4763.1]	**ParaSettingHistory**

The LMS14... stores the last 4 types of parameterization from the parameter stick or the ACS420 PC software.
Both user level and type of parameterization are stored.
The information is provided in the form of a string comprising 16 numbers.
2 numbers always belong together, and 4 numbers describe the parameterization.
The string contains the last 4 parameterizations.
The fist 2 numbers describe the type of parameterization, the next 2 the user level.
The parameterization made last is always the first in the string.
Time information provided about the parameterizations is not stored.

Example of evaluation:
Value shown by the ACS700/ACS790 PC software: 0204510352030207
Subdivision into 4 groups of parameterization: 0204 - 5103 - 5203 - 0207

Last parameterization:

0204 ⇨ 02, 04 ⇨	02: Parameterized with ACS420 PC software
	04: User level *OEM2*

Last but 1 parameterization:

5103 ⇨ 51, 03 ⇨	51: Parameterized with stick
	03: User level *OEM headquarters*

Last but 2 parameterization:

5203 ⇨ 52, 03 ⇨	52: Online DD parameterized with stick
	03: User level *OEM headquarters*

Last but 3 parameterization:

0207 ⇨ 02, 07 ⇨	02: Parameterized with ACS420 PC software
	07: User level *Commissioning*

Overview of the types of parameterization:

ACS420 online parameterization	01
ACS420 F1 parameterization	02
Canceling of ACS420 lock	04
Parameter stick parameter	51
Parameter stick online DD	52

Overview of user levels:

Siemens headquarters	01
OEM headquarters	03
OEM2	04
OEM	05
Heating expert	06
Commissioning	07
Enduser	08

Online DD group number

Line no.	*Operating line*
[4762.1]	OnlineDD group number

Group number of online DD used by the unit. Only online DDs of the same group can be interchanged with the parameter stick. If a 0 is entered in the LMS14… as the online DD group number, the unit has not yet been assigned an online DD group.

CustomerNo_ParaSet

Line no.	*Operating line*
[4689.1]	**CustomerNo_ParaSet**

Customer number from parameter set.
When setting the parameters with the parameter stick, this number is used as a reference to ensure that parameters of third-party devices cannot be changed.

6.42.1 Monitoring mains voltage/mains frequency

The LMS14... monitors constantly mains voltage and mains frequency.

Monitoring mains voltage

If mains voltage drops below the threshold of AC 180 V, error message *Undervoltage* is generated. The LMS14... assumes the *Start prevention* state.
The error is automatically canceled as soon as mains voltage returns to a level above AC 185 V.

Monitoring mains frequency

Error message *Mains frequency* is triggered if the measured frequency drops below 42 Hz or exceeds 72 Hz. The LMS14... assumes the *Start prevention* state.
The error is automatically canceled as soon as mains frequency returns to a valid level.

Display of measured values

The voltages and frequencies currently measured can be read via the ACS700/ACS790 PC software, menu **Production**.

Mains frequency

Line no.	*Operating line*
[3891.1]	**Mains frequency**

Mains frequency currently measured by the LMS14...

Mains voltage

Line no.	*Operating line*
[3907.1]	**Mains voltage**

Mains voltage currently measured by the LMS14...

7 Plant diagrams

The applications are presented in the form of basic diagrams, heat source versions and extra functions. Heat source versions can be selected by setting the respective parameters. If extra functions are required, the multifunctional inputs and outputs must be appropriately set.

Note!
For heat source versions and extra functions, refer to separate TS catalog P2359.

7.1 Basic diagrams

The application diagrams depicted below can be preselected by entering a number (*Presetting* (5700)). The plant diagram is the result of preselection and connected sensors.

Note!
The sensors contained in the respective plant diagram must be connected, thus ensuring that automatic sensor identification does not select some other plant diagram. Plant components shown in the form of broken lines are optional.

With certain applications, extension modules (max. 3) must be added to obtain the required diagram.

Plant diagram 1: Pump circuit without DHW

Multifunctional terminals

LMS14…	
QX1	Q1

Plant diagram 2: Pump circuit with DHW storage tank and charging pump

Multifunctional terminals

LMS14…	
QX1	Q1
QX3	Q3
BX1	B31

Plant diagram 3: Pump circuit with instantaneous water heater and diverting valve

Multifunctional terminals

LMS14…	
QX1	Q1
QX3	B34
HX1	DHW flow switch

Plant diagram 4: Pump circuit with DHW stratification storage tank and diverting valve, with extension module 1 including solar integration

Multifunctional terminals

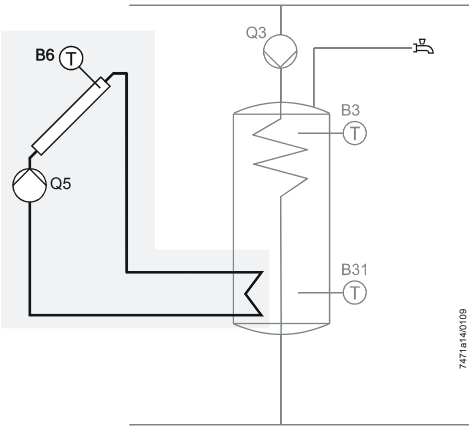
LMS14…	
QX1	Q1
QX2	Q33
QX3	Q3
BX1	B31
BX2	B36
QX21 EM1	Q5
BX21 EM1	B6

7.2 Extra functions in general

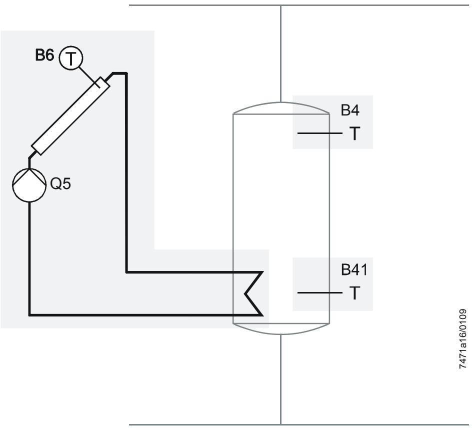
The extra functions can be selected via operating page *Configuration* and complement the basic diagrams of the respective controllers. The type and number of extra functions that can be applied depend on the multifunctional outputs and inputs QX… or BX… Depending on the type of application, the use of extra functions necessitates a number of appropriate operating line settings.

Solar

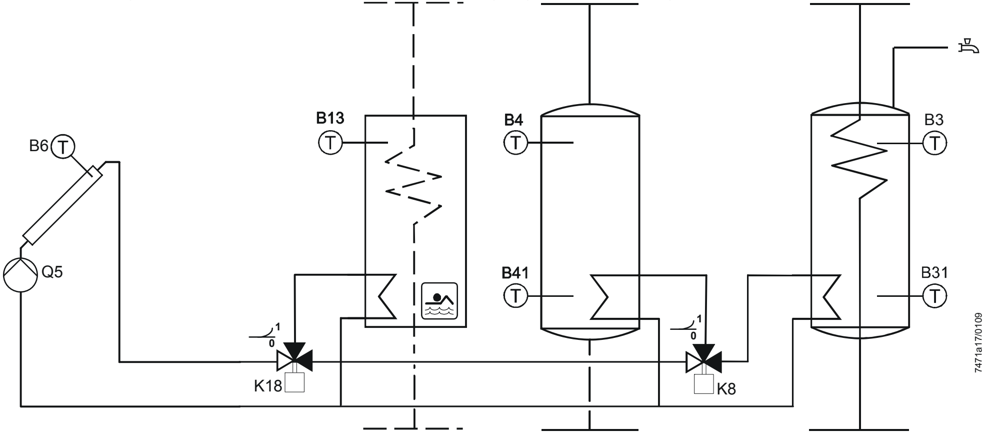
DHW charging collector pump, collector sensor



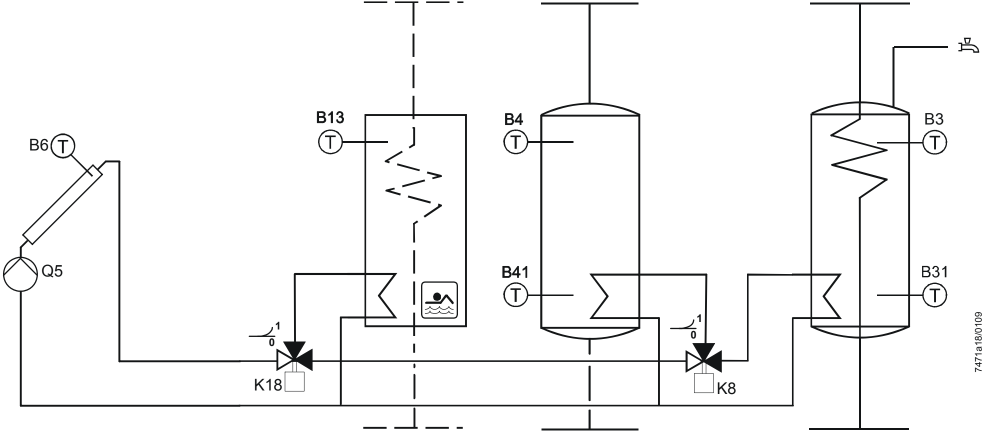
Buffer storage tank charging



Solar storage tank and swimming pool charging via diverting valves with one collector

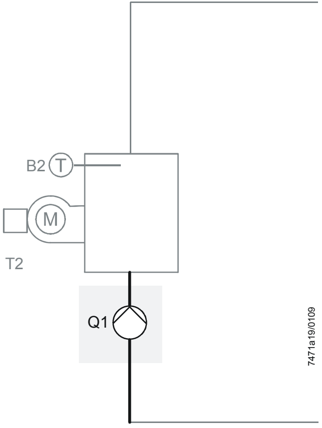


Solar storage tank and swimming pool charging via charging pumps with one collector

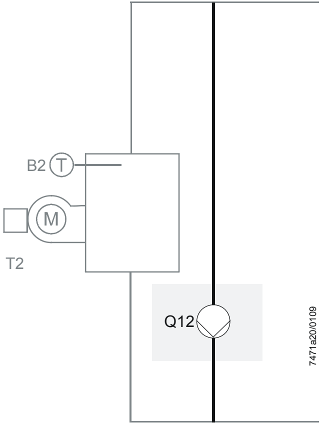


Boiler

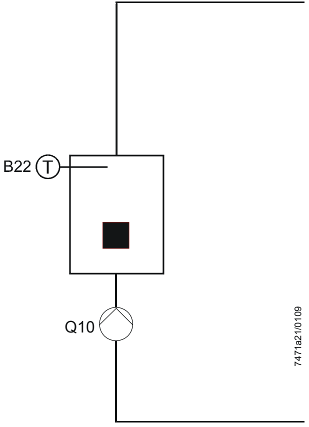
Boiler pump



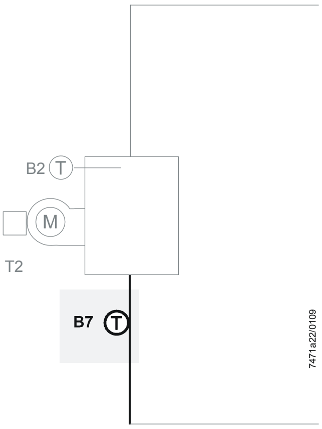
Bypass pump



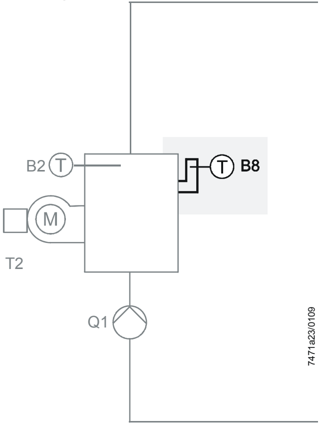
Solid fuel boiler pump



Return sensor

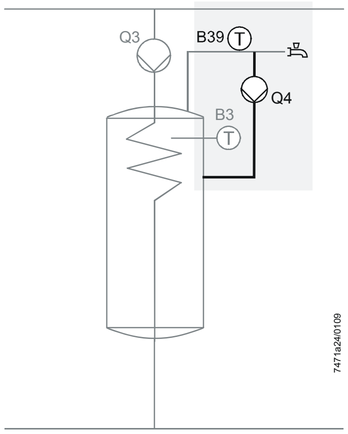


Flue gas temperature sensor

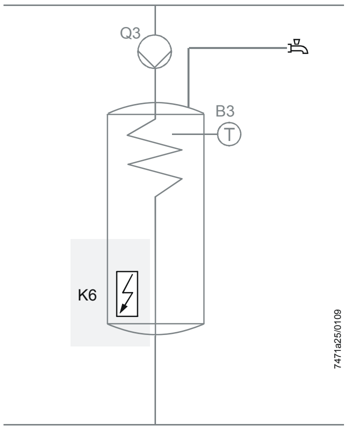


DHW storage tank (DHW)

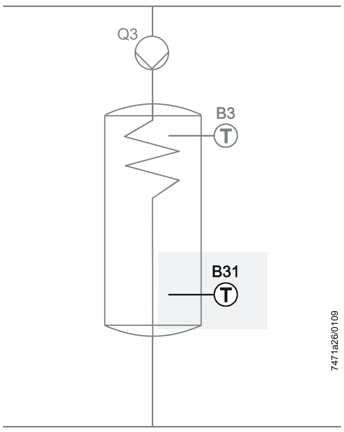
DHW circulating pump



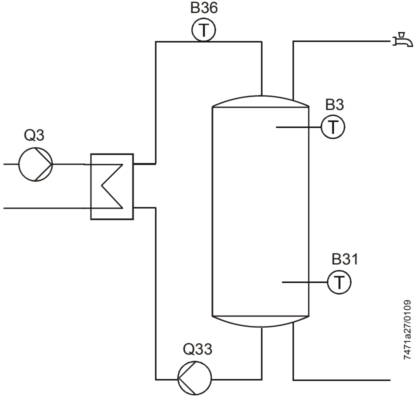
Electric immersion heater for DHW



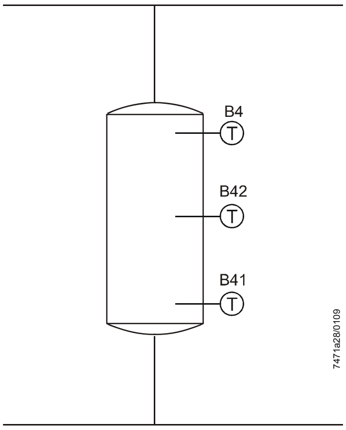
2nd DHW sensor



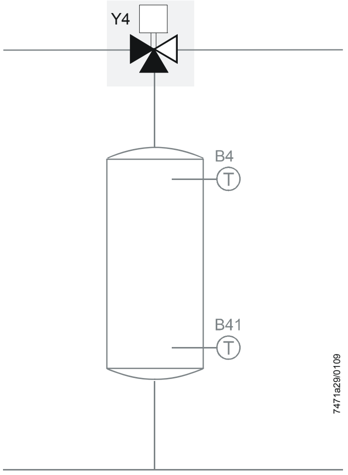
DHW storage tank with external heat exchanger, charging pump, and intermediate circuit pump



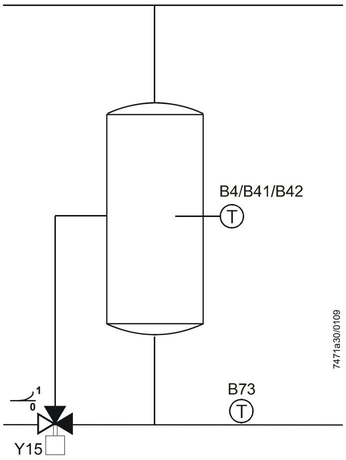
Buffer storage tank



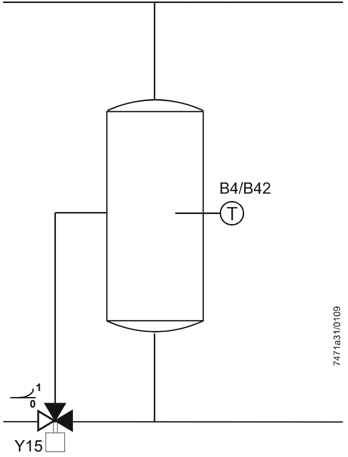
Heat source shutoff valve buffer



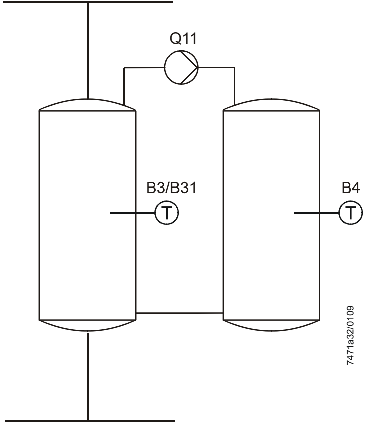
Return diversion



Partial tank charging

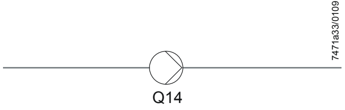


Storage tank charge transfer



Heat converter

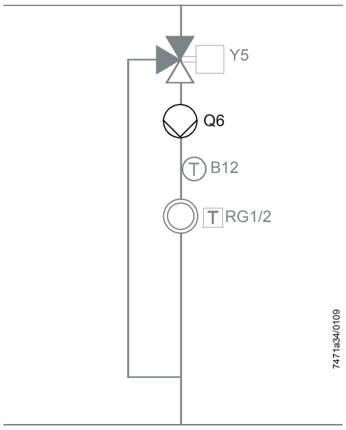
System pump Q14



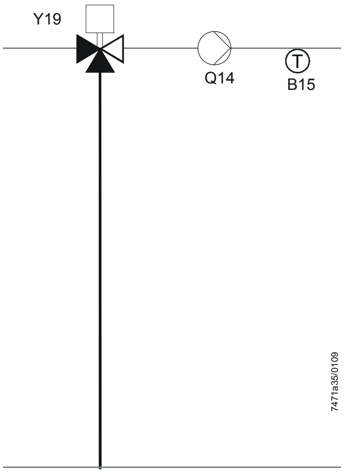
7.3 Extra functions with mixing group or extension module AVS75.39x…/AGU2.550...

The extra functions can be selected via operating page *Function extension module 1* (6020), *Function extension module 2* (6021), and *Function extension module 3* (6022) and supplement the basic diagrams of the respective LMS14…

1st mixing heating circuit
2nd mixing heating circuit
3rd mixing heating circuit



Primary controller



Key to mains voltage

Designation	Description
T2	Burner 1st stage
	Release modulating burner
Q1	Boiler pump
Q2	Heating circuit pump HC1
Q3	DHW charging pump/diverting valve
Q4	Circulating pump
Q5	Collector pump
Q6	Heating circuit pump HC2
Q10	Solid fuel boiler pump
Q11	Storage tank transfer pump
Q12	Bypass pump
Q14	System pump
Q15	Consumer heating circuit pump VK1
Q18	Consumer heating circuit pump VK2
Q19	Swimming pool pump
Q20	Heating circuit pump HC3
Q21/22/23	2nd pump stage HC pump 1-3
Q25	Cascade pump
Q33	DHW intermediate circuit pump
Q34	Instantaneous water heater pump
Q35	DHW mixing pump
Y1	1st heating circuit mixing valve opening
Y2	1st heating circuit mixing valve closing
Y4	Heat source shutoff valve
Y5	2nd heating circuit mixing valve opening
Y6	2nd heating circuit mixing valve closing
Y11	3rd heating circuit mixing valve opening
Y12	3rd heating circuit mixing valve closing
Y15	Buffer return valve
Y19	Primary controller mixing valve opening
Y20	Primary controller mixing valve closing
K6	Electric immersion heater DHW
K8	Solar controlling element buffer
K9	Solar pump external exchanger
K10	Alarm output/alarm relay
K13	Time program 5
K18	Solar controlling element swimming pool
K27	Heat request
K28	Refrigeration request
K34	Water filling

Key to low-voltage

Designation	**Description**
B1	Flow sensor heating circuit 1
B10	Common flow sensor
B12	Flow sensor heating circuit 2
B13	Swimming pool sensor
B2	Boiler sensor
B22	Solid fuel boiler sensor
B3	DHW sensor
B31	DHW sensor
B35	DHW flow sensor
B36	DHW charging sensor
B38	DHW outlet sensor
B4	Buffer sensor
B41	Buffer sensor
B42	Buffer sensor
B15	Flow sensor primary controller
B39	DHW circulation sensor
B6	Collector sensor
B63	Solar flow sensor
B64	Solar return sensor
B7	Return sensor
B70	Cascade return sensor
B73	Common return sensor
B8	Flue gas temperature sensor
B9	Outside sensor
RG1	Room unit 1
RG2	Room unit 2
RG3	Room unit 3
FS	Flow switch

8 Technical data

8.1 LMS14… basic unit

8.1.1 General data

Mains voltage (rated voltage)	AC 230 V
Mains frequency	50 Hz to DIN EN 298
Power consumption	
- Operation	Max. 14 W
- Power pack	Max. 14 W
Rated surge voltage category	III (as per DIN EN 60664)
Degree of protection	IP00 IP40 (to be ensured when fitted inside the boiler)
Safety class	Parts of safety class 0 and of PELV
Degree of pollution	2
Software classes	As per DIN EN 60730-2-5
- Controller part	Class A
- Burner control	Class C
Dimensions (L x W x D)	230 x 150 x 30 mm
Weight	Approx. 0.254 kg
Unit fuse	2 x T6.3H250 internal
Mounting position	Optional

⚠ **Caution!**
When making 100% inspections as per DIN EN 60335-1, Addendum A, only AC voltage may be applied. If DC voltage tests are conducted, the LMS14... can get damaged.

8.1.2 Environmental conditions

Storage	DIN EN 60721-3-1
- Climatic conditions	Class 1K3
- Mechanical conditions	Class 1M2
- Temperature range	-20...60 °C
- Humidity	<90% r.h. (noncondensing)
Transport	DIN EN 60068-2 and DIN EN 60731-3-2
- Climatic conditions	Class 2K3
- Mechanical conditions	Class 2M2
- Temperature range	-20...60 °C
- Humidity	<90% r.h. (noncondensing)
Operation	DIN EN 60721-3-3
- Climatic conditions	Class 3K3
- Mechanical conditions	Class 3M2
- Temperature range	0...60 °C
- Humidity	<85% r.h. (noncondensing)
- Vibrations	EN 298/DIN EN 60068-2

⚠ **Warning!**
Condensation, formation of ice and ingress of water are not permitted!

8.1.3 Electrical connections

Total current all mains components connected to LMS14... and clipins	5 A (at UMains = AC 230 V; Ta = 25 °C)
Mains extension	AUX1/AUX2
- Voltage	AC 230 V
- Current	Depending on current draw of heating circuit pump, programmable AC 230 V output, fuel valve, DHW charging pump, external ignition module and clipins used
QX1	
- Voltage	AC 230 V +10%/-15%
- Current	5 mA…1 A, cosφ >0.8
- Cable length	≤120 m
QX2	
- Voltage	AC 230 V +10%/-15%
- Current	5 mA…1 A, cosφ >0.8
- Cable length	≤120 m
QX3	
- Voltage	AC 230 V +10%/-15%
- Current	5 mA…1 A, cosφ >0.8
- Cable length	≤120 m
Flame supervision/ionization probe	
- Switching thresholds	Min. 0.8 µA (required DC current)
- Current	Typically 4 µA, max. 10.5 µA
- Response time in the event of loss of flame	≤1 s
- Physical contact	The ionization probe and its connections must be located such that adequate protection against direct or indirect contact with active parts is ensured in every unfavorable position allowed under correct usage conditions
- Cable length for flame detector	≤1 m

Note!

Conductors L- and N are interchangeable!

Safety limit thermostat	
- Voltage	AC 230 V
- Current	5 mA...1 A, cosφ >0.6 Carrying power to the fuel valve and ignition
- Cable length	≤3 m
Fuel valve	
- AC output	AC 230 V +10%/-15% Valve must still open at AC 175 V
- Current	5 mA…0.5 A, cosφ >0.6

Note!

- A fuel valve with rectifier may be connected to the fuel valve output only if approved by Siemens!
- In this case, additional protective measures inside the LMS14... must be taken (optional components)

RAC output (optional components)	RAC 230 V +10%/-15% 100 Hz Valve must still open at RAC 175 V
- Output	Max. 20 W, cosφ >0.9
General data on connection of fuel valve	
- Cable length	Max. 3 m for AC/RAC
- Capacitive extra circuit or surge voltage limiting protective elements	Not permitted
External ignition module	
- Voltage	AC 230 V +10%/-15%
- Current	5 mA…0.5 A, cosφ >0.6 Full ignition required at AC 175 V
- Cable length	Max. 3 m
-Starting current	Max 1 A
In terms of switching performance, every external ignition module used must be approved by Siemens!	
Fan control	For fans driven by mains-powered DC motor Refer to separate Siemens specification: Spezifikation_LMU5x_TrafoGebläse_de_VX.Y.doc (mandatory)
Sensor TK1 (B2)	NTC 10k
- Continuous temperature	Max. 100 °C
- Short-time temperature	Max. 125 °C
- Sensor tolerance	±2 K
- Cable length	≤3 m
- Aging	±3%
- τ	≤20 s
- Other requirements	To DIN EN 60730-2-9

ℹ Note!
QAx36... must be used as per the relevant specification.

8.1.4 Low-voltage side

8.1.4.1. Inputs B7/BX4

Sensor (B7)/multifunctional sensor BX4 (X4)	
- Resistance value	
- Sensor (B7)	NTC 10k Refer to boiler sensor
- Multifunctional sensor (BX4)	NTC 10k (QAZ36…, QAD36…) NTC 20k (flue gas sensor) Pt1000 optional for collector sensor and flue gas sensor)
- Cable length	≤3 m

Note!
Sensor input BX4 is firmly assigned to sensor B7. Reading in of sensor B7 is safety-related.

8.1.4.2. Inputs B3/B38

Sensor B3/B38 (X5)	
- Resistance value	NTC 10k
- Cable length	≤10 m (when connecting a thermostat to the input for the DHW sensor, high-quality thermostat contact material is required (e.g. gold-plated contacts), since signal voltage at this input is DC 5 V)

8.1.4.3. Inputs BX1/BX2/BX3

Sensor inputs BX1…BX3 (X5)	
- Resistance value	NTC 10k (QAZ36…, QAD36…) NTC 20k (flue gas sensor) Pt1000 (optional for collector sensor and flue gas sensor)
- Cable length	≤120 m **Observe cross-sectional area of wires!** (Refer to chapter *Cross-sectional area sensors*)

8.1.4.4. Input B9

Sensor B9 (X5)	
- Resistance value	NTC 1k Refer to specification QAC34…
- Cable length	≤120 m **Observe cross-sectional area of wires!** (Refer to chapter *Cross-sectional area sensors*)

8.1.4.5. Input H1

Multifunctional input/pressure sensor (X6)	
- Output voltage LMS14...	DC 15 V ±5%
	DC 5 V ±5%
- Current	Imax. 10 mA each input
- Input voltage LMS14...	DC 10 V
- Analog input	Safety extra low-voltage
- Operating range	DC 0…10 V
- Input resistance	>100 kΩ
- Digital input	
- Safety extra low-voltage for potential-free low-voltage contacts	
Voltage with contact open	DC 15 V
Voltage with contact closed	DC 1.5 mA
- Cable length	≤10 m

8.1.4.6. Input H3

Multifunctional input/pressure sensor (X4)	
- Output voltage LMS14...	DC 15 V ±5%
	DC 5 V ±5%
- Current	Imax. 10 mA
- Input voltage LMS14...	DC 10 V
- Analog input	Safety extra low-voltage
- Operating range	DC 0…10 V
- Input resistance	>100 kΩ
- Digital input	
- Safety extra low-voltage for potential-free low-voltage contacts	
Voltage with open contact	DC 15 V
Voltage with closed contact	DC 1.5 mA
- Cable length	≤10 m

8.1.4.7. Input H4

Multifunctional input/pressure sensor (X6)	
- Output voltage LMS14...	DC 15 V ±5%
	DC 5 V ±5%
- Current	Imax. 10 mA
- Input frequency	0/1Hz … 1 kHz
- Digital input	
- Safety extra low-voltage for potential-free low-voltage contacts	
Voltage with contact open	DC 5 V
Voltage with contact closed	DC 2 mA
Frequency input	
Duty cycle	10…90%
t_{on} ; t_{off}	>300 µs
Resolution	0.1 Hz @ 1Hz…1kHz
Rise/drop-out time	≤20 µs
Cable length	≤10 m

8.1.4.8. Input H5

Multifunctional input/room thermostat (X6)	
- Voltage	DC 5 V
- Digital input	
- Safety extra low-voltage for potentialfree low-voltage contacts	
Voltage with contact open	DC 5 V
Voltage with contact closed	DC 2 mA
- Cable length	≤120 m **Observe cross-sectional area of wires!** (Refer to chapter *Cross-sectional area sensors*)

8.1.4.9. Input H6

Multifunctional input/gas pressure switch (X5)	
- Digital input	
- Safety extra low-voltage for potential-free low-voltage contacts	
Voltage with contact open	DC 5 V
Voltage with contact closed	DC 2 mA
- Cable length	≤120 m **Observe cross-sectional area of wires!** (Refer to chapter *Cross-sectional area sensors*)

8.1.4.10. Input H7

Multifunctional input/air pressure switch (X4)	
- Digital input	
- Safety extra low-voltage for potential-free low-voltage contacts	
Voltage with contact open	DC 5 V
Current with contact closed	DC 2 mA
- Cable length	≤10 m

8.1.4.11. Input for reset (EK)

Reset button (X4/X30)	
Digital input	Active upon short-circuit after low-voltage GND
- Safety extra low voltage for potential-free low-voltage contacts	
Voltage with contact open	DC 5 V
Current with contact closed	DC 0.5 mA
- Line length	≤1 m

8.1.5 PWM fan/Hall connection facility

Warning!
Mandatory requirement: Observe separate Siemens specification
Spezifikation_LMU5x_TrafoGebläse_de_VX.Y.doc

PWM fan/Hall connection facility (X8)	
- PWM output	
- Safety extra low voltage	
Voltage with output open	DC 24 V
Current	Max. DC 15 mA
- Line length	≤3 m
- Basic control frequency (adjustable)	800…4800 Hz (default 4096 Hz)
- Hall input, fan speed	
Voltage with output open	DC <1 V
Input resistance	37 kOhm
Frequency range	0…900 Hz
- Duty cycle	30…70 %

8.1.6 PWM pump connection

PWM pump connection (X15)	
- PWM output	As per interface definition of Grundfos for UPER circulating pumps
- Safety extra low voltage	
Output voltage at Iout = 0	DC 15 V ±5%, Ri = 1 k
Output current (short-circuit-proof)	Max. 15 mA
PWM frequency	1.536 kHz
- Line length	≤10 m

8.1.7 Control of diverting valve

Control of stepper motor (bipolar) (X16)	
- Outputs	For 4 VA bipolar stepper motors
- Standard version LMS14...	180 mA winding current (total)
- Resistance per winding	50 R < Rmotor < 110 R
- Safety extra low voltage	
Voltage with output open	DC 24 V
Current	Max. DC 200 mA at 10% on time
- Line length	≤3 m
Step frequency	200 Hz

8.1.8 BSB users

BSB terminals (X7/X30/X50)	
- Operator unit	AVS37…
- Room unit	QAA55.../QAA75…
- Connection	2- or 3-wire
- Cable length	Max. 200 m at 1.5 mm² cross-sectional area of cable
- Cable resistance	Max. 3 x 14 Ω
- Cross-sectional area of cable	Min. 0.5 mm²
- Users	Max. 5 (1 operator unit, 3 room units, 1 service unit)

8.1.9 Cross-sectional area sensors

Cross-sectional area	Maximum length
0.25 mm²	20 m
0.5 mm²	40 m
1 mm²	80 m
1.5 mm²	120 m

8.2 Parameter stick AGU2.56xx109

General unit data

Degree of protection	IP20
Safety class	PELV ensured via LMS14.../LMS15...
Degree of contamination	2
Dimensions	60x20x12 mm (LxWxH)
Weight	Approx. 16 g
Mounting position	Optional
Life cycle	Max. 300 h
Electrical data	Mains supply DC 5 V ±5%

Warning!
Use parameter stick only for setting the parameters on the LMS14.../LMS15...
Do not plug it in during operation and do not use it for continuous operation!

Environmental conditions

Storage	DIN EN 60721-3-1
- Climatic conditions	Class 1K3
- Mechanical conditions	Class 1M3
- Temperature range	-20...60 °C
- Humidity	<90% r.h. (noncondensing)
Transport	DIN EN 60068-2 and DIN EN 60731-3-2
- Climatic conditions	Class 2K3
- Mechanical conditions	Class 2M2
- Temperature range	-20...60 °C
- Humidity	<90% r.h. (noncondensing)
Operation	DIN EN 60721-3-3
- Climatic conditions	Class 3K3
- Mechanical conditions	Class 3M2
- Temperature range	0...60 °C
- Humidity	<85% r.h. (noncondensing)

Warning!
Condensation, formation of ice and ingress of water are not permitted!

Warning!
The AGU2.56... may only be plugged into the respective socket on the LMS14.../LMS15... or OCI432...!

8.3 Sensor characteristics

8.3.1 NTC 1k

T [°C]	R [Ω]	T [°C]	R [Ω]	T [°C]	R [Ω]
-30	13034	0	2857	30	827
-29	12324	1	2730	31	796
-28	11657	2	2610	32	767
-27	11031	3	2496	33	740
-26	10442	4	2387	34	713
-25	9889	5	2284	35	687
-24	9369	6	2186	36	663
-23	8880	7	2093	37	640
-22	8420	8	2004	38	617
-21	7986	9	1920	39	595
-20	7578	10	1840	40	575
-19	7193	11	1763	41	555
-18	6831	12	1690	42	536
-17	6489	13	1621	43	517
-16	6166	14	1555	44	500
-15	5861	15	1492	45	483
-14	5574	16	1433	46	466
-13	5303	17	1375	47	451
-12	5046	18	1320	48	436
-11	4804	19	1268	49	421
-10	4574	20	1218	50	407
-9	4358	21	1170		
-8	4152	22	1125		
-7	3958	23	1081		
-6	3774	24	1040		
-5	3600	25	1000		
-4	3435	26	962		
-3	3279	27	926		
-2	3131	28	892		
-1	2990	29	859		

8.3.2 NTC 10k

T [°C]	R [Ω]	T [°C]	R [Ω]	T [°C]	R [Ω]
-30	175203	50	3605	130	298
-25	129289	55	2989	135	262
-20	96360	60	2490	140	232
-15	72502	65	2084	145	206
-10	55047	70	1753	150	183
-5	42158	75	1481	155	163
0	32555	80	1256	160	145
5	25339	85	1070	165	130
10	19873	90	915	170	117
15	15699	95	786	175	105
20	12488	100	677	180	95
25	10000	105	586	185	85
30	8059	110	508	190	77
35	6535	115	443	195	70
40	5330	120	387	200	64
45	4372	125	339		

8.3.3 Pt1000

T [°C]	R [Ω]	T [°C]	R [Ω]	T [°C]	R [Ω]
–30	882.2	50	1194	130	1498.3
–25	901.9	55	1213.2	135	1517.1
–20	921.6	60	1232.4	140	1535.8
–15	941.2	65	1251.6	145	1554.6
–10	960.9	70	1270.8	150	1573.3
–5	980.4	75	1289.9	155	1591.9
0	1000	80	1309	160	1610.5
5	1019.5	85	1328	165	1629.1
10	1039	90	1347.1	170	1647.7
15	1058.5	95	1366.1	175	1666.3
20	1077.9	100	1385.1	180	1684.8
25	1097.3	105	1404.0	185	1703.3
30	1116.7	110	1422.9	190	1721.7
35	1136.1	115	1441.8	195	1740.2
40	1155.4	120	1460.7	200	1758.6
45	1174.7	125	1479.5		

8.3.4 NTC 20k

T [°C]	R [Ω]	T [°C]	R [Ω]	T [°C]	R [Ω]
-50	1755765	70	3489	200	145
-40	818659	80	2515	2100	122
-30	406438	90	1845	220	103
-20	213261	100	1377	230	88
-10	117521	110	1043	240	76
0	67650	120	801	250	65
10	40491	130	624	260	57
20	25099	140	491	270	49
25	20000	150	392	280	43
30	16057	160	315	290	38
40	10569	170	256	300	34
50	7140	180	210		
60	4938	190	174		

9 List of figures

Index

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