

The product

Pexal® is an innovative pipe capable of responding to different installation techniques and different applications, from hot and cold potable water distribution, to centralized distribution, from convector and radiator heating systems to floor, wall and ceiling heating and air cooling systems, from compressed air distribution systems to industrial installations. The Pexal® Gas pipe with an outer yellow layer is suitable and is certified for transporting fuel gas inside buildings (for more details, please refer to the dedicated documentation).

The Pexal® multilayer pipes combine the advantages of synthetic materials and in particular of the crosslinked polyethylene such as resistance to abrasion and corrosion, chemical resistance and hygiene with those of aluminium such as resistance to high temperatures and pressures, dimensional stability, impermeability to oxygen and light, and low thermal expansion.

The result is a product consisting of different layers of materials that combined together allow excellent properties to be obtained which can not be reached by a pipe made of only one material.

Features

The characteristics of the Pexal® pipes make this product highly reliable and extremely easy to install.

- **Durability and mechanical strength**

The system has a durability of at least 50 years guaranteed by the product standards at pressures of 10 bar and temperatures up to 80°C (for more details see the “Application fields” section). For operating temperatures lower than the working temperature, the pipes can withstand pressures above 10 bar while maintaining a high degree of reliability over time. If it's necessary to make the pipes work beyond this limit, it is mandatory to consult the Valsir technical office to verify its feasibility.

- **Resistance to corrosion**

The total resistance to corrosion, to building materials and to the main chemical compounds allows them to be used for various applications, even industrial ones.

- **Smoothness and resistance to scale formation**

The extreme smoothness of the inner surface (roughness of 0.007 mm) prevents the formation of deposits such as limescale and also ensures low pressure drops over time.

- **Resistance to abrasion**

Crosslinked polyethylene is abrasion resistant, and this is a synonym of durability, since the pipes are not affected by the abrasive action of impurities that are carried by the water at high speed.

- **Flexibility and shape stability**

The combination of crosslinked polyethylene and aluminium guarantees excellent flexibility features in bending (also manual bending). The Pexal® pipe can be bent manually up to the 32 mm diameter and mechanically for the larger diameters, with curvature radii of up to 2.5 times the diameter. The excellence of the Pexal® pipes resides also in its extraordinary shape stability: once bent and installed, it maintains the configuration over time allowing a reduction of the number of anchoring clips needed, which in surface mounting is reduced by 40% of the clips required for plastic pipes such as PE-X, PE-RT, PP-R, PB, PVC-C etc. Thanks to these features, the Pexal® pipes are also the ideal solution in areas subjected to earthquakes.

- **Thermal expansion**

Thermal expansion is about 8 times lower than that of plastic pipes and is comparable to that of metal pipes. A 10 m Pexal® pipe subjected to a 50°C temperature difference will expand by 13 mm in contrast to a plastic pipe (crosslinked polyethylene) that expands by 90 mm.

- **Lightweight**

The pipes are extremely lightweight compared to metal pipes: the weight is 1/3 compared to that of a corresponding copper pipe and 1/10 compared to that of a corresponding steel pipe.

- **Acoustic insulation**

Crosslinked polyethylene is elastic and absorbs vibrations and therefore offers excellent acoustic insulation.

- **Oxygen and light barrier**

The butt-welded aluminium layer represents a permanent oxygen and light barrier, avoiding in this way the two main causes of algae formation and corrosion in plastic pipes.

- **Thermal conductivity**

The thermal conductivity of the pipe is 0.42 - 0.52 W/m·K (in relation to the diameter), approximately 900 times lower than that of copper, an aspect which is extremely important to ensure reduced temperature losses.

- **Hygiene**

Non-toxic materials are used for the pipes and fittings and the system is certified for drinking water distribution.

- **Ecology**

Pexal® is manufactured with fully recyclable materials, the production processes are energetically efficient in order to have a low impact on the environment. Valsir adopts Green Building principles, with an eye on environmental protection and conservation of resources.

Technical data

Typical technical data.

Features	Values	Testing methods
Material	Crosslinked polyethylene internal layer PE-Xb, internal bonding layer, intermediate aluminium layer, external bonding layer, crosslinked polyethylene external layer PE-Xb	-
Colour	RAL White 9003	-
Dimensions	14÷110 mm	-
Application	Hot and cold potable water distribution, convector and radiator heating systems, radiant heating and cooling systems, compressed air distribution systems, industrial installations.	-
Connections	By fittings Pexal® Brass, Bravopress®, Pexal® XL, Pexal® Easy e Pexal® Twist	-
Minimum operating temperature ⁽¹⁾	-60°C	-
Maximum temperature	+95°C/+100°C	EN ISO 21003-1
Maximum pressure	+10 bar	EN ISO 21003-1
Density at 23°C	> 0.950 g/cm ³ (crosslinked polyethylene)	-
Softening temperature	135°C	-
Thermal expansion coefficient	0.026 mm/m·K	-
Thermal conductivity	0.42÷0.52 W/m·K	-
Internal roughness	0.007 mm	-
Oxygen permeability	0 mg/l	-
UV Resistance	Yes, if protected with UV-resistant paint	-
Halogen levels	Halogen-free	-
Reaction to fire	C-s2,d0	EN 13501-1

(1) At any rate above the freezing temperature of the transported fluid.

Application fields

The conditions of use of the Pexal® pipes are shown in the technical data tables outlined above; however, according to the international standard EN ISO 21003-1 there are four classes of application or fields of use that need to be ascertained by performing laboratory tests in combination with the operating pressure p_D chosen by the producer which can be 4, 6, 8, 10 bar. These application fields are given in the table below. The Pexal® pipes are certified for all four classes of application for pressures up to 10 bar.

Application fields and operating conditions in compliance with EN ISO 21003-1.

Application fields	Operating temperature T_D	Duration of T_D	Maximum operating temperature T_{max}	Duration of T_{max}	Malfunctioning temperature T_{mal}	Duration of T_{mal}	Typical application
	[°C]	[years]	[°C]	[years]	[°C]	[hours]	
1 ^a	60	49	80	1	95	100	Domestic hot water (60°C)
2 ^a	70	49	80	1	95	100	Domestic hot water (70°C)
4 ^a	20	2.5	70	2.5	100	100	Floor heating and low temperature systems
	+	+					
	40	20					
	+	+					
5 ^a	60	25	90	1	100	100	High temperature heating systems
	+	+					
	80	10					

Range

The range of Pexal® pipes is extremely wide: they are produced in a 14 mm diameter to 110 mm diameter and are available in coils or straight lengths, without sheath, with 6 and 10 mm insulating sheath or with corrugated protective sheath.

Range of Pexal® pipes.

Pipe dimensions	Pexal® pipe in coils	Pexal® pipe in straight lengths	Pexal® pipe with 6 mm insulating sheath	Pexal® pipe with 10 mm insulating sheath	Pexal® pipe with corrugated protective sheath	Pexal® pipe with double corrugated protective sheath
14x2	100 m	5 m	50 m (grey)	-	-	-
16x2	100 m, 200 m	5 m	50 m (grey, red, blue)	50 m (blue)		50 m
16x2.25	100 m	5 m	50 m (grey)	50 m (blue)	-	-
18x2	100 m	5 m	50 m (grey)	-	-	-
20x2	100 m	5 m	50 m (grey, red, blue)	50 m (red, blue)	50 m (red, blue)	50 m
20x2.5	100 m	5 m	25 m (grey), 50 m (grey)	50 m (blue)	-	-
26x3	50 m	5 m	50 m (grey, red, blue)	50 m (red, blue)	50 m (red, blue)	-
32x3	50 m	5 m	-	25 m (grey, red)	25 m (red, blue)	-
40x3.5	-	5 m	-	-	-	-
50x4	-	5 m	-	-	-	-
63x4.5	-	5 m	-	-	-	-
75x5	-	5 m	-	-	-	-
90x7	-	5 m	-	-	-	-
110x10	-	5 m	-	-	-	-

Pexal® pipe features

Pexal® pipes without insulation are suitable for a multitude of applications and if necessary can be suitably insulated once the installation has been completed.

Pexal® pipe features (diameters from 14 to 26 mm).

External diameter	[mm]	14	16	16	18	20	20	26
Thickness	[mm]	2	2	2.25	2	2	2.5	3
Internal diameter	[mm]	10	12	11.5	14	16	15	20
Water volume	[l/m]	0.078	0.113	0.104	0.154	0.201	0.176	0.314
Weight	[g/m]	97	113	120	130	156	177	286
Weight with water	[g/m]	175	226	224	284	357	353	599
Maximum operating temperature	[°C]	95	95	95	95	95	95	95
Maximum operating pressure	[bar]	10	10	10	10	10	10	10
Thermal expansion coefficient	[mm/m·K]	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Thermal conductivity	[W/m·K]	0.44	0.44	0.43	0.44	0.47	0.45	0.47
Internal roughness	[mm]	0.007	0.007	0.007	0.007	0.007	0.007	0.007
Oxygen permeability	[mg/l]	0	0	0	0	0	0	0

Pexal® pipe features (diameters from 32 to 110 mm).

External diameter	[mm]	32	40	50	63	75	90	110
Thickness	[mm]	3	3.5	4	4.5	5	7	10
Internal diameter	[mm]	26	33	42	54	65	76	90
Water volume	[l/m]	0.53	0.854	1.383	2.286	3.312	4.528	6.362
Weight	[g/m]	390	545	833	1232	1603	2403	3810
Weight with water	[g/m]	919	1397	2213	3513	4908	6922	10159
Maximum operating temperature	[°C]	95	95	95	95	95	95	95
Maximum operating pressure	[bar]	10	10	10	10	10	10	10
Thermal expansion coefficient	[mm/m·K]	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Thermal conductivity	[W/m·K]	0.50	0.49	0.50	0.51	0.52	0.47	0.44
Internal roughness	[mm]	0.007	0.007	0.007	0.007	0.007	0.007	0.007
Oxygen permeability	[mg/l]	0	0	0	0	0	0	0

Multilayer Pexal® insulated pipe features

Pexal® pipes that are covered in the factory with thermal insulating sleeves are suitable in all applications that require a certain degree of insulation against condensation and against energy loss combined with an extremely practical and economic installation.



Multilayer Pexal® insulated pipe features.

Pipe	Insulation layer thickness	External diameter of the insulated pipe	Weight	Thermal conductivity of the insulated pipe
	[mm]	[mm]	[g/m]	[W/m·K]
14x2	6	26	105	0.055
16x2	6	28	121	0.054
16x2	10	36	133	0.049
16x2.25	6	28	138	0.057
16x2.25	10	36	150	0.051
18x2	6	30	139	0.054
20x2	6	32	166	0.053
20x2	10	40	179	0.048
20x2,5	6	32	199	0.057
20x2,5	10	40	212	0.051
26x3	6	38	304	0.060
26x3	10	46	320	0.053
32x3	10	52	430	0.052

The features of the material used for the production of the insulating sheath are indicated in the table.

Features of the material used for the production of the insulating sheath.

Features	Unit	Value
Material	-	High density closed cell polyethylene
Fire resistance class (EN 13501-1)	-	BL-s1,d0
Density	[kg/m³]	33
Thermal conductivity at 0°C	[W/m·K]	0,0331 ±2%
Thermal conductivity at 10°C	[W/m·K]	0,0346 ±2%
Thermal conductivity at 40°C	[W/m·K]	0,0384 ±2%
Traction resistance	[N/mm²]	>0.18
Ultimate elongation	[%]	>80
Water vapour diffusion resistance factor - μ	-	7400

Features of the multilayer Pexal® pipe with corrugated protective sheath

Pexal® pipes that are covered in the factory with a protective corrugated insulating sleeve are generally used in domestic water supply systems that require protection or the possibility of removing or replacing the pipes.



Features of the multilayer Pexal® pipe with corrugated protective sheath.

Pipe	Sheath thickness	External diameter of the pipe including the sheath	Weight	Crushing
	[mm]	[mm]	[g/m]	[N/m]
16x2	0.8	26.5	170	320
16x2 double	0.85	25	334	320
20x2	0.9	30.5	237	320
20x2 double	0.95	30.5	466	320
26x3	0.9	37.5	392	320
32x3	0.9	44.8	532	320

The features of the material used for the production of the corrugated protective sheath are indicated in the table.

Features of the material used for the production of the corrugated protective sheath.

Features	U.M.	Value
Material	-	High density polyethylene
Flame-retardant	-	No
Density	[kg/m ³]	961
Thermal conductivity	[W/m·K]	0.38
Traction resistance	[N/mm ²]	> 22
Ultimate elongation	[%]	> 350

Potability

The Pexal® system is suitable and has been certified by international institutes for applications in water supply distribution systems: Austria, Australia, Germany, France, Hungary, Italy, Holland, Poland, Romania, Russia, Ukraine, Great Britain, South Africa.

Certifications

The Pexal® system is manufactured and certified according to EN ISO 21003 Standards by the strictest certification bodies that control and frequently verify its performance in our production plants in Italy. The approvals of Valsir supply systems are available on the website www.valsir.it

The Pexal® system is EPD (Environmental Product Declaration) certified. This document describes environmental impacts of a specific quantity of material or service during the life cycle. The EPD document can be downloaded from the website www.valsir.it in the EPD area.

Connection systems

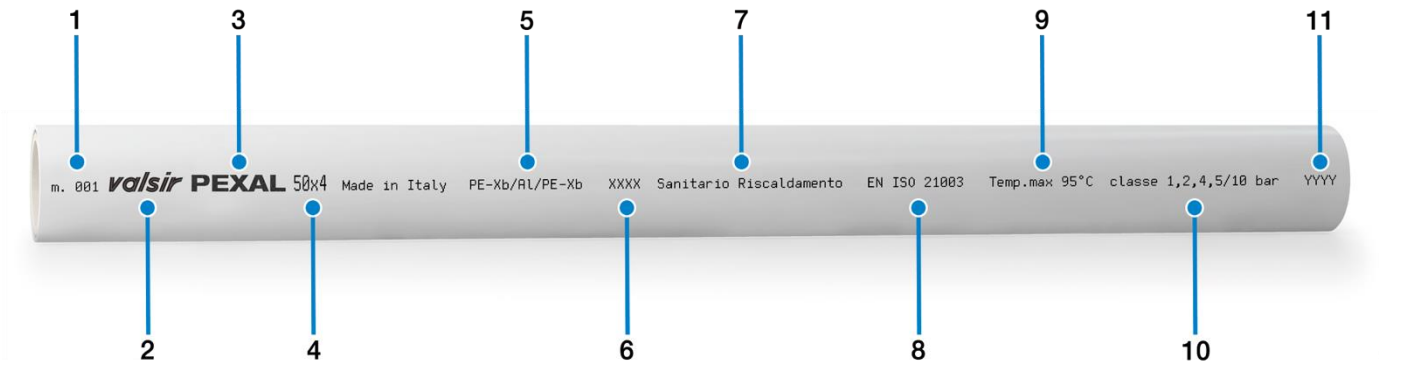
The Pexal® pipes can be combined with the different types of Valsir fittings.

Connection systems.

Pexal® pipe	Pexal® Brass Brass press fittings	Bravopress® Multi-press PPSU fittings	Pexal® Easy Full bore PPSU fittings	Pexal® Twist Brass compression fittings	Pexal® XL Modular PPSU fittings
14x2	•		•	•	
16x2	•	•	•	•	
16x2.25	•		•	•	
18x2	•			•	
20x2	•	•	•	•	
20x2.5	•		•	•	
26x3	•	•	•	•	
32x3	•	•	•	•	
40x3.5	•	•	•		
50x4	•	•	•		
63x4.5	•	•	•		
75x5	•		•		
90x7	•				•
110x10					•

Marking

The marking of the Pexal® pipes contains all the information required by current regulations as well as all the data necessary to trace the product.

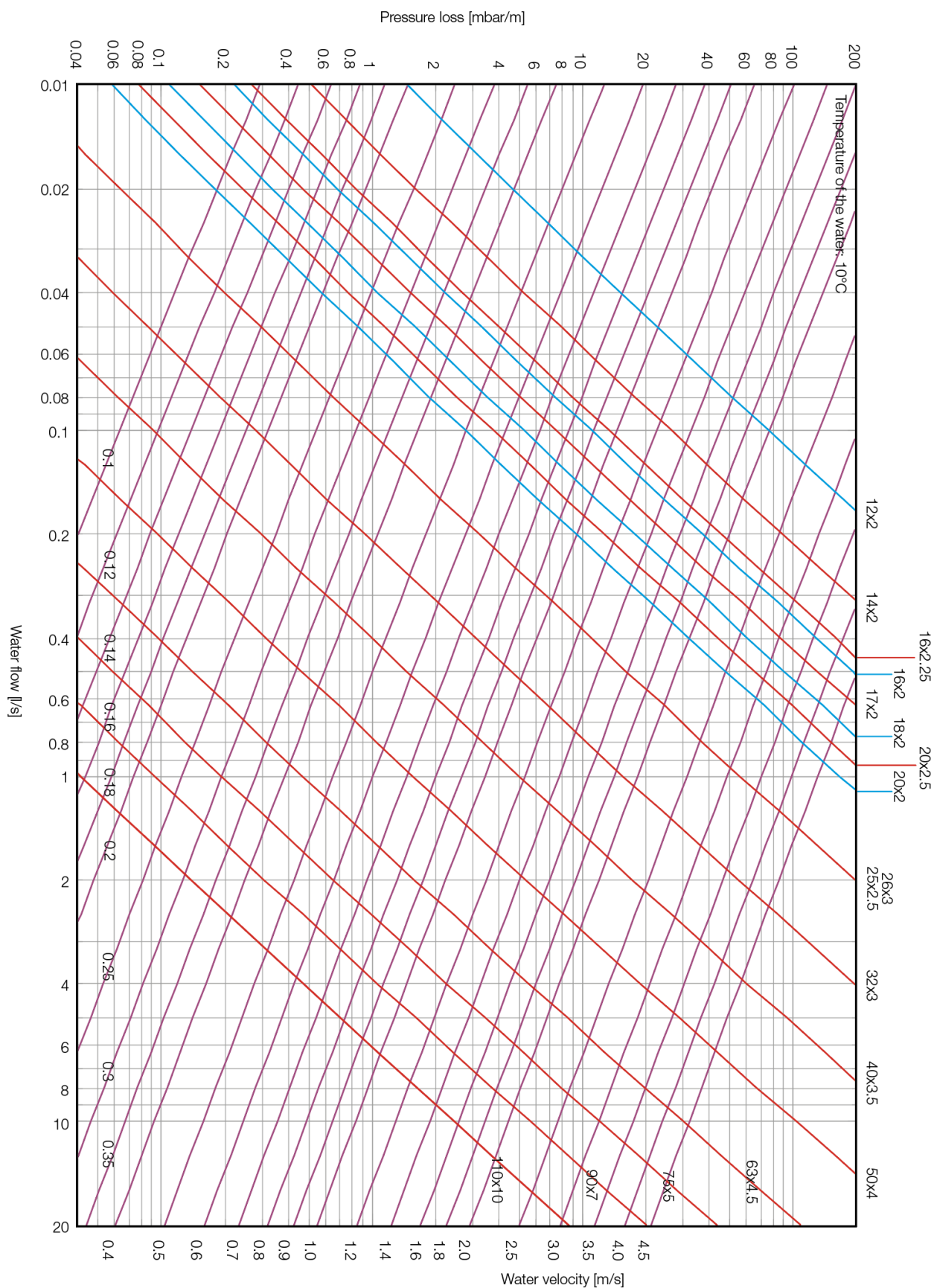


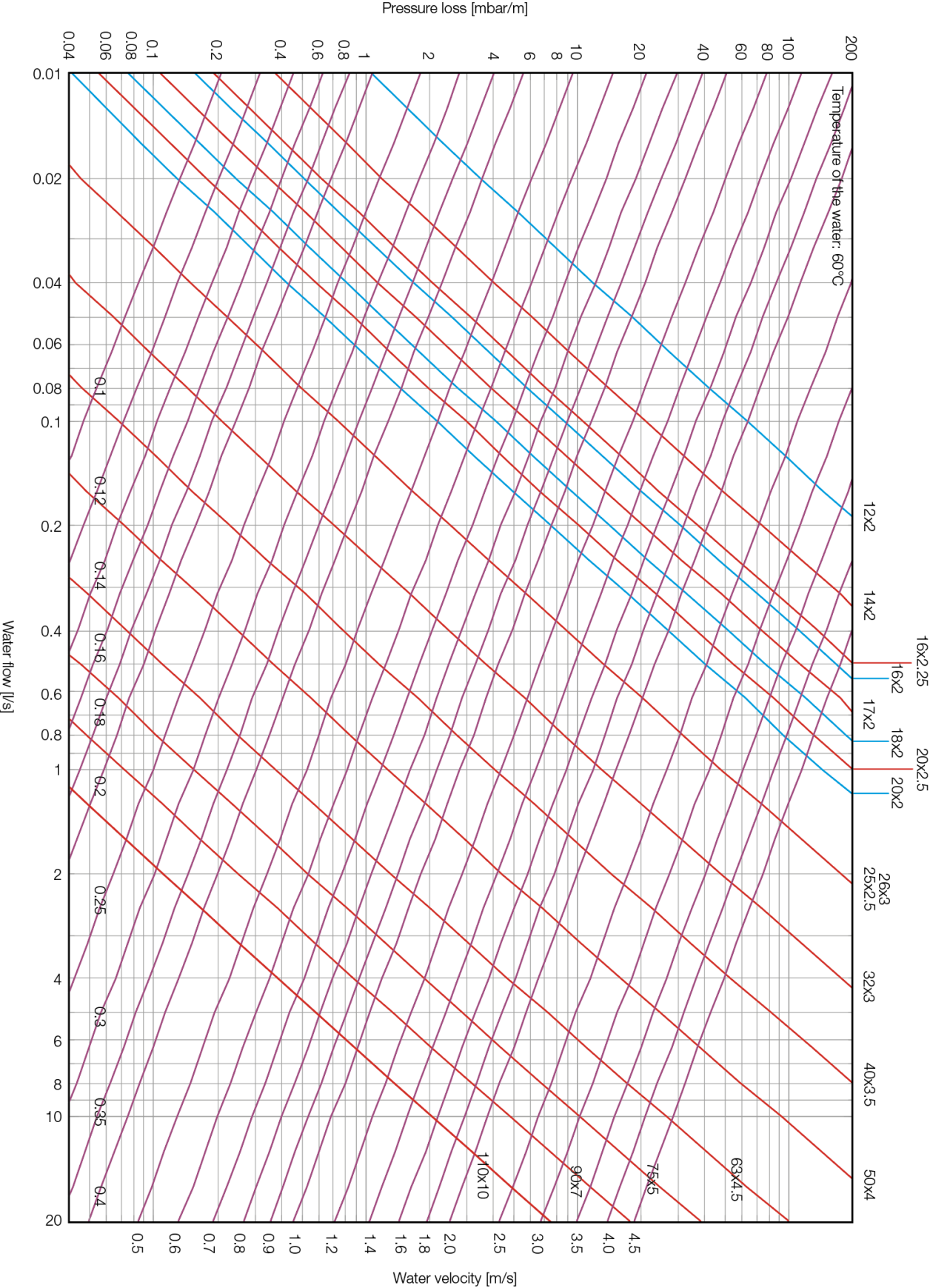
1. Length
2. Name of the manufacturer
3. Brand name (Pexal)
4. External diameter and thickness
5. Identification of material (PE-Xb/AL/PE-Xb)
6. Indication of production
7. Indication of the application area (water supply or heating)
8. Standard of reference
9. Maximum operating temperature
10. Application classes and maximum operating pressure
11. Indication of international certifications and product approvals

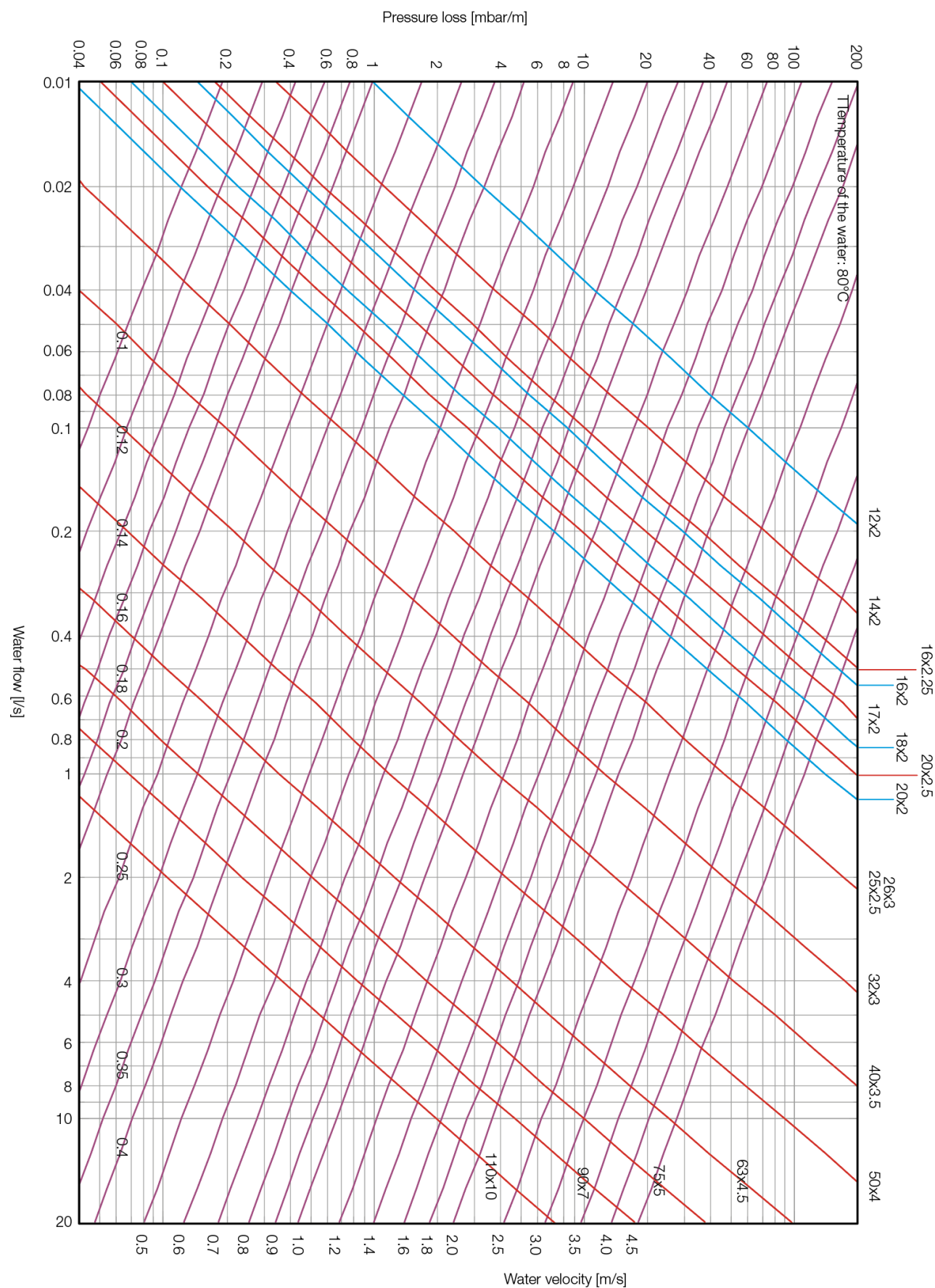
Continuous pressure losses

The calculation of continuous pressure losses is carried out by using the following diagrams that provide the loss values based on the water temperature. The diagrams also allow the flow velocity to be determined.

Continuous pressure losses for conveyance of water at 10°C.







Continuous pressure losses for conveyance of water at 10°C. (Q= water flow [l/s], v= velocity [m/s], J= pressure loss [mbar/m].)

Pipe	12x2		14x2		16x2.25		16x2		17x2		18x2		20x2.5	
Q	v	J	v	J	v	J	v	Q	v	J	v	J	v	J
0.01	0.2	1.5	0.1	0.5	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1
0.02	0.4	4.7	0.3	1.6	0.2	0.8	0.2	0.7	0.2	0.5	0.1	0.3	0.1	0.2
0.03	0.6	9.3	0.4	3.2	0.3	1.7	0.3	1.4	0.2	0.9	0.2	0.7	0.2	0.5
0.04	0.8	15.3	0.5	5.3	0.4	2.7	0.4	2.2	0.3	1.5	0.3	1.1	0.2	0.8
0.05	1.0	22.5	0.6	7.8	0.5	4.0	0.4	3.3	0.4	2.2	0.3	1.6	0.3	1.1
0.06	1.2	30.9	0.8	10.7	0.6	5.5	0.5	4.5	0.5	3.1	0.4	2.2	0.3	1.6
0.07	1.4	40.5	0.9	13.9	0.7	7.2	0.6	5.9	0.5	4.0	0.5	2.8	0.4	2.0
0.08	1.6	51.2	1.0	17.6	0.8	9.0	0.7	7.4	0.6	5.0	0.5	3.5	0.5	2.6
0.09	1.8	63.0	1.1	21.6	0.9	11.1	0.8	9.1	0.7	6.2	0.6	4.3	0.5	3.1
0.10	2.0	76.0	1.3	26.0	1.0	13.3	0.9	10.9	0.8	7.4	0.6	5.2	0.6	3.8
0.15	3.0	156.7	1.9	53.2	1.4	27.2	1.3	22.2	1.1	15.1	1.0	10.6	0.8	7.6
0.20	4.0	263.4	2.5	89.0	1.9	45.3	1.8	36.9	1.5	25.1	1.3	17.6	1.1	12.6
0.25	5.0	395.3	3.2	132.9	2.4	67.5	2.2	54.9	1.9	37.3	1.6	26.1	1.4	18.7
0.30	6.0	552.0	3.8	184.9	2.9	93.6	2.7	76.2	2.3	51.7	1.9	36.1	1.7	25.9
0.35			4.5	244.7	3.4	123.7	3.1	100.6	2.6	68.2	2.3	47.6	2.0	34.1
0.40			5.1	312.3	3.9	157.6	3.5	128.1	3.0	86.7	2.6	60.5	2.3	43.3
0.45			5.7	387.6	4.3	195.3	4.0	158.6	3.4	107.3	2.9	74.9	2.5	53.6
0.50					4.8	236.7	4.4	192.2	3.8	130.0	3.2	90.6	2.8	64.8
0.55					5.3	281.9	4.9	228.7	4.1	154.6	3.6	107.7	3.1	76.9
0.60					5.8	330.7	5.3	268.3	4.5	181.2	3.9	126.1	3.4	90.1
0.65							5.7	310.8	4.9	209.8	4.2	145.9	3.7	104.2
0.70									5.3	240.3	4.5	167.1	4.0	119.2
0.75									5.7	272.8	4.9	189.6	4.2	135.2
0.80											5.2	213.4	4.5	152.2
0.85											5.5	238.6	4.8	170.0
0.90											5.8	265.0	5.1	188.8
0.95													5.4	208.5
1.0													5.7	229.2
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Continuous pressure losses for conveyance of water at 10°C. (continue).

Pipe	20x2		25x2.5/26x3		32x3		40x3.5		50x4		63x4.5		75x5		90x7		110x10	
Q	v	J	v	J	v	J	v	J	v	J	v	J	v	J	v	J	v	J
0.01	0.0	0.1																
0.02	0.1	0.2	0.1	0.1														
0.03	0.1	0.4	0.1	0.1	0.1	0.0												
0.04	0.2	0.6	0.1	0.2	0.1	0.1												
0.05	0.2	0.8	0.2	0.3	0.1	0.1	0.1	0.0										
0.06	0.3	1.2	0.2	0.4	0.1	0.1	0.1	0.0										
0.07	0.3	1.5	0.2	0.5	0.1	0.2	0.1	0.0	0.1	0.0								
0.08	0.4	1.9	0.3	0.7	0.2	0.2	0.1	0.1	0.1	0.0								
0.09	0.4	2.3	0.3	0.8	0.2	0.2	0.1	0.1	0.1	0.0								
0.10	0.5	2.8	0.3	1.0	0.2	0.3	0.1	0.1	0.1	0.0								
0.15	0.7	5.6	0.5	1.9	0.3	0.6	0.2	0.2	0.1	0.1	0.1	0.0						
0.20	1.0	9.3	0.6	3.2	0.4	0.9	0.2	0.3	0.1	0.1	0.1	0.0	0.1	0.0				
0.25	1.2	13.8	0.8	4.7	0.5	1.4	0.3	0.4	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0		
0.30	1.5	19.0	1.0	6.5	0.6	1.9	0.4	0.6	0.2	0.2	0.1	0.1	0.1	0.0	0.1	0.0		
0.35	1.7	25.0	1.1	8.6	0.7	2.4	0.4	0.8	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.40	2.0	31.7	1.3	10.8	0.8	3.1	0.5	1.0	0.3	0.3	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.45	2.2	39.2	1.4	13.4	0.8	3.8	0.5	1.2	0.3	0.4	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.50	2.5	47.4	1.6	16.1	0.9	4.6	0.6	1.5	0.4	0.5	0.2	0.1	0.2	0.1	0.1	0.0	0.1	0.0
0.55	2.7	56.2	1.8	19.1	1.0	5.4	0.6	1.7	0.4	0.5	0.2	0.2	0.2	0.1	0.1	0.0	0.1	0.0
0.60	3.0	65.8	1.9	22.3	1.1	6.3	0.7	2.0	0.4	0.6	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0
0.65	3.2	76.1	2.1	25.8	1.2	7.3	0.8	2.3	0.5	0.7	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0
0.70	3.5	87.0	2.2	29.5	1.3	8.3	0.8	2.6	0.5	0.8	0.3	0.3	0.2	0.1	0.2	0.0	0.1	0.0
0.75	3.7	98.7	2.4	33.4	1.4	9.4	0.9	3.0	0.5	0.9	0.3	0.3	0.2	0.1	0.2	0.1	0.1	0.0
0.80	4.0	111.0	2.5	37.5	1.5	10.5	0.9	3.4	0.6	1.1	0.3	0.3	0.2	0.1	0.2	0.1	0.1	0.0
0.85	4.2	124.0	2.7	41.8	1.6	11.8	1.0	3.7	0.6	1.2	0.4	0.4	0.3	0.1	0.2	0.1	0.1	0.0
0.90	4.5	137.6	2.9	46.4	1.7	13.0	1.1	4.1	0.6	1.3	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.0
0.95	4.7	151.9	3.0	51.1	1.8	14.3	1.1	4.6	0.7	1.4	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.0
1.0	5.0	166.9	3.2	56.1	1.9	15.7	1.2	5.0	0.7	1.6	0.4	0.5	0.3	0.2	0.2	0.1	0.2	0.0
1.1	5.5	198.9	3.5	66.7	2.1	18.7	1.3	5.9	0.8	1.9	0.5	0.6	0.3	0.2	0.2	0.1	0.2	0.0
1.2	6.0	233.5	3.8	78.2	2.3	21.8	1.4	6.9	0.9	2.2	0.5	0.7	0.4	0.3	0.3	0.1	0.2	0.0
1.3			4.1	90.5	2.4	25.2	1.5	8.0	0.9	2.5	0.6	0.8	0.4	0.3	0.3	0.1	0.2	0.0
1.4			4.5	103.7	2.6	28.9	1.6	9.1	1.0	2.9	0.6	0.9	0.4	0.4	0.3	0.2	0.2	0.1
1.5			4.8	117.7	2.8	32.7	1.8	10.3	1.1	3.2	0.7	1.0	0.5	0.4	0.3	0.2	0.2	0.1
1.6			5.1	132.5	3.0	36.8	1.9	11.6	1.2	3.6	0.7	1.1	0.5	0.4	0.4	0.2	0.3	0.1
1.7			5.4	148.1	3.2	41.1	2.0	12.9	1.2	4.0	0.7	1.2	0.5	0.5	0.4	0.2	0.3	0.1
1.8			5.7	164.6	3.4	45.6	2.1	14.3	1.3	4.5	0.8	1.3	0.5	0.6	0.4	0.3	0.3	0.1
1.9					3.6	50.3	2.2	15.8	1.4	4.9	0.8	1.5	0.6	0.6	0.4	0.3	0.3	0.1
2.0					3.8	55.2	2.3	17.3	1.4	5.4	0.9	1.6	0.6	0.7	0.4	0.3	0.3	0.1
2.1					4.0	60.4	2.5	18.9	1.5	5.9	0.9	1.8	0.6	0.7	0.5	0.3	0.3	0.1
2.2					4.1	65.8	2.6	20.6	1.6	6.4	1.0	1.9	0.7	0.8	0.5	0.4	0.3	0.1
2.3					4.3	71.3	2.7	22.3	1.7	6.9	1.0	2.1	0.7	0.9	0.5	0.4	0.4	0.1
2.4					4.5	77.1	2.8	24.1	1.7	7.5	1.0	2.2	0.7	0.9	0.5	0.4	0.4	0.1
2.5					4.7	83.1	2.9	26.0	1.8	8.1	1.1	2.4	0.8	1.0	0.6	0.5	0.4	0.2
2.6					4.9	89.4	3.0	27.9	1.9	8.7	1.1	2.6	0.8	1.1	0.6	0.5	0.4	0.2
2.7					5.1	95.8	3.2	29.9	1.9	9.3	1.2	2.8	0.8	1.1	0.6	0.5	0.4	0.2
2.8					5.3	102.4	3.3	31.9	2.0	9.9	1.2	2.9	0.8	1.2	0.6	0.6	0.4	0.2
2.9					5.5	109.3	3.4	34.0	2.1	10.6	1.3	3.1	0.9	1.3	0.6	0.6	0.5	0.2
3.0					5.7	116.3	3.5	36.2	2.2	11.2	1.3	3.3	0.9	1.4	0.7	0.6	0.5	0.2
3.5							4.1	48.0	2.5	14.8	1.5	4.4	1.1	1.8	0.8	0.8	0.6	0.3
4.0							4.7	61.4	2.9	18.9	1.7	5.6	1.2	2.3	0.9	1.1	0.6	0.4
4.5							5.3	76.3	3.2	23.5	2.0	6.9	1.4	2.8	1.0	1.3	0.7	0.4
5.0							5.8	92.7	3.6	28.4	2.2	8.4	1.5	3.4	1.1	1.6	0.8	0.5
5.5									4.0	33.9	2.4	10.0	1.7	4.1	1.2	1.9	0.9	0.6
6									4.3	39.7	2.6	11.7	1.8	4.8	1.3	2.2	0.9	0.8
7									5.1	52.8	3.1	15.5	2.1	6.3	1.5	2.9	1.1	1.0
8									5.8	67.6	3.5	19.7	2.4	8.0	1.8	3.8	1.3	1.3
9											3.9	24.5	2.7	9.9	2.0	4.7	1.4	1.6
10											4.4	29.8	3.0	12.0	2.2	5.6	1.6	2.0
11											4.8	35.5	3.3	14.3	2.4	6.7	1.7	2.3
12											5.2	41.7	3.6	16.8	2.6	7.9	1.9	2.8
13											5.7	48.4	3.9	19.5	2.9	9.1	2.0	3.2
14													4.2	22.3	3.1	10.4	2.2	3.7
15													4.5	25.4	3.3	11.8	2.4	4.2
16													4.8	28.6	3.5	13.3	2.5	4.8
18													5.4	35.6	4.0	16.5	2.8	5.9
20															4.4	20.1	3.1	7.3
22															4.8	23.9	3.5	8.7
24															5.3	28.1	3.8	10.3
26															5.7	32.6	4.1	12.0

Continuous pressure losses for conveyance of water at 60°C. (Q= water flow [l/s], v= velocity [m/s], J= pressure loss [mbar/m].)

Pipe	12x2		14x2		16x2.25		16x2		17x2		18x2		20x2.5	
Q	v	J	v	J	v	J	v	Q	v	J	v	J	v	J
0.01	0.2	1.1	0.1	0.4	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
0.02	0.4	3.5	0.3	1.2	0.2	0.6	0.2	0.5	0.2	0.3	0.1	0.2	0.1	0.2
0.03	0.6	7.2	0.4	2.5	0.3	1.3	0.3	1.0	0.2	0.7	0.2	0.5	0.2	0.4
0.04	0.8	11.9	0.5	4.1	0.4	2.1	0.4	1.7	0.3	1.2	0.3	0.8	0.2	0.6
0.05	1.0	17.7	0.6	6.0	0.5	3.1	0.4	2.5	0.4	1.7	0.3	1.2	0.3	0.9
0.06	1.2	24.6	0.8	8.4	0.6	4.3	0.5	3.5	0.5	2.4	0.4	1.7	0.3	1.2
0.07	1.4	32.5	0.9	11.0	0.7	5.6	0.6	4.6	0.5	3.1	0.5	2.2	0.4	1.6
0.08	1.6	41.4	1.0	14.0	0.8	7.1	0.7	5.8	0.6	3.9	0.5	2.8	0.5	2.0
0.09	1.8	51.4	1.1	17.3	0.9	8.8	0.8	7.1	0.7	4.9	0.6	3.4	0.5	2.4
0.10	2.0	62.3	1.3	20.9	1.0	10.6	0.9	8.6	0.8	5.9	0.6	4.1	0.6	2.9
0.15	3.0	131.5	1.9	43.7	1.4	22.1	1.3	17.9	1.1	12.1	1.0	8.5	0.8	6.1
0.20	4.0	225.0	2.5	74.3	1.9	37.3	1.8	30.3	1.5	20.5	1.3	14.3	1.1	10.2
0.25	5.0	342.3	3.2	112.4	2.4	56.3	2.2	45.6	1.9	30.8	1.6	21.4	1.4	15.3
0.30	6.0	483.4	3.8	157.9	2.9	78.9	2.7	63.9	2.3	43.0	1.9	29.9	1.7	21.3
0.35			4.5	211.0	3.4	105.1	3.1	85.1	2.6	57.2	2.3	39.7	2.0	28.3
0.40			5.1	271.4	3.9	134.9	3.5	109.1	3.0	73.3	2.6	50.8	2.3	36.2
0.45			5.7	339.2	4.3	168.3	4.0	136.1	3.4	91.4	2.9	63.2	2.5	45.0
0.50					4.8	205.3	4.4	165.9	3.8	111.3	3.2	77.0	2.8	54.7
0.55					5.3	245.8	4.9	198.6	4.1	133.1	3.6	92.0	3.1	65.3
0.60					5.8	289.9	5.3	234.1	4.5	156.7	3.9	108.3	3.4	76.8
0.65							5.7	272.4	4.9	182.3	4.2	125.8	3.7	89.2
0.70									5.3	209.7	4.5	144.7	4.0	102.5
0.75									5.7	239.0	4.9	164.8	4.2	116.7
0.80											5.2	186.2	4.5	131.8
0.85											5.5	208.9	4.8	147.8
0.90											5.8	232.8	5.1	164.7
0.95													5.4	182.4
1.0													5.7	201.1
1.1														
1.2														
1.3														
1.4														
1.5														
1.6														
1.7														
1.8														
1.9														
2.0														
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Continuous pressure losses for conveyance of water at 60°C. (continue)

Pipe	20x2		25x2.5/26x3		32x3		40x3.5		50x4		63x4.5		75x5		90x7		110x10	
Q	v	J	v	J	v	J	v	J	v	J	v	J	v	J	v	J	v	J
0.01	0.0	0.0																
0.02	0.1	0.1	0.1	0.0														
0.03	0.1	0.3	0.1	0.1	0.1													
0.04	0.2	0.4	0.1	0.2	0.1													
0.05	0.2	0.6	0.2	0.2	0.1	0.1	0.1	0.0										
0.06	0.3	0.9	0.2	0.3	0.1	0.1	0.1	0.0										
0.07	0.3	1.1	0.2	0.4	0.1	0.1	0.1	0.0	0.1	0.0								
0.08	0.4	1.5	0.3	0.5	0.2	0.1	0.1	0.0	0.1	0.0								
0.09	0.4	1.8	0.3	0.6	0.2	0.2	0.1	0.1	0.1	0.0								
0.10	0.5	2.2	0.3	0.7	0.2	0.2	0.1	0.1	0.1	0.0								
0.15	0.7	4.4	0.5	1.5	0.3	0.4	0.2	0.1	0.1	0.0	0.1	0.0						
0.20	1.0	7.4	0.6	2.5	0.4	0.7	0.2	0.2	0.1	0.1	0.1	0.0	0.1	0.0				
0.25	1.2	11.1	0.8	3.8	0.5	1.1	0.3	0.3	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0		
0.30	1.5	15.5	1.0	5.2	0.6	1.5	0.4	0.5	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0		
0.35	1.7	20.6	1.1	6.9	0.7	1.9	0.4	0.6	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.40	2.0	26.3	1.3	8.8	0.8	2.5	0.5	0.8	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.45	2.2	32.7	1.4	10.9	0.8	3.1	0.5	1.0	0.3	0.3	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.50	2.5	39.7	1.6	13.3	0.9	3.7	0.6	1.2	0.4	0.4	0.2	0.1	0.2	0.0	0.1	0.0	0.1	0.0
0.55	2.7	47.4	1.8	15.8	1.0	4.4	0.6	1.4	0.4	0.4	0.2	0.1	0.2	0.1	0.1	0.0	0.1	0.0
0.60	3.0	55.8	1.9	18.6	1.1	5.1	0.7	1.6	0.4	0.5	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0
0.65	3.2	64.7	2.1	21.5	1.2	6.0	0.8	1.9	0.5	0.6	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0
0.70	3.5	74.4	2.2	24.7	1.3	6.8	0.8	2.1	0.5	0.7	0.3	0.2	0.2	0.1	0.2	0.0	0.1	0.0
0.75	3.7	84.6	2.4	28.0	1.4	7.7	0.9	2.4	0.5	0.8	0.3	0.2	0.2	0.1	0.2	0.0	0.1	0.0
0.80	4.0	95.5	2.5	31.6	1.5	8.7	0.9	2.7	0.6	0.8	0.3	0.3	0.2	0.1	0.2	0.0	0.1	0.0
0.85	4.2	107.1	2.7	35.3	1.6	9.7	1.0	3.0	0.6	0.9	0.4	0.3	0.3	0.1	0.2	0.1	0.1	0.0
0.90	4.5	119.2	2.9	39.3	1.7	10.8	1.1	3.4	0.6	1.0	0.4	0.3	0.3	0.1	0.2	0.1	0.1	0.0
0.95	4.7	132.0	3.0	43.5	1.8	11.9	1.1	3.7	0.7	1.2	0.4	0.3	0.3	0.1	0.2	0.1	0.1	0.0
1.0	5.0	145.5	3.2	47.8	1.9	13.1	1.2	4.1	0.7	1.3	0.4	0.4	0.3	0.2	0.2	0.1	0.2	0.0
1.1	5.5	174.3	3.5	57.2	2.1	15.6	1.3	4.9	0.8	1.5	0.5	0.4	0.3	0.2	0.2	0.1	0.2	0.0
1.2	6.0	205.6	3.8	67.3	2.3	18.4	1.4	5.7	0.9	1.8	0.5	0.5	0.4	0.2	0.3	0.1	0.2	0.0
1.3			4.1	78.3	2.4	21.3	1.5	6.6	0.9	2.0	0.6	0.6	0.4	0.2	0.3	0.1	0.2	0.1
1.4			4.5	90.0	2.6	24.5	1.6	7.6	1.0	2.3	0.6	0.7	0.4	0.3	0.3	0.1	0.2	0.1
1.5			4.8	102.5	2.8	27.8	1.8	8.6	1.1	2.6	0.7	0.8	0.5	0.3	0.3	0.2	0.2	0.1
1.6			5.1	115.8	3.0	31.4	1.9	9.7	1.2	3.0	0.7	0.9	0.5	0.4	0.4	0.2	0.3	0.1
1.7			5.4	129.9	3.2	35.1	2.0	10.8	1.2	3.3	0.7	1.0	0.5	0.4	0.4	0.2	0.3	0.1
1.8			5.7	144.8	3.4	39.1	2.1	12.0	1.3	3.7	0.8	1.1	0.5	0.4	0.4	0.2	0.3	0.1
1.9					3.6	43.3	2.2	13.3	1.4	4.1	0.8	1.2	0.6	0.5	0.4	0.2	0.3	0.1
2.0					3.8	47.6	2.3	14.6	1.4	4.5	0.9	1.3	0.6	0.5	0.4	0.3	0.3	0.1
2.1					4.0	52.2	2.5	16.0	1.5	4.9	0.9	1.4	0.6	0.6	0.5	0.3	0.3	0.1
2.2					4.1	57.0	2.6	17.5	1.6	5.3	1.0	1.6	0.7	0.6	0.5	0.3	0.3	0.1
2.3					4.3	62.0	2.7	19.0	1.7	5.8	1.0	1.7	0.7	0.7	0.5	0.3	0.4	0.1
2.4					4.5	67.2	2.8	20.5	1.7	6.3	1.0	1.8	0.7	0.7	0.5	0.4	0.4	0.2
2.5					4.7	72.5	2.9	22.2	1.8	6.8	1.1	2.0	0.8	0.8	0.6	0.4	0.4	0.2
2.6					4.9	78.1	3.0	23.9	1.9	7.3	1.1	2.1	0.8	0.9	0.6	0.4	0.4	0.2
2.7					5.1	83.9	3.2	25.6	1.9	7.8	1.2	2.3	0.8	0.9	0.6	0.4	0.4	0.2
2.8					5.3	89.9	3.3	27.4	2.0	8.3	1.2	2.4	0.8	1.0	0.6	0.5	0.4	0.2
2.9					5.5	96.1	3.4	29.3	2.1	8.9	1.3	2.6	0.9	1.1	0.6	0.5	0.5	0.2
3.0					5.7	102.5	3.5	31.2	2.2	9.5	1.3	2.8	0.9	1.1	0.7	0.5	0.5	0.2
3.5							4.1	41.7	2.5	12.6	1.5	3.7	1.1	1.5	0.8	0.7	0.6	0.3
4.0							4.7	53.6	2.9	16.2	1.7	4.7	1.2	1.9	0.9	0.9	0.6	0.4
4.5							5.3	67.1	3.2	20.2	2.0	5.8	1.4	2.4	1.0	1.1	0.7	0.5
5.0							5.8	81.9	3.6	24.6	2.2	7.1	1.5	2.9	1.1	1.3	0.8	0.6
5.5									4.0	29.4	2.4	8.5	1.7	3.4	1.2	1.6	0.9	0.7
6									4.3	34.7	2.6	10.0	1.8	4.0	1.3	1.9	0.9	0.8
7									5.1	46.4	3.1	13.3	2.1	5.3	1.5	2.5	1.1	1.1
8									5.8	59.8	3.5	17.1	2.4	6.8	1.8	3.2	1.3	1.4
9											3.9	21.3	2.7	8.5	2.0	3.9	1.4	1.7
10											4.4	26.0	3.0	10.4	2.2	4.8	1.6	2.1
11											4.8	31.2	3.3	12.4	2.4	5.7	1.7	2.5
12											5.2	36.8	3.6	14.6	2.6	6.7	1.9	2.9
13											5.7	42.8	3.9	17.0	2.9	7.8	2.0	3.4
14													4.2	19.5	3.1	9.0	2.2	3.9
15													4.5	22.3	3.3	10.2	2.4	4.4
16													4.8	25.2	3.5	11.6	2.5	5.0
18													5.4	31.5	4.0	14.4	2.8	6.2
20															4.4	17.6	3.1	7.6
22															4.8	21.1	3.5	9.1
24															5.3	24.9	3.8	10.7
26															5.7	29.0	4.1	12.5

Continuous pressure losses for conveyance of water at 80°C. (Q= water flow [l/s], v= velocity [m/s], J= pressure loss [mbar/m].)

Pipe	12x2		14x2		16x2.25		16x2		17x2		18x2		20x2.5	
Q	v	J	v	J	v	J	v	Q	v	J	v	J	v	J
0.01	0.2	1.0	0.1	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.02	0.4	3.3	0.3	1.1	0.2	0.6	0.2	0.5	0.2	0.3	0.1	0.2	0.1	0.2
0.03	0.6	6.7	0.4	2.3	0.3	1.2	0.3	1.0	0.2	0.7	0.2	0.5	0.2	0.3
0.04	0.8	11.2	0.5	3.8	0.4	2.0	0.4	1.6	0.3	1.1	0.3	0.8	0.2	0.5
0.05	1.0	16.8	0.6	5.7	0.5	2.9	0.4	2.4	0.4	1.6	0.3	1.1	0.3	0.8
0.06	1.2	23.4	0.8	7.9	0.6	4.0	0.5	3.3	0.5	2.2	0.4	1.6	0.3	1.1
0.07	1.4	31.0	0.9	10.4	0.7	5.3	0.6	4.3	0.5	2.9	0.5	2.0	0.4	1.5
0.08	1.6	39.5	1.0	13.3	0.8	6.7	0.7	5.5	0.6	3.7	0.5	2.6	0.5	1.9
0.09	1.8	49.1	1.1	16.4	0.9	8.3	0.8	6.8	0.7	4.6	0.6	3.2	0.5	2.3
0.10	2.0	59.6	1.3	19.9	1.0	10.0	0.9	8.2	0.8	5.5	0.6	3.9	0.6	2.8
0.15	3.0	126.8	1.9	41.9	1.4	21.0	1.3	17.1	1.1	11.5	1.0	8.0	0.8	5.7
0.20	4.0	217.9	2.5	71.4	1.9	35.7	1.8	29.0	1.5	19.5	1.3	13.6	1.1	9.7
0.25	5.0	332.7	3.2	108.5	2.4	54.1	2.2	43.8	1.9	29.5	1.6	20.5	1.4	14.6
0.30	6.0	471.2	3.8	152.9	2.9	76.0	2.7	61.5	2.3	41.3	1.9	28.7	1.7	20.4
0.35			4.5	204.8	3.4	101.6	3.1	82.1	2.6	55.1	2.3	38.1	2.0	27.1
0.40			5.1	264.0	3.9	130.7	3.5	105.6	3.0	70.8	2.6	48.9	2.3	34.8
0.45			5.7	330.5	4.3	163.3	4.0	131.9	3.4	88.3	2.9	61.0	2.5	43.3
0.50					4.8	199.5	4.4	161.0	3.8	107.8	3.2	74.4	2.8	52.7
0.55					5.3	239.3	4.9	193.0	4.1	129.1	3.6	89.0	3.1	63.1
0.60					5.8	282.5	5.3	227.9	4.5	152.2	3.9	104.9	3.4	74.3
0.65							5.7	265.5	4.9	177.3	4.2	122.1	3.7	86.4
0.70									5.3	204.2	4.5	140.6	4.0	99.4
0.75									5.7	232.9	4.9	160.3	4.2	113.3
0.80											5.2	181.3	4.5	128.1
0.85											5.5	203.5	4.8	143.7
0.90											5.8	227.0	5.1	160.3
0.95													5.4	177.7
1.0													5.7	196.0
1.1														
1.2														
1.3														
1.4														
1.5														
1.6														
1.7														
1.8														
1.9														
2.0														
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Continuous pressure losses for conveyance of water at 80°C. (continue)

Pipe	20x2		25x2.5/26x3		32x3		40x3.5		50x4		63x4.5		75x5		90x7		110x10	
Q	v	J	v	J	v	J	v	J	v	J	v	J	v	J	v	J	v	J
0.01																		
0.02	0.1	0.1	0.1	0.0														
0.03	0.1	0.2	0.1	0.1	0.1	0.0												
0.04	0.2	0.4	0.1	0.1	0.1	0.0												
0.05	0.2	0.6	0.2	0.2	0.1	0.1	0.1	0.0										
0.06	0.3	0.8	0.2	0.3	0.1	0.1	0.1	0.0										
0.07	0.3	1.1	0.2	0.4	0.1	0.1	0.1	0.0	0.1	0.0								
0.08	0.4	1.4	0.3	0.5	0.2	0.1	0.1	0.0	0.1	0.0								
0.09	0.4	1.7	0.3	0.6	0.2	0.2	0.1	0.1	0.1	0.0								
0.10	0.5	2.0	0.3	0.7	0.2	0.2	0.1	0.1	0.1	0.0								
0.15	0.7	4.2	0.5	1.4	0.3	0.4	0.2	0.1	0.1	0.0	0.1	0.0						
0.20	1.0	7.1	0.6	2.4	0.4	0.7	0.2	0.2	0.1	0.1	0.1	0.0	0.1	0.0				
0.25	1.2	10.6	0.8	3.6	0.5	1.0	0.3	0.3	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0		
0.30	1.5	14.8	1.0	5.0	0.6	1.4	0.4	0.4	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0		
0.35	1.7	19.7	1.1	6.6	0.7	1.8	0.4	0.6	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.40	2.0	25.3	1.3	8.4	0.8	2.3	0.5	0.7	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.45	2.2	31.4	1.4	10.5	0.8	2.9	0.5	0.9	0.3	0.3	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.50	2.5	38.3	1.6	12.7	0.9	3.5	0.6	1.1	0.4	0.3	0.2	0.1	0.2	0.0	0.1	0.0	0.1	0.0
0.55	2.7	45.7	1.8	15.1	1.0	4.2	0.6	1.3	0.4	0.4	0.2	0.1	0.2	0.1	0.1	0.0	0.1	0.0
0.60	3.0	53.8	1.9	17.8	1.1	4.9	0.7	1.5	0.4	0.5	0.3	0.1	0.2	0.1	0.1	0.0	0.1	0.0
0.65	3.2	62.6	2.1	20.7	1.2	5.7	0.8	1.8	0.5	0.6	0.3	0.2	0.2	0.1	0.1	0.0	0.1	0.0
0.70	3.5	71.9	2.2	23.7	1.3	6.5	0.8	2.0	0.5	0.6	0.3	0.2	0.2	0.1	0.2	0.0	0.1	0.0
0.75	3.7	82.0	2.4	27.0	1.4	7.4	0.9	2.3	0.5	0.7	0.3	0.2	0.2	0.1	0.2	0.0	0.1	0.0
0.80	4.0	92.6	2.5	30.4	1.5	8.3	0.9	2.6	0.6	0.8	0.3	0.2	0.2	0.1	0.2	0.0	0.1	0.0
0.85	4.2	103.9	2.7	34.1	1.6	9.3	1.0	2.9	0.6	0.9	0.4	0.3	0.3	0.1	0.2	0.1	0.1	0.0
0.90	4.5	115.8	2.9	37.9	1.7	10.4	1.1	3.2	0.6	1.0	0.4	0.3	0.3	0.1	0.2	0.1	0.1	0.0
0.95	4.7	128.4	3.0	42.0	1.8	11.4	1.1	3.6	0.7	1.1	0.4	0.3	0.3	0.1	0.2	0.1	0.1	0.0
1.0	5.0	141.5	3.2	46.2	1.9	12.6	1.2	3.9	0.7	1.2	0.4	0.4	0.3	0.1	0.2	0.1	0.2	0.0
1.1	5.5	169.8	3.5	55.4	2.1	15.0	1.3	4.7	0.8	1.4	0.5	0.4	0.3	0.2	0.2	0.1	0.2	0.0
1.2	6.0	200.5	3.8	65.3	2.3	17.7	1.4	5.5	0.9	1.7	0.5	0.5	0.4	0.2	0.3	0.1	0.2	0.0
1.3			4.1	75.9	2.4	20.5	1.5	6.3	0.9	1.9	0.6	0.6	0.4	0.2	0.3	0.1	0.2	0.0
1.4			4.5	87.4	2.6	23.6	1.6	7.3	1.0	2.2	0.6	0.7	0.4	0.3	0.3	0.1	0.2	0.1
1.5			4.8	99.7	2.8	26.8	1.8	8.2	1.1	2.5	0.7	0.7	0.5	0.3	0.3	0.1	0.2	0.1
1.6			5.1	112.8	3.0	30.3	1.9	9.3	1.2	2.8	0.7	0.8	0.5	0.3	0.4	0.2	0.3	0.1
1.7			5.4	126.6	3.2	34.0	2.0	10.4	1.2	3.2	0.7	0.9	0.5	0.4	0.4	0.2	0.3	0.1
1.8			5.7	141.2	3.4	37.8	2.1	11.6	1.3	3.5	0.8	1.0	0.5	0.4	0.4	0.2	0.3	0.1
1.9					3.6	41.9	2.2	12.8	1.4	3.9	0.8	1.1	0.6	0.5	0.4	0.2	0.3	0.1
2.0					3.8	46.2	2.3	14.1	1.4	4.3	0.9	1.3	0.6	0.5	0.4	0.2	0.3	0.1
2.1					4.0	50.7	2.5	15.4	1.5	4.7	0.9	1.4	0.6	0.6	0.5	0.3	0.3	0.1
2.2					4.1	55.3	2.6	16.9	1.6	5.1	1.0	1.5	0.7	0.6	0.5	0.3	0.3	0.1
2.3					4.3	60.2	2.7	18.3	1.7	5.6	1.0	1.6	0.7	0.7	0.5	0.3	0.4	0.1
2.4					4.5	65.3	2.8	19.8	1.7	6.0	1.0	1.8	0.7	0.7	0.5	0.3	0.4	0.1
2.5					4.7	70.6	2.9	21.4	1.8	6.5	1.1	1.9	0.8	0.8	0.6	0.4	0.4	0.2
2.6					4.9	76.1	3.0	23.1	1.9	7.0	1.1	2.0	0.8	0.8	0.6	0.4	0.4	0.2
2.7					5.1	81.7	3.2	24.8	1.9	7.5	1.2	2.2	0.8	0.9	0.6	0.4	0.4	0.2
2.8					5.3	87.6	3.3	26.5	2.0	8.0	1.2	2.3	0.8	0.9	0.6	0.4	0.4	0.2
2.9					5.5	93.7	3.4	28.4	2.1	8.6	1.3	2.5	0.9	1.0	0.6	0.5	0.5	0.2
3.0					5.7	100.0	3.5	30.2	2.2	9.1	1.3	2.6	0.9	1.1	0.7	0.5	0.5	0.2
3.5							4.1	40.5	2.5	12.2	1.5	3.5	1.1	1.4	0.8	0.7	0.6	0.3
4.0							4.7	52.2	2.9	15.6	1.7	4.5	1.2	1.8	0.9	0.8	0.6	0.4
4.5							5.3	65.4	3.2	19.5	2.0	5.6	1.4	2.3	1.0	1.1	0.7	0.5
5.0							5.8	80.0	3.6	23.8	2.2	6.8	1.5	2.7	1.1	1.3	0.8	0.6
5.5									4.0	28.6	2.4	8.2	1.7	3.3	1.2	1.5	0.9	0.7
6									4.3	33.7	2.6	9.6	1.8	3.9	1.3	1.8	0.9	0.8
7									5.1	45.2	3.1	12.9	2.1	5.1	1.5	2.4	1.1	1.0
8									5.8	58.4	3.5	16.6	2.4	6.6	1.8	3.0	1.3	1.3
9											3.9	20.7	2.7	8.2	2.0	3.8	1.4	1.7
10											4.4	25.3	3.0	10.0	2.2	4.6	1.6	2.0
11											4.8	30.4	3.3	12.0	2.4	5.5	1.7	2.4
12											5.2	35.9	3.6	14.2	2.6	6.5	1.9	2.8
13											5.7	41.8	3.9	16.5	2.9	7.6	2.0	3.3
14													4.2	19.0	3.1	8.7	2.2	3.8
15													4.5	21.7	3.3	9.9	2.4	4.3
16													4.8	24.5	3.5	11.2	2.5	4.8
18													5.4	30.7	4.0	14.0	2.8	6.0
20															4.4	17.1	3.1	7.4
22															4.8	20.6	3.5	8.8
24															5.3	24.3	3.8	10.4
26															5.7	28.3	4.1	12.1

