

Instructions for the preparation of PUR foam-bags

Background

Besides proper selection of the amount of liquid polyurethane foam, for the correct filling and insulation of joints, the following are very important:

- temperature of liquid foam components in the bag,
- ambient temperature and humidity during assembly,
- service pipe temperature,
- moisture of the junction (joint and pipe connection),
- proper mixing of liquid foam components.

The PUR foam packed in bag kits (Foam-bags) contains two liquid components, which, when mixed with each other and poured into the joint, foams-up and fills it entirely, creating PUR insulation with the same properties as in straight pipes and prefabricated elements.

Both liquid foam components are pre-packaged in an amount that ensures the right mixing ratio and quantity to correctly fill the particular combinations of joint and service pipe.

Foam-bags are always delivered in insulating boxes with information and instructions about conditions of proper storage.

Foam-bags are made of diffusion barrier film. Each foam-bag is divided into two parts by a clamping partition. Component A - polyol (bright, clear) is located in the transparent part, and component B - isocyanate (brown) is located in the part of the bag that contains an aluminium diffusion barrier. Bags with liquid foam contain information about its content (designation of polyol/cyclopentane and isocyanate) and hazard symbols. The label attached to the foam-bag also shows the kit number and the expiration date.

Storage / temperature of liquid foam components

Keeping the liquid foam components within the optimal temperature range is critical for homogeneity of the foam after its foaming.

The start and chemical reaction time of liquid components is variable and depends on:

- storage temperature,
- the accuracy of mixing,
- the pouring time to the junction.

Therefore, liquid PUR foam is best stored in rooms with a temperature of 15-25 ° C. The temperature of liquid components must not be allowed to exceed +35°C or fall below 0°C.

The recommended optimum temperature for foaming and insulating joints is +20°C.

Storage temperature [°C]	Mixing time [s]	Pouring time [s]
10	30	70
15	25	60
20	20	50
25	20	45
30	15	40

Change in temperature of liquid foam in polystyrene thermal insulation boxes

Foam in foam-bags is delivered in polystyrene boxes, which are designed to maintain a constant temperature of liquid components. On the construction site, foam should also be stored in closed polystyrene boxes. After removing the foam, the box should be carefully closed to maintain the correct temperature.

The table below shows the temperature changes of the foam stored in the thermal insulation box and outside as a function of time for different ambient temperatures.

		<p>Symbol designations:</p> <p> °C - means the installation temperature in °C</p> <p> °C - means the storage temperature in °C</p>
<p>Change in the temperature of liquid foam over time, stored in a thermal insulation box, for different ambient temperatures.</p>	<p>Change in the temperature of the liquid foam in the bag over time, outside the insulation box, for different ambient temperatures.</p>	

Liquid foam heating/cooling

Where the temperature of the liquid foam is close to or exceeds the permissible temperature limit, it must be placed in a room with a temperature of 18-24°C.

It should be kept in mind that:

- at high temperature of liquid components, the start time of the foaming reaction may be too short and will prevent pouring the entire content of the foam bag into the junction,
- at low temperature of liquid components, the start time of the foaming reaction and the gelation time may be too long, which causes, that the insulation may not fill the entire junction, and its quality will be low.

Please note that the time of reheating/cooling in the insulation box is long.

The heating/cooling time should be selected according to the diagrams in the table below.

Liquid foam heating/cooling time diagrams		
		<p> 20°C - ambient temperature 20°C</p> <p> - heating/cooling time in hours</p>
<p>Time of foam reheating/cooling in an insulating box</p>	<p>Time of foam reheating/cooling in the bag outside the styrofoam box</p>	

Assembly - ambient temperature

If the ambient temperature is higher than +10°C and lower than +30°C, the process of insulating the joints with foam proceeds normally - then proceed as described in the assembly instructions of the joint.

When the ambient temperature is below +10°C, the (especially the lower part) should be gently heated to +30÷40°C.

On a working pipeline, insulating with liquid foam can be done only after the line pipe has cooled up to approx. 20°C. On a hot day with additional heavy sunlight, the temperature in the installed junction may exceed +50°C. To avoid this, cover the joint with a white film reflecting the sun's rays.

Remark! The MEZ and heat-shrinkable non-crosslinked joints MTM, MTM+ i MTO1 shall not be heated.

Moisture in the joints

Because moisture in the joint causes an additional acceleration of the foaming reaction and worsens the quality of insulation, therefore in order to prevent moisture from condensing inside the unfoamed joint, care should be taken to:

- the junction area shall be dry before joint installation.
- avoid joints' installation in wet weather. If necessary - use a tent.
- fill the junctions with foam on the day of joints' installation, If this is not possible, the filling holes should be closed with a vent plug and sealed with insulating tape.

Insulating joints on hot/cold junction

If the temperature of the junction is below +10°C or higher than +50°C, before pouring the foam into the joint, it is recommended to wrap it with polyethylene foam 5mm thick.

Particular attention should be paid when pouring foam into joints on a hot pipeline, as this results in a shorter start time of the foaming reaction, and a higher pressure of the foaming foam, especially when the work is carried out in the summer on sunny days.

If it is necessary to insulate the junctions in such conditions, it is imperative:

1. Liquid components of the insulating foam must not have a temperature higher than +18°C. To achieve the required temperature, liquid foam should be stored long enough before use in a cool room.
2. Bearing in mind the reduced reaction time of the foam components in the hot junction, the mixed foam should be poured as soon as possible through the foaming hole into the joint.
3. The junction must be sheltered from the sun (especially in summer).

Mixing of the liquid PUR components

Foil bag divided into two parts by a clamping partition (that protects the components of the PUR foam before accidental mixing). To mix two components, remove the plastic caps at both ends of the clamp and pull firmly on the rubber gasket pressed into the U profile of the clamp. After removing the partition, you can proceed for mixing both liquid foam components.

Mix the foam vigorously so that both liquid components form a homogeneous light brown liquid. The colour of the mixture should be uniform, without visible streaks and layers. Thorough mixing of liquid foam components ensures a homogeneous insulation structure and, as a result, correct filling of the junction.

Depending on the temperature of the components, both liquids should be mixed by vigorously shaking them for approx. 15-30s. Mixing, due to the rapid growth of the foam, should not be longer than given in below table for a given ambient temperature.

Storage temperature [°C]	Mixing time [s]	Pouring time into the junction [s]
10	30	70
15	25	60
20	20	50
25	20	45
30	15	40

Pouring of the liquid foam into the junction

Unscrew one of the cap. Place the opened spout in the lowest filling hole of the joint. Pour the foam inside the junction. During the process of pouring it is recommended to twist the bag in order to avoid blocking the outflow by gas bubbles.

Note: In case two sets of foam-bags are required to insulate one joint, it is recommended that two operators mix the foams in foam-bags in such a way as to enable both foam-bags are poured simultaneously through both foaming holes into the junction.

Junction ventilation

After pouring the foam into the joint, the filling holes should be closed with vent plugs ("with tail ones") by setting the "tails" perpendicular to the axis of the joint.

At this point, the insulation of further junctions can be proceeded. At this time, the foam is growing inside the joint, and pushes out the air from the joint through the foaming holes. A sign of proper filling of the joint is a foam outflow through the holes in the ventilation plugs.

Note: wait with further installation until the foam outflows got hardened.

Removing of the ventilation plugs

10 minutes after filling the junction with foam, the ventilation plugs can be rotated half a turn, that makes them easier to later removal.

After the foam has completely hardened and cooled, on the same day on which the junction is insulated, but not earlier than after 30 minutes from the moment the foam is poured into the inside of the joint, it is necessary to remove the ventilation plugs, clean the edges of the foaming holes from foam residues and heat the welded plugs or hammer in the expansion plugs.

The assembly waste should be disposed in accordance with the local / national requirements.

Welding plugs installation

Weld the plugs according to the instructions of the plugs' welding device. It is recommended to heat-up the plug and the foaming hole at the same time for 30 seconds at a temperature of 230°C, then press the plug evenly until the weld solidifies.

Before heating, clean the foam residues and degrease the edges of the holes in the joint and degrease the plug.

Expanding plugs installation

The expansion plugs consist of two elements: dished one with mastic and chocker one to be pushed and locking in the foaming hole. After cleaning the foaming holes in the joint from foam residues and their degreasing, first, we hammer the dished element with the flange into the foaming hole, and then into the recess of the first one the second chocker element causing sealing and blocking complete set in the foaming hole.