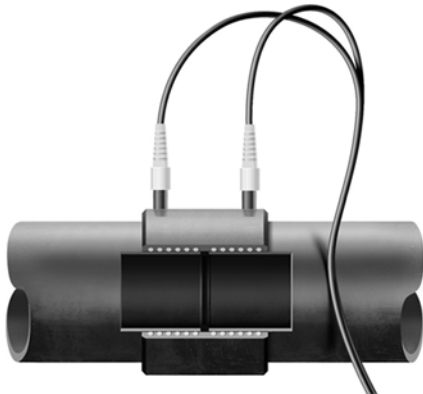


5.2.2 Electrofusion



Electrofusion is a rapid and simple way of permanent jointing. Using the akafusion couplers and equipment, pipes, fittings and prefabricated pipe sections can efficiently be assembled. Most Akatherm products can be welded by electrofusion.

Preparations

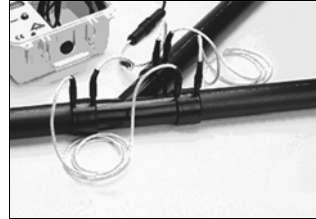
The following guidelines are of importance when making a proper electrofusion joint:

- Establish a work space where the welding can be done without being effected by major weather conditions. Temperature $-10^{\circ}\text{C}/+40^{\circ}\text{C}$.
- Check the equipment functions properly. Welding equipment used on site deserves special attention.
- The resistance wire in the akafusion coupler lies at the surface for a good heat exchange. The resistance wires need to be covered by the inserted pipe or fitting to guarantee a proper working.
- Complete insertion is essential to utilize the fusion and cold zones in the coupler.

In the fusion zone the resistance wires are positioned. On both sides of a fusion zone a cold zone prevents the molten HDPE from outpouring and contains the fusion process.

During the fusion process the pipe/fitting expand and touches the inner coupler wall. The electrofusion joint is made with the pressure caused by the expanding HDPE and the heat from the resistance wires.

Multiple welding



The control boxes CB315 and CB160 are capable of welding several electrofusion couplers simultaneously in the same time that is needed for producing one electrofusion weld.

The combined diameters of the couplers to be joined should not exceed 200 mm. For example in the case of a 45° 75/50 mm tee; both the diameters 75 mm and the branch 50 mm can be welded in one cycle.

Rule of thumb:

Sum of diameters couplers < 200 mm



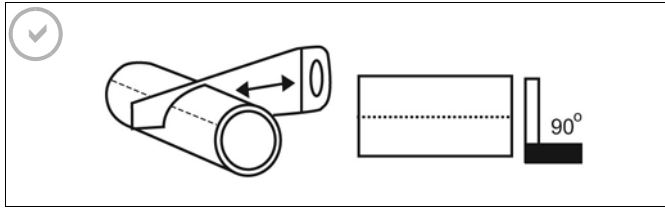
Illustration 5.2.10 Akafusion coupler with fusion and cold zones

HDPE drainage

Installation guidelines

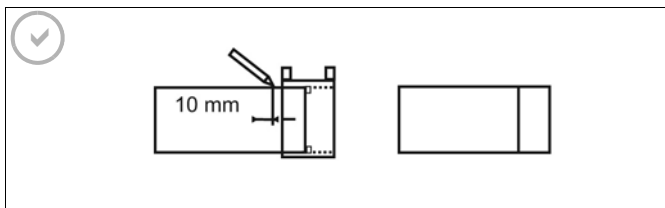
Welding process

Cut pipe square



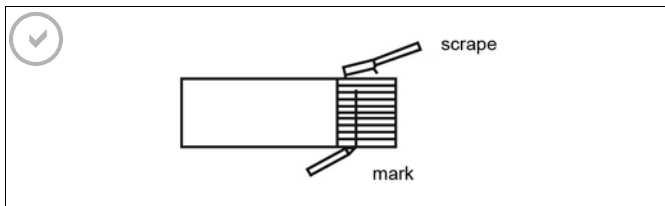
The pipe ends must be cut square to ensure that the resistance wire in the coupler is completely covered by the pipe or fitting

Mark surface for scraping



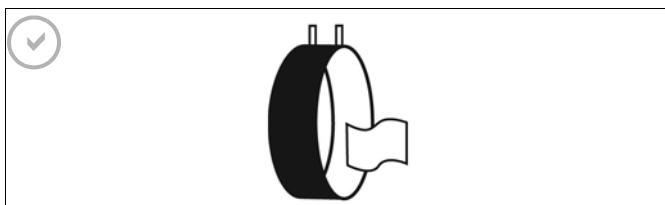
Mark insertion depth +10 mm to ensure that across the full welding zone the oxidized layer will be removed.

Scrape pipe and mark insertion depth



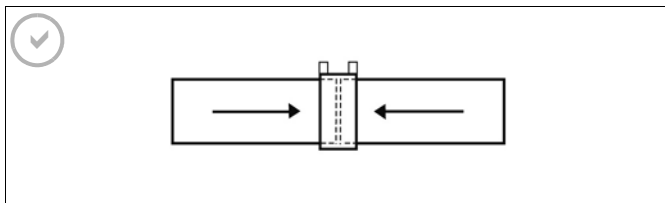
The outer surface of the pipe (approx. 0.2mm deep) must be scraped the full zone that will be covered by the coupler to remove any surface 'oxidation'. The insertion depth should be marked again to safeguard full insertion.

Clean electrofusion coupler



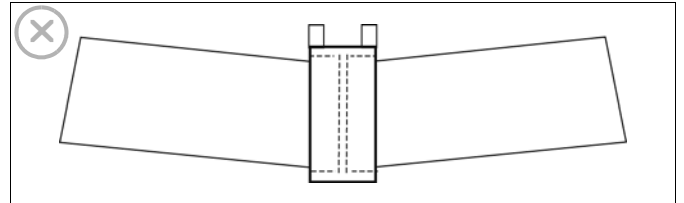
Before assembling the pipes into the coupler ensure that all surfaces are clean and dry.

Insert pipe/fitting until marked line



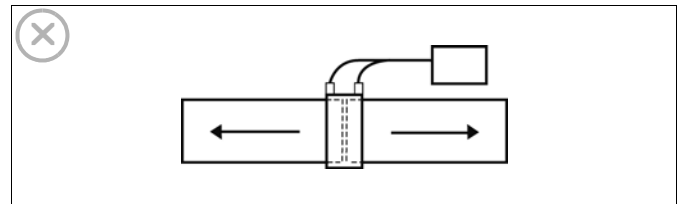
Ensure that the pipe is pushed as straight as possible into the coupler up to the marked insertion depth. This is to ensure that all the wires are covered with HDPE during the fusion cycle.

Prevent misalignment



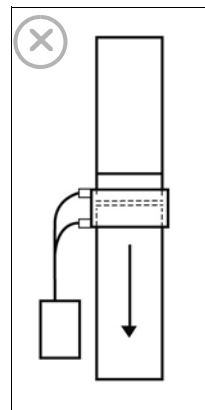
Misalignment will cause extra load on the fusion zone causing additional HDPE to melt resulting in the outpouring of HDPE or wire movement.

Prevent joint movement during welding



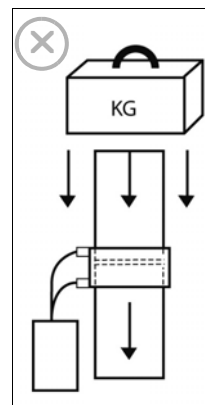
The movement of the pipe can cause melted HDPE to flow out of the joint. This can result in wire movement and probably a shortcut and thus a bad weld or fire hazard.

Prevent coupler from sliding down when center stop removed



The sliding down of the electrofusion coupler will cause movement of the wires and probably a shortcut and thus a bad weld or fire hazard.

Remove vertical loading during welding



An additional load on the vertical pipe will transfer extra HDPE material to the fusion zone. This will cause movement of the wires and probably a shortcut and thus a bad weld or fire hazard.

Installation guidelines

HDPE drainage

Welding electrofusion coupler and cooling down

After connecting the cables of the control box the fusion process can be commenced by pushing the start button. Both the CB315 and CB160 control boxes adapt the welding time to the ambient temperature. When it is colder than 20°C the welding time is extended and when the ambient temperature exceeds 20°C the welding time is shortened. Welding below an ambient temperature of -10°C is not recommended. For welding times and cooling down time see table 5.4.2. For extensive instructions see manual of CB315 and CB160. The joint assembly should not be disturbed during the fusion cycle and for the specified cooling time afterwards.

diameter d_1	system	welding time	cooling time
mm		sec	min
40-160	Constant current 5A	80	20
200-315	Constant power 220V	420	30

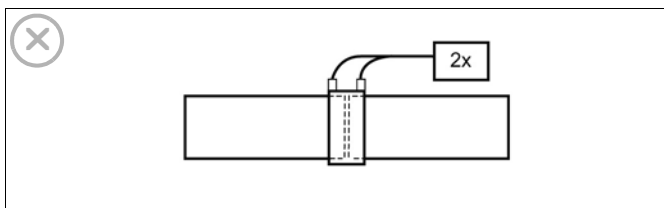
Table 5.4.2. welding parameters akafusion couplers

The cooling period can be reduced by 50% when the following conditions are met:

- No additional load or strain during cooling
- Full load after complete cooling time

Never weld coupler twice

During the fusion cycle the right amount of energy is put in to the fusion zones for making a good electrofusion joint. A second fusion cycle would put that much energy into the joint causing the HDPE to melt extensively. This will cause movement of the wires and probably a shortcut. In the extreme case it can even cause fire.



Assessing an electrofusion weld

It is harder to judge an electrofusion weld than a butt-weld. An indication of a good weld is the welding indicator (see illustration). The pop-outs on the fitting are however only an indication of a weld having been executed. They do not guarantee the integrity of the joint. The amount of movement of the pop-out depends on a number of factors including the size tolerances of the components and any ovality of the pipe/fitting. If all preparations have taken place successfully like marking the insertion depth, scraping etc. and the pipe assembly wasn't under any additional load during welding and cooling a joint can be marked OK when the welding indicators are protruded. If a significant quantity of melt exudes from the fitting after welding there may be a misalignment of the components, excessive tolerances or an accidental second welding of the fitting. The integrity of such joints is suspect.

Please note that the fitting will become too hot to be touched during the welding process. The temperature will continue to increase for some time after the fusion process has ended.

Deformation

A too big deformation can cause problems during assembly and welding of the components. The maximum allowed deformation is $0,02 \times d_1$. This results in a maximum difference between the largest and smallest diameter corresponding with table 5.2.5. The pipe needs to be "rounded" using clamps when the deformation is larger.

diameter d_1	$d_1 \text{ max} - d_1 \text{ min}$ (mm)
40	1,0
50	1,0
56	1,0
63	1,0
75	1,5
90	2,0
110	2,0
125	2,5
160	3,0
200	4,0
250	5,0
315	6,0

Table 5.2.5 Deformation pipe