

Solvent welding Instructions

Solvent welding, or cement jointing, is the longitudinal joining system for connecting rigid PVC-C pipes and fittings.

The “solvent welding” is carried out using solvent cements obtained by dissolving PVC-C polymer in a solvent mixture. This solvent liquefies the walls of the pipe and/ or fitting, allowing the constituent material to chemically combine and be subsequently welded. Chemical welding allows permanent joints be achieved possessing chemical and mechanical strength characteristics identical to those of the pipes and fittings joined. The solvent cements must be selected according to the type of thermoplastic resin to weld, in that the nature of the solvents vary, as does the weld material contained in them. It must be remembered, therefore, that all the solvent cements designed for joining TemperFIP100® pipes and fittings and forming part of the TemperFIP100® system must be used to join pipes, fittings and valves of the same material.

The same solvent cement must not, under any circumstances, be used for joining other products with different thermoplastic resins to those used in the TemperFIP100® system .

To this end, FIP has designed special TemperGLUE and TemperGLUE/Weld-On 724 solvent cements using the same “PVC-C CORZAN™” resin used for the production of pipes, fittings and valves, and which guarantees highly reliable permanent joints.

Before starting any solvent welding operations, the efficiency and condition of the equipment used and the pieces to be assembled must be verified, in particular the uniformity, fluidity and expiry date of the solvent cement.

- 1) Cut the pipe perpendicular to its axis to obtain a clean square section, preferably using a wheeled pipe cutter designed specifically for thermoplastic pipes (fig. 1).
- 2) Chamfer the outer edges of the pipe in order to ensure that it enters the socket of the fitting at an angle of 15°. The chamfering operation must be carried out at all costs, otherwise the lack of chamfer can lead to the solvent being scraped off the surface of the fitting, thus compromising the effectiveness of the joint. The chamfering must be carried out using the appropriate chamfering tool (fig. 2).
- 3) Measure the depth of the socket of the fitting to the internal shoulder and mark the corresponding distance on the end of the pipe (fig. 3-4).
- 4) Using a clean paper towel or applicator soaked in Cleaner-Primer or Primer P70 (TemperFIP), remove any traces of dirt or grease from the outer surface of the pipe for the entire cementing length. Repeat the same operation on the internal surface of the socket of the fitting, leaving the surfaces softened (fig. 3-4).

Leave the surfaces to dry for a few minutes before applying the solvent cement. Remember that, in addition to cleaning the joint surfaces, Cleaner-Primer TemperFIP100® or Primer P70 also performs the important role of softening and preparing the surface to receive the solvent cement, an operation that enables a perfect joint to be obtained..

- 5) Apply the TemperGLUE or TemperGLUE/Weld-On 724 solvent cement in a uniform manner longitudinally over both parts to be assembled (outer surface of the pipe and internal coupling surface of the fitting) using an applicator or suitably sized coarse brush (table “Characteristics and dimensions of brushes and applicators”) .



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

It is advisable to use an applicator/brush of dimensions not less than half the diameter of the pipe (fig. 7-8).

The TemperGLUE solvent cement must be applied along the entire length of the joining surface of both the pipe and the fitting:

- for the entire depth of the socket of the fitting as far as the internal shoulder
- for the entire joint length of the pipe previously marked on the outer surface

6) Fully insert the pipe into the fitting immediately and without any rotation. Only after this operation will it be possible to slightly rotate both ends (max. 1/4 of a turn between pipe and fitting). This rotation movement will render the layer of applied solvent cement more uniform.

7) The pipe must be inserted in the fitting as soon and as quick as possible (after no more than 20-25 seconds is recommended). Depending on the external diameter of the pipe and, as a result, possible handling difficulties, the insertion of the pipe into the fitting must be carried out:

- manually by one person for external diameters < 90 mm.
- manually by two people for external diameters from d 90 to d < 160 mm.
- using mechanical pipe-pullers for external diameters > 160 mm.

8) Immediately after fully inserting the pipe in the fitting, apply pressure to the joined parts for a few seconds. Then use crepe paper or a clean cloth to remove any excess solvent cement from the outer surfaces, and from internal surfaces where possible (fig. 9).

9) Solvent cement drying: the joined parts must be left to stand in order to allow the solvent cement to set naturally without generating any unnecessary stress. The setting time depends on the amount of stress that the joint will be placed under.

In particular, the following minimum setting times must be respected according to the ambient temperature:

- before handling the joint:
 - from 5 to 10 minutes for ambient T. > 10°C
 - from 15 to 20 minutes for ambient T. < 10°C
- for repair joints on pipes of any size or pressure not subject to hydraulic testing:
 - 1 hour for each atm of applied pressure
- for joints in pipes and fittings of any diameter subject to pressure testing up to PN 16:
 - minimum 24 hours

The solvent cement setting times indicated are valid at ambient temperature (approx. 25°C.). For particular climatic conditions (humidity, temperature, etc...), we recommend you contact our technical services department and/or the solvent cement manufacturer for more information .



Fig. 6



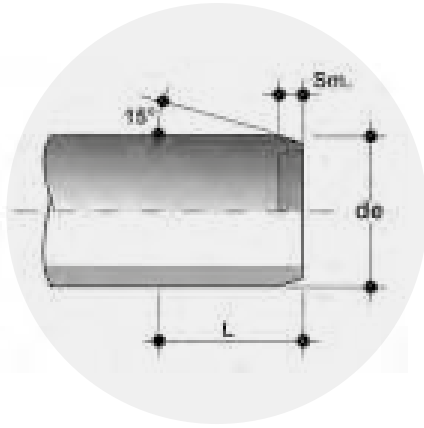
Fig. 7



Fig. 8



Fig. 9



Insertion, solvent welding and chamfer length

External diameter de (mm)	Solvent welding length L (mm)	Chamfer Sm (mm)
16	14	1.5
20	16	1.5
25	18.5	3
32	22	3
40	26	3
50	31	3
63	37.5	5
75	43.5	5
90	51	5
110	61	5
160	86	5
225	118.5	5÷6

Characteristics and dimensions of brushes-applicators

External diameter de (mm)	Type and dimensions of Brush or Applicator
16 - 25	Round (8 - 10 mm)
32 - 63	Round (20 - 25 mm)
75 - 160	Rectangular / round (45 - 50 mm)
>160	Rectangular / cylindrical (45 - 50 mm)

Warnings

- In the case where the external diameter of the pipe and the internal diameter of the fitting are at opposite extremes of their tolerance values, the dry pipe cannot be inserted in the dry socket of the fitting. Insertion will only be possible after having applied the cleaner-primer and solvent cement to both parts to be joined.
- TemperGLUE and TemperGLUE/Weld-On 724 solvent cements are produced using the same PVC-C CORZAN™ resin that FIP uses for the production of the pipes, fittings and valves that make up the TemperFIP system. Unless otherwise specified, the solvent cement used on the surfaces to join must also be usable with the following tolerances:
 - Maximum interference 0.2 mm.
 - Maximum clearance 0.3 mm.
- A combination of TemperGLUE/Weld-On 724 and Primer P70 for PVC-C CORZAN™ is recommended for particularly aggressive chemical fluids (strong acids and bases).
- When using TemperGLUE solvent cement and Primer TemperFIP Cleaners, the following precautions should be adopted:
 - Use gloves and safety glasses to protect hands and eyes.
 - Use the cleaner and solvent cement in a working environment with sufficient ventilation to avoid the formation of pockets of air containing concentrations of evaporated solvent, which can irritate the respiratory tract and eyes.
- Due to the volatile nature of the solvents in the cleaner and cement, the containers must be closed immediately after use.
- Solvents in the gaseous phase tend to form flammable mixtures. Therefore, remove any ignition sources such as welding operations, accumulation of electrostatic charges, etc. from the work area, and do not smoke. In all cases, it is advisable to adhere strictly to the solvent cement manufacturer's warnings written on the packaging.
- IN ORDER to prevent a deterioration in the performance of the cleaner and solvent cement, the joining operations should be carried out within an ambient temperature range of between + 5 °C and + 40 °C.
- The amount of solvent cement used on the joints depends on a number of factors (environmental conditions, pipe size, cement viscosity, operator experience, etc.) which are often difficult to quantify. In this respect, Table "Rigid PVC-C pipes and fittings. Theoretical solvent cement consumption" reports the approximate quantities of cement normally used for joining various diameter pipes and fittings.
- After having completed all the joints and prior to putting the lines into service, make sure that the insides of the pipes and fittings are completely free of any solvent traces/vapours. This will prevent contamination of the fluids conveyed.

Rigid PVC-C pipes and fittings theoretical solvent cement consumption

Pipe/Fitting diameter d (mm)	Number of joints per kg of solvent cement
16	550
20	500
25	450
32	400
40	300
50	200
63	140
75	90
90	60
110	40
160	15
225	6

Most common defects

The table reports the most common types of defect encountered if the correct solvent welding procedure is not followed.

Solvent cement too fluid (incorrect diluent addition)	
Immediate effect	Solvent weld failure
Consequence	Joint separation or leaks from between the pipe and fitting
Excess solvent cement	
Immediate effect	Internal and external runs beyond the joint zone
Consequence	Weakening of the outer surface of the joint area and formation of bubbles with micro-cracks/sources of fracture in the base material
Excessively dense solvent cement due to evaporated solvent	
Immediate effect	Solvent weld failure
Consequence	Joint separation or leaks from between the pipe and fitting. Possible surface cracks triggering cracks in the base material
Insufficient and/or incorrect distribution of solvent cement	
Immediate effect	Solvent weld failure or local weakness
Consequence	Joint separation or leaks from between the pipe and fitting
Incorrect pipe insertion (incomplete, excessive, misaligned)	
Immediate effect	Imperfect joint
Consequence	Transmission of mechanical stresses from the pipe to the fitting and/or leaks from the joint
Impurities and/or humidity on the surfaces of the parts to join	
Immediate effect	Imperfect joint
Consequence	Joint separation or leaks (fluid seepage) from between the pipe and fitting