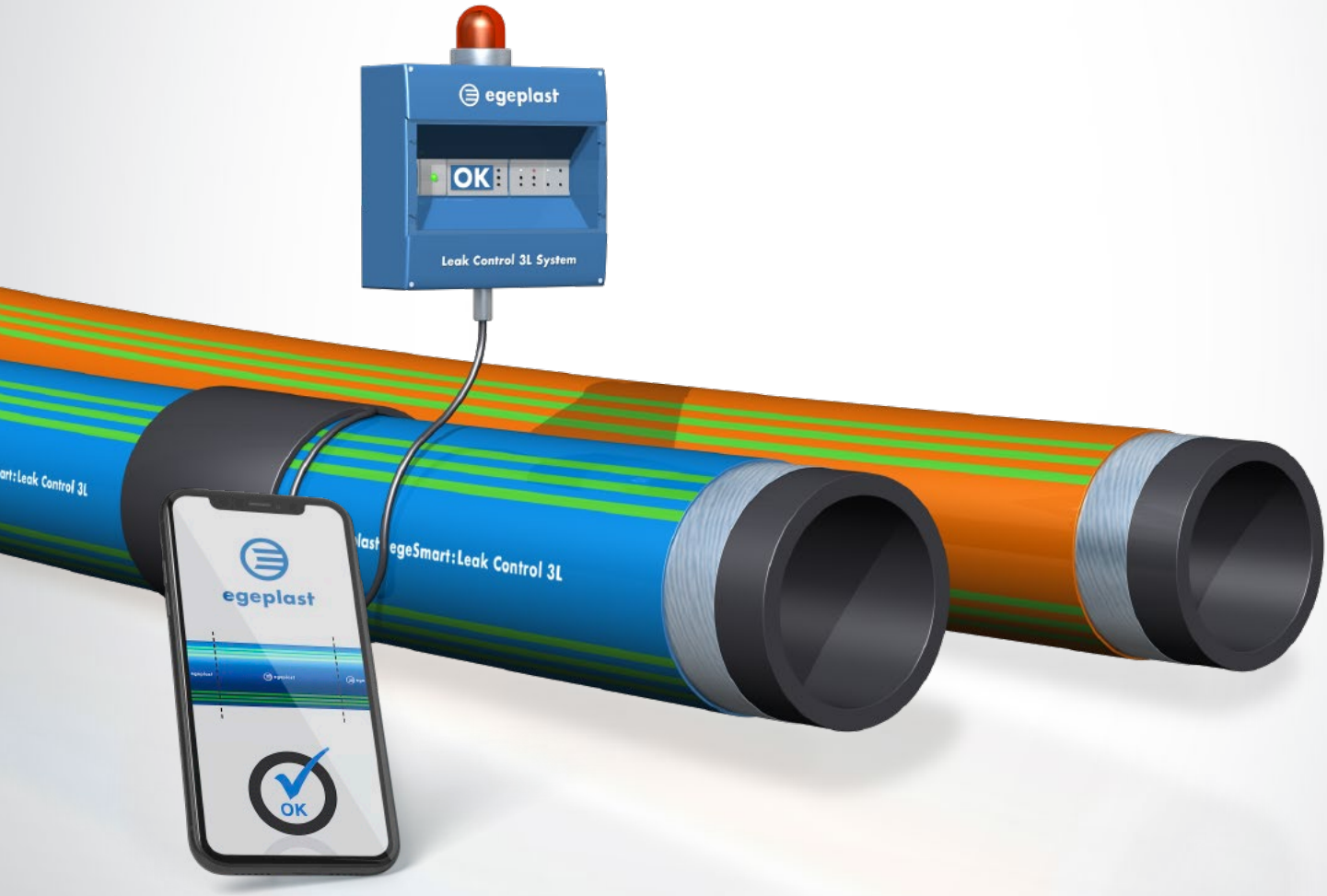
egeplast

egeSmart: Leak Control 3L

Processing Guidelines



egeplast

Foreword

Details given in this brochure reflect the state of the art. No claim is made with regard to their completeness, they are intended for instruction and guidance; no obligation may be derived from it. Mistake and subject to change reserved.

Our customer service will be pleased to answer any further questions regarding the installation or use of our products, or any other questions. In addition, our customer and applications engineering services are pleased to be at your disposal to provide any technical guidance that you may want.

Publisher:
egeplast international GmbH

Issue:
September 2026

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Content

1 Processing Guidelines egeSmart: Leak Control 3L 4

1.1 General Information 4

1.2 Permissible Bending Radii 6

1.3 Permissible Tensile Forces 7

1.4 Joining Techniques 8

1.4.1 Electrofusion Welding 8

1.4.2 Butt Welding 11

1.4.3 egeSmart: Leak Control 3L Report 14

1.4.4 System Components 15

1.4.5 Verification of the 3L System Requirements 15

1.4.6 Important Note on Locating Faults 16

1.5 Tables 17

1 Processing Guidelines

egeSmart : Leak Control 3L

Supplement to the installation instructions for PE pressure pipes A 135 and A 435
from the Kunststoffrohrverband e.V. in Bonn

1.1 General Information

The egeplast egeSmart : Leak Control 3L is deployed as an underground pipe to meet stringent safety requirements for the transport of fluid media. These could be water, industrial or sewage pipelines through water protection zones (DWA-A 142). It offers, in addition to impermeability, the possibility of permanent leakage monitoring as well as localisation of pipe damage.
Even the slightest damage to the pipe system is immediately indicated and can be located to an accurancy of within 1m.

The following conditions must be fulfilled to allow for pipe monitoring according to the egeplast egeSmart : Leak Control 3L principle:

- At least one factory-made egeplast egeSmart : Leak Control 3L connecting piece must be attached.
- There must be electrical continuity of the detection layer across all pipe joints and also throughout all installed fittings.
- Electrical insulation of the detection layer to the ground/soil must be ensured. The joints must be directly insulated after welding. The connecting joints must be dry and clean; any moisture must be removed. It is also essential to insulate the pipe ends.
- The egeplast egeSmart : Leak Control 3L must be installed such that an electrical return through the ground is guaranteed. egeplast must be consulted in case of any planned installation in a protective pipe.

Scope of application

The installation instructions apply to soil covered egeSmart : Leak Control 3L pipes with core pipes made of PE 100-RC for use as drinking and wastewater pressure pipelines as well as industry and gravity pipelines. The pipe joints and pipeline components must be rated for use with their respective operating pressures.

The serviceability of the system is guaranteed only when the joints are constructed in conformance with the egeplast installation guidelines.

Installation, open trench



egeplast egeSmart: Leak Control 3L pipes are suited for installation without a sand bed due to the highly stress crack resistant material PE 100-RC. The excavated soil is suitable for backfilling, as long as it can be compacted.

In order to assess the filling soil, the DIN 18196, inter alia, is relevant.

The pipe trench is to be constructed, among others, according to DIN 4124 (Excavation Pits and Trenches). The working area must be sufficiently measured so that professional installation of piping components and insulation of the pipe joints would be possible without impairment. Dry excavation pits throughout the entire installation process are a prerequisite.

Drinking water and sewage pressure pipelines are to be laid at a depth of 1.0 to 1.8 m (according to climate and ground conditions) safe from frost. Applicable to the construction of water pipelines is, furthermore, DVGW Worksheet W400-2.

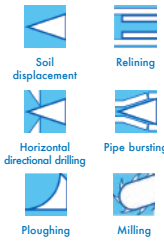
The construction of waste water pipelines which will be operated under pressure, is dealt with and described in DIN EN 1610, by which DIN EN 805 must also be considered, if necessary. The stipulations in DIN EN 805, that are relevant for the construction and inspection of pipelines, are included in DVGW Worksheet W 400-2.

Longitudinal force-locked joining procedures must be carried out according to the current standards of DVS.

Butt welding is recommended. Sand must be filled in the area of the joints; the fittings must also be covered and surrounded with sand. If a blacktop or paving is to be fabricated, work should be postponed until the lines have undergone their final inspection.

If there are joints insulated with shrinking sleeves lying in the region of necessary pipe bends, egeplast must be consulted in detail regarding the permissible bending radius.

Installation, trenchless method



Multilayer pipes, such as the egeplast egeSmart: Leak Control 3L is a practical solution in the case of trenchless installation and rehabilitation, as the outer surface of the pipe is securely protected against wear. The DVGW Worksheets GW 321 (horizontal directional drilling) and GW 323 (pipe bursting) recommend the application of such protective layer pipes.

- The DVGW rules define the maximum permissible tensile forces. Exceeding the permissible tensile forces will cause permanent damage to the new pipeline and shall be prevented by taking the appropriate measures. The tensile forces are to be measured and recorded.
- In the case of protective layer pipes, special pulling heads with an outer sleeve, that surrounds the protective layer, are recommended. Alternatively, the joint edge is to be constructively protected (refer to Figures 1-1 and 1-2).
- The axially force-locking connection must be established according to applicable rules of DVGW and DVS.

In the case of trenchless installation, however, only butt welding is permitted for this type of piping system.

- The trenchless installation of the egeplast egeSmart: Leak Control 3L system requires the use of special shrinking sleeves. The design of the required shrinking sleeves must be coordinated with egeplast.
- The minimum permissible bending radius must be observed. If there are welds insulated with shrinking sleeves lying in the region of any pipe bends required, egeplast must be consulted in detail regarding the bending radius.


Fig 1-1


Fig 1-2

1.2 Permissible Tensile Forces

The bending radius must not fall below any of the following bending radii. Pipe elbows or fittings are to be used in the case of smaller radii.

Pipe wall temperatures [°C]	Minimum permissible bending radius R_{min} [in mm]				
	SDR 33	SDR 26	SDR 17/17,6	SDR 11	SDR 7,4
0	150,0 x OD	112,5 x OD	75,0 x OD	75,0 x OD	75,0 x OD
10	100,0 x OD	75,0 x OD	52,5 x OD	52,5 x OD	52,5 x OD
20	60,0 x OD	45,0 x OD	30,0 x OD	30,0 x OD	30,0 x OD

Tab1-1: Following KRV Installation Instructions A 135/99-15 und A 435/96-10, DVGW Worksheet GW 320, GW 321, GW 324, GW 325 and DVGW Data Sheet GW 323

OD = Outer diameter core pipe [in mm]

$$R_{interpolated} = R_{20°C} + \left[\frac{R_{0°C} - R_{20°C}}{20°C}\right] \cdot (20°C - \vartheta_{pipe\ wall})$$

In the case of pipe wall temperatures between 0 °C und 20 °C, the respective permissible bending radius can be determined by linear interpolation.

with:

$R_{interpolated}$ = required bending radius [mm]
$R_{0°C}$ = Bending radius of the pipe at 0 °C [mm]
$R_{20°C}$ = Bending radius of the pipe at 20 °C [mm]
$\vartheta_{pipe\ wall}$ = Temperature of the pipe wall during installation [°C]

Temporary permissible bending radii for e.g. trenchless installation methods

Pipe wall temperatures [°C]	Temporary permissible, construction-related bending radii Rmin [in mm] for e.g. trenchless installation methods	
	SDR 17	SDR 11
0	56,0 x OD	37,0 x OD
20	22,0 x OD	15,0 x OD

Tab1-2: In conformity with DVGW Worksheet GW 320-1

OD = Outer diameter core pipe [in mm]

ⓘ In the case of a temporary, process-related reduction of the permissible bending radii, damage caused by buckling when bending or overexpanding must be constructively ruled out.

ⓘ The above-mentioned bending radii do not apply to pipes whose joints were post-factory coated with a mechanical protective coating, as e.g. two-component polyurethane coatings.

1.3 Permissible Tensile Forces

The values apply to pipes made of PE 100, PE 100-RC as well as for egeplast protective layer pipes such as the egeSmart: Leak Control 3L System (since only the medium-carrying pressure pipe will be burdened during pipe installation). They are to be measured and recorded. Exceeding the permissible tensile forces will lead to permanent damage to the pipeline, appropriate measures shall be taken to avoid this.

Special pulling heads are to be used. In order to prevent protruding edges and to ensure that the protective layer is no additional obstacle when installing, pulling heads with an outer sleeve which surrounds the protective outer layer are commonly used. As an alternative, the protruding edge is to be constructively protected.

Tensile force: Permissible tensile force in kN for pipes of PE 100 and PE 100-RC at 20 °C pipe wall temperature

Note: Values are to be reduced by 10% for pulling periods of > 30 min. and 25% for a pulling period of > 20 h.

Outer diameter	Permissible tensile force egeSmart: Leak Control 3L			
OD [mm]	SDR 17,6 [kN]	SDR 17 [kN]	SDR 11 [kN]	SDR 7,4 [kN]
25		1,31	1,64	2,36
32	1,71	1,80	2,65	3,81
40	2,72	2,83	4,22	5,96
50	4,29	4,43	6,56	9,34
63	6,71	7,06	10,42	14,69
75	9,55	9,96	14,56	20,93
90	13,60	14,34	21,06	30,01
110	20,51	21,43	31,40	45,00
125	26,28	27,33	40,66	57,94
140	33,16	34,32	50,76	72,83
160	43,12	44,89	66,66	94,97
180	54,38	56,88	84,25	120,04
200	67,51	70,29	103,90	148,50
225	85,29	89,03	131,64	187,81
250	105,14	109,30	162,01	231,74
280	131,85	137,29	203,06	290,67
315	166,99	173,98	257,20	367,97
355	211,37	221,22	326,38	466,77
400	268,93	280,03	414,55	593,08
450	339,90	354,89	525,39	750,23
500	420,55	438,59	648,06	925,83
560	525,86	549,18	812,24	
630	666,20	695,93	1028,79	

Tab 1-3: See also DVGW Worksheets GW 320, GW 321, GW 324, GW 325 and DVGW Code of practice GW 323



Fig 1-3



Fig 1-4

1.4 Joining Techniques

1.4.1 **Electrofusion Welding**

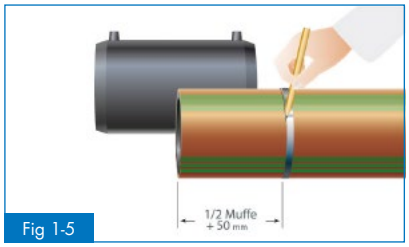
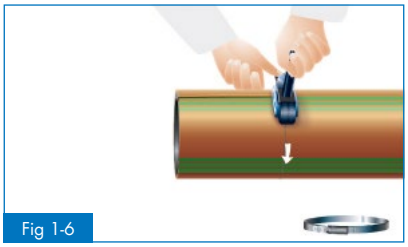


Fig 1-5

Marking the area from which the protective layer is to be peeled


Fig 1-6

Removal of the protective layer with the egeplast M10 / M10 maxi peeling tool

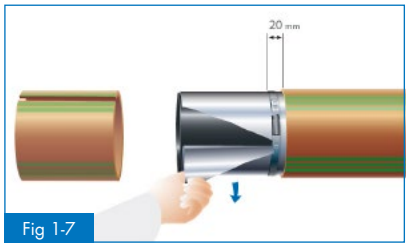
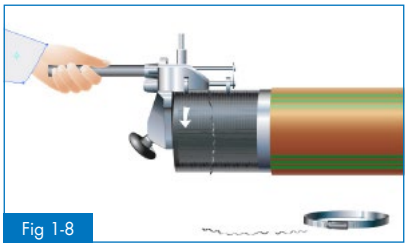
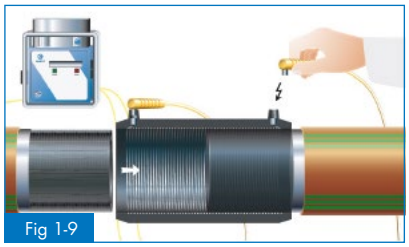


Fig 1-7

Removal of the aluminium layer by means of a hose clip


Fig 1-8

Removal of the oxide layer using a rotary scraper


Fig 1-9

Welding acc. to DVS 2207, Part 1

Removal of the outer layer at the jobsite (Fig 1-5 to 1-6)

If not already delivered with the outer layer being removed, the layer must be removed in the welding area without leaving any residue. For removal of the protective layer, we recommend the peeling tool M10 or M10 maxi.

The length of the pipe to be peeled corresponds to half the length of the fitting plus at least 50mm (see Tab 1-4 on page 17).

Welding of the pipeline (Fig 1-7 to 1-9)

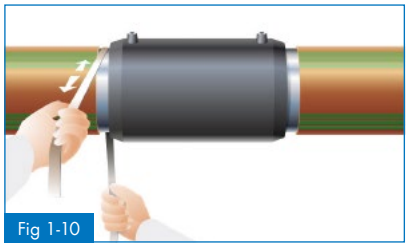
After removal of the protective layer, part of the aluminium layer has to be removed. A hose clip, or similar, can simplify the process. This is attached to the aluminium layer in such a way that approximately 20 mm of aluminium remains on the core pipe. The aluminium is carefully removed from the core pipe so that it tears at the hose clip (Fig 1-7).

It has to be ensured that the aluminium layer ends outside the span of the electrofusion coupler. The contact surfaces must be prepared from the base material prior to welding (Fig 1-8)!

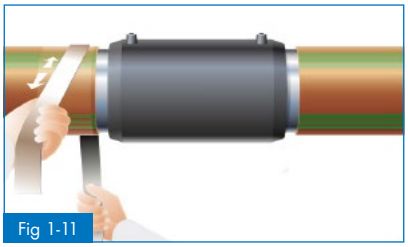
Standards for workmanship are laid out in DVS 2207, Part 1. The processing instructions given by the respective manufacturers are to be followed.

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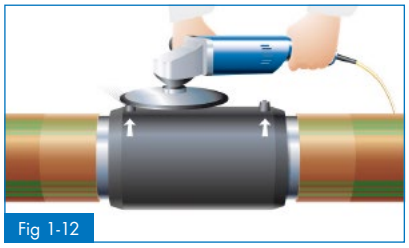
Continuation electrofusion welding


Fig 1-10

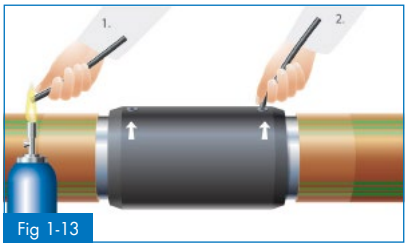
Roughen the aluminium layer


Fig 1-11

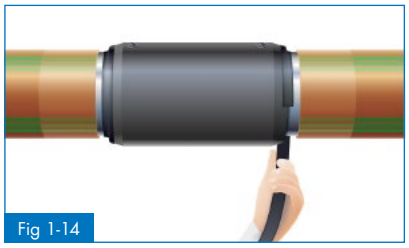
Roughen the protective layer in the area of the shrinking sleeves


Fig 1-12

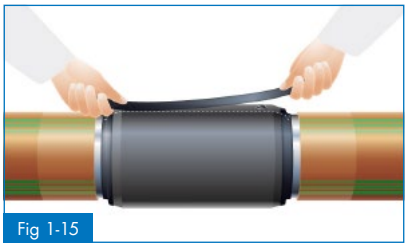
Removal of the contact plugs


Fig 1-13

Insulating the contact plugs


Fig 1-14

Sealing of the ring gap between pipe and the electrofusion fitting


Fig 1-15

Sealing the contact plugs

Preparation of the post-insulation (Fig 1-10 to 1-12)

After welding, the remaining aluminium foil between the electrofusion coupler and the protective layer is to be roughened using sandpaper (P100) until the slightly bluish colour of the aluminium surface turns uniformly silver (Fig 1-10). Roughening off the bluish colour is essential for a functioning leak monitoring. The surface must be cleaned with PE cleaner after roughening.
Then roughen the protective layer with sandpaper (P60) in the area where the shrinking sleeve is to be positioned, to improve adhesion of the shrinking sleeve (Fig 1-11).

In the next step, the contact plugs of the fitting are removed (Fig 1-12)

Post-insulation and restoring the electrical connection (Fig 1-13 to 1-18)

Once the contact plugs have been removed, the area of the removed contact plugs must be insulated (Fig 1-13). This is done by heating a hot melt stick (LCRP stick) and pressing it onto the area to be insulated. Ensure that the entire surface of the area is completely insulated.

The next step is to seal the ring gap between the pipe and the electrofusion coupler with egeplast (LCMD50) filling adhesive over the entire surface (Fig 1-14). The contact plugs, which are already insulated by the hot melt adhesive, must then be additionally sealed with egeplast (LCMD50) filling adhesive. For this purpose, a strip of filling adhesive is glued across the electrofusion coupler (Fig 1-15).

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Fig 1-16

Applying of two aluminium adhesive tapes

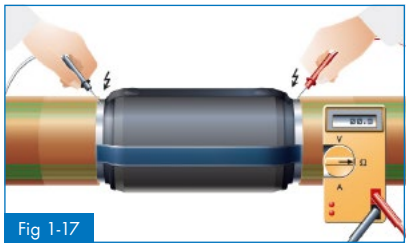


Fig 1-17

Measuring and recording the electrical resistance

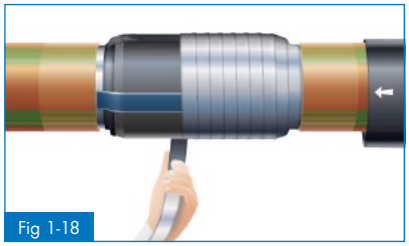


Fig 1-18

Wrapping of the fitting with aluminium adhesive tape



Fig 1-19

Attaching the heat shield and applying the heat shrink product

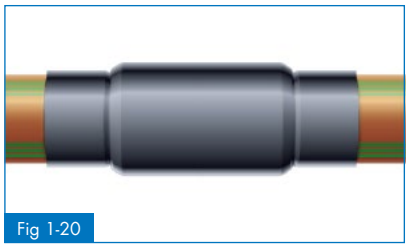


Fig 1-20

Welded joint, protected by the heat shrink product

Continuation electrofusion welding

To restore the electrical connection at the welded joints, a high-conductivity aluminium adhesive tape (19mm wide) is used. On the exposed, roughened aluminium surfaces, cleaned of emery dust, two strips of high-conductivity aluminium adhesive tape are applied onto the fitting lengthwise (Fig 1-16). The adhesive tapes are to be applied at a distance of 180° based on the circumference. The contact surfaces of the adhesive tape must be pressed firmly on the aluminium surface.

The electrical resistance is then measured using an ohmmeter (Fig 1-17). The measurement is made between each of the roughened aluminium surfaces just in front of the outer layer (on the area of aluminium belonging to the pipe). The measured resistance value is not permitted to be more than 0,5 Ohms. If this value is exceeded, the joint must be reapplied.

The measured value is to be recorded for every joint (see section 1.4.3). These records are to be produced for egeplast, or for companies authorised by egeplast, when the egeplast egeSmart: Leak Control 3L pipeline is verified.

To create the detection layer and permeation barrier at the pipe joint, an aluminium adhesive tape (50 mm wide) is wrapped around the joint with a minimum overlap of 50%, starting at a minimum distance of 0.5 cm from the protective layer. At the other end of the wrapping there must also be a minimum distance of 0.5 cm from the protective layer (Fig 1-18). The aluminium adhesive tape used for wrapping must be supplied by egeplast. The fitting should be wrapped in one piece. The foil must adhere firmly to the pipe, avoiding bubbles or air pockets. If necessary, use a pressure roller (e.g. silicone roller) during and after wrapping.

Restoring the mechanical protection (Fig 1-19 to Fig 1-20)

The aluminium layer is then wrapped using shrinking products (LCM Complete Kit) to electrically isolate it from its surroundings.

The shrinking sleeve or mat should be positioned centrally over the electrofusion coupler. It is not permitted to shorten the shrinking products.

Prior to the shrinking process, the protective layer at the border area of the shrink product must be protected with suitable heat protection (Fig 1.19).

The application of a shrinking sleeve or a heat shrink mat should always be applied from the centre outwards using a gentle gas flame. Air pockets should be avoided as far as possible.

Backfilling

Backfilling with sand is required in the area of the welded joint and the fittings. As an additional protection against external damage, the area can be safeguarded with a pipe half shell laid over the position of the joint.

If a black top or paving has to be fabricated, that work should be postponed until final inspection of the pipeline.

1.4.2 **Butt Welding**

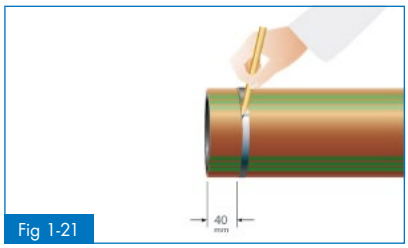


Fig 1-21

Marking the area from which the layer is to be peeled

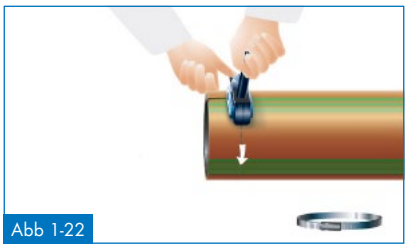


Abb 1-22

Removal of the protective layer with the egeplast M10 / M10 maxi peeling tool

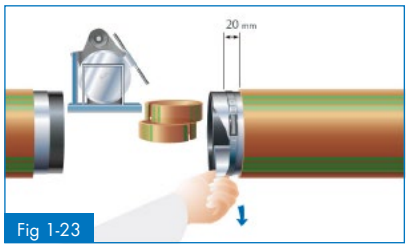


Fig 1-23

Removal of the aluminium layer with the help of a hose clip

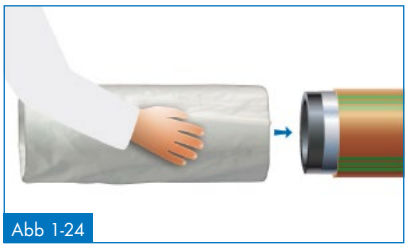


Abb 1-24

Mount shrinking sleeve prior to welding the pipe, do not remove the protective foil

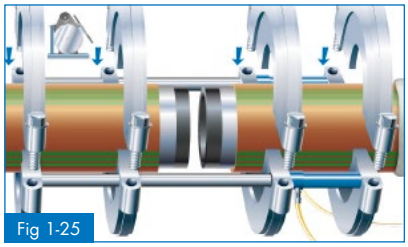


Fig 1-25

Mount the special clamping jaws (see Table 1-5)

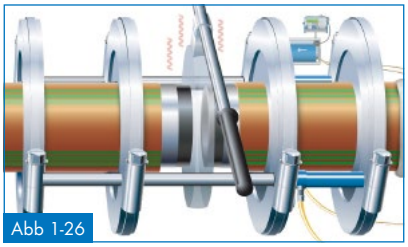


Abb 1-26

Welding according to DVS 2207, Part 1

Removal of the outer layer at the jobsite (Fig 1-21 to Fig 1-22)

If not already delivered with the outer layer being removed, the layer must be removed in the welding area without leaving any residue. For removal of the protective layer, we recommend the peeling tool M10 or M10 maxi.
The length of outer layer to be peeled is at least 40mm (see Tab 1-4 on page 17).

Welding of the pipeline (Fig1-23 to Fig 1-26)

After removal of the protective layer has taken place, the aluminium layer is partially removed. A hose clip or similar simplifies the procedure. This is fixed onto the remaining aluminium layer so that at least 20 mm of aluminium remains in place (Fig 1-23). Starting from the pipe opening, the aluminium is peeled carefully away from the core pipe so that it tears off at the hose clip.

For mechanical protection of the joint, egeplast recommends the use of egeplast egeFit® shrinking sleeves. The sleeve is packed in a plastic foil for delivery. This foil protects it from humidity and contamination. The sleeve must be pushed onto the pipe to be welded while it is still in its packed condition, prior to establishing the pipe connection. (Fig 1-24)

The use of special clamping jaws is required to make sure that the pipe ends are properly clamped in the butt welding machine and to prevent damage to the protective layer (Fig 1-25). These are adjusted exactly for the thickness of the protective layer, which varies according to the core pipe diameter, and are available from egeplast.

Further processing takes place as specified in DVS 2207, Part 1, until the formation of a uniformly circular weld bead (Fig 1-26).

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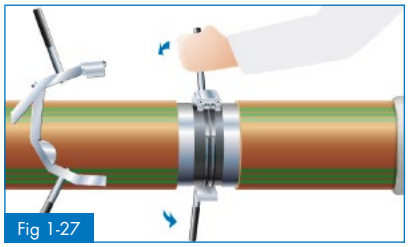


Fig 1-27

Removal of the weld bead with an outer debeader

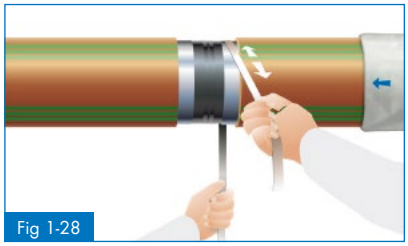


Fig 1-28

Roughen the aluminium layer

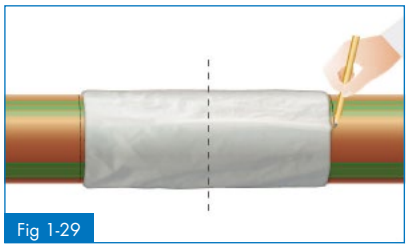


Fig 1-29

Positioning of the shrinking sleeve

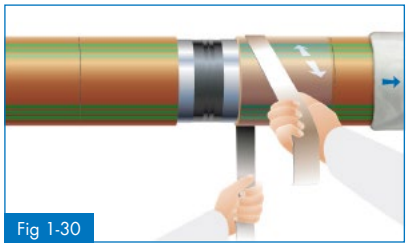


Fig 1-30

Roughen the protective layer in the area of the shrinking sleeves

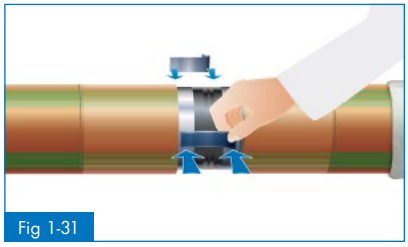


Fig 1-31

Applying both aluminium adhesive tapes

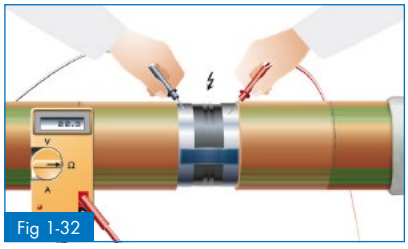


Fig 1-32

Measuring and recording the electrical resistance

Continuation butt welding

Post-insulation and restoring the electrical connection (Fig 1-27 to 1-34)

After welding is finished and the welding zone has cooled down, the weld bead is to be removed using an outer debeader (Fig 1-27).

The remaining aluminium foil is to be roughened using sandpaper (PE 100) until the light bluish colouration of the aluminium surface becomes a continuous silvery colour (Fig1-28). Roughening off the bluish colour is essential for a functioning leak monitoring. The surface must be cleaned with PE cleaner after roughening.

Then roughen the protective layer with sandpaper (P60) in the area where the shrinking sleeve is to be positioned, to improve adhesion of the shrinking sleeve. To do this, position the shrinking sleeve centrally over the weld and mark the shrink area. Then, push the sleeve back and roughen the marked area (Fig 1-30).

In order to restore the electrical connection at the welded joints, a high-conductivity aluminium adhesive tape (19mm wide) is used. On the exposed, roughened aluminium surfaces, cleaned of emery dust, two strips of the high-conductivity aluminium adhesive tape are applied onto the joint lengthwise (Fig 1-32). The adhesive tapes are to be applied at a distance of 180° based on the circumference. The contact surfaces of the adhesive tape must be pressed firmly on the aluminium surface.

The electrical resistance is then measured using an ohmmeter (Fig 1-32). The measurement is made between each of the roughened aluminium surfaces just in front of the outer layer (on the area of aluminium belonging to the pipe). The measured resistance value is not permitted to be more than 0,5 Ohms. If this value is exceeded, the joint must be reapplied.

The measured value is to be recorded for every joint (see section 1.4.3). The records are to be produced for the egeplast company, when the egeplast egeSmart: Leak Control 3L pipeline is verified.

To create the detection layer and permeation barrier at the pipe joint, an aluminium adhesive tape (50 mm wide) is wrapped around the joint with a minimum overlap of 50%, starting at a minimum distance of 0.5 cm from the protective layer. At the other end of the wrapping there must also be a minimum distance of 0.5 cm from the protective layer (Fig 1-33). The aluminium adhesive tape used for wrapping must be supplied by egeplast.

The welding area should be wrapped in one piece. The foil must adhere firmly to the pipe, avoiding bubbles or air pockets. If necessary, use a pressure roller (e.g. silicone roller) during and after wrapping.

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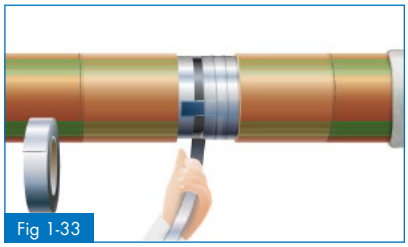


Fig 1-33

Wrapping the weld area with aluminium adhesive tape

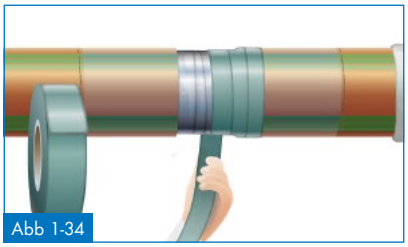


Abb 1-34

Water-tight insulation of the electrical joints, with a minimum overlap of 2 cm

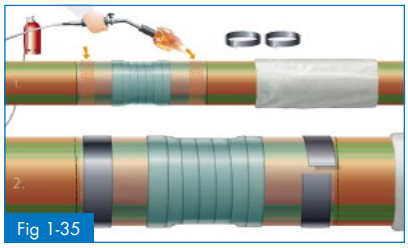


Fig 1-35

Preheating the pipe surface and applying the hot-melt adhesive

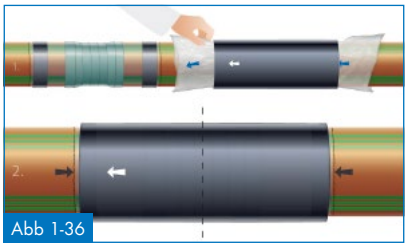


Abb 1-36

Alignment of the shrinking sleeve and removal of the protective foil



Fig 1-37

Attaching the heat shield and applying the heat shrink product

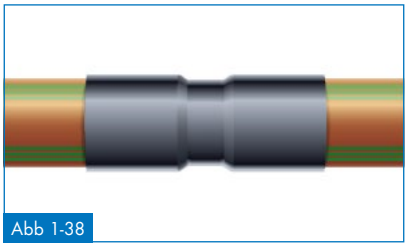


Abb 1-38

Welded joint protected by the heat shrink product

Continuation butt welding

The next step is to insulate the pipe joint with egeplast wrapping green (Fig 1-34). The joint must be completely wrapped with a minimum overlap of 2 cm. It is important to ensure that the beginning and end of the wrapping are at least 5 cm on the protective layer.

Restoring the mechanical protection (Fig 1-35 to 1-38)

For the restoration of mechanical protection, egefit® shrinking sleeves are used.
To do this, dry and clean the shrink area. Preheat the pipe surface and apply the provided hot-melt adhesive on both sides approximately 5 cm from the end of the shrinking sleeve (Fig 1-35).

Next, remove the protective foil of the sleeve in a single direction. Align the shrinking sleeve centrally and position it over the weld seam.

Before the shrinking process, protect the protective layer at the edge of the shrinking sleeve using suitable heat protection mats.

Shrink the sleeve using a soft, yellow gas flame. Always work from the center outward, keeping the propane burner constantly moving around (Fig 1-37). When the shrinking sleeve fits closely and is cooled down to ambient temperature, the installation is complete.

Connection of the measuring cable using the egeSmart: Leak Control 3L connecting piece

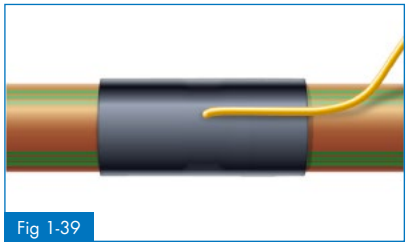


Fig 1-39

egeplast egeSmart: Leak Control 3L connecting piece

The egeplast egeSmart: Leak Control 3L connecting piece provides the electrical connection from the monitoring unit to the aluminium detection layer of the egeSmart: Leak Control 3L pipe to be monitored. The connecting piece is supplied as a fully assembled egeplast egeSmart: Leak Control 3L pipe section. Dimensioning of the egeSmart: Leak Control 3L connecting piece in carried out as for the pipeline to be monitored. The connecting piece is to be integrated close to where the egeSmart: Leak Control 3L monitoring unit is to be installed.

1.4.3 egeplast egeSmart: Leak Control 3L Report

To be filled out for each joint. To be shown on the concluding verification of the 3L system requirements.

Project: _____

_____

Constructing company: _____

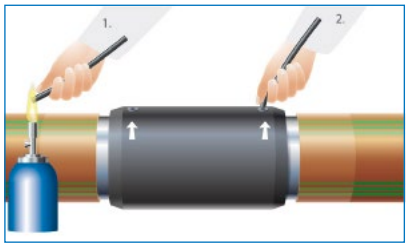
_____

Control parameters

Serial number for egeSmart: Leak Control 3L report: _____

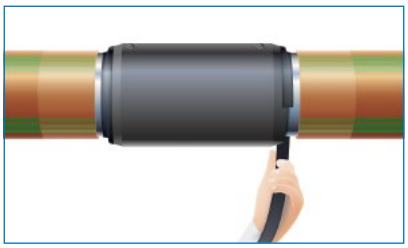
Identifi cation of the egeSmart: Leak Control 3L joint: _____

Joining technique: ○ Electrofusion welding ○ Butt welding



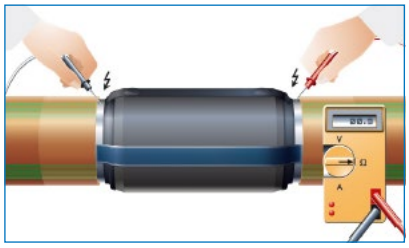
① Insulation of the contact plugs with Raychem melt sticks

Performed: ○ Yes ○ No



② Sealing of the ring gap between the electrofusion coupler and the pipe with Raychem filling adhesive

Performed: ○ Yes ○ No



In the case of measured values of the contact resistance > 0,5 Ω the electrical connection must be tested. If necessary, the electrical connection must be renewed!

③ Measurements after manufacturing the electrical connection

Contact resistance from the already installed to the new pipe section: _____Ω

Authentication

Executor: _____

Date: _____

Signature: _____

1.4.4 System Components

Fittings

In the case of fittings, e.g. pipe branches and bends in the egeSmart: Leak Control 3L main lines, only egeSmart: Leak Control 3L fittings of egeplast must be used. The fittings are to be laid in a sandbed. Welding of the pipes with the fittings and insulation has to take place in line with the processing directives for butt welding and/or electrofusion welding.

Manholes

- egeplast egeSmart: Leak Control 3L manholes

The egeplast egeSmart: Leak Control 3L manholes are made from polyethylene. Their wall construction matches that of the egeSmart: Leak Control 3L pipe. The manholes are fabricated according to the customers specifications. Welding and insulation of the egeSmart: Leak Control 3L pipes with the egeSmart: Leak Control 3L manhole is carried out as per the installation guidelines for butt welding or electrofusion welding, as the case may be.

- Other manhole systems

For these manhole structures (made of concrete, PE, PP, PVC or GRP), special egeSmart: Leak Control 3L connection pieces for manhole structures are to be attached at the entrances and exits of the manholes. The connection pieces are factory-assembled after consultation. The pipe is to be sealed using standard techniques (e.g. wall collar, Link-Seal modular seals, or equivalent) in the area of the manhole entrances and exits. At the connection pieces, joints on the inside of the manhole to other fittings, components, cleaning ports, etc. are to be made using flanged or welded joints. The manhole diameter should be chosen such that the installations described above can be carried out inside the manhole.

Important note:
Flanges and other metallic components installed in soil are excluded from monitoring.

1.4.5 Verification of the 3L System Requirements

Continuity and isolation

Verification of both the continuity of the aluminium layer and the isolation of the aluminium from the ground is performed after installation of the egeplast egeSmart: Leak Control 3L pipe.
The verification is performed by egeplast or an authorized service provider; The installation of the monitoring unit for the egeSmart: Leak Control 3L pipe is done, after successful verification, by the client or the constructing company.

The verification of the contiunity of the aluminium layer requires that it is accessible from the pipe ends. Access to the aluminium layer can be achieved using the 3L connection pieces.This procedure allows the pipe trench to be filled in before verification is carried out. Furthermore, the continuity can also be checked at any time while the pipe is in service. An alternative approach is to isolate the pipe ends only after verification of continuity. The trench must then be kept open at these positions on the pipe. In the places where the aluminium layer is exposed, the pipe may not have any contact with the ground or with any groundwater that may be present.

The isolation against soil should be checked at the earliest 1 week after the pipe trench has been backfilled. This ensures sufficient soil moisture. The drier the bedding material is during installation, the longer the waiting time before checking the insulation should be.

1.4.6 Important Note on Locating Faults

A significant advantage of the egeSmart : Leak Control 3L system is its ability to precisely locate potential leaks. This enables quick repairs and the rapid resumption of the egeSmart : Leak Control 3L system's operation.

The sheath fault location method is used for fault detection. This method generates a voltage funnel at the fault location, which can then be pinpointed.

Grounding systems must be installed at structures such as shafts and at the starting and ending points of the egeSmart : Leak Control 3L system, as per requirements. These grounding systems can complicate fault detection. Therefore, it is recommended to set up the grounding systems as follows:

1. Deep Earth Electrode: These have the least impact on fault detection.

2. Radiating Earth Electrode: These should not be laid directly along the pipeline route but should have a lateral minimum distance of 2 meters or follow a separate route.

3. Potential Equalization Conductors: If different structures and their grounding systems need to be connected, this should be done using an insulated connection cable.

4. Non-insulated Connection Cables: If insulated connection cables are not possible or desired, a bare, earth-contacting conductor should be laid with a lateral minimum distance of 2 meters outside the pipeline route.

   Note: This can complicate fault detection as it may cause a potential shift of the voltage funnel.

1.5 Tables

Layer backcut recommended (Minimum values)

Before electrofusion welding or butt welding of egeplast egeSmart:Leak Control 3L pipes can take place, the protective layer must be removed with egeplast peeling tools. *Peeling of the pipe ends can be carried out by egeplast on request. For this we need an indication of the welding procedure to be used.*

Layer Backcut for the egeplast egeSmart:Leak Control 3L		
Medium-Bearing Pipe DIN 8074 OD [mm]	Butt welding [mm]	Electrofusion welding* [mm]
25	40	90
32	40	95
40	40	100
50	40	105
63	40	115
75	40	120
90	40	130
110	40	140
125	40	145
140	50	150
160	50	155
180	50	160
200	50	165
225	50	175
250	50	185
280	60	190
315	60	200
355	60	205
400	60	215
450	60	225
500	70	235
560	70	240
630	70	255

Tab 1-4 * Dimensions specified for the product ranges of the Georg Fischer, Friatec, and Plasson companies, Long sleeve fittings are not considered

Overview of outer and core pipe diameter of egeplast egeSmart: Leak Control 3L pipes / butt welding machines / clamps

Special clamps which are adapted to the outer diameter of the egeSmart: Leak Control 3L pipe are required using butt fusion welding so that the ends of pipes can be securely positioned. Appropriate clamps and adapters for WIDOS welding machines that may be required for particular tasks can be obtained from egeplast.

The following list contains the outer diameter of the pipes as well as the types of WIDOS machines that may be used, depending on the pipe dimensions.

Medium-Bearing Pipe DIN 8074 OD [mm]	Outer diameter egeSmart: Leak Control 3L [mm]	WIDOS Welding Machines - Area of Application				
		WIDOS 4600	WIDOS 4800	WIDOS 4900	WIDOS 5100	WIDOS 6100
25	27,4					
32	34,9					
40	43,5					
50	54,5					
63	67,5	●	●*	●*		
75	80,1	●	●*	●*		
90	95,6	●	●*	●*		
110	116,4	●	●*	●*		
125	132,0	●	●*	●*		
140	147,3	●	●*	●*		
160	168,4	●	●*	●*		
180	189,0	●	●*	●*		
200	209,0	●	●*	●*		
225	234,1	●	●*	●*		
250	259,1		●	●	●*	
280	289,2				●*	
315	325,0				●*	
355	366,0				●	
400	411,0				●	
450	461,1					●
500	511,3					●
560	571,5					●
630	642,4					
710	720,0					
800	810,0					
900	910,0					
1000	1010,0					
Manufacturing tolerances possible		* Appropriate adapter required				

Tab 1-5

Notices

egeplast

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