

Installation Instructions

Ducts and Fittings of High-Density polyethylene (PE-HD) for buried cable ductings



Contents

	page
General	3
Scope	3
Transport and storage of the conduit parts	3
Installation in the open trench	4
Installation of the conduit parts and connection of the ducts	5
Spacers	7
Directional changes in the duct route	7
Duct connections	8
Clamp and screw connections	8
Sealing socket connections	8
Creation of sealing socket connections	9
Connection to buildings	9
Subsequent works on installed pipelines	9
Backfilling and compacting	9
Leak test	10
Calibration	10
Special measures	10
Alternative installation techniques	10
Standards and regulations	11
Bibliographic references	11

General

The installation of cable ducts and fittings of polyethylene (PE-HD) is to be carried out by skilled workers under experienced supervision. During the building-up of the pipelines the additional technical regulations of the network operators (contractor) are to be respected.

Apart from this, the accident prevention regulations of the industrial trade associations/ industrial safety examinations and other involved authorities must be adhered to.

Scope

These instructions are valid for the installation of ducts and fittings acc. to DIN 16876 „Ducts and Fittings of High-Density polyethylene (PE-HD) for buried cable ductings – Dimensions and technical delivery conditions“.

Transport and storage of the conduit parts

PE-ducts may be transported in their original packaging in a temperature range from -20°C to 50°C with no problems. For bulk stacking, a deformation of the duct with duct temperatures $> 35^{\circ}\text{C}$ is to be avoided. This is carried out by reducing the stack height or by covering with white foil.

The conduit parts must be transported with suitable vehicles and loaded on and off by experienced personnel.

The storage and the transport of the ducts and fittings must be carried out at site in such a way that no lasting deformation or damage may occur.

The stockyard should be even so that a sufficient supporting surface is provided. Coils are to be stored horizontally. Other forms of storage require appropriate measures (danger of buckling). Following measure for the storage of bars has proven effective:



Racked ducts bundles may be stacked. Condition is that the wooden parts lie on top of each other.

If the ducts are not delivered in bundles, the stack height of bulk ducts may not exceed 1.0 m. The stack must be secured to the side.

Ducts and fittings, if stored in the open air for a long time, should be protected from direct sunlight, e.g. by covering.

Unilateral sunlight may cause curvatures, particularly at thin-walled tubes, due to the temperature differences (banana effect). This process may be avoided or reversed by covering the ducts, for example.

Contact with damaging media, like motor fuel, solvents or similar substances is to be excluded (see detail in regulation DVS 2205-1 – enclosure media list).

Installation in the open trench

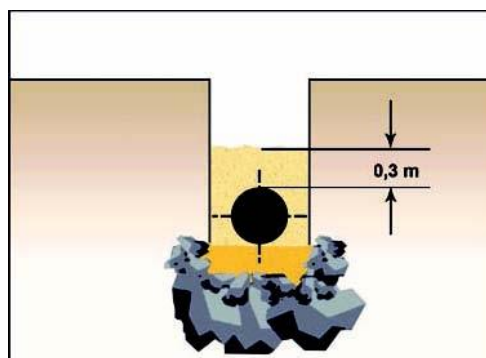
With regard to the type of the trench, the definitions of DIN 4124 apply.

Ducts and fittings may be installed in standard depths according to table 1 and in compliance with the installation conditions acc. to worksheet ATV-DVWK-A 127 under the boundary conditions (90% proctor density), no groundwater, soil G1, trench width acc. to DIN EN 1610. When laying in bundles, SDR series ≤ 6 have to be chosen. Under these conditions a separate static proof is not required.

Table 1: Installation depth

no-traffic zones		traffic zones up to SLW 60	
SDR 33	SDR 26	SDR 17,6	SDR 11
0,8 m – 4 m		0,8 m – 5 m	

Only stone-free and compressible material may be used for the trench floor and the duct embedment.



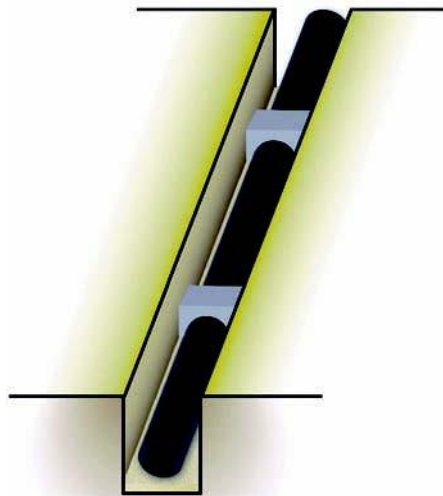
Before the installation process the trench floor is to be vibrated with a light compressing device.

In rocky or stony ground the duct trench is to be dug out at least 0,15 m deeper and the spoil is to be replaced with a rock-free deposit (sand, fine gravel with maximum grain of \varnothing 20 mm).

With non-load bearing and strongly aqueous trench floors as well as the danger of washing out of the backfill material due to a changing water table, a stabilization is to be secured by suitable measures.

Bearings and beddings of the duct and fitting are to be carried out acc. to DIN EN 1610.

With suitable measure it must be avoided in steep areas that the duct embedding floats off and the conduit washes away. In sloping and steep areas the conduit is also to be secured against subsiding, for example with bolts:



If possible, the duct connection lines must be kept free for the pressure test.

Installation of the conduit parts and connection of the ducts

Prior to the installation, the pipeline parts must be checked for damages and similar harm and to be cleaned in the connecting areas. The connecting area must be free from damage in order to achieve a lasting sealing.

The pipeline components should be checked prior to installation damage and similar impairments and to clean the connection area. The connection portion has to be free of damage in order to achieve a lasting seal.

Grooves and scratches on the duct may not be deeper than 10% of the admissible minimum duct wall thickness. Damaged parts are to be rejected.

During the installation the ducts and the fittings should have approximatively the same temperature. They may be installed in a temperature range of -5°C up to 35°C . For polyethylene ducts, the longitudinal alterations caused by temperature are to be observed

The cutting of the pipes must be carried out if necessary with a fine-toothed saw or a suitable pipe cutter. The tubes must be cut at right angles.

Ridges and unevennesses on the boundaries are to be removed with a suitable tool, e.g. a coarse file, retracting blades or scrapers. During this, cuts and nicks are to be avoided.

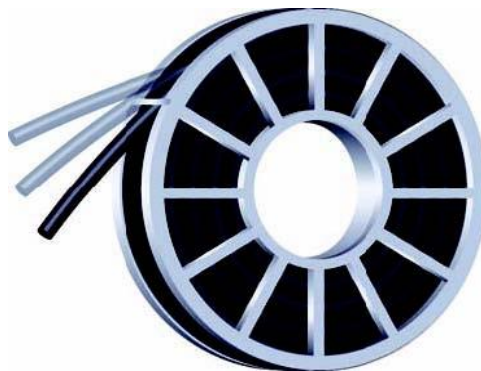
If necessary, the duct extremities must be worked on according to the type of connection. The unspooling of the duct from a coil can take place in various ways. With ducts up to an outside diameter of up to 63 mm, in general the coil is unspooled in vertical position, whereby the beginning of the duct is to be fixed.

With larger dimensions it is recommended to use an unspooling apparatus. The regulations of the apparatus manufacturer are to be observed.



The ducts are to be unspooled straightly and may not be bent.

Unspooling the ducts from drums or coils it must be noted that the ends of the ducts or single layers may spring quickly away on losing the fixing. After fixing the duct end, the bindings are to be loosened continuously.



As particularly with larger ducts considerable forces are set free, corresponding care is to be taken (danger of accident).

Moreover, it is to be noticed during unspooling that the flexibility of the duct is affected by the ambient temperature. With temperatures near to frost, it is recommended for the simple handling, to warm up the still wound up ducts by storage in a heated tent or hall over a period of time of several hours. A warming up with open flame is not admissible.

All ducts are to be installed tension-free. For achieving a tension-free installation, the temperature related longitudinal alteration of the ducts must be observed. With the increase or the decrease of the duct wall temperature by 1 Kelvin (1 K = 1°C), a PE-HD duct lengthens or shortens by 0.2 mm per metre length.

Before setting a fixed point (e.g. chamber connection) the duct must be adjusted to the soil temperature. The adjustment time should be at least 2 hours. For this purpose, a cover by partial filling or protection of the pipeline parts against direct sun rays is recommended.

Spacers

For multi-layer arrangement of protective ducts in duct trenches, it is advisable to fix the ducts by means of spacers.

To avoid point loading of the ducts, the width of the bearing surface should be adapted to the duct dimensions. The width of the bearing surface should not fall below 0.13 to 0.15 xd .



Directional changes in the duct route

For directional changes in the duct route prefabricated bends are used. In a restricted way, the elasticity of the duct material may be used for coils, drums and longitudinally actuated connections for bending the duct without being warmed. The smallest bending radius permitted in this process is dependent on the installation temperature and may not fall below the value indicated in table 2.

Table 2: Smallest permissible bending radius

Pipe temperature	Smallest permissible bending radius R			
	SDR 11	SDR 17,6	SDR 26	SDR 33
20°C	20 x d		30 x d	
10°C	35 x d		45 x d	
0°C	50 x d		60 x d	

Duct connections

Following types of connections are used for cable ductings acc. to DIN 16876 of PE-HD:

- Clamp and screw connections;
- Sealing socket connections.

Welded connections for ducts of PE acc. to DIN 16876 are not intended. Therefore they require the duct manufacturer's release.

Clamp and screw connections

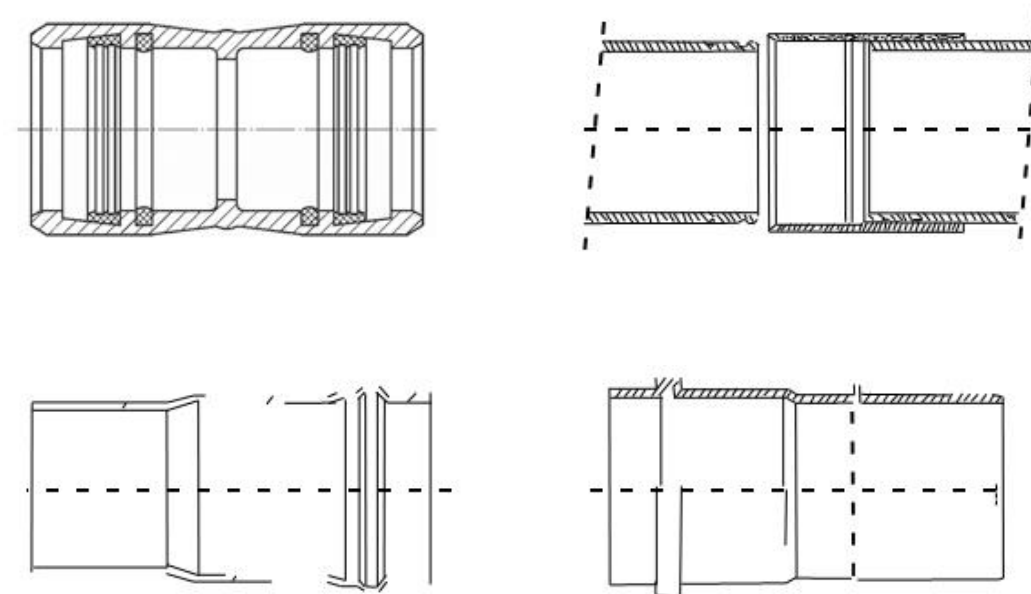
Connections that are used where traction and pressure resistant connections (see DIN 16876) are required, e.g. for the injection of cables. The duct connectors must meet the requirements of DIN 8076. The manufacturer's instructions are to be observed for the installation.



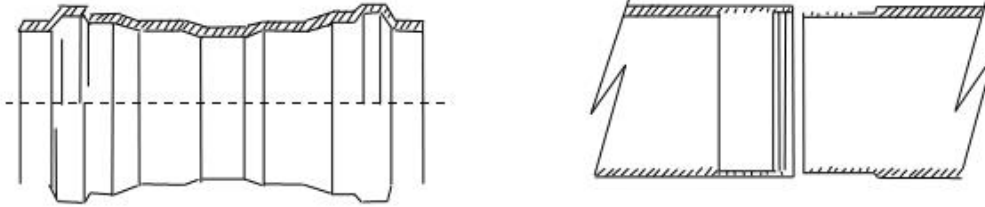
Example for screw and clamp connectors

Sealing socket connections

An elastomer sealed, not longitudinally actuated connection, which is realized as preformed socket as well as double sealing socket and push-fit socket.



Examples for elastomer sealed connectors



Examples for elastomer sealed connectors

Creation of sealing socket connections

The type of connection is to be carried out according to the manufacturer's instructions.

- Check position and intactness of the sealing ring;
- chamfer the insertion side of the duct with a chamfering tool or a coarse file in an angle of 15° and remove the burr
- apply thinly the lubricant, recommended by the manufacturer
- push the duct into the socket up to the end stop. A marking should serve as push control

Connections to buildings

Connections to buildings must be carried out using suitable conducts.

Subsequent work on installed pipelines

For the repair of empty channels, the damaged pipe section is separated by vertical cuts to the duct axis. After chamfering both duct ends, a double sealing socket with a longer socket part is pushed on the duct ends up to the stop end. The distance between both double sockets is measured.

The fitted length with chamfered ends is pushed in one of the double sockets up to the end stop and the opposite double socket is pushed back to the end stop of the fitted length.

Suitable repair kits have to be used for the repair of occupied channels.

Backfilling and compacting

The compacting contributes directly to the stability of the buried line and must therefore be carried out carefully.

On both sides of the pipeline, stone-free compressible soil (max. grain size \varnothing 20 mm) is to be deposited in layers up to 0,3 m and compacted by hand or with light mechanical device. The ducts may not be shifted laterally. Ducts with small nominal diameter must be secured in their altitude during the embedding.

During the backfilling and compacting, the DIN EN 1610 is to be observed. Special attention is to be paid to the lateral compaction, in order to avoid a subsequent deformation of the ducts. As possible, the duct joints shall be kept free for the leak test.

Leak test

The pipeline is to be tested for tightness. The requirements concerning the acceptance terms must be coordinated with the contractor.

If no other demands are made concerning the tightness, the pressure test is to be carried out in sections with air (over pressure 200 mbar) before filling the trench. The specifications in DIN EN 1610 have to be observed.

Calibration

After the pressure test, a calibration must be carried out. The calibre to be used is to be agreed on with the contractor in dependence of the intended occupancy of the cable conduit. The different ovalities of the material in coils or in bars must be observed.

Special measures

Depending on the intended occupancy of the underground protection conduits, safety distances at intersections and parallel installations must be observed to comply with the relevant regulations and rules.

Alternative installation techniques

Ducts of polyethylene may partially be used for alternative installation techniques acc. to DIN 16876. The approved installation methods and limits for use must be coordinated with the duct manufacturer.

Standards and Regulations

DIN 4124	Excavations and trenches – slopes, planking and strutting breadths of working spaces / Baugruben und Gräben -Böschungen, Verbau, Arbeitsraumbreiten
DIN 8076	Pressure pipelines made from thermoplastics material – Metal and plastics compression fittings for polyethylene (PE) pipes – General quality requirements and testing Druckrohrleitungen aus thermoplastischen Kunststoffen -Klemmverbinder aus Metallen und Kunststoffen für Rohre aus Polyethylen (PE) – Allgemeine Güteanforderungen und Prüfung
DIN 16876	Pipes and fittings of high-density polyethylene (PE-HD) for buried cable ducting – Dimensions and technical delivery conditions Rohre und Formstücke aus Polyethylen hoher Dichte (PE-HD) für erdverlegte Kabelschutzrohrleitungen -Maße und technische Lieferbedingungen
DIN EN 1610	Construction and testing of drains and sewers Verlegung und Prüfung von Abwasserleitungen und -kanälen
Work sheet ATV-DVWK-A 127	Static calculation of drains and sewerd Statische Berechnung von Abwasserkanälen und -leitungen
Regulation	Calculation of containers and apparatuses made of thermoplastics DVS 2205 - parameter Berechnung von Behältern und Apparaten aus Thermoplasten DVS 2205-1 – Kennwerte

Bibliographical reference

Kunststoffrohr-Handbuch; Rohrleitungssysteme für die Ver-und Entsorgung sowie weitere Anwendungsgebiete; 4. Auflage, Vulkan-Verlag Essen; ISBN 3-8027-2718-5.