

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control

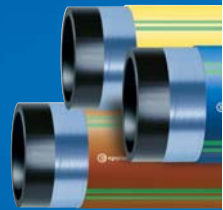


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8 Safeguarding the Environment via continuous Leak Monitoring

8.1 Procedure Description

Maximum safety through continuous leak monitoring

Sewage as well as other critical media are usually transported underground. The state of a pipeline buried under the ground, unlike that of a pipeline installed above ground, cannot be assessed visually. Assessments such as these are becoming ever more important; indeed, they are frequently prescribed by regulations. In addition to straight status monitoring, some facility is also often required for monitoring the pipeline continuously for leakage as well as for localising the damaged spot or leak in the event of damage.

These requirements are met by the egeplast 3L Leak Control. The continuous leakage monitoring affords security; the location of any damage which may occur to an accuracy of within a metre saves time and money.

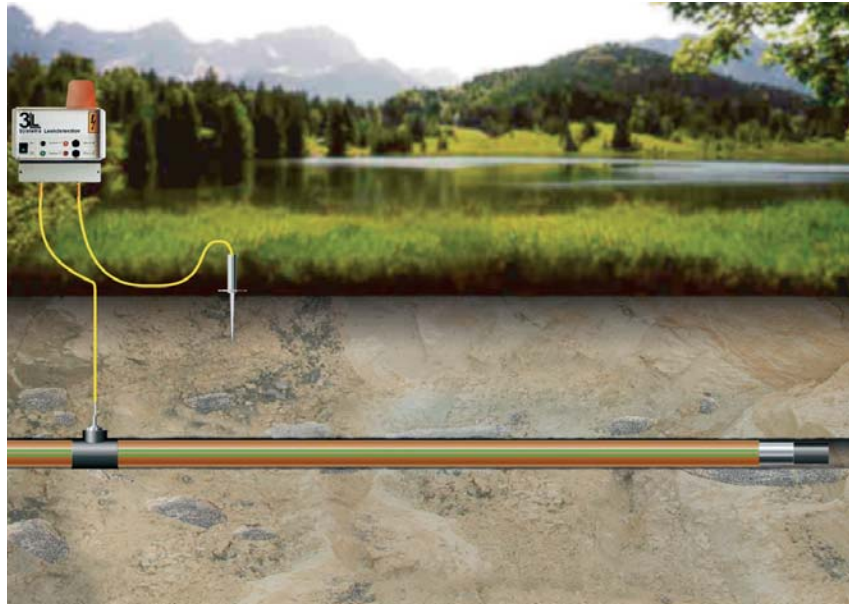


Fig 8-1: Gas and water pipelines, as well as sensitive sewage or industrial pipelines, can be monitored temporarily, or even continuously, for damage while in service.



Fig 8-2

Operating principle of monitoring

The aluminium layer integrated in the pipe string to be monitored is attached, via a connector fitting, to a monitoring unit. It is now possible to apply a measurement voltage to the aluminium layer, either temporarily at intervals, or permanently. In the event of damage to the pipe, the aluminium layer comes into contact with the surrounding soil. This causes an impulse to be triggered at the monitoring unit. Notification of the damage can now be given by an acoustic or optical signal.

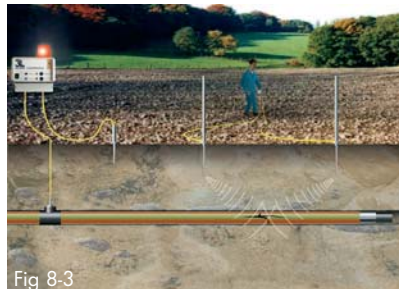


Fig 8-3

Operating principle of leak location for non-sealed surfaces

The location of damage under non-sealed surfaces is carried out using ground spikes. The ground spikes are positioned within the surface of the terrain above the pipe; by measuring the resistance potentials, this allows the position of the leak to be pinpointed to within half a metre.

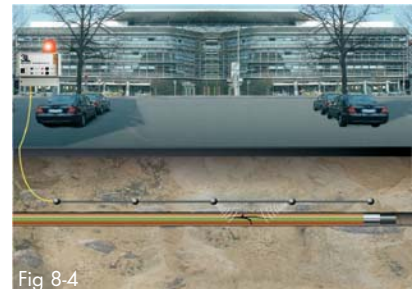


Fig 8-4

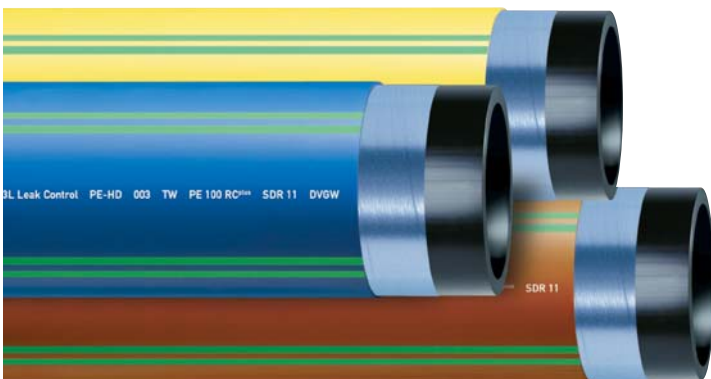
Continuous leak location using a locating cable

If the surface is sealed after installation of the egeplast 3L Leak Control pipe, pinpointing using ground spikes is no longer possible. In cases such as these, a locating cable with measuring probes is laid parallel to the pipeline. This enables the location of any damage to be indicated to within 10 cm as soon as it occurs. The effort involved in breaking through the surface is thus minimised.

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8.2 Product Description

egeplast 3L Leak Control



Drinking Water Pipes · Gas Pipes · Sewage Pressure Pipes · Industrial Pipes

The basis for the egeplast 3L Leak Control pipeline system is the triple-layer construction of the pipe. The inner, medium-bearing pipe made of PE 100 RC^{plus} (Resistance to Cracking) is enveloped with a conductive and diffusion-proof aluminium layer. The aluminium layer is protected by an outer coating made of reinforced polypropylene. This clever combination allows the egeplast 3L Leak Control System to offer permanent leakage monitoring and localisation of pipe damage or leaks to an accuracy of within 10 cm.

The pipe system can be used for both pressure pipelines and gravity pipelines alike. The egeplast 3L Leak Control System is applicable for any circumstance in which security is of prime importance! Drinking water and sewage pipelines (for example, through water protection zones), and also industrial pipelines which carry sensitive or critical media, can be monitored using this system with no problem.

egeplast 3L Leak Control pipes are manufactured using PE 100 RC^{plus} materials which are highly resistant to stress-induced cracking, in line with the requirements for the medium-bearing pipe specified by DIN 8074 and 8075.

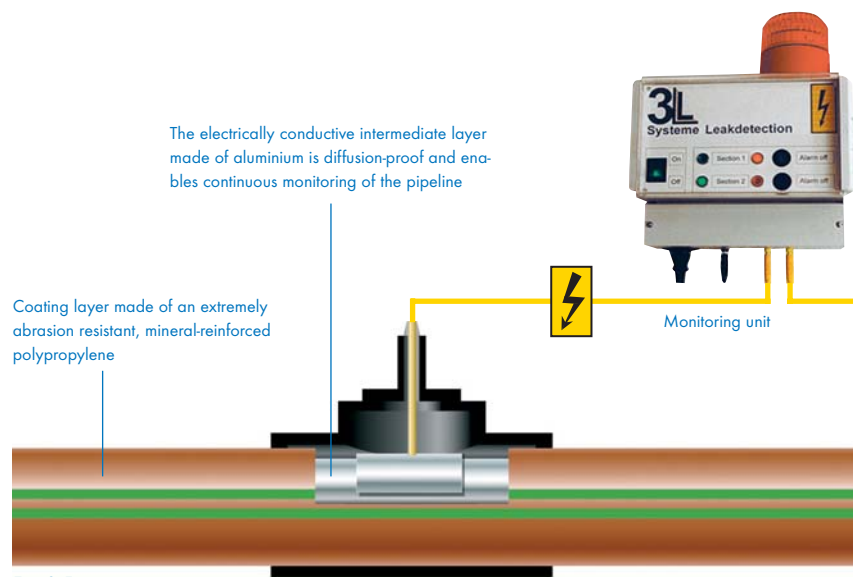
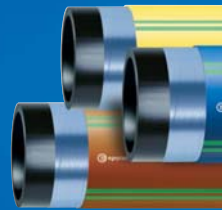


Fig 8-5

8 Safeguarding the Environment via continuous Leak Monitoring



8.3 PE 100 RC^{plus} Quality Assurance

Modern installation procedures make special demands of pipe material. The materials used must satisfy additional requirements, over and above the material properties monitored according to the applicable standards and DVGW Worksheet GW 335 Part A2. The resistance of the pipe material to slow crack growth is critical

for the lifespan of the pipe under extreme operating conditions, if the pipe is to achieve the standard service life of 100 years in spite of the increased demands. In particular, resistance to stress-induced cracking can be improved enormously through optimised polymerisation. The qualities of today's PE 100 RC^{plus} allow it to almost

reach the resistance to stress-induced cracking of cross-linked polyethylene PEX, which has been used for years in harsh conditions.

The notch test and the FNCT test provide information about the stress-induced cracking behaviour (slow crack growth) of a pipe material.

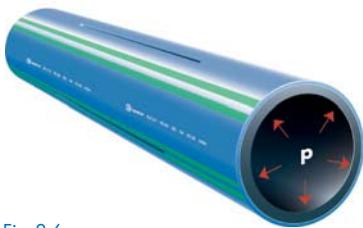


Fig 8-6:
Notch test (ISO 13479)

In the notch test according to ISO 13479, a section of pipe is notched as specified, and afterwards tested to destruction at a test temperature of 80°C and test pressure of 9.2 bar (SDR 11, PE 100).



Fig 8-7:
Full notch creep test FNCT (ISO 16770)

ISO 16770 describes a further development of the notch test. In the FNCT, small test bars of the material to be tested are incised with a sharp edge and, at 80°C (+2% Arkopal N 100), subjected to a constant tensile load of 4 N/mm² until they fail. The test simulates localised stress concentrations.

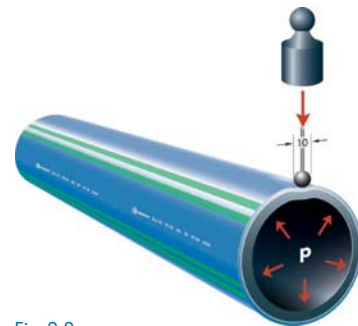


Fig 8-8:
Point load test using the Dr. Hessel method

An additional check is the point load test using the Dr. Hessel method. This test reproduces very well the effect of a stone pressing against the pipe. A pipe, which has been internally pressurised, is also dented inwards using a round punch as a point load (penetration depth: 8.2% of the external diameter) in order to simulate the stress caused by a stone. The test is carried out at a temperature of 80°C (+2% Arkopal N 100).



So as to be able to make estimates of the service life of pipes under additional point loading, Dr. Hessel Ingenieurtechnik compared tests of pipes under internal pressure, and with additional point loading, to the results from the FNCT test (3R international 4/2001 and

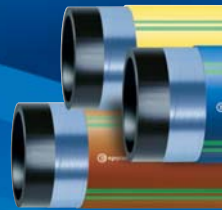
6/2001). With this comparison, the stresses to which a pipe installed without a sand bed is exposed during its operating life may be related to the results of FNCT testing, and thus the FNCT test may be adopted for regular quality monitoring.

Performed within the framework of the full quality testing cycle are: monitoring of the material properties of all PE 100 RC^{plus} raw material charges by

FNCT tests, and monitoring of the material properties after processing of the raw material. The latter is carried out on the produced pipe by a testing laboratory which is accredited to perform such analyses. The PE 100 RC^{plus} materials perform distinctly better than the standard PE 100 types in both the notch and FNCT tests, with values that lie well above those stipulated for pipes with protective properties.

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egeplast 3L Leak Control



	Internal Pressure Creep Test	S4 Test (Fast Crack Growth) 110x10 mm	Notch Test	FNCT	Point Load Test, Dr. Hessel Method
PE as per GW 335 Part A2	$\sigma = 12,4\text{N/mm}^2$; 20°C ≥ 100 h as per DIN 8075	pc ≥ 8 bar	80°C; 9.2bar ≥ 500 h	250 - 800 h ¹⁾	1000 - 3000 h ¹⁾
PE 100 + ²⁾	$\sigma = 12,4\text{N/mm}^2$; 20°C ≥ 200 h	pc ≥ 10 bar	80°C; 9.2bar ≥ 500 h	250 - 800 h ¹⁾ >300 h ³⁾	1000 - 3000 h ¹⁾
PE 100 RC ^{plus}	$\sigma = 12,4\text{N/mm}^2$; 20°C ≥ 200 h	pc ≥ 10 bar	80°C; 9.2bar ≥ 5000 h	≥ 8760 h	≥ 8760 h

Tab 8-1 1) Values from 3R-international 4/2001 and 6/2001

2) The PE 100+ Association is an amalgamation of polyethylene manufacturers who voluntarily exceed the standard requirements

3) Data from a few manufacturers

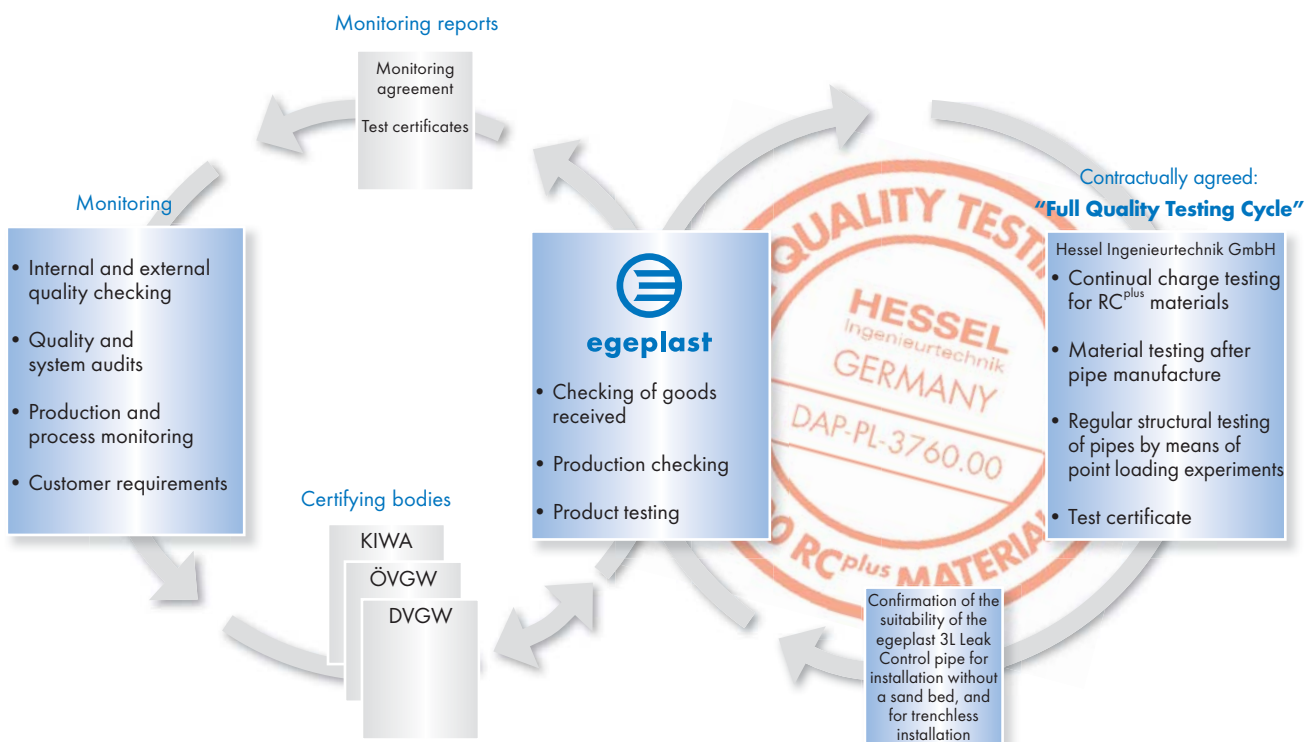
The quality of the material utilised can be documented on request with a 3.1 B certificate.

egeplast uses only selected PE 100 materials (PE 100 RC^{plus}) for the egeplast 3L Leak Control pipe. These materials must demonstrate a time to failure of at least 8760 h in the FNCT. As an additional

control, the quality of PE 100 RC^{plus} is monitored within the framework of the full quality testing cycle. The quality of these materials is such that their suitability for a 100 year service life for a pipe under point loading may be confirmed by structural testing. egeplast 3L Leak Control pipes are subjected regularly to such structural testing: an inter-

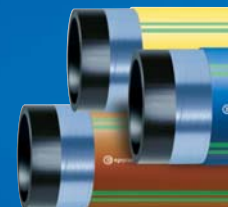
nal pressure creep test lasting for one year, with additional point loading, at 80 C (+2% Arkopal N 100). The PE 100 RC^{plus} materials perform distinctly better than the standard PE 100 types in both the notch and FNCT tests, with values that lie well above those stipulated for pipes with protective properties.

Continuous quality monitoring



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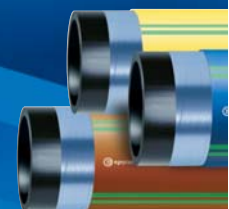


Testing of the Material PE 100 RC ^{plus}			
Property	Requirement	Test Procedure	Frequency
Melt index	as per specifications	EN ISO 1133:1999 Condition T 5 kg, 190°C 10 minutes	Min. 1 x per week as well as on every change of material and on every dimension check
Loss on drying	≤ 0.1%	Infrared method	per charge
Homogeneity	≤ grade 3	ISO 18553	per charge
Density	≥ 930 kg/m ³	DIN EN ISO 1183-2, DIN EN ISO 1872-1	per charge
Colour	as per DVGW GW 335 Part A2		regularly
Resistance to weathering	as per DVGW GW 335 Part A2 DIN EN 12201-1 DIN EN 1555-1	Black as per ISO 6964, blue and yellow as per DIN EN 921 and following DIN EN ISO 6259-1	regularly
Thermal stability	>20 minutes at 200°C	DIN EN 728	per charge
Microbiology	as per KTW recommendation as well as DVGW GW 335 Part A2	DVGW W 270	approval testing
Rapid crack propagation	as per DVGW GW 335 Part A2 DIN EN 12201-1 DIN EN 1555-1	ISO 13477	1 x annually
Gas resistance	as per DVGW GW 335 Part A2 DIN EN 12201-1 DIN EN 1555-1	DVGW GW 335 Part A2	approval testing
Hygiene	as per KTW recommendation as well as DVGW GW 335 Part A2	DIN EN 10204	approval testing
Odour and taste	as per KTW recommendation as well as DVGW GW 335 Part A2	DIN EN 10204	per charge
Slow crack growth	as per DVGW GW 335 Part A2 DIN EN 12201-1 DIN EN 1555-1	Notch test DIN EN ISO 13479	1 x annually
Slow crack growth	>8760 h as per Full Quality Testing Cycle	FNCT ISO 16770 80°C, 4 N/mm ² , 2% Arkopal	per charge

Tab 8-2

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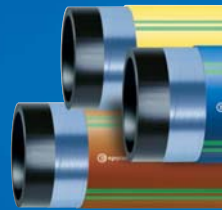
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Additional Testing of the Finished PE 100 RC ^{plus} Piping			
Property	Requirement	Test Procedure	Frequency
Labelling	as per DVGW GW 335 Part A2 DIN EN 12201-2 DIN EN 1555-2	visual inspection	regularly every 2 hours
Texture	as per DVGW GW 335 Part A2	visual inspection	regularly every 2 hours
Colour	as per DVGW GW 335 Part A2	visual inspection	regularly every 2 hours
Warm storage	as per DVGW GW 335 Part A2		1 x per week
Homogeneity	as per DVGW GW 335 Part A2	visual inspection	1 x per week
Thermal stability	>20 minutes at 200 °C	DIN EN 728	1 x per week
Internal pressure creep test	as per DVGW GW 335 Part A2 DIN EN 12201-2 DIN EN 1555-2	80 °C, 165 h; PE 80 $\sigma = 4.6 \text{ N/mm}^2$ PE 100 $\sigma = 5.5 \text{ N/mm}^2$	on every start at least 1 x per week
Melt index	max. 20% variation from the raw material	EN ISO 1133:1999 Condition T 5 kg, 190 °C 10 minutes	on every change and on every dimension check at least 1 x per week
Hygiene	as per KTW recommendation as well as DVGW GW 335 Part A2	DVGW W 270	1 x annually
Labelling	as per DVGW GW 335 Part A2 DIN EN 12201-2 DIN EN 1555-2	visual inspection	regularly every 2 hours
Slow crack growth	>8760 h as per Full Quality Testing Cycle	FNCT ISO 16770 80 °C, 4 N/mm ² , 2% Arkopal	6 x annually
Point loading test	>8760 h as per Full Quality Testing Cycle	HESSEL PA PLP 2.2-2 2004-05 80 °C, 4 N/mm ² , 2% Arkopal	3 x annually

Tab 8-3

The egeplast 3L Leak Control is, as a consequence of its excellent resistance to stress-induced cracking, insensitive to point loads and therefore need not be bedded in sand. It is suitable for installation without a sand bed, and for trenchless installation.



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Ingenieurtechnik

Confirmation of continuous Quality Inspection

Subject: Inspection of pipes made from PE 100 RC^{plus} within the scope of the „Full Quality Testing Cycle“

Product: egeplast 3L Leak Control- for drinking water, gas supply and waste water for non-conventional pipe installation

Manufacturer: egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7, DE-48268 Greven, Germany

Scope of inspection: (Full Quality Testing Cycle)

1. Prove of the transfer-function from testing to service conditions
2. Inspection of the materials properties of all raw material batches designated as PE 100 RC^{plus} using the FNCT
3. Inspection of the materials properties after processing
4. Prove of the expected minimum service life using pipes under point load in type tests every year
5. Statistical validation of the minimum requirements of PE 100 RC^{plus}



This is to certify that due to the above mentioned inspections the following minimum requirements are fulfilled:

FNCT (PA FNCT 2.1-3 2004-03): 4 N/mm², 80 °C, 2% Arkopal N-100 testing time: > 8760 h

Point loading test (PA PLP 2.2-2 2004-05): 4 N/mm², 80 °C, 2% Arkopal N-100 testing time: > 8760 h

The egeplast 3L Leak Control made from PE 100 RC^{plus} are qualified for sandless and trenchless installation techniques.

HESSEL Ingenieurtechnik GmbH

Officially approved as a test, inspection and certification facility (NRW 37).

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DAP-PL-3760.00

According to DIN EN ISO/IEC 17025 accredited Test-Laboratory by
DAP Deutsches Akkreditierungssystem Prüfwesen GmbH

Date: 11.05.2007

Authorized to sign:

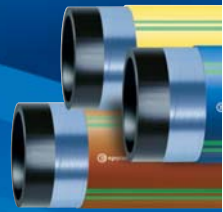
(Dr.-Ing. Joachim Hessel)

It is not allowed to multiply this confirmation or parts of this confirmation without written permission of HESSEL Ingenieurtechnik.

Fig 8-9

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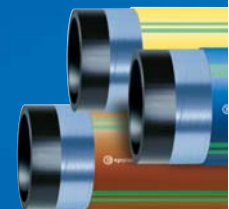
8.4 Technical Information

8.4.1 Product Data Sheet for egeplast 3L Leak Control Drinking Water Pipes

Dimension:	OD 25 mm - OD 1200 mm
Pipe construction:	 <ul style="list-style-type: none">• Medium-bearing pipe black• Protective coating on the outside blue to identify the medium as drinking water with 4 green double stripes to signify a pipe with a protective coating SDR 17; SDR 11; SDR 7.4
Material:	Medium-bearing pipe: PE 100 RC ^{plus} (Resistance to Crack) Detection layer: Patented, diagonally overlapping and continuously wound aluminium foil with a defined degree of adhesion to the core pipe Protective coating: Patented, mineral-reinforced polypropylene coating, continuously extruded on during the manufacturing process
Approval:	DVGW*, SVGW*, ÖVGW*, DIN-Gost*, IGNG*, DWI* <small>*The approvals pertain to the medium-bearing pipe</small>
Standards:	DVGW GW 335; DIN 8074/75; DIN EN 12201
Welding group:	003
Labelling:	With coloured metre marking on the medium-bearing pipe and additional marking of the protective coating
Delivery form:	<ul style="list-style-type: none">• 6, 12 or 20 m straight lengths (up to max. 30 m)• Bundled coils of 100 m (up to OD 160/180 mm)• Custom lengths on request• Larger lengths on drums
Regulatory code / installation methods:	DVGW W400-1/2, GW 320, GW 321, GW 323; DIN EN 805; DIN 4124
Material testing:	HESSEL Ingenieurtechnik 

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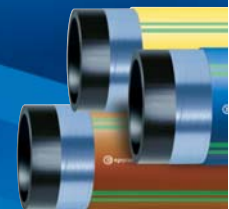


8.4.2 Product Data Sheet for egeplast 3L Leak Control Gas Pipes

Dimension:	OD 25 mm - OD 1200 mm
Pipe construction:	 <ul style="list-style-type: none">• Medium-bearing pipe black• Protective coating on the outside orange to identify the medium as natural gas with 4 green double stripes to signify a pipe with a protective coating <p>SDR 17; SDR 17.6; SDR 11</p>
Material:	Medium-bearing pipe: PE 100 RC ^{plus} (Resistance to Crack) Detection layer: Patented, diagonally overlapping and continuously wound aluminium foil with a defined degree of adhesion to the core pipe Protective coating: Patented, mineral-reinforced polypropylene coating, continuously extruded on during the manufacturing process
Approval:	DVGW*, SVGW, ÖVGW*, DIN-Gost*, IGNG* <small>*The approvals pertain to the medium-bearing pipe</small>
Standards:	DVGW GW 335; DIN 8074/75; DIN EN 1555
Welding group:	003
Labelling:	With coloured metre marking on the medium-bearing pipe and additional marking of the protective coating
Delivery form:	<ul style="list-style-type: none">• 6, 12 or 20 m straight lengths (up to max. 30 m)• Bundled coils of 100 m (up to OD 160/180 mm)• Custom lengths on request• Larger lengths on drums
Regulatory code / installation methods:	DVGW G 472, GW 320, GW 321, GW 323; DIN EN 12007; DIN 4124
Material testing:	HESSEL Ingenieurtechnik 

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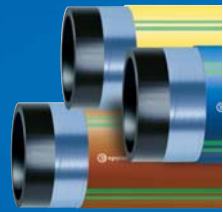
egeplast **3L** Leak Control



8.4.3 Product Data Sheet for egeplast 3L Leak Control Sewage Pipes

Dimension:	OD 25 mm - OD 1200 mm
Pipe construction:	 <ul style="list-style-type: none"> • Medium-bearing pipe black • Protective coating on the outside brown to identify the medium as sewage with 4 green double stripes to signify a pipe with a protective coating <p>SDR 11; SDR 17; SDR 7.4</p>
Material:	<p>Medium-bearing pipe: PE 100 RC^{plus} (Resistance to Crack)</p> <p>Detection layer: Patented, diagonally overlapping and continuously wound aluminium foil with a defined degree of adhesion to the core pipe</p> <p>Protective coating: Patented, mineral-reinforced polypropylene coating, continuously extruded on during the manufacturing process</p>
Approval:	The egeplast 3L Leak Control sewage pressure pipes are manufactured according to ZP 14.3.1 and bear the DIN Certco mark of conformity
Standards:	DVGW GW 335; DIN 8074/75; DIN EN 13244, GKR Guideline, ATV-DVWK-A142/M 146
Welding group:	003
Labelling:	With coloured metre marking on the medium-bearing pipe and additional marking of the protective coating
Delivery form:	<ul style="list-style-type: none"> • 6, 12 or 20 m straight lengths (up to max. 30 m) • Bundled coils of 100 m (up to OD 160/180 mm) • Custom lengths on request • Larger lengths on drums
Regulatory code / installation methods:	Recommended: by analogy to DVGW W400-1/2, GW 320, GW 321; GW 323; DIN EN 805; DIN 4124
Material testing:	HESSEL Ingenieurtechnik 

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8.4.4 Protection from Abrasion during Trenchless Installation

The egeplast 3L Leak Control is the result of consistent development of the well proven SLM® pipe. Confirmation of its improved quality has been provided by established, independent testing institutes.

The pressure bearing pipe wall consists of PE 100 RC^{plus} (optionally PE 80), which guards reliably against damage by virtue of its excellent crack resistance.

The protective coating of polypropylene reliably protects the medium-bearing pipe against scratches and scoring from outside. In addition, point loads, such as those which can arise through stones or shards, are spread over a greater surface area by the protective coating, thus reducing the stress concentration.

The hardness of the pipe coating results from the special composition of the material. egeplast incorporates

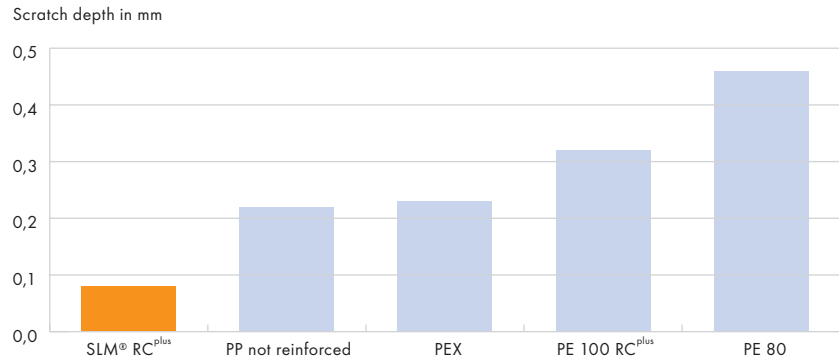


Fig 8-10: Results of scratch testing, official materials testing institute at the University of Hanover

mineral microparticles into the polypropylene protective coating; these permit noticeably less scoring and abrasion.

These clear improvements in the product characteristics have been verified through scratch testing by the Materialprüfanstalt (Materials Testing Institute) in Hanover, amongst others (Fig 8-10).

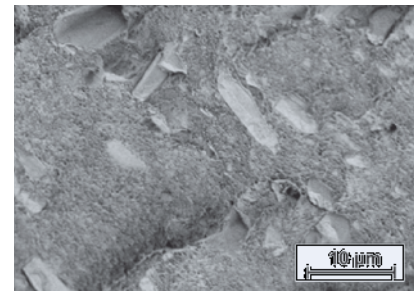


Fig 8-11: Mineral microparticles in the coating material

8.4.5 Double Protection against Point Loads

Pipes with protective coatings offer double protection against point loads:

- Like a “hard” shell, the protective coating keeps the direct load away from the pressure bearing pipe and distributes the additional stress. Analyses using the finite element method show what advantages a pipe with a protective coating has with regard to its resilience to point loading. No stress concentration acts on the core pipe in the immediate area of contact.
- The selected high-quality, extremely crack resistant PE 100 RC^{plus} polyethylene materials of the pressure bearing core pipe give crack formation no chance. For pipe bursting, the DVGW demands FNCT values of 2700 h for drinking water pipes and 3300 h for gas pipes in its Worksheet GW 323. All PE 100 RC^{plus}-materials are checked during the incoming goods inspection for >8760 h. These requirements are met by the core pipes of the egeplast 3L Leak Control.

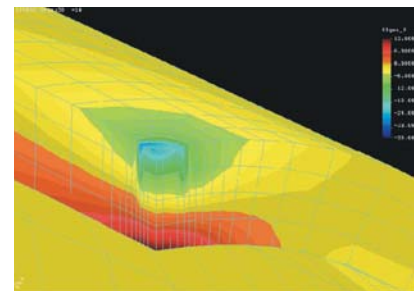


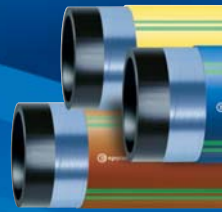
Fig 8-12: Finite element method (FEM) computational model, Muenster University of Applied Sciences, stress concentration: point and linear load safety line for coated pipe



Fig 8-13: Point load test using the Dr. Hessel method

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egeplast 3L Leak Control



8.5 Installation Guidelines for the egeplast 3L Leak Control System

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

8.5.1 General Information on Installation

The egeplast 3L Leak Control is deployed as an underground pipe to meet stringent safety requirements for the transport of fluid media. These could be water, gas, or industrial pipelines, or else sewage pipelines through water protection zones (ATV-DVWK-A 142). It offers, in addition to proof against diffusion, 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 accuracy of within 10 cm.

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

- At least one factory-made egeplast 3L Leak Control connector fitting must be attached.
- The aluminium detection layer must be electrically continuous across all pipe joints as well as right over all attached fittings.
- Electrical isolation of the aluminium detection layer from the ground must be ensured; the pipe ends are also to be strictly isolated.
- The egeplast 3L Leak Control pipe is to be laid such that an electrical return path through the ground is guaranteed. Installation inside a protective pipe is not permissible and is, basically, not necessary.

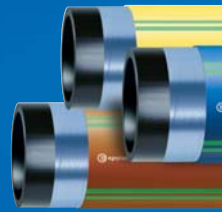
Scope of application

The installation instructions apply to soil covered egeplast 3L Leak Control pipes with core pipes made of HDPE in accordance with DIN 8074 and DIN 8075 for use as drinking and domestic water pipelines, and as gas pipelines. The pipe joints and pipe-

line 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.

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egeplast 3L Leak Control



Installation, open trench method



egeplast 3L Leak Control pipes are suited for installation without a sand bed because they are made of PE 100 RC^{plus}, which is highly resistant to stress-induced cracking. Their suitability for installation without a sand bed is verified by an independent testing institute on the basis of continual quality checks.

The excavated soil is suitable for backfilling if it can be compacted. egeplast does not make any provisos for its composition in terms of grain size. Considerable cost savings result from eliminating the need to dispose of the excavated soil. For assessment of individual cases, it is necessary to deter-

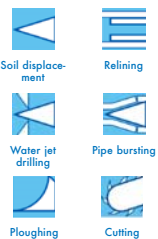
mine the total cost of soil replacement and weigh that against the additional cost of the egeplast 3L Leak Control. The standards for assessment of the fill base are set by ZTVA-StB 97 from the German Road and Transportation Research Association in Cologne as well as by DIN 4022 and DIN 18196. The pipe trench is to be dug out in accordance with DIN 4124 (trench profile and sheeting) and DIN 1998 (lay-out of pipelines in public areas). The minimum covering for gas pipelines is 0.6 to 1.0 m, although the covering can be reduced to 0.5 m for sections up to ca. 2.0 m long which do not carry a heavy load (front gardens, pavements). 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 conduits is, furthermore, DVGW Worksheet W400-2.

Longitudinal force-locked joining procedures must be carried out according to the current regulatory codes of the DVGW and DVS. The regions near welded joints are to be backfilled with sand.

If there are welds insulated with heat shrink sleeves lying in the region of necessary pipe bends, egeplast must be consulted in detail regarding the bend radius.

Installation, trenchless method



There is a higher risk of damage during trenchless installation and renovation procedures. The extent of this damage to the pipe cannot be determined afterwards (black box installation)!

For this reason, pipes with a protective coating are essential. Multiple layer pipes such as the egeplast 3L Leak Control constitute a practicable solution here: they allow continued use of the approved and tested egeplast gas, drinking water, and sewage pipes, while ensuring that the outer surfaces of the pipes are abrasion resistant for use with innovative installation methods. DVGW Worksheets GW 321 (horizon-

tal directional drilling) and GW 323 (pipe bursting) recommend the use of pipes with protective coatings.

The DVGW regulations specify the maximum permitted tractive forces for trenchless installation procedures; these may not be exceeded. Overshooting these limits leads to permanent damage to the new pipeline. egeplast recommends the use of suitable data loggers for complete documentation of the construction project. The minimum allowable bend radius should be observed.

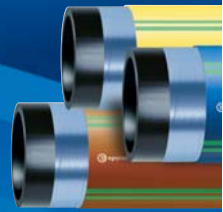
Longitudinal force-locked joining procedures must be carried out according to the current regulatory codes of the DVGW and DVS.

Trenchless installation of the egeplast 3L Leak Control requires the use of special heat shrink sleeves. If pipe lengths including joints are installed using trenchless laying techniques, egeplast is to be consulted about the design of the heat shrink sleeves required.

The minimum allowable bend radius must be observed. If there are welds insulated with heat shrink sleeves lying in the region of any pipe bends required, egeplast must be consulted in detail regarding the bend radius.

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egeplast 3L Leak Control



8.5.2 Joining Techniques

Electrofusion welding



Fig 8-14: Straightening bundled coil and drum ends with the egeplast pipe-heater system

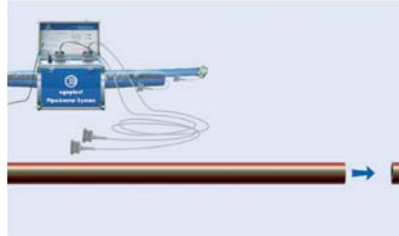


Fig 8-15: The pipe ends are prepared optimally for secure welding

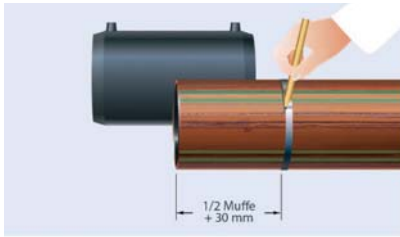


Fig 8-16: Marking the area from which the coating is to be peeled

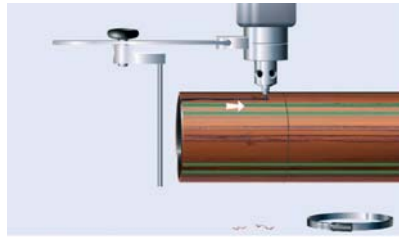


Fig 8-17: Removal of the protective coating with the egeplast coating cutter



Fig 8-18: Removal of the protective coating with the egeplast M10 peeling tool

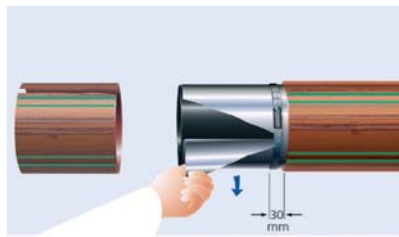


Fig 8-19: Removal of the aluminium coating with the help of a hose clip



Fig 8-20: Removal of the oxide layer using a rotary scraper

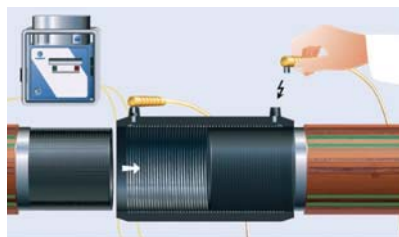


Fig 8-21: Welding in accordance with DVS 2207, Part 1

egeplast 3L Leak Control pipes may be welded to all the commonly used moulded fittings made from PE 100 and PE 80 for electrofusion welding, after peeling the coating from the pipe ends. The guidelines and specifications given by the fittings manufacturers must also be followed.

The protective coating must be removed before electrofusion welding of 3L Leak Control pipes can take place. egeplast provides coat peeling tools suitable for that purpose (Fig 8-16–18). The length of coating to be peeled corresponds to half the length of the electrofusion coupler plus at least 30 mm.

After removal of the protective coating has taken place, the aluminium foil is partially removed. A hose clip or similar simplifies the procedure. This is fixed onto the remaining aluminium foil so that at least 30 mm of aluminium foil remain in place between the electrofusion coupler to be mounted later and the protective coating (Fig 8-19). Starting from the pipe opening, the aluminium foil is peeled carefully away from the core pipe so that it tears off at the hose clip. It is to be ensured that the aluminium foil ends outside the span of the electrofusion coupler.

The contact surfaces must be prepared by scraping and cleaning before welding (Fig 8-20).

For stress free welding of pipe supplied as bundled coils, egeplast recommends use of the egeplast pipe-heater system. Once the electrofusion couplers have been mounted, the treated areas are heated to fusion temperature by passing electric current through integrated resistance wires (heating coil) in the electrofusion couplers, and thereby welded together (Fig 8-21). The welding process starts automatically if the device is set up appropriately. The assembly instructions given by the respective manufacturers are to be followed. Standards for workmanship are laid out in DVS 2207, Part 1.

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8 Safeguarding the Environment via continuous Leak Monitoring

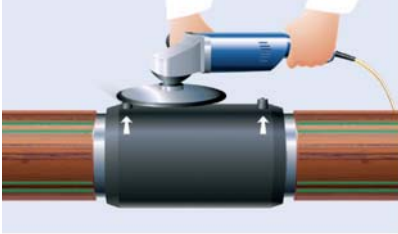
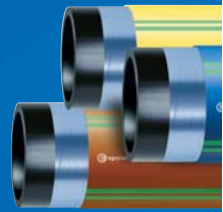


Fig 8-22: Removing the projecting wrap connectors

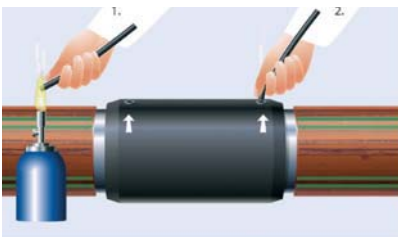


Fig 8-23: Insulating the wrap connectors



Fig 8-24: Rubbing down the aluminium foil



Fig 8-25: Sanding the protective coating in the region of the heat shrink sleeves

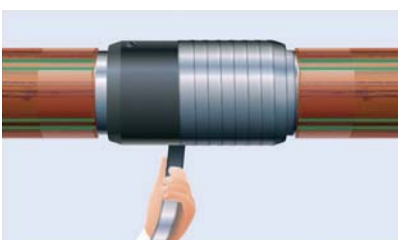


Fig 8-26: Wrapping the weld fitting with aluminium adhesive tape

Continued: electrofusion welding

After welding is finished and the welding zone has cooled down, the wrap connectors projecting from the electrofusion welding sleeve are sawn off (Fig 8-22). After that, the region of the sawn off wrap connectors must be insulated (Fig 8-23). For this, a hot melt stick from the Tyco Raychem company is heated up and pressed onto the surface to the insulated. It must be ensured that the region is insulated over its full area. The information provided by the manufacturer, Tyco Raychem, is to be heeded regarding the use of the hot melt stick.

The aluminium foil remaining between the electrofusion coupler and the protective coating is rubbed down using sandpaper (P100) until the light bluish colouration of the aluminium surface becomes a continuous silvery colour (Fig 8-24). The bluish colouration results from a primer which is required for the production of the pipe but, because of its high insulating resistance, has a negative effect on the flow of the measuring potential. If the primer is not removed, this cannot flow properly, and consequently leakage monitoring cannot take place.

Following this, the protective coating in the region of the heat shrink sleeves to be fitted later must be rubbed down using sandpaper (P60) in order to achieve better adhesion for the heat shrink sleeves (Fig 8-25).

An aluminium adhesive tape is wrapped around the joint, on top of the exposed and sanded aluminium foil – starting at a minimum distance of 0.5 cm from the protective coating – with at least 50% overlapping. A gap of at least 0.5 cm must likewise be left at the other end of the winding (Fig 8-26). The aluminium adhesive tape to be used for wrapping must be obtained from the egeplast company. The fitting should be wrapped in a single run. The foil must, in the process, adhere firmly to the pipe; bubbles or air pockets are to be avoided. The foil should, if necessary, be worked on with a press roller (e.g. silicone roller) during and after wrapping. Should the aluminium foil come to an end or tear off during the wrapping process, one must proceed as follows:

1. Cut off the aluminium foil ca. 5 cm before the end of the roll
2. Stick the end of the foil firmly to the pipe
3. Roughen the surface of the end of the foil (ca. 5 cm) with sandpaper (P100)
4. Cut away the start of the new roll (ca. 10 cm), and stick it first to the full area of the roughened surface of the aluminium foil already in place
5. Continue the wrapping procedure until the end of the fitting

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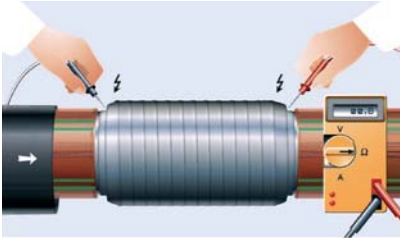
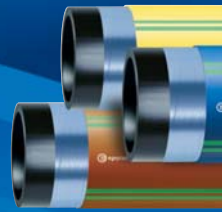


Fig 8-27: Measuring and recording the contact resistance



Fig 8-28: Attaching the heat shield and applying the heat shrink product

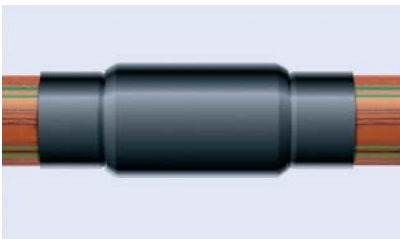


Fig 8-29: Welded joint protected by the heat shrink product

Continued: electrofusion welding

Once the electrofusion coupler has been wrapped, its contact resistance is measured using an ohmmeter. The measurement is made between each of the sanded aluminium surfaces just in front of the coating (on the area of aluminium belonging to the pipe). The measured resistance value is not permitted to be more than 3 Ohms. If this value is exceeded, the wrapping must be reapplied. The measured value is to be recorded for every joint (see Section 8.5.3). These records are to be produced for the egeplast company, or for companies authorised by egeplast, when the egeplast 3L Leak Control pipeline is verified.

The aluminium layer must subsequently be covered using heat shrink products from the Tyco Raychem company and thus electrically isolated from its environment. The choice and type of heat shrink product differs according to the pipe laying procedure and should be cleared with egeplast.

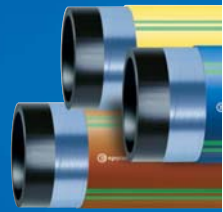
The respective handling instructions provided by Tyco Raychem are to be followed. It must be ensured that the protective coating is overlapped by the heat shrink product for at least 10cm right and left of the aluminium foil.

Before the shrinking procedure begins, the protective coating must itself be protected by using a suitable heat shield at the border area of the shrink product (Fig 8-28). The application of heat shrink tubing or a heat shrink sheet always proceeds from the middle outwards, working with a low gas flame. Air pockets are to be avoided as far as possible in the process.

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

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



Butt fusion welding

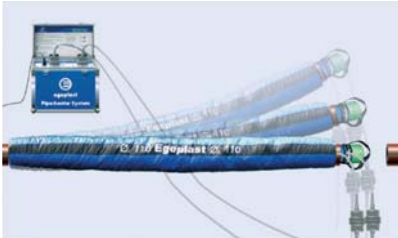


Fig 8-30: Straightening bundled coil and drum ends with the egeplast pipe-heater system

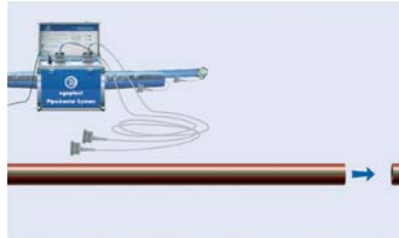


Fig 8-31: The pipe ends are prepared optimally for secure welding

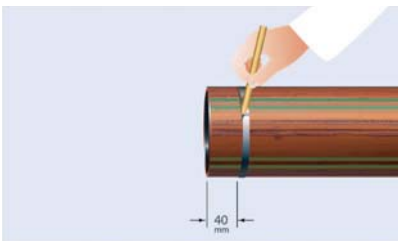


Fig 8-32: Marking the area from which the coating is to be peeled

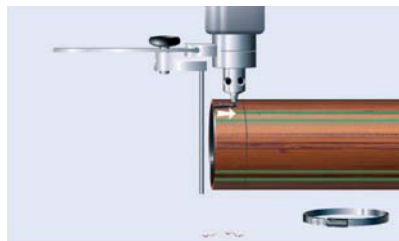


Fig 8-33: Removal of the protective coating with the egeplast coating cutter



Fig 8-34: Removal of the protective coating with the egeplast M10 peeling tool

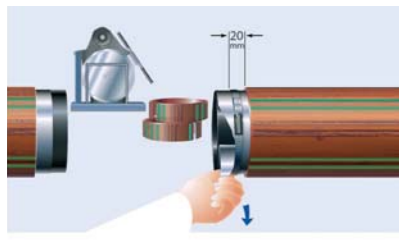


Fig 8-35: Removal of the aluminium coating with the help of a hose clip

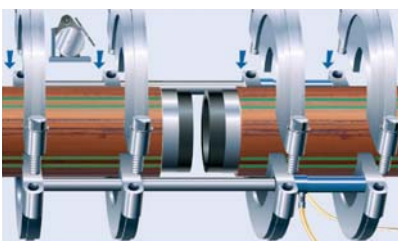


Fig 8-36: Fastening the special inserts available from egeplast (see Table 8-5)

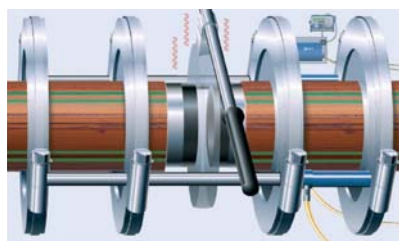


Fig 8-37: Welding in accordance with DVS 2207, Part 1

egeplast 3L Leak Control pipes are manufactured from PE 100 RC^{plus} materials belonging to welding group 003. The protective coating is extruded onto the medium-bearing pipe, and is removed according to the egeplast installation instructions before joining. After this, welding with one another and with any other approved material is possible.

The protective coating must be removed before butt fusion welding of egeplast3L Leak Control pipes can take place. egeplast provides coat peeling tools suitable for this purpose (Fig 8-32–34). The length of coating to be peeled is at least 40 mm.

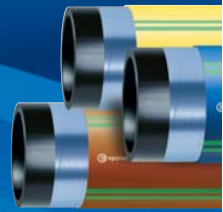
After removal of the protective coating has taken place, the aluminium foil is partially removed. A hose clip or similar simplifies the procedure. This is fixed onto the remaining aluminium foil so that at least 20 mm of aluminium foil remain in place (Fig 8-35). Starting from the pipe opening, the aluminium foil is peeled carefully away from the core pipe so that it tears off at the hose clip.

The use of special inserts is required to make sure that the pipe ends are properly clamped in the butt welding machine and to prevent damage to the protective coating (Fig 8-36). These are adjusted exactly for the thickness of the protective coating, which varies according to the core pipe diameter; they are available from egeplast. The sequence of operations continues as specified in DVS 2207, Part 1, until the formation of a uniformly circular weld bead (Fig 8-37).

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8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



Continued: butt fusion welding

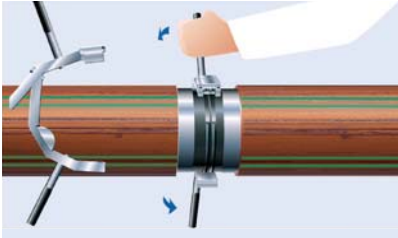


Fig 8-38: Removing of the weld bead with an external bead remover



Fig 8-39: Rubbing down the aluminium foil

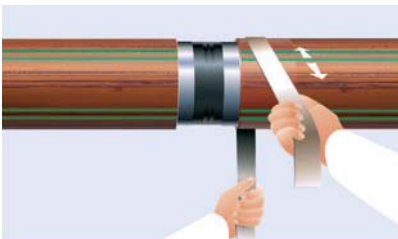


Fig 8-40: Sanding the protective coating in the region of the heat shrink sleeves



Fig 8-41: Wrapping the weld area aluminium adhesive tape

After welding is finished and the welding zone has cooled down, the weld bead is to be removed using an external bead remover (Fig 8-38).

The remaining aluminium foil is rubbed down using sandpaper (P100) until the light bluish colouration of the aluminium surface becomes a continuous silvery colour (Fig 8-39). The bluish colouration results from a primer which is required for the production of the pipe but, because of its high insulating resistance, has a negative effect on the flow of the measuring potential. If the primer is not removed, this cannot flow properly, and consequently leakage monitoring cannot take place.

Following this, the protective coating in the region of the heat shrink sleeves to be fitted later must be rubbed down using sandpaper (P60) in order to achieve better adhesion (Fig 8-40).

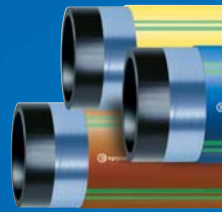
An aluminium adhesive tape is wrapped around the joint, on top of the exposed and sanded aluminium foil – starting at a minimum distance of 0.5 cm from the protective coating – with at least 50% overlapping. A gap of at least 0.5 cm must likewise be left at the other end of the winding (Fig 8-41). The aluminium adhesive tape to be used for wrapping must be obtained from the egeplast company.

The region of the weld should be wrapped in a single run. The foil must, in the process, adhere firmly to the pipe; bubbles or air locks are to be avoided. The aluminium foil should, if necessary, be worked on with a press roller (e.g. silicone roller) during and after wrapping. Should the aluminium foil come to an end or tear off during the wrapping process, one must proceed as follows:

1. Cut off the aluminium foil ca. 5 cm before the end of the roll
2. Stick the end of the foil firmly to the pipe
3. Roughen the surface of the end of the foil (ca. 5 cm) with sandpaper (P100)
4. Cut away the start of the new roll (ca. 10 cm), and stick it first to the full area of the roughened surface of the aluminium foil already in place
5. Continue the wrapping procedure until the end of the region of the weld

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8 Safeguarding the Environment via continuous Leak Monitoring



Continued: butt fusion welding

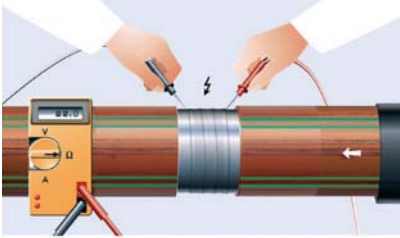


Fig 8-42: Measuring and recording the contact resistance



Fig 8-43: Attaching the heat shield and applying the heat shrink product



Fig 8-44: Welded joint protected by the heat shrink product

Once the region of the weld has been wrapped, its contact resistance is measured using an ohmmeter. The measurement is made between each of the sanded aluminium surfaces just in front of the coating (on the area of aluminium belonging to the pipe). The measured resistance value is not permitted to be more than 3 Ohms. If this value is exceeded, the wrapping must be reapplied. The measured value is to be recorded for every joint (see Section 8.5.3). The records are to be produced for the egeplast company, or for companies authorised by egeplast, when the egeplast 3L Leak Control pipeline is verified.

The aluminium layer must subsequently be covered using heat shrink products from the Tyco Raychem company and thus electrically isolated from its environment. The choice and type of heat shrink product differs according to the pipe laying procedure and should be cleared with egeplast.

The respective handling instructions provided by Tyco Raychem are to be followed. It must be ensured that the protective coating is overlapped by the heat shrink product for at least 10cm right and left of the aluminium foil.

Before the shrinking procedure begins, the protective coating must itself be protected by using a suitable heat shield at the border area of the shrink product (Fig 8-43). The application of heat shrink tubing or a heat shrink sheet always proceeds from the middle outwards, working with a low gas flame. Air pockets are to be avoided as far as possible in the process.

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

Attachment of the measuring cable by means of the egeplast 3L Leak Control connector fitting

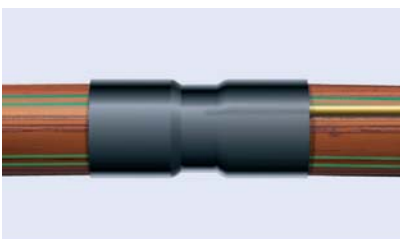


Fig 8-45: 3L Leak Control connector fitting

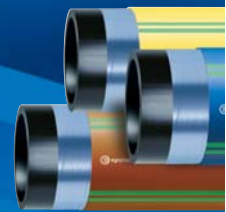
The egeplast 3L Leak Control connector fitting provides the electrical connection from the monitoring unit to the aluminium detection layer of the 3L Leak Control pipe to be monitored.

The connector fitting is supplied as a fully assembled egeplast 3L Leak Control pipe section. Dimensioning of the 3L Leak Control connector fitting is carried out as for the pipe string to be monitored. The connector fitting is to

be welded in close to where the 3L Leak Control monitoring unit is to be installed. Alternatively, a connection to the pipe can be made in a shaft or operations building on site. The pipe must be freely accessible for fabricating a connection on site. A minimum of 0.5 m of the pipe must be available for making the connection. The egeplast company must be consulted before any fabrication on site is planned.

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



Branches and elbows

Only 3L Leak Control fittings from the egeplast company are to be used for pipe branches and elbows. Welding of the pipes with the moulded fittings, and insulating the joints, is carried out as per the installation guidelines for butt fusion welding or electrofusion welding, as the case may be.

Shaft structures

egeplast 3L Leak Control shaft structure

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

Other shaft systems

For these shaft structures (made of concrete, PE, PP, PVC or GRP), special 3L Leak Control connector fittings for shaft structures are to be attached at the entrances and exits of the shaft. The connector fittings are factory-assembled after consultation. The connections can, alternatively, be fabricated on site provided that the requirements for that are satisfied. Consultation with egeplast is necessary for this. This is done such that the 3L cable connections always come to be located inside the shaft. The 3L linking cables have waterproof plug connectors which are to be hooked up inside the shaft on site.

The pipe is to be sealed using standard techniques (e.g. wall collar, Link-Seal seal, or equivalent) in the region of the shaft entrances and exits. At the connector fittings, joints on the inside of the shaft to other fittings, mounded components, cleaning ports, etc. are to be made using flange or welded joints.

The shaft diameter should be chosen such that the installations described above can be carried out inside the shaft.

Verification of the 3L system requirements

Continuity and isolation

Verification of both the continuity of the aluminium layer and the isolation of the aluminium layer from the ground is performed after installation of the egeplast 3L Leak Control pipe.

The verification is performed by an authorized service provider; the details and date of the inspection should be agreed with them.

The installation of the monitoring unit for the 3L Leak Control pipe takes place following successful verification of the pipe.

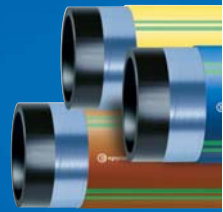
The verification of the continuity of the aluminium layer requires that it is accessible from the pipe ends. Access to the aluminium layer can be achieved using the 3L connector fittings. This procedure allows the pipe trench to be filled in before verification is carried out. Furthermore, the continuity 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 trench is to be filled in immediately after the verification of continuity.

The verification of isolation from the ground should take place, at the earliest, 1 week after filling in the pipe trench. This ensures that the soil is sufficiently damp. The drier the bedding material is during installation, the longer the waiting time to choose before verifying the isolation.

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egeplast **3L** Leak Control



8.5.3 egeplast 3L Leak Control Welded Joint Report

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

Construction project:

Constructing company:

Control parameters

Serial number for 3L Leak Control welded joint report: _____

Identification of the 3L Leak Control welded joint: _____

Measurements after wrapping with aluminium adhesive tape

Contact resistance from the already installed to the new pipe section (max. 3 Ω): _____ Ω

Authentication

Executor: _____

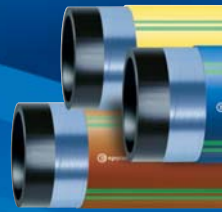
Date: _____

Signature: _____

For measured contact resistance values $> 3 \Omega$, wrapping with the aluminium adhesive tape must be carried out afresh!

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egeplast 3L Leak Control



8.5.4 Tables

Coating backcut recommended

Before electrofusion welding or butt fusion welding of egeplast 3L Leak Control pipes can take place, the pro-

TECTIVE COATING MUST BE REMOVED WITH egeplast COAT PEELING TOOLS. COAT PEELING OF THE PIPE ENDS CAN BE CAR-

RIED OUT BY egeplast ON REQUEST. FOR THIS WE NEED AN INDICATION OF THE WELDING PROCEDURE TO BE USED.

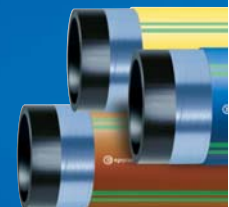
Coating Backcut for the egeplast 3L Leak Control				
Medium-Bearing Pipe DIN 8074 OD [mm]	Butt Fusion Welding [mm]	Electrofusion Welding* [mm]	When Using Widos External Bead Removers [mm]	
25	40	70	-	-
32	40	75	-	-
40	40	80	-	-
50	40	85	-	-
63	40	95	-	-
75	40	100	-	-
90	40	110	-	-
110	40	120	35	Size 1
125	40	125	35	Size 1
140	40	130	35 40	Size 1 Size 2
160	40	135	35 40	Size 1 Size 2
180	40	140	40	Size 2 Size 3
200	40	145	40	Size 2 Size 3
225	40	155	40	Size 2 Size 3
250	40	165	40	Size 3
280	40	170	40 50	Size 3 Size 4
315	40	180	40 50	Size 3 Size 4
355	40	185	50	Size 4
400	40	195	50	Size 4
450	40	205	50	Size 4
500	40	215	60	Size 5
560	40	220	60	Size 5
630	40	235	50 60	Size 5 Size 8

Long sleeve fittings are not considered. Preferred equipment sizes for the Widos external bead remover are given

Tab 8-4* Dimensions specified for the product ranges of the Georg Fischer, Friatec, and Plasson companies

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



Overview of external and medium-bearing pipe diameters for egeplast 3L Leak Control inserts for butt welding machines

For welding, the pipe ends are gripped with inserts* which are specially adjusted to the egeplast 3L Leak Control external diameter so that the pipe ends to be welded can be fixed securely.

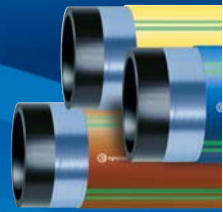
Medium-Bearing Pipe DIN 8074 OD [mm]	Outer Diameter of the egeplast 3L Leak Control Pipe [mm]
25	27.4
32	34.9
40	43.4
50	53.6
63	66.8
75	79.0
90	94.3
110	115.0
125	130.3
140	145.7
160	166.4
180	187.0
200	207.0
225	232.0
250	257.0
280	287.0
315	322.0
355	362.2
400	410.6
450	460.0
500	510.0
560	570.0
630	640.0
710	720.0
800	810.0
900	910.0
1000	1010.0

Subject to manufacturing tolerances

Tab 8-5* Special inserts for WIDOS welding machines are available from egeplast for this purpose.

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast 3L Leak Control



8.6 RFP Forms

8.6.1 RFP Form for egeplast 3L Leak Control Drinking Water Pipe



Preliminary note:

Drinking water pressure pipe in accordance with DIN 8074/8075, DIN EN 12201, made of PE 100 RC^{plus} with the highest resistance to slow crack growth (FNCT minimum requirement: ≥ 8760 h in accordance with DVS 2203-4; $T=80^{\circ}\text{C}$, $\sigma=4\frac{\text{N}}{\text{mm}^2}$, 2% Arkopal), pipe colour black. Verified in accordance with both DIN 8075 and DVGW GW 335 Part A2, with an additional, continuously extruded protective coating made of mineral-reinforced signal blue polypropylene akin to RAL 5005, with 4 yellow-green double stripes akin to RAL 6018, in accordance with the recommendations of DVGW Worksheets GW 321 and GW 323. An aluminium layer lies between the HDPE pipe and the protective coating, functioning as a metallic permeation barrier as well as an electrical conductor for pipe monitoring and/or leakage detection / location.

Monitoring of constant material quality as well as regular structural testing is carried out by an independent testing institute which is accredited according to DIN EN ISO/IEC 17025 to perform such analyses.

The suitability of the product for installation without a sand bed, and for trenchless installation, is verified by an independent assessor.

All necessary pipeline joints created by means of either electrofusion welding or butt fusion welding are to be made according to the requirements of the applicable DVS technical guidelines. The pipeline junctions are to be completed according to the pipe manufacturer's current technical installation instructions. The piping is to be stored and transported on the building site in compliance with the KRV guidelines.

Product:

egeplast 3L Leak Control drinking water pressure pipe made of PE 100 RC^{plus} or equivalent

Manufacturer:

egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de http://www.egeplast.de

Specification of services:

egeplast 3L Leak Control drinking water pressure pipe made of PE 100 RC^{plus} with dimensions:

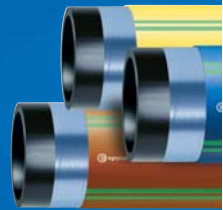
_____mm, SDR_____

- delivered as straight lengths of 6 / 12 m
- delivered as bundled coils in lengths of _____m

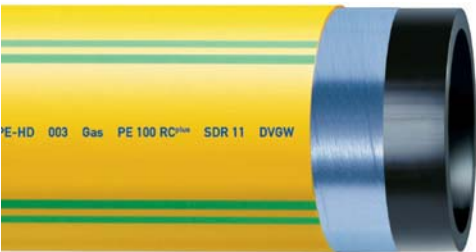
Deliver _____running metres and install professionally according to DIN and appropriate installation guidelines as drinking water pressure pipe: _____€ / running metre

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



8.6.2 RFP Form for egeplast 3L Leak Control Gas Pipe



Preliminary note:

Gas pressure pipe in accordance with DIN 8074/8075, DIN EN 1555, made of PE 100 RC^{plus} with the highest resistance to slow crack growth (FNCT minimum requirement: ≥ 8760 h in accordance with DVS 2203-4; $T=80^{\circ}\text{C}$, $\sigma=4\frac{\text{N}}{\text{mm}^2}$, 2% Arkopal), pipe colour black. Verified in accordance with both DIN 8075 and DVGW GW 335 Part A2, with an additional, continuously extruded protective coating made of mineral-reinforced yellow-orange polypropylene akin to RAL 5005, with 4 yellow-green double stripes akin to RAL 6018, in accordance with the recommendations of DVGW Worksheets GW 321 and GW 323. An aluminium layer lies between the HDPE pipe and the protective coating, functioning as a metallic permeation barrier as well as an electrical conductor for pipe monitoring and/or leakage detection / location.

Monitoring of constant material quality as well as regular structural testing is carried out by an independent testing institute which is accredited according to DIN EN ISO/IEC 17025 to perform such analyses.

The suitability of the product for installation without a sand bed, and for trenchless installation, is verified by an independent assessor.

All necessary pipeline joints created by means of either electrofusion welding or butt fusion welding are to be made according to the requirements of the applicable DVS technical guidelines. The pipeline junctions are to be completed according to the pipe manufacturer's current technical installation instructions. The piping is to be stored and transported on the building site in compliance with the KRV guidelines.

Product:

egeplast 3L Leak Control gas pressure pipe
made of PE 100 RC^{plus} or equivalent

Manufacturer:

egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de <http://www.egeplast.de>

Specification of services:

egeplast 3L Leak Control gas pressure pipe
made of PE 100 RC^{plus} with dimensions:

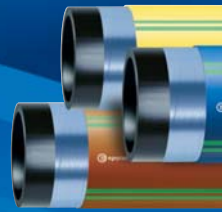
_____mm, SDR_____

- delivered as straight lengths of 6 / 12 m
- delivered as bundled coils in lengths of _____m

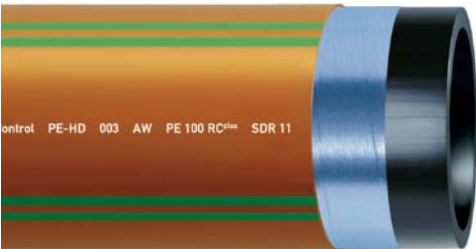
Deliver _____running metres and install professionally according to DIN and appropriate installation guidelines as gas pressure pipe: _____€ / running metre

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast 3L Leak Control



8.6.3 RFP Form for egeplast 3L Leak Control Sewage Pressure Pipe



Preliminary note:

Sewage pressure pipe in accordance with DIN 8074/8075, DIN EN 13244, made of PE 100 RC^{plus} with the highest resistance to slow crack growth (FNCT minimum requirement: ≥ 8760 h in accordance with DVS 2203-4; $T=80$ C, $\sigma=4 \frac{N}{mm^2}$, 2% Arkopal), pipe colour black. Verified in accordance with DIN 8075 as well as DIN Certco mark of conformity, DINplus, in accordance with ZP 14.3.1, with an additional, continuously extruded protective coating made of mineral-reinforced brown polypropylene akin to RAL 8017, with 4 yellow-green double stripes akin to RAL 6018, in accordance with the recommendations of DVGW Worksheets GW 321 and GW 323. An aluminium layer lies between the HDPE pipe and the protective coating, functioning as a metallic permeation barrier as well as an electrical conductor for pipe monitoring and/or leakage detection / location.

Monitoring of constant material quality as well as regular structural testing is carried out by an independent testing institute which is accredited according to DIN EN ISO/IEC 17025 to perform such analyses.

The suitability of the product for installation without a sand bed, and for trenchless installation, is verified by an independent assessor.

All necessary pipeline joints created by means of either electrofusion welding or butt fusion welding are to be made according to the requirements of the applicable DVS technical guidelines. The pipeline junctions are to be completed according to the pipe manufacturer's current technical installation instructions. The piping is to be stored and transported on the building site in compliance with the KRV guidelines.

Product:

egeplast 3L Leak Control sewage pressure pipe
made of PE 100 RC^{plus} or equivalent

Manufacturer:

egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de <http://www.egeplast.de>

Specification of services:

egeplast 3L Leak Control sewage pressure pipe
made of PE 100 RC^{plus} with dimensions:

_____mm, SDR_____

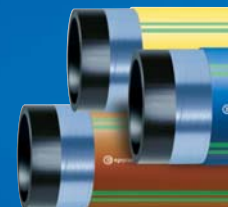
- delivered as straight lengths of 6 / 12 m
- delivered as bundled coils in lengths of _____m

Deliver _____running metres and install professionally according to DIN and appropriate installation guidelines as

sewage pressure pipe: _____€ / running metre

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



8.6.4 RFP Form for egeplast 3L Leak Control Accessories – Moulded Fittings and Shafts

Description:

HDPE Elbow

Drawn / press-formed elbow made of PE 100 with long welding ends for butt fusion and electrofusion welding. With factory-made 3-layer construction for continuous leakage monitoring with the egeplast 3L Leak Control System or equivalent. All necessary pipeline joints created by means of either electrofusion welding or butt fusion welding are to be made according to the requirements of the applicable DVS technical guidelines. The pipeline junctions are to be completed according to the pipe manufacturer's current technical installation instructions.

Product / Make:

egeplast 3L Leak Control 3-layer elbow made of PE 100 or equivalent

Manufacturer:

egeplast Werner Strumann GmbH & Co. KG

Robert-Bosch-Str. 7

48268 Greven, Germany

Tel.: +49.2575.9710-0

Fax: +49.2575.9710-110

e-mail: info@egeplast.de

http://www.egeplast.de

Specification of services:

egeplast 3L Leak Control 3-layer elbow made of PE 100with

dimension _____mm, SDR _____, degrees _____

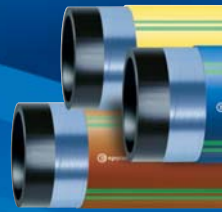
Deliver _____units and join professionally according to DIN and appropriate installation guidelines using the

- electrofusion welding process
- butt fusion welding process

with the pipeline: _____€ / unit

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



RFP Form for egeplast 3L Leak Control Accessories – Moulded Fittings and Shafts

Description:

HDPE Branch

Branch made of PE 100 with long welding ends for butt fusion and electrofusion welding. With factory-made 3-layer construction for continuous leakage monitoring with the egeplast 3L Leak Control System or equivalent. All necessary pipeline joints created by means of either electrofusion welding or butt fusion welding are to be made according to the requirements of the applicable DVS technical guidelines. The pipeline junctions are to be completed according to the pipe manufacturer's current technical installation instructions.

Product / Make:

egeplast 3L Leak Control 3-layer branch made of PE 100 or equivalent

Manufacturer:

egeplast Werner Strumann GmbH & Co. KG

Robert-Bosch-Str. 7

48268 Greven, Germany

Tel.: +49.2575.9710-0

Fax: +49.2575.9710-110

e-mail: info@egeplast.de

http://www.egeplast.de

Specification of services:

egeplast 3L Leak Control 3-layer branch made of PE 100 with

dimension _____mm, SDR _____,

dimension of the branch pipe _____mm, SDR _____, degrees _____

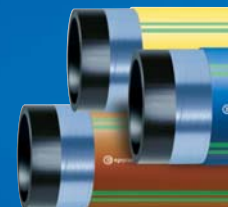
Deliver _____units and join professionally according to DIN and appropriate installation guidelines using the

- electrofusion welding process
- butt fusion welding process

with the pipeline: _____€ / unit

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



RFP Form for egeplast 3L Leak Control Accessories – Moulded Fittings and Shafts

Description: Connector / crossover fitting
For connection of the base unit, or for shaft structures (1 unit obligatory), with factory-made contact to the aluminium monitoring layer incl. 10 m linking cable.

Product / Make: egeplast 3L Leak Control connector fitting or equivalent

Manufacturer: egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de <http://www.egeplast.de>

Specification of services: egeplast 3L Leak Control connector fitting with
dimension _____mm, SDR_____
Deliver _____units and mount professionally according to DIN and
appropriate installation guidelines: _____€ / unit

Description: Linking cable extension
For extending the cable link to the 3L Leak Control connector / crossover fitting.

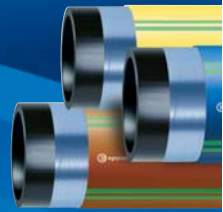
Product / Make: egeplast 3L Leak Control linking cable extension

Manufacturer: egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de <http://www.egeplast.de>

Specification of services: Deliver egeplast 3L Leak Control linking cable extension of length _____m
and mount professionally according to DIN and appropriate installation
guidelines: _____€ / running metre

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



RFP Form for egeplast 3L Leak Control Accessories – Moulded Fittings and Shafts

Description:

HDPE Shaft

Monitorable egeplast 3L Leak Control shaft made of laminated pipe with integrated aluminium layer according to DIN 16961. Shaft consisting of shaft casing and shaft floor, fully monitorable with the 3L system. Shaft construction suitable for taking a reinforced concrete cover plate. All necessary connections created by means of either electrofusion welding or butt fusion welding are to be made according to the requirements of the applicable DVS technical guidelines. The connections are to be completed according to the pipe manufacturer's current technical installation instructions.

Product / Make:

egeplast 3L Leak Control System shaft made of HDPE laminated pipe with integrated aluminium layer or equivalent

Manufacturer:

egeplast Werner Strumann GmbH & Co. KG

Robert-Bosch-Str. 7

48268 Greven, Germany

Tel.: +49.2575.9710-0

Fax: +49.2575.9710-110

e-mail: info@egeplast.de

<http://www.egeplast.de>

Specification of services:

egeplast 3L Leak Control System shaft made of HDPE laminated pipe with integrated aluminium layer

Shaft diameter _____mm

Inlet pipe diameter 3L Leak Control _____mm, SDR_____

Outflow pipe diameter 3L Leak Control _____mm, SDR_____

Number of ports _____

Installation depth _____m

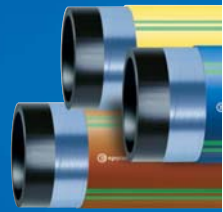
Deliver units and join professionally according to DIN and appropriate installation guidelines using the

- electrofusion welding process
- butt fusion welding process

with the pipeline: _____€ / unit

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control

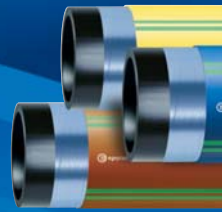


RFP Form for egeplast 3L Leak Control Accessories – Moulded Fittings and Shafts

Description:	3L shaft monitoring egeplast 3L Leak Control shaft monitoring for shaft structures that are lacking equipment for monitoring the level of the liquid in the shaft, using the egeplast 3L Leak Control monitoring unit
Product / Make:	egeplast 3L Leak Control shaft monitoring
Manufacturer:	egeplast Werner Strumann GmbH & Co. KG Robert-Bosch-Str. 7 48268 Greven, Germany Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110 e-mail: info@egeplast.de http://www.egeplast.de
Specification of services:	Deliver units and mount professionally according to DIN and appropriate installation guidelines: _____€ / unit

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



8.6.5 RFP Form for egeplast 3L Leak Control Accessories – Monitoring Unit

Description:

Monitoring unit

Consisting of a switching unit for installation indoors or else inside a temperature-regulated, watertight electrical cabinet, including cable break monitoring as far as the connection to the aluminium layer, leak simulation, overvoltage protection for the measuring circuit, LCD display, reset function, operating manual as well as installation and handover on site, but without activation. The 220 V power supply with overvoltage protection is supplied by the customer.

Product / Make:

egeplast 3L Leak Control monitoring unit or equivalent

Manufacturer:

egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de <http://www.egeplast.de>

Specification of services:

Deliver units and mount professionally according to DIN and appropriate installation guidelines: _____ € / unit

Description:

Continuity monitoring

Equipment for periodically checking the continuity of the aluminium layer of a pipe string after installation of the egeplast 3L Leak Control pipe to be monitored, incl. installation within the scope of the installation of the monitoring unit. The 220 V power supply with overvoltage protection and the connector fittings at the pipe ends are both supplied by the customer.

Product / Make:

egeplast 3L Leak Control continuity monitoring

Manufacturer:

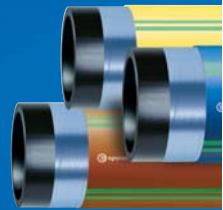
egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de <http://www.egeplast.de>

Specification of services:

egeplast 3L Leak Control continuity monitoring
Deliver units and mount professionally according to DIN and appropriate installation guidelines: _____ € / unit

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control

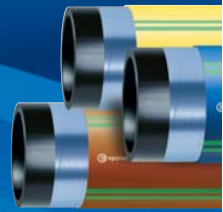


RFP Form for egeplast 3L Leak Control Accessories

Description:	Interface to existing external control system For transmission of the monitoring unit switch states to an existing external control system, incl. plug connection (mounted socket and counterpart, 4-pol.).
Product / Make:	egeplast 3L Leak Control interface
Manufacturer:	egeplast Werner Strumann GmbH & Co. KG Robert-Bosch-Str. 7 48268 Greven, Germany Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110 e-mail: info@egeplast.de http://www.egeplast.de
Specification of services:	egeplast 3L Leak Control interface Deliver units and mount professionally according to DIN and appropriate installation guidelines: _____ € / unit
Description:	Flashing light on the casing of the monitoring unit Warning light on the monitoring unit for optical indication of a malfunction alert.
Product / Make:	egeplast 3L Leak Control flashing light
Manufacturer:	egeplast Werner Strumann GmbH & Co. KG Robert-Bosch-Str. 7 48268 Greven, Germany Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110 e-mail: info@egeplast.de http://www.egeplast.de
Specification of services:	egeplast 3L Leak Control flashing light on the casing of the monitoring unit Deliver units and mount professionally according to DIN and appropriate installation guidelines: _____ € / unit

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



RFP Form for egeplast 3L Leak Control Accessories

Description: **Watertight flashing light for external installation**
Warning light on the external housing for optical indication of a malfunction alert.

Product / Make: egeplast 3L Leak Control watertight flashing light

Manufacturer: egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de <http://www.egeplast.de>

Specification of services: egeplast 3L Leak Control flashing light for external installation
Deliver units and mount professionally according to DIN and appropriate installation guidelines: _____ € / unit

Description: **Cellular phone forwarding**
For forwarding of alert messages in SMS form incl. GSM module and programming, matched to the requirements on site.
SIM card supplied by customer.

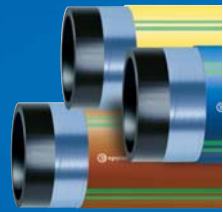
Product / Make: egeplast 3L Leak Control cellular phone forwarding

Manufacturer: egeplast Werner Strumann GmbH & Co. KG
Robert-Bosch-Str. 7 48268 Greven, Germany
Tel.: +49.2575.9710-0 Fax: +49.2575.9710-110
e-mail: info@egeplast.de <http://www.egeplast.de>

Specification of services: egeplast 3L Leak Control cellular phone forwarding
Deliver units and mount professionally according to DIN and appropriate installation guidelines: _____ € / unit

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



8.6.6 RFP Form for egeplast 3L Leak Control Accessories – Insulating Material

Description:

Heat shrink tubing

Made of modified, molecularly cross-linked and heat shrinkable polyolefin. Coated on the inside with a permanently elastic sealing adhesive. Application as per Data Sheet GW 15 in accordance with DIN 30672. For use with open trench installation techniques.

Product / Make:

Raychem

Manufacturer:

egeplast Werner Strumann GmbH & Co. KG

Robert-Bosch-Str. 7

48268 Greven, Germany

Tel.: +49.2575.9710-0

Fax: +49.2575.9710-110

e-mail: info@egeplast.de

<http://www.egeplast.de>

Specification of services:

Raychem CPSM-C30 – 70/26 – 1000 mm for OD 25-32 mm

Deliver _____units and mount professionally according to DIN and appropriate installation guidelines: _____€ / unit

Raychem CPSM-C30 – 90/36 – 1000 mm for OD 40-50 mm

Deliver _____units and mount professionally according to DIN and appropriate installation guidelines: _____€ / unit

Raychem CPSM-C30 – 120/54 – 1000 mm for OD 63-75 mm

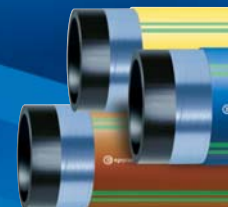
Deliver _____units and mount professionally according to DIN and appropriate installation guidelines: _____€ / unit

Raychem CPSM-C30 – 164/80 – 1000 mm for OD 90-110 mm

Deliver _____units and mount professionally according to DIN and appropriate installation guidelines: _____€ / unit

8 Safeguarding the Environment via continuous Leak Monitoring

egeplast **3L** Leak Control



Raychem CPSM-C30 - 195/102 - 1000 mm for OD 125-160 mm

Deliver _____units and mount professionally according to DIN and appropriate installation guidelines: _____€ / unit

Raychem TPSM-C30 - 255/135 - 600 mm for OD 180 mm

Deliver _____units and mount professionally according to DIN and appropriate installation guidelines: _____€ / unit

Raychem MEPS-C30 - 900 - 900 mm for OD 200 mm

Deliver _____units and mount professionally according to DIN and appropriate installation guidelines: _____€ / unit

Other heat shrink tubing sizes on request

Special heat shrink sleeves are to be utilised for trenchless installation procedures. The use of these heat shrink sleeves is to be cleared with egeplast.

8.6.7 RFP Form for egeplast 3L Leak Control - Services

Description:

Verification of the 3L system requirements

Verification of the continuity of the aluminium layer and its isolation from the ground as well as installation and handover of the monitoring unit for egeplast 3L Leak Control pipe on site, incl. 1 activation.

Service provider:

egeplast Werner Strumann GmbH & Co. KG

Robert-Bosch-Str. 7

48268 Greven, Germany

Tel.: +49.2575.9710-0

Fax: +49.2575.9710-110

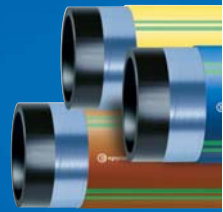
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8.7 Recycling and Environmental Protection



Fig 8-46

Polyethylene is an organic material and consists only of carbon and hydrogen. It has a wholly neutral impact on the environment. PE, being a thermoplastic, can be remelted an almost unlimited number of times and processed into new products. Pipe off-cuts and discarded plastic pipe material, which, for example, accumulate during the installation of plastic pipe systems, should therefore be recycled if at all possible.

At the start of 1994, the Kunststoffrohrverband (KRV), together with the Gütegemeinschaft Kunststoffrohre (GKR), had already introduced a national collection and recycling system for plastic materials, which is free of charge for the trade and its customers and incorporates an obligation to take back these materials. This environmentally conscious system eliminates dumping or incineration together with the high costs which arise from disposal by these methods.



Fig 8-47: Recycling box

Recycling boxes are provided on a loan basis to the customer as collection containers. The plastic pipe material, at least partially cleaned, is then thrown into these boxes. Once the boxes have been filled, their collection and exchange for empty boxes is arranged. Only boxes which are filled exclusively with plastic pipe material are taken. The recycling boxes are then brought, via regional collection points, to a recycling plant in which the collected pipe material is sorted, cleaned, and cut into small pieces to be employed subsequently for other uses.

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