

Cold Water with pressure in PVC

Technical datasheet – FERSIL PVC-U TH PN10 for thread joint



PVC-U TH PN10 pipe for thread joint

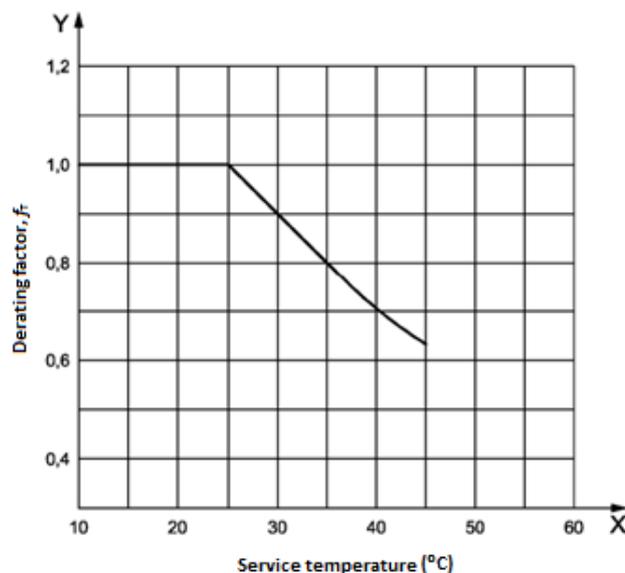
The unplasticized poly (vinyl chloride) (PVC-U) pipe TH range has a design stress of $\sigma = 10$ MPa considering a minimum required strength of MRS = 25 MPa with a design factor of $C = 2,5$. These pipes are oversized in thickness in order to withstand a threaded opening without decreasing the pipe hydrostatic resistance for cold water (20 °C) supply with a nominal service pressure up to 10 bar.

These pipes follow the product specifications defined by standards BS 3506 and EN ISO 1452-2.

This technical datasheet is applicable to PVC-U TH pipes for threaded joints with PVC-U or Brass fittings, which are used in the following conditions:

- buried underground in water supply including taps;
- above ground in water transport inside and outside of buildings structure;
- a maximum operating pressure, MOP, up to 10 bar (1.0 MPa = 10 kg/cm²);
- an operating temperature of 20 °C as reference temperature;

The products in question may also be subjected to fluids whose temperature does not exceed 45 °C. For temperatures between 20 °C and 45 °C, the operating pressure is obtained by multiplying the nominal pressure by the derating factor shown in Graph 1.



Graph 1 - Temperature derating factor

As range complement FERSIL sells brass fittings from other manufacturers, guaranteeing the same quality and durability as all these fittings are compatible with FERSIL brand pipes.

Material

The compound for the production of PVC-U TH PN10 pipes must be prepared with PVC resin, to which shall be added those additives which are needed to facilitate the production by extrusion processes.

Material properties for PVC-U TH PN10 pipes		
Characteristic	Value	Test method
Density (23 ° C)	1,35 to 1,46 kg/cm ³	EN ISO 1183
Elasticity modulus, E_1	≥ 3.200 MPa	EN ISO 6259-1 and -2
Coefficient of linear expansion	0,06 mm/m.K ⁻¹	ASTM D 696-70
Thermal conductivity	0,122 kcal/m.h.°C	-
Fire reaction	Self-extinguishable	-

General characteristics

Appearance

When viewed without magnification the internal and external surfaces of pipes, shall be smooth, clean and free from bubbles, scoring, cavities and other surface defects that may affect the performance of the pipes. The ends of the pipe shall be cut cleanly and square to the axis.

Colour

The colour of the pipes shall be grey (type RAL 7037) and shall be uniform throughout the wall. They are allowed slight variations in the appearance of colour

Marking

All pipes must be marked in a permanent and legible manner and in a way that the marking does not cause cracks or other types of failure, in such way that after storage, weathering, handling and installation, legibility is maintained.

Pipes should be marked at intervals of 1 m. The minimum mark required for the pipes should be:

"FERSIL PVC10 TH d, 1.0MPa DATE+HOUR+OP (FERSIL traceability code)"

Note: The pipe producer is not responsible for marking being illegible due to actions caused by installation and use such as painting, scratching, covering of the pipes or by use of solvents and detergents.

Geometrical Characteristics

The dimensions of the pipe shall be measured in accordance with EN ISO 3126.

The mean outside diameters, (d_{em}), wall thickness (e), and length (L) shall be in accordance with next table.



Dimensions and tolerances for PVC-U TH PN10 pipes				
Nominal outside diameter \varnothing_{ext} (")	Mean outside diameter \varnothing_{ext} (mm)	Mean wall thickness e_m (mm)	Mean inside diameter \varnothing_{ext} (mm)	Pipe length L (m)
1/2	20,9	2,8	15,3	6 +0.06 -0.03
3/4	26,4	3,2	20,0	6 +0.06 -0.03
1	33,2	3,9	25,4	6 +0.06 -0.03
1.1/4	41,9	4,5	32,9	6 +0.06 -0.03
1.1/2	48,0	5,0	38,0	6 +0.06 -0.03
2	59,6	5,2	49,2	6 +0.06 -0.03
2.1/2	75,0	5,4	64,2	6 +0.06 -0.03
3	87,8	6,3	75,2	6 +0.06 -0.03

Physical and Mechanical Characteristics

PVC-U TH pipes are design for a maximum operating pressure (MOP) of 10 bar \approx 1.0 MPa \approx 10 kg/cm², with water and other fluids up to 20 ° C. These pipes have excellent impact resistance and hydrostatic pressure which gives them a good robustness and durability.

Mechanical characteristics for PVC-U TH PN10 pipes		
Characteristics	Value	Test method
Impact resistance (round-the-clock method) (water or air, 0°C, striker d25/d90, mass/fall height by d_n)	TIR \leq 10%	ISO 3127 (replaces EN 744)
Resistance to internal pressure (short term) (water in water, 20 °C, 4,2xPN bar)	\geq 1 h without failure	ISO 1167-1 and -2

The PVC-U TH PN10 pipes have excellent physical properties which gives them great flexibility in handling, ease of installation and recommended use in domestic and industrial piping systems.

Physical characteristics for PVC-U TH PN10 pipes		
Characteristic	Value	Test method
Vicat softening temperature (VST)	\geq 80°C	ISO 2507-1 (replaces EN 727)
Longitudinal reversion on pipes (air, 150°C, 60 min)	\leq 5%, The pipe shall exhibit no bubbles or cracks	EN ISO 2505 (method B) (replaces EN 743)

Chemical Characteristics

PVC-U TH PN10 pipes, have good behaviour when exposed to most chemicals used in water treatment stations (a large number of chemicals, including alkalis and most of acids), as the chemicals present in most types of soil or concrete in which pipe system has been installed. These pipes can be used in industrial applications for transport of several liquids, gases or pastes compatible with the PVC-U.

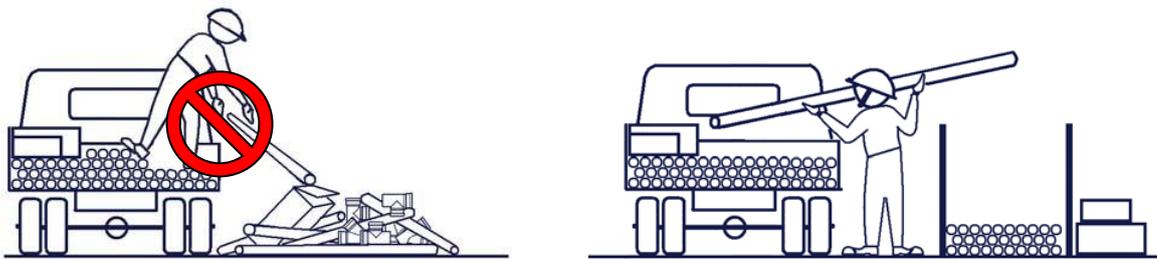
The chemical resistance of pipes and fittings depends on the service conditions such temperature, pressure and loads above the piping system. For more detailed information, see FERSIL table of chemical resistance or consult ISO/TR 10358.

Effect on water quality

The FERSIL pipes were tested according to standard EN 12873-2 complying with the established requirements of “Decreto de Lei 306/2007” with subsequent modifications, the correspondent “Real Decreto RD 140/2003” with subsequent modifications, that both makes the transposition to the national law (Portugal and Spain) of the UE Water Directive, as regards the effect of our products on water quality for human consumption.

Advice with handling, storage and transportation

When handled by a single person, the pipes should be downloaded, raised and carried in a controlled way without being thrown or dragged. During handling must be avoided impacts, scratches and other operations that could damage the pipe and fittings, especially if the ambient temperature is too low. To avoid damage to the pipe, this must be loaded and not drawn into the workplace.



Sticks or pallets' handling require proper mechanical equipment. The chosen technique mustn't cause any damage to the pipes.

The storage area should be close to the workplace and the floor must be smooth and level.

Pipes must be stored away from heat sources and contact with sharp objects, in order to avoid deformations or defects that could become permanent.

PVC-U pipes should be stored far from heat sources and should not contact with potentially dangerous products such as petrol, diesel, fuel, paints or solvents.

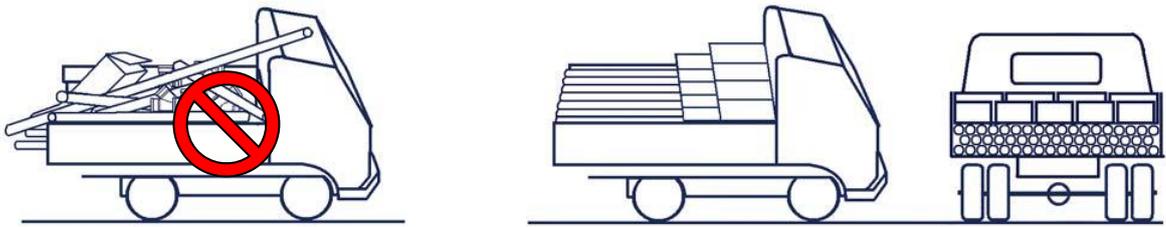
Prolonged exposure to UV radiation (sunlight) can reduce the pipes' strength to impact and cause discoloration. If stored outdoors, it is recommended some form of protection against direct sunlight.



The pallets' side holders should be placed at maximum intervals of 1,5m. The pipes should be supported throughout its length. Pipes of different diameters and thicknesses should be stored separately. If not possible, the ones with bigger diameter and thickness should be placed in the back.

When transporting pipes, the vehicles should have flat platforms, free of nails or other protrusions. It should be equipped with around 2m spaced side holders. All the holders should be flat without protrusions. If the pipe's length exceeds the vehicle one, the suspended part should not exceed 1m long.

Pipes with more stiffness should be placed beneath the ones with lower rigidity.



Advice in installation

Technical installation should be in compliance with the document EN 806 and the General Regulations for Buildings.

The PVC-U pipes and fittings to use should be in accordance with the indicated diameters in the project. They should be placed according to the layout shown in the project.

It should be particularly careful when installing PVC-U piping systems at temperatures below 5 °C. During the phases of installation, testing and operation, there never allow freezing water inside the pipes and fittings.

The connection of the pipe sections is performed using fittings of PVC-U or Brass with compatible dimensions to ensure the joint tightness.

The manual heating process for changing the curvature of a pipe requires that the heat applied in the pipe must be either with warm air and controlled manner. The manufacturing of fittings from pipes with manual heating processes are possible but not recommended by pipe and fittings producers, because in most cases the installers have no means to ensure the dimensional stability of the pipe and to prevent the possible degradation of PVC.

Note: PVC-U softening temperature is 79 °C and start degradation at 140/185 °C if the heat exposure time is excessive. The temperature and heating time must be homogeneous and balanced to avoid changes in critical dimensions (like diameters and wall thicknesses) which may affect the compatibility and tightness of the assembly and also to prevent PVC degradation in the area which applies heat.

Joining methods

If necessary, cut the pipe perpendicularly to its axis with a fine toothed saw, or a circular pipe cutter and remove any burrs.



Threaded joints with PVC-U or brass fittings

Special attention should be given to threaded joints execution so as not to have lack of tightness problems.

- The threading must be done by a qualified installer.
- Choose the appropriated set of tools for BSP thread joins dimensions, and check if cutters are sharp.
- The position and adjustment of the tool into the pipe center is critical to avoid the decentering of thread and premature fractures on the pipe.
- Open thread with the length equivalent to the depth of the fitting socket;
- As sealant we only recommend the use of Teflon. Apply Teflon with at least two passages per thread;
- Assemble the fitting into the pipe and thread until the end of effective length (depth of the fitting socket).

Thermal expansion

Like all thermoplastic materials, PVC-U pipes swell with increasing temperature and with a decrease contract. The physical property which represents this characteristic is the linear coefficient of expansion and is characteristic of each material. Its value indicates the extension in mm recorded in a meter of tube per °C of temperature increase.

The pipe elongation can be calculated by the equation:

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

wherein:

ΔL elongation in length (mm)

α is the linear expansion coefficient (mm/m.°C), for PVC-U is 0,06 mm/m.°C

L is the length of the pipe at the initial temperature (m)

ΔT is the temperature change (°C)

For example, for an ambient temperature of 20 °C the transport of water at 40 °C would increase a 6 m pipe length in 7,2 mm ($\Delta L = 0,06 \times 6 \times (40-20) = 7,2 \text{ mm}$).

As thread joints sustain axial forces, pay special attention to anchor properly the pipe and fittings in the direction changes, to permit the normal expansion due temperature changes in water flow.

Anchoring pipe segments

Piping systems must not be tightened by the brackets (holders), but handled by lifting tapes in order to allow some movement caused by thermal expansion and do not affect the proper functioning of the pipeline.

The supports should not have rough or sharp surfaces that may be in contact with the pipes, it is recommended the use of protection with soft surfaces.

Attention should be given to the need of creating fixed points positioned in the direction changes (tees, knees, etc.) and in the reductions to absorb the hydraulic impulses and close to the valves, counters and taps. As the PVC-U TH PN10 is rigid, it requires less support than the flexible plastic systems.

For horizontal pipes, support the pipe at intervals of 90 cm diameter equal to or less than 1 " and 120 cm for larger diameters. For vertical pipes, in addition to a fixed support at the level of the floor, place also a sliding clamp between consecutive floors.

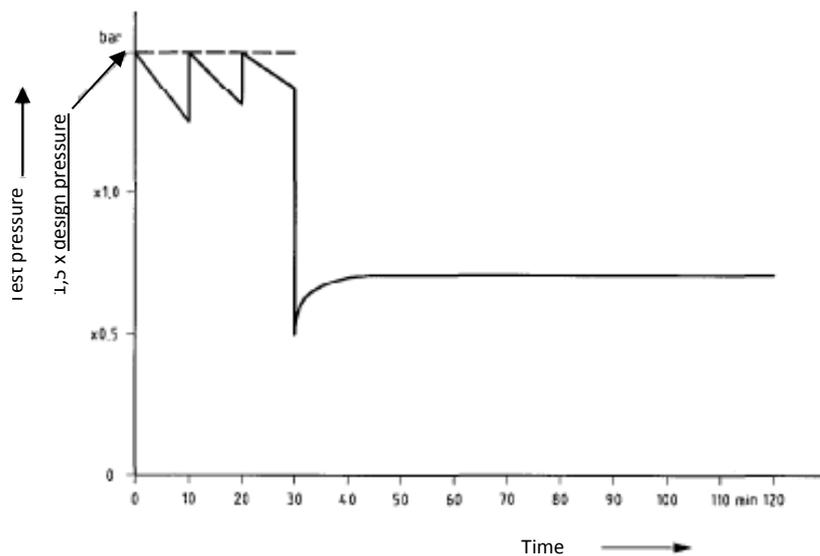
Other spacing may be used, based on conservative engineering assumptions, support points shall be provided following the table:

Maximum recommended distance between anchoring points for PVC-U TH PN10 pipes		
Nominal outside diameter \varnothing_{ext} (")	Horizontal piping (m)	Vertical piping (m)
1/2	0,95	1,20
3/4	1,05	1,30
1	1,20	1,40
1.1/4	1,35	1,50
1.1/2	1,50	1,70
2	1,70	2,00
2.1/2	1,80	2,20
3	2,00	2,50

Site pressure testing

The practices recommended by the Manufacturer and by the Water Company must be followed. In the absence of information, method A as indicated in the procedure given in CEN / TR 12108, it should be followed:

- Purge;
- Set test pressure equal to 1.5 times the pressure defined in the project (pressure provided by the Water Company in the building entrance);
- For next 30 minutes check for leaks and compensate the pressure due to pipeline expansion;
- Wait 90 minutes and if no leakage, the test is valid.



Note: A small loss in pressure can be caused by expansion of the pipe and must not be considered as failed.

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