Sewer PVC cold series (rainwater and venting)

Solid wall pipes PN4 TD, grey with lip ring sockets (TD)

FIL TUBOS presents a piping system in non-plasticized poly(vinyl chloride) (PVC-U), for cold water drainage and ventilation.

This Technical Data Sheet is applicable to FIL TUBOS PVC-U SEWAGE PN4 TD pipes, their joints and joints with PVC-U components and other materials that are used in:

- Drainage pipes for domestic wastewater (at low temperature), with continuous use up to 45°C;
- Ventilation pipes associated with domestic sewage;
- Rainwater pipes inside the building structure, including the facades.

They are compatible with PVC-U fittings of the Series "B" EN 1329, ensuring the tightness of the joints.

They can be installed inside the wall, false walls and ceiling, suspended or embedded in the slab.

Note: For installations buried inside and up to 1 meter from the building (application code "BD" or "UD"), FIL TUBOS recommends the use of compact wall tubes for underground non-pressure sewerage, in accordance with EN 1401 -1, in class SN4 (with SDR 41) or SN8 (with SDR 34) and marked "UD".

MATERIAL

The PVC-U compound used in the manufacture of FIL TUBOS PVC-U SEWAGE PN4 TD pipes, is PVC Resin to which the necessary additives are added to facilitate production. The following table shows the typical characteristics of PVC.

Material characteristics for PVC-U pipes	
Characteristic	Value
Elastic modulus $E_{(1min.)}$	3.200 to 3.600 MPa
Density (23°C)	≈ 1,5 kg/m^3
Thermal expansion coefficient	0,06 to 0,08 mm/m.K
Thermal conductivity	0,16 W/m.K
Surface resistance	> 10^{12} Ω
Poisson coefficient	0,35
Fire behaviour	Self-extinguishable

GENERAL CHARACTERISTICS

Aspect

When observed without magnification, the inner and outer surfaces of pipes must be smooth, clean and free from defects that could affect their performance. The pipe ends must be perpendicular to their axis.

Colour

The pipes are coloured on the entire wall and the colour should preferably be light grey (type RAL 7037). Small variations in appearance and colour tone are allowed.

Marking

The marking elements must be printed or engraved directly on the pipes or be on a label, in such a way that after storage, exposure to the weather, handling and installation, they must maintain their legibility in accordance with one of the following levels:

a) Durable during use (marked on tube and accessory)

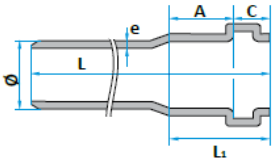
b) Readable until the system or component is installed (marked on packaging)

The minimum marking required for the pipes must be in accordance with the example as applicable, with the marking frequency not less than once per pipe:

FIL TUBOS – GRUPO FERSIL PVC-U ESGOTO d_n PN4 DATA+HORA+OP

GEOMETRICAL CHARACTERISTICS

The dimensions of PVC-U SEWAGE PN4 TD pipes are determined in accordance with the EN ISO 3126 standard and must be in accordance with the following table.



PVC-U SEWER PN4 TD pipes dimensions			
External diameter d_{em} (mm)	Medium wall-thickness e_m (mm)	Socket length A_{med}+c_{med} e $L_{1\,med}$ (mm)	Pipe length [1] L (m)
40	1,6	20+18 e 38	3
50	1,6	22+17 e 39	3
63	1,6	29+20 e 49	3
75	1,6	29+20 e 49	3
90	1,6	32+21 e 53	3
110	1,9	48+25 e 73	3
125	2,1	53+26 e 79	3

TYPES OF FITTINGS

PVC-U SEWAGE PN4 TD pipes use the range of PVC-U Series B EN 1329 fittings. The range of fittings mentioned in this technical document includes injected fittings and fabricated fittings from pipe ends and other fittings.

Fittings with lip ring sockets (TD)

- Bends (45°, 67°30' and 87°30'), TD (MF)
- Branches and reduction branches (simple and double) (45°), TD (MF)
- Tees and reduction tees (simple and double) (87°30'), TD (MF)
- Couplers, TD (FF)
- Invert reducers, TD (MF)

Note: MF – Male/Female FF – Female/Female

Other fittings to complement the range

With FERSIL fittings, FIL TUBOS also market some fittings from other brands. These fittings are 100% compatible with FIL TUBOS PVC-U SEWAGE PN4 TD pipes, guaranteeing the same quality and durability.

- Plugs, access plugs and reduction caps
- Grafts and safety grafts (TU)
- Sink siphon (with rubber seal WC)
- WC bend connectors and straight connectors (with rubber seal WC)
- Threaded knees 87°30', for bottom discharge in shower trays
- Lip rings TPE (EN 681-2)
- Air admittance valves (EN 12380)
- Noise isolating clamps
- Fire protection collars (EN 1366-3 with fire resistance up to 2h)

PVC-U floor traps (EN 1253), to complement the range

To complement the range, FIL TUBOS offers a set of floor traps (drains and siphons) with covers, manufactured in accordance with EN 1253. These floor traps can be installed at drainage or access points for maintenance of the sewage networks in bathrooms, kitchens and laundries,, balconies, galleries, terraces and plant beds.

- Siphon floor traps with Ø90 cover, Ø40 inlets and Ø50 outlet
- Siphon floor traps with Ø110 cover, Ø40 inlets and Ø50 outlet
- Siphon floor traps with Ø90 cover, Ø40 or Ø50 inlets and Ø75 outlet
- Self siphon bend Ø40 or Ø50
- Plugs M Ø40 or Ø50
- Reducer sockets (TU) Ø40x32 or Ø50x40
- Thread rings for covers (TU) Ø90, Ø110 and Ø125, for floor traps and for pipe risers
- Crossing rims for stainless steel covers (TU) Ø90, for floor traps
- ABS chrome covers Ø90, Ø110 and Ø125
- Metal covers Ø90, Ø110 and Ø125
- Metal perforated covers Ø90, Ø110 and Ø125
- Stainless steel covers Ø90

Physical and mechanical characteristics

PVC-U SEWAGE PN4 TD pipes have the physical and mechanical characteristics according to the following table:

Physical and mechanical characteristics of PVC-U SEWAGE PN4 TD pipes		
Characteristic	Value	Test method
Vicat softening temperature (VST)	≥ 79°C	EN ISO 2507-1
Pipes longitudinal reversion (air, 150°C, 30 min)	≤ 5%, Must not have blisters or cracks	EN ISO 2505 (B method)
Impact resistance (round-the-clock) (water or air, 0°C, hammer d25/d90, mass/drop height per d_n)	TIR ≤ 10%	EN ISO 3127

CHEMICAL CHARACTERISTICS

PVC-U SEWAGE PN4 TD pipes offers a good behavior when exposed to most chemicals used in wastewater treatment plants (a large number of chemicals, including most alkalis and acids), as well as products chemicals present in most types of soil or

concrete structures in which the pipe system is installed. Chemical resistance depends on service conditions such as temperature, pressure and loads applied upon installation. For more detailed information, see the FERSIL group chemical resistance table.

PERFORMANCE CHARACTERISTICS

The most important test for system performance in piping is the water tightness of the joints between pipes or between pipes and fittings. The joints between PVC-U SEWAGE PN4 TD pipes have the performance characteristics described in the following table:

Performance characteristics of PVC-U SEWAGE PN4 TD joints		
Characteristic	Value	Test method
Water tightness (0,5 bar, 15 min)	Without leaks	EN ISO 13254
Air tightness (0,1 bar, 5 min, rotation at 0°, 90°, 180° and 270°)	Without leaks	EN ISO 13255

FIRE BEHAVIOUR

FIL TUBOS PVC-U SEWAGE PN4 TD pipes are self-extinguishing and have good fire behavior.

PACKING

The FIL TUBOS PVC-U SEWAGE PN4 TD are packed in bundles and these are palletized for storage and for transport by truck.

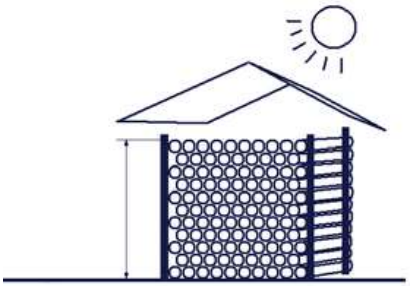
Packing of pipes on pallets PVC-U SEWAGE PN4 TD					
$Ø_{ext}$ (mm)	Qt./bundle (pipes)	Qt./bundle (m)	Qt./pallet (bundles)	Qt./pallet (pipes)	Qt./pallet (m)
40	18	54	20	360	1.080
50	10	30	20	200	600
63	10	30	16	160	480
75	10	30	16	160	480
90	5	15	20	100	300
110	5	15	16	80	240
125	5	15	12	60	180

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.

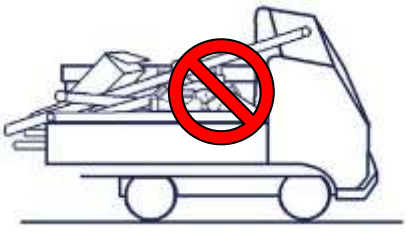
Sticks or pallets' handling require proper mechanical equipment. The chosen technique mustn't cause any damage to the pipes. The storage area should be close to the workplace and the floor must be smooth and level.
Pipes must be stored away from heat sources and contact with sharp objects, in order to avoid deformations or defects that could become permanent. Fittings should be stored in their original packaging until use.

PVC-U pipes and fittings 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 CEN / TR 13801 and the General Regulation for Buildings installations. 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 is good practice to place the pipes and fittings with spigot (male ends) inserted in the socket in the same direction of flow.

The horizontal pipes should have slopes equal to or greater than 0,5% in the direction of flow to facilitate the gravity flow and the air vent.

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 the joining methods of the pipe itself or using fittings of the same material and class and ensuring full tightness.

The manual heating process for changing the curvature of a pipe or the manufacture of a socket 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 pipes and fittings producers, because in most cases the installers have no means to ensure the dimensional stability of the pipe or fitting 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.

The manufacturing of sockets in situ must have the correct length and diameter for a tight joint by a solvent cement process with specific solvent adhesives for PVC-U. Before bonding the new socket should be cleaned, sanded and degreased with suitable solvent for PVC (to prepare the bonding surface).
To avoid the need to manufacture sockets and long bends in situ, FERSIL offers a very wide range of fittings (including branches, tees, reductions, simple and telescopic joints, clips and grafts) with the necessary angles and with sockets for elastomeric lip-rings or for solvent cement joints, and double socket fittings to be use with plain pipes. Complemented this offering with flexible spiral pipes from IBOTEC range Spiral Plus - Hydro, that are compatible with PVC-U double socket fittings for solvent cement joints, which usually are used in swimming pools and small repairs in soil and waste horizontal discharge systems.

Jointing method

If necessary, cut the pipe perpendicularly to its axis with a fine toothed saw, or a circular pipe cutter and remove any burrs. Fittings must not be cut, because the dimensions are already adjusted for tight joints.

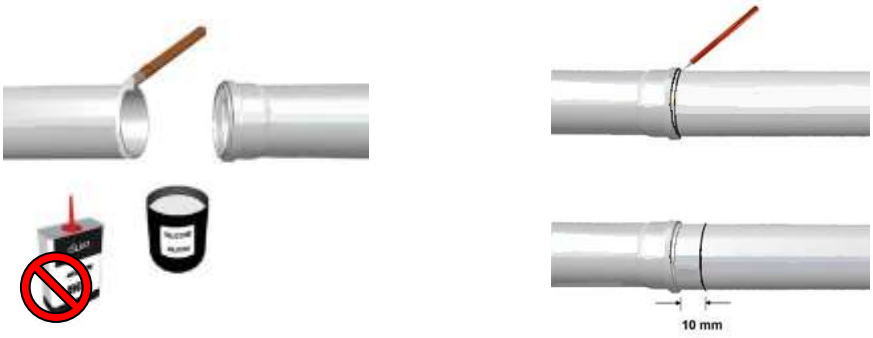
Do the chamfer at an angle of ± 15 ° using proper equipment, or a fine toothed sanding.

Joints with sockets for elastomeric lip-ring TPE (EN 681-2)

The design of pipe sockets and the lip-ring are specific of the pipe or fitting manufacturer, and should not be replaced by other. If elastomeric lip-rings are provided separately, the groove should be cleaned and removed from all foreign matter, than place de lip-ring correctly.

Lubricate the spigot (male end) of the pipe or fitting and if necessary also lubricate the lip-ring placed in the socket. For high durability and tightness of joints, FERSIL only recommend in jointing procedure the use of silicone grease or industrial Vaseline suitable for rubber rings.

After the two surfaces' lubrication, the introduction must be made to avoid dirt deposit.



The PVC-U linear thermal expansion coefficient is considered 0,06 to 0,08 mm per meter length and Celsius degree. Under normal circumstances, the spigot should not be completely inserted into the socket, its end should be 10 mm spaced (typically 10 mm per 3 m pipe's is enough). Before final assembly, the extension to be introduced should be referenced by a pencil trace. Excessive piping misalignments should be avoided (angular deviation) to not compromising the tightness of the joint.

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:

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

where:

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 a discharge from a washing machine at 90 °C would increase a 3 m pipe length in 12,6 mm (ΔL = 0,06 x 3 x (90-20) = 12,6 mm). However, the discharge is not continuous since it only comes in contact with hot water, a part of the inner wall of the pipe section and for a short period of time. Under normal circumstances, the 10 mm provided in setting up of an elastomeric li-ring joint is sufficient.

Anchoring discharged pipe segments

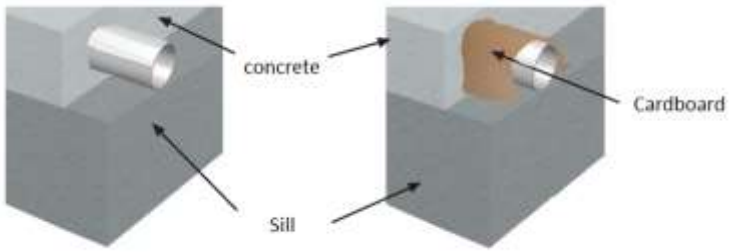
As joints by sealing ring not sustain axial forces, pay special attention to anchor properly the pipe and fittings in the direction changes.

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, support points shall be provided following the table:

Maximum recommended distance between anchoring points for PVC-U ESGOTO PN4 TD pipes

Nominal outside diameter d_n (mm)	Pipes embedded in concrete		Pipes not embedded in concrete	
	Horizontal piping (m)	Vertical down piping (m)	Horizontal piping (m)	Vertical down piping (m)
40	0,50	1,00	0,50	1,20
50	0,50	1,00	0,50	1,50
63	1,00	1,50	0,80	2,00
75	1,00	1,50	0,80	2,00
90	1,00	2,00	0,90	2,00
110	1,00	2,00	1,10	2,00
125	1,00	2,00	1,25	2,00

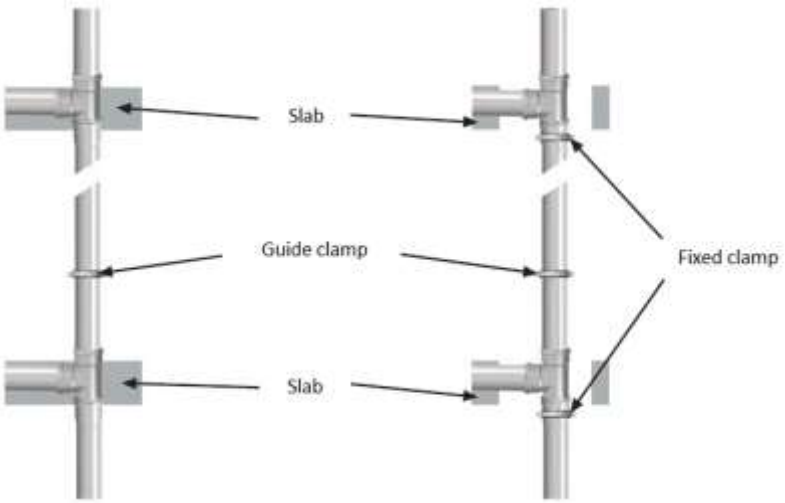
Before embedded in concrete the piping system, pipe and fitting joints should be covered to prevent them from mortar or screed into the socket. The coating with mortar or screed height must not exceed 0,5m. The branches for discharging water at high temperatures (e.g. from the discharge of washing machines) should be installed so as to allow free expansion of the pipes, for example, covered with corrugated board or other coating.



For non-embedded in the concrete, pipes should be provided with support points (fixed or tab) as referred in the previous table.

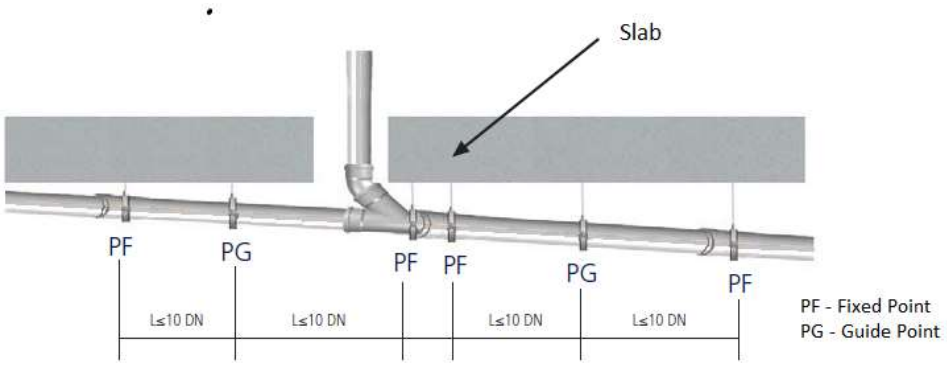
Placement of the vertical discharge stacks pipes

If the branches are attached to the slab, an additional clamp should be installed for each 2,0 m pipe length. If the branches are not fixed on the slab, a fixed point should be placed in the derivation to prevent sliding and a fixing clamp should be placed in the pipe socket with an additional guide clamp (clamp is not fully tightened in) each 2,0 m pipe length.



Placement of drains and suspended horizontal pipes

The distance between the anchoring points cannot be bigger than 10 times the diameter of the pipe. In the case of suspended horizontal pipes with Ø32, Ø40 and Ø50, the distance between anchoring points should be 0,5m.

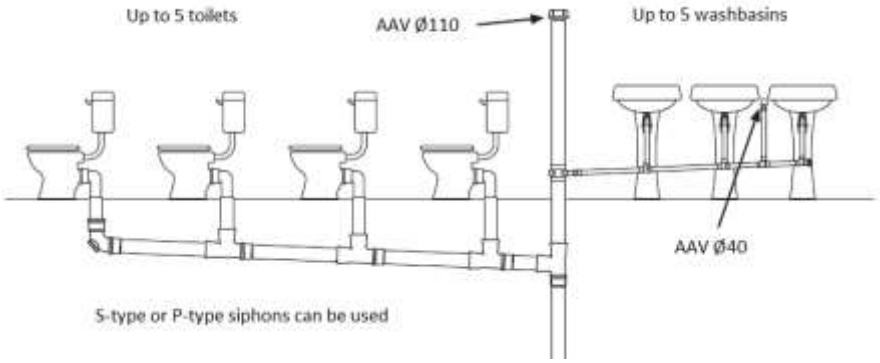


Air admission valves

The Ø40 mm air admission valves (AAV) can be installed directly on the socket of Ø40 PVC-U Series B pipe. If the branches to vent are Ø50 mm, should be use a d_n 50/40 eccentric reduction to connect the AAV to the Ø50 PVC-U Series B pipe.

The AAV must be fitted in a vertical position, a minimum of 100mm above the pipe being vented. To prevent self-siphoning, a connection to the Ø40 mm AAV is required within 1,5m from the floor trap box. To prevent induced siphoning in a row of wash-basins, a Ø40 mm AAV can be fitted between two wash-basins farther from the discharge stack.

If the valve to be installed in or in close proximity to a habitable space where noise of operation may cause nuisance, then consideration must be given to the use of suitable form of sound insulation. The AAV 40 mm can be installed inside a cabinet providing that it is not completely closed, to let the admittance of fresh air.



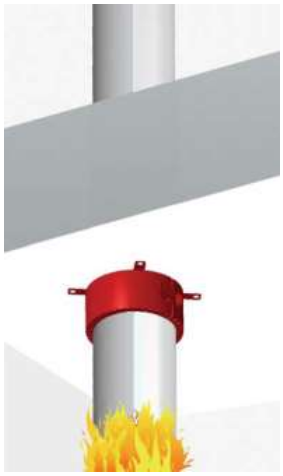
The Ø110 mm AAV can be installed directly on the socket of Ø110 PVC-U Series B pipe. If the stack to vent is Ø125 mm, should be use a d_n 125/110 eccentric reduction to connect the AAV to the Ø125 PVC-U Series B pipe. It should be considered the calculation of the need air flow rate.

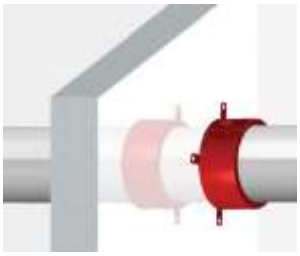
The VAA must be fitted in a vertical position a minimum of 200 mm above the highest branch connection. The valve should be installed within the building where it easily accessible but not subjected to outers interference. Ventilation stacks higher than 45 m or 10 floors must not be fitted with the Ø110 mm AAV.

If the valve is fitted inside a duct, then the duct will require ventilation. The AAV usually not required maintenance, but in event of accidental damage o router interference the AAV must be renewed. Air admittance valves should not be used as the only ventilation to septic tanks or cesspools.

Fire-protection collars

To protect against the spread of fire from floor to floor, a fire –protection collar should be placed up against the ceiling level of the compartment. If fire-break protection is desired for two continuous horizontal compartments a fire-protection collar must be placed on both sides of the wall.





Site tightness test

In order to ensure the proper functioning of piping system, it is recommended a final tightness test. This test is carried out under the following conditions:

- The test focuses on the installed piping collectors, subjecting them to the same pressure as the one provided in eventual obstruction of the piping system;
- Cover up the collectors with plugs and each drop/fall pipe is filled with water up to the height correspondent to the point of discharge of the lower device installed in the system, and check the joints for leaks;

In the lowest cover point, a pressure gauge should not undergo pressure lowering, at least during 15 min.

FIL.
TUBOS ANGOLA
Zona Industrial de Viana
Luanda - Luanda
Angola
Tel.: +244 922 859 229 | Tel.: +244 929 999 203
geral@fil-angola.com