PIPES

1.1 STANDARD and RIXc multilayer pipe

1.2 SYNTHETIC PIPES

1.1 HENCO STANDARD and RIXc multilayer pipe

The HENCO STANDARD and RIXc multilayer pipe is a multi-purpose pipe

	**Drinking water**	As drinking water pipes for both hot and cold water and for all possible types of drinking water quality (In accordance with European standard 98/83/EC).
	**Heating**	As a heating pipe.
	**Underfloor heating**	For heating and cooling floors, walls and ceilings.
	**Cooled water**	Suitable for cooling applications and ice water applications.
	**Rainwater**	As a rainwater pipe for reusing water inside buildings within the specified load values.
	**Gas**	As a gas pipe in countries where the the system has been tested and where a certificate is available.
	**Compressed air**	As compressed air piping in oil-free installations (with activated oil filter).
	**Heating oil**	As heating oil piping within the specified load values.
	**Other applications**	On request and subject to written consent from Henco.

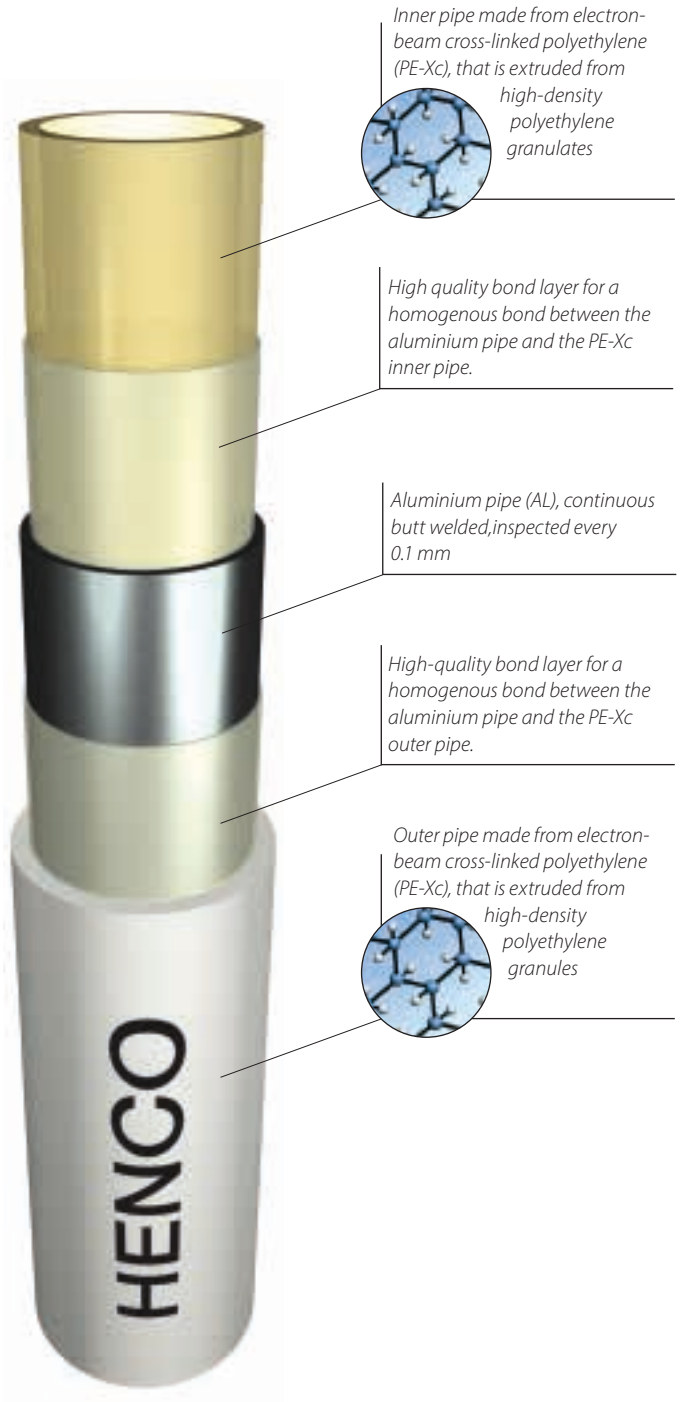
PE-Xc /AL / PE-Xc
100% QUALITY

Composition of the HENCO STANDARD and RIXc multilayer pipe (PE-Xc/AL/PE-Xc)

The Henco multilayer pipe consists of a continuous butt-welded aluminium pipe with an inner and outer 4 layer made from polyethylene that has been cross-linked using electron beams. The different layers are bonded to each other by a high quality connecting layer.
This results in the Henco multilayer pipe: a pipe that combines all of the advantages of synthetic materials and metal pipes.

The inner and outer pipe are made from polyethylene (HDPE) granulates which have been cross-linked using electron beams. Cross-linking multiplies the natural qualities of the polyethylene many times over. This improves the pressure and temperature resistance of the pipe. The pipe meets the most stringent requirements for drinking water installations, and is even resistant to aggressive substances.

The aluminium pipe guarantees that the pipe stays oxygen-tight and retains its shape. The butt welds along the length of the aluminium pipe ensure that the aluminium retains a consistent thickness. Consequently, the cross-linked outer layer that is applied with the connecting layer to the aluminium pipe by means of the bond layer will also have the same thickness. This also offers advantages when pressing, as it means that the press loads are perfectly distributed. Depending on the diameter of the pipe, the thickness of the aluminium layer is calculated in such a way that the pipe always retains the greatest flexibility and resistance to pressure.

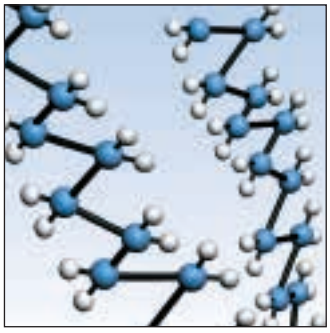


PE-Xc /AL / PE-Xc
100% QUALITY

Inner and outer pipes made from PE-Xc with guaranteed quality

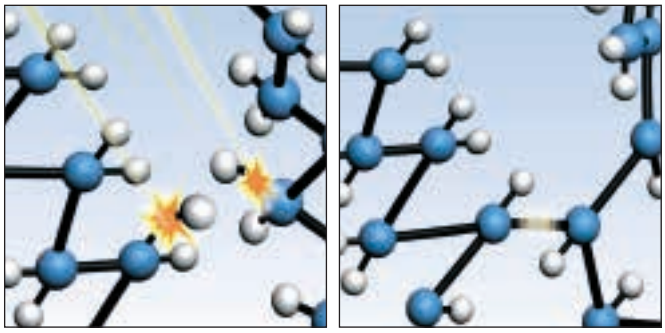
Henco produces multilayer pipes which have both an inner and outer pipe consisting of PE-Xc, electron-beam cross-linked polyethylene.

PE = stands for **polyethylene**
X = stands for **cross-linking**
c = stands for **cross-linking by means of electron beams,** in other words the process in which the polyethylene is cross-linked



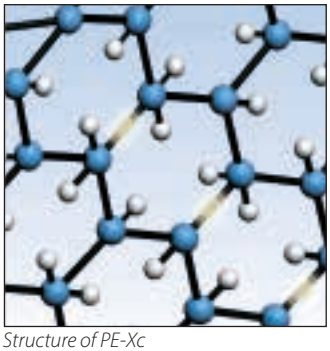
Structure of high-density polyethylene

Polyethylene is a plastic that consists of various chains of molecules. These chains are not directly connected to each other. The basic structure is kept together by weak mutual forces between the molecules. When heated, the chains move further away from each other. This makes the material become softer, more elastic and less pressure-resistant. In other words, polyethylene is less suited to sanitary applications or heating.



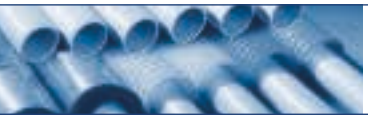
Cross-linking process by means of electron beams

Exposing the multilayer pipe to intense electron beams creates **cross connections** between the different molecular chains in the plastic. The electrons cause the hydrogen atoms to split from the various polyethylene chains. This enables carbon atoms to bond to each other and form a strong cross-linked structure.



Structure of PE-Xc

The cross connections mean the movement of the chains with respect to each other is kept to a minimum. Applying heat or another form of energy will not distort, the strong structure of the pipe. Cross-linked polyethylene displays optimal behaviour under continuous loads due to pressure or temperature loads. Cross-linking gives **enormous durability**.



1 PIPES

The best and most accurate way of cross-linking polyethylene is through the use of electron beams.

Polyethylene can be cross-linked in the following ways:

a. **PE-Xa**: the so-called Engel process, where the polyethylene is mixed with highly concentrated organic peroxide. The peroxide enables bonding to occur to take place between the polyethylene chains. This is a chemical method..

b. **PE-Xb**: cross-linking is achieved by adding silane to the polyethylene, followed by a water treatment. This is a chemical method.

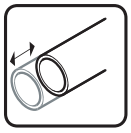
c. **PE-Xc**: in contrast to the two previous methods, cross-linking takes place during a second process when the pipe is exposed to intense electron beams. The beams excite the polyethylene molecules so much that they cross-link. This is a physical method.

The German standard DIN 16892 determines the minimum degree of cross-linking for each of the methods.

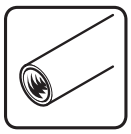
Cross-linking methods		Procedure	
Description	Minimum cross-linking levels according to DIN 16892 standard	Physical	Chemical
PE-Xa	70 %		Peroxide
PE-Xb	65 %		Silane
PE-Xc	60 %	Electron beams	

So you can see that in order to meet the standard, a PE-Xa pipe needs 70% cross-linking, a PE-Xb pipe needs 65% cross-linking and a PE-Xc pipe needs only 60% cross-linking. Furthermore, the PE-Xc is a physical method which means that no chemical additives are used, so by definition the pipe does not have to be rinsed for sanitary use.

Resistant to temperature and pressure
The working temperature can be up to 95°C, and the maximum working pressure 10 bar.



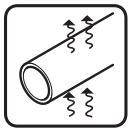
Minimum linear expansion
The aluminium layer in the Henco pipe means that it has a coefficient of expansion comparable to that of copper and 8 times less than an ordinary plastic pipe.
Its coefficient of expansion is 0.025 mm/mK.



Resistant to corrosion
The smooth inner and outer surfaces of the pipe prevents the build-up of scale or other debris.
This avoids sedimentation and corrosion are avoided. The smoothness of the inner pipe also ensures for minimum pressure loss.

Retains its shape
The pipe retains the required shape after bending. Unlike other synthetic pipes it does not have a thermal memory. This simplifies and speeds up the installation of the pipe and the assembly of any fittings.

Resistant to wear
The outer and inner pipe are made from polyethylene that has been cross-linked using electron beams. This means that the pipe does not suffer wear, even at high temperatures and flow rates.



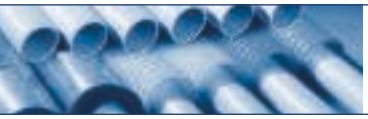
Fully sealed against oxygen and water vapour (diffusion)
The integrated aluminium layer prevents the penetration of oxygen into the pipe. This avoids corrosion problems with any metal components in the installation.

Lightweight (which means fast and simple assembly)
Fast and simple installation saves you time and money. The Henco pipe is flexible and extremely light.
A coil of 200 m HENCO STANDARD 16X2 weighs a mere 25 kg.

Long life
If the pipe is used according to the specified working pressure and temperature,
it will have a guaranteed working life of at least 50 years.

No noise problems
In contrast to metal pipes, water shock or flow noises do not cause noise problems in these pipes if the correct diameter is chosen. You can avoid contact noises through correct assembly.

From drinking water (in accordance with 98/83/EC) to chemical liquids
The pipe meets the most stringent toxicological and hygienic requirements. It is totally suitable for transporting drinking water. The pipe is also resistant to various liquid chemicals..



Technical properties of the HENCO STANDARD and RIXc multilayer pipe

Technical profile of the HENCO STANDARD and RIXc multilayer pipe

Outer diameter (mm)	12	14	16	16 RIXC	18	18 RIXC	20	20 RIXC	26	26 RIXC	32	40	50	63	75	90
Inner diameter (mm)	8.8	10	12	12	14	14	16	16	20	20	26	33	42	54	63	76
Wall thickness (mm)	1.6	2	2	2	2	2	2	2	3	3	3	3.5	4	4.5	6	7
Max. working temperature (°C) **	60	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Max. working pressure (bar)	6	10	16	10	10	10	16	10	16	10	16	10	10	10	10	10
Application class (EN ISO21003-1)	4	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5
Coefficient of thermal conductivity (W/mK)	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0,43
Coefficient of linear expansion (mm/mK)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0,025
Minimum tensile strength of adhesive layer (N/10 mm)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Surface roughness of inner pipe (µ)	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Oxygen diffusion (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Min. bending radius, manual/external spiral spring (mm)	5XDU	5XDU	5XDU	5XDU	5XDU	5XDU	5XDU	5XDU	5XDU	5XDU	*	*	*	*	*	*
Min. bending radius, manual/internal spiral spring (mm)	3XDU	3XDU	3XDU+	3XDU+	3XDU	3XDU	3XDU	3XDU	3XDU	3XDU	*	*	*	*	*	*
Degree of cross-linking (%)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Weight (kg/m)	0,084	0,108	0,125	0,101	0,132	0,125	0,147	0,129	0,285	0,261	0,390	0,528	0,766	1,155	1,516	2,155
Flow (l/h)	0.061	0.079	0.113	0.113	0.154	0.154	0.201	0.201	0.314	0.314	0.531	0.855	1.385	2.29	3.117	4,536

* Elbow fittings should be used here

** Application class table (EN ISO 21003-1)

+ 2XDU when using a BM-16 bending tool

Application class table (EN ISO 21003-1 / ISO 10508)

Application class table (EN ISO 21003-1)							
Application class	T_D	Time [a]	T_{max}	Time	T_{mal}	Time	Typical application
	°C	years	°C	years	°C	h	
1[a]	60	49	80	1	95	100	Hot water supply (60°C)
2[a]	70	49	80	1	95	100	Hot water supply (70°C)
4[b]	20 + cumulative 40 + cumulative 60	2.5 20 25	70	2.5	100	100	Underfloor heating and low-temperature radiators
5[b]	20 + cumulative 60 + cumulative 80	14 25 10	90	1	100	100	High-temperature radiators

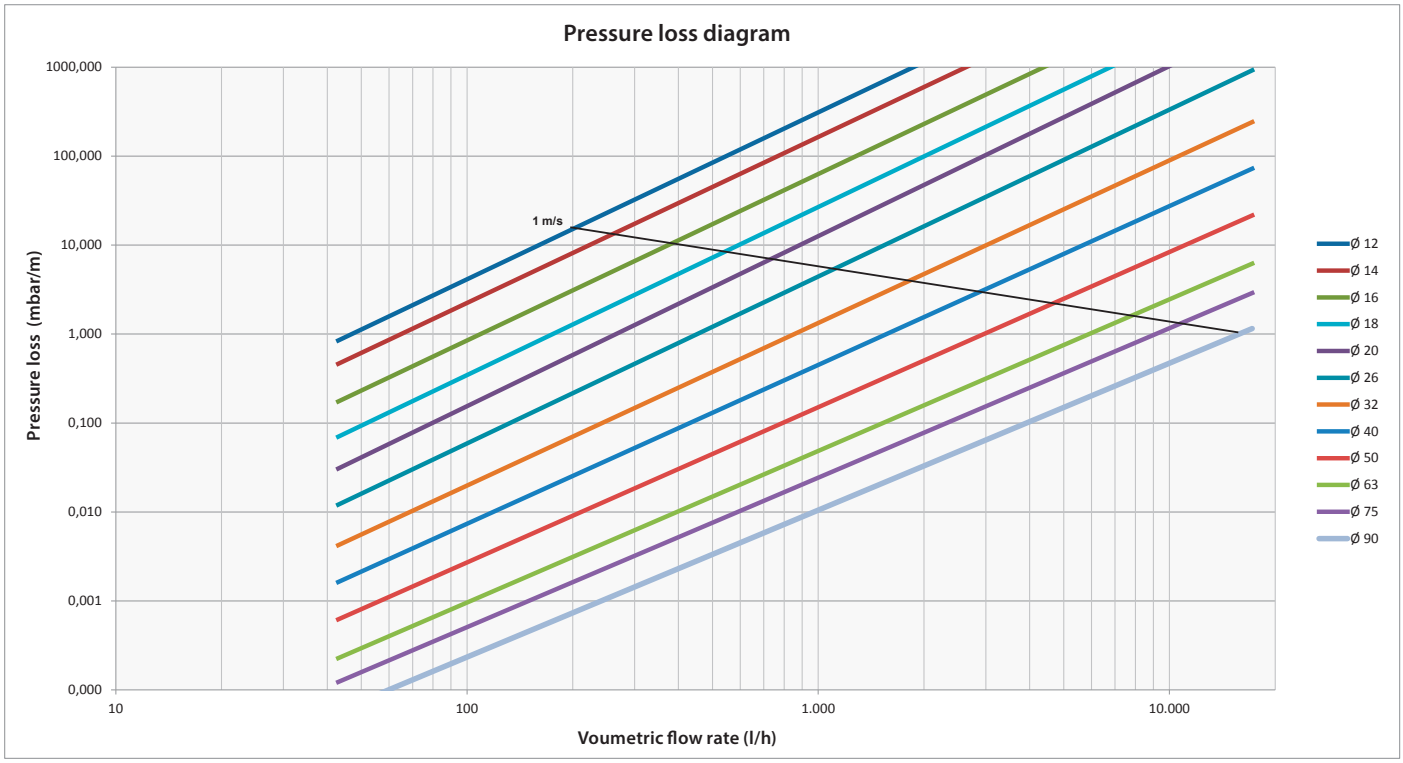
NOTE This international standard does not apply for Td, Tmax and Tmal greater than those shown in the table above.

a Countries can choose either class 1 or class 2 according to with their national legislation.

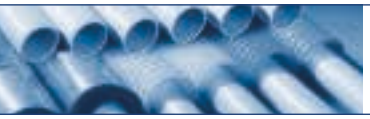
b Where there is more than 1 design temperature for a class, the times should be added together. "Plus cumulative" in the table implies a temperature profile for the aforementioned temperature over a certain period. (e.g. for class 5, the design temperature profile over 50 years is 20°C over 14 years. This becomes 60 °C over 25 years, 80 °C over 10 years, 90 °C over 1 year and 100 °C over 100 hours respectively.

Pressure loss tables for the HENCO multilayer pipe

Liquids lose energy when they flow through a pipe as a result of friction between the liquid and the walls of the pipe. The diagram and tables below show the pressure loss for a given volumetric flow rate in relation to the pipe diameter and the flow speed.



PE-Xc /AL / PE-Xc
100% QUALITY



1 PIPES

		Diameter 12		Diameter 14		Diameter 16		Diameter 18		Diameter 20		Diameter 26		Diameter 32		Diameter 40		Diameter 50		Diameter 63		Diameter 75		Diameter 90	
Energy	Flow	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss
(kW/h)	(l/h)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)
1	43	0,20	0,85	0,15	0,46	0,11	0,17	0,08	0,07	0,06	0,03	0,04	0,01	0,02	0,00	0,01	0,00	0,01	0,00	0,01	0,00	0,00	0,00	0,00	0,00
2	86	0,39	2,82	0,30	1,53	0,21	0,64	0,16	0,31	0,12	0,16	0,08	0,06	0,05	0,01	0,03	0,00	0,02	0,00	0,01	0,00	0,01	0,00	0,01	0,00
3	129	0,59	5,77	0,46	3,12	0,32	1,30	0,23	0,62	0,18	0,33	0,11	0,11	0,07	0,03	0,04	0,01	0,03	0,00	0,02	0,00	0,01	0,00	0,01	0,00
4	172	0,79	9,64	0,61	5,19	0,42	2,16	0,31	1,03	0,24	0,55	0,15	0,19	0,09	0,05	0,06	0,02	0,03	0,01	0,02	0,00	0,02	0,00	0,01	0,00
5	215	0,98	14,40	0,76	7,74	0,53	3,21	0,39	1,53	0,30	0,81	0,19	0,28	0,11	0,08	0,07	0,03	0,04	0,01	0,03	0,00	0,02	0,00	0,01	0,00
6	258	1,18	20,04	0,91	10,74	0,63	4,44	0,47	2,11	0,36	1,11	0,23	0,38	0,14	0,11	0,08	0,04	0,05	0,01	0,03	0,00	0,02	0,00	0,02	0,00
7	301	1,38	26,53	1,07	14,19	0,74	5,85	0,54	2,78	0,42	1,46	0,27	0,50	0,16	0,14	0,10	0,05	0,06	0,01	0,04	0,00	0,03	0,00	0,02	0,00
8	344	1,57	33,87	1,22	18,09	0,85	7,44	0,62	3,52	0,48	1,85	0,30	0,63	0,18	0,18	0,11	0,06	0,07	0,02	0,04	0,01	0,03	0,00	0,02	0,00
9	387	1,77	42,06	1,37	22,43	0,95	9,20	0,70	4,35	0,54	2,28	0,34	0,78	0,20	0,22	0,13	0,07	0,08	0,02	0,05	0,01	0,03	0,00	0,02	0,00
10	430	1,97	51,08	1,52	27,20	1,06	11,13	0,78	5,26	0,59	2,76	0,38	0,94	0,23	0,27	0,14	0,09	0,09	0,03	0,05	0,01	0,04	0,00	0,03	0,00
11	473	2,16	60,94	1,67	32,40	1,16	13,24	0,85	6,25	0,65	3,27	0,42	1,11	0,25	0,32	0,15	0,10	0,09	0,03	0,06	0,01	0,04	0,00	0,03	0,00
12	516	2,36	71,62	1,83	38,03	1,27	15,52	0,93	7,31	0,71	3,82	0,46	1,30	0,27	0,37	0,17	0,12	0,10	0,04	0,06	0,01	0,05	0,01	0,03	0,00
13	559	2,56	83,13	1,98	44,09	1,37	17,96	1,01	8,45	0,77	4,41	0,49	1,50	0,29	0,43	0,18	0,14	0,11	0,04	0,07	0,01	0,05	0,01	0,03	0,00
14	602	2,75	95,46	2,13	50,58	1,48	20,57	1,09	9,67	0,83	5,05	0,53	1,71	0,32	0,49	0,20	0,16	0,12	0,05	0,07	0,01	0,05	0,01	0,04	0,00
15	645	2,95	108,61	2,28	57,49	1,59	23,35	1,16	10,96	0,89	5,72	0,57	1,94	0,34	0,55	0,21	0,18	0,13	0,06	0,08	0,02	0,06	0,01	0,04	0,00
16	688	3,15	122,58	2,44	64,82	1,69	26,30	1,24	12,34	0,95	6,43	0,61	2,18	0,36	0,61	0,22	0,20	0,14	0,06	0,08	0,02	0,06	0,01	0,04	0,00
17	731	3,34	137,36	2,59	72,58	1,80	29,41	1,32	13,78	1,01	7,17	0,65	2,43	0,38	0,68	0,24	0,22	0,15	0,07	0,09	0,02	0,07	0,01	0,04	0,00
18	774	3,54	152,96	2,74	80,76	1,90	32,69	1,40	15,30	1,07	7,96	0,68	2,69	0,41	0,76	0,25	0,24	0,16	0,08	0,09	0,02	0,07	0,01	0,05	0,00
19	817	3,73	169,38	2,89	89,35	2,01	36,13	1,48	16,90	1,13	8,78	0,72	2,96	0,43	0,83	0,27	0,27	0,16	0,08	0,10	0,03	0,07	0,01	0,05	0,01
20	860	3,93	186,61	3,04	98,37	2,11	39,73	1,55	18,57	1,19	9,65	0,76	3,25	0,45	0,91	0,28	0,29	0,17	0,09	0,10	0,03	0,08	0,01	0,05	0,01
21	903	4,13	204,64	3,20	107,81	2,22	43,50	1,63	20,31	1,25	10,55	0,80	3,55	0,47	1,00	0,29	0,32	0,18	0,10	0,11	0,03	0,08	0,01	0,06	0,01
22	946	4,32	223,49	3,35	117,66	2,33	47,43	1,71	22,13	1,31	11,48	0,84	3,86	0,50	1,09	0,31	0,34	0,19	0,11	0,11	0,03	0,08	0,02	0,06	0,01
23	989	4,52	243,15	3,50	127,93	2,43	51,53	1,79	24,03	1,37	12,46	0,88	4,19	0,52	1,18	0,32	0,37	0,20	0,12	0,12	0,04	0,09	0,02	0,06	0,01
24	1032	4,72	263,62	3,65	138,62	2,54	55,78	1,86	25,99	1,43	13,47	0,91	4,53	0,54	1,27	0,34	0,40	0,21	0,13	0,13	0,04	0,09	0,02	0,06	0,01
25	1075	4,91	284,90	3,81	149,72	2,64	60,20	1,94	28,03	1,49	14,52	0,95	4,87	0,56	1,36	0,35	0,43	0,22	0,14	0,13	0,04	0,10	0,02	0,07	0,01
26	1118	5,11	306,98	3,96	161,24	2,75	64,79	2,02	30,15	1,55	15,61	0,99	5,23	0,59	1,46	0,36	0,46	0,22	0,15	0,14	0,04	0,10	0,02	0,07	0,01
27	1161	5,31	329,88	4,11	173,17	2,85	69,53	2,10	32,33	1,61	16,73	1,03	5,61	0,61	1,57	0,38	0,50	0,23	0,16	0,14	0,05	0,10	0,02	0,07	0,01
28	1204	5,50	353,58	4,26	185,53	2,96	74,43	2,17	34,59	1,66	17,89	1,07	5,99	0,63	1,67	0,39	0,53	0,24	0,17	0,15	0,05	0,11	0,02	0,07	0,01
29	1247	5,70	378,08	4,41	198,29	3,07	79,50	2,25	36,93	1,72	19,09	1,10	6,39	0,65	1,78	0,41	0,56	0,25	0,18	0,15	0,05	0,11	0,03	0,08	0,01
30	1290	5,90	403,39	4,57	211,47	3,17	84,73	2,33	39,33	1,78	20,32	1,14	6,79	0,68	1,90	0,42	0,60	0,26	0,19	0,16	0,06	0,12	0,03	0,08	0,01
31	1333	6,09	429,51	4,72	225,07	3,28	90,12	2,41	41,81	1,84	21,59	1,18	7,21	0,70	2,01	0,43	0,64	0,27	0,20	0,16	0,06	0,12	0,03	0,08	0,01
32	1376	6,29	456,44	4,87	239,07	3,38	95,67	2,49	44,36	1,90	22,90	1,22	7,65	0,72	2,13	0,45	0,67	0,28	0,21	0,17	0,06	0,12	0,03	0,08	0,01
33	1419	6,49	484,16	5,02	253,50	3,49	101,38	2,56	46,99	1,96	24,24	1,26	8,09	0,74	2,25	0,46	0,71	0,28	0,22	0,17	0,07	0,13	0,03	0,09	0,01
34	1462	6,68	512,70	5,18	268,33	3,59	107,25	2,64	49,68	2,02	25,62	1,29	8,54	0,77	2,38	0,48	0,75	0,29	0,24	0,18	0,07	0,13	0,03	0,09	0,01
35	1505	6,88	542,04	5,33	283,58	3,70	113,28	2,72	52,45	2,08	27,04	1,33	9,01	0,79	2,50	0,49	0,79	0,30	0,25	0,18	0,07	0,13	0,04	0,09	0,01
36	1548	7,08	572,18	5,48	299,24	3,81	119,47	2,80	55,30	2,14	28,49	1,37	9,49	0,81	2,64	0,50	0,83	0,31	0,26	0,19	0,08	0,14	0,04	0,09	0,02
37	1591	7,27	603,12	5,63	315,32	3,91	125,82	2,87	58,21	2,20	29,98	1,41	9,98	0,83	2,77	0,52	0,87	0,32	0,27	0,19	0,08	0,14	0,04	0,10	0,02
38	1634	7,47	634,87	5,78	331,81	4,02	132,34	2,95	61,19	2,26	31,51	1,45	10,48	0,86	2,91	0,53	0,92	0,33	0,29	0,20	0,09	0,15	0,04	0,10	0,02
39	1677	7,67	667,43	5,94	348,71	4,12	139,01	3,03	64,25	2,32	33,07	1,48	10,99	0,88	3,05	0,55	0,96	0,34	0,30	0,20	0,09	0,15	0,04	0,10	0,02
40	1720	7,86	700,78	6,09	366,02	4,23	145,84	3,11	67,38	2,38	34,67	1,52	11,52	0,90	3,19	0,56	1,00	0,35	0,31	0,21	0,09	0,15	0,05	0,11	0,02
41	1763	8,06	734,94	6,24	383,75	4,33	152,84	3,18	70,59	2,44	36,30	1,56	12,05	0,92	3,34	0,57	1,05	0,35	0,33	0,21	0,10	0,16	0,05	0,11	0,02
42	1806	8,26	769,90	6,39	401,89	4,44	159,99	3,26	73,86	2,50	37,98	1,60	12,60	0,95	3,49	0,59	1,10	0,36	0,34	0,22	0,10	0,16	0,05	0,11	0,02
43	1849	8,45	805,67	6,55	420,44	4,55	167,30	3,34	77,21	2,56	39,68	1,64	13,16	0,97	3,64	0,60	1,14	0,37	0,36	0,22	0,11	0,16	0,05	0,11	0,02
44	1892	8,65	842,24	6,70	439,40	4,65	174,77	3,42	80,62	2,62	41,43	1,67	13,73	0,99	3,80	0,62	1,19	0,38	0,37	0,23	0,11	0,17	0,05	0,12	0,02
45	1935	8,85	879,61	6,85	458,78	4,76	182,40	3,49	84,11	2,68	43,21	1,71	14,32	1,01	3,96	0,63	1,24	0,39	0,39	0,23	0,12	0,17	0,06	0,12	0,02
46	1978	9,04	917,78	7,00	478,57	4,86	190,20	3,57	87,67	2,74	45,02	1,75	14,91	1,04	4,12	0,64	1,29	0,40	0,40	0,24	0,12	0,18	0,06	0,12	0,02
47	2021	9,24	956,75	7,15	498,76	4,97	198,15	3,65	91,31	2,79	46,87	1,79	15,52	1,06	4,28	0,66	1,34	0,41	0,42	0,25	0,13	0,18	0,06	0,12	0,02
48	2064	9,44	996,53	7,31	519,37	5,07	206,26	3,73	95,01	2,85	48,76	1,83	16,13	1,08	4,45	0,67	1,40	0,41	0,44	0,25	0,13	0,18	0,06	0,13	0,03
49	2107	9,63	1037,11	7,46	540,40	5,18	214,52	3,81	98,79	2,91	50,68	1,86	16,76	1,10	4,62	0,68	1,45	0,42	0,45	0,26	0,13	0,19	0,06	0,13	0,03
50	2150	9,83	1078,49	7,61	561,83	5,29	222,95	3,88	102,64	2,97	52,64	1,90	17,40	1,13	4,80	0,70	1,50	0,43	0,47	0,26	0,14	0,19	0,07	0,13	0,03
51	2193	10,02	1120,67	7,76	583,67	5,39	231,54	3,96	106,56	3,03	54,64	1,94	18,05	1,15	4,97	0,71	1,56	0,44	0,49	0,27	0,14	0,20	0,07	0,13	0,03
52	2236	10,22	1163,65	7,92	605,93	5,50	240,29	4,04	110,55	3,09	56,67	1,98	18,71	1,17	5,15	0,73	1,61	0,45	0,50	0,27	0,15	0,20	0,07	0,14	0,03
53	2279	10,42	1207,44	8,07	628,60	5,60	249,19	4,12	114,61	3,15	58,73	2,02	19,39	1,19	5,34	0,74	1,67	0,46	0,52	0,28	0,16	0,20	0,07	0,14	0,03
54	2322	10,61	1252,03	8,22	651,68	5,71	258,26	4,19	118,75	3,21	60,84	2,05	20,07	1,22	5,52	0,75	1,73	0,47	0,54	0,28	0,16	0,21	0,08	0,14	0,03
55	2365	10,81	1297,41	8,37	675,17	5,81	267,48	4,27	122,95	3,27	62,98	2,09	20,77	1,24	5,71	0,77	1,79	0,47	0,56	0,29	0,17	0,21	0,08	0,14	0,03
56	2408	11,01	1343,60	8,52	699,07	5,92	276,87	4,35	127,23	3,33	65,15	2,13	21,48	1,26	5,90	0,78	1,85	0,48	0,57	0,29	0,17	0,21	0,08	0,15	0,03
57	2451	11,20	1390,59	8,68	723,38	6,03	286,41	4,43	131,58	3,39	67,36	2,17	22,20	1,28	6,10	0,80	1,91	0,49	0,59	0,30	0,18	0,22	0,08	0,15	0,03
58	2494	11,40	1438,38	8,83	748,10	6,13	296,11	4,50	136,00	3,45	69,61	2,21	22,93	1,31	6,30	0,81	1,97	0,50	0,61	0,30	0,18	0,22	0,09	0,15	0,04
59	2537	11,60	1486,97	8,98	773,23	6,24	305,97	4,58	140,49	3,51	71,89	2,25	23,67	1,33	6,50	0,82	2,03	0,51	0,63	0,31	0,19	0,23	0,09	0,16	0,04
60	2580	11,79	1536,37	9,13	798,78	6,34	315,99	4,66	145,05	3,57	74,21	2,28	24,42	1,35	6,70	0,84	2,09	0,52	0,65	0,31	0,19	0,23	0,09	0,16	0,04
61	2623	11,99	1586,56	9,29	824,73	6,45	326,17	4,74	149,69	3,63	76,56	2,32	25,19	1,37	6,91	0,85	2,16	0,53	0,67	0,32	0,20	0,23	0,10	0,16	0,04
62	2666	12,19	1637,55	9,44	851,10	6,55	336,51	4,82	154,39	3,69	78,95	2,36	25,97	1,40	7,12	0,87	2,22	0,54	0,69	0,32	0,21	0,24	0,10	0,16	0,04
63	2709	12,38	1689,35	9,59	877,88	6,66	347,00	4,89	159,17	3,75	81,37	2,40	26,75	1,42	7,33	0,88	2,29	0,54	0,71	0,33	0,21	0,24	0,10	0,17	0,04
64	2752	12,58	1741,94	9,74	905,06	6,77	357,66	4,97	164,02	3,81	83,83	2,44	27,55	1,44	7,55	0,89	2,35	0,55	0,73	0,33	0,22	0,25	0,10	0,17	0,04
65	2795	12,78	1795,34	9,89	932,66	6,87	368,47	5,05	168,94	3,86	86,33	2,47	28,36	1,46	7,77	0,91	2,42	0,56	0,75	0,34	0,22	0,25	0,11	0,17	0,04
66	2838	12,97	1849,53	10,05	960,67	6,98	379,44	5,13	173,93	3,92	88,86	2,51	29,18	1,49	7,99	0,92	2,49	0,57	0,77	0,34	0,23	0,25	0,11	0,17	0,04
67	2881	13,17	1904,53	10,20	989,09	7,08	390,57	5,20	178,99	3,98	91,43	2,55	30,02	1,51	8,21	0,94	2,56	0,58	0,79	0,35	0,24	0,26	0,11	0,18	0,05
68	2924	13,37	1960,33	10,35	1017,91	7,19	401,86	5,28	184,12	4,04	94,03	2,59	30,86	1,53	8,44	0,95	2,63	0,59	0,81	0,35	0,24	0,26	0,12	0,18	0,05
69	2967	13,56	2016,92	10,50	1047,15	7,29	413,31	5,36	189,32	4,10	96,67	2,63	31,71	1,55	8,67	0,96	2,70	0,60	0,84	0,36	0,25	0,26	0,12	0,18	0,05
70	3010	13,76	2074,32	10,66	1076,80	7,40	424,91	5,44	194,60	4,16	99,34	2,66	32,58	1,58	8,90	0,98	2,77	0,60	0,86	0,37	0,26	0,27	0,12	0,18	0,05
71	3053	13,96	2132,52	10,81	1106,86	7,51	436,68	5,51	199,94	4,22	102,05	2,70	33,46	1,60	9,14	0,99	2,84	0,61	0,88	0,37	0,26	0,27	0,12	0,19	0,05
72	3096	14,15	2191,52	10,96	1137,33	7,61	448,60	5,59	205,36	4,28	104,80	2,74	34,35	1,62	9,38	1,01	2,92	0,62	0,90	0,38	0,27	0,28	0,13	0,19	0,05
73	3139	14,35	2251,32	11,11	1168,21	7,72	460,68	5,67	210,85	4,34	107,58	2,78	35,25	1,64	9,62	1,02	2,99	0,63	0,93	0,38	0,28	0,28	0,13	0,19	0,05
74	3182	14,55	2311,91	11,26	1199,50	7,82	472,92	5,75	216,41	4,40	110,39	2,82	36,16	1,67	9,87	1,03	3,07	0,64	0,95	0,39	0,28	0,28	0,13	0,20	0,05
75	3225	14,74	2373,31	11,42	1,231,21	7,93	485,32	5,82	222,04	4,46	113,25	2,85	37,08	1,69	10,12	1,05	3,14	0,65	0,97	0,39	0,29	0,29	0,14	0,20	0,06

Medium: water at 70°C

P = Q x ΔT x 1.163
= power in watts

1 mbar/m = 100 Pa/m

ΔT = 20°C

Water velocity
Central heating: max. 1m/s
Sanitary: max. 3m/s

		Diameter 12		Diameter 14		Diameter 16		Diameter 18		Diameter 20		Diameter 26		Diameter 32		Diameter 40		Diameter 50		Diameter 63		Diameter 75		Diameter 90	
Energy	Flow	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss
(kW/h)	(l/h)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)
76	3268	14,94	2435,51	11,57	1263,32	8,03	497,88	5,90	227,74	4,52	116,13	2,89	38,02	1,71	10,37	1,06	3,22	0,66	1,00	0,40	0,30	0,29	0,14	0,20	0,06
77	3311	15,14	2498,51	11,72	1295,84	8,14	510,60	5,98	233,51	4,58	119,06	2,93	38,96	1,73	10,62	1,08	3,30	0,66	1,02	0,40	0,30	0,30	0,14	0,20	0,06
78	3354	15,33	2562,30	11,87	1328,77	8,25	523,47	6,06	239,36	4,64	122,02	2,97	39,92	1,76	10,88	1,09	3,38	0,67	1,04	0,41	0,31	0,30	0,15	0,21	0,06
79	3397	15,53	2626,90	12,03	1362,11	8,35	536,50	6,14	245,27	4,70	125,01	3,01	40,88	1,78	11,14	1,10	3,46	0,68	1,07	0,41	0,32	0,30	0,15	0,21	0,06
80	3440	15,73	2692,30	12,18	1395,86	8,46	549,69	6,21	251,26	4,76	128,04	3,04	41,86	1,80	11,40	1,12	3,54	0,69	1,09	0,42	0,32	0,31	0,15	0,21	0,06
81	3483	15,92	2758,50	12,33	1430,02	8,56	563,04	6,29	257,31	4,82	131,10	3,08	42,85	1,82	11,67	1,13	3,62	0,70	1,12	0,42	0,33	0,31	0,16	0,21	0,06
82	3526	16,12	2825,49	12,48	1464,59	8,67	576,55	6,37	263,44	4,88	134,20	3,12	43,85	1,85	11,94	1,15	3,70	0,71	1,14	0,43	0,34	0,31	0,16	0,22	0,07
83	3569	16,31	2893,29	12,63	1499,57	8,77	590,22	6,45	269,64	4,94	137,34	3,16	44,87	1,87	12,21	1,16	3,78	0,72	1,17	0,43	0,35	0,32	0,16	0,22	0,07
84	3612	16,51	2961,88	12,79	1534,97	8,88	604,04	6,52	275,91	4,99	140,51	3,20	45,89	1,89	12,48	1,17	3,87	0,72	1,19	0,44	0,35	0,32	0,17	0,22	0,07
85	3655	16,71	3031,28	12,94	1570,77	8,99	618,02	6,60	282,25	5,05	143,72	3,23	46,92	1,91	12,76	1,19	3,95	0,73	1,22	0,44	0,36	0,33	0,17	0,22	0,07
86	3698	16,90	3,101,47	13,09	1606,98	9,09	632,16	6,68	288,66	5,11	146,96	3,27	47,97	1,94	13,04	1,20	4,04	0,74	1,25	0,45	0,37	0,33	0,18	0,23	0,07
87	3741	17,10	3172,47	13,24	1643,60	9,20	646,46	6,76	295,14	5,17	150,24	3,31	49,03	1,96	13,32	1,22	4,13	0,75	1,27	0,45	0,38	0,33	0,18	0,23	0,07
88	3784	17,30	3244,26	13,40	1680,63	9,30	660,92	6,83	301,70	5,23	153,55	3,35	50,10	1,98	13,61	1,23	4,21	0,76	1,30	0,46	0,38	0,34	0,18	0,23	0,07
89	3827	17,49	3316,86	13,55	1718,07	9,41	675,53	6,91	308,32	5,29	156,90	3,39	51,18	2,00	13,90	1,24	4,30	0,77	1,33	0,46	0,39	0,34	0,19	0,23	0,08
90	3870	17,69	3390,25	13,70	1755,92	9,51	690,31	6,99	315,02	5,35	160,28	3,42	52,27	2,03	14,19	1,26	4,39	0,78	1,35	0,47	0,40	0,35	0,19	0,24	0,08
91	3913	17,89	3464,44	13,85	1794,18	9,62	705,24	7,07	321,78	5,41	163,70	3,46	53,37	2,05	14,48	1,27	4,48	0,79	1,38	0,48	0,41	0,35	0,19	0,24	0,08
92	3956	18,08	3539,44	14,00	1832,85	9,73	720,33	7,15	328,62	5,47	167,16	3,50	54,48	2,07	14,78	1,29	4,57	0,79	1,41	0,48	0,42	0,35	0,20	0,24	0,08
93	3999	18,28	3615,23	14,16	1871,93	9,83	735,58	7,22	335,53	5,53	170,65	3,54	55,60	2,09	15,08	1,30	4,66	0,80	1,44	0,49	0,43	0,36	0,20	0,25	0,08
94	4042	18,48	3691,82	14,31	1911,42	9,94	750,99	7,30	342,50	5,59	174,17	3,58	56,74	2,12	15,39	1,31	4,76	0,81	1,47	0,49	0,43	0,36	0,21	0,25	0,08
95	4085	18,67	3769,21	14,46	1951,32	10,04	766,55	7,38	349,55	5,65	177,73	3,62	57,89	2,14	15,69	1,33	4,85	0,82	1,49	0,50	0,44	0,36	0,21	0,25	0,09
96	4128	18,87	3847,40	14,61	1991,63	10,15	782,27	7,46	356,67	5,71	181,33	3,65	59,04	2,16	16,00	1,34	4,95	0,83	1,52	0,50	0,45	0,37	0,21	0,25	0,09
97	4171	19,07	3926,39	14,77	2032,35	10,25	798,15	7,53	363,86	5,77	184,96	3,69	60,21	2,18	16,31	1,36	5,04	0,84	1,55	0,51	0,46	0,37	0,22	0,26	0,09
98	4214	19,26	4006,18	14,92	2073,47	10,36	814,19	7,61	371,13	5,83	188,63	3,73	61,39	2,21	16,63	1,37	5,14	0,85	1,58	0,51	0,47	0,38	0,22	0,26	0,09
99	4257	19,46	4086,76	15,07	2115,01	10,47	830,39	7,69	378,46	5,89	192,33	3,77	62,58	2,23	16,95	1,38	5,23	0,85	1,61	0,52	0,48	0,38	0,23	0,26	0,09
100	4300	19,66	4168,15	15,22	2156,96	10,57	846,75	7,77	385,86	5,95	196,07	3,81	63,78	2,25	17,27	1,40	5,33	0,86	1,64	0,52	0,48	0,38	0,23	0,26	0,09
101	4343	19,85	4250,34	15,37	2199,32	10,68	863,26	7,84	393,34	6,01	199,84	3,84	65,00	2,27	17,59	1,41	5,43	0,87	1,67	0,53	0,49	0,39	0,23	0,27	0,10
102	4386	20,05	4333,32	15,53	2242,08	10,78	879,93	7,92	400,88	6,07	203,65	3,88	66,22	2,30	17,92	1,43	5,53	0,88	1,70	0,53	0,50	0,39	0,24	0,27	0,10
103	4429	20,25	4417,10	15,68	2285,26	10,89	896,76	8,00	408,50	6,12	207,50	3,92	67,46	2,32	18,25	1,44	5,63	0,89	1,73	0,54	0,51	0,40	0,24	0,27	0,10
104	4472	20,44	4501,69	15,83	2328,84	10,99	913,75	8,08	416,18	6,18	211,38	3,96	68,70	2,34	18,58	1,45	5,73	0,90	1,76	0,54	0,52	0,40	0,25	0,27	0,10
105	4515	20,64	4587,07	15,98	2372,84	11,10	930,89	8,15	423,94	6,24	215,29	4,00	69,96	2,36	18,92	1,47	5,83	0,91	1,79	0,55	0,53	0,40	0,25	0,28	0,10
106	4558	20,84	4673,25	16,14	2417,24	11,21	948,20	8,23	431,77	6,30	219,24	4,03	71,23	2,39	19,25	1,48	5,94	0,91	1,82	0,55	0,54	0,41	0,26	0,28	0,10
107	4601	21,03	4760,23	16,29	2462,06	11,31	965,66	8,31	439,67	6,36	223,23	4,07	72,51	2,41	19,59	1,50	6,04	0,92	1,86	0,56	0,55	0,41	0,26	0,28	0,11
108	4644	21,23	4848,01	16,44	2507,28	11,42	983,28	8,39	447,64	6,42	227,25	4,11	73,80	2,43	19,94	1,51	6,15	0,93	1,89	0,56	0,56	0,41	0,26	0,28	0,11
109	4687	21,43	4936,59	16,59	2552,92	11,52	1001,06	8,47	455,68	6,48	231,30	4,15	75,10	2,45	20,29	1,52	6,25	0,94	1,92	0,57	0,57	0,42	0,27	0,29	0,11
110	4730	21,62	5025,97	16,74	2598,96	11,63	1018,99	8,54	463,79	6,54	235,39	4,19	76,42	2,48	20,64	1,54	6,36	0,95	1,95	0,57	0,58	0,42	0,27	0,29	0,11
111	4773	21,82	5116,15	16,90	2645,41	11,73	1037,09	8,62	471,97	6,60	239,52	4,22	77,74	2,50	20,99	1,55	6,46	0,96	1,99	0,58	0,59	0,43	0,28	0,29	0,11
112	4816	22,02	5207,12	17,05	2692,27	11,84	1055,34	8,70	480,23	6,66	243,68	4,26	79,08	2,52	21,34	1,57	6,57	0,97	2,02	0,58	0,60	0,43	0,28	0,30	0,11
113	4859	22,21	5298,90	17,20	2739,54	11,95	1073,75	8,78	488,55	6,72	247,88	4,30	80,42	2,54	21,70	1,58	6,68	0,98	2,05	0,59	0,60	0,43	0,29	0,30	0,12
114	4902	22,41	5391,47	17,35	2787,22	12,05	1092,32	8,85	496,94	6,78	252,11	4,34	81,78	2,57	22,06	1,59	6,79	0,98	2,08	0,60	0,61	0,44	0,29	0,30	0,12
115	4945	22,60	5484,84	17,51	2835,31	12,16	1111,05	8,93	505,41	6,84	256,38	4,38	83,15	2,59	22,43	1,61	6,90	0,99	2,12	0,60	0,62	0,44	0,30	0,30	0,12
116	4988	22,80	5579,02	17,66	2883,81	12,26	1129,93	9,01	513,94	6,90	260,68	4,41	84,53	2,61	22,79	1,62	7,01	1,00	2,15	0,61	0,63	0,44	0,30	0,31	0,12
117	5031	23,00	5673,99	17,81	2932,72	12,37	1148,97	9,09	522,55	6,96	265,02	4,45	85,92	2,63	23,16	1,64	7,13	1,01	2,19	0,61	0,64	0,45	0,31	0,31	0,12
118	5074	23,19	5769,76	17,96	2982,04	12,47	1168,17	9,16	531,23	7,02	269,40	4,49	87,32	2,66	23,54	1,65	7,24	1,02	2,22	0,62	0,65	0,45	0,31	0,31	0,13
119	5117	23,39	5866,32	18,11	3031,77	12,58	1187,53	9,24	539,97	7,08	273,81	4,53	88,73	2,68	23,91	1,66	7,35	1,03	2,25	0,62	0,66	0,46	0,32	0,31	0,13
120	5160	23,59	5963,69	18,27	3081,91	12,69	1207,05	9,32	548,79	7,14	278,25	4,57	90,16	2,70	24,29	1,68	7,47	1,04	2,29	0,63	0,67	0,46	0,32	0,32	0,13
121	5203	23,78	6061,86	18,42	3132,45	12,79	1226,72	9,40	557,68	7,19	282,73	4,60	91,59	2,72	24,67	1,69	7,58	1,04	2,32	0,63	0,68	0,46	0,32	0,32	0,13
122	5246	23,98	6160,82	18,57	3183,41	12,90	1246,55	9,47	566,64	7,25	287,24	4,64	93,04	2,75	25,06	1,71	7,70	1,05	2,36	0,64	0,69	0,47	0,33	0,32	0,13
123	5289	24,18	6260,59	18,72	3234,77	13,00	1266,54	9,55	575,67	7,31	291,79	4,68	94,50	2,77	25,44	1,72	7,82	1,06	2,40	0,64	0,71	0,47	0,33	0,32	0,14
124	5332	24,37	6361,15	18,88	3286,55	13,11	1286,69	9,63	584,77	7,37	296,38	4,72	95,97	2,79	25,83	1,73	7,94	1,07	2,43	0,65	0,72	0,48	0,34	0,33	0,14
125	5375	24,57	6462,51	19,03	3338,73	13,21	1306,99	9,71	593,95	7,43	301,00	4,76	97,45	2,81	26,22	1,75	8,06	1,08	2,47	0,65	0,73	0,48	0,34	0,33	0,14
126	5418	24,77	6564,67	19,18	3391,32	13,32	1327,46	9,79	603,19	7,49	305,66	4,79	98,94	2,84	26,62	1,76	8,18	1,09	2,50	0,66	0,74	0,48	0,35	0,33	0,14
127	5461	24,96	6667,63	19,33	3444,33	13,42	1348,08	9,86	612,50	7,55	310,35	4,83	100,44	2,86	27,02	1,78	8,30	1,10	2,54	0,66	0,75	0,49	0,35	0,33	0,14
128	5504	25,16	6771,39	19,48	3497,74	13,53	1368,86	9,94	621,89	7,61	315,07	4,87	101,95	2,88	27,42	1,79	8,42	1,10	2,58	0,67	0,76	0,49	0,36	0,34	0,15
129	5547	25,36	6875,94	19,64	3551,56	13,64	1389,80	10,02	631,34	7,67	319,84	4,91	103,47	2,90	27,82	1,80	8,54	1,11	2,61	0,67	0,77	0,49	0,36	0,34	0,15
130	5590	25,55	6981,30	19,79	3605,79	13,74	1410,89	10,10	640,87	7,73	324,63	4,95	105,01	2,93	28,23	1,82	8,66	1,12	2,65	0,68	0,78	0,50	0,37	0,34	0,15
131	5633	25,75	7087,45	19,94	3660,43	13,85	1432,14	10,17	650,46	7,79	329,47	4,99	106,55	2,95	28,64	1,83	8,79	1,13	2,69	0,68	0,79	0,50	0,37	0,35	0,15
132	5676	25,95	7194,41	20,09	3715,48	13,95	1453,56	10,25	660,13	7,85	334,33	5,02	108,11	2,97	29,05	1,85	8,91	1,14	2,73	0,69	0,80	0,51	0,38	0,35	0,15
133	5719	26,14	7302,16	20,25	3770,94	14,06	1475,12	10,33	669,87	7,91	339,24	5,06	109,68	2,99	29,47	1,86	9,04	1,15	2,77	0,69	0,81	0,51	0,39	0,35	0,16
134	5762	26,34	7410,71	20,40	3826,80	14,16	1496,85	10,41	679,67	7,97	344,17	5,10	111,26	3,02	29,89	1,87	9,17	1,16	2,80	0,70	0,82	0,51	0,39	0,35	0,16
135	5805	26,54	7520,06	20,55	3883,08	14,27	1518,74	10,48	689,55	8,03	349,15	5,14	112,85	3,04	30,31	1,89	9,29	1,16	2,84	0,70	0,84	0,52	0,40	0,36	0,16
136	5848	26,73	7630,21	20,70	3939,77	14,38	1540,78	10,56	699,50	8,09	354,16	5,18	114,45	3,06	30,73	1,90	9,42	1,17	2,88	0,71	0,85	0,52	0,40	0,36	0,16
137	5891	26,93	7741,15	20,85	3996,86	14,48	1562,98	10,64	709,52	8,15	359,20	5,21	116,06	3,08	31,16	1,91	9,55	1,18	2,92	0,72	0,86	0,53	0,41	0,36	0,16
138	5934	27,13	7852,90	21,01	4054,37	14,59	1585,34	10,72	719,61	8,21	364,28	5,25	117,69	3,11	31,59	1,93	9,68	1,19	2,96	0,72	0,87	0,53	0,41	0,36	0,17
139	5977	27,32	7965,44	21,16	4112,28	14,69	1607,85	10,80	729,77	8,27	369,39	5,29	119,32	3,13	32,02	1,94	9,81	1,20	3,00	0,73	0,88	0,53	0,42	0,37	0,17
140	6020	27,52	8078,78	21,31	4170,60	14,80	1630,53	10,87	740,01	8,32	374,54	5,33	120,97	3,15	32,46	1,96	9,94	1,21	3,04	0,73	0,89	0,54	0,42	0,37	0,17
141	6063	27,72	8192,92	21,46	4229,33	14,90	1653,36	10,95	750,31	8,38	379,73	5,37	122,62	3,18	32,90	1,97	10,08	1,22	3,08	0,74	0,90	0,54	0,43	0,37	0,17
142	6106	27,91	8307,86	21,62	4288,47	15,01	1676,35	11,03	760,68	8,44	384,95	5,40	124,29	3,20	33,34	1,98	10,21	1,23	3,12	0,74	0,92	0,54	0,43	0,37	0,18
143	6149	28,11	8423,60	21,77	4348,02	15,12	1699,49	11,11	771,12	8,50	390,20	5,44	125,97	3,22	33,78	2,00	10,34	1,23	3,16	0,75	0,93	0,55	0,44	0,38	0,18
144	6192	28,31	8540,14	21,92	4407,98	15,22	1722,80	11,18	781,64	8,56	395,49	5,48	127,66	3,24	34,23	2,01	10,48	1,24	3,20	0,75	0,94	0,55	0,44	0,38	0,18
145	6235	28,50	8657,47	22,07	4468,35	15,33	1746,26	11,26	792,22	8,62	400,82	5,52	129,36	3,27	34,68	2,03	10,62	1,25	3,24	0,76	0,95	0,56	0,45	0,38	0,18
146	6278	28,70	8775,61	22,22	4529,13	15,43	1769,88	11,34	802,88	8,68	406,18	5,56	131,07	3,29	35,13	2,04	10,75	1,26	3,28	0,76	0,96	0,56	0,46	0,38	0,18
147	6321	28,90	8894,54	22,38	4590,32	15,54	1793,66	11,42	813,61	8,74	411,58	5,59	132,79	3,31	35,59	2,05	10,89	1,27	3,32	0,77	0,98	0,56	0,46	0,39	0,19
148	6364	29,09	9014,27	22,53	4651,91	15,64	1817,60	11,49	824,40	8,80	417,01	5,63	134,53	3,33	36,04	2,07	11,03	1,28	3,37	0,77	0,99	0,57	0,47	0,39	0,19
149	6,407	29,29	9134,80	22,68	4713,92	15,75	1841,69	11,57	835,27	8,86	422,47	5,67	136,27	3,36	36,51	2,08	11,17	1,29	3,41	0,78	1,00	0,57	0,47	0,39	0,19
150	6450	29,48	9256,13	22,83	4776,33	15,86	1865,95	11,65	846,21	8,92	427,98	5,71	138,03	3,38	36,97	2,10	11,31	1,29	3,45	0,78	1,01	0,58	0,48	0,40	0,19

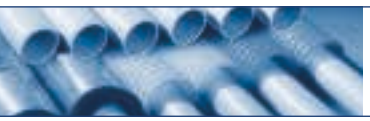
Medium: water at 70°C

P = Q x ΔT x 1.163
= power in watts

1 mbar/m = 100 Pa/m

ΔT = 20°C

Water velocity
Central heating: max. 1m/s
Sanitary: max. 3m/s



1 PIPES

		Diameter 12		Diameter 14		Diameter 16		Diameter 18		Diameter 20		Diameter 26		Diameter 32		Diameter 40		Diameter 50		Diameter 63		Diameter 75		Diameter 90	
Energy	Flow	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss
(kW/h)	(l/h)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)
151	6493	29,68	9378,25	22,99	4839,16	15,96	1890,36	11,73	857,22	8,98	433,51	5,75	139,80	3,40	37,44	2,11	11,45	1,30	3,49	0,79	1,02	0,58	0,48	0,40	0,20
152	6536	29,88	9501,18	23,14	4902,39	16,07	1914,92	11,80	868,29	9,04	439,08	5,78	141,57	3,42	37,91	2,12	11,59	1,31	3,54	0,79	1,04	0,58	0,49	0,40	0,20
153	6579	30,07	9624,90	23,29	4966,03	16,17	1939,65	11,88	879,44	9,10	444,69	5,82	143,36	3,45	38,38	2,14	11,73	1,32	3,58	0,80	1,05	0,59	0,50	0,40	0,20
154	6622	30,27	9749,42	23,44	5030,08	16,28	1964,53	11,96	890,66	9,16	450,33	5,86	145,16	3,47	38,85	2,15	11,88	1,33	3,62	0,80	1,06	0,59	0,50	0,41	0,20
155	6665	30,47	9874,75	23,59	5094,54	16,38	1989,57	12,04	901,96	9,22	456,01	5,90	146,98	3,49	39,33	2,17	12,02	1,34	3,67	0,81	1,07	0,59	0,51	0,41	0,21
156	6708	30,66	10000,86	23,75	5159,41	16,49	2014,77	12,12	913,32	9,28	461,73	5,94	148,80	3,51	39,81	2,18	12,17	1,35	3,71	0,81	1,09	0,60	0,51	0,41	0,21
157	6751	30,86	10127,78	23,90	5224,69	16,60	2040,13	12,19	924,75	9,34	467,47	5,97	150,63	3,54	40,30	2,19	12,31	1,35	3,75	0,82	1,10	0,60	0,52	0,41	0,21
158	6794	31,06	10255,50	24,05	5290,37	16,70	2065,64	12,27	936,25	9,39	473,26	6,01	152,48	3,56	40,78	2,21	12,46	1,36	3,80	0,82	1,11	0,61	0,53	0,42	0,21
159	6837	31,25	10384,01	24,20	5356,47	16,81	2091,32	12,35	947,83	9,45	479,08	6,05	154,33	3,58	41,27	2,22	12,61	1,37	3,84	0,83	1,13	0,61	0,53	0,42	0,21
160	6880	31,45	10513,33	24,36	5422,98	16,91	2117,15	12,43	959,47	9,51	484,93	6,09	156,20	3,60	41,77	2,24	12,76	1,38	3,89	0,84	1,14	0,61	0,54	0,42	0,22
161	6923	31,65	10643,44	24,51	5489,89	17,02	2143,13	12,50	971,18	9,57	490,82	6,13	158,07	3,63	42,26	2,25	12,91	1,39	3,93	0,84	1,15	0,62	0,54	0,42	0,22
162	6966	31,84	10774,35	24,66	5557,21	17,12	2169,28	12,58	982,97	9,63	496,74	6,16	159,96	3,65	42,76	2,26	13,06	1,40	3,98	0,85	1,16	0,62	0,55	0,43	0,22
163	7009	32,04	10906,06	24,81	5624,95	17,23	2195,58	12,66	994,82	9,69	502,70	6,20	161,86	3,67	43,26	2,28	13,21	1,41	4,02	0,85	1,18	0,63	0,56	0,43	0,22
164	7052	32,24	11038,56	24,96	5693,09	17,34	2222,04	12,74	1006,75	9,75	508,70	6,24	163,77	3,69	43,76	2,29	13,36	1,42	4,07	0,86	1,19	0,63	0,56	0,43	0,23
165	7095	32,43	11171,87	25,12	5761,64	17,44	2248,66	12,81	1018,75	9,81	514,73	6,28	165,69	3,72	44,27	2,31	13,51	1,42	4,11	0,86	1,20	0,63	0,57	0,43	0,23
166	7138	32,63	11305,97	25,27	5830,60	17,55	2275,44	12,89	1030,81	9,87	520,79	6,32	167,63	3,74	44,78	2,32	13,66	1,43	4,16	0,87	1,22	0,64	0,58	0,44	0,23
167	7181	32,83	11440,87	25,42	5899,97	17,65	2302,37	12,97	1042,95	9,93	526,89	6,36	169,57	3,76	45,29	2,33	13,82	1,44	4,21	0,87	1,23	0,64	0,58	0,44	0,23
168	7224	33,02	11576,57	25,57	5969,75	17,76	2329,46	13,05	1055,16	9,99	533,03	6,39	171,53	3,78	45,81	2,35	13,97	1,45	4,25	0,88	1,24	0,64	0,59	0,44	0,24
169	7267	33,22	11713,07	25,73	6039,93	17,86	2356,71	13,13	1067,44	10,05	539,20	6,43	173,49	3,81	46,33	2,36	14,13	1,46	4,30	0,88	1,26	0,65	0,59	0,45	0,24
170	7310	33,42	11850,37	25,88	6110,53	17,97	2384,12	13,20	1079,79	10,11	545,40	6,47	175,47	3,83	46,85	2,38	14,29	1,47	4,35	0,89	1,27	0,65	0,60	0,45	0,24
171	7353	33,61	11988,47	26,03	6181,53	18,08	2411,69	13,28	1092,21	10,17	551,64	6,51	177,46	3,85	47,37	2,39	14,44	1,48	4,39	0,89	1,29	0,66	0,61	0,45	0,25
172	7396	33,81	12127,36	26,18	6252,95	18,18	2439,41	13,36	1104,70	10,23	557,92	6,55	179,45	3,87	47,90	2,40	14,60	1,48	4,44	0,90	1,30	0,66	0,61	0,45	0,25
173	7439	34,01	12267,05	26,33	6324,77	18,29	2467,29	13,44	1117,26	10,29	564,23	6,58	181,46	3,90	48,43	2,42	14,76	1,49	4,49	0,90	1,31	0,66	0,62	0,46	0,25
174	7482	34,20	12407,54	26,49	6397,00	18,39	2495,33	13,51	1129,89	10,35	570,58	6,62	183,48	3,92	48,96	2,43	14,92	1,50	4,54	0,91	1,33	0,67	0,63	0,46	0,25
175	7525	34,40	12548,83	26,64	6469,64	18,50	2523,53	13,59	1142,59	10,41	576,96	6,66	185,52	3,94	49,49	2,45	15,08	1,51	4,59	0,91	1,34	0,67	0,63	0,46	0,26
176	7568	34,60	12690,92	26,79	6542,69	18,60	2551,88	13,67	1155,37	10,47	583,38	6,70	187,56	3,96	50,03	2,46	15,25	1,52	4,64	0,92	1,36	0,67	0,64	0,46	0,26
177	7611	34,79	12833,81	26,94	6616,15	18,71	2580,39	13,75	1168,21	10,52	589,83	6,74	189,61	3,99	50,57	2,47	15,41	1,53	4,68	0,92	1,37	0,68	0,65	0,47	0,26
178	7654	34,99	12977,49	27,10	6690,02	18,82	2609,06	13,82	1181,12	10,58	596,31	6,77	191,68	4,01	51,12	2,49	15,57	1,54	4,73	0,93	1,38	0,68	0,65	0,47	0,26
179	7697	35,19	13121,97	27,25	6764,30	18,92	2637,89	13,90	1194,11	10,64	602,84	6,81	193,75	4,03	51,66	2,50	15,74	1,54	4,78	0,93	1,40	0,69	0,66	0,47	0,27
180	7740	35,38	13267,25	27,40	6838,98	19,03	2666,87	13,98	1207,16	10,70	609,39	6,85	195,84	4,05	52,21	2,52	15,90	1,55	4,83	0,94	1,41	0,69	0,67	0,47	0,27
181	7783	35,58	13413,33	27,55	6914,08	19,13	2696,01	14,06	1220,29	10,76	615,99	6,89	197,94	4,08	52,76	2,53	16,07	1,56	4,88	0,94	1,43	0,69	0,67	0,48	0,27
182	7826	35,77	13560,21	27,70	6989,58	19,24	2725,31	14,13	1233,49	10,82	622,61	6,93	200,05	4,10	53,32	2,54	16,23	1,57	4,93	0,95	1,44	0,70	0,68	0,48	0,27
183	7869	35,97	13707,89	27,86	7065,50	19,34	2754,77	14,21	1246,75	10,88	629,28	6,96	202,17	4,12	53,87	2,56	16,40	1,58	4,98	0,96	1,46	0,70	0,69	0,48	0,28
184	7912	36,17	13856,36	28,01	7141,82	19,45	2784,39	14,29	1260,09	10,94	635,98	7,00	204,30	4,14	54,44	2,57	16,57	1,59	5,03	0,96	1,47	0,71	0,69	0,48	0,28
185	7955	36,36	14005,63	28,16	7218,55	19,56	2814,16	14,37	1273,50	11,00	642,71	7,04	206,44	4,17	55,00	2,59	16,74	1,60	5,08	0,97	1,48	0,71	0,70	0,49	0,28
186	7998	36,56	14155,70	28,31	7295,69	19,66	2844,09	14,45	1286,98	11,06	649,48	7,08	208,59	4,19	55,56	2,60	16,91	1,61	5,14	0,97	1,50	0,71	0,71	0,49	0,29
187	8041	36,76	14306,57	28,47	7373,24	19,77	2874,18	14,52	1300,52	11,12	656,28	7,12	210,76	4,21	56,13	2,61	17,08	1,61	5,19	0,98	1,51	0,72	0,72	0,49	0,29
188	8084	36,95	14458,24	28,62	7451,19	19,87	2904,43	14,60	1314,14	11,18	663,12	7,15	212,93	4,23	56,71	2,63	17,25	1,62	5,24	0,98	1,53	0,72	0,72	0,50	0,29
189	8127	37,15	14610,71	28,77	7529,56	19,98	2934,83	14,68	1327,83	11,24	669,99	7,19	215,12	4,26	57,28	2,64	17,43	1,63	5,29	0,99	1,54	0,72	0,73	0,50	0,29
190	8170	37,35	14763,97	28,92	7608,34	20,08	2965,39	14,76	1341,59	11,30	676,90	7,23	217,32	4,28	57,86	2,66	17,60	1,64	5,34	0,99	1,56	0,73	0,74	0,50	0,30
191	8213	37,54	14918,03	29,07	7687,52	20,19	2996,11	14,83	1355,42	11,36	683,85	7,27	219,52	4,30	58,44	2,67	17,77	1,65	5,39	1,00	1,57	0,73	0,74	0,50	0,30
192	8256	37,74	15072,89	29,23	7767,12	20,30	3026,99	14,91	1369,33	11,42	690,83	7,31	221,74	4,32	59,02	2,68	17,95	1,66	5,45	1,00	1,59	0,74	0,75	0,51	0,30
193	8299	37,94	15228,55	29,38	7847,12	20,40	3058,03	14,99	1383,30	11,48	697,84	7,34	223,97	4,35	59,61	2,70	18,12	1,67	5,50	1,01	1,60	0,74	0,76	0,51	0,31
194	8342	38,13	15385,01	29,53	7927,53	20,51	3089,22	15,07	1397,34	11,54	704,89	7,38	226,21	4,37	60,20	2,71	18,30	1,67	5,55	1,01	1,62	0,74	0,76	0,51	0,31
195	8385	38,33	15542,26	29,68	8008,35	20,61	3120,57	15,14	1411,45	11,59	711,97	7,42	228,47	4,39	60,79	2,73	18,48	1,68	5,61	1,02	1,64	0,75	0,77	0,51	0,31
196	8428	38,53	15700,32	29,84	8089,58	20,72	3152,08	15,22	1425,64	11,65	719,09	7,46	230,73	4,41	61,38	2,74	18,66	1,69	5,66	1,02	1,65	0,75	0,78	0,52	0,31
197	8471	38,72	15859,17	29,99	8171,22	20,82	3183,74	15,30	1439,89	11,71	726,25	7,50	233,00	4,44	61,98	2,75	18,84	1,70	5,71	1,03	1,67	0,76	0,79	0,52	0,32
198	8514	38,92	16018,82	30,14	8253,26	20,93	3215,57	15,38	1454,21	11,77	733,44	7,53	235,29	4,46	62,58	2,77	19,02	1,71	5,77	1,03	1,68	0,76	0,79	0,52	0,32
199	8557	39,12	16179,27	30,29	8335,72	21,04	3247,55	15,45	1468,61	11,83	740,67	7,57	237,58	4,48	63,18	2,78	19,20	1,72	5,82	1,04	1,70	0,76	0,80	0,52	0,32
200	8600	39,31	16340,52	30,44	8418,59	21,14	3279,68	15,53	1483,07	11,89	747,93	7,61	239,89	4,50	63,79	2,80	19,38	1,73	5,88	1,04	1,71	0,77	0,81	0,53	0,33
201	8643	39,51	16502,56	30,60	8501,86	21,25	3311,98	15,61	1497,61	11,95	755,22	7,65	242,21	4,53	64,40	2,81	19,56	1,73	5,93	1,05	1,73	0,77	0,82	0,53	0,33
202	8686	39,71	16665,40	30,75	8585,54	21,35	3344,44	15,69	1512,22	12,01	762,55	7,69	244,54	4,55	65,01	2,82	19,74	1,74	5,99	1,05	1,74	0,77	0,82	0,53	0,33
203	8729	39,90	16829,04	30,90	8669,63	21,46	3377,05	15,77	1526,89	12,07	769,92	7,73	246,88	4,57	65,62	2,84	19,93	1,75	6,04	1,06	1,76	0,78	0,83	0,53	0,33
204	8772	40,10	16993,48	31,05	8754,13	21,56	3409,82	15,84	1541,64	12,13	777,32	7,76	249,23	4,59	66,24	2,85	20,11	1,76	6,10	1,06	1,78	0,78	0,84	0,54	0,34
205	8815	40,30	17158,72	31,21	8839,04	21,67	3442,74	15,92	1556,46	12,19	784,76	7,80	251,59	4,62	66,86	2,87	20,30	1,77	6,15	1,07	1,79	0,79	0,85	0,54	0,34
206	8858	40,49	17324,76	31,36	8924,36	21,78	3475,83	16,00	1571,35	12,25	792,23	7,84	253,97	4,64	67,48	2,88	20,49	1,78	6,21	1,08	1,81	0,79	0,85	0,54	0,34
207	8901	40,69	17491,59	31,51	9010,09	21,88	3509,07	16,08	1586,31	12,31	799,73	7,88	256,35	4,66	68,11	2,89	20,67	1,79	6,26	1,08	1,82	0,79	0,86	0,55	0,35
208	8944	40,89	17659,22	31,66	9096,23	21,99	3542,47	16,15	1601,34	12,37	807,28	7,92	258,75	4,68	68,73	2,91	20,86	1,79	6,32	1,09	1,84	0,80	0,87	0,55	0,35
209	8987	41,08	17827,65	31,81	9182,77	22,09	3576,03	16,23	1616,44	12,43	814,85	7,95	261,15	4,71	69,37	2,92	21,05	1,80	6,38	1,09	1,86	0,80	0,88	0,55	0,35
210	9030	41,28	17996,88	31,97	9269,73	22,20	3609,74	16,31	1631,61	12,49	822,46	7,99	263,57	4,73	70,00	2,94	21,24	1,81	6,43	1,10	1,87	0,81	0,88	0,55	0,36
211	9073	41,48	18166,91	32,12	9357,09	22,30	3643,62	16,39	1646,85	12,55	830,11	8,03	266,00	4,75	70,64	2,95	21,43	1,82	6,49	1,10	1,89	0,81	0,89	0,56	0,36
212	9116	41,67	18337,73	32,27	9444,86	22,41	3,677,65	16,46	1662,16	12,61	837,79	8,07	268,44	4,77	71,28	2,96	21,62	1,83	6,55	1,11	1,91	0,81	0,90	0,56	0,36
213	9159	41,87	18509,36	32,42	9533,04	22,52	3,711,83	16,54	1677,54	12,67	845,51	8,11	270,89	4,80	71,92	2,98	21,82	1,84	6,61	1,11	1,92	0,82	0,91	0,56	0,36
214	9202	42,06	18681,78	32,58	9621,63	22,62	3,746,18	16,62	1692,99	12,72	853,26	8,14	273,35	4,82	72,56	2,99	22,01	1,85	6,66	1,12	1,94	0,82	0,91	0,56	0,37
215	9245	42,26	18855,00	32,73	9710,63	22,73	3,780,68	16,70	1708,52	12,78	861,05	8,18	275,82	4,84	73,21	3,01	22,20	1,86	6,72	1,12	1,96	0,82	0,92	0,57	0,37
216	9288	42,46	19029,02	32,88	9800,04	22,83	3815,34	16,78	1724,11	12,84	868,87	8,22	278,30	4,86	73,86	3,02	22,40	1,86	6,78	1,13	1,97	0,83	0,93	0,57	0,37
217	9331	42,65	19203,83	33,03	9889,85	22,94	3850,16	16,85	1739,77	12,90	876,73	8,26	280,80	4,89	74,52	3,03	22,60	1,87	6,84	1,13	1,99	0,83	0,94	0,57	0,38
218	9374	42,85	19379,45	33,18	9980,08	23,04	3885,14	16,93	1755,51	12,96	884,62	8,30	283,30	4,91	75,17	3,05	22,79	1,88	6,90	1,14	2,01	0,84	0,95	0,57	0,38
219	9417	43,05	19555,86	33,34	10623,10	23,15	3920,27	17,01	1771,31	13,02	892,55	8,33	285,82	4,93	75,83	3,06	22,99	1,89	6,96	1,14	2,02	0,84	0,95	0,58	0,38
220	9460	43,24	19733,07	33,49	10161,75	23,26	3955,57	17,09	1787,19	13,08	900,52	8,37	288,34	4,95	76,49	3,08	23,19	1,90	7,01	1,15	2,04	0,84	0,96	0,58	0,39
221	9503	43,44	19911,08	33,64	10253,21	23,36	3991,02	17,16	1803,14	13,14	908,51	8,41	290,88	4,98	77,16	3,09	23,39	1,91	7,07	1,15	2,06	0,85	0,97	0,58	0,39
222	9546	43,64	20089,88	33,79	10345,07	23,47	4026,62	17,24	1819,15	13,20	916,55	8,45	293,43	5,00	77,83	3,10	23,59	1,92	7,13	1,16	2,08	0,85	0,98	0,59	0,39
223	9589	43,83	20269,49	33,95	10437,34	23,57	4062,39	17,32	1835,24	13,26	924,62	8,49	295,99	5,02	78,50	3,12	23,79	1,92	7,19	1,16	2,09	0,86	0,99	0,59	0,40
224	9632	44,03	20449,89	34,10	10530,01	23,68	4098,31	17,40	1851,40	13,32	932,72	8,52	298,56	5,04	79,17	3,13	23,99	1,93	7,25	1,17	2,11	0,86	0,99	0,59	0,40
225	9675	44,23	20631,09	34,25	10623,10	23,78	4134,39	17,47	1867,62	13,38	940,86	8,56	301,15	5,07	79,85	3,15	24,19	1,94	7,31	1,17	2,13	0,86	1,00	0,59	0,40

Medium: water at 70°C

P = Q x ΔT x 1.163
= power in watts

1 mbar/m = 100 Pa/m

ΔT = 20°C

Water velocity
Central heating: max. 1m/s
Sanitary: max. 3m/s

HENCO

		Diameter 12		Diameter 14		Diameter 16		Diameter 18		Diameter 20		Diameter 26		Diameter 32		Diameter 40		Diameter 50		Diameter 63		Diameter 75		Diameter 90	
Energy	Flow	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss
(kW/h)	(l/h)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)
226	9718	44,42	20813,09	34,40	10716,60	23,89	4170,63	17,55	1883,92	13,44	949,03	8,60	303,74	5,09	80,53	3,16	24,39	1,95	7,38	1,18	2,14	0,87	1,01	0,60	0,41
227	9761	44,62	20995,89	34,55	10810,50	24,00	4207,02	17,63	1900,29	13,50	957,24	8,64	306,34	5,11	81,21	3,17	24,60	1,96	7,44	1,18	2,16	0,87	1,02	0,60	0,41
228	9804	44,82	21179,48	34,71	10904,82	24,10	4243,57	17,71	1916,73	13,56	965,49	8,68	308,96	5,13	81,89	3,19	24,80	1,97	7,50	1,19	2,18	0,87	1,03	0,60	0,41
229	9847	45,01	21363,88	34,86	10999,54	24,21	4280,28	17,78	1933,24	13,62	973,77	8,71	311,58	5,16	82,58	3,20	25,01	1,98	7,56	1,20	2,20	0,88	1,04	0,60	0,42
230	9890	45,21	21549,07	35,01	11094,67	24,31	4317,15	17,86	1949,82	13,68	982,08	8,75	314,22	5,18	83,27	3,21	25,22	1,98	7,62	1,20	2,22	0,88	1,04	0,61	0,42
231	9933	45,41	21735,06	35,16	11190,21	24,42	4354,18	17,94	1966,47	13,74	990,43	8,79	316,87	5,20	83,96	3,23	25,42	1,99	7,68	1,21	2,23	0,89	1,05	0,61	0,42
232	9976	45,60	21921,85	35,32	11286,16	24,52	4391,36	18,02	1983,19	13,79	998,81	8,83	319,53	5,22	84,66	3,24	25,63	2,00	7,74	1,21	2,25	0,89	1,06	0,61	0,43
233	10019	45,80	22109,43	35,47	11382,52	24,63	4428,70	18,10	1999,98	13,85	1007,23	8,87	322,20	5,25	85,36	3,26	25,84	2,01	7,81	1,22	2,27	0,89	1,07	0,61	0,43
234	10062	46,00	22297,82	35,62	11479,28	24,74	4466,20	18,17	2016,85	13,91	1015,69	8,90	324,88	5,27	86,06	3,27	26,05	2,02	7,87	1,22	2,29	0,90	1,08	0,62	0,43
235	10105	46,19	22487,00	35,77	11576,46	24,84	4503,86	18,25	2033,78	13,97	1024,18	8,94	327,57	5,29	86,76	3,28	26,26	2,03	7,93	1,23	2,30	0,90	1,09	0,62	0,44
236	10148	46,39	22676,98	35,92	11674,04	24,95	4541,67	18,33	2050,78	14,03	1032,71	8,98	330,27	5,31	87,47	3,30	26,47	2,04	8,00	1,23	2,32	0,91	1,09	0,62	0,44
237	10191	46,59	22867,76	36,08	11772,04	25,05	4579,64	18,41	2067,86	14,09	1041,27	9,02	332,99	5,34	88,18	3,31	26,68	2,05	8,06	1,24	2,34	0,91	1,10	0,62	0,44
238	10234	46,78	23059,34	36,23	11870,44	25,16	4617,77	18,48	2085,00	14,15	1049,86	9,06	335,71	5,36	88,89	3,33	26,90	2,05	8,12	1,24	2,36	0,91	1,11	0,63	0,45
239	10277	46,98	23251,71	36,38	11969,25	25,26	4656,06	18,56	2102,21	14,21	1058,49	9,10	338,45	5,38	89,61	3,34	27,11	2,06	8,19	1,25	2,38	0,92	1,12	0,63	0,45
240	10320	47,18	23444,88	36,53	12068,47	25,37	4694,50	18,64	2119,50	14,27	1067,16	9,13	341,20	5,40	90,33	3,35	27,33	2,07	8,25	1,25	2,40	0,92	1,13	0,63	0,45
241	10363	47,37	23638,85	36,69	12168,10	25,48	4733,10	18,72	2136,85	14,33	1075,86	9,17	343,95	5,43	91,05	3,37	27,54	2,08	8,31	1,26	2,41	0,92	1,14	0,64	0,46
242	10406	47,57	23833,62	36,84	12268,13	25,58	4771,86	18,79	2154,28	14,39	1084,59	9,21	346,72	5,45	91,77	3,38	27,76	2,09	8,38	1,26	2,43	0,93	1,15	0,64	0,46
243	10449	47,77	24029,19	36,99	12368,58	25,69	4810,78	18,87	2171,78	14,45	1093,37	9,25	349,50	5,47	92,50	3,40	27,97	2,10	8,44	1,27	2,45	0,93	1,15	0,64	0,46
244	10492	47,96	24225,55	37,14	12469,44	25,79	4849,85	18,95	2189,34	14,51	1102,17	9,29	352,29	5,49	93,23	3,41	28,19	2,11	8,51	1,27	2,47	0,94	1,16	0,64	0,47
245	10535	48,16	24422,72	37,29	12570,70	25,90	4889,09	19,03	2206,98	14,57	1111,01	9,32	355,09	5,52	93,96	3,42	28,41	2,11	8,57	1,28	2,49	0,94	1,17	0,65	0,47
246	10578	48,36	24620,68	37,45	12672,37	26,00	4928,48	19,11	2224,69	14,63	1119,89	9,36	357,91	5,54	94,70	3,44	28,63	2,12	8,64	1,28	2,51	0,94	1,18	0,65	0,47
247	10621	48,55	24819,44	37,60	12774,45	26,11	4968,02	19,18	2242,47	14,69	1128,80	9,40	360,73	5,56	95,44	3,45	28,85	2,13	8,70	1,29	2,53	0,95	1,19	0,65	0,48
248	10664	48,75	25018,99	37,75	12876,94	26,22	5007,73	19,26	2260,32	14,75	1137,75	9,44	363,57	5,58	96,18	3,47	29,07	2,14	8,77	1,29	2,55	0,95	1,20	0,65	0,48
249	10707	48,94	25219,35	37,90	12979,84	26,32	5047,59	19,34	2278,24	14,81	1146,73	9,48	366,41	5,61	96,92	3,48	29,30	2,15	8,84	1,30	2,56	0,95	1,21	0,66	0,48
250	10750	49,14	25420,50	38,06	13083,15	26,43	5087,61	19,42	2296,23	14,87	1155,75	9,51	369,27	5,63	97,67	3,49	29,52	2,16	8,90	1,31	2,58	0,96	1,22	0,66	0,49
251	10793	49,34	25622,45	38,21	13186,87	26,53	5127,79	19,49	2314,29	14,92	1164,80	9,55	372,14	5,65	98,42	3,51	29,74	2,17	8,97	1,31	2,60	0,96	1,22	0,66	0,49
252	10836	49,53	25825,20	38,36	13290,99	26,64	5168,13	19,57	2332,42	14,98	1173,89	9,59	375,02	5,67	99,17	3,52	29,97	2,17	9,04	1,32	2,62	0,97	1,23	0,66	0,50
253	10879	49,73	26028,75	38,51	13395,53	26,74	5208,62	19,65	2350,62	15,04	1183,01	9,63	377,91	5,70	99,92	3,54	30,19	2,18	9,10	1,32	2,64	0,97	1,24	0,67	0,50
254	10922	49,93	26233,10	38,66	13500,47	26,85	5249,27	19,73	2368,89	15,10	1192,16	9,67	380,81	5,72	100,68	3,55	30,42	2,19	9,17	1,33	2,66	0,97	1,25	0,67	0,50
255	10965	50,12	26438,24	38,82	13605,82	26,96	5290,08	19,80	2387,23	15,16	1201,36	9,70	383,72	5,74	101,44	3,56	30,64	2,20	9,24	1,33	2,68	0,98	1,26	0,67	0,51
256	11008	50,32	26644,18	38,97	13711,58	27,06	5331,04	19,88	2405,64	15,22	1210,58	9,74	386,64	5,76	102,21	3,58	30,87	2,21	9,31	1,34	2,70	0,98	1,27	0,67	0,51
257	11051	50,52	26850,92	39,12	13817,75	27,17	5372,17	19,96	2424,13	15,28	1219,85	9,78	389,57	5,79	102,97	3,59	31,10	2,22	9,38	1,34	2,72	0,99	1,28	0,68	0,51
258	11094	50,71	27058,46	39,27	13924,33	27,27	5413,45	20,04	2442,68	15,34	1229,14	9,82	392,52	5,81	103,74	3,61	31,33	2,23	9,44	1,35	2,74	0,99	1,29	0,68	0,52
259	11137	50,91	27266,80	39,42	14031,31	27,38	5454,89	20,11	2461,30	15,40	1238,48	9,86	395,47	5,83	104,51	3,62	31,56	2,23	9,51	1,35	2,76	0,99	1,30	0,68	0,52
260	11180	51,11	27475,93	39,58	14138,71	27,48	5496,48	20,19	2480,00	15,46	1247,85	9,89	398,44	5,85	105,29	3,63	105,29	2,24	9,58	1,36	2,78	1,00	1,31	0,69	0,52
261	11223	51,30	27685,86	39,73	14246,51	27,59	5538,24	20,27	2498,76	15,52	1257,25	9,93	401,42	5,88	106,06	3,65	32,02	2,25	9,65	1,36	2,80	1,00	1,32	0,69	0,53
262	11266	51,50	27896,59	39,88	14354,73	27,70	5580,15	20,35	2517,60	15,58	1266,69	9,97	404,41	5,90	106,85	3,66	32,26	2,26	9,72	1,37	2,82	1,00	1,33	0,69	0,53
263	11309	51,70	28108,12	40,03	14463,35	27,80	5622,22	20,43	2536,50	15,64	1276,16	10,01	407,41	5,92	107,63	3,68	32,49	2,27	9,79	1,37	2,84	1,01	1,33	0,69	0,54
264	11352	51,89	28320,44	40,19	14572,38	27,91	5664,44	20,50	2555,48	15,70	1285,67	10,05	410,42	5,94	108,41	3,69	32,73	2,28	9,86	1,38	2,86	1,01	1,34	0,70	0,54
265	11395	52,09	28533,57	40,34	14681,82	28,01	5706,83	20,58	2574,52	15,76	1295,21	10,08	413,44	5,97	109,20	3,70	32,96	2,29	9,93	1,38	2,88	1,02	1,35	0,70	0,54
266	11438	52,29	28747,49	40,49	14791,67	28,12	5749,37	20,66	2593,64	15,82	1304,79	10,12	416,47	5,99	109,99	3,72	33,20	2,30	10,00	1,39	2,90	1,02	1,36	0,70	0,55
267	11481	52,48	28962,21	40,64	14901,92	28,22	5792,07	20,74	2612,83	15,88	1314,40	10,16	419,51	6,01	110,79	3,73	33,43	2,30	10,07	1,39	2,92	1,02	1,37	0,70	0,55
268	11524	52,68	29177,73	40,79	15012,59	28,33	5834,92	20,81	2632,09	15,94	1324,05	10,20	422,57	6,03	111,59	3,75	33,67	2,31	10,14	1,40	2,94	1,03	1,38	0,71	0,55
269	11567	52,88	29394,04	40,95	15123,67	28,44	5877,94	20,89	2651,41	15,99	1333,74	10,24	425,63	6,06	112,39	3,76	33,91	2,32	10,21	1,40	2,96	1,03	1,39	0,71	0,56
270	11610	53,07	29611,16	41,10	15235,15	28,54	5921,11	20,97	2670,81	16,05	1343,46	10,27	428,71	6,08	113,19	3,77	34,15	2,33	10,28	1,41	2,98	1,04	1,40	0,71	0,56
271	11653	53,27	29829,07	41,25	15347,04	28,65	5964,44	21,05	2690,28	16,11	1353,21	10,31	431,80	6,10	113,99	3,79	34,39	2,34	10,35	1,41	3,00	1,04	1,41	0,71	0,57
272	11696	53,47	30047,78	41,40	15459,34	28,75	6007,93	21,12	2709,82	16,17	1363,00	10,35	434,90	6,12	114,80	3,80	34,63	2,35	10,43	1,42	3,02	1,04	1,42	0,72	0,57
273	11739	53,66	30267,29	41,56	15572,05	28,86	6051,57	21,20	2729,43	16,23	1372,82	10,39	438,01	6,15	115,61	3,82	34,87	2,36	10,50	1,43	3,04	1,05	1,43	0,72	0,57
274	11782	53,86	30487,59	41,71	15685,17	28,96	6095,37	21,28	2749,11	16,29	1382,68	10,43	441,13	6,17	116,43	3,83	35,11	2,36	10,57	1,43	3,06	1,05	1,44	0,72	0,58
275	11825	54,06	30708,70	41,86	15798,70	29,07	6139,33	21,36	2768,86	16,35	1392,58	10,47	444,26	6,19	117,25	3,84	35,36	2,37	10,64	1,44	3,08	1,05	1,45	0,72	0,58
276	11868	54,25	30930,60	42,01	15912,63	29,18	6183,45	21,44	2788,69	16,41	1402,51	10,50	447,40	6,21	118,07	3,86	35,60	2,38	10,71	1,44	3,10	1,06	1,46	0,73	0,58
277	11911	54,45	31153,30	42,16	16026,98	29,28	6227,73	21,51	2808,58	16,47	1412,47	10,54	450,55	6,24	118,89	3,87	35,85	2,39	10,79	1,45	3,12	1,06	1,47	0,73	0,59
278	11954	54,65	31376,80	42,32	16141,73	29,39	6272,16	21,59	2828,54	16,53	1422,47	10,58	453,72	6,26	119,71	3,89	36,09	2,40	10,86	1,45	3,14	1,07	1,48	0,73	0,59
279	11997	54,84	31601,09	42,47	16256,89	29,49	6316,75	21,67	2848,57	16,59	1432,51	10,62	456,89	6,28	120,54	3,90	36,34	2,41	10,93	1,46	3,16	1,07	1,49	0,74	0,60
280	12040	55,04	31826,19	42,62	16372,46	29,60	6361,50	21,75	2868,68	16,65	1442,58	10,66	460,08	6,30	121,37	3,91	36,59	2,42	11,01	1,46	3,19	1,07	1,50	0,74	0,60
281	12083	55,23	32052,08	42,77	16488,44	29,70	6406,40	21,82	2888,85	16,71	1452,68	10,69	463,28	6,33	122,21	3,93	36,84	2,42	11,08	1,47	3,21	1,08	1,51	0,74	0,60
282	12126	55,43	32278,77	42,93	16604,83	29,81	6451,46	21,90	2909,09	16,77	1462,82	10,73	466,48	6,35	123,04	3,94	37,09	2,43	11,15	1,47	3,23	1,08	1,52	0,74	0,61
283	12169	55,63	32506,26	43,08	16721,63	29,92	6496,68	21,98	2929,41	16,83	1473,00	10,77	469,70	6,37	123,88	3,96	37,34	2,44	11,23	1,48	3,25	1,09	1,53	0,75	0,61
284	12212	55,82	32734,54	43,23	16838,83	30,02	6542,06	22,06	2949,79	16,89	1483,21	10,81	472,93	6,40	124,72	3,97	37,59	2,45	11,30	1,48	3,27	1,09	1,54	0,75	0,62
285	12255	56,02	32963,63	43,38	16956,45	30,13	6587,60	22,13	2970,25	16,95	1493,45	10,85	476,17	6,42	125,57	3,98	37,84	2,46	11,38	1,49	3,29	1,09	1,55	0,75	0,62
286	12298	56,22	33193,51	43,53	17074,47	30,23	6633,29	22,21	2990,77	17,01	1503,73	10,88	479,43	6,44	126,42	4,00	38,09	2,47	11,45	1,49	3,31	1,10	1,56	0,75	0,62
287	12341	56,41	33424,19	43,69	17192,90	30,34	6679,14	22,29	3011,37	17,07	1514,05	10,92	482,69	6,46	127,27	4,01	38,34	2,48	11,53	1,50	3,33	1,10	1,57	0,76	0,63
288	12384	56,61	33655,67	43,84	17311,74	30,44	6725,15	22,37	3032,04	17,12	1524,40	10,96	485,96	6,49	128,12	4,03	38,60	2,49	11,60	1,50	3,36	1,10	1,58	0,76	0,63
289	12427	56,81	33887,94	43,99	17430,99	30,55	6771,32	22,44	3052,77	17,18	1534,78	11,00	489,25	6,51	128,98	4,04	38,85	2,49	11,68	1,51	3,38	1,11	1,59	0,76	0,64
290	12470	57,00	34121,02	44,14	17550,65	30,66	6817,64	22,52	3073,58	17,24	1545,21	11,04	492,54	6,53	129,84	4,05	39,11	2,50	11,76	1,51	3,40	1,11	1,60	0,76	0,64
291	12513	57,20	34354,89	44,30	17670,72	30,76	6864,12	22,60	3094,46	17,30	1555,66	11,07	495,85	6,55	130,70	4,07	39,36	2,51	11,83	1,52	3,42	1,12	1,61	0,77	0,64
292	12556	57,40	34589,56	44,45	17791,19	30,87	6910,76	22,68	3115,41	17,36	1566,15	11,11	499,17	6,58	131,56	4,08	39,62	2,52	11,91	1,52	3,44	1,12	1,62	0,77	0,65
293	12599	57,59	34825,02	44,60	17912,08	30,97	6957,55	22,76	3136,43	17,42	1576,68	11,15	502,50	6,60	132,43	4,10	39,88	2,53	11,98	1,53	3,47	1,12	1,63	0,77	0,65
294	12642	57,79	35061,29	44,75	18033,37	31,08	7004,51	22,83	3157,52	17,48	1587,24	11,19	505,84	6,62	133,30	4,11	40,14	2,54	12,06	1,53	3,49	1,13	1,64	0,77	0,66
295	12685	57,99	35298,35	44,90	18155,07	31,18	7051,62	22,91	3178,68	17,54	1597,84	11,23	509,19	6,64	134,17	4,12	40,40	2,55	12,14	1,54	3,51	1,13	1,65	0,78	0,66
296	12728	58,18	35536,21	45,06	18277,18	31,29	7098,89	22,99	3199,91	17,60	1608,47	11,26	512,55	6,67	135,05	4,14	40,66	2,55	12,22	1,55	3,53	1,14	1,66	0,78	0,66
297	12771	58,38	35774,87	45,21	18399,70	31,40	7146,31	23,07	3221,21	17,66	1619,13	11,30	515,92	6,69	135,93	4,15	40,92	2,56	12,29	1,55	3,55	1,14	1,67	0,78	0,67
298	12814	58,58	36014,33	45,36	18522,63	31,50	7193,90	23,14	3242,58	17,72	1629,84	11,34	519,31	6,71	136,81	4,17	41,18	2,57	12,37	1,56	3,58	1,14	1,68	0,79	0,67
299	12857	58,77	36254,59	45,51	18645,97	31,61	7241,64	23,22	3264,02	17,78	1,640,57	11,38	522,70	6,73	137,69	4,18	41,45	2,58	12,45	1,56	3,60	1,15	1,69	0,79	0,68
300	12900	58,97	36495,64	45,67	18769,71	31,71	7289,54	23,30	3285,53	17,84	1,651,34	11,42	526,11	6,76	138,58	4,19	41,71	2,59	12,53	1,57	3,62	1,15	1,70	0,79	0,68

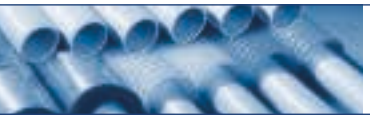
Medium: water at 70°C

P = Q x ΔT x 1.163
= power in watts

1 mbar/m = 100 Pa/m

ΔT = 20°C

Water velocity
Central heating: max. 1m/s
Sanitary: max. 3m/s



1 PIPES

		Diameter 12		Diameter 14		Diameter 16		Diameter 18		Diameter 20		Diameter 26		Diameter 32		Diameter 40		Diameter 50		Diameter 63		Diameter 75		Diameter 90	
Energy	Flow	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss
(kW/h)	(l/h)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)
301	12943	59,17	36737,49	45,82	18893,87	31,82	7337,59	23,38	3307,11	17,90	1662,15	11,45	529,52	6,78	139,47	4,21	41,97	2,60	12,61	1,57	3,64	1,15	1,71	0,79	0,68
302	12986	59,36	36980,14	45,97	19018,43	31,92	7385,81	23,45	3328,77	17,96	1672,99	11,49	532,95	6,80	140,36	4,22	42,24	2,61	12,69	1,58	3,67	1,16	1,72	0,80	0,69
303	13029	59,56	37223,59	46,12	19143,40	32,03	7434,18	23,53	3350,49	18,02	1683,87	11,53	536,39	6,82	141,26	4,24	42,51	2,61	12,76	1,58	3,69	1,16	1,73	0,80	0,69
304	13072	59,76	37467,83	46,27	19268,78	32,14	7482,71	23,61	3372,28	18,08	1694,78	11,57	539,84	6,85	142,16	4,25	42,77	2,62	12,84	1,59	3,71	1,17	1,74	0,80	0,70
305	13115	59,95	37712,87	46,43	19394,57	32,24	7531,40	23,69	3394,15	18,14	1705,73	11,61	543,30	6,87	143,06	4,26	43,04	2,63	12,92	1,59	3,73	1,17	1,75	0,80	0,70
306	13158	60,15	37958,71	46,58	19520,77	32,35	7580,24	23,76	3416,08	18,20	1716,71	11,64	546,77	6,89	143,96	4,28	43,31	2,64	13,00	1,60	3,76	1,17	1,76	0,81	0,71
307	13201	60,35	38205,35	46,73	19647,38	32,45	7629,24	23,84	3438,09	18,25	1727,73	11,68	550,25	6,91	144,87	4,29	43,58	2,65	13,08	1,60	3,78	1,18	1,77	0,81	0,71
308	13244	60,54	38452,79	46,88	19774,39	32,56	7678,40	23,92	3460,16	18,31	1738,78	11,72	553,75	6,94	145,78	4,31	43,85	2,66	13,16	1,61	3,80	1,18	1,78	0,81	0,71
309	13287	60,74	38701,02	47,04	19901,82	32,66	7727,72	24,00	3482,31	18,37	1749,87	11,76	557,25	6,96	146,69	4,32	44,12	2,67	13,24	1,61	3,82	1,19	1,80	0,81	0,72
310	13330	60,94	38950,06	47,19	20029,65	32,77	7777,19	24,08	3504,52	18,43	1760,99	11,80	560,77	6,98	147,61	4,33	44,39	2,68	13,32	1,62	3,85	1,19	1,81	0,82	0,72
311	13373	61,13	39199,89	47,34	20157,89	32,88	7826,82	24,15	3526,81	18,49	1772,15	11,84	564,29	7,00	148,52	4,35	44,67	2,68	13,40	1,62	3,87	1,19	1,82	0,82	0,73
312	13416	61,33	39450,52	47,49	20286,54	32,98	7876,61	24,23	3549,17	18,55	1783,34	11,87	567,83	7,03	149,44	4,36	44,94	2,69	13,49	1,63	3,89	1,20	1,83	0,82	0,73
313	13459	61,52	39701,94	47,64	20415,60	33,09	7926,56	24,31	3571,59	18,61	1794,57	11,91	571,38	7,05	150,37	4,38	45,22	2,70	13,57	1,63	3,92	1,20	1,84	0,82	0,74
314	13502	61,72	39954,17	47,80	20545,07	33,19	7976,66	24,39	3594,09	18,67	1805,83	11,95	574,94	7,07	151,29	4,39	45,49	2,71	13,65	1,64	3,94	1,20	1,85	0,83	0,74
315	13545	61,92	40207,19	47,95	20674,94	33,30	8026,93	24,46	3616,66	18,73	1817,13	11,99	578,51	7,09	152,22	4,40	45,77	2,72	13,73	1,64	3,96	1,21	1,86	0,83	0,74
316	13588	62,11	40461,01	48,10	20805,23	33,40	8077,35	24,54	3639,30	18,79	1828,47	12,03	582,09	7,12	153,16	4,42	46,04	2,73	13,81	1,65	3,99	1,21	1,87	0,83	0,75
317	13631	62,31	40715,63	48,25	20935,92	33,51	8127,92	24,62	3662,01	18,85	1839,83	12,06	585,68	7,14	154,09	4,43	46,32	2,74	13,89	1,65	4,01	1,22	1,88	0,84	0,75
318	13674	62,51	40971,04	48,41	21067,02	33,62	8178,66	24,70	3684,79	18,91	1851,24	12,10	589,28	7,16	155,03	4,44	46,60	2,74	13,98	1,66	4,03	1,22	1,89	0,84	0,76
319	13717	62,70	41227,26	48,56	21198,53	33,72	8229,55	24,77	3707,64	18,97	1862,68	12,14	592,90	7,18	155,97	4,46	46,88	2,75	14,06	1,67	4,06	1,22	1,90	0,84	0,76
320	13760	62,90	41484,27	48,71	21330,45	33,83	8280,60	24,85	3730,56	19,03	1874,15	12,18	596,52	7,21	156,91	4,47	47,16	2,76	14,14	1,67	4,08	1,23	1,91	0,84	0,77
321	13803	63,10	41742,08	48,86	21462,78	33,93	8331,81	24,93	3753,55	19,09	1885,66	12,22	600,16	7,23	157,86	4,49	47,44	2,77	14,23	1,68	4,10	1,23	1,93	0,85	0,77
322	13846	63,29	42000,68	49,01	21595,52	34,04	8383,17	25,01	3776,61	19,15	1897,20	12,25	603,81	7,25	158,81	4,50	47,72	2,78	14,31	1,68	4,13	1,23	1,94	0,85	0,77
323	13889	63,49	42260,09	49,17	21728,66	34,14	8434,69	25,09	3799,74	19,21	1908,78	12,29	607,46	7,27	159,76	4,51	48,01	2,79	14,39	1,69	4,15	1,24	1,95	0,85	0,78
324	13932	63,69	42520,29	49,32	21862,22	34,25	8486,37	25,16	3822,94	19,27	1920,39	12,33	611,13	7,30	160,71	4,53	48,29	2,80	14,48	1,69	4,18	1,24	1,96	0,85	0,78
325	13975	63,88	42781,29	49,47	21996,18	34,36	8538,21	25,24	3846,22	19,32	1932,04	12,37	614,81	7,32	161,67	4,54	48,57	2,80	14,56	1,70	4,20	1,25	1,97	0,86	0,79
326	14018	64,08	43043,09	49,62	22130,55	34,46	8590,21	25,32	3869,56	19,38	1943,73	12,41	618,50	7,34	162,63	4,56	48,86	2,81	14,65	1,70	4,22	1,25	1,98	0,86	0,79
327	14061	64,28	43305,69	49,78	22265,33	34,57	8642,36	25,40	3892,97	19,44	1955,45	12,44	622,20	7,36	163,59	4,57	49,14	2,82	14,73	1,71	4,25	1,25	1,99	0,86	0,80
328	14104	64,47	43569,08	49,93	22400,52	34,67	8694,67	25,47	3916,46	19,50	1967,20	12,48	625,92	7,39	164,56	4,58	49,43	2,83	14,82	1,71	4,27	1,26	2,00	0,86	0,80
329	14147	64,67	43833,28	50,08	22536,12	34,78	8747,14	25,55	3940,01	19,56	1978,99	12,52	629,64	7,41	165,53	4,60	49,72	2,84	14,90	1,72	4,30	1,26	2,02	0,87	0,81
330	14190	64,87	44098,27	50,23	22672,13	34,88	8799,76	25,63	3963,63	19,62	1990,81	12,56	633,38	7,43	166,50	4,61	50,01	2,85	14,99	1,72	4,32	1,27	2,03	0,87	0,81
331	14233	65,06	44364,06	50,38	22808,54	34,99	8852,54	25,71	3987,33	19,68	2002,67	12,60	637,12	7,45	167,47	4,63	50,30	2,86	15,07	1,73	4,35	1,27	2,04	0,87	0,82
332	14276	65,26	44630,64	50,54	22945,37	35,10	8905,48	25,78	4011,09	19,74	2014,57	12,63	640,88	7,48	168,45	4,64	50,59	2,86	15,16	1,73	4,37	1,27	2,05	0,87	0,82
333	14319	65,46	44898,03	50,69	23082,60	35,20	8958,58	25,86	4034,93	19,80	2026,50	12,67	644,65	7,50	169,43	4,65	50,88	2,87	15,24	1,74	4,39	1,28	2,06	0,88	0,82
334	14362	65,65	45166,21	50,84	23220,24	35,31	9011,84	25,94	4058,84	19,86	2038,46	12,71	648,42	7,52	170,41	4,67	51,17	2,88	15,33	1,74	4,42	1,28	2,07	0,88	0,83
335	14405	65,85	45435,19	50,99	23358,29	35,41	9065,25	26,02	4082,81	19,92	2050,46	12,75	652,21	7,54	171,40	4,68	51,46	2,89	15,42	1,75	4,44	1,28	2,08	0,88	0,83
336	14448	66,05	45704,97	51,15	23496,75	35,52	9118,82	26,09	4106,86	19,98	2062,50	12,79	656,01	7,57	172,38	4,70	51,75	2,90	15,50	1,75	4,47	1,29	2,10	0,89	0,84
337	14491	66,24	45975,54	51,30	23635,62	35,62	9172,55	26,17	4130,98	20,04	2074,57	12,82	659,83	7,59	173,37	4,71	52,05	2,91	15,59	1,76	4,49	1,29	2,11	0,89	0,84
338	14534	66,44	46246,92	51,45	23774,89	35,73	9226,43	26,25	4155,17	20,10	2086,67	12,86	663,65	7,61	174,37	4,72	52,34	2,92	15,68	1,76	4,52	1,30	2,12	0,89	0,85
339	14577	66,64	46519,09	51,60	23914,58	35,84	9280,48	26,33	4179,42	20,16	2098,81	12,90	667,48	7,63	175,36	4,74	52,64	2,93	15,77	1,77	4,54	1,30	2,13	0,89	0,85
340	14620	66,83	46792,06	51,75	24054,67	35,94	9334,68	26,41	4203,75	20,22	2110,99	12,94	671,33	7,66	176,36	4,75	52,94	2,93	15,85	1,77	4,57	1,30	2,14	0,90	0,86
341	14663	67,03	47065,82	51,91	24195,17	36,05	9389,03	26,48	4228,15	20,28	2123,20	12,98	675,18	7,68	177,37	4,77	53,23	2,94	15,94	1,78	4,59	1,31	2,15	0,90	0,86
342	14706	67,23	47340,39	52,06	24336,08	36,15	9443,55	26,56	4252,62	20,34	2135,44	13,01	679,05	7,70	178,37	4,78	53,53	2,95	16,03	1,79	4,62	1,31	2,16	0,90	0,87
343	14749	67,42	47615,75	52,21	24477,40	36,26	9498,22	26,64	4277,16	20,40	2147,72	13,05	682,92	7,72	179,38	4,79	53,83	2,96	16,12	1,79	4,64	1,32	2,18	0,90	0,87
344	14792	67,62	47891,91	52,36	24619,13	36,36	9553,05	26,72	4301,77	20,45	2160,04	13,09	686,81	7,75	180,39	4,81	54,13	2,97	16,21	1,80	4,67	1,32	2,19	0,91	0,87
345	14835	67,81	48168,87	52,52	24761,27	36,47	9608,04	26,79	4326,45	20,51	2172,39	13,13	690,71	7,77	181,40	4,82	54,43	2,98	16,30	1,80	4,69	1,32	2,20	0,91	0,88
346	14878	68,01	48446,63	52,67	24903,81	36,58	9663,19	26,87	4351,20	20,57	2184,77	13,17	694,62	7,79	182,42	4,84	54,73	2,99	16,38	1,81	4,72	1,33	2,21	0,91	0,88
347	14921	68,21	48725,18	52,82	25046,77	36,68	9718,49	26,95	4376,03	20,63	2197,19	13,21	698,54	7,81	183,44	4,85	55,03	2,99	16,47	1,81	4,74	1,33	2,22	0,91	0,89
348	14964	68,40	49004,54	52,97	25190,13	36,79	9773,95	27,03	4400,92	20,69	2209,65	13,24	702,47	7,84	184,46	4,86	55,34	3,00	16,56	1,82	4,77	1,33	2,24	0,92	0,89
349	15007	68,60	49284,69	53,12	25333,90	36,89	9829,57	27,10	4425,88	20,75	2222,14	13,28	706,42	7,86	185,48	4,88	55,64	3,01	16,65	1,82	4,80	1,34	2,25	0,92	0,90
350	15050	68,80	49565,63	53,28	25478,08	37,00	9885,34	27,18	4450,91	20,81	2234,67	13,32	710,37	7,88	186,51	4,89	55,95	3,02	16,74	1,83	4,82	1,34	2,26	0,92	0,90
351	15093	68,99	49847,38	53,43	25622,67	37,10	9941,28	27,26	4476,02	20,87	2247,23	13,36	714,34	7,90	187,54	4,91	56,25	3,03	16,83	1,83	4,85	1,35	2,27	0,93	0,91
352	15136	69,19	50129,92	53,58	25767,67	37,21	9997,37	27,34	4501,19	20,93	2259,82	13,40	718,31	7,93	188,57	4,92	56,56	3,04	16,92	1,84	4,87	1,35	2,28	0,93	0,91
353	15179	69,39	50413,27	53,73	25913,07	37,32	10053,62	27,42	4526,43	20,99	2272,45	13,43	722,30	7,95	189,61	4,93	56,87	3,05	17,02	1,84	4,90	1,35	2,30	0,93	0,92
354	15222	69,58	50697,41	53,89	26058,89	37,42	10110,02	27,49	4551,75	21,05	2285,12	13,47	726,30	7,97	190,65	4,95	57,17	3,05	17,11	1,85	4,92	1,36	2,31	0,93	0,92
355	15265	69,78	50982,34	54,04	26205,11	37,53	10166,58	27,57	4577,13	21,11	2297,82	13,51	730,31	7,99	191,69	4,96	57,48	3,06	17,20	1,85	4,95	1,36	2,32	0,94	0,93
356	15308	69,98	51268,08	54,19	26351,74	37,63	10223,31	27,65	4602,59	21,17	2310,56	13,55	734,33	8,02	192,73	4,98	57,79	3,07	17,29	1,86	4,98	1,37	2,33	0,94	0,93
357	15351	70,17	51554,61	54,34	26498,78	37,74	10280,18	27,73	4628,11	21,23	2323,33	13,59	738,36	8,04	193,78	4,99	58,10	3,08	17,38	1,86	5,00	1,37	2,34	0,94	0,94
358	15394	70,37	51841,94	54,49	26646,23	37,84	10337,22	27,80	4653,71	21,29	2336,14	13,62	742,40	8,06	194,83	5,00	58,41	3,09	17,47	1,87	5,03	1,37	2,36	0,94	0,94
359	15437	70,57	52130,07	54,65	26794,09	37,95	10394,41	27,88	4679,38	21,35	2348,98	13,66	746,45	8,08	195,88	5,02	58,73	3,10	17,56	1,87	5,06	1,38	2,37	0,95	0,95
360	15480	70,76	52419,00	54,80	26942,36	38,06	10451,76	27,96	4705,11	21,41	2361,85	13,70	750,51	8,11	196,94	5,03	59,04	3,11	17,66	1,88	5,08	1,38	2,38	0,95	0,95
361	15523	70,96	52708,72	54,95	27091,03	38,16	10509,27	28,04	4730,92	21,47	2374,77	13,74	754,59	8,13	198,00	5,05	59,35	3,12	17,75	1,88	5,11	1,38	2,39	0,95	0,96
362	15566	71,16	52999,25	55,10	27240,12	38,27	10566,94	28,11	4756,80	21,52	2387,71	13,78	758,67	8,15	199,06	5,06	59,67	3,12	17,84	1,89	5,13	1,39	2,40	0,95	0,96
363	15609	71,35	53290,57	55,26	27389,61	38,37	10624,76	28,19	4782,75	21,58	2400,69	13,81	762,77	8,17	200,12	5,07	59,98	3,13	17,94	1,89	5,16	1,39	2,42	0,96	0,97
364	15652	71,55	53582,68	55,41	27539,51	38,48	10682,74	28,27	4808,76	21,64	2413,71	13,85	766,88	8,20	201,19	5,09	60,30	3,14	18,03	1,90	5,19	1,40	2,43	0,96	0,97
365	15695	71,75	53875,60	55,56	27689,82	38,58	10740,88	28,35	4834,85	21,70	2426,76	13,89	771,00	8,22	202,26	5,10	60,61	3,15	18,12	1,91	5,21	1,40	2,44	0,96	0,98
366	15738	71,94	54169,31	55,71	27840,54	38,69	10799,18	28,42	4861,01	21,76	2439,85	13,93	775,13	8,24	203,33	5,12	60,93	3,16	18,22	1,91	5,24	1,40	2,45	0,96	0,98
367	15781	72,14	54463,83	55,86	27991,66	38,79	10857,63	28,50	4887,24	21,82	2452,97	13,97	779,27	8,26	204,40	5,13	61,25	3,17	18,31	1,92	5,27	1,41	2,47	0,97	0,99
368	15824	72,34	54759,13	56,02	28143,20	38,90	10916,24	28,58	4913,54	21,88	2466,13	14,00	783,42	8,29	205,48	5,14	61,57	3,18	18,41	1,92	5,29	1,41	2,48	0,97	0,99
369	15867	72,53	55055,24	56,17	28295,15	39,01	10975,01	28,66	4939,91	21,94	2479,32	14,04	787,58	8,31	206,56	5,16	61,89	3,18	18,50	1,93	5,32	1,42	2,49	0,97	0,99
370	15910	72,73	55352,15	56,32	28447,50	39,11	11033,93	28,74	4966,35	22,00	2492,55	14,08	791,75	8,33	207,65	5,17	62,21	3,19	18,59	1,93	5,35	1,42	2,50	0,98	1,00
371	15953	72,93	55649,85	56,47	28600,26	39,22	11093,02	28,81	4992,87	22,06	2505,81	14,12	795,94	8,35	208,73	5,19	62,53	3,20	18,69	1,94	5,37	1,42	2,52	0,98	1,00
372	15996	73,12	55948,35	56,63	28753,43	39,32	11152,26	28,89	5019,45	22,12	2519,11	14,16	800,13	8,38	209,82	5,20	62,86	3,21	18,78	1,94	5,40	1,43	2,53	0,98	1,01
373	16039	73,32	56247,65	56,78	28907,01	39,43	11211,66	28,97	5046,10	22,18	2532,44	14,19	804,34	8,40	210,91	5,21	63,18	3,22	18,88	1,95	5,43	1,43	2,54	0,98	1,01
374	16082	73,52	56547,75	56,93	29061,00	39,53	11271,21	29,05	5072,82	22,24	2545,81	14,23	808,55	8,42	212,01	5,23	63,50	3,23	18,98	1,95	5,46	1,43	2,55	0,99	1,02
375	16125	73,71	56848,64	57,08	29215,39	39,64	11330,93	29,12	5099,62	22,30	2559,21	14,27	812,78	8,44	213,10	5,24	63,83	3,24	19,07	1,96	5,48	1,44	2,57	0,99	1,02

Medium: water at 70°C

P = Q x ΔT x 1.163
= power in watts

1 mbar/m = 100 Pa/m

ΔT = 20°C

Water velocity
Central heating: max. 1m/s
Sanitary: max. 3m/s

Download tabel pressure loss

		Diameter 12		Diameter 14		Diameter 16		Diameter 18		Diameter 20		Diameter 26		Diameter 32		Diameter 40		Diameter 50		Diameter 63		Diameter 75		Diameter 90	
Energy	Flow	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss	Speed	Pressure loss
(kW/h)	(l/h)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)	(m/s)	(mbar/m)
376	16168	73,91	57150,33	57,23	29370,20	39,75	11390,80	29,20	5126,48	22,36	2572,65	14,31	817,02	8,47	214,20	5,26	64,15	3,24	19,17	1,96	5,51	1,44	2,58	0,99	1,03
377	16211	74,11	57452,82	57,39	29525,41	39,85	11450,83	29,28	5153,41	22,42	2586,12	14,35	821,27	8,49	215,31	5,27	64,48	3,25	19,26	1,97	5,54	1,45	2,59	0,99	1,03
378	16254	74,30	57756,11	57,54	29681,04	39,96	11511,01	29,36	5180,42	22,48	2599,63	14,38	825,53	8,51	216,41	5,28	64,81	3,26	19,36	1,97	5,57	1,45	2,61	1,00	1,04
379	16297	74,50	58060,20	57,69	29837,07	40,06	11571,36	29,43	5207,49	22,54	2613,17	14,42	829,80	8,53	217,52	5,30	65,14	3,27	19,46	1,98	5,59	1,45	2,62	1,00	1,05
380	16340	74,69	58365,08	57,84	29993,51	40,17	11631,86	29,51	5234,64	22,60	2626,75	14,46	834,09	8,56	218,63	5,31	65,47	3,28	19,56	1,98	5,62	1,46	2,63	1,00	1,05
381	16383	74,89	58670,76	58,00	30150,35	40,27	11692,52	29,59	5261,85	22,65	2640,36	14,50	838,38	8,58	219,75	5,33	65,80	3,29	19,65	1,99	5,65	1,46	2,64	1,00	1,06
382	16426	75,09	58977,24	58,15	30307,61	40,38	11753,33	29,67	5289,14	22,71	2654,01	14,54	842,69	8,60	220,86	5,34	66,13	3,30	19,75	1,99	5,68	1,47	2,66	1,01	1,06
383	16469	75,28	59284,52	58,30	30465,28	40,49	11814,30	29,75	5316,49	22,77	2667,69	14,58	847,00	8,62	221,98	5,35	66,46	3,31	19,85	2,00	5,70	1,47	2,67	1,01	1,07
384	16512	75,48	59592,59	58,45	30623,35	40,59	11875,44	29,82	5343,92	22,83	2681,41	14,61	851,33	8,65	223,11	5,37	66,79	3,31	19,95	2,00	5,73	1,47	2,68	1,01	1,07
385	16555	75,68	59901,46	58,60	30781,83	40,70	11936,72	29,90	5371,42	22,89	2695,17	14,65	855,67	8,67	224,23	5,38	67,12	3,32	20,04	2,01	5,76	1,48	2,70	1,01	1,08
386	16598	75,87	60211,13	58,76	30940,72	40,80	11998,17	29,98	5398,98	22,95	2708,95	14,69	860,01	8,69	225,36	5,40	67,46	3,33	20,14	2,01	5,79	1,48	2,71	1,02	1,08
387	16641	76,07	60521,60	58,91	31100,02	40,91	12059,77	30,06	5426,62	23,01	2722,78	14,73	864,37	8,71	226,49	5,41	67,79	3,34	20,24	2,02	5,82	1,48	2,72	1,02	1,09
388	16684	76,27	60832,87	59,06	31259,73	41,01	12121,53	30,13	5454,33	23,07	2736,64	14,77	868,74	8,74	227,62	5,42	68,13	3,35	20,34	2,03	5,84	1,49	2,73	1,02	1,09
389	16727	76,46	61144,93	59,21	31419,85	41,12	12183,45	30,21	5482,11	23,13	2750,53	14,80	873,13	8,76	228,76	5,44	68,46	3,36	20,44	2,03	5,87	1,49	2,75	1,03	1,10
390	16770	76,66	61457,79	59,37	31580,38	41,23	12245,53	30,29	5509,96	23,19	2764,46	14,84	877,52	8,78	229,90	5,45	68,80	3,37	20,54	2,04	5,90	1,50	2,76	1,03	1,10
391	16813	76,86	61771,45	59,52	31741,31	41,33	12307,76	30,37	5537,88	23,25	2778,42	14,88	881,92	8,80	231,04	5,47	69,14	3,37	20,64	2,04	5,93	1,50	2,77	1,03	1,11
392	16856	77,05	62085,91	59,67	31902,65	41,44	12370,15	30,44	5565,87	23,31	2792,42	14,92	886,34	8,83	232,19	5,48	69,48	3,38	20,74	2,05	5,96	1,50	2,79	1,03	1,11
393	16899	77,25	62401,17	59,82	32064,41	41,54	12432,70	30,52	5593,93	23,37	2806,46	14,96	890,76	8,85	233,33	5,49	69,82	3,39	20,84	2,05	5,98	1,51	2,80	1,04	1,12
394	16942	77,45	62717,22	59,97	32226,57	41,65	12495,41	30,60	5622,06	23,43	2820,52	14,99	895,20	8,87	234,48	5,51	70,16	3,40	20,94	2,06	6,01	1,51	2,81	1,04	1,12
395	16985	77,64	63034,07	60,13	32389,14	41,75	12558,27	30,68	5650,26	23,49	2834,63	15,03	899,64	8,89	235,64	5,52	70,50	3,41	21,04	2,06	6,04	1,51	2,83	1,04	1,13
396	17028	77,84	63351,72	60,28	32552,11	41,86	12621,29	30,75	5678,53	23,55	2848,77	15,07	904,10	8,92	236,79	5,54	70,84	3,42	21,14	2,07	6,07	1,52	2,84	1,04	1,13
397	17071	78,04	63670,16	60,43	32715,50	41,97	12684,47	30,83	5706,87	23,61	2862,94	15,11	908,57	8,94	237,95	5,55	71,19	3,43	21,24	2,07	6,10	1,52	2,85	1,05	1,14
398	17114	78,23	63989,41	60,58	32879,30	42,07	12747,81	30,91	5735,28	23,67	2877,15	15,15	913,05	8,96	239,11	5,56	71,53	3,43	21,34	2,08	6,13	1,53	2,87	1,05	1,14
399	17157	78,43	64309,45	60,74	33043,50	42,18	12811,30	30,99	5763,77	23,72	2891,39	15,18	917,54	8,98	240,28	5,58	71,87	3,44	21,45	2,08	6,16	1,53	2,88	1,05	1,15
400	17200	78,63	64630,29	60,89	33208,11	42,28	12874,95	31,07	5792,32	23,78	2905,67	15,22	922,04	9,01	241,45	5,59	72,22	3,45	21,55	2,09	6,19	1,53	2,89	1,05	1,15

Medium: water at 70°C

P = Q x ΔT x 1.163
= power in watts

1 mbar/m = 100 Pa/m

ΔT = 20°C

Water velocity
Central heating: max. 1m/s
Sanitary: max. 3m/s

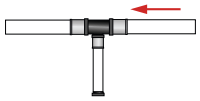
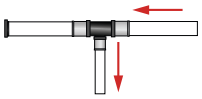
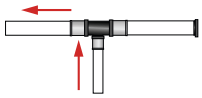
Overview of flow loss coefficients (Zeta values)

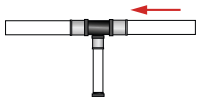
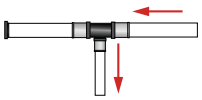
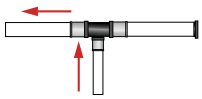
Liquids do not only lose energy when they flow through a pipe. They also lose energy when they change direction. This is because liquids have to overcome extra resistance.

The table below provides an overview of the flow loss coefficients for the various fittings and the corresponding number of meters of piping.

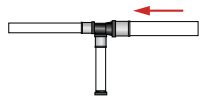
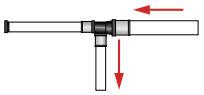
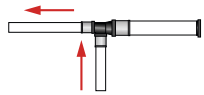
Zeta values (Medium: water at 15°C Flow speed: 2 m/s)										
		Ø14	Ø16	Ø18	Ø20	Ø26	Ø32	Ø40	Ø50	Ø63
Curved bend	zeta	1.50	1.25	1.10	1.85	0.70	-	-	-	-
	m	0.74	0.65	0.61	0.50	0.49	-	-	-	-
90° bend	zeta	3.071	2.021	2.839	1.87	1.974	1.981	1.865	1.753	1.666
	m	1.16	0.96	1.63	1.27	1.76	2.44	3.08	3.88	5.01
45° bend	zeta	-	-	-	-	-	-	0.761	0.69	0.614
	m	-	-	-	-	-	-	1.26	1.53	1.84
Straight coupling	zeta	0.918	0.689	0.61	0.559	0.504	0.472	0.388	0.342	0.327
	m	0.35	0.33	0.35	0.38	0.45	0.58	0.64	0.76	0.98
T-piece	zeta	1.026	0.829	0.739	0.639	0.629	0.562	0.472	0.407	0.347
	m	0.39	0.39	0.42	0.43	0.56	0.69	0.78	0.90	1.04
	zeta	2.772	2.329	2.126	1.89	1.974	1.844	1.716	2.001	1.884
	m	1.05	1.10	1.22	1.28	1.76	2.27	2.83	4.43	5.66
	zeta	2.851	2.372	2.268	2.010	2.104	1.898	1.716	1.902	1.785
	m	1.08	1.12	1.30	1.36	1.88	2.34	2.83	4.21	5.36

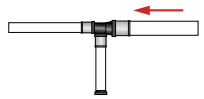
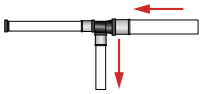
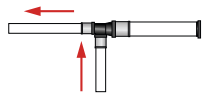
Zeta values (Medium: water at 15°C Flow speed: 2 m/s)

			Ø16-Ø14-Ø16	Ø18-Ø14-Ø18	Ø18-Ø16-Ø18	Ø20-Ø14-Ø20	Ø20-Ø16-Ø20	Ø20-Ø18-Ø20	Ø26-Ø16-Ø26	Ø26-Ø18-Ø26	Ø26-Ø20-Ø26	Ø32-Ø16-Ø32	Ø32-Ø18-Ø32	Ø32-Ø20-Ø32	Ø32-Ø26-Ø32
T-piece reduction		zeta	0.79	0.702	0.734	0.606	0.588	0.648	0.578	0.563	0.592	0.544	0.539	0.544	0.549
		m	0.37	0.40	0.42	0.41	0.40	0.44	0.52	0.50	0.53	0.67	0.66	0.67	0.68
		zeta	1.864	1.726	1.711	1.486	1.516	1.575	1.256	1.359	1.358	1.32	1.289	1.257	1.296
		m	0.88	0.99	0.98	1.01	1.03	1.07	1.12	1.21	1.21	1.63	1.59	1.55	1.60
		zeta	1.697	1.578	1.654	1.408	1.408	1.497	1.181	1.033	1.119	1.464	1.245	1.074	1.129
		m	0.80	0.91	0.95	0.95	0.95	1.01	1.05	0.92	1.00	1.80	1.53	1.32	1.39

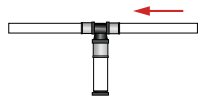
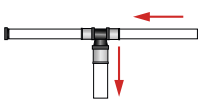
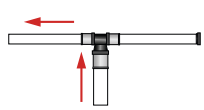
			Ø40-Ø16-Ø40	Ø40-Ø20-Ø40	Ø40-Ø26-Ø40	Ø40-Ø32-Ø40	Ø50-Ø20-Ø50	Ø50-Ø26-Ø50	Ø50-Ø32-Ø50	Ø50-Ø40-Ø50	Ø63-Ø26-Ø63	Ø63-Ø32-Ø63	Ø63-Ø40-Ø63	Ø63-Ø50-Ø63
		zeta	0.427	0.378	0.477	0.447	0.362	0.357	0.377	0.397	0.312	0.317	0.327	0.337
		m	0.70	0.62	0.74	0.74	0.80	0.79	0.83	0.88	0.94	0.95	0.98	1.01
		zeta	1.315	1.155	1.123	1.599	1.056	1.022	1.183	1.243	1.014	1.262	1.119	1.326
		m	2.17	1.91	1.85	2.64	2.34	2.26	2.62	2.75	3.05	3.79	3.36	3.98
		zeta	1.412	1.101	0.999	1.49	1.101	1.027	0.861	0.855	0.92	1.04	0.696	0.988
		m	2.33	1.82	1.65	2.46	2.44	2.27	1.91	1.89	5.77	3.12	2.09	2.97

Zeta values (Medium: water at 15°C Flow speed: 2 m/s)

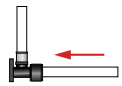
			Ø16-Ø14-Ø14	Ø18-Ø16-Ø16	Ø20-Ø16-Ø16	Ø20-Ø18-Ø18	Ø20-Ø20-Ø16	Ø26-Ø20-Ø20	Ø26-Ø26-Ø16	Ø26-Ø26-Ø20	Ø32-Ø26-Ø26	Ø40-Ø32-Ø32	Ø40-Ø40-Ø26
T-piece 2X reduction		zeta	0.907	0.732	0.699	0.759	0.80	0.694	0.859	0.674	0.671	0.673	0.704
		m	0.43	0.42	0.47	0.51	0.54	0.62	0.77	0.60	0.83	1.11	1.16
		zeta	1.902	1.667	1.759	1.657	1.90	1.413	1.983	2.441	1.254	1.441	1.721
		m	0.90	0.96	1.19	1.12	1.29	1.26	1.77	2.18	1.54	2.38	2.84
		zeta	1.879	1.885	1.34	1.924	1.11	1.731	0.978	1.104	1.398	1.609	0.748
		m	0.89	1.08	0.91	1.30	0.75	1.54	0.87	0.98	1.72	2.65	1.23

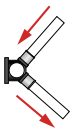
			Ø40-Ø40-Ø32	Ø50-Ø40-Ø40	Ø26-Ø16-Ø20	Ø26-Ø20-Ø16	Ø32-Ø20-Ø26	Ø40-Ø20-Ø32	Ø40-Ø26-Ø32	Ø50-Ø20-Ø40	Ø50-Ø26-Ø40	Ø50-Ø32-Ø40
		zeta	0.633	0.597	0.694	0.832	0.619	0.633	0.673	0.616	0.587	0.621
		m	1.04	1.32	0.62	0.74	0.76	1.04	1.11	1.36	1.30	1.37
		zeta	1.701	1.308	1.445	2.526	1.236	1.142	1.123	1.061	1.088	1.307
		m	2.81	2.89	1.29	2.25	1.52	1.88	1.85	2.35	2.41	2.89
		zeta	1.02	1.328	1.393	1.337	1.231	1.102	1.143	1.056	1.054	1.223
		m	1.68	2.94	1.24	1.19	1.52	1.82	1.89	2.34	2.33	2.71

Zeta values (Medium: water at 15°C Flow speed: 2 m/s)

			Ø16-Ø18-Ø16	Ø16-Ø20-Ø16	Ø20-Ø26-Ø20	Ø26-Ø32-Ø26	Ø32-Ø40-Ø32	Ø40-Ø50-Ø40
T-piece enlarged		zeta	0.841	0.896	0.671	0.629	0.678	0.452
		m	0.48	0.61	0.60	0.77	1.12	1.00
		zeta	1.483	1.255	1.14	1.029	1.233	2.209
		m	0.85	0.85	1.02	1.27	2.03	4.80
		zeta	1.749	1.598	1.507	1.395	1.629	2.298
		m	1.00	1.08	1.34	1.72	2.69	5.08

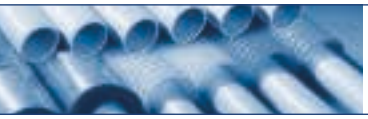
Zeta values (Medium: water at 15°C Flow speed: 2 m/s)

		Ø14-1/2"	Ø16-3/8"	Ø16-1/2"	Ø18-1/2"	Ø20-1/2"	Ø20-3/4"	Ø26-3/4"
Backplate 	zeta	1.697	1.417	1.441	1.513	1.587	1.264	1.385
	m	0.64	0.67	0.68	0.87	1.07	0.86	1.24

		Ø16-1/2"-Ø16	Ø20-1/2"-Ø20
Double backplate 	zeta	4.157	4.315
	m	1.97	2.92

		Ø16-Ø14	Ø18-Ø14	Ø18-Ø16	Ø20-Ø14	Ø20-Ø16	Ø20-Ø18	Ø26-Ø16	Ø26-Ø18	Ø26-Ø20
Reduction 	zeta	0.953	0.913	0.722	0.838	0.765	0.669	0.746	0.813	0.684
	m	0.45	0.52	0.41	0.57	0.52	0.45	0.67	0.73	0.61

		Ø32-Ø16	Ø32-Ø20	Ø32-Ø26	Ø40-Ø26	Ø40-Ø32	Ø50-Ø32	Ø50-Ø40	Ø63-Ø40	Ø63-Ø50
	zeta	0.807	0.689	0.598	0.622	0.599	0.671	0.592	0.661	0.531
	m	0.99	0.85	0.74	1.03	0.99	1.46	1.31	1.99	1.60



1 PIPES

Expansion table

All materials used in manufacturing the pipe expand when they are warmed and shrink when they cool down. That is why you always have to take length differences into account as a result of variations in temperature. The temperature difference and the length of the pipe are the two parameters that will determine the change in length. You can use the expansion table below to see the change in length that can be expected with a certain pipe length and a certain temperature difference. The coefficient of expansion is the same for all diameters.

Expansion (mm/m)	Temperature difference (ΔT)							
Pipe length (m)	10°C	20°C	30°C	40°C	**50°C**	60°C	70°C	80°C
1	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
2	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00
3	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00
4	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
5	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00
6	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00
7	1.75	3.50	5.25	7.00	8.75	10.50	12.25	14.00
8	2.00	4.00	6.00	8.00	**10.00**	12.00	14.00	16.00
9	2.25	4.50	6.75	9.00	11.25	13.50	15.75	18.00
10	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20.00

The expansion table (expressed in mm) was created using the following formula:

$$\Delta L = L \times \alpha \times \Delta T$$

Where:
- ΔL = change in length
- L = length of pipe
- α = coefficient of expansion
- ΔT = temperature difference

and where the coefficient of expansion is 0.025 mm/mK irrespective of the diameter of the pipe.

Example:

Given that: L = **8 m**
α = 0.025 mm/mK
ΔT = **50°C** (where Tmin=20°C and Tmax=70°C)

Required: ΔL

Solution: Consult the expansion table or apply the formula.

From the table: ΔL = 10.0 mm

Using the formula: $\Delta L = L \times \alpha \times \Delta T$
$\Delta L = 8 \times 0.025 \times 50$
ΔL = **10.0 mm**

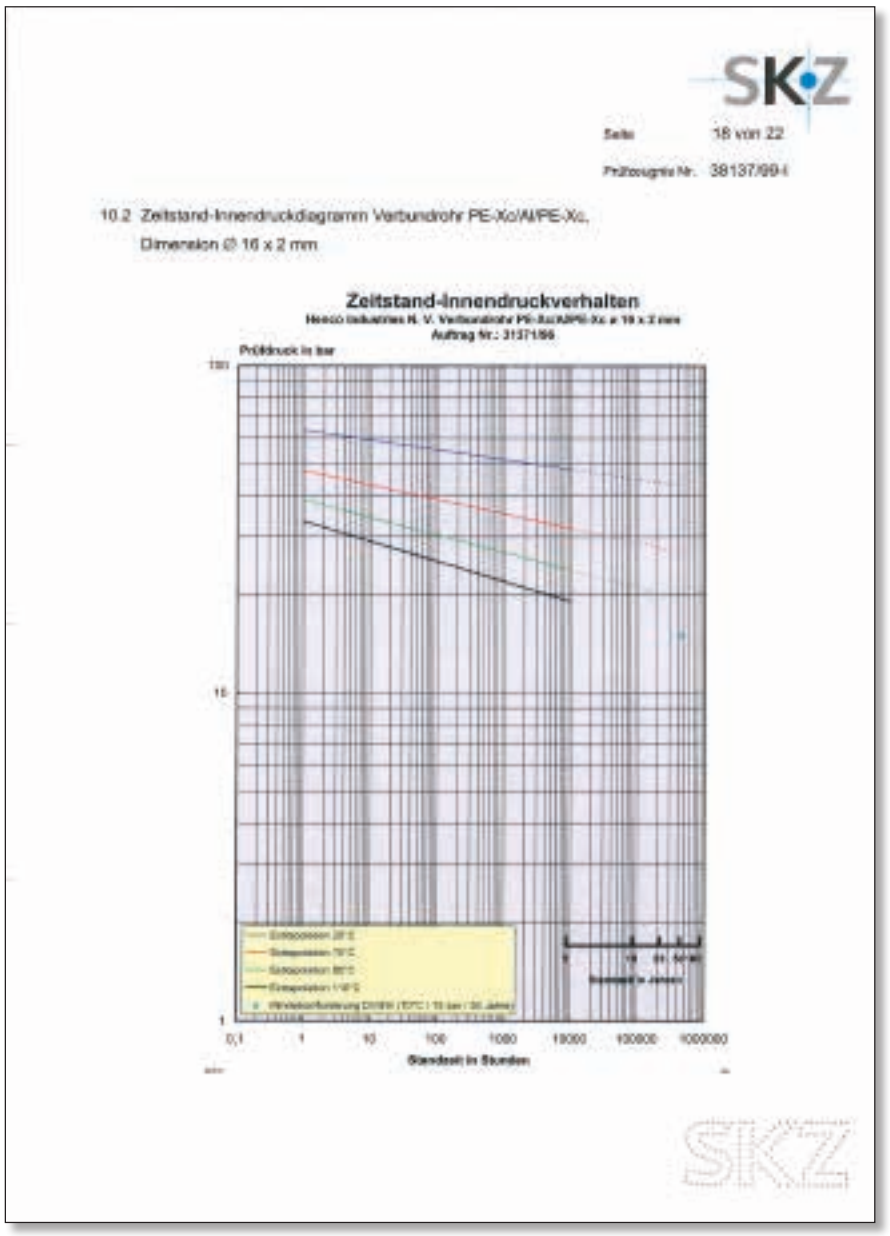
This change in length should be considered when a professional installs the piping system.

Regression curve (working life) of the Henco STANDARD and RIXc multilayer pipes

The working life of the multilayer pipe depends on the temperature and pressure in the pipe. The straight lines in the diagram below show the pressure that the pipe is capable of withstanding at a certain age and a constant water temperature. Clearly the pipe can withstand less pressure as it becomes older. To obtain German DVGW certification, a pipe must be able to withstand a pressure of 1.5 its working pressure after 50 years and at a constant water temperature of 70°C.

The regression curves for the different diameters of the Henco multilayer pipe sshow that for all pipe diameters, after 50 years with a water temperature of 70°C, the pipes are able to resist a much greater pressure than that required for DVGW certification. The Henco pipe has a working life of at least 50 years.

Please see the example below of the regression curve for diameter 16, as drawn up by the test laboratory of the SKZ in Germany.



HENCO PRE-INSULATED

Version: STANDARD and RIXc

General

The PE-Xc/Al/PE-Xc pipes come with a round or eccentric thermal insulating material. This material is made from extruded PE foam with a closed cell structure and protects the pipe against:

- Heat loss/heat transmission
- Condensation
- Expansion
- Noise transmission

The PE foam has a sturdy outer layer made from PE with a red or blue meshed vapour tight structure. This protects the foam against damage, so that the insulating properties of the product are not lost even during rough building work. The technical characteristics of the thermal insulation are as follows:

Insulation value (DIN 52613 / ISO 8497)	0.040 W/mK at +40°C 0.036 W/mK at +10°C
Fire classification	C_L-s1-d0 (EN 13501)
Temperature resistance	-40°C to + 100°C
Usage temperature	+5°C to +100°C (EN 14707)
Sound damping	Up to 23 dB(A) (DIN 52218)
Thickness (round)	6, 10 or 13 mm
Water vapour diffusion resistance	6315 mu

Transmission table															
	Ø14		Ø16			Ø18		Ø20			Ø26			Ø32	
AT	6 mm	10 mm	6 mm	10 mm	13 mm	6 mm	10 mm	6 mm	10 mm	13 mm	6 mm	10 mm	13 mm	6 mm	10 mm
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	-0.4	-0.4	-0.4	-0.4	-0.3	-0.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2
-2.0	-0.9	-0.8	-0.8	-0.7	-0.7	-0.7	-0.7	-0.7	-0.6	-0.6	-0.5	-0.5	-0.5	-0.4	-0.4
-3.0	-1.3	-1.2	-1.2	-1.1	-1.0	-1.1	-1.0	-1.0	-0.9	-0.9	-0.8	-0.7	-0.7	-0.6	-0.6
-4.0	-1.8	-1.6	-1.6	-1.4	-1.3	-1.4	-1.3	-1.3	-1.2	-1.1	-0.1	-0.1	-0.9	-0.9	-0.8
-5.0	-2.2	-2.0	-2.0	-1.8	-1.7	-1.8	-1.6	-1.6	-1.5	-1.4	-1.3	-1.2	-1.2	-1.1	-1.0
-6.0	-2.7	-2.4	-2.4	-2.2	-2.0	-2.1	-2.0	-2.0	-1.8	-1.7	-1.6	-1.5	-1.4	-1.3	-1.2
-7.0	-3.1	-2.8	-2.8	-2.5	-2.4	-2.5	-2.3	-2.3	-2.1	-2.0	-1.8	-1.7	-1.6	-1.5	-1.4
-8.0	-3.5	-3.2	-3.2	-2.9	-2.7	-2.9	-2.6	-2.6	-2.4	-2.3	-2.1	-1.9	-1.9	-1.7	-1.6
-9.0	-4.0	-3.6	-3.6	-3.2	-3.0	-3.2	-2.9	-2.9	-2.7	-2.6	-2.3	-2.2	-2.1	-1.9	-1.8
-10.0	-4.4	-4.0	-4.0	-3.6	-3.4	-3.6	-3.3	-3.3	-3.0	-2.8	-2.6	-2.4	-2.3	-2.2	-2.0
-11.0	-4.9	-4.4	-4.4	-3.9	-3.7	-3.9	-3.6	-3.6	-3.3	-3.1	-2.9	-2.7	-2.5	-2.4	-2.2
-12.0	-5.3	-4.8	-4.8	-4.3	-4.0	-4.3	-3.9	-3.9	-3.6	-3.4	-3.1	-2.9	-2.8	-2.6	-2.4
-13.0	-5.8	-5.2	-5.1	-4.7	-4.4	-4.7	-4.3	-4.3	-3.9	-3.7	-3.4	-3.2	-3.0	-2.8	-2.6
-14.0	-6.2	-5.6	-5.5	-5.0	-4.7	-5.0	-4.6	-4.6	-4.2	-4.0	-3.6	-3.4	-3.2	-3.0	-2.8
-15.0	-6.6	-6.0	-5.9	-5.4	-5.0	-5.4	-4.9	-4.9	-4.5	-4.3	-3.9	-3.6	-3.5	-3.2	-3.1
-16.0	-7.1	-6.4	-6.3	-5.7	-5.4	-5.7	-5.2	-5.2	-4.8	-4.6	-4.2	-3.9	-3.7	-3.4	-3.3
-17.0	-7.5	-6.8	-6.7	-6.1	-5.7	-6.1	-5.6	-5.6	-5.1	-4.8	-4.4	-4.1	-3.9	-3.7	-3.5
-18.0	-8.0	-7.1	-7.1	-6.5	-6.0	-6.4	-5.9	-5.9	-5.4	-5.1	-4.7	-4.4	-4.2	-3.9	-3.7
-19.0	-8.4	-7.5	-7.5	-6.8	-6.4	-6.8	-6.2	-6.2	-5.7	-5.4	-4.9	-4.6	-4.4	-4.1	-3.9
-20.0	-8.8	-7.9	-7.9	-7.2	-6.7	-7.2	-6.5	-6.5	-6.0	-5.7	-5.2	-4.9	-4.6	-4.3	-4.1
-21.0	-9.3	-8.3	-8.3	-7.5	-7.1	-7.5	-6.9	-6.9	-6.3	-6.0	-5.5	-5.1	-4.9	-4.5	-4.3
-22.0	-9.7	-8.7	-8.7	-7.9	-7.4	-7.9	-7.2	-7.2	-6.6	-6.3	-5.7	-5.3	-5.1	-4.7	-4.5

The table shows the surface temperature of the insulation at a certain temperature difference.

Example: - ambient temperature: 24°C
- cold water temperature: 6°C
- temperature difference: 6°C - 24°C= -18°C

For a 16 mm pipe provided with 10 mm insulation that has a temperature difference of -18°C the correction value is of -6.5°C.

The is means that the surface temperature is then 17.5°C (24°C - 6.5°C).

To avoid condensation, the surface temperature of the insulation must always be higher than the dew point temperature.

HENCO PROTECTION HOSE

Version: STANDARD, RIXc and 5L PE-Xc

General

The Henco STANDARD and RIXc multilayer pipes and the 5L PE-Xc synthetic pipes are also supplied with a ribbed protection hose.

Material and characteristics

Extra protection
The protective sleeves are made from Polyethylene. This offers extra protection to pipes carrying water and gas during building works.

Low insulating capacity
This prevents laid pipes from transmitting too much heat to the floor above when the pipes are used with central heating systems.
The layer of air in the protective sleeve provides an insulating effect.

Henco always recommends to use a protective sleeve for additional mechanical protection. An additional benefit of using a protective sleeve is that supply and return pipes can be colour coded which prevents mistakes with incorrectly connected pipes.

Gas installations
In gas installations, you are only allowed to combine the yellow protective sleeves with the Henco STANDARD multilayer pipe for gas. See page 29 for the gas specifications concerning protective sleeves.

Range

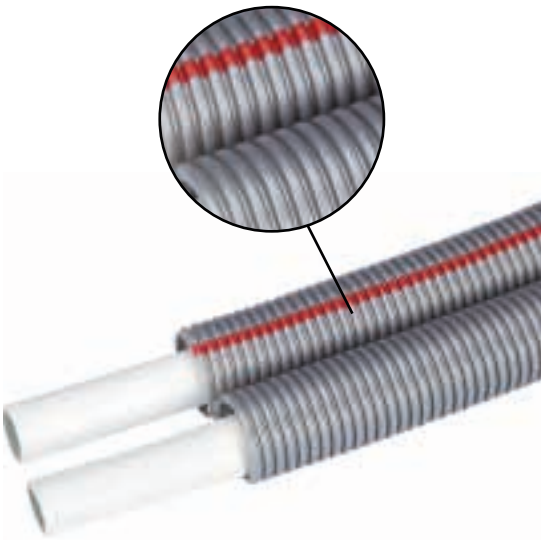
Pipe sleeves can be supplied in red, blue, yellow or black in diameters ranging from 14 to 32 mm.

HENCO COMBI®

Versions: STANDARD and RIXc

General

The Henco COMBI® consists of two PE-Xc/AL/PE-Xc pipes which are provided with a double polyethylene protective sleeves. The double protective sleeve is made from two individual sleeves which are connected to each other at various points. This means that you can fit floor fastenings between the two sleeves. As the pipes are only connected at various points, it requires little effort to separate the pipes.



Advantages

The Henco COMBI pipe combines the benefits of having a single protective sleeve with the following advantages

- Fast installation (supply and return pipes can be fitted in one job)
- Less fastenings required on the floor below
- Neat (parallel) installation

Red marking

It is important that the fitter is able to tell which is the supply and which is the return pipe. That is why one of the protective sleeves carries a red marking.

Henco recommends that you always use a protective sleeve for additional mechanical protection.

HENCO GAS

Version: STANDARD and with protective sleeve

General

The Henco STANDARD multilayer pipe PE-Xc/Al/PE-Xc and the PE protective sleeve can also be used with gas, provided that you use yellow pipes and sleeves.

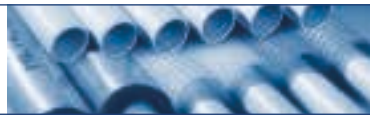
The Henco system for gas is only permitted in countries where a gas quality mark has been granted. Always consult the applicable regulations for gas piping systems which apply in the country.

The Henco synthetic gas system carries the KIWA-GASTEC gas quality mark 39581/01 and is intended for domestic gas installations and for transporting gas according to NPR-3378-5 and NPR-3378-6 of December 2012 and the amendments 3378-5/A1 and 3378-6/A1.
In addition, the Henco gas system with brass press fittings possesses the UNI/TS 11344 quality mark.

- KIWA-GASTEC
- UNI/TS 11344

Synthetic gas pipes don't have to be protected against corrosion in humid areas. This is in contrast to metal gas piping which must be protected against corrosion. Using synthetic piping gives significant savings during purchase and installation.

System
The Henco gas system comprises the Henco PE-Xc/AL/PE-Xc multilayer pipes for gas which can be provided with or without protective sleeves and the Henco PVDF and brass press fittings for gas.



Colour indication

The pipes and sleeves are yellow and are printed with the Henco brand name and the KIWA-GASTEC name.
The sleeves of the fitting are required to have a yellow stamp.

Solely for use with gas installations

The yellow pipe (protection hose) and the specially marked gas fittings can only be used in gas installations. The gas fittings are provided with special O-ring seals (HNBR) that have been specially designed for gas and do not work in water installations. Therefore regular water fittings cannot be used in gas installations and conversely , gas fittings cannot be used with water!

Protection hoses

Protection hoses have been adopted and are obligatory in certain circumstances. Protective sleeves give extra protection to pipes carrying gas when building works are being carried out.
Henco always recommends to use a protective sleeve as it provides additional mechanical protection.
The pipe sleeves are made from polyethylene and can also be supplied separately.

Instructions for the installation of gas piping

- You should choose the piping route so that that likelihood of damage to pipes from drilling or inserting nails for example is as low as possible.
- When pipes are bent, the minimum bending radius specified by Henco should be respected. You should remove any cracked pipes.
- When carrying out building work you should block off the end of the gas pipe to prevent debris from entering the pipe. If dirt does enter the pipe, you should remove this using inert gas or compressed air.
- Pipes and fittings which show signs of surface damage should not be used.

Installation specifications for gas piping and gas fittings

Basic criteria

- NPR-3378-5 of December 2012 and the amendment 3378-5/A1
- NPR-3378-6 of December 2012 and the amendment 3378-6/A1

Positioning pipes
Pipes can be positioning in the following ways:
- A In view
- B Concealed
- C In the ground

The Henco gas system can be used subject to the following requirements:
- Pipes use press connections (cannot be detached)
- Positioning pipes A-B-C

Explanations (the sub-numbers refer to NEN 3378-6):

A Pipes in view (NPR 3378-6, 4.2)

(4.2.1) Examples/definitions of pipes in view:
- a pipe in a well-accessible crawl space. Well-accessible implies a door or access hatch measuring 1 m x 0.60 m and a clearance height of at least 0.80 m
- a gas meter installed in a meter box, closed off with a door
- a burner, closed off with a door

(4.2.2) A crawl space is accessible if it can be accessed for inspection, maintenance and replacement:
- via a crawl hatch measuring at least 1 m x 0.60 m
- a clearance height of at least 0.80 m
- without obstacles impeding free passage

Two types of accessible crawl spaces can be distinguished:

(4.2.2.2) A crawl space with watertight damp-proofing on the bottom bottom (e.g. concrete with contiguous watertight rising walls): It is allowed to install the pipe with a pipe sleeve in this situation, provided that the area is permanently dry and ventilated by means of opposing ventilation openings. The pipe sleeve can be interrupted at the fittings. The Henco gas fittings and multilayer pipes do not require additional protection against corrosion.

(4.2.2.3) A crawl space without watertight damp-proofing on the bottom (e.g. sand): In crawl spaces without watertight damp-proofing, gas pipes should be installed with an uninterrupted pipe sleeve. This pipe sleeve must be:
- made of a synthetic
- uninterrupted, i.e. no fittings under the floor
- able to dispose of any leak gas above the floor. Henco gas pipes and pipe sleeves do not require protection against corrosion.

(4.2.3.2)) Space where a gas meter is installed (meter area)
If a Henco multilayer pipe is installed in the area where a gas meter is installed, it needs to be protected against mechanical and heat loads by means of a flexible pipe sleeve made of PE. The fittings do not require protection by means of a pipe sleeve.

(4.2.3.3) Space where a burner is installed
If a multilayer pipe is installed in the area where a burner is installed, it needs to be protected against mechanical and heat loads by means of a flexible pipe sleeve made of PE. The fittings do not require protection by means of a pipe sleeve.

(4.2.3.4) Pipe shafts
If a multilayer pipe is installed in an accessible pipe shaft, it needs to be protected against mechanical and heat loads by means of a flexible pipe sleeve made of PE. The fittings do not require protection by means of a pipe sleeve.

(4.2.4) Pipes above a lowered removable ceiling
If a multilayer pipe is installed in the space above a lowered removable ceiling (system ceiling), it should be protected against mechanical and heat loads by means of a flexible pipe sleeve made of PE. The fittings do not require protection by means of a pipe sleeve.

B Concealed pipes (NPR 3378-6, 4.3)

With regard to pipes in inaccessible or out-of-reach spaces, a distinction is made between the following three circumstances:

- pipes in potentially humid and corrosive spaces
- pipes in dry, non-corrosive spaces
- embedded pipes in floors and walls

(4.3.2.2) E.g. in humid crawl spaces without watertight damp-proofing on the bottom, multilayer pipes are allowed, provided that they are installed in an uninterrupted pipe sleeve. In this case, the use of fittings for additional connections is not allowed. Both ends of the pipe sleeve must protrude at least 20 mm above the finished floor. If any additional connection is required, a connection by means of a T-piece above the floor could be a solution. A second pipe with a pipe sleeve can then be connected similarly (as a bypass) to the T-piece. It is important that the brackets around the pipe sleeve are sufficiently wide, to allow any leaked gas to flow freely between the inner pipe and the pipe sleeve.

(4.3.2.3)) Pipes in dry, non-corrosive spaces (e.g. fixed ceilings, back panelling, joisting, storey floors, ...): The use of pipe sleeves in these cases is not obligatory. The pipe trajectory must be chosen in such a manner that any risk of damage e.g. by drilling or nailing is avoided.

Press fittings are tensile proof and therefore allowed.

(4.3.3) Embedded pipes
Multilayer pipes and press fittings can be embedded in floors and walls. If the situation permits, we recommend fitting the pipe with a flexible pipe sleeve, but this is not obligatory. Before or during the work, the pipe sleeve will provide more mechanical protection for the inner pipe.

The material of the architectural construction should not be allowed to damage the piping and the fitting. Where the pipe protrudes from the floors and walls, we recommend using a piece of pipe sleeve as protection. At the transition of the finished floor or wall it will protect the inner pipe against notch effects.

(4.3.4)) Pipes in a closed pipe trench, tunnel or masonry ducts
Henco multilayer pipes and press fittings can be used in this case. If the situation permits, we recommend fitting the pipe with a flexible pipe sleeve, but this is not obligatory. Before or during the work, the pipe sleeve will provide more mechanical protection for the inner pipe. If the duct has a watertight damp-proofing at the bottom, it must be ventilated upwards.

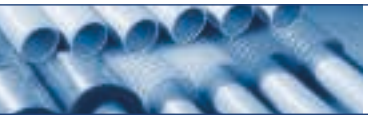
C Pipes in the ground (NPR 3378-7)

The use of multilayer pipes and fittings for gas transport in the ground is allowed, from a diameter of 16 mm up to and including a diameter of 40 mm, in combination with the press fittings, within the plot lines.

- Gas inlet bends should be used for façade feed-throughs.
- The press fittings need to be protected with DENSO grease tape.
- The multilayer pipes need to be fitted with a pipe sleeve.
- An underground warning tape must be applied approximately 30 cm above the pipe.
- If the ground is covered with 0.80 m of clean sand, mechanical protection measures must be taken, when technical objections arise.

It is recommended to feed the gas pipe through with a pipe sleeve in a solid PVC/PE/PP pipe sleeve.

Gas pipes should not be installed under buildings, in polluted soil, in rubble soil and where root growth and significant subsidence may occur.



1 PIPES

Summary

Places where gas pipes are NOT allowed (NPR 3378-6, 5.0):

- cavities, except in case of perpendicular feed-through with a pipe sleeve
- chimneys, drainage or ventilation ducts
- waste or fuel ducts or elevator shafts

Application/installation WITHOUT a pipe sleeve (NPR 3378-6):

- (4.3.3) Embedded or plastered-over pipes in floors and walls: Henco PVDF press fittings are allowed without protective measures.
- (4.3.2.3) Pipes between joisting/storey floors/fixed ceilings/ walls/ back panelling /behind kitchen units/ in closed pipe trenches/closed ducts: Henco PVDF press fittings are allowed without protective measures.

Application/installation WITH a pipe sleeve (NPR 3378-6):

- (4.2.3.2) In meter boxes from the gas meter until the pipe disappears from view (not visible with the naked eye): Henco PVDF press fittings are allowed, pipe sleeve up to the fitting.
- (4.2.3.3) Connecting pipes to burners until the pipe disappears from view (not visible with the naked eye): Henco a PVDF press fittings are allowed, pipe sleeve up to the fitting.
- (4.2.4)(4.2.3.4.) Lowered ceilings (system ceilings) /accessible pipe shafts: Henco PVDF press fittings are allowed, pipe sleeve up to the fitting.
- (4.2.2.2) Crawl space with watertight damp-proofing on the bottom: Henco PVDF press fittings are allowed, pipe sleeve up to the fitting.
- (4.2.2.3) Crawl space (basement) without watertight damp-proofing on the bottom, uninterrupted pipe sleeve, approx. 20 mm protruding from the finished floor: Henco PVDF press fittings are not allowed.

Application/installation WITH a pipe sleeve in the ground (NPR 3378-7, 5.0):

- Apply a pipe sleeve up to the Henco PVDF press fittings.
- Wrap Henco PVDF press fittings in DENSO grease tape (commercially available with QA gas quality label).
- Apply a yellow underground warning tape (GAS) approx. 30 cm above the gas pipe (also commercially available).
- It is recommended to install the gas pipe in a pipe sleeve made of PVC/PE/PP. However, this is not obligatory.

Protection hose

Henco always recommends to use a protective sleeve as it provides additional mechanical protection.
The Henco pipe sleeve meets the following requirements:

- Synthetic
- Internal & external diameter
- Gas tight

Mechanical damage

We recommend that you do not expose piping in gas installations to the risk of mechanical damage and/or external mechanical stresses.

Earthing

Synthetic piping should not be earthed using a metal barrier coating.

Disconnection from the gas supply

It merits attention that you should be able to disconnect installations from the gas supply as follows:

- After each point of entry in a home that does not have its own stopcock.
- After the point of entry to every physical building if the gas supply serves several separate buildings.
- Outside a heating room
- Immediately after the point of entry to a practical room or laboratory
- Immediately before a gas pressure regulator and metering equipment.
- Where gas appliances are located (in the case of decorative devices this can also be inside the meter cupboard)

Protection in event of a gas leak (Detailed info: NPR-3378-5 of December 2012)

When there is a drop in gas pressure or the gas supply is reconnected there should not be an unlimited discharge of unburned gas from the piping or gas appliance. This is not a problem for gas appliances fitted with a cutoff valve.
The following apply to gas appliances that are not fitted with a cutoff valve:

- Premises: a gas cutoff valve should be fitted behind every stopcock in sections of piping between the gas meter and the appliance.
- In homes, a gas shutoff value should be used in the section of pipe that is immediately behind the tap at the gas meter.

Type of gas

Henco gas pipes and press fittings are suitable for:

- Natural gas
- Propane
- Butane

For more information, refer to NEN 1078.

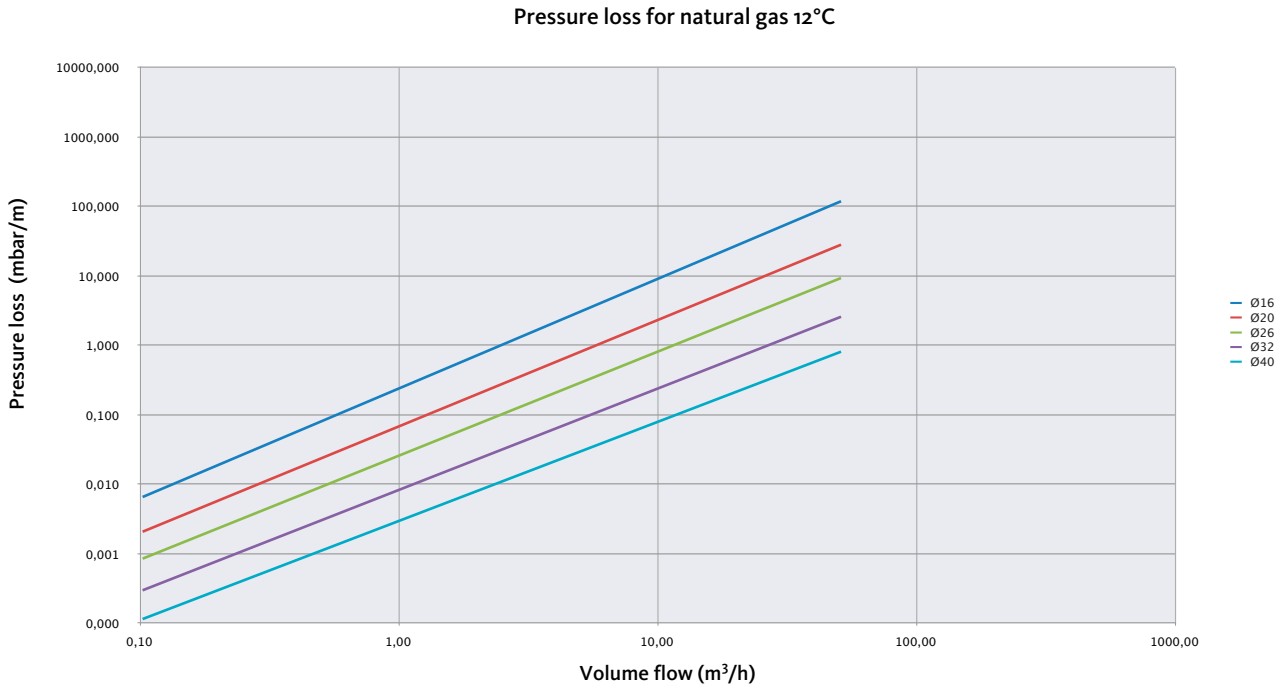
Pressure test

The piping is first thoroughly tested using a blast of air at a pressure of 1 bar (1000 mbar). The pressure should then be reduced to a test pressure that is 100 mb above the working pressure. The piping is considered to be gas-tight when there is no visible drop in pressure over a period of 5 minutes. A U-tube manometer or digital manometer is used to measure the pressure drop.

Note: these guidelines are only a small part of the actual standard. For further details about these guidelines, please consult NPR 3378-5 and NPR 3378-6.

Pressure loss diagram and pressure loss table for gas pipes

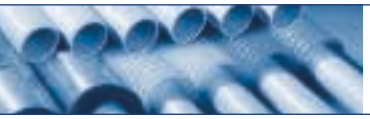
Just like water, gas also loses energy due to frictional forces against the wall of the pipe. You can make correct pipe calculations by using the pressure loss diagrams for gas. Under the NEN 1078 standard, piping systems should be planned so that the pressure loss is not greater than the difference between the working pressure and the minimum required supply pressure that is set by the manufacturer of the appliance.This means for a household gas installation that the total pressure loss from the outlet of the gas meter to the appliance may be 250 Pa 12 (2.5 mbar).



HENCO multilayer pipe for GAS

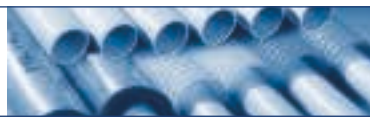
Atmospheric pressure 1013
Gas temperature 12 °C
Calorific value of natural gas 35.17 MJ/m³ (Upper value for the Netherlands)
Initial precharge 30 mbar

		Ø16			Ø20			Ø26			Ø32			Ø40		
Energy kWh	Volume flow m³/h	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)
1	0,10	0,25	0,66	0,0066	0,14	0,21	0,0021	0,09	0,09	0,0009	0,05	0,03	0,0003	0,03	0,01	0,0001
2	0,20	0,50	1,32	0,0132	0,28	0,42	0,0042	0,18	0,17	0,0017	0,11	0,06	0,0006	0,07	0,02	0,0002
3	0,31	0,75	1,98	0,0198	0,42	0,63	0,0063	0,27	0,26	0,0026	0,16	0,09	0,0009	0,10	0,03	0,0003
4	0,41	1,01	2,64	0,0264	0,57	0,83	0,0083	0,36	0,34	0,0034	0,21	0,12	0,0012	0,13	0,05	0,0005
5	0,51	1,26	3,29	0,0329	0,71	1,04	0,0104	0,45	0,43	0,0043	0,27	0,15	0,0015	0,17	0,06	0,0006
6	0,61	1,51	3,95	0,0395	0,85	1,25	0,0125	0,54	0,51	0,0051	0,32	0,18	0,0018	0,20	0,07	0,0007
7	0,72	1,76	4,61	0,0461	0,99	1,46	0,0146	0,63	0,60	0,0060	0,38	0,21	0,0021	0,23	0,08	0,0008
8	0,82	2,01	5,27	0,0527	1,13	1,67	0,0167	0,72	0,68	0,0068	0,43	0,24	0,0024	0,27	0,09	0,0009
9	0,92	2,26	5,93	0,0593	1,27	1,88	0,0188	0,81	0,77	0,0077	0,48	0,27	0,0027	0,30	0,10	0,0010
10	1,02	2,52	10,91	0,1091	1,41	2,08	0,0208	0,91	0,85	0,0085	0,54	0,30	0,0030	0,33	0,12	0,0012
11	1,13	2,77	12,81	0,1281	1,56	2,29	0,0229	1,00	0,94	0,0094	0,59	0,33	0,0033	0,37	0,13	0,0013
12	1,23	3,02	14,85	0,1485	1,70	2,50	0,0250	1,09	1,02	0,0102	0,64	0,36	0,0036	0,40	0,14	0,0014
13	1,33	3,27	17,02	0,1702	1,84	4,39	0,0439	1,18	1,11	0,0111	0,70	0,39	0,0039	0,43	0,15	0,0015
14	1,43	3,52	19,31	0,1931	1,98	4,98	0,0498	1,27	1,20	0,0120	0,75	0,42	0,0042	0,47	0,16	0,0016
15	1,54	3,77	21,72	0,2172	2,12	5,60	0,0560	1,36	1,28	0,0128	0,80	0,45	0,0045	0,50	0,17	0,0017
16	1,64	4,02	24,26	0,2426	2,26	6,24	0,0624	1,45	1,37	0,0137	0,86	0,48	0,0048	0,53	0,18	0,0018
17	1,74	4,28	26,91	0,2691	2,41	6,92	0,0692	1,54	2,42	0,0242	0,91	0,51	0,0051	0,57	0,20	0,0020
18	1,84	4,53	29,69	0,2969	2,55	7,62	0,0762	1,63	2,67	0,0267	0,96	0,54	0,0054	0,60	0,21	0,0021
19	1,94	4,78	32,58	0,3258	2,69	8,36	0,0836	1,72	2,92	0,0292	1,02	0,57	0,0057	0,63	0,22	0,0022
20	2,05	5,03	35,59	0,3559	2,83	9,12	0,0912	1,81	3,19	0,0319	1,07	0,60	0,0060	0,67	0,23	0,0023
21	2,15	5,28	38,71	0,3871	2,97	9,92	0,0992	1,90	3,46	0,0346	1,13	1,01	0,0101	0,70	0,24	0,0024
22	2,25	5,53	41,95	0,4195	3,11	10,74	0,1074	1,99	3,75	0,0375	1,18	1,09	0,0109	0,73	0,25	0,0025
23	2,35	5,79	45,30	0,4530	3,25	11,59	0,1159	2,08	4,04	0,0404	1,23	1,18	0,0118	0,76	0,26	0,0026
24	2,46	6,04	48,76	0,4876	3,40	12,46	0,1246	2,17	4,35	0,0435	1,29	1,27	0,0127	0,80	0,28	0,0028
25	2,56	6,29	52,33	0,5233	3,54	13,37	0,1337	2,26	4,66	0,0466	1,34	1,36	0,0136	0,83	0,29	0,0029
26	2,66	6,54	56,02	0,5602	3,68	14,30	0,1430	2,35	4,98	0,0498	1,39	1,45	0,0145	0,86	0,30	0,0030
27	2,76	6,79	59,81	0,5981	3,82	15,25	0,1525	2,44	5,31	0,0531	1,45	1,54	0,0154	0,90	0,50	0,0050
28	2,87	7,04	63,71	0,6371	3,96	16,24	0,1624	2,54	5,65	0,0565	1,50	1,64	0,0164	0,93	0,54	0,0054
29	2,97	7,29	67,72	0,6772	4,10	17,25	0,1725	2,63	6,00	0,0600	1,55	1,74	0,0174	0,96	0,57	0,0057
30	3,07	7,55	71,84	0,7184	4,24	18,29	0,1829	2,72	6,36	0,0636	1,61	1,85	0,0185	1,00	0,60	0,0060
31	3,17	7,80	76,07	0,7607	4,39	19,35	0,1935	2,81	6,73	0,0673	1,66	1,95	0,0195	1,03	0,64	0,0064
32	3,28	8,05	80,40	0,8040	4,53	20,44	0,2044	2,90	7,10	0,0710	1,71	2,06	0,0206	1,06	0,67	0,0067
33	3,38	8,30	84,84	0,8484	4,67	21,56	0,2156	2,99	7,49	0,0749	1,77	2,17	0,0217	1,10	0,71	0,0071
34	3,48	8,55	89,38	0,8938	4,81	22,70	0,2270	3,08	7,88	0,0788	1,82	2,28	0,0228	1,13	0,74	0,0074
35	3,58	8,80	94,03	0,9403	4,95	23,87	0,2387	3,17	8,29	0,0829	1,88	2,40	0,0240	1,16	0,78	0,0078
36	3,68	9,06	98,79	0,9879	5,09	25,07	0,2507	3,26	8,70	0,0870	1,93	2,52	0,0252	1,20	0,82	0,0082
37	3,79	9,31	103,64	1,0364	5,24	26,28	0,2628	3,35	9,12	0,0912	1,98	2,64	0,0264	1,23	0,86	0,0086
38	3,89	9,56	108,60	1,0860	5,38	27,53	0,2753	3,44	9,55	0,0955	2,04	2,76	0,0276	1,26	0,90	0,0090
39	3,99	9,81	113,67	1,1367	5,52	28,80	0,2880	3,53	9,98	0,0998	2,09	2,89	0,0289	1,30	0,94	0,0094
40	4,09	10,06	118,83	1,1883	5,66	30,09	0,3009	3,62	10,43	0,1043	2,14	3,01	0,0301	1,33	0,98	0,0098
41	4,20	10,31	124,10	1,2410	5,80	31,41	0,3141	3,71	10,88	0,1088	2,20	3,15	0,0315	1,36	1,02	0,0102
42	4,30	10,56	129,47	1,2947	5,94	32,76	0,3276	3,80	11,35	0,1135	2,25	3,28	0,0328	1,40	1,06	0,0106
43	4,40	10,82	134,95	1,3495	6,08	34,13	0,3413	3,89	11,82	0,1182	2,30	3,41	0,0341	1,43	1,11	0,0111
44	4,50	11,07	140,52	1,4052	6,23	35,52	0,3552	3,98	12,29	0,1229	2,36	3,55	0,0355	1,46	1,15	0,0115
45	4,61	11,32	146,19	1,4619	6,37	36,94	0,3694	4,07	12,78	0,1278	2,41	3,69	0,0369	1,50	1,20	0,0120
46	4,71	11,57	151,97	1,5197	6,51	38,38	0,3838	4,17	13,28	0,1328	2,46	3,83	0,0383	1,53	1,24	0,0124
47	4,81	11,82	157,85	1,5785	6,65	39,85	0,3985	4,26	13,78	0,1378	2,52	3,98	0,0398	1,56	1,29	0,0129
48	4,91	12,07	163,82	1,6382	6,79	41,34	0,4134	4,35	14,29	0,1429	2,57	4,12	0,0412	1,60	1,34	0,0134
49	5,02	12,33	169,90	1,6990	6,93	42,85	0,4285	4,44	14,81	0,1481	2,63	4,27	0,0427	1,63	1,39	0,0139
50	5,12	12,58	176,07	1,7607	7,07	44,39	0,4439	4,53	15,34	0,1534	2,68	4,42	0,0442	1,66	1,43	0,0143
51	5,22	12,83	182,34	1,8234	7,22	45,96	0,4596	4,62	15,88	0,1588	2,73	4,57	0,0457	1,70	1,48	0,0148
52	5,32	13,08	188,72	1,8872	7,36	47,54	0,4754	4,71	16,42	0,1642	2,79	4,73	0,0473	1,73	1,53	0,0153
53	5,43	13,33	195,19	1,9519	7,50	49,16	0,4916	4,80	16,97	0,1697	2,84	4,89	0,0489	1,76	1,58	0,0158
54	5,53	13,58	201,76	2,0176	7,64	50,79	0,5079	4,89	17,53	0,1753	2,89	5,05	0,0505	1,80	1,64	0,0164
55	5,63	13,83	208,42	2,0842	7,78	52,45	0,5245	4,98	18,10	0,1810	2,95	5,21	0,0521	1,83	1,69	0,0169
56	5,73	14,09	215,19	2,1519	7,92	54,13	0,5413	5,07	18,68	0,1868	3,00	5,38	0,0538	1,86	1,74	0,0174
57	5,83	14,34	222,05	2,2205	8,06	55,84	0,5584	5,16	19,26	0,1926	3,05	5,54	0,0554	1,90	1,79	0,0179
58	5,94	14,59	229,01	2,2901	8,21	57,57	0,5757	5,25	19,85	0,1985	3,11	5,71	0,0571	1,93	1,85	0,0185
59	6,04	14,84	236,07	2,3607	8,35	59,32	0,5932	5,34	20,45	0,2045	3,16	5,88	0,0588	1,96	1,90	0,0190
60	6,14	15,09	243,22	2,4322	8,49	61,10	0,6110	5,43	21,06	0,2106	3,21	6,06	0,0606	2,00	1,96	0,0196
61	6,24	15,34	250,48	2,5048	8,63	62,90	0,6290	5,52	21,68	0,2168	3,27	6,23	0,0623	2,03	2,02	0,0202
62	6,35	15,60	257,82	2,5782	8,77	64,72	0,6472	5,61	22,30	0,2230	3,32	6,41	0,0641	2,06	2,07	0,0207
63	6,45	15,85	265,27	2,6527	8,91	66,56	0,6656	5,70	22,93	0,2293	3,38	6,59	0,0659	2,10	2,13	0,0213
64	6,55	16,10	272,81	2,7281	9,06	68,43	0,6843	5,80	23,57	0,2357	3,43	6,77	0,0677	2,13	2,19	0,0219



1 PIPES

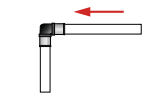
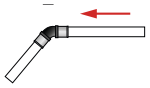
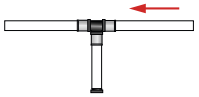
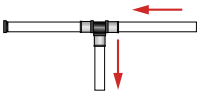
		Ø16			Ø20			Ø26			Ø32			Ø40		
Energy kWh	Volume flow m^3/h	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)
65	6.65	16.35	280.44	2.8044	9.20	70.33	0.7033	5.89	24.22	0.2422	3.48	6.95	0.0695	2,16	2,25	0,0225
66	6.76	16.60	288.18	2.8818	9.34	72.24	0.7224	5.98	24.87	0.2487	3.54	7.14	0.0714	2,20	2,31	0,0231
67	6.86	16.85	296.00	2.96	9.48	74.18	0.7418	6.07	25.53	0.2553	3.59	7.33	0.0733	2,23	2,37	0,0237
68	6.96	17.10	303.93	3.0393	9.62	76.14	0.7614	6.16	26.20	0.262	3.64	7.52	0.0752	2,26	2,43	0,0243
69	7.06	17.36	311.95	3.1195	9.76	78.12	0.7812	6.25	26.88	0.2688	3.70	7.71	0.0771	2,29	2,49	0,0249
70	7.17	17.61	320.06	3.2006	9.90	80.13	0.8013	6.34	27.56	0.2756	3.75	7.91	0.0791	2,33	2,55	0,0255
71	7.27	17.86	328.27	3.2827	10.05	82.16	0.8216	6.43	28.26	0.2826	3.80	8.10	0.0810	2,36	2,62	0,0262
72	7.37	18.11	336.57	3.3657	10.19	84.21	0.8421	6.52	28.96	0.2896	3.86	8.30	0.0830	2,39	2,68	0,0268
73	7.47	18.36	344.97	3.4497	10.33	86.29	0.8629	6.61	29.66	0.2966	3.91	8.50	0.0850	2,43	2,75	0,0275
74	7.57	18.61	353.46	3.5346	10.47	88.38	0.8838	6.70	30.38	0.3038	3.96	8.71	0.0871	2,46	2,81	0,0281
75	7.68	18.86	362.05	3.6205	10.61	90.50	0.9050	6.79	31.10	0.311	4.02	8.91	0.0891	2,49	2,88	0,0288
76	7.78	19.12	370.73	3.7073	10.75	92.65	0.9265	6.88	31.83	0.3183	4.07	9.12	0.0912	2,53	2,94	0,0294
77	7.88	19.37	379.50	3.795	10.89	94.81	0.9481	6.97	32.57	0.3257	4.13	9.33	0.0933	2,56	3,01	0,0301
78	7.98	19.62	388.37	3.8837	11.04	97.00	0.97	7.06	33.31	0.3331	4.18	9.54	0.0954	2,59	3,08	0,0308
79	8.09	19.87	397.34	3.9734	11.18	99.21	0.9921	7.15	34.07	0.3407	4.23	9.76	0.0976	2,63	3,15	0,0315
80	8.19	20.12	406.39	4.0639	11.32	101.44	1.0144	7.24	34.83	0.3483	4.29	9.97	0.0997	2,66	3,22	0,0322
81	8.29	20.37	415.54	4.1554	11.46	103.70	1.0370	7.33	35.59	0.3559	4.34	10.19	0.1019	2,69	3,29	0,0329
82	8.39	20.63	424.79	4.2479	11.60	105.97	1.0597	7.43	36.37	0.3637	4.39	10.41	0.1041	2,73	3,36	0,0336
83	8.50	20.88	434.12	4.3412	11.74	108.27	1.0827	7.52	37.15	0.3715	4.45	10.63	0.1063	2,76	3,43	0,0343
84	8.60	21.13	443.55	4.4355	11.88	110.59	1.1059	7.61	37.94	0.3794	4.50	10.86	0.1086	2,79	3,50	0,0350
85	8.70	21.38	453.08	4.5308	12.03	112.94	1.1294	7.70	38.74	0.3874	4.55	11.08	0.1108	2,83	3,57	0,0357
86	8.80	21.63	462.69	4.6269	12.17	115.30	1.153	7.79	39.54	0.3954	4.61	11.31	0.1131	2,86	3,64	0,0364
87	8.91	21.88	472.40	4.724	12.31	117.69	1.1769	7.88	40.36	0.4036	4.66	11.54	0.1154	2,89	3,72	0,0372
88	9.01	22.13	482.20	4.822	12.45	120.10	1.2010	7.97	41.17	0.4117	4.72	11.77	0.1177	2,93	3,79	0,0379
89	9.11	22.39	492.10	4.921	12.59	122.53	1.2253	8.06	42.00	0.42	4.77	12.01	0.1201	2,96	3,87	0,0387
90	9.21	22.64	502.09	5.0209	12.73	124.98	1.2498	8.15	42.84	0.4284	4.82	12.24	0.1224	2,99	3,94	0,0394
91	9.31	22.89	512.17	5.1217	12.88	127.46	1.2746	8.24	43.68	0.4368	4.88	12.48	0.1248	3,03	4,02	0,0402
92	9.42	23.14	522.34	5.2234	13.02	129.96	1.2996	8.33	44.52	0.4452	4.93	12.72	0.1272	3,06	4,10	0,0410
93	9.52	23.39	532.60	5.326	13.16	132.48	1.3248	8.42	45.38	0.4538	4.98	12.96	0.1296	3,09	4,17	0,0417
94	9.62	23.64	542.96	5.4296	13.30	135.02	1.3502	8.51	46.24	0.4624	5.04	13.21	0.1321	3,13	4,25	0,0425
95	9.72	23.90	553.41	5.5341	13.44	137.58	1.3758	8.60	47.11	0.4711	5.09	13.46	0.1346	3,16	4,33	0,0433
96	9.83	24.15	563.95	5.6395	13.58	140.17	1.4017	8.69	47.99	0.4799	5.14	13.70	0.137	3,19	4,41	0,0441
97	9.93	24.40	574.58	5.7458	13.72	142.77	1.4277	8.78	48.88	0.4888	5.20	13.95	0.1395	3,23	4,49	0,0449
98	10.03	24.65	585.30	5.853	13.87	145.40	1.454	8.87	49.77	0.4977	5.25	14.21	0.1421	3,26	4,57	0,0457
99	10.13	24.90	596.12	5.9612	14.01	148.05	1.4805	8.96	50.67	0.5067	5.30	14.46	0.1446	3,29	4,65	0,0465
100	10.24	25.15	607.02	6.0702	14.15	150.72	1.5072	9.06	51.57	0.5157	5.36	14.72	0.1472	3,33	4,73	0,0473
101	10.34	25.40	618.02	6.1802	14.29	153.42	1.5342	9.15	52.49	0.5249	5.41	14.98	0.1498	3,36	4,82	0,0482
102	10.44	25.66	629.11	6.2911	14.43	156.13	1.5613	9.24	53.41	0.5341	5.47	15.24	0.1524	3,39	4,90	0,0490
103	10.54	25.91	640.29	6.4029	14.57	158.87	1.5887	9.33	54.34	0.5434	5.52	15.50	0.155	3,43	4,98	0,0498
104	10.65	26.16	651.56	6.5156	14.71	161.63	1.6163	9.42	55.27	0.5527	5.57	15.76	0.1576	3,46	5,07	0,0507
105	10.75	26.41	662.93	6.6293	14.86	164.41	1.6441	9.51	56.21	0.5621	5.63	16.03	0.1603	3,49	5,15	0,0515
106	10.85	26.66	674.38	6.7438	15.00	167.21	1.6721	9.60	57.16	0.5716	5.68	16.30	0.163	3,53	5,24	0,0524
107	10.95	26.91	685.93	6.8593	15.14	170.03	1.7003	9.69	58.12	0.5812	5.73	16.57	0.1657	3,56	5,32	0,0532
108	11.05	27.17	697.56	6.9756	15.28	172.87	1.7287	9.78	59.08	0.5908	5.79	16.84	0.1684	3,59	5,41	0,0541
109	11.16	27.42	709.29	7.0929	15.42	175.74	1.7574	9.87	60.05	0.6005	5.84	17.11	0.1711	3,63	5,50	0,0550
110	11.26	27.67	721.11	7.2111	15.56	178.63	1.7863	9.96	61.03	0.6103	5.89	17.39	0.1739	3,66	5,59	0,0559
111	11.36	27.92	733.02	7.3302	15.71	181.54	1.8154	10.05	62.01	0.6201	5.95	17.67	0.1767	3,69	5,68	0,0568
112	11.46	28.17	745.02	7.4502	15.85	184.47	1.8447	10.14	63.01	0.6301	6.00	17.95	0.1795	3,73	5,76	0,0576
113	11.57	28.42	757.11	7.5711	15.99	187.42	1.8742	10.23	64.01	0.6401	6.05	18.23	0.1823	3,76	5,85	0,0585
114	11.67	28.67	769.29	7.6929	16.13	190.39	1.9039	10.32	65.01	0.6501	6.11	18.51	0.1851	3,79	5,95	0,0595
115	11.77	28.93	781.56	7.8156	16.27	193.38	1.9338	10.41	66.02	0.6602	6.16	18.80	0.188	3,82	6,04	0,0604
116	11.87	29.18	793.92	7.9392	16.41	196.40	1.964	10.50	67.04	0.6704	6.22	19.09	0.1909	3,86	6,13	0,0613
117	11.98	29.43	806.37	8.0637	16.55	199.44	1.9944	10.59	68.07	0.6807	6.27	19.38	0.1938	3,89	6,22	0,0622
118	12.08	29.68	818.91	8.1891	16.70	202.49	2.0249	10.69	69.11	0.6911	6.32	19.67	0.1967	3,92	6,31	0,0631
119	12.18	29.93	831.54	8.3154	16.84	205.57	2.0557	10.78	70.15	0.7015	6.38	19.96	0.1996	3,96	6,41	0,0641
120	12.28	30.18	844.27	8.4427	16.98	208.67	2.0867	10.87	71.20	0.712	6.43	20.26	0.2026	3,99	6,50	0,0650
121	12.39	30.44	857.08	8.5708	17.12	211.79	2.1179	10.96	72.25	0.7225	6.48	20.56	0.2056	4,02	6,60	0,0660
122	12.49	30.69	869.98	8.6998	17.26	214.94	2.1494	11.05	73.31	0.7331	6.54	20.86	0.2086	4,06	6,69	0,0669
123	12.59	30.94	882.97	8.8297	17.40	218.10	2.181	11.14	74.38	0.7438	6.59	21.16	0.2116	4,09	6,79	0,0679
124	12,69	31,19	896,05	8,9605	17,54	221,29	2,2129	11,23	75,46	0,7546	6,64	21,46	0,2146	4,12	6,88	0,0688
125	12,79	31,44	909,23	9,0923	17,69	224,49	2,2449	11,32	76,54	0,7654	6,70	21,77	0,2177	4,16	6,98	0,0698
126	12,90	31,69	922,49	9,2249	17,83	227,72	2,2772	11,41	77,63	0,7763	6,75	22,07	0,2207	4,19	7,08	0,0708
127	13,00	31,94	935,84	9,3584	17,97	230,97	2,3097	11,50	78,73	0,7873	6,80	22,38	0,2238	4,22	7,18	0,0718
128	13,10	32,20	949,28	9,4928	18,11	234,23	2,3423	11,59	79,83	0,7983	6,86	22,69	0,2269	4,26	7,28	0,0728
129	13,20	32,45	962,81	9,6281	18,25	237,52	2,3752	11,68	80,94	0,8094	6,91	23,01	0,2301	4,29	7,38	0,0738
130	13,31	32,70	976,43	9,7643	18,39	240,84	2,4084	11,77	82,06	0,8206	6,97	23,32	0,2332	4,32	7,48	0,0748
131	13,41	32,95	990,14	9,9014	18,53	244,17	2,4417	11,86	83,18	0,8318	7,02	23,64	0,2364	4,36	7,58	0,0758
132	13,51	33,20	1003,94	10,0394	18,68	247,52	2,4752	11,95	84,32	0,8432	7,07	23,96	0,2396	4,39	7,68	0,0768

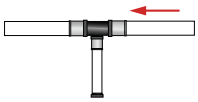
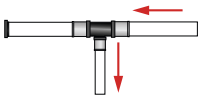


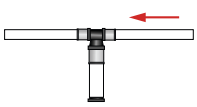
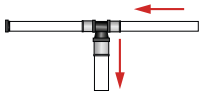
		Ø16			Ø20			Ø26			Ø32			Ø40		
Energy kWh	Volume flow m^3/h	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)	Speed (m(n)/s)	Pressure loss (Pa/m)	Pressure loss (mbar/m)
133	13.61	33.45	1017.82	10.1782	18.82	250.89	2.5089	12.04	85.45	0.8545	7.13	24.28	0.2428	4,42	7,78	0,0778
134	13.72	33.71	1031.80	10.318	18.96	254.29	2.5429	12.13	86.60	0.866	7.18	24.60	0.246	4,46	7,88	0,0788
135	13.82	33.96	1045.87	10.4587	19.10	257.71	2.5771	12.22	87.75	0.8775	7.23	24.92	0.2492	4,49	7,99	0,0799
136	13.92	34.21	1060.02	10.6002	19.24	261.14	2.6114	12.32	88.91	0.8891	7.29	25.25	0.2525	4,52	8,09	0,0809
137	14.02	34.46	1074.27	10.7427	19.38	264.60	2.646	12.41	90.08	0.9008	7.34	25.58	0.2558	4,56	8,19	0,0819
138	14.13	34.71	1088.60	10.886	19.53	268.08	2.6808	12.50	91.25	0.9125	7.39	25.91	0.2591	4,59	8,30	0,0830
139	14.23	34.96	1103.03	11.0303	19.67	271.58	2.7158	12.59	92.43	0.9243	7.45	26.24	0.2624	4,62	8,40	0,0840
140	14.33	35.21	1117.54	11.1754	19.81	275.10	2.751	12.68	93.62	0.9362	7.50	26.57	0.2657	4,66	8,51	0,0851
141	14.43	35.47	1132.14	11.3214	19.95	278.64	2.7864	12.77	94.81	0.9481	7.55	26.91	0.2691	4,69	8,62	0,0862
142	14.54	35.72	1146.83	11.4683	20.09	282.20	2.822	12.86	96.01	0.9601	7.61	27.24	0.2724	4,72	8,72	0,0872
143	14.64	35.97	1161.61	11.6161	20.23	285.78	2.8578	12.95	97.22	0.9722	7.66	27.58	0.2758	4,76	8,83	0,0883
144	14.74	36.22	1176.48	11.7648	20.37	289.38	2.8938	13.04	98.43	0.9843	7.72	27.92	0.2792	4,79	8,94	0,0894
145	14.84	36.47	1191.43	11.9143	20.52	293.01	2.9301	13.13	99.65	0.9965	7.77	28.27	0.2827	4,82	9,05	0,0905
146	14.94	36.72	1206.48	12.0648	20.66	296.65	2.9665	13.22	100.88	1.0088	7.82	28.61	0.2861	4,86	9,16	0,0916
147	15.05	36.98	1221.61	12.2161	20.80	300.32	3.0032	13.31	102.11	1.0211	7.88	28.96	0.2896	4,89	9,27	0,0927
148	15.15	37.23	1236.83	12.3683	20.94	304.00	3.0400	13.40	103.35	1.0335	7.93	29.31	0.2931	4,92	9,38	0,0938
149	15.25	37.48	1252.15	12.5215	21.08	307.71	3.0771	13.49	104.60	1.0460	7.98	29.66	0.2966	4,96	9,49	0,0949
150	15.35	37.73	1267.55	12.6755	21.22	311.44	3.1144	13.58	105.86	1.0586	8.04	30.01	0.3001	4,99	9,60	0,0960
151	15.46	37.98	1283.03	12.8303	21.36	315.19	3.1519	13.67	107.12	1.0712	8.09	30.36	0.3036	5,02	9,72	0,0972
152	15.56	38.23	1298.61	12.9861	21.51	318.96	3.1896	13.76	108.39	1.0839	8.14	30.72	0.3072	5,06	9,83	0,0983
153	15.66	38.48	1314.28	13.1428	21.65	322.75	3.2275	13.85	109.66	1.0966	8.20	31.08	0.3108	5,09	9,94	0,0994
154	15.76	38.74	1330.03	13.3003	21.79	326.56	3.2656	13.95	110.94	1.1094	8.25	31.44	0.3144	5,12	10,06	0,1006
155	15.87	38.99	1345.87	13.4587	21.93	330.39	3.3039	14.04	112.23	1.1223	8.31	31.80	0.318	5,16	10,17	0,1017
156	15.97	39.24	1361.80	13.618	22.07	334.24	3.3424	14.13	113.53	1.1353	8.36	32.16	0.3216	5,19	10,29	0,1029
157	16.07	39.49	1377.82	13.7782	22.21	338.11	3.3811	14.22	114.83	1.1483	8.41	32.53	0.3253	5,22	10,40	0,1040
158	16.17	39.74	1393.93	13.9393	22.36	342.00	3.42	14.31	116.14	1.1614	8.47	32.90	0.329	5,26	10,52	0,1052
159	16.28	39.99	1410.12	14.1012	22.50	345.91	3.4591	14.40	117.45	1.1745	8.52	33.26	0.3326	5,29	10,64	0,1064
160	16.38	40.25	1426.41	14.2641	22.64	349.85	3.4985	14.49	118.77	1.1877	8.57	33.64	0.3364	5,32	10,75	0,1075
161	16.48	40.50	1442.78	14.4278	22.78	353.80	3.538	14.58	120.10	1.2010	8.63	34.01	0.3401	5,35	10,87	0,1087
162	16.58	40.75	1459.24	14.5924	22.92	357.78	3.5778	14.67	121.44	1.2144	8.68	34.38	0.3438	5,39	10,99	0,1099
163	16.68	41.00	1475.79	14.7579	23.06	361.77	3.6177	14.76	122.78	1.2278	8.73	34.76	0.3476	5,42	11,11	0,1111
164	16.79	41.25	1492.42	14.9242	23.20	365.79	3.6579	14.85	124.13	1.2413	8.79	35.14	0.3514	5,45	11,23	0,1123
165	16.89	41.50	1509.15	15.0915	23.35	369.82	3.6982	14.94	125.49	1.2549	8.84	35.52	0.3552	5,49	11,35	0,1135
166	16.99	41.75	1525.96	15.2596	23.49	373.88	3.7388	15.03	126.85	1.2685	8.89	35.90	0.359	5,52	11,47	0,1147
167	17.09	42.01	1542.86	15.4286	23.63	377.95	3.7795	15.12	128.22	1.2822	8.95	36.28	0.3628	5,55	11,59	0,1159
168	17.20	42.26	1559.85	15.5985	23.77	382.05	3.8205	15.21	129.59	1.2959	9.00	36.67	0.3667	5,59	11,72	0,1172
169	17.30	42.51	1576.92	15.7692	23.91	386.17	3.8617	15.30	130.98	1.3098	9.06	37.06	0.3706	5,62	11,84	0,1184
170	17.40	42.76	1594.09	15.9409	24.05	390.31	3.9031	15.39	132.37	1.3237	9.11	37.44	0.3744	5,65	11,96	0,1196
171	17.50	43.01	1611.34	16.1134	24.19	394.47	3.9447	15.48	133.76	1.3376	9.16	37.84	0.3784	5,69	12,09	0,1209
172	17.61	43.26	1628.68	16.2868	24.34	398.64	3.9864	15.57	135.16	1.3516	9.22	38.23	0.3823	5,72	12,21	0,1221
173	17.71	43.52	1646.10	16.461	24.48	402.84	4.0284	15.67	136.57	1.3657	9.27	38.62	0.3862	5,75	12,34	0,1234
174	17.81	43.77	1663.62	16.6362	24.62	407.06	4.0706	15.76	137.99	1.3799	9.32	39.02	0.3902	5,79	12,46	0,1246
175	17.91	44.02	1681.22	16.8122	24.76	411.30	4.113	15.85	139.41	1.3941	9.38	39.42	0.3942	5,82	12,59	0,1259
176	18.02	44.27	1698.91	16.9891	24.90	415.56	4.1556	15.94	140.84	1.4084	9.43	39.82	0.3982	5,85	12,71	0,1271
177	18.12	44.52	1716.69	17.1669	25.04	419.84	4.1984	16.03	142.28	1.4228	9.48	40.22	0.4022	5,89	12,84	0,1284
178	18.22	44.77	1734.55	17.3455	25.18	424.15	4.2415	16.12	143.72	1.4372	9.54	40.62	0.4062	5,92	12,97	0,1297
179	18.32	45.02	1752.51	17.5251	25.33	428.47	4.2847	16.21	145.17	1.4517	9.59	41.03	0.4103	5,95	13,10	0,1310
180	18.42	45.28	1770.55	17.7055	25.47	432.81	4.3281	16.30	146.62	1.4662	9.64	41.44	0.4144	5,99	13,23	0,1323
181	18.53	45.53	1788.68	17.8868	25.61	437.17	4.3717	16.39	148.09	1.4809	9.70	41.85	0.4185	6,02	13,36	0,1336
182	18.63	45.78	1806.89	18.0689	25.75	441.55	4.4155	16.48	149.56	1.4956	9.75	42.26	0.4226	6,05	13,49	0,1349
183	18.73	46.03	1825.20	18.252	25.89	445.95	4.4595	16.57	151.03	1.5103	9.81	42.67	0.4267	6,09	13,62	0,1362
184	18.83	46.28	1843.59	18.4359	26.03	450.38	4.5038	16.66	152.51	1.5251	9.86	43.08	0.4308	6,12	13,75	0,1375
185	18.94	46.53	1862.06	18.6206	26.18	454.82	4.5482	16.75	154.00	1.54	9.91	43.50	0.435	6,15	13,88	0,1388
186	19.04	46.79	1880.63	18.8063	26.32	459.28	4.5928	16.84	155.50	1.555	9.97	43.92	0.4392	6,19	14,01	0,1401
187	19.14	47.04	1899.28	18.9928	26.46	463.77	4.6377	16.93	157.00	1.57	10.02	44.34	0.4434	6,22	14,15	0,1415
188	19.24	47.29	1918.02	19.1802	26.60	468.27	4.6827	17.02	158.51	1.5851	10.07	44.76	0.4476	6,25	14,28	0,1428
189	19.35	47.54	1936.85	19.3685	26.74	472.79	4.7279	17.11	160.02	1.6002	10.13	45.18	0.4518	6,29	14,41	0,1441
190	19.45	47.79	1955.77	19.5577	26.88	477.34	4.7734	17.20	161.55	1.6155	10.18	45.61	0.4561	6,32	14,55	0,1455
191	19.55	48.04	1974.77	19.7477	27.02	481.90	4.819	17.30	163.08	1.6308	10.23	46.04	0.4604	6,35	14,68	0,1468
192	19.65	48.29	1993.86	19.9386	27.17	486.49	4.8649	17.39	164.61	1.6461	10.29	46.46	0.4646	6,39	14,82	0,1482
193	19.76	48.55	2013.03	20.1303	27.31	491.09	4.9109	17.48	166.15	1.6615	10.34	46.90	0.469	6,42	14,96	0,1496
194	19.86	48.80	2032.30	20.323	27.45	495.72	4.9572	17.57	167.70	1.677	10.39	47.33	0.4733	6,45	15,09	0,1509
195	19.96	49.05	2051.65	20.5165	27.59	500.36	5.0036	17.66	169.26	1.6926	10.45	47.76	0.4776	6,49	15,23	0,1523
196	20.06	49.30	2071.09	20.7109	27.73	505.03	5.0503	17.75	170.82	1.7082	10.50	48.20	0.482	6,52	15,37	0,1537
197	20.16	49.55	2090.61	20.9061	27.87	509.71	5.0971	17.84	172.38	1.7238	10.56	48.64	0.4864	6,55	15,51	0,1551
198	20.27	49.80	2110.22	21.1022	28.01	514.42	5.1442	17.93	173.96	1.7396	10.61	49.08	0.4908	6,59	15,65	0,1565
199	20.37	50.06	2129.92	21.2992	28.16	519.14	5.1914	18.02	175.54	1.7554	10.66	49.52	0.4952	6,62	15,79	0,1579
200	20.47	50.31	2149.71	21.4971	28.30	523.89	5.2389	18.11	177.13	1.7713	10.72	49.96	0.4996	6,65	15,93	0,1593

Overview of flow loss coefficients (Zeta values)

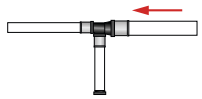
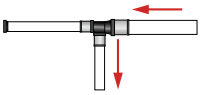
Liquids do not only lose energy when they flow through a pipe. They also lose energy when they change direction. This is because liquids have to overcome extra resistance. The table below provides an overview of the flow loss coefficients for the various fittings and the corresponding number of meters of piping.

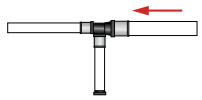
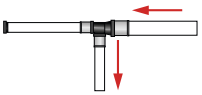
Zeta values*		Ø16	Ø20	Ø26	Ø32	Ø40
Bend 90° 	zeta	21,9	12,1	9,3	6,3	6,1
	m	6,3	5	5,1	4,8	6,2
Bend 45° 	zeta					2,6
	m					2,6
Straight coupling 	zeta	7,9	3,8	2,9	1,7	1,3
	m	2,3	1,5	1,6	1,3	1,3
T-piece 	zeta	8,1	4,1	3,2	1,9	1,7
	m	2,3	1,7	1,7	1,4	1,8
	zeta	22,8	12,8	10,7	7	6,7
	m	6,5	5,3	5,8	5,2	6,8

Zeta values*		Ø20-Ø16-Ø20	Ø26-Ø16-Ø26	Ø26-Ø20-Ø26	Ø32-Ø20-Ø32	Ø32-Ø26-Ø32	Ø40-Ø16-Ø40	Ø40-Ø26-Ø40	Ø40-Ø32-Ø40
T-piece reduction 	zeta	4,1	2,7	2,8	1,5	1,6	1,6	1,5	1,7
	m	1,7	1,5	1,5	1,1	1,2	1,7	1,5	1,8
	zeta	40,5	75,3	20,1	49,5	17,2	na	42,3	15,8
	m	16,6	40,8	10,9	37,3	13	na	42,9	16

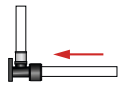
Zeta values*		Ø16-Ø20-Ø16	Ø20-Ø26-Ø20	Ø26-Ø32-Ø26	Ø32-Ø40-Ø32
T-piece enlarged 	zeta	8,4	4,2	2,9	2,4
	m	2,4	1,7	1,6	1,8
	zeta	38,6	20	17,1	13,1
	m	15,9	10,9	12,9	13,3

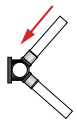
Zeta values*

			Ø20-Ø16-Ø16	Ø20-Ø20-Ø16	Ø26-Ø20-Ø20	Ø26-Ø26-Ø16	Ø26-Ø26-Ø20	Ø32-Ø26-Ø26	Ø40-Ø32-Ø32	Ø40-Ø40-Ø26	Ø40-Ø40-Ø32	Ø26-Ø16-Ø20	Ø26-Ø20-Ø16
T-piece 2x reduction		zeta	16,4	16,4	7,2	43,6	6,5	5,3	3,8	14,5	3,7	7,4	42,3
		m	6,7	6,7	3,9	23,6	3,5	4	3,9	14,7	3,7	4	22,9
		zeta	36,6	12,6	19,6	10,1	12,7	17,3	14,1	6,2	6,4	82,3	34,4
		m	15	5,2	10,6	5,5	6,9	13	14,3	6,3	6,5	44,6	18,7

		Ø26-Ø20-Ø16	Ø32-Ø20-Ø26	Ø40-Ø20-Ø32	Ø40-Ø26-Ø32	Ø50-Ø20-Ø40	Ø50-Ø26-Ø40	Ø50-Ø32-Ø40
	zeta	42,3	5,5	3,5	3,8			
	m	22,9	4,2	3,6	3,8			
	zeta	34,4	46,8	113,4	40,6			
	m	18,7	35,2	115	41,2			

Zeta values*

			Ø16-1/2"	Ø20-1/2"	Ø20-3/4"	Ø26-3/4"
Backplate		zeta	19,3	9,4	13,1	7,1
		m	5,5	3,9	5,4	3,8

			Ø16-1/2"-Ø16	Ø20-1/2"-Ø20
Double backplate		zeta	37,9	25,9
		m	10,9	10,6
		zeta	23,5	10,3
		m	6,7	4,2

			Ø20-Ø16	Ø26-Ø16	Ø26-Ø20	Ø32-Ø20	Ø32-Ø26	Ø40-Ø26	Ø40-Ø32
Reduction		zeta	18,7	39,9	7,3	17,9	5,9	14,2	3,4
		m	7,7	21,6	4	13,4	4,5	14,4	3,5

*** Henco multilayer pipe GAS**

Atmospheric presure	1013	Calorific value of natural gas	35,17 MJ//m^3
Gas temperature	12°C	Initial precharge	30 mbar

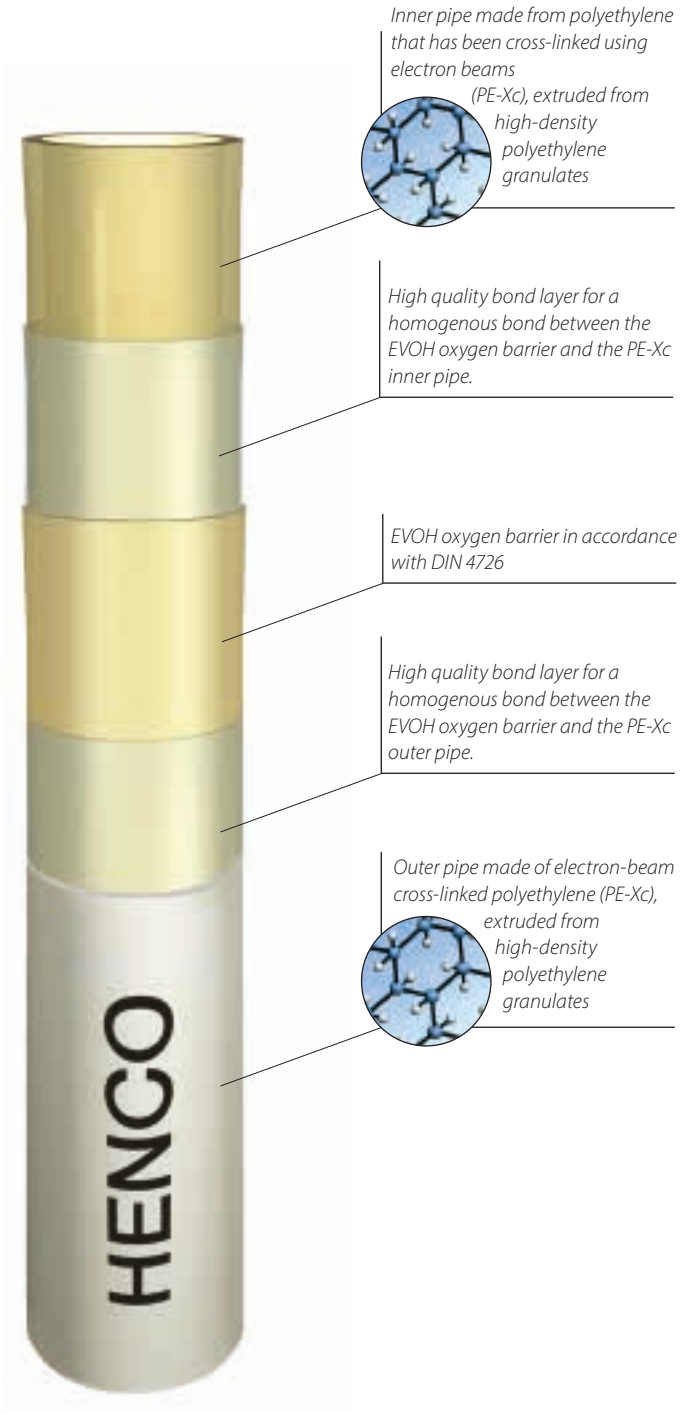
1.2 SYNTHETIC PIPES

HENCO 5L PE-Xc

General

The Henco 5L PE-Xc synthetic pipe is made up of five layers. It has an inner and outer layer of electron-beam cross-linked polyethylene that has been cross-linked using electron beams EVOH oxygen barrier that conforms with with DIN 4726 which allows this synthetic pipe to be used in heating applications. These three different layers are bonded to each other by two high-quality, homogenous connecting layers.

See page 7 for more detailed information about cross-linking.



HENCO 5L PE-Xc WITH PROTECTION HOSE

See page 26 for the specifications of the protection hose

Technical characteristics of the HENCO 5L PE-Xc synthetic pipe

Technical profile of the HENCO 5L PE-Xc synthetic pipe

Outer diameter (mm)	12	14	16	17	18	20	25	32
Inner diameter (mm)	8	10	12	13	14	16	20.4	26.2
Wall thickness (mm)	2	2	2	2	2	2	2.3	2.9
Max. working temperature (°C)	Depending on the application classes and dimensions (see DIN EN ISO 15875-2 table)							
Application class (ISO10508)	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5	2 - 4 - 5
Max. working pressure (bar)	Depending on the application classes and dimensions (see DIN EN ISO 15875-2 table)							
Coefficient of thermal conductivity (W/mK)	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Coefficient of linear expansion (mm/mK)	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Surface roughness of inner pipe (µ)	7	7	7	7	7	7	7	7
Oxygen diffusion DIN 4726 (g/m^3/day)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Degree of cross-linking (%)	60	60	60	60	60	60	60	60
Weight (kg/m)	0.065	0.086	0.088	0.091	0.095	0.117	0.172	0.274
Flow (l/h)	0.050	0.079	0.113	0.133	0.154	0.201	0.327	0.539

Application class table (DIN EN ISO 15875-1)

Application class table (DIN EN ISO 15875-1)							
Application class	T_D		T_{max}		T_{mal}		Typical application
	°C	Time [a] years	°C	Time years	°C	Time h	
1[a]	60	49	80	1	95	100	Hot water supply (60°C)
2[a]	70	49	80	1	95	100	Hot water supply (70°C)
4[b]	20 + cumulative 40 + cumulative 60	2.5 20 25	70	2.5	100	100	Underfloor heating and low-temperature radiators
5[b]	20 + cumulative 60 + cumulative 80	14 25 10	90	1	100	100	High-temperature radiators

NOTE This international standard does not apply for Td, Tmax and Tmal greater than those shown in the table above.

a Countries can choose either class 1 or class 2 according to with their national legislation.

b Where there is more than 1 design temperature for a class, the times should be added together. "Plus cumulative" in the table implies a temperature profile for the aforementioned temperature over a certain period. (e.g. for class 5, the design temperature profile over 50 years is. This becomes 60 °C over 14 years, 80 °C over 10 years, 90 °C over 1 year and 100 °C over 100 hours respectively. .

DIN EN ISO 15875-2 TABLE

Maximum working pressure table 5L PE-Xc (DIN EN ISO 15875-2)								
Application class	Ø12 x 2	Ø14 x 2	Ø16 x 2	Ø17 x 2	Ø18 x 2	Ø20X 2	Ø25 x 2.3	Ø32 x 2.9
1	10	10	10	10	8	8	6	6
2	10	10	10	8	8	6	6	6
4	10	10	10	10	10	8	8	8
5	10	10	8	8	8	6	6	6

Value expressed in bar