

5 Trenchless Installation and Renovation

egeplast **SLM[®] RC^{plus}**

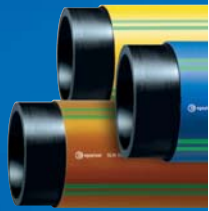


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5 Trenchless Installation and Renovation

5.1 Procedure Description

Trenchless installation:
Very high requirement on pipelines

Open-trench pipe installation not only represents a hazard to traffic and causes annoyance to local residents but also permanently damages the road surface. This has resulted in a growing acceptance of trenchless pipe installation methods, which can also be used to lay pipes under rivers, lakes or traffic routes.

At the same time, these methods save time and money. Cost savings of up to 50 percent can be achieved according to a publication by the Bavarian State Ministry for Regional Development and Environmental Affairs of September 11, 1996 - a powerful argument in view of the high cost pressure on the public purse.

Various options are available for trenchless pipe installation. With all

these methods, there is an increased risk of pipe damage. The extent of this damage cannot be determined once the pipe is laid (black box installation!). For this reason, pipes with a protective outer layer are required and are therefore recommended by the DVGW (German Association of Gas and Water Engineering) for directional drilling (Code of Practice GW 321) and for pipe bursting (Code of Practice GW 323).

Horizontal directional drilling (HDD)

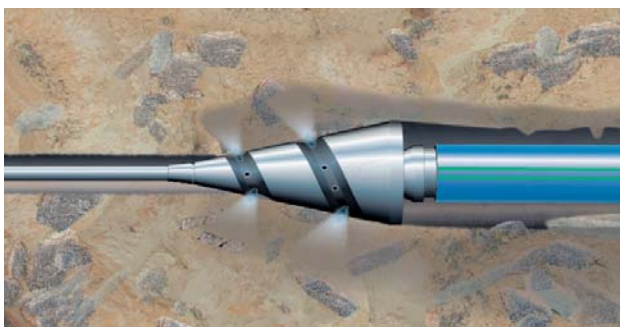
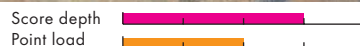


Fig 5-1



Horizontal directional drilling is a steerable wet drilling method. Depending on the nature of the soil and borehole radius, scratches, scoring and point loading by stones can damage the newly installed pipe.

Soil suppression



Fig 5-2



Using an impact mole, pipes - generally domestic service connections - are "fired" over a few metres through the ground. Surrounding stones scratch the new pipe and cause point loads.

Relining (long pipe)

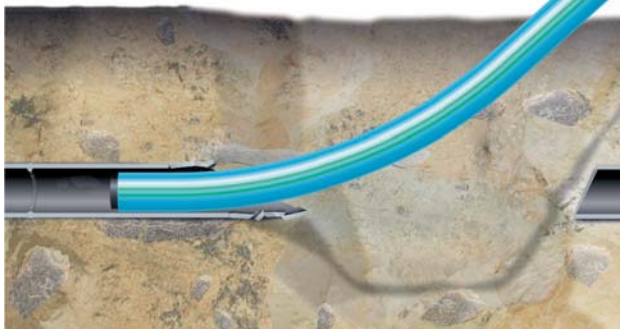


Fig 5-3



This method is used for renovating defective pipelines. Depending on the condition of the old pipe, scratches and scoring can be caused to the new pipe. Steel pipes with single-V butt joint pose a particularly high risk. Increased point loads are not likely with this method.

Pipe bursting



Fig 5-4

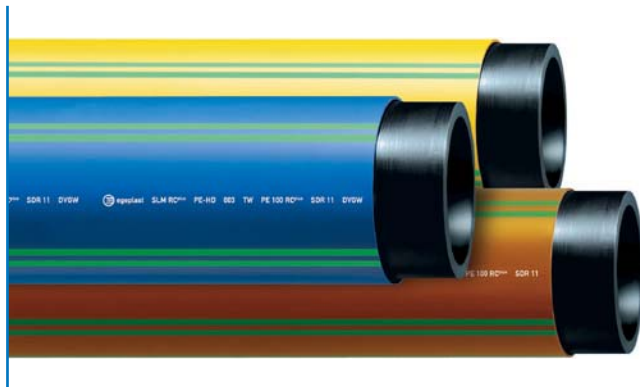


This method is technically challenging. Depending on the material from which the old pipe is made and the condition of the old pipe, the new pipe is susceptible to scratches and scoring. Shards and stones can give rise to increased point loads during service.

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5.2 Product Description

egeplast SLM® RC^{plus}



Drinking Water Pipes · Gas Pipes ·
Sewage Pressure Pipes

Trenchless installation methods impose higher demands on the pipe material. The pressure-bearing pipe wall of the egeplast SLM® RC^{plus} is produced from modern PE 100 RC^{plus} pipe materials (Resistance to Crack), and the pipe also has an extremely abrasion-resistant outer layer to protect it from scratches and scoring. This hard outer layer is essential for black box installation and therefore recommended by the German DVGW for trenchless installation techniques.

The egeplast SLM® RC^{plus} pipe offers the following protective functions:

Protective function 1

In order to prevent pipe failure, the EN standards and DVGW Worksheets G 472 and W 400-2 permit abrasions only to 10% of the minimum wall thickness. Furthermore, the damage must run out smoothly so as to prevent crack initiation.

To reliably protect HDPE pipes from scoring during trenchless installation, egeplast has, therefore, added the extra protective coating of the egeplast SLM® RC^{plus} pipe. The secure protection from scoring and notching relies on an additional layer made of a mineral-reinforced polypropylene. This prevents damage from reaching the pressure bearing pipe core.

Protective function 2

The double layer construction inhibits fast crack growth.

Protective function 3

In operation, the protective coating prevents direct contact between stones or old pipe shards and the pressure bearing HDPE pipe. The point loads which arise are distributed by the protective coating, thereby distinctly reducing the stress peaks.

Protective function 4

The modern, crack resistant substance of the core pipe, made of PE 100 RC^{plus}, provides the protection against crack propagation. The tear strength of this material has been demonstrated by its high values in the FNCT test.

Protective function 5

The material of the core pipe has a very high resistance to stress-induced cracking; this prevents cracks on the inside of the pipe from being generated by the stress peaks which result from point loads.

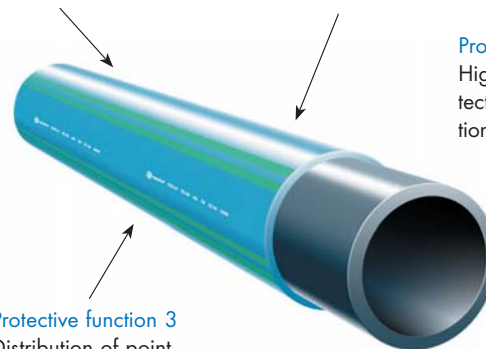
Protective function 2
Weakening of fast crack propagation

Protective function 1
Protection from scoring and notching

Protective function 5
High crack resistance protects against crack formation through point loads

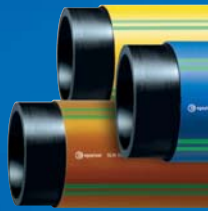
Protective function 3
Distribution of point loads

Protective function 4
High tear strength gives cracks no chance



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5.3 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.

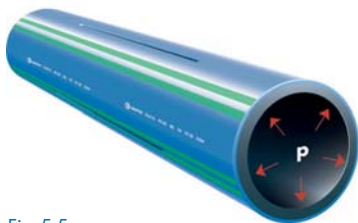


Fig 5-5:
Notch test (ISO 13479)

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 5-6:
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.

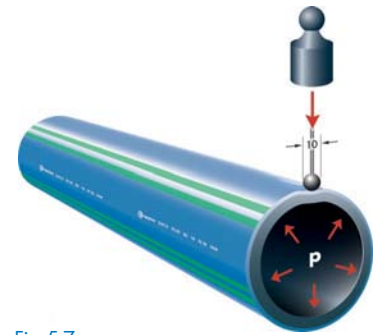


Fig 5-7:
Point load test using the Dr. Hessel method

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

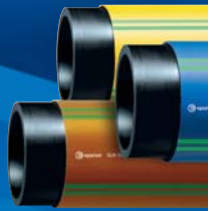
6/2001). With this comparison, the stresses to which a pipe installed without a sand bed is exposed during its operating life may be related to the results of FNCT testing, and thus the FNCT test may be adopted for regular quality monitoring.

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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	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 5-1 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.

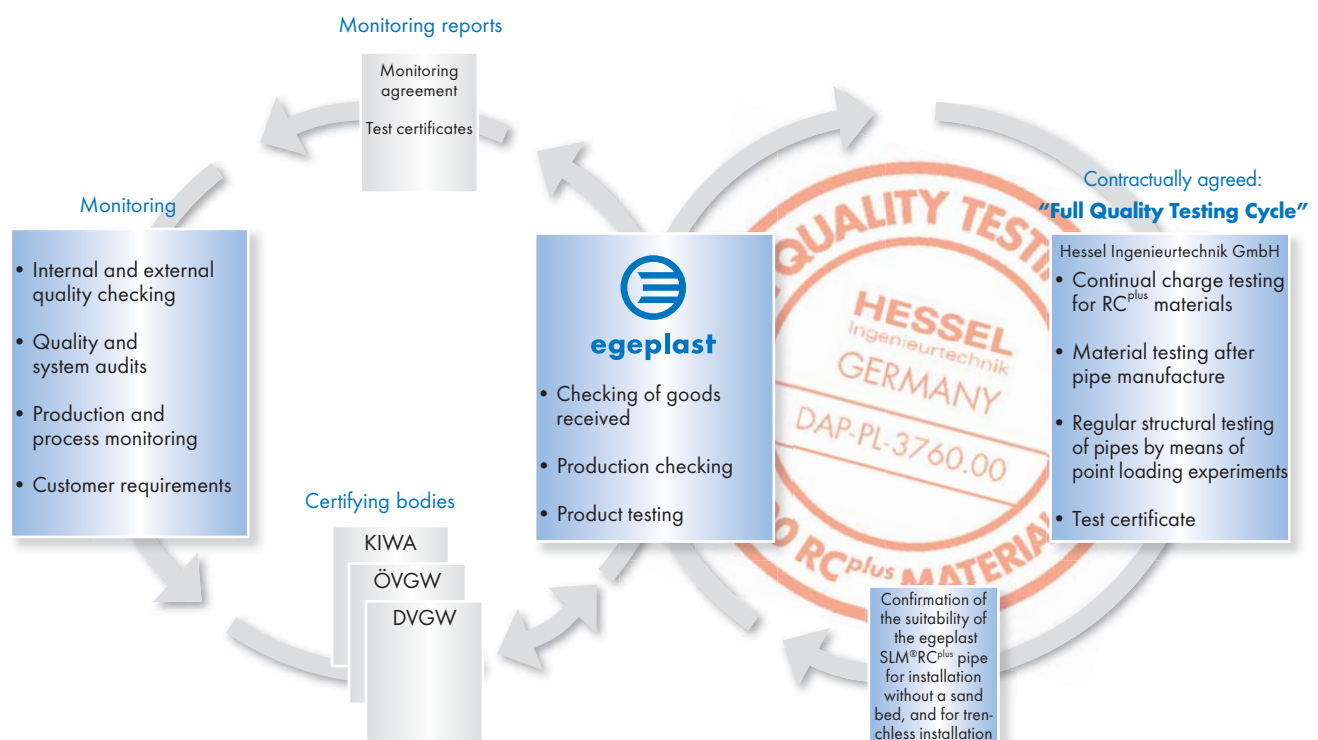
egeplast uses only selected PE 100 materials (PE 100 RC^{plus}) for the egeplast SLM[®] RC^{plus} pipe. These materials must demonstrate a time to failure of at least 8760 h in the FNCT. As an additional

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 SLM[®] RC^{plus} pipes are subjected regularly to such structural testing: an internal

pressure creep test lasting for one year, with additional point loading, at 80 °C (+2% Arkopal N 100).

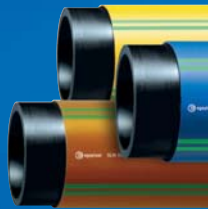
The PE 100 RC^{plus} materials perform distinctly better than the standard PE 100 types in both the notch and FNCT tests, with values that lie well above those stipulated for pipes with protective properties.

Continuous quality monitoring



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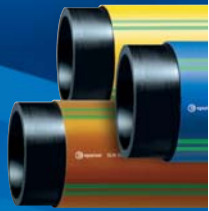


Testing of the Material PE 100 RC ^{plus}			
Property	Requirement	Test Procedure	Frequency
Melt index	as per specifications	EN ISO 1133:1999 Condition T 5 kg, 190°C 10 minutes	Min. 1 x per week as well as on every change of material and on every dimension check
Loss on drying	≤ 0.1%	Infrared method	per 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		approval testing
Odour and taste	as per KTW recommendation as well as DVGW GW 335 Part A2		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 5-2

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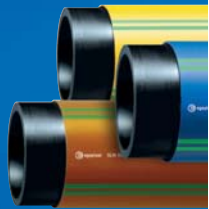
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Additional Testing of the Finished PE 100 RC ^{plus} Piping			
Property	Requirement	Test Procedure	Frequency
Labelling	as per DVGW GW 335 Part A2 DIN EN 12201-2 DIN EN 1555-2	visual inspection	regularly every 2 hours
Texture	as per DVGW GW 335 Part 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 5-3

The egeplast SLM[®] RC^{plus} pipe 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.



HESSEL
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 **SLM[®] RC^{plus}**-pipe 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 SLM[®] RC^{plus}-pipes 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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D-52159 Roetgen

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

Date: 11.05.2007

Authorized to sign:

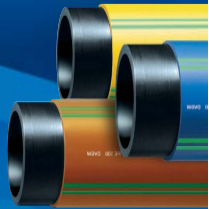
(Dr.-Ing. Joachim Hessel)

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

Fig 5-8

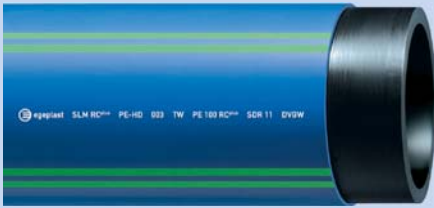
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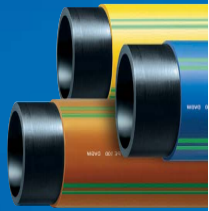
5.4 Technical Information

5.4.1 Product Data Sheet for egeplast SLM[®] RC^{plus} Drinking Water Pipes

Dimension:	OD 25 mm – OD 1200 mm
Pipe construction:	 • 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 toCrack) Protective coating: Patented, mineral-reinforced polypropylene coating, continuously extruded on during the manufacturing process
Approval:	DVGW*, SVGW, ÖVGW*, DIN-Gost*, IGNG*, DWI* *The approvals pertain to the medium-bearing pipe
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:	• 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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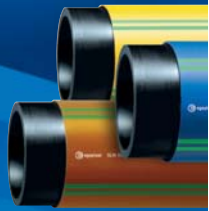


5.4.2 Product Data Sheet for egeplast SLM[®] RC^{plus} Gas Pipes

Dimension:	OD 25 mm – OD 1200 mm
Pipe construction:	 • 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 SDR 17; SDR 17.6; SDR 11
Material:	Medium-bearing pipe: PE 100 RC^{plus} (Resistance to Crack) Protective coating: Patented, mineral-reinforced polypropylene coating, continuously extruded on during the manufacturing process
Approval:	DVGW*, SVGW, ÖVGW*, DIN-Gost*, IGNG* *The approvals pertain to the medium-bearing pipe
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:	• 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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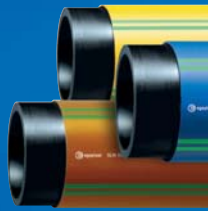


5.4.3 Product Data Sheet for egeplast SLM[®] RC^{plus} Sewage Pressure Pipes

Dimension:	OD 25 mm – OD 1200 mm
Pipe construction:	 • 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 SDR 17; SDR 11; SDR 7.4
Material:	Medium-bearing pipe: PE 100 RC^{plus} (Resistance to Crack) Protective coating: Patented, mineral-reinforced polypropylene coating, continuously extruded on during the manufacturing process
Approval:	The egeplast SLM [®] RC ^{plus} 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
Welding group:	003
Labelling:	With coloured metre marking on the medium-bearing pipe and additional marking of the protective coating
Delivery form:	• 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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egeplast SLM® RC^{plus}



5.4.4 Protection from Abrasion during Trenchless Installation

The egeplast SLM® RC^{plus} 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 mineral microparticles into the polypropylene

Scratch depth in mm



Fig 5-9: Results of scratch testing, official materials testing institute at the University of Hanover

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 5-9).

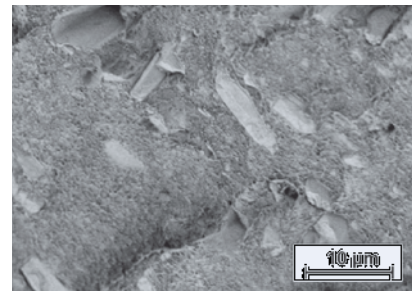


Fig 5-10: Mineral microparticles in the coating material

5.4.5 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 SLM® RC^{plus}.

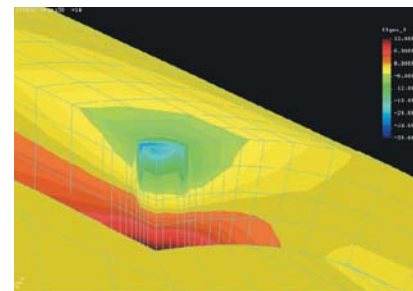


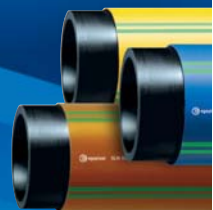
Fig 5-11: Finite element method (FEM) computational model, Muenster University of Applied Sciences, stress concentration: point and linear load safety line for coated pipe



Fig 5-12: Point load test using the Dr. Hessel method

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5.5 Installation Guidelines for egeplast SLM® RC^{plus} Pipes

Supplement to the installation instructions for PE pressure pipes A 135 and A435 from the Kunststoffrohrverband e.V. in Bonn

5.5.1 General Information on Installation

The egeplast SLM® RC^{plus} consists of a core pipe in accordance with DIN 8074/75, upon which a protective coating is additionally extruded in order to increase its scratch and abrasion resistance. The four green double stripes serve to identify it as a multiple layer pipe.

Scope of application

The installation instructions apply to soil covered egeplast SLM® RC^{plus} 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 pipeline components must be rated for use with their respective operating pressures.

Installation, open trench method



Open with sand bed



Open without sand bed

egeplast SLM® RC^{plus} 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 back-filling 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 determine the total cost of soil replacement and weigh that against the additional cost of the egeplast SLM® RC^{plus} pipe.

Installation, ploughing and milling



Ploughing



Cutting

The egeplast SLM® RC^{plus} pipe is flexible and manoeuvrable. These attributes make installation using the ploughing or milling procedures possible. The minimum allowable bend radius should be observed. The bend radius can, however, be under-stepped for a short time during the installation process, provided that the pipe string is supported by some mechanism, e.g. guide rollers, that makes kinking of the pipe impossible.

The increased stretching of the outer fibres which results from this is not critical for PE 100RC^{plus}, the material used here.

Installation, trenchless method



Soil displacement



Relining



Water jet drilling



Pipe bursting

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. Multilayer pipes such as the egeplast SLM® RC^{plus} 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 (horizontal directional drilling) and GW 323 (pipe bursting) rec-

ommend the use of pipes with protective coatings.

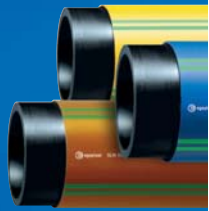
The DVGW regulations specify the maximum permitted tractive forces for trenchless installation procedures; these may not be exceeded. Over-shooting these limits leads to permanent damage to the new piping. egeplast recommends the use of suitable data loggers for complete documentation of the construction 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.

The egeplast installation guidelines should be followed so as to avoid edges at the joints.

5 Trenchless Installation and Renovation

egeplast **SLM[®] RC^{plus}**



5.5.2 Joining Techniques

Open trench installation, ploughing and milling – electrofusion welding

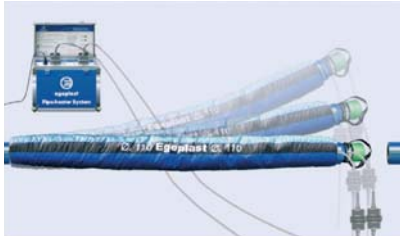


Fig 5-13: Straightening bundled coil and drum ends with the egeplast pipe-heater system



Fig 5-14: The pipe ends are prepared optimally for secure welding

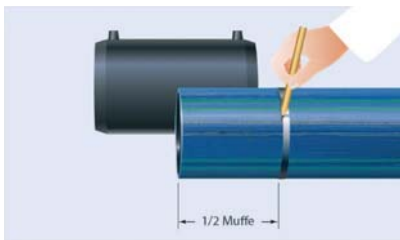


Fig 5-15: Marking the area from which the coating is to be peeled

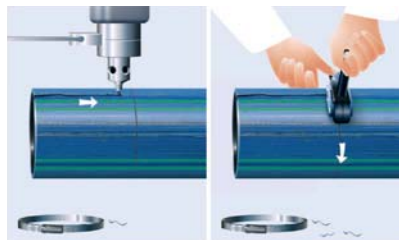


Fig 5-16: Removal of the protective coating with the egeplast coating cutter or with the egeplast M10 peeling tool



Fig 5-17: Removal of the oxide layer using a rotary scraper

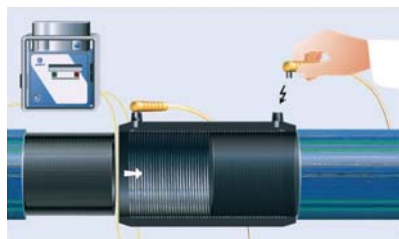


Fig 5-18: Welding in accordance with DVS 2207, Part 1

egeplast SLM[®] RC^{plus} 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.

Before electrofusion welding of egeplast SLM[®] RC^{plus} pipes the protective coating must be removed using an egeplast peeling tool (Fig 5-15/16). Peeling of the pipe ends can be carried out by egeplast on request.

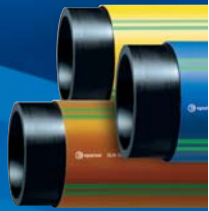
The length of coating to be peeled corresponds to at least half the length of the electrofusion coupler (see Tab 5-4). The contact surfaces must be prepared by scraping and cleaning before welding (Fig 5-17).

For stress free welding of pipe supplied as bundled coils, egeplast recommends use of the egeplast pipe-heater system (Fig 5-13/14).

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 5-18). 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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Open trench installation, ploughing and milling – butt fusion welding

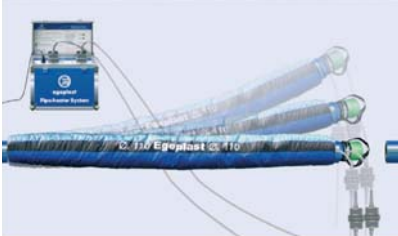


Fig 5-19: Straightening bundled coil and drum ends with the egeplast pipe-heater system



Fig 5-20: The pipe ends are prepared optimally for secure welding

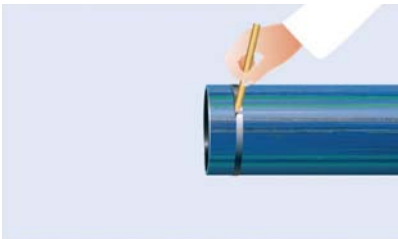


Fig 5-21: Marking the area from which the coating is to be peeled (see Table 5-4)

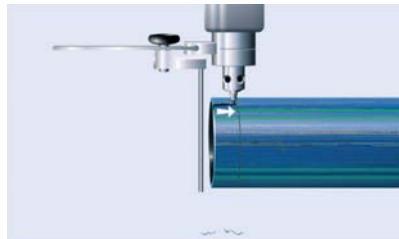


Fig 5-22: Removal of the protective coating with the egeplast coating cutter

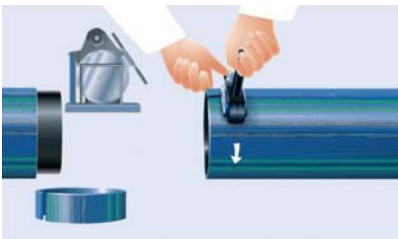


Fig 5-23: Removal of the protective coating with the egeplast M10 peeling tool

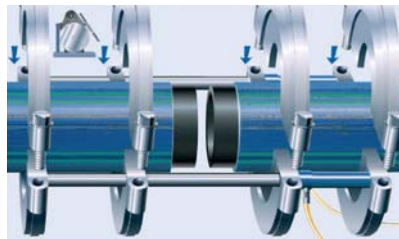


Fig 5-24: Fastening the special inserts available from egeplast (see Table 5-5)

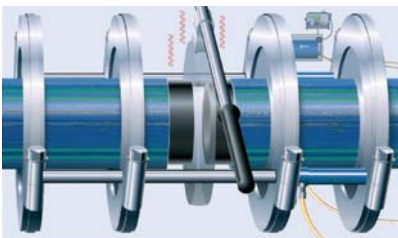


Fig 5-25: Welding in accordance with DVS 2207, Part 1

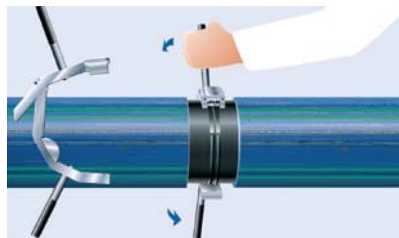


Fig 5-26: Removal of the weld bead with an external bead remover

egeplast SLM[®] RC^{plus} 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.

Before butt fusion welding of egeplast SLM[®] RC^{plus} pipes can take place, the protective coating must be removed using an egeplast peeling tool (Fig 5-21-23). It is advisable to use the M10 peeling tool and the outer layer cutter for this. Rotary scrapers are not recommended. Coat peeling of the pipe ends can be carried out by egeplast on request. Welding should be carried out in compliance with DVS 2207, Part 1 in standard welding machines, in which the use of inserts adjusted to the specific external diameter is recommended. Inserts suitable for welding machines from the Widos company can be supplied free of charge by egeplast (Tab 5-5).

For stress free welding of pipe supplied as bundled coils, egeplast recommends use of the egeplast pipe-heater system (Fig 5-19/20). The sequence of operations continues as specified in DVS 2207, Part 1, until the formation of a uniformly circular weld bead (Fig 5-25/26).

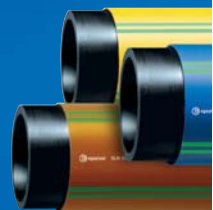
For open trench installation, and for ploughing and cutting using egeplast pipes with protective coatings, covering of the welded joint afterwards is not necessary.

Exception:

When using the mole ploughing method, the joints must be covered after welding as per the instructions "Pipe bursting – butt fusion welding".

5 Trenchless Installation and Renovation

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Pipe bursting – butt fusion welding



Fig 5-27: Straightening bundled coil and drum ends with the egeplast pipe-heater system

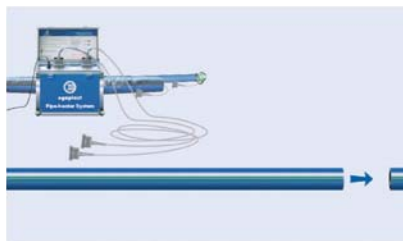


Fig 5-28: The pipe ends are prepared optimally for secure welding

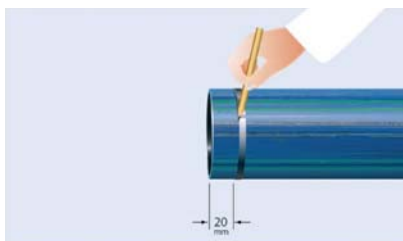


Fig 5-29: Marking the area from which the coating is to be peeled (see Table 5-4)



Fig 5-30: Removal of the protective coating with the egeplast coating cutter

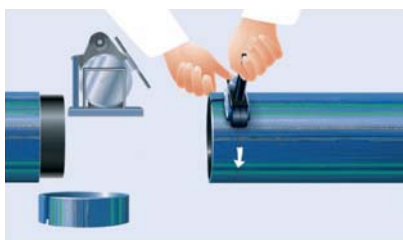


Fig 5-31: Removal of the protective coating with the egeplast M10 peeling tool

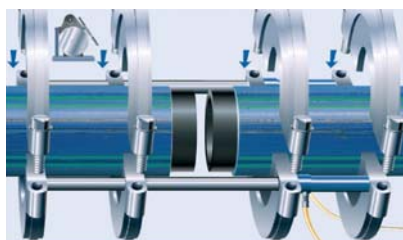


Fig 5-32: Fastening the special inserts available from egeplast (see Table 5-5)

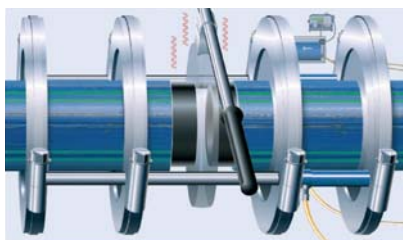


Fig 5-33: Welding in accordance with DVS 2207, Part 1

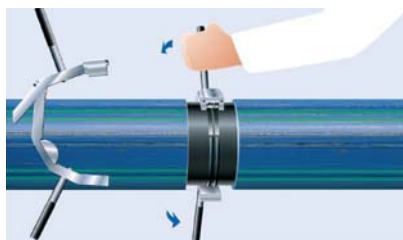


Fig 5-34: Removal of the weld bead with an external bead remover

egeplast SLM[®] RC^{plus} 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.

Before butt fusion welding of egeplast SLM[®] RC^{plus} pipes can take place, the protective coating must be removed for at least 20 mm using an egeplast coat peel tool (Fig 5-29-31). It is advisable to use the M10 peeling tool and the coating cutter for this. Rotary scrapers are not recommended. Peeling of the pipe ends can be carried out by egeplast on request. Welding should be carried out in compliance with DVS 2207, Part 1 in standard welding machines, in which the use of inserts adjusted to the specific external diameter is recommended. Inserts suitable for welding machines from the Widos company can be supplied free of charge by egeplast (Tab 5-5). For stress free welding of pipe supplied as bundled coils, egeplast recommends use of the egeplast pipe-heater system (Fig 5-27/28).

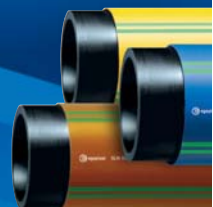
The sequence of operations continues as specified in DVS 2207, Part 1, until the formation of a uniformly circular weld bead (Fig 5-33/34).

According to DVGW Worksheet GW 323, suitable external protection is required for pipes made of PE 100 installed by means of trenchless methods using the pipe bursting procedure. The pipe's external protection must be reconstituted to give a flush outside surface. It is therefore mandatory with egeplast SLM[®] RC^{plus} to protect the area about the weld separately for pipe bursting installation. If the formation of the weld bead should reach beyond the thickness of the protective coating, then the bead is to be removed using an external bead remover.

Continued on the next page →

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Continued: pipe bursting – butt fusion welding

The unprotected area between the peeled ends of the coating has to be evened out and protected. In this way, a smooth pipe surface is created which does not offer any point of mechanical contact. The exposed PE pipe is to be roughened with sandpaper (or similar) to guarantee strong bonding. egeplast recommends the following alternative procedures for covering afterwards:

Alternative A: Covering with Densolid HK7

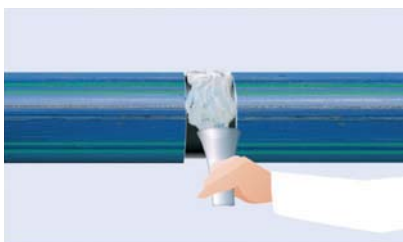


Fig 5-35: Coating with Densolid HK7

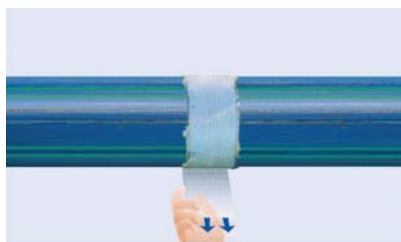


Fig 5-36: Laying down the fabric tape

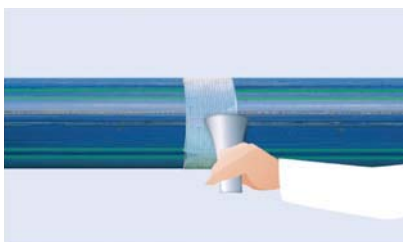


Fig 5-37: Smoothing out the filler material

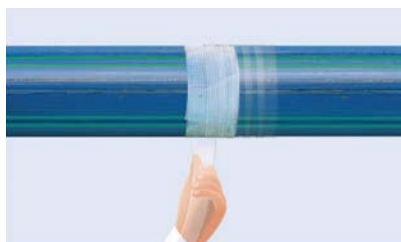


Fig 5-38: Smoother surface by wrapping with adhesive tape

Alternative B: Covering with resin-impregnated glass fibre wrapping

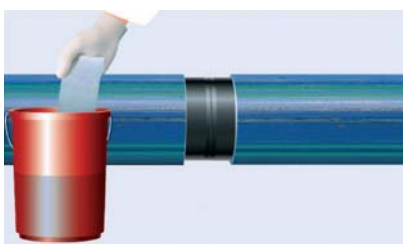


Fig 5-39: Soak the wrapping in clear water for 10-15 sec. according to the manufacturer's instructions

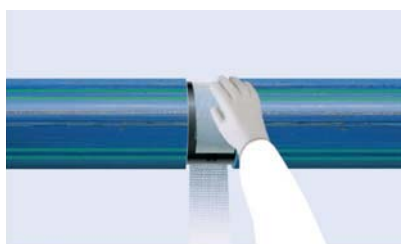


Fig 5-40: Wind the wrapping tautly around the weld area until it is flush with the protective coating

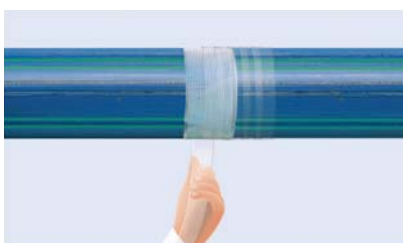


Fig 5-41: Bind the covered area liberally with adhesive tape for a more even hardening

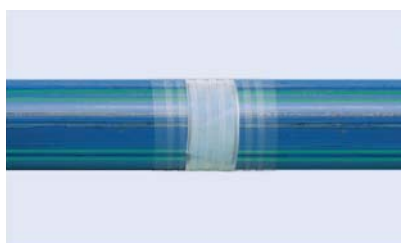


Fig 5-42: Do not put any strain on the pipeline until the wrapping has fully hardened

Densolid HK7 is a fast curing, impact resistant two-component filler material based on polyurethane. To reduce the curing time at lower temperatures, the faster reacting Densolid HK7-W should be used in winter. The filled ring should be reinforced additionally with polyester fabric mesh (e.g. Densolan ES) for external pipe diameters ≥ 110 mm (Fig 5-36). A single layer wrapping is sufficient for dimensions of 110-180 mm; for dimensions ≥ 180 mm, the fabric should be laid down in two layers in the filling coat before it has hardened. When using fabric tape, care should be taken to press the tape well into the resin so that the filler material permeates the mesh of the fabric well. The manufacturer's recommendations for handling are to be observed.

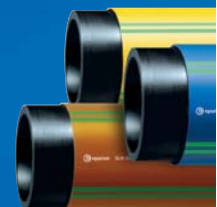
As an alternative to Densolid HK7, egeplast offers resin-impregnated glass fibre wrappings. These are activated with water. After soaking in clear water for ca. 10-15 sec, the wrapping is wound around the area to be insulated. In doing so, care should be taken that this area is fully wrapped, and that it is wrapped until it is flush with the protective coating. The wrappings are obtainable in widths between 2.5 cm and 12.5 cm, according to the exposed area to be covered. The finished area is bound liberally with adhesive tape afterwards for a more even hardening of the wrapping.

No strain should be put on the pipeline until the wrapping has fully hardened. The manufacturer's instructions are to be followed in doing so.

The continuously flush external surface required for pipe strings intended for use in trenchless installation procedures is guaranteed by the covering process described above.

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egeplast **SLM[®] RC^{plus}**



HDD – Horizontal directional drilling and relining – butt fusion welding



Fig 5-43: Straightening bundled coil and drum ends with the egeplast pipe-heater system

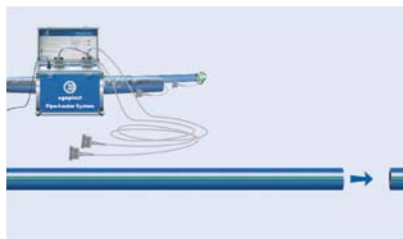


Fig 5-44: The pipe ends are prepared optimally for secure welding

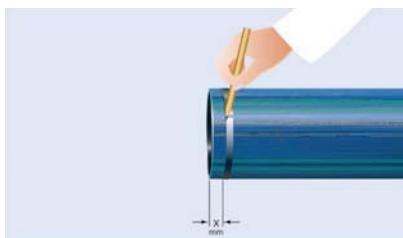


Fig 5-45: Marking the area from which the coating is to be peeled



Fig 5-46: Removal of the protective coating with the egeplast coating cutter

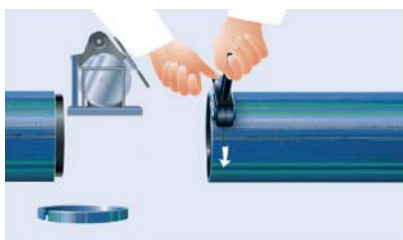


Fig 5-47: Removal of the protective coating with the egeplast M10 peeling tool

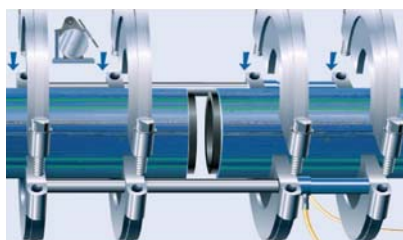


Fig 5-48: Fastening the special inserts available from egeplast (see Table 5-5)

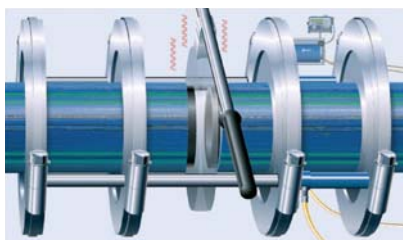


Fig 5-49: Welding in accordance with DVS 2207, Part 1

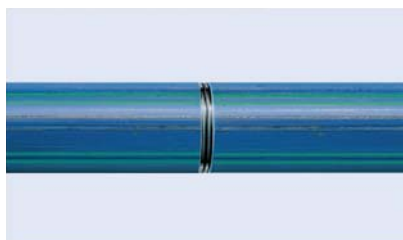


Fig 5-50: The finished weld

Before butt fusion welding of egeplast SLM[®] RC^{plus} pipes can take place, the protective coating must be removed using an egeplast coat peeling tool. For relining and horizontal drilling under easy soil conditions, the weld bead can be sufficient as protection for the weld zone. In this case, it is, however, necessary that the weld bead fills out completely the unprotected area between the polypropylene coatings. Fixed coat peeling lengths cannot be specified due to varying conditions at construction sites. Some guidance is offered by Appendix 1 of DVS 2202-1 (Acceptable Weld Bead Widths for Butt Fusion Weld Seams on Pipes made of PE and PP); see also Fig 5-57.

Oversized gap widths, which are not filled out by formation of the weld bead, must be covered over in accordance with the guidelines for pipe bursting – butt fusion welding (see page 15/16).

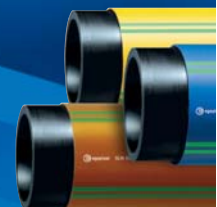
The use of special inserts is required to make sure that the pipe ends are properly clamped in the butt welding machine and to prevent damage to the protective coating (Fig 5-48). These are adjusted exactly for the thickness of the protective coating, which varies according to the core pipe diameter, and are available from egeplast.

For stress free welding of pipe supplied as bundled coils, egeplast recommends use of the egeplast pipe-heater system (Fig 5-43/44).

The sequence of operations continues as specified in DVS 2207, Part 1, until the formation of a uniformly circular weld bead (Fig 5-49/50). The weld bead must fill out the annular interstice between the protective coatings so that protection is provided for the core pipe during HDD or relining.

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Screw-clamp joints

egeplast SLM[®] RC^{plus} pipes can be joined using clamp connectors made of plastic or metal. Clamp connectors made of plastic must conform to DIN 8076 Part 3; those made of metal must conform to DIN 8076 Part 1 or 2.

The pipe end must be flared when using clamp joints with support bushings. This is usually accomplished by driving in the support bushings.

When assembling clamp joints, the pipe end should be chamfered on the inside without notching, and the protective coating is to be removed appropriately.

Flanged joints

The following types of design are commonly used for making flanged joints (see DIN 16963 Parts 4 and 8):

- Stub end for electrofusion welding
- Stub end for butt fusion welding

The axes of the pipeline sections to be joined must be aligned when making flange joints. The bolts should be tightened evenly in a crosswise sequence. Note: Use lapped flanges with steel inserts.

Welding of tapping fittings

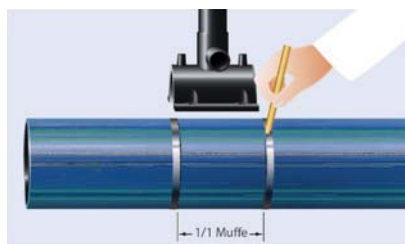


Fig 5-51: Marking the area from which the coating is to be peeled

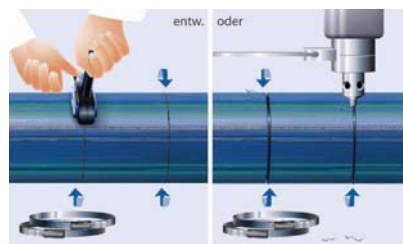


Fig 5-52: Removal of the protective coating with the egeplast M10 peeling tool or with the egeplast coating cutter

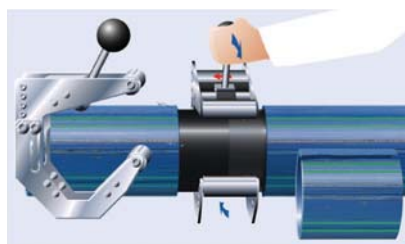


Fig 5-53: Removal of the oxide layer using a suitable scraping tool

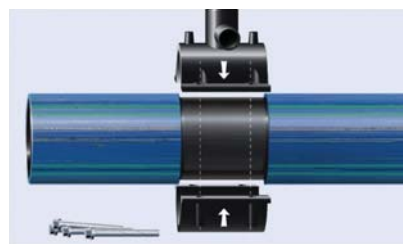


Fig 5-54: Mounting the tapping fitting according to the manufacturer's installation instructions



Fig 5-55: Welding the tapping fitting in accordance with DVS 2207, Part 1

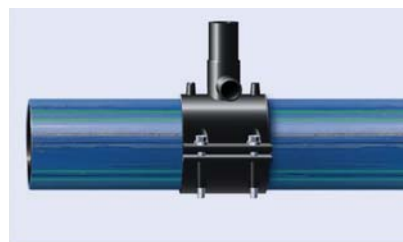


Fig 5-56: The tapping fitting is welded securely to the egeplast SLM[®] RC^{plus} pipe

There are, in general, two methods of mounting tapping fittings:

- Mounting of tapping valves with drill hole sealing bushes, System EWE for drinking water. These seal in the tapping hole and can therefore be used for pipes with multiple-layer protective coatings.
- When mounting welded tapping fittings, the protective coating on the relevant length of pipe must be removed.

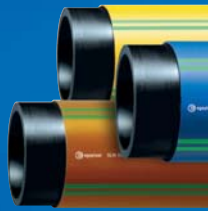
Use of the egeplast coat peeling tool

Coat peeling can be carried out with the egeplast M10 peeling tool (Fig 5-52). For OD above 160 mm, egeplast recommends the combined use of the coat peeling tool and the coating cutter.

A starting point must first be formed when using the M10 peeling tool. This can be done e.g. using a standard file. Great care should be taken to only file a hole in the coating and not the damage the core pipe. It is then possible, beginning from the prepared starting point, to cut back a section for the tapping fitting using the M10 peeling tool. Welding of the tapping fitting is to be carried out in accordance with DVS 2207-1 and the technical guidelines given by the manufacturer of the welded fitting.

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egeplast **SLM[®] RC^{plus}**



5.5.3 System Techniques

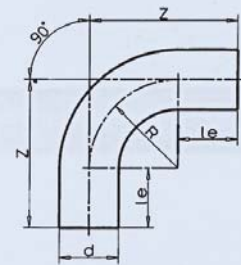
egeplast SLM[®] RC^{plus} pipes can be integrated into the pipeline network with all the moulded fittings and joining elements normally used in the trade. The manufacturers' instructions should be followed in doing so.

Moulded fittings are also offered as part of the egeplast SLM[®] RC^{plus} pipe system.

A selection of commonly used moulded fittings is shown for illustration below.

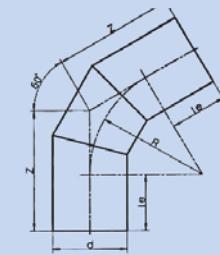
Seamlessly drawn elbow
made of PE 100 RC^{plus}

Constructed according
to requirements



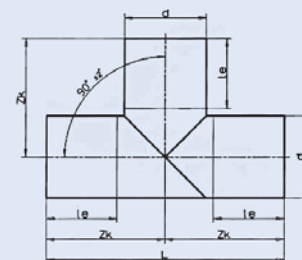
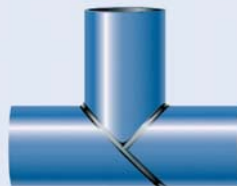
Segmented elbow
made of PE 100 RC^{plus}

Constructed according
to requirements



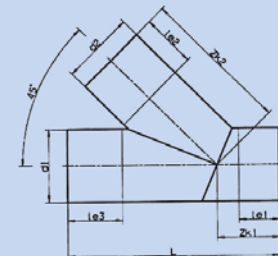
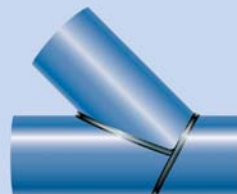
Segmented T-Pieces

Constructed according
to requirements



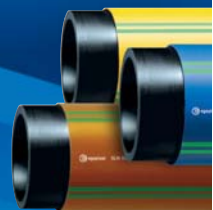
Branches

Constructed according
to requirements



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egeplast SLM® RCplus



5.5.4 Tables

Coating backcut recommended for the pipe bursting installation procedure, open trench installation, ploughing, and cutting

Before electrofusion welding or butt fusion welding of egeplast SLM® RCplus pipes can take place, the protective

coating must be removed with egeplast peeling tool. Coat 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.

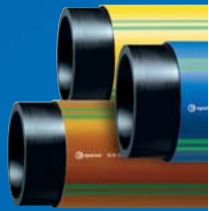
Coating Backcut for the egeplast SLM® RCplus				
Medium-Bearing Pipe DIN 8074 OD [mm]	Butt Fusion Welding [mm]	Electrofusion Welding* [mm]	When Using Widos External Bead Removers [mm]	
25	30	40	-	-
32	30	45	-	-
40	30	50	-	-
50	30	55	-	-
63	30	65	-	-
75	30	70	-	-
90	30	80	-	-
110	30	90	35	Size 1
125	30	95	35	Size 1
140	30	100	35 40	Size 1 Size 2
160	30	105	35 40	Size 1 Size 2
180	30	110	40	Size 2 Size 3
200	30	115	40	Size 2 Size 3
225	30	125	40	Size 2 Size 3
250	30	135	40	Size 3
280	30	140	40 50	Size 3 Size 4
315	30	150	40 50	Size 3 Size 4
355	30	155	50	Size 4
400	30	165	50	Size 4
450	30	175	50	Size 4
500	30	185	60	Size 5
560	30	190	60	Size 5
630	30	205	5060	Size 5 Size 8

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

Tab 5-4: * Dimensions specified for the product ranges of the Georg Fischer, Friatec, and Plasson companies

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egeplast **SLM[®] RC^{plus}**



Guiding values for the coating backcut required for butt fusion welding – HDD and relining

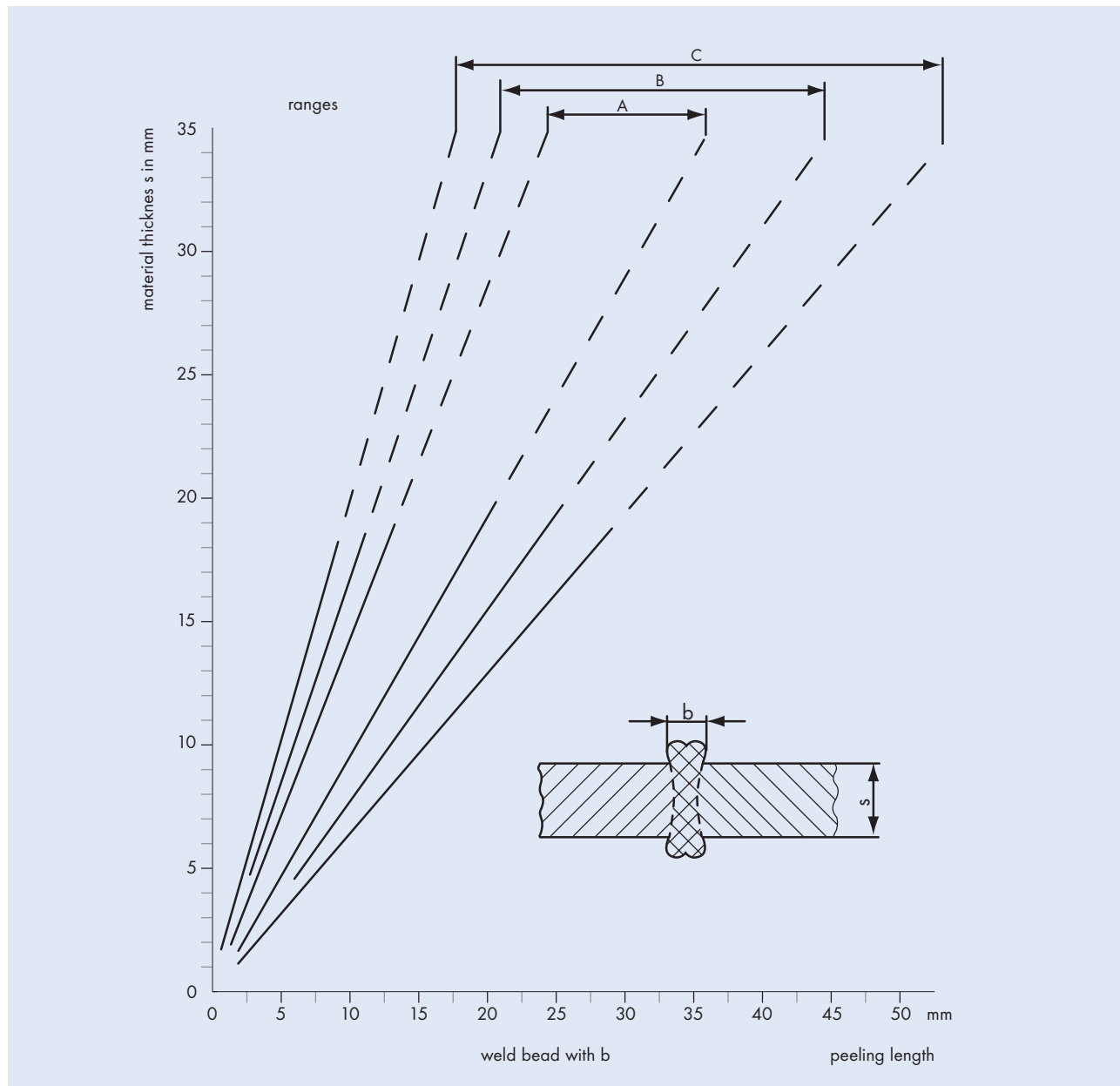


Fig 5-57: Bead width according to DVS Guideline 2202-1

Note:

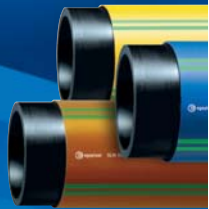
For relining and HDD under easy soil conditions, the weld bead can be sufficient as protection for the weld zone. In this case, it is, however, necessary that the weld bead fills out completely the unprotected area between the polypropylene coatings. Fixed coat peeling lengths cannot be

specified due to varying conditions at construction sites. Overly wide gaps, in which soil or stones could become trapped as the pipe is drawn in, are to be avoided. Some guidance is offered by Appendix 1 of DVS 2202-1 (Acceptable Weld Bead Widths for Butt Fusion Weld Seams on Pipes

made of PE and PP). The diagram provides guiding values; these must be adjusted by carrying out test welds. egeplast applications engineering is pleased to assist with determining this adjustment.

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egeplast **SLM[®] RC^{plus}**



Overview of external and medium-bearing pipe diameters for egeplast SLM[®] RC^{plus} inserts for butt welding machines

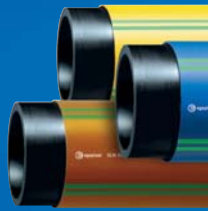
For welding, the pipe ends are gripped with inserts* which are specially adjusted to the egeplast SLM[®] RC^{plus} outer diameter so that the pipe ends to be welded can be fixed securely.

Medium-Bearing Pipe DIN 8074 OD [mm]	Outer Diameter of the egeplast SLM [®] RC ^{plus} Pipe with Protective Coating [mm]
25	26,9
32	34,3
40	42,6
50	52,8
63	66,1
75	78,3
90	93,6
110	114,2
125	129,5
140	145,0
160	165,6
180	187,0
200	207,0
225	232,0
250	257,0
280	287,0
315	322,0
355	362,0
400	410,0
450	460,0
500	510,0
560	570,0
630	640,0
710	720,0
800	810,0
900	910,0
1000	1010,0
1200	1210,0
Subject to manufacturing tolerances	

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

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Material requirements for covering with DENSOLID HK7/HK7-W and DENSOLAN ES

Densolid HK7/HK7-W

For a layer thickness of 3 mm, one dual pack is sufficient for an area of ca. 600 cm².

The requirements given are based on a backcut of 20 mm to the protective layer, on both sides, for egeplast SLM[®] RC^{plus} pipes.

Densolan ES fabric tape

The approximate quantity of DENSOLAN ES tape is given for...

DENSOLAN ES is supplied as rolls of 15 m in widths of 35 mm and 60 mm.

...dimensions up to OD 160 mm by

OD 3.2 running metres

...dimensions from OD 180 mm by

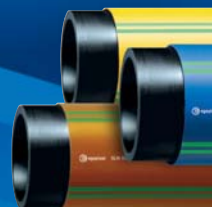
OD 6.4 running metres

OD [mm]	egeplast SLM [®] RC ^{plus} Quantity of HK7/HK7-W Units / Weld Seam	egeplast SLM [®] RC ^{plus} Quantity of Densolan ES Tape Metres / Weld Seam
25	0.20	-
32	0.20	-
40	0.20	-
50	0.20	-
63	0.20	-
75	0.25	-
90	0.35	-
110	0.50	0.40
125	0.50	0.40
140	0.50	0.50
160	1.00	0.60
180	1.00	1.20
200	1.00	1.40
225	1.00	1.60
250	2.00	1.60
280	2.00	1.80
315	2.00	2.10
355	2.00	2.30
400	3.00	2.60
450	3.00	2.90
500	3.00	3.20
560	3.00	3.60
630	4.00	4.10
710	4.00	4.60
800	5.00	5.20
900	5.00	5.80
1000	6.00	6.40
1200	7.00	7.70

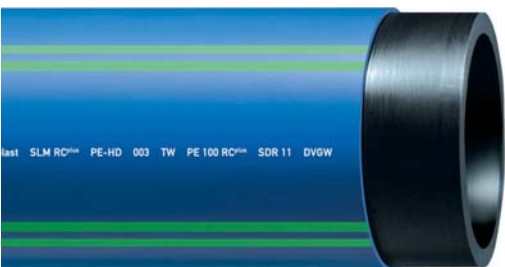
Tab: 5-6

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egeplast SLM® RC^{plus}



5.6 RFP Forms



5.6.1 RFP Form for egeplast SLM® RC^{plus} Drinking Water Pipe

Preliminary note:

Drinking water 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 a continuously extruded protective coating, added subsequently, 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.

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 manual. The piping is to be stored and transported on the building site in compliance with the KRV guidelines.

Product:

egeplast SLM® RC^{plus} drinking water 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 SLM® RC^{plus} drinking water pipe
made of PE 100 RC^{plus} with dimensions:

_____mm, SDR_____

☐ delivered as straight lengths of 6 / 12 m

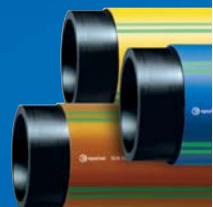
☐ delivered as bundled coils in lengths of _____m

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

drinking water pipe: _____€ / running metre

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egeplast **SLM[®] RC^{plus}**



5.6.2 RFP Form for egeplast SLM[®] RC^{plus} Gas Pipe



Preliminary note:

Gas 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 a continuously extruded protective coating, added subsequently, made of mineral-reinforced yellow-orange polypropylene akin to RAL 1033, with 4 yellow-green double stripes akin to RAL 6018, in accordance with the recommendations of DVGW Worksheets GW 321 and GW 323.

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 manual. The piping is to be stored and transported on the building site in compliance with the KRV guidelines.

Product:

egeplast SLM[®] RC^{plus} gas 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 SLM[®] RC^{plus} gas pipe
made of PE 100 RC^{plus} with dimensions:

_____mm, SDR_____

☐ delivered as straight lengths of 6 / 12 m

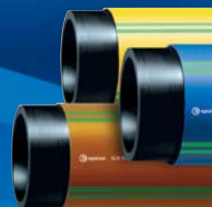
☐ delivered as bundled coils in lengths of _____m

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

gas pipe: _____€ / running metre

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egeplast SLM® RC^{plus}



5.6.3 RFP Form for egeplast SLM® RC^{plus} 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; $T=80^{\circ}\text{C}$, $\sigma = \frac{N}{\text{mm}^2}$, 2% Arkopal), pipe colour black. Verified in accordance with DIN 8075 as well as DIN Certco in accordance with ZP 14.3.1, labelled with the DIN Certco DINplus mark of conformity, with a continuously extruded protective coating, added subsequently, 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.

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 manual. The piping is to be stored and transported on the building site in compliance with the KRV guidelines.

Product:

egeplast SLM® RC^{plus} 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 SLM® RC^{plus} sewage pressure pipe
made of PE 100 RC^{plus} with dimensions:

_____mm, SDR_____

☐ delivered as straight lengths of 6 / 12 m

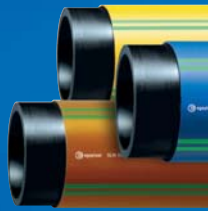
☐ delivered as bundled coils in lengths of _____m

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

sewage pressure pipe: _____€ / running metre

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5.7 Recycling and Environmental Protection



Fig 5-58

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 5-59: 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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