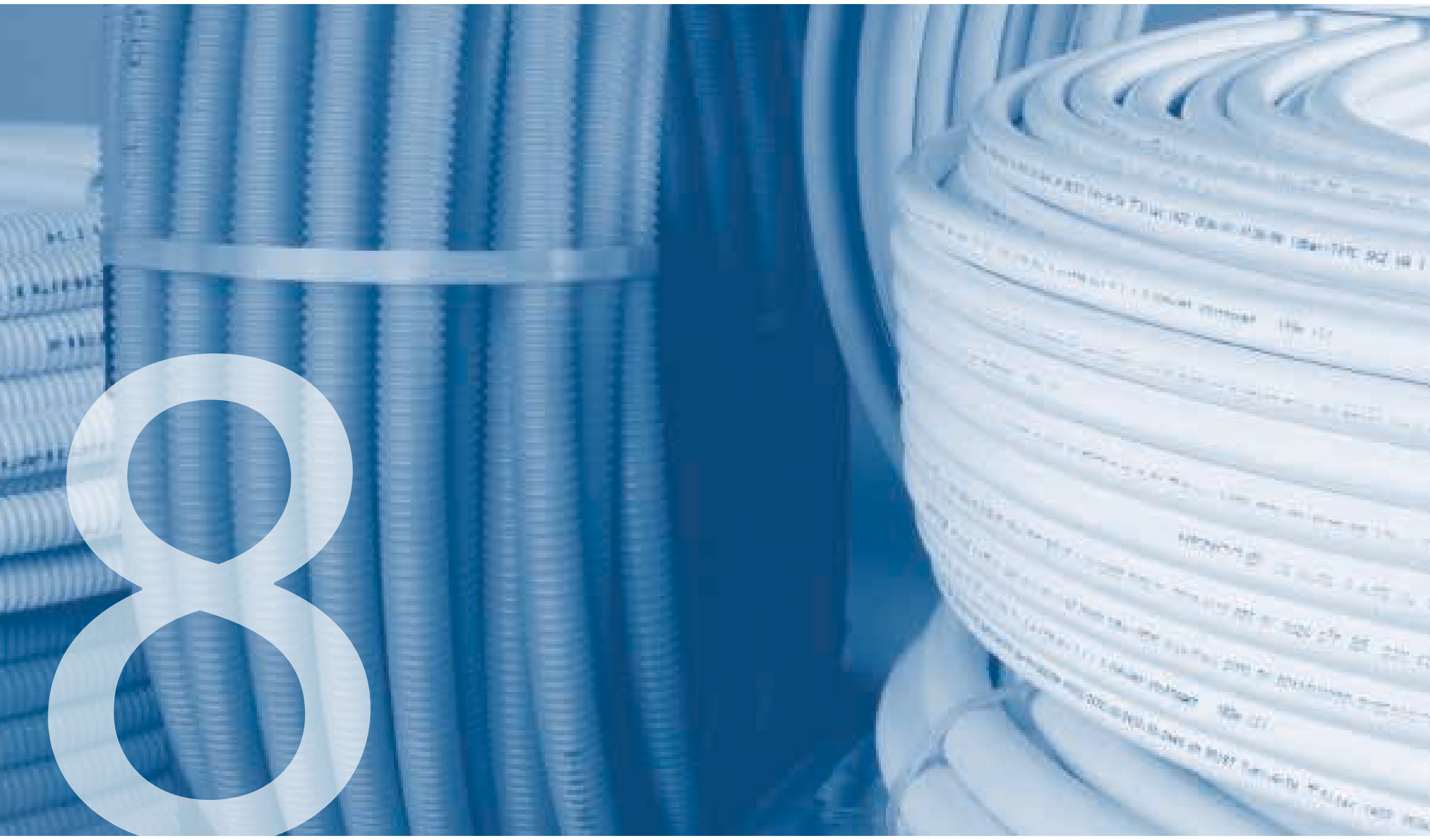
SPECIFICATIONS



8.1 SANITARY

General description

The piping system for sanitary applications is comprised of multilayer pipes and press fittings. The entire system has been technically approved and certified by the most important test institutes including DVGW, KIWA and ATG.

Material and characteristics

Pipes

Composition of pipes

The pipes consist of 5 layers:

- an inner pipe made from polyethylene (PE-Xc) that has been cross-linked using electron beams and extruded from high density polyethylene granulates
- a high quality bond layer to give homogenous bond between the aluminium pipe and the PE-Xc inner pipe.
- an aluminium pipe that has been welded seamlessly along its length and has been inspected 1x by machine
- a high quality bond layer to give homogenous bond between the aluminium pipe and the PE-Xc outer pipe
- an outer pipe made from polyethylene (PE-Xc) that has been cross-linked using electron beams and extruded from high density polyethylene granulates.

Technical profile

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 (DIN EN ISO 21003-1)
[+] 2xDu when using a BM-16 bending tool

1 2 3 4 5 6 7 8 9 10 11

Application class table (DIN EN ISO 21003-1)

Application class	T_D °C	T_D Time[a] years	T_{max} °C	T_{max} Time years	T_{mal} °C	T_{mal} Time h	Typical application
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. .

Marking

The marking on the pipes (repeated every meter) is structured as follows:

Henco ®	Registered trademark
2200 HERENTALS - BELGIUM	Place of production
PE-Xc	Cross-linked high-density polyethylene
AL 0.4	0.4 Aluminium (depending on pipe Ø)
PE-Xc	Cross-linked high-density polyethylene
16*2	Outer diameter *wall thickness
201905	Date of production
L238	Line and time code
HN000	Code for Henco mark
10BAR / 95°C	Nominal working pressure = max. temp
KIWA CLASS 2 ISO 1/KOMO	Dutch certificate
DVGW DW…	German certificate
ÖVGWW1.377	Austrian certificate
ATG…	Belgian certificate
ÖN B5157 Typ1-A-TW	Australian certificate
ψ Sitac1422 0536/01;0138/98 10 bar/70°C SKZ	Swedish certificate
VA 1.14/12039	Danish certificate
UNI10954-1TIPOACLASSE1IIPUNI319	Italian certificate
SVGW…	Swedish certificate
NBI…	Norwegian certificate
STF	Finnish certificate
DIN…	German standard
001M<I>	Meter indication

Pipe with sleeve

The multilayer pipe and sleeve need to be manufactured by the same company. The sleeve is made from polyethylene and is red, blue or black in colour. The manufacturer's installation instructions describe when and under which circumstances the pipe should be fitted with a sleeve. The pipe and sleeve should be available in the following dimensions:

Protective sleeve		
Dimensions	Coil length	Colour
14x2	25 m	blue/red/black
	50 m	blue/red/black
	100 m	blue/red/black
16x2	25 m	blue/red/black
	50 m	blue/red/black
	100 m	blue/red/black
18x2	50 m	blue/red/black
	100 m	blue/red/black
20x2	25 m	blue/red/black
	50 m	blue/red/black
	100 m	blue/red/black
26x3	25 m	blue/red/black
	50 m	blue/red/black
32x3	25 m	blue/red/black

Pre-insulated pipe

PE-Xc/Al/PE-Xc pipes come with a round or eccentric thermal insulating material made from extruded PR foam with a closed cell structure. The PE foam comes with a sturdy meshed PE outer casing in red or blue. The multilayer pipes and insulation should be from the same manufacturer. The insulation should meet the following conditions:

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)
Noise absorption	Up to 23 dB(A) (DIN 52218)
Thickness (round)	6 , 10 or 13 mm
Water vapour diffusion resistance	6315 mu

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The pre-insulated pipes are available in the following dimensions:

Round insulation						
	6 mm		10 mm		13 mm	
Dimensions	Coil length	Colour	Coil length	Colour	Coil length	Colour
14x2	100 m	red or blue	50 m	red or blue	-	-
16x2	100 m	red or blue	50 m	red or blue	50 m	blue
18x2	50 m	red or blue	50 m	red or blue	50 m	-
20x2	50 m	red or blue	50 m	red or blue	50 m	blue
26x3	25 - 50 m	red or blue	25 - 50 m	red or blue	50 m	blue
32x3	25 m	red or blue	25 m	red of blue	25 m	blue

Eccentric insulation				
	6 mm above and 13 mm below		6 mm above and 26 mm below	
Dimensions	Coil length	Colour	Coil length	Colour
16x2	50 m	blue	25 m	blue
18x2	50 m	blue	-	blue
20x2	25 m	blue	25 m	blue
26x3	25 m	blue	25 m	blue

Connections

The entire sanitary installation is connected using press fittings made from polyvinylidene fluoride (PVDF). The synthetic press fittings and the multilayer pipes should be made by the same manufacturer. You should always use press fittings with leak detection for any press connections up to diameter 26. This means that the press fittings will be designed such that there will be an immediate pressure drop in non-pressed connections when the installation is pressurised.

The PVDF press fittings must be fitted with O-rings to guarantee the seal between the pipe and the fitting.

The sleeves must be made from stainless steel. They are also provided with 3 openings for visual inspections, and a special rim that enables the fitting to be perfectly positioned in the pressing jaws specified by the manufacturer.

If brass press fittings are used, these must come from the same manufacturer and be provided with a synthetic insulating ring to prevent electrolysis between the aluminium of the pipe and the brass of the fitting. The fittings must also be providedwith O-rings and sleeves made from stainless steel.

Manifolds

All manifolds are made from brass and come in 1″ and 3/4" versions and have 2 to 10 branches with eurokonus connections. They are also fitted with a 3/8″ screw thread for fitting automatic air vent. The centre-to-centre distance between the branches is 50 mm, and the distance from the outside of the brass to the middle of the first branch is 26 mm.

The galvanised manifolds are provided with ball valves and a eurokonus connection on each outlet. These manifolds are provided with 2, 3 or 4 connections. They are supplied as constituent elements that can be attached to each other, and have a female thread at one end and a 1″ or 3/4" male thread at the other end.
You should only use the brackets supplied by the manufacturer to attach the manifolds to a wall. The cabinets for the manifolds should also be from the same manufacturer.

Connections

The connection between the piping and the manifold is guaranteed by press fittings made from polyvinylidene fluoride (PVDF). The synthetic press fittings and the multilayer pipes should be made by the same manufacturer. All press connections with diameters up to 26 should be made using press fittings with leak detection. This means that the press fittings are designed so that there there will be an immediate pressure drop in connections which are not pressed when the installation is under pressure.

Pressure tests

The entire sanitary installation must undergo pressure tests in accordance with DIN 1988 as specified by the manufacturer.

Insurance and guarantee

The manufacturer must be able to present a test certificate from the IKP university in Stuttgart demonstrating compliance with the DIN 4726 standard and/or DVGW approval and/or KIWA approval and/or ATG approval.

The pipe is insured against damage after delivery for a period of at least 10 years and for a sum of 10,000,000 euros for each incident of damage per year. A guarantee certificate is always supplied with the registration documents.

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8.2 HEATING

General description

The piping for heating applications comprises multilayer pipes and press fittings. The entire system is technically approved and certified by the most important test institutes including DVGW, KIWA and ATG.

Material and characteristics

Pipes

Composition of pipes

The pipes consist of 5 layers:

- an inner pipe made from polyethylene (PE-Xc) that has been cross-linked using electron beams and extruded from high density polyethylene granulates
- a high quality bond layer to give homogenous bond between the aluminium pipe and the PE-Xc inner pipe.
- an aluminium pipe that has been welded seamlessly along its length and has been inspected 1x by machine
- a high quality bond layer to give homogenous bond between the aluminium pipe and the PE-Xc outer pipe
- an outer pipe made from polyethylene (PE-Xc) that has been cross-linked using electron beams and extruded from high density polyethylene granulates.

Technical profile

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 (DIN EN ISO 21003-1)
$^{+}$ 2xDu when using a BM-16 bending tool

Application class table (DIN EN ISO 21003-1)

Application class	T_D °C	T_D Time [a] years	T_{max} °C	T_{max} Time years	T_{mal} °C	T_{mal} Time h	Typical application
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. .

Marking

The marking on the pipes (repeated every meter) is structured as follows:

Henco ®	Registered trademark
2200 HERENTALS - BELGIUM	Place of production
PE-Xc	Cross-linked high-density polyethylene
AL 0.4	0.4 Aluminium (depending on pipe Ø)
PE-Xc	Cross-linked high-density polyethylene
16*2	Outer diameter *wall thickness
201905	Date of production
L238	Line and time code
HN000	Code for Henco mark
10bar / 95°C	Nominal working pressure = max. temp
KIWA CLASS 2 ISO 1/KOMO	Dutch certificate
DVGW DW…	German certificate
ÖVGWW1.377	Austrian certificate
ATG…	Belgian certificate
ÖN B5157 Typ1-A-TW	Australian certificate
ψ Sitac1422 0536/01;0138/98 10 bar/70°C SKZ	Swedish certificate
VA 1.14/12039	Danish certificate
UNI10954-1tipoAclasse1IIPUNI319	Italian certificate
SVGW…	Swedish certificate
NBI…	Norwegian certificate
STF	Finnish certificate
DIN…	German standard
001m<l>	Meter indication

8 SPECIFICATIONS

Pipe with sleeve

The multilayer pipe and sleeve need to be manufactured by the same company. The sleeve is made from polyethylene and is red, blue or black in colour. The manufacturer's installation instructions describe when and under which circumstances the pipe should be fitted with a sleeve.
The pipe and sleeve should be available in the following dimensions:

Protective sleeve		
Dimensions	Coil length	Colour
14x2	25 m	blue/red/black
	50 m	blue/red/black
	100 m	blue/red/black
16x2	25 m	blue/red/black
	50 m	blue/red/black
	100 m	blue/red/black
18x2	50 m	blue/red/black
	100 m	blue/red/black
20x2	25 m	blue/red/black
	50 m	blue/red/black
	100 m	blue/red/black
26x3	25 m	blue/red/black
	50 m	blue/red/black
32x3	25 m	blue/red/black

Pre-insulated pipe

PE-Xc/Al/PE-Xc pipes come with a round or eccentric thermal insulating material made from extruded PR foam with a closed cell structure. The PE foam comes with a sturdy meshed PE outer casing in red or blue. The multilayer pipes and insulation should be from the same manufacturer. The insulation should meet the following conditions:

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)
Noise absorption	Up to 23 dB(A) (DIN 52218)
Thickness (round)	6 , 10 or 13 mm
Water vapour diffusion resistance	6315 mu

The pre-insulated pipes are available in the following dimensions:

Round insulation						
	6 mm		10 mm		13 mm	
Dimensions	Coil length	Colour	Coil length	Colour	Coil length	Colour
14x2	100 m	red or blue	50 m	red or blue	-	-
16x2	100 m	red or blue	50 m	red or blue	50 m	blue
18x2	50 m	red or blue	50 m	red or blue	50 m	-
20x2	50 m	red or blue	50 m	red or blue	50 m	blue
26x3	25 - 50 m	red or blue	25 - 50 m	red or blue	50 m	blue
32x3	25 m	red or blue	25 m	red of blue	25 m	blue

Eccentric insulation				
	6 mm above and 13 mm below		6 mm above and 26 mm below	
Dimensions	Coil length	Colour	Coil length	Colour
16x2	50 m	blue	25 m	blue
18x2	50 m	blue	-	blue
20x2	25 m	blue	25 m	blue
26x3	25 m	blue	25 m	blue

Connections

The entire sanitary installation is connected using press fittings made from polyvinylidene fluoride (PVDF). The synthetic press fittings and the multilayer pipes should be made by the same manufacturer. You should always use press fittings with leak detection for any press connections up to diameter 26. This means that the press fittings will be designed such that there will be an immediate pressure drop in non-pressed connections when the installation is pressurised.

The PVDF press fittings must be fitted with O-rings to guarantee the seal between the pipe and the fitting.

The sleeves must be made from stainless steel. They are also provided with 3 openings for visual inspections, and a special rim that enables the fitting to be perfectly positioned in the pressing jaws specified by the manufacturer.

If brass press fittings are used, these must come from the same manufacturer and be provided with a synthetic insulating ring to prevent electrolysis between the aluminium of the pipe and the brass of the fitting. The fittings must also be providedwith O-rings and sleeves made from stainless steel.

Manifolds

All manifolds are made of brass. The manifolds exist in 1" or 3/4" designs and have 2 to 10 branches with eurokonus connections. They are also fitted with a 3/8" screw thread for the fitting of an automatic air vent. The centre-to-centre distance between the branches is 50 mm, and the distance from the outside of the brass to the middle of the first branch is 26 mm.

The galvanised manifolds are provided with ball valves and a eurokonus connection on each outlet. These manifolds are provided with 2, 3 or 4 connections. They are supplied as constituent elements that can be attached to each other, with at one end a female thread and the other end a 1" or 3/4" male thread.

Assembly of the manifolds on the wall is exclusively using wall brackets specified by the manufacturer. The cabinets for the manifolds must also come from the same manufacturer.

Valves and fittings for radiators

The valves and fittings as well as all other parts of the system should originate from the same manufacturer.
The valves and fittings should be provided with eurokonus connections. You are not permitted to use connections that do not have a universal millimetric thread.

The thermostatic value and fittings must be fitted with an adjustable KV valve. All heating bodies must be connected according to the two-pipe principle.

Connections

The connection between the piping and the manifold is ensured by press-fit connections made from polyvinylidene fluoride (PVDF). The synthetic press-fit connections and the multilayer pipes should be made by the same manufacturer. All press connections with diameters up to 26 should be made using press-fit connections with leak detection. This means that the press-fit connections are designed such that there there will be an immediate pressure drop in connections which are not pressed when the installation is under pressure.

Pressure tests

The entire sanitary installation must undergo pressure tests in accordance with DIN 1988 as specified by the manufacturer.

Insurance and guarantee

The manufacturer must be able to present a test certificate from the IKP university in Stuttgart demonstrating compliance with the DIN 4726 standard and/or DVGW approval and/or KIWA approval and/or ATG approval.

The pipe is insured against damage after delivery for a period of at least 10 years and for a sum of 10,000,000 euros for each incident of damage per year. A guarantee certificate is always supplied with the registration documents.