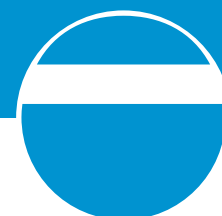


TECHNICAL DATA SHEET

VALSIR® SUPPLY SYSTEMS

THERMOLINE



valsir®
QUALITY FOR PLUMBING

The product

Thermoline® is a plastic pipe produced with crosslinked polyethylene and is supplied with and without an oxygen barrier (EVOH). This product is widely used for the production of floor, wall and ceiling heating and cooling **radiant systems** but also for **heating systems** in general.

Thermoline® has an excellent resistance to abrasion, corrosion, and chemical agents and is characterized by excellent hygiene and exceptional elasticity.

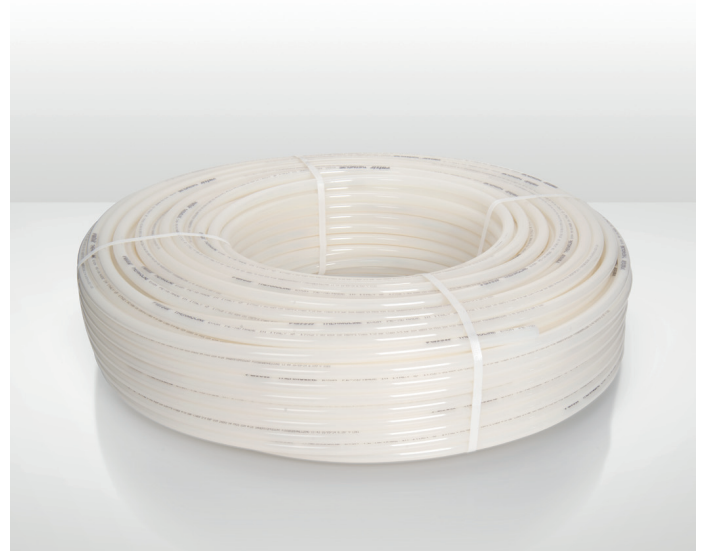


Figure Layering of the pipe with oxygen barrier (EVOH).

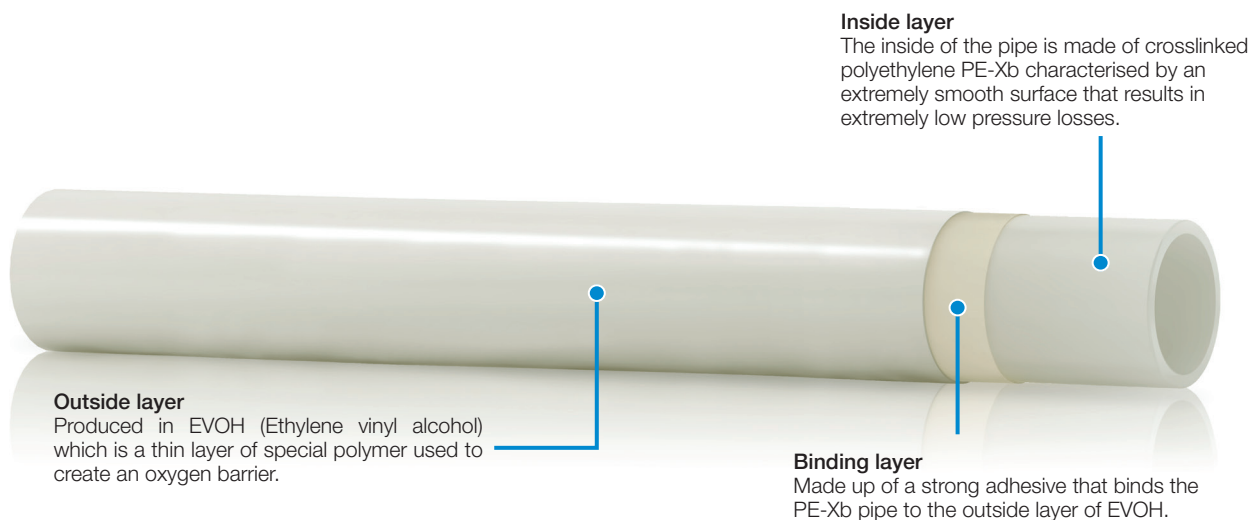


Figure Layering of the pipe without oxygen barrier (EVOH).



Features

Advantages and features of the Thermoline® pipes.

Resistance to corrosion

This pipe is characterised by a total resistance to corrosion, to building materials and to the majority of chemical compounds.

Smoothness and resistance to scale formation

The extreme smoothness of the inner surface (roughness of 0.007 mm), as well as preventing the formation of limescale, also ensures low pressure drops over time.

Resistance to abrasion

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

Flexibility

Crosslinked polyethylene is extremely flexible and this facilitates installation of the pipe even in awkward positions. The pipes can be bent either cold or, for tighter bends, using a stream of hot air at about 130°C which causes the polyethylene to soften; in this phase, the crosslinked polyethylene becomes transparent and can be shaped according to necessity until it has completely cooled. This operation cannot be performed on pipes with an oxygen barrier as it would compromise the features of the pipe.

Lightweight

The pipes are extremely lightweight compared to metal pipes: the crosslinked polyethylene weighs 8 times less than steel and 10 times less than copper.

Thermal memory

If heated with a stream of air at 130°C crosslinked polyethylene becomes transparent and regains its original shape if lost due to crushing or excessive bending without compromising its mechanical strength. This operation cannot be performed on pipes with an oxygen barrier as it would compromise the pipe's features.

Resistance at low temperatures

It is possible to use crosslinked polyethylene at very low temperatures due to its high elasticity (as low as minus 100°C); even though at below 0°C temperatures crosslinked polyethylene does not become brittle, it is nevertheless important that the water doesn't freeze inside the pipe to avoid that, due to expansion of the water, stress is generated in very limited areas of the pipe wall that could lead to the ductile failure of the same.

Durability

The system has a durability of at least 50 years guaranteed by the product standards.

Acoustic insulation

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

Thermal Conductivity

Thermal conductivity of the pipe is 0.38 W/m·K, approximately 900 times lower than that of copper, an aspect which is extremely important to ensure reduced temperature losses.

Ecology

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

Technical data

Table Typical technical data.

| Features | Value | Testing methods |
|--|--|-----------------|
| Material | Crosslinked polyethylene PE-Xb. The pipe with an oxygen barrier also has an adhesive layer and an EVOH outer layer. | - |
| Colour | Translucent white | - |
| Dimensions | 12÷25 mm | - |
| Application | Radiator heating systems, convector heating systems, radiant heating and cooling systems. | - |
| Fittings | Pexal® Brass, Bravopress® and Pexal® Twist fittings | - |
| Minimum operating temperature ⁽¹⁾ | -100°C | - |
| Maximum temperature ⁽²⁾ | +100°C | EN ISO 21003-1 |
| Maximum pressure | Differs according to the pipe diameter, see section "Application fields" | - |
| Density at 23°C | > 0.950 g/cm ³ (crosslinked polyethylene) | - |
| Softening temperature | 135°C | - |
| Ultimate strength at 23°C | 20 MPa | - |
| Thermal expansion coefficient | 0.14÷0.20 mm/m·K | - |
| Thermal conductivity | 0.38 W/m·K | - |
| Internal roughness | 0.007 mm | - |
| Oxygen permeability | In relation to the diameter, see the "Range" chapter. | DIN 4726 |
| UV Resistance | No | - |
| Halogen levels | Halogen-free | - |

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

(2) For more details see the "Application fields" section.

Application fields

The Thermoline® pipes are manufactured and certified according to EN ISO 15875 and therefore can be used, in relation to the application class and the working pressure indicated in the technical data table outlined above, at the temperature and duration conditions specified in the following table.

Table Application fields and operating conditions in accordance with ISO 15875-1.

| Application class | Operating temperature T_D | Duration of T_D | Maximum operating temperature T_{max} | Duration of T_{max} | Malfunctioning temperature T_{mal} | Duration of T_{mal} | Typical application |
|-------------------|-----------------------------|-------------------|---|-----------------------|--------------------------------------|-----------------------|---|
| | [°C] | [years] | [°C] | [years] | [°C] | [hours] | |
| 4 ^a | 20 | 2.5 | 70 | 2.5 | 100 | 100 | Floor heating and low temperature systems |
| | + | + | | | | | |
| | 40 | 20 | | | | | |
| | + | + | | | | | |
| 5 ^a | 60 | 25 | 90 | 1 | 100 | 100 | High temperature heating system |
| | + | + | | | | | |
| | 60 | 25 | | | | | |
| | + | + | | | | | |
| | 80 | 10 | | | | | |

DIN 16893 suggests another method to evaluate the operating conditions of crosslinked polyethylene pipes; with this standard it is possible to calculate the maximum operating pressure of the pipes at different temperatures as indicated in the following table

Table Maximum operating pressures calculated in accordance with DIN 16893.

| External diameter | [mm] | 12 | 14 | 15 | 16 | 17 | 18 | 20 | 20 | 25 |
|--------------------------|-------|------|------|------|------|------|------|------|------|------|
| Thickness | [mm] | 2 | 2 | 2.5 | 2 | 2 | 2 | 2 | 2.8 | 2.3 |
| Maximum pressure at 20°C | [bar] | 25.2 | 21.0 | 25.2 | 18.0 | 16.8 | 15.8 | 14.0 | 20.5 | 12.5 |
| Maximum pressure at 50°C | [bar] | 17.6 | 14.7 | 17.6 | 12.6 | 11.8 | 11.0 | 9.8 | 14.4 | 8.8 |
| Maximum pressure at 70°C | [bar] | 14.1 | 11.8 | 14.1 | 10.1 | 9.4 | 8.8 | 7.8 | 11.5 | 7.0 |

Note. The maximum mechanical stress of crosslinked polyethylene at 50 years and a safety factor SF of 1.5 were taken into consideration.

Range

The Thermoline® pipes are available in coils from diameter 12 mm to diameter 25 mm, with or without an oxygen barrier (EVOH) and with a corrugated protective sheath

| Pipe dimensions | Thermoline® EVOH pipe (with oxygen barrier) | Thermoline® pipe (without oxygen barrier) | Thermoline® pipe (without oxygen barrier) with corrugated protective sheath |
|-----------------|---|---|---|
| 12x2 | 200 m | - | - |
| 14x2 | 200, 240, 600 m | - | - |
| 15x2.5 | 200 m | - | 20 m (red, blue) |
| 16x2 | 120, 200, 240, 480, 600 m | 100 m | 50 m (red, blue) |
| 17x2 | 120, 200, 240, 480, 600 m | - | - |
| 18x2 | 200 m | 100 m | 50 m (red, blue) |
| 20x2 | 120, 200, 240, 480, 600 m | 100 m | 50 m (red, blue) |
| 20x2.8 | 200, 500 m | - | 50 m (red, blue) |
| 25x2.3 | 50 m | 50 m | - |

Thermoline® pipe features

Thermoline® pipes without insulation are used mainly for the construction of floor heating and cooling systems. If necessary, they can be insulated after the installation.

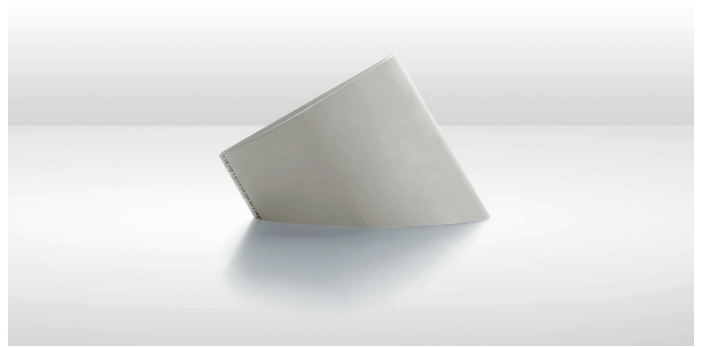


Table Thermoline® pipe features.

| | | | | | | | | | | |
|---|--------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|-----------------|------------------------|
| External diameter | [mm] | 12 | 14 | 15 | 16 | 17 | 18 | 20 | 20 | 25 |
| Thickness | [mm] | 2 | 2 | 2.5 | 2 | 2 | 2 | 2 | 2.8 | 2.3 |
| Internal diameter | [mm] | 8 | 10 | 10 | 12 | 13 | 14 | 16 | 14.4 | 20.4 |
| Water volume | [l/m] | 0.050 | 0.079 | 0.079 | 0.113 | 0.133 | 0.154 | 0.201 | 0.163 | 0.327 |
| Weight | [g/m] | 65 | 78 | 100 | 91 | 97 | 103 | 116 | 153 | 206 |
| Weight with water | [g/m] | 115 | 156 | 179 | 203 | 229 | 256 | 317 | 316 | 532 |
| Calculated series S_{calc} | - | 2.5 | 3.0 | 2.5 | 3.5 | 3.8 | 4 | 4.5 | 3.1 | 4.9 |
| Application class and operating pressure⁽¹⁾ | [bar] | Class 5/10 | Class 5/10 | Class 5/10 | Class 4/10 | Class 4/10 | Class 4/10 | Class 4/8 | Class 5/10 | Class 4/8 Class 5/6 |
| Thermal expansion coefficient at 20°C | [mm/m·K] | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 |
| Thermal expansion coefficient at 100°C | [mm/m·K] | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| Thermal conductivity | [W/m·K] | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 |
| Internal roughness | [mm] | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |
| Oxygen permeability⁽²⁾ | [mg /m²·day] | ≤3.6 at 80°C | ≤3.6 at 80°C | ≤3.6 at 80°C | ≤3.6 at 80°C | ≤3.6 at 80°C | ≤3.6 at 80°C | ≤0.32 at 40°C | ≤3.6 at 80°C | ≤3.6 at 80°C |

(1) In accordance with EN ISO 15875, for details, see the "Application fields" section.

(2) Requirements contained in DIN 4726.

Thermoline® pipes with corrugated protective sheath features

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

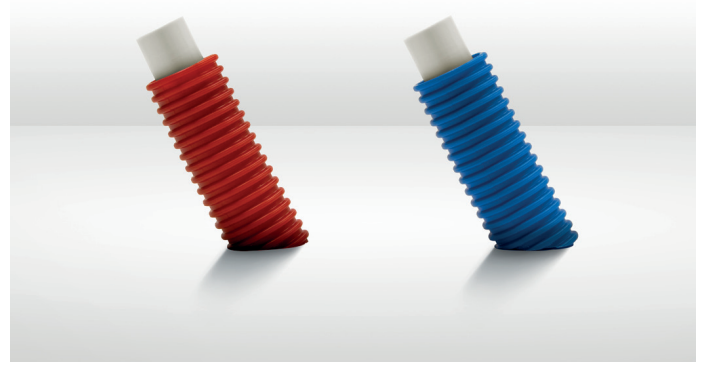


Table Thermoline® pipes with corrugated protective sheath features.

| Pipe | Sheath thickness | External diameter sheathed pipe | Weight |
|------|------------------|---------------------------------|--------|
| | [mm] | [mm] | [g/m] |
| 16x2 | 0.85 | 26.5 | 147 |
| 18x2 | 0.95 | 28.5 | 170 |
| 20x2 | 1.05 | 30.5 | 193 |

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

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

| Features | M.U. | Value |
|--------------------------|----------------------|---------------------------|
| Material | - | High density polyethylene |
| Flame-retardant | - | No |
| Density | [kg/m ³] | 961 |
| Thermal conductivity | [W/m·K] | 0.38 |
| Traction resistance | [N/mm ²] | > 22 |
| Ultimate elongation | [%] | > 350 |
| Steam permeability μ | - | >100,000 |

Connection systems

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

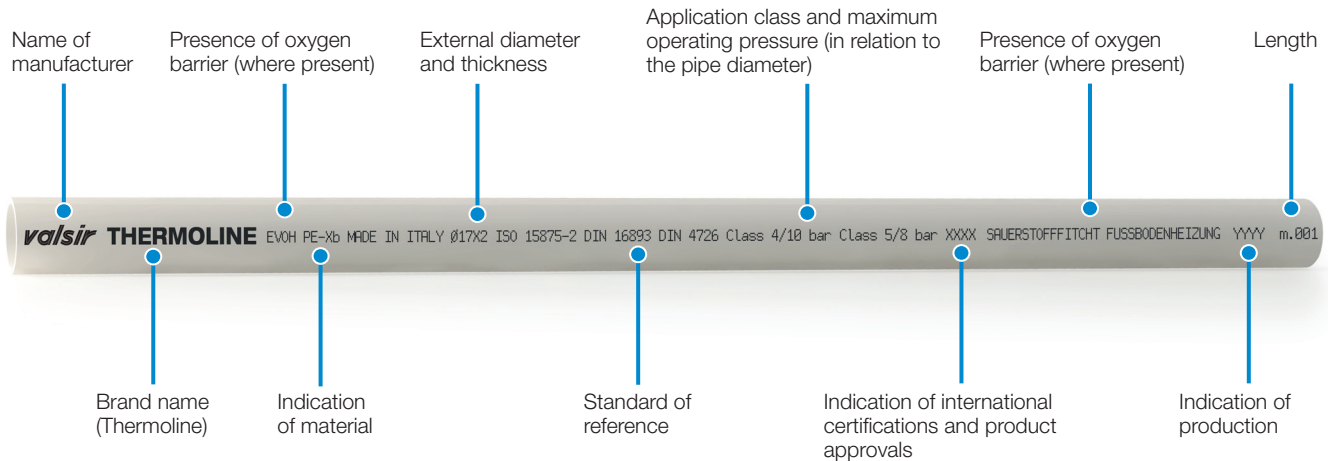
| Thermoline® pipe | Pexal® Brass Brass press fittings | Bravopress® PPSU multi-press fittings | Pexal Easy® Full bore PPSU fittings | Pexal® Twist Brass compression fittings |
|------------------|--------------------------------------|--|--|--|
| 12x2 | | | | |
| 14x2 | • | | | • |
| 15x2.5 | | | | |
| 16x2 | • | • | | • |
| 17x2 | | | | |
| 18x2 | • | | | • |
| 20x2 | • | • | | • |
| 20x2.8 | | | | |
| 25x2.3 | | | | |

Approvals:

The approvals of Valsir® supply systems are available on the website: www.valsir.com

Marking

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



PLUMBING

WASTE SYSTEMS



SUPPLY SYSTEMS



GAS SYSTEMS



FLUSH SYSTEMS



BATHROOM SYSTEMS



TRAPS



RADIANT SYSTEMS



DRAINAGE SYSTEMS



HRV SYSTEM



ACADEMY



SEWER SYSTEMS



WATER TREATMENT



BUILDING

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