

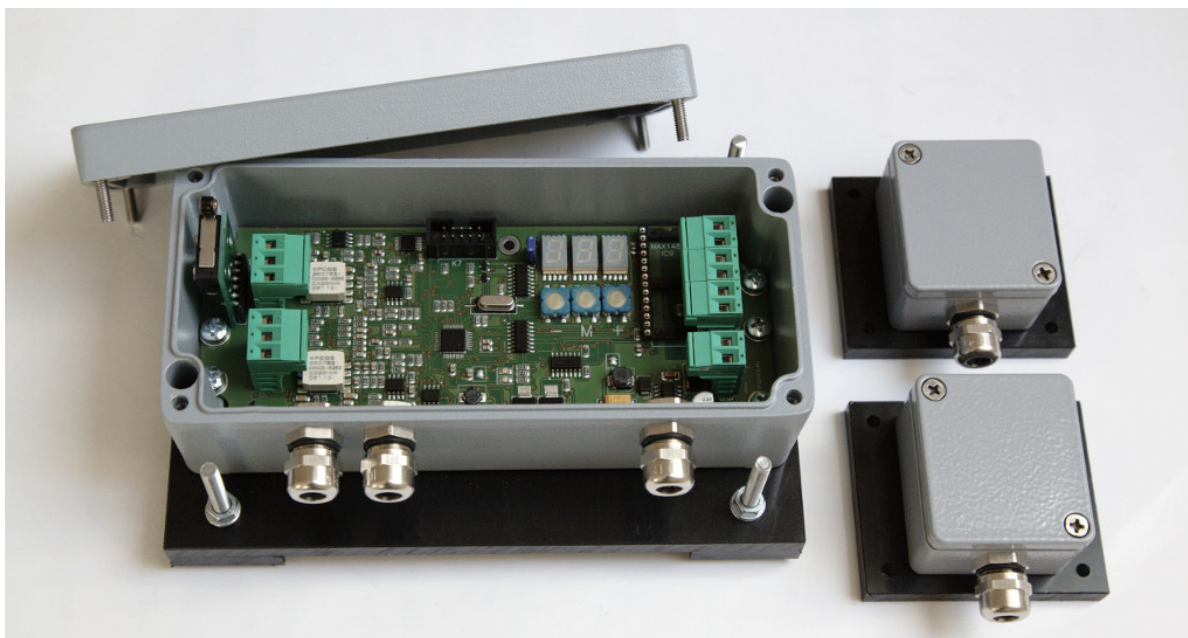
# USER GUIDE

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## PERIMETER WIRE FENCE VIBRATION DETECTOR

# AN307

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*User Guide Version:*  
V1.10

October 2022

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## 1 Introduction

AN307 is used for security of a wired fence of up to a length of two times 300 m in two directions, all together of up to a length of 600 m. A sensor cable, especially sensitive to mechanical vibrations, should be fastened to the fence. The cable ends by an end module on one side. The other cable end is connected to the electronic system (main unit), perceiving the activities taking place on the wire. The AN307 main unit does not have its own supply unit and must therefore be connected to an integral system (alarm panel) with additional power supply. The principle of getting information out of the sensor cable is patented.

### 1.1 DSIGP® Technology

The new DSIGP® technology has made this product unique. The vibrations of the fence caused by other than normal weather or wind conditions are recognized by the new DSIGP® technology. Disturbances caused by external influences, for instance EMF, are successfully eliminated.

### 1.2 Terminals for Relays Output

The AN307 main unit has two relay outputs for two different types of alarms: a tamper and a burglary alarm. All relay outputs are made in a normal close (NC) technique. The tamper alarm goes on under different conditions: cutting the sensor cable, short circuit in the sensor cable, switching off the sensor cable, or opening up the top of the main unit casing. The burglary alarm goes on in case of non-allowable activities on the wire fence (climbing over the fence, bumping into the fence, cutting the sensor wire...). It does not go on in the case of the wind blowing (except if the fence is broken and it bumps into something because of the wind), hard raining, or snowing. It also does not go on if the birds are sitting on the fence. All relays switch to open position in case the power supply is disconnected.

### 1.3 Terminals for RS485 (option)

ANSI TIA/EIA-485 standard can be used for communication within alarm system. ANSI TIA/EIA-485 standard, commonly known as 485, specifies balanced data-transmission schemes for transmitting data over long distances in noisy environments. The same terminals are used for one relay and RS485 therefore relay stays inactive. Terminals A and B are there for connecting to other devices. This terminal is galvanic isolated from the power supply and the rest of the device to avoid delusion currents.

## 2 Installation

Cable AS257, which works as a sensor, is installed in a wired fence about 1m above ground level. Cable is fastened onto a fence in every 40 - 60 cm by plastic clips. On one side, the cable ends with an end module, while on the other end, it is connected to the main unit. The main unit has two relays on the output side, one for the burglary alarm and the other for the anti-tamper. The main unit must be connected to the integral system (an alarm panel with additional battery supply and alarm condition information). Maximum security is achieved only when these instructions are followed.

### 2.1 Installation of the Main Unit

The main unit should be fixed by four screws onto the fence pillar. The main unit should be fixed onto the fence without its casing touching the metal parts of the fence. It is recommended that the cable glands face the ground (see Figure 1). This protects the casing from water intrusion. Attention should also be given to the arch of the cable leading into the main unit (see Figure 1). The arch must have at least a 5 cm radius, This protects the lower part of the arch from water and ice. When the cable gland is

installed properly, the rubber must embrace and hold the cable. The cable should be fixed firmly even when we try to pull it out of the casing (see Figure 2).

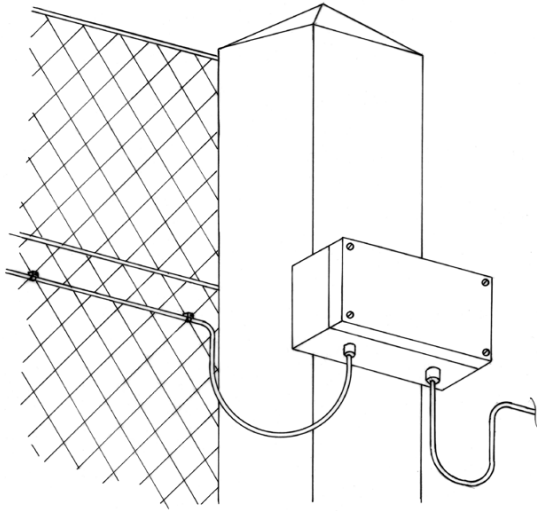


Figure 1: The main unit

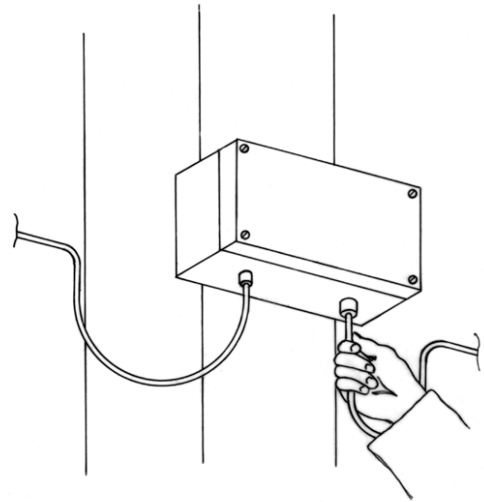


Figure 2: Checking the fixedness of the cable

## 2.2 Fixing the Sensor Cable to the Fence

The cable is fixed onto the wired fence by plastic clips (PLT 2 IM 100). Plastic clips are UV resistant and made for an outdoor installation. The cable should be fixed every 40 - 60 cm. It must be fixed onto the fence and not onto the stretched wire that is usually installed in the middle of the fence (see Figure 3). An arch can be made every 5 - 10 meters in order to achieve better sensitivity (see Figure 4).

A smaller arch should also be made at the pillars (radius 10 cm). This prevents damage to the wire which would be caused by the expansion/contraction taking place at very high/low temperatures.

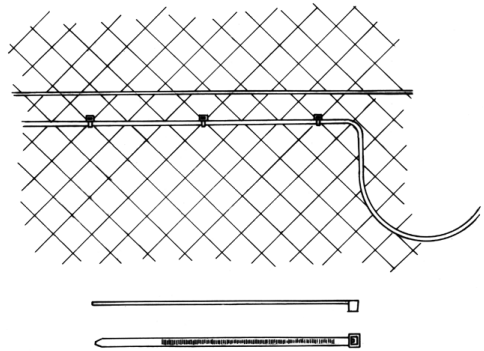


Figure 3: Fixing the cable with plastic clips

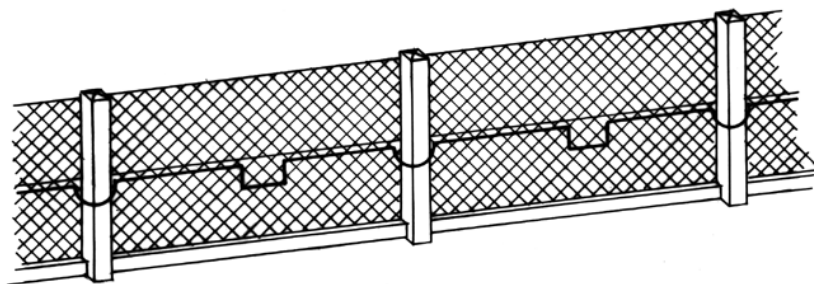


Figure 4: Wire fence

### 2.3 Installation of the End Module

The end module should be fixed onto the fence without casing touching the metal parts of the fence. It should be fixed by four screws so that the cable gland faces the ground. The sensor cable must be arched before entering the end module in order for the water to fall off the cable (see Figure 5).

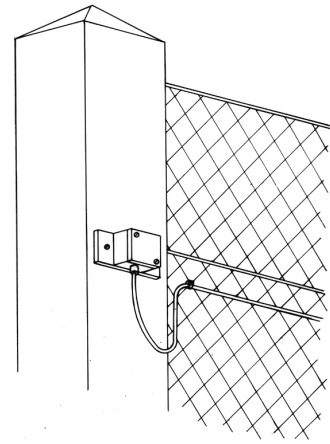


Figure 5: The end module

### 2.4 Installation of the Sensor Cable

The sensor cable has a shield and four wires (black, red, yellow and white). The sensor cable is connected to the main unit by a terminal Fence so that the black and red wires are connected to position 1, the yellow and white wires to position 2 and the shield to position GND. The cable should be striped as close to the terminal as possible (see Figure 7). On the end module the cable should be connected to the terminal: the black and red to position 1, the yellow and white to position 2, and the shield to position G. The cable should be striped as close as possible to the terminal (see Figure 6).

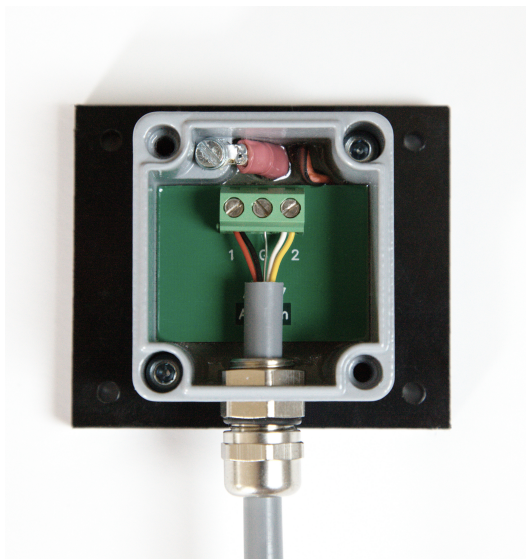


Figure 6: Connecting the sensor cable to the end unit

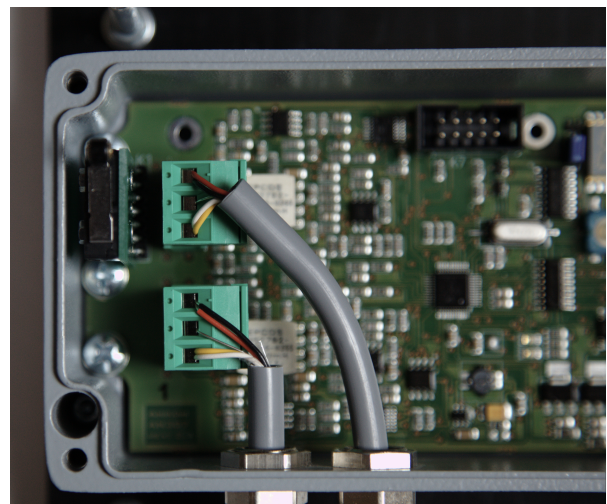


Figure 7: Connecting the sensor cable to the main unit

Before connecting the supply, it is necessary to check the cable impedance. The end module must be connected. The Fence connector on the side of the main unit must be pulled out. Three measurements of impedance must be made: between positions 1 & 2, between 1 & G, and between 2 & G. The values of all three measurements should be  $640\text{ k}\Omega (\pm 50\text{ k}\Omega)$ . In case of a higher impedance value, we must make sure that the end module has been connected properly and check if the sensor cable is damaged.

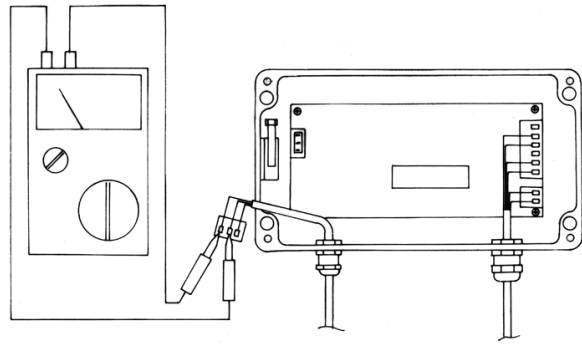


Figure 8: Measuring the sensor impedance cable with an Ohmmeter

## 2.5 Installation Single Wing

If there is a need for connection for only one sensor cable, on the terminal Fence, which is not used, dummy load must be connected (see Figure 9 and Figure 10).

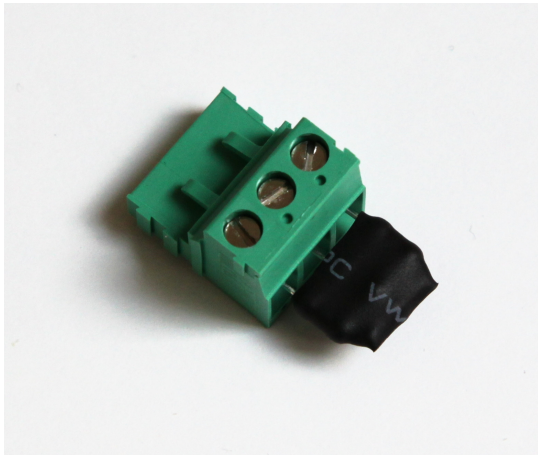


Figure 9: The dummy load

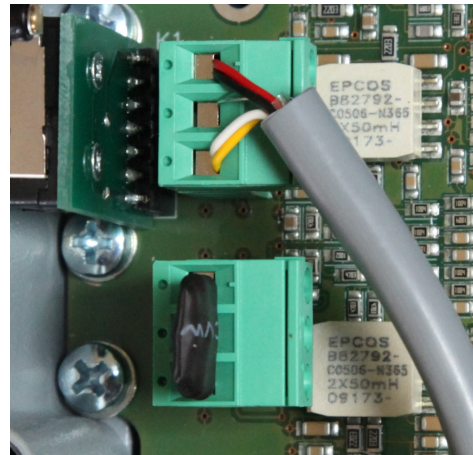


Figure 10: The dummy load connected to the terminal Fence 2

## 2.6 Installation of the Power Supply and the Alarm Outputs

The supply and the output signal should be connected to the main unit by a shield alarm cable with eight or more wires ( $2 \times 1,5 + 6 \times 0,22$ ). The supply voltage is 12 VDC, and can be between 8 and 18 Volts (See Figure 11 and Figure 12).

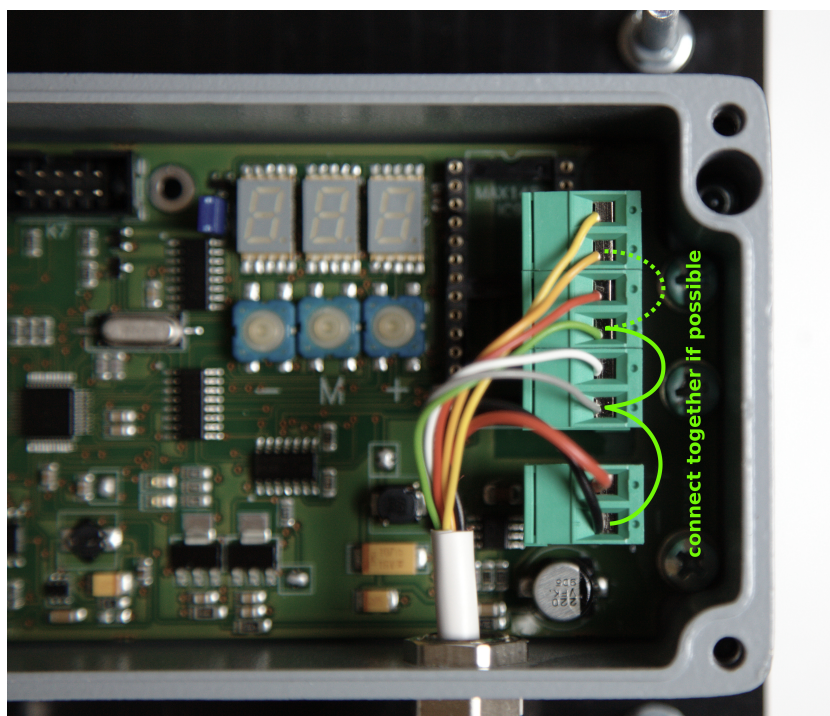


Figure 11: Connecting the power cable to the main unit.  
(If RS485 is used, do not connect A or B terminal to minus power supply!)

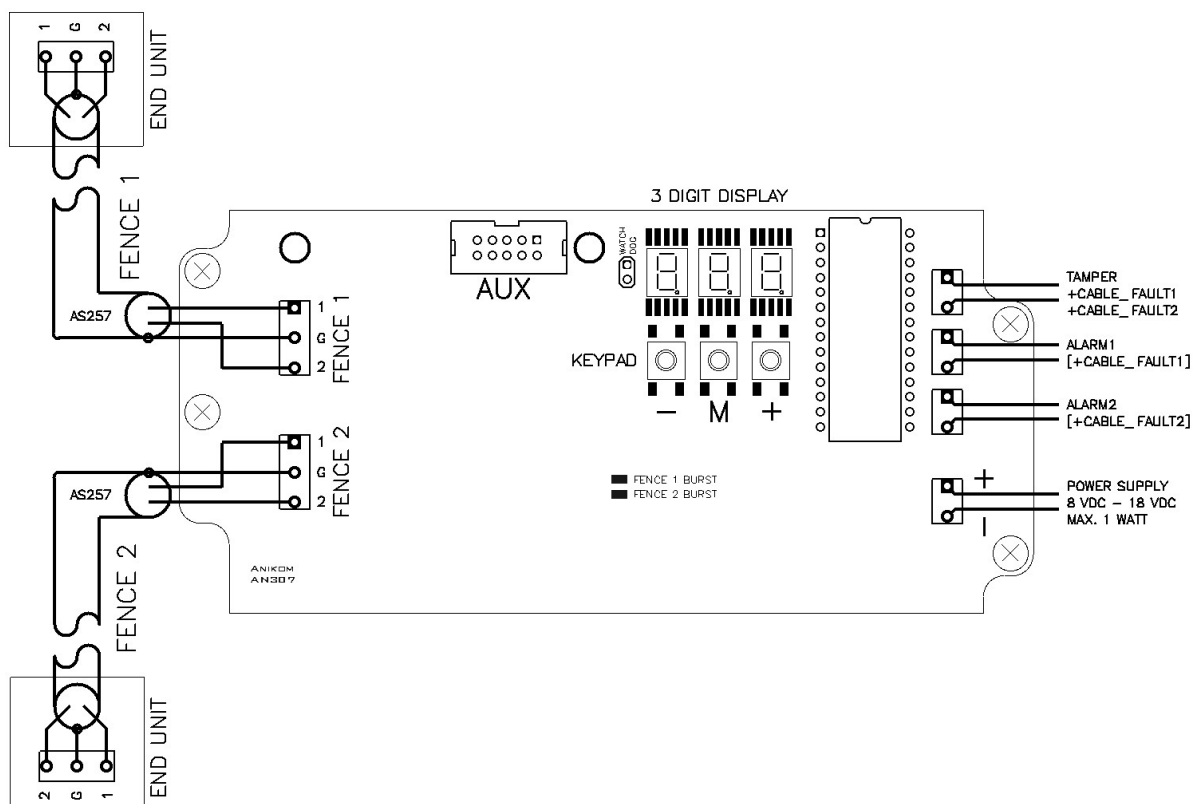


Figure 12: Connecting of the main unit. (MAX1480BCPI must not be in the DIL28 socket!)

## 2.7 Installation of the RS485 Option

RS485 option can be simply installed by putting standard integrated circuits MAX1480BCPI to the DIL28 socket (it is placed between display/keypad and relays terminals, see Figure 13). Notch type of the integrated circuits MAX1480BCPI must be on the top (as is drawn on the PCB). Please note, that any putting or removal MAX1480BCPI must be done with the power switch off, otherwise serious damage can occur on the device. When the power is switched on, the AN307 detects, if MAX1480BCPI is present, and take the further action (set relays and rs485 terminals according Figure 12 or Figure 13, respectively). The RS485 communication cable must be twisted pair, to achieve best performance.

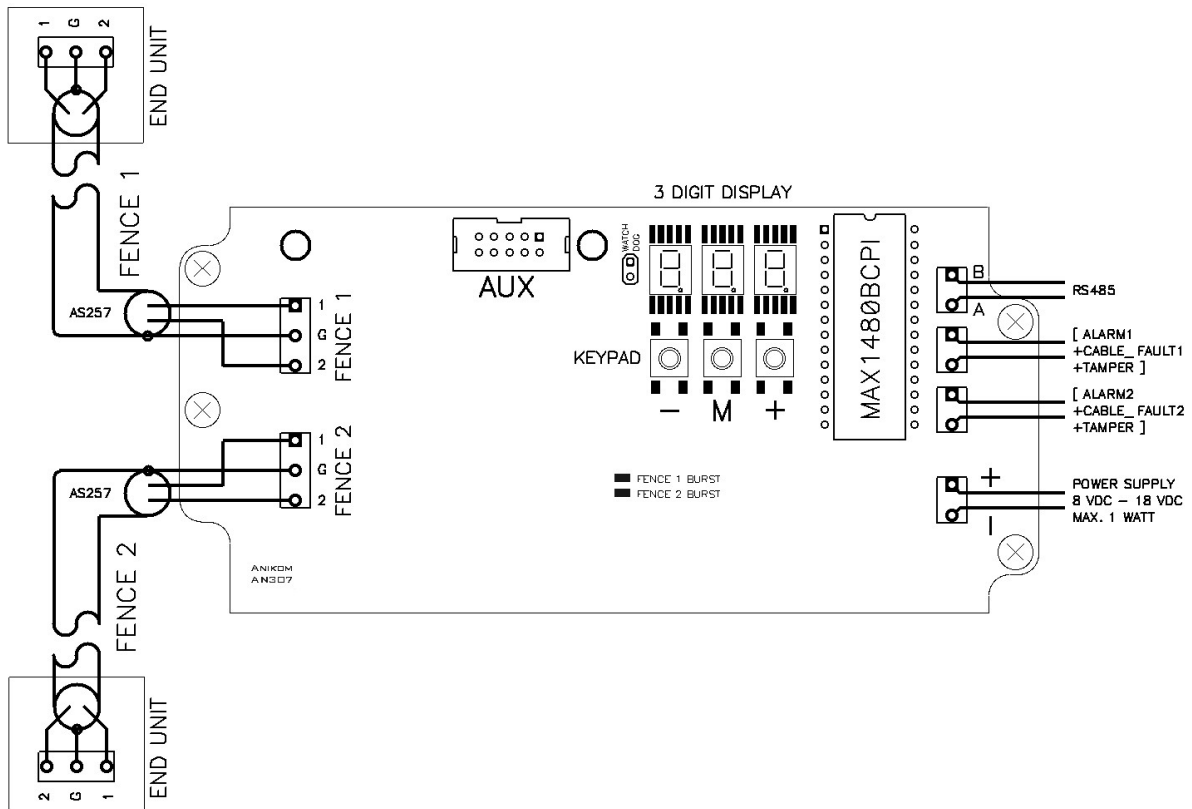


Figure 13: Connecting of the main unit with RS485 option (MAX1480BCPI must be inserted into DIL28 socket)

### 3 Windmill

False alarms may appear at high wind speed. Solution for this issue is measurement wind speed and reduce the sensitivity at higher wind speed. Wind measurement can be done with combination of the WTS307 and the WSS100/REED. Therefore, the WTS307 and the WSS100/REED compensate (decrease) of sensitivity of the AN307 device at high wind speed.

#### 3.1 WSS100/REED

The WSS100/REED is easy installation wind speed sensor with the reed contact output. It can measure the wind up to 55,0 m/s. The WSS100/REED should be mounted near the AN307 device on a pipe with 20 mm outside diameter. The sensor consists of a anodized aluminum body and the head of the sensor with a stainless steel ball bearings and windmills. The wind anemometer cups can be, if necessary, replaced. The cable to connect WSS100/REED has standard length of 10 meters. Working temperature is from  $-25^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ . The sensitivity of the AN307 is reduced depending on the wind speed. Threshold for starting reduce sensitivity is set by the parameter Wind Sensitivity Adjustment (see Table 1). If this parameter is set to 1, then reduction of sensitivity starts at the wind speed 8.5 m/s, if set to 2, then reduction starts at 8 m/s, if set to 3 then reduction starts at 7.5 m/s, and in this way to 15, where reduction starts at wind speed 1.5 m/s.



Figure 14: Windmill WSS100/REED

#### 3.2 WTS307

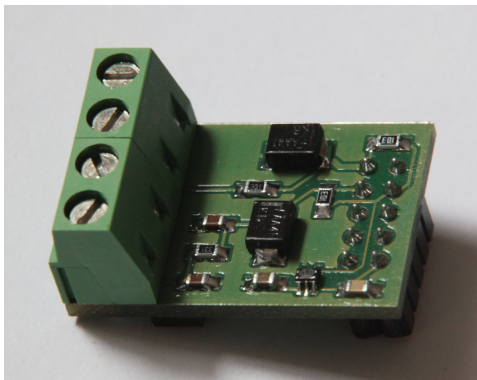


Figure 15: WTS307

The WTS307 is small piggyback device installed inside the AN307 device. The WTS307 has also two additional inputs, one for connecting the wind measurement device WSS100/REED, other for future use (auxiliary). The WTS307 will work on AN306, AN307 or AN307COM device. Prerequisite is firmware version 2.09 or higher. The firmware version can be checked by holding the + (plus) key on the AN307 and press the tamper switch. The firmware version is then displayed on the 3-digit display in the AN307.

### 3.3 WST307 montage

The WTS307 should be clipped into AUX terminal inside AN307 (see Figure 3 ).

The WSS100/REED should be connected to the right two terminals at WTS307 (green and brown wires). Polarization is irrelevant. The WTS307 should be mounted in to the AN307 when there is no power supply attached to the AN307 device, otherwise some damage could occur. WTS307 has additional lighting protection diodes built in. It is static electricity insensitive device.

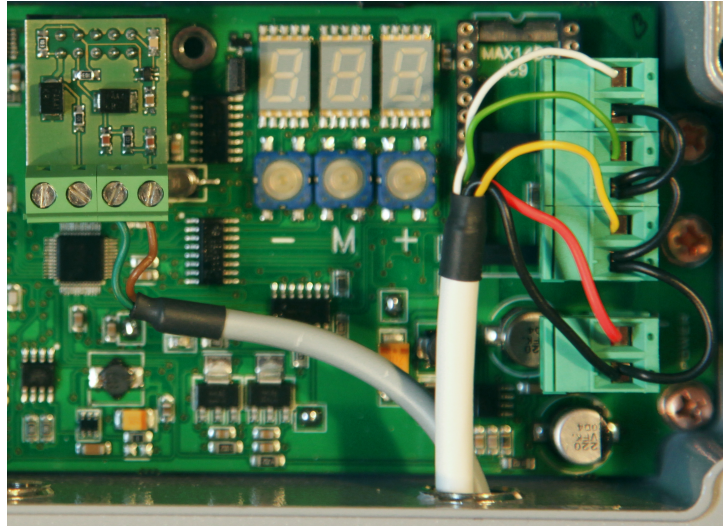


Figure 16: WTS307 montage

### 3.4 Mouse over monitoring of temperature and wind speed

On the Guard software there is some additional parameters that could be seen by mouse over line. Of course, this function works only with AN307COM devices and Guard software. Wind speed in meters per seconds and km per hour is displayed. Sensitivity Adjust is indicator which approximately shows how large is compensation of sensitivity. If this number is 0, there is no compensation. If temperature is low, Sensitivity Adjust will go up to number 3 (increase sensitivity). If wind speed is high, Sensitivity Adjust will go down to number -12 (decrease sensitivity). If there is low temperature and high wind speed, both influences will compensate to maintain right sensitivity.

## 4 Wiring Recommendation and Lightning Protection

One possible way of connecting the AN307 system to the back end is shown in Figure 18. Each AN307 is connected with a shielded alarm cable containing six wires ( $2 \times 1,5 + 4 \times 0,22$ ). Due to the possibility of lightnings we abide by some rules:

- The shield of the alarm cable should be connected to the ground at the General Alarm Collecting Device - GACD (which can be an alarm panel, a communicator ... etc). At the AN307 site, the shield should be left open.
- The minus terminal at the AN307 and the terminals of relays, which have same potential (minus power supply), should be connected to each other inside AN307 if possible ( please see Figure 11 and Figure 18). Before doing this, it must be checked if the common terminal and the minus terminal on GACD have the same potential (resistance between those terminals must be less than 0.1 Ohm).
- If separate power supplies for AN307 and GACD are used, the minus terminals from both power supplies should be connected together.
- Grounding should be always done at one place, usually near GACD or the main power supply. Never use grounding loops since phantom currents might occur. In other words, if more spatially separated devices are used in the system, only one should be grounded (usually the power supply unit).
- If the AN307COM mode is used, the communication lines A and B from RS485 should not be connected to the minus or any other terminal.
- If some additional protection for communication or relay wires is used at the AN307 site, the ground of the protection device should be connected to the minus terminal of AN307. Never connect the ground of the protection device to the shield of the alarm cable!
- The fence itself should be grounded, see Figure 17. The resistance to the ground should be less than 20 Ohm. Consult the manufacturer of the fence on how to ground the fence. You should also consider the regulations in your country regarding the grounding protection of electrical equipment and buildings.

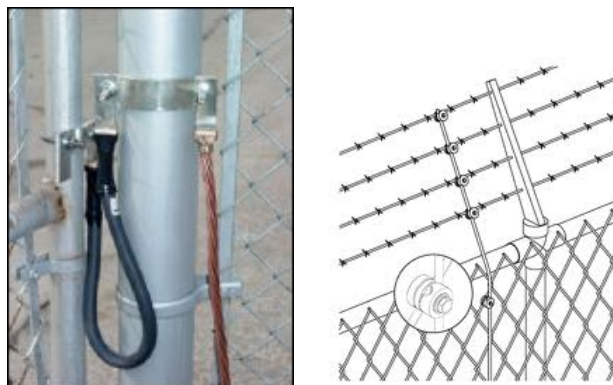


Figure 17: Fence grounding examples

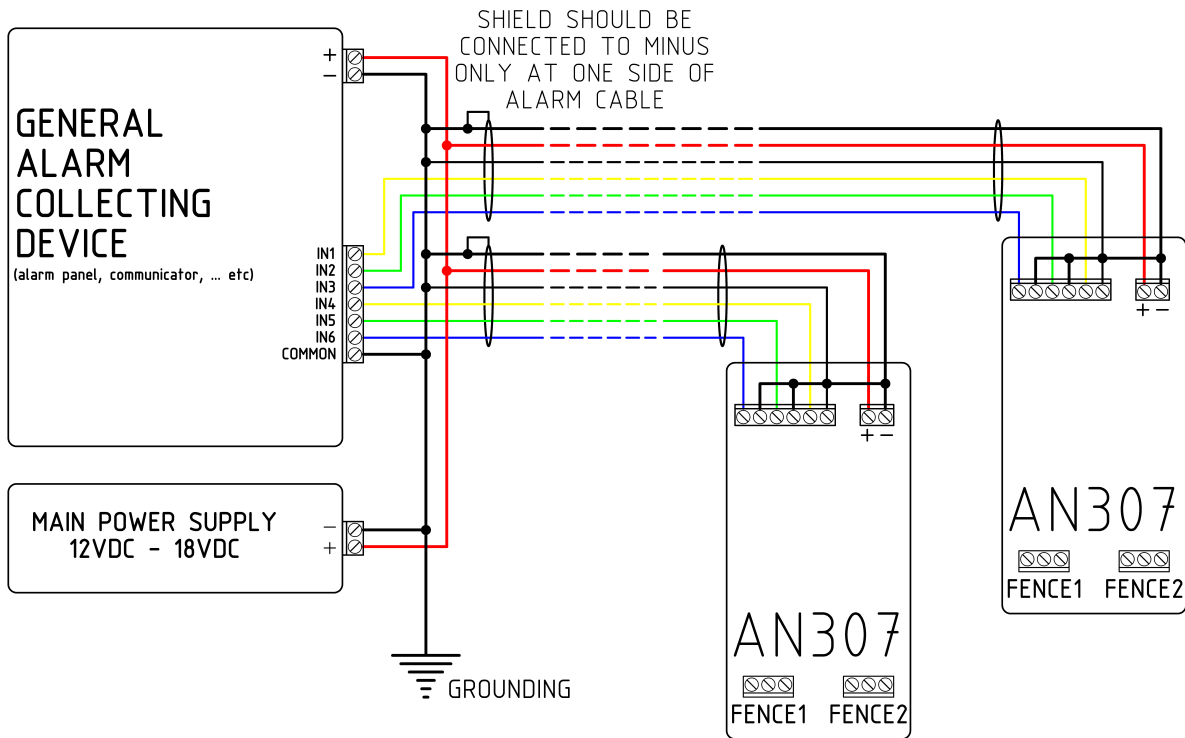


Figure 18: Connecting more than one AN307 to the back end

#### 4.1 Watch Dog

The AN307 has a double watch dog (a mechanism which resets the device if something unexpected happens). One watch dog is on the software level, other one is on the hardware level. The hardware watch dog can be enabled and disabled with the jumper (the jumper is located on the PCB between the 3 digit display and the AUX terminal). If the jumper is attached, then watch dog is enabled. Make sure that the jumper for watch dog is always attached (enabled).

#### 4.2 How to Repair a Cut Off Cable

The repair of a broken cable can be done with a special connecting module, AC300. The installation of the connecting module is shown in Figure 19. Generally, the installation is the same as the installation of the end module. The AC300 connecting module has two cable glands and two connectors with three positions marked as 1, 2 and G. The cable must be connected to the terminal so that the black and red wire go connect to position 1, while the yellow and white wire connect to position 2, and the shield to position G. The cable should be striped as close to the terminal as possible. This should be the case for both cables.

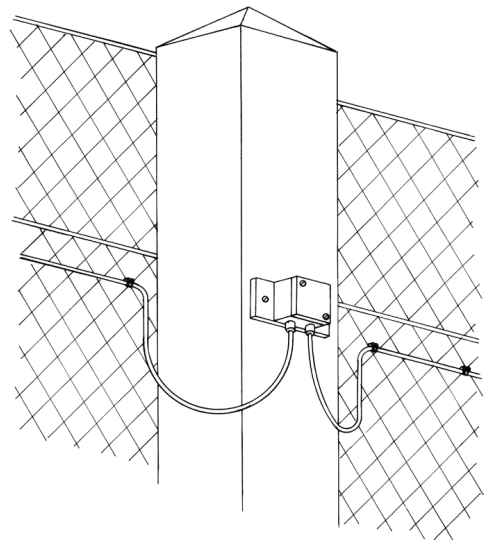


Figure 19: Connecting module AC300

## 5 Operation Balance and Control

The detector AN307 is balanced by the three keys on the keypad and the three digit display. The parameters that can be adjusted are: the sensitivity for both wings, the beat number for both wings, the acquisition period, adding a cable fault event to alarm relays (when the MAX1480BCPI is not build in), the operation of relays (when the MAX1480BCPI is build in), the RS485 device address (when the MAX1480BCPI is build in), the measurement of temperature, the wind sensitivity, and the algorithm type.

Each time the M key (menu) is pressed and held, the display shows the function. When the M key is released, the value of that function is shown. At that moment, the adjustment of the value is possible (with + key and – key). After the first function is adjusted, we again, press the M key, which displays the second function (and so on for all the subsequent functions). All the functions are shown in Table 1. For faster adjustment, the + or – key can be held. Firstly, the value is increased/decreased rather slowly. Longer the key is held, faster the value changes.

If the key is not pressed for 4 seconds, the display becomes blank and the AN307 leaves the program mode. The current values are stored in the nonvolatile memory.

Function	Display	Possible Values	Changeable by $\pm$ keys	Comments	Default Value
Sensitivity of Fence 1	FE1	0 - 150	yes		60
Sensitivity of Fence 2	FE2	0 - 150	yes		60
Beat Number of Fence 1	bE1	1 - 9	yes		3
Beat Number of Fence 2	bE2	1 - 9	yes		3
Acquisition Period	PEr	2 - 60	yes	seconds	7
Add Cable Fault to Alarm Event	SAb	0 - 1	yes	0=no, 1=yes, only when MAX1480 is not inserted	1
RS485 Address	ADr	2 - 255	yes	only when MAX1480 is inserted	4
RS485 Relays Usage	rEL	0 - 1	yes	0=no, 1=yes, only when MAX1480 is inserted	0
Temperature Measurement	tEM	0 - 1	yes	0=no, 1=yes	0
Wind Sensitivity Adjustment	bLo	0 - 15	yes		1
Algorithm	ALG	0, 1, 2 or 3	yes		3
Counter of Alarm 1	CA1	0 - 999	no		
Counter of Alarm 2	CA2	0 - 999	no		

Table 1: Programming functions

### 5.1 Sensitivity Settings (FE1, FE2)

When the key M is pressed for the first time (when the display is blank), the function Sensitivity of Fence is displayed. The display shows FE (see Table 1). After the M key is released, the display shows, for example, 032. With the + and - keys, the value of the Sensitivity of the Fence can be changed to values between 0 (minimum sensitivity) and 150 (maximum sensitivity). The second press to the M key takes Sensitivity of Fence 2.

### 5.2 Beat Number Settings (bE1, bE2)

The next time the M (menu) key is pressed, the display shows bE1 (function Beat Number of Fence 1). This value can be between 1 and 9. With the + and - keys, the value of Beat Number of Fence 1 can be changed. The further press M key takes Beat Number of Fence 2. If the beat number is set to 1, the alarm is launched after the first beat on the fence. If the beat number is set to 2, alarm is launched after the second beat to the fence (inside acquisition period, see Section 5.3).

This function is very useful when, for example, playing children on a nearby playground cause a ball to repeatedly hit the fence. If the beat number is, for example, set to 3, then the first beat (in this case the ball) will not trigger the alarm.

### 5.3 Acquisition Time Period Settings (PEr)

The next time the M (menu) key is pressed, the display shows PEr (function Acquisition Period). The acquisition period is a sampling window time in which AN307 counts the number of beats. For example, if this parameter is set to 7 and the beat number is set to 3, the alarm will trigger if it registers 3 beats in 7 seconds (the fence burst LED blinks 3 times). The acquisition time period can be set between 2 and 60 seconds. A short acquisition period and a high beat number should be avoided (for example, beat number 4 and acquisition period 3 seconds will never trigger the alarm).

### 5.4 Add Cable Fault to Alarm Event Settings (Sab)

If this parameter is set to 0, relays for Alarm 1 and Alarm 2 will trigger only for alarms on the fence. If this parameter is set to 1, relays for Alarm 1 and Alarm 2 will trigger on the fence alarm or the cable fault (see Figure 12). The cable fault is always present on the tamper relay (so even this parameter is set to 0, the cable fault will not be lost). This parameter is valid if the MAX1480BCPI is not build in.

### 5.5 RS485 Address (Adr)

This is the unique address of particularity device. Each device must have solely address to avoid confusion on the RS485 bus. The address can be set between 2 and 255. The address 1 is reserved for the master unit. This parameter is valid if the MAX1480BCPI is build in.

### 5.6 Switch On/Off Relays (rEL)

If this parameter is set to 1, the relays for the Alarm 1 and Alarm 2 are active (see Figure 13). The relay for Fence 1 will be active for Alarm 1 or Cable Fault 1 or Tamper. The relay for Fence 2 will be active for Alarm 2 or Cable Fault 2 or Tamper. If this parameter is set to 0, all relays are inactive (only the RS485 is active). If the relays are not connected, set this parameter to 0. This will reduce power consumption. This parameter is valid if the MAX1480BCPI is build in.

### 5.7 Temperature Measurement (tEM)

If this parameter is set to 1, the temperature is measured on the PBC board. At low temperatures, the sensitivity is automatically increased, because the sensor cable is less sensitive to vibration at very low temperatures.

### 5.8 Wind Sensitivity Adjustment (bLo)

If the wind sensitivity adjustment is set from 1 to 15 and the windmill is connected, the sensitivity is automatically reduced the wind blows. The higher is the wind sensitivity adjustment set, more is sensitivity reduced. Set this parameter high enough so that false alarms do not occur when the wind blows. If no windmill is connected or if the wind is not blows, this parameter has no effect.

### 5.9 Algorithm (ALG)

Four types of the detection algorithm can be set.

The Algorithm 0 is least sensitive among the three algorithms and the sensitivity should be set a bit higher (start with sensitivity 60 or more). This is the basic algorithm (the same algorithm as in firmware version V2.16 or earlier).

The Algorithm 1 is the same as Algorithm 0. The only difference is that it is more sensitive. Sensitivity should be set lower then with Algorithm 0 (start with sensitivity 40).

The Algorithm 2 is even more sensitive than Algorithm 1, it is also adaptable to periodic disturbances. Start with sensitivity 25.

The Algorithm 3 is similar as Algorithm 2 with the addition of the wind filter. The wind filter minimizes false alarms because of the wind.

### 5.10 Alarm Counter (CA1, CA2)

The counter CA1 or CA2 are increased every time Alarm 1 or Alarm 2 is launched, respectively. Counter can not be adjusted by user. If the counter reach 999, it takes value 0 at next alarm.

### 5.11 Led Diodes Fence 1,2 Burst

The LED fence 1 and the LED fence 2 light up in case the sensor wire is shaken. This is an indication of a beat (see Figure 12 and Figure 13).

### 5.12 Supply Voltage Measurement

The power supply voltage is measured by pressing the tamper switch (on the left side of the AN307 box). The voltage is displayed on the display (for example, if the supply voltage is 12.3 V, the display shows value 12.3). This function is very useful in case of very long supply cables from the power supply unit to the AN307 unit. The voltage drop on the power supply cables can be high (depending on the length and cross-section of the power cable) causing too low voltage at AN307. The voltage on the AN307 must be between 8.0 VDC and 18.0 VDC. If the voltage is below 8.0 VDC, the AN307 becomes less reliable. Voltage higher than 18.0 VDC should also be avoided.

### 5.13 Firmware Version

By pressing and holding the + (plus) key and simultaneously pressing the tamper switch, the firmware version is displayed (at the time of writing this manual, the firmware version is 2.27).

### 5.14 Reset Parameters to Default Values

To reset the parameters, the power supply must be switched off. By pressing and holding the – (minus) key and switching on the power, all parameters are set to default values. The counters CA1 and CA2 are set to 0. On the display, rSt is shown for a few seconds. The values are set according Table 1.

### 5.15 Events Showing on the Display

If nothing is happening, the display is blank. The display has two main functions: showing the parameters (see Table 1) in program mode and showing the events (see Table 2). The event is displayed for 3 seconds. After that the display goes blank.

Display	Event	Comment
AL1	Alarm on input Fence 1	Alarm triggered.
AL2	Alarm on input Fence 2	Alarm triggered.
OP1	Open wires on Fence 1	The sensor cable is not connected.
OP2	Open wires on Fence 2	The sensor cable is not connected.
CL1	Short wires on Fence 1	The sensor cable is short-circuited.
CL2	Short wires on Fence 2	The sensor cable is short-circuited.
OL1	OK on Fence 1	The sensor cable is connected the right way.
OL2	OK on Fence 2	The sensor cable is connected the right way.
CAS	Open AN307 box	The tamper switch is opened.
12.0	Measurement of supply voltage	The power supply voltage is displayed.

Table 2: Events shown on display

## 6 Parts of the AN307 Detector

Parts of the AN307 detector are:

- A main unit in a waterproof aluminum casing (IP 65) 175 mm x 80 mm x 60 mm.
- Two pieces of an ending unit AE307 in a waterproof aluminum casing (IP65) 50 mm x 45 mm x 30 mm.

Additional parts of the AN307 detector:

- Two times a sensor cable up to 300 m length.
- A UV protected plastic clips for fixing the sensor cable type V-01 UV.
- A connecting module AC300, used for connection of the cut off sensor cable.

## 7 Technical Characteristics

Master unit:	waterproof IP65 aluminum casing
Wight of master unit:	970 g
Dimensions of master unit:	175 mm x 80 mm x 60 mm
Ending unit:	waterproof IP65 aluminum casing
Dimensions of ending unit:	50 mm x 45 mm x 30 mm
Weight of ending unit:	140 g
Type of sensor cable:	AS257
Diameter of sensor cable:	6 mm
Working temperature:	from -30°C to +70°C
Technology:	new unique DSIGP <sup>®</sup>
Supply voltage:	from 8.0 VDC to 18.0 VDC
Supply protection:	with 600W transient voltage suppressors
Power consumption:	less than 1 W
Relays:	3 relays, NC (only two are active, when RS485 is build in)
Relays max current:	2 A
Relays max. switching voltage:	30 VDC
Relays protection:	protected with 600W/36V transient voltage suppressors
Tuning on board:	menu system with 3 keys and 3 digit display
Tuning remotely:	Guard software if MAX1480 is installed (RS485)
RS485 (option):	terminal A and B
RS485 protection:	galvanic isolation, ±15kV ESD-Protected

Table 3: Technical characteristics

## 8 Warranty and Disclaimer

The product is constructed by all the enforced technical norms and corresponds to the regulations of the electromagnetic compatibility (UL RS Slovenia, 64/2001). The product is a low voltage device (up to 18 VDC). Therefore, it does not pose a danger of electrical shock. The product is not intended for installation in areas where the presence of explosive gases is possible. The producer ensures the operation of the product and is engaged to eliminate all the defects on the product in the period of normal usage. If the product is not repaired in 45 days, it will be replaced. The product has a one year guarantee from the purchase date. The guarantee is not valid in case of damages caused by incompetent electrical workers or atmospheric causes (the blow of direct or indirect lightning, caused static electricity from the thunderstorm).

The fence should be grounded. Resistance to the ground should be less than 20 Ohm. The manufacturer of the fence should be consulted on how to ground the fence. One must also consider the regulations regarding grounding protection of electrical equipment and buildings in one's country.

The guarantee is valid only for the product itself. The producer does not assume responsibility for other damages caused by malfunctioning or wrong operation of the product. The producer, moreover, does not assume responsibility for whichever type of damages caused by a third party protected with this product. In cases of this kind the plant must adequately be assured from the insurance agency.

The installation must be evaluated for proper operation at least in half year period and maintenance records must be kept. The guarantee is valid if the date of purchase on the guarantee certificate is proven from the stamp and from the company of the authorized dealer. The period of guarantee is extended for the repair time. Assistance and pieces of reciprocation for the product are assured for the period of 7 years.

## 9 Contact

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