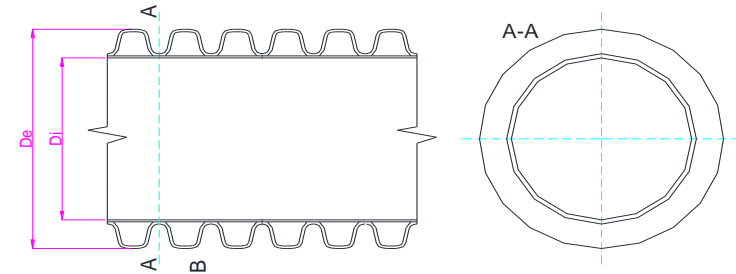


EN 61386-24



Applications: conduits for underground protection buried L.V. (*) cable and optical fibres

Technical data:

In keeping with:

- CEI EN 50086-2-4:94 + A1:2001 norm (buried underground conduits) - meeting the requirements of L.V. D. 73/23/EEC and further emendments
- EN 61386-24: Conduit systems for cable management - particular requirements for for conduit systems bburied underground

Protection and management of insulated conductors and/or cables in electrical installations or in communication systems up to 1.000 V a.c. and/or 1.500 V d.c.

Scope:

Conduits can be used also for M.V. cable protection, after approval of contracting authority and construction supervision

Quality Certifications: Third-Party certification issued by IMQ (for further valid certificates check relevant pricelist)

Raw Material: Outer wall: HD-PE - Inner wall: HDPE

Colour: Outer profiled layer colour: GREY RAL 7035; Inner smooth layer colour: BLACK

Joint: By sliding sleeves

Accessories: Sliding socket made of PE and internal wire made of PET or PP

Installation procedure: According to National laws and present specification

Package: Coils 50 m lenght (25 m for DN200) with sleeve and internal wire. Strapped with No. 6 tied polypropylene strings

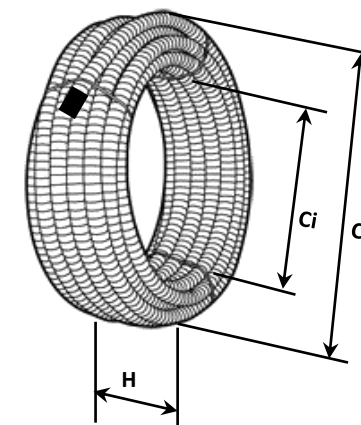
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Technical features:

Property	Test method	Test parameters	Designation
Compression test	EN 61386-24, 6.1.1	sample deflection = 5% of inner diameter	Type 450 (450 N)
Resistance to impact	EN 61386-24, 6.1.2	EN 61386-24, par. 10,3	Type L for DN 40-50, type N for DN ≥ 63
Resistance to bending	EN 61386-24, 6.1.3	EN 61386-24, par. 10,4	max. bending diam. = 8*DN

Conduit systems type 450 and above are intended to be directly buried underground without additional precautions

Dimensions :

DN/OD	mean outside dia.		mean inside dia.		Coil length (m)	Coil dimensions (cm)			Remarks
	min	max	reale/act.	min. std.		Ce	Ci	H	
40	40	40,8	31	> 30	50 ± 1%	65	35	36	a
50	50	51	40	> 37	50 ± 1%	76	36	42	a
63	63	64,2	51	> 47	50 ± 1%	103	43	31	a
75	75	76,4	61	> 56	50 ± 1%	103	35	37	a
90	90	91,7	75	>> 67	50 ± 1%	118	36	40	a
110	110	112	96	>> 82	50 ± 1%	124	43	52	a
125	125	127,3	106	>> 94	50 ± 1%	145	58	52	ab
140	140	142,6	122	>> 106	50 ± 1%	160	60	56	a
160	160	162,9	139	>> 120	50 ± 1%	170	54	52	ab
200	200	203,6	180	>> 150	25 ± 1%	170	45	70	a



- (1) Preferred values according to EN 61386-24
 (a) IMQ certified
 (b) Mechanical properties in keeping with spec. ENEL DS4247-1999

EN 61386-24

TECNICAL GUIDE FOR USE & INSTALLATION

TRANSPORT

Suitable vehicles shall be used, with flat platforms and no sharp edges which may damage the pipes.

Load carefully the pipes and secure them by suitable connections at the truck. In the loading lay-out, take care in order to avoid any coil deformation or buckling

DOWNLOADING & HANDLING

- Use suitable devices for downloading and handling the pipes.
- During downloading:
 - 1) bulk coils:
 - 1A) $DN \leq 110$: pallets or protection boards shall be used, where to lay and stack coils while handling & moving. Stack height H shall be chosen in order to guarantee operators' safety and tumbling of coils from stack (typically: $H < 1,4$ m)
 - 1B) $DN > 110$: transport coils individually; apply protections to forks before lifting coils
 - 2) coils in packaged pallets: download and move pallets individually
- Avoid cracks, injuries, abrasions and impingements and any other damage. The safety of the operator shall be ensured any case.

RECEPTION OF GOODS

While downloading always check the conformity of the goods to the purchase specs and/or the reference norms, in particular:

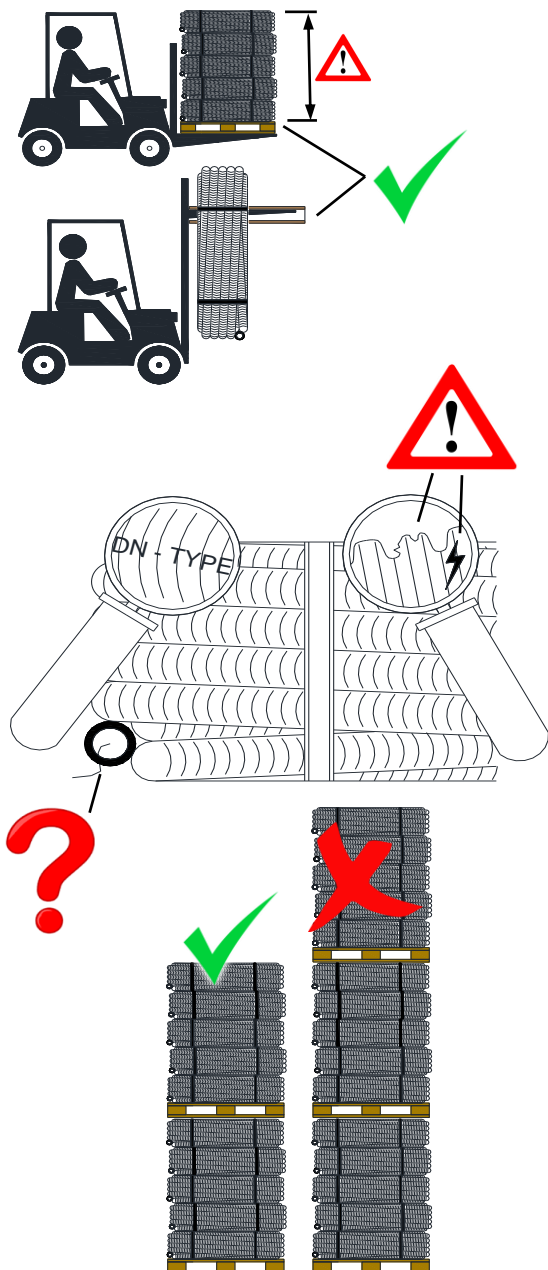
- check indications given by marking;
- check macro defects of geometry / appearance or any other visible defect (e.g. abrasion, surface conditions);
- check the reliability of the joint elements and the presence of the internal wire

STOCKING & STACKING

Stock the pipes by laying them on a flat surface, with large wooden tables put at a suitable distance, without sharp edges, steady, protected and sheltered. In

particular:

- 1) bulk coils: stack coils horizontally; lay the stack on pallets or suitable wooden frames; stack height H shall not exceed 1,4 m.
- 2) coils in packaged pallets: Stack up to 2 pallets, provided they are identical

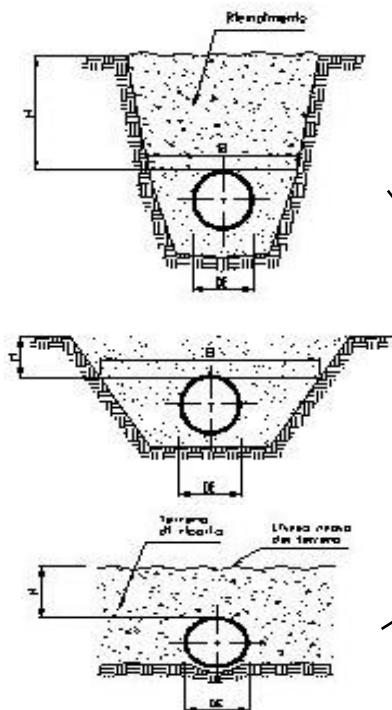


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TRENCH CLASSIFICATION

Trench type is dependent from installation depth -H- and trench width -B- related to nominal size DN (DE) of conduit

Trench type shall be chosen according to type of native soil, installation depth and need to guarantee safety of personnel involved in conduit laying



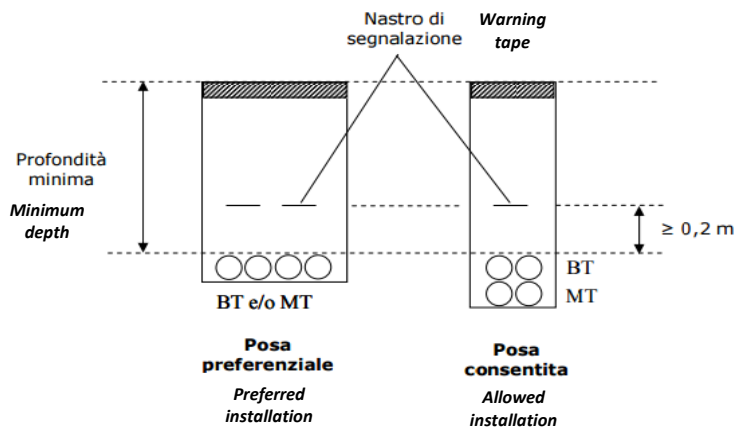
Trench type	B	
Narrow trench	$\leq 3 \text{ DE}$	$< H/2$
Wide trench	$> 3 \text{ DE}$ $< 10 \text{ DE}$	$< H/2$
Infinite trench	$\geq 10 \text{ DE}$	$\geq H/2$

Whereas possible, narrow trench type should be chosen, since stresses acting on pipe due to external loads are lower than in other trench configurations

Narrow trench type is usually chosen where native soil is sandy or gravel

Conduits shall be installed at a minimum 1,0 m depth in order to guarantee integrity in case of shallow excavations which may be carried out after the installation of conduits and in order to decrease the effect of external loads

CONDUIT LAYING



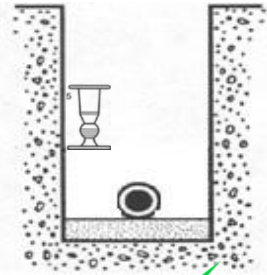
More pipes can be laid into the same trench, according to the layout in side figure

Pipes should be laid on the same level; in case of M.V. and L.V. conduits laid into the same trench, stacked installation is accepted, provided L.V. conduits will be laid on the upper layer

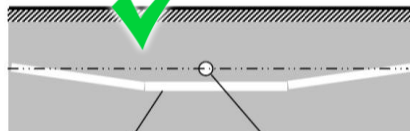
A warning tape shall be laid on the top of the conduits, at a minimum distance 0,2 m, with the sign "ELECTRIC CABLES"

EN 61386-24

TRENCH BOTTOM



Trench bottom shall be flat, without sharp edges and stones which may damage the conduits
In order to provide a continuous support throughout the whole length, a layer of levelled sand will be used for the trench bottom.
No need to use concrete for trench bottom



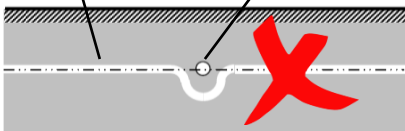
- While choosing the conduit path, pipe bending into the trench should be limited as much as possible; maximum bending radius should not exceed 1,5 mt.
- M.V / L.V. pipeline profile should be straight and linear; In case of interferences / crossing with other existing structures / obstacles, "bottlenecks" should be avoided as much as possible

Cavidotto (ad es. incrocio con altra canalizzazione)

Ostacolo (ad es. incrocio con altra canalizzazione)

Conduit

Obstacle (e.g. other pipe)



PIPE LAYING AND CHECKS

- Once pipes have been laid, alignment and continuity of conduit shall be checked before filling up the trench
- In particular, in order to prevent the penetration of stones/sand into the conduits, the following shall be checked:
 - + pipe joints (special care shall be taken with this respect)
 - + tightness of pipe ends which are not connected to manholes

**Vedi / see
Tab. 15**

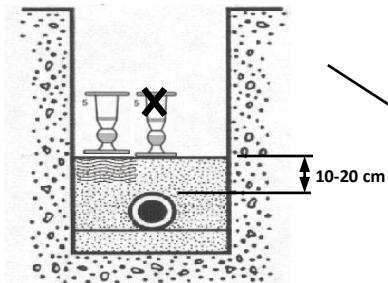
CHOICE OF BEDDING AND BACKFILLING SOILS

- Granular, compactable soils such as sand, gravel or mixture of sand-gravel (grains 10-15 mm size) shall be used for bedding
- Compact bedding soil in order to provide uniform load distribution throughout the whole length of conduit
- Provide a side compaction of the conduit; granular, compactable soils shall be used for side backfilling, such as sand and/or gravel; do not use organic and not compactable soils

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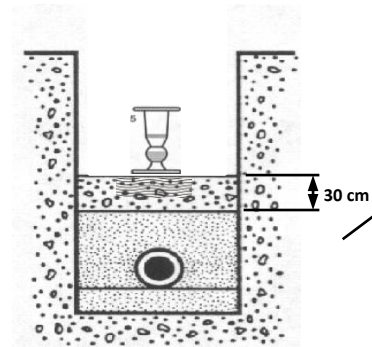
BACKFILLING

Backfilling shall be carried out in two steps:



1st step:

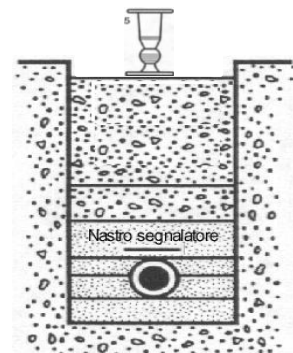
- Backfill conduit till a height 10-20 cm over the pipe; provide compaction at both sides; do not compact over the pipe in order not to stress/overload the pipe;
- Granular soils (e.g. sand) shall be used for side compaction; wet the sand in order to provide a higher compaction rate.



2nd step:

Final backfilling will be carried out in layer of 30 cm each; excavated material can be used, provided it will be purified from vegetables, big stones, debris, etc.
Each layer shall be compacted with care

Arrange final upper surface for laying of the top layer (e.g. organic soil, binder, tout-venant, etc.)



DISTANCES AND PARALLELISM WITH OTHER EXISTING INFRASTRUCTURES

Special prescription shall be respected, regarding crossings and parallelisms with other structures; these prescriptions will concern:

- + Type of existing infrastructure (e.g. tank, gas pipe, other pipes)
- + Minimum distance between conduit and infrastructure
- + Relative positioning between conduit and structure
- + Additional works to be carried out in order to provide higher safety

EN 61386-24
ANNEX:
STATIC VERIFICATION OF CONDUITS

fitness for purpose (static verification) of conduits in different installation conditions has been assessed according to:



- EN 1295 Structural design of buried pipelines under various conditions of loading
- EN 1046 Plastic piping and ducting systems - Systems outside building - structures for the conveyance of water or sewage - Practices for installation above and below ground
- ISO 9969 Thermoplastic pipes: determination of ring stiffness

Ring stiffness (SN) according to EN has been measured according to internal tests carried out on conduits

- $SN \geq 4$ Kpa per/for $DN/OD = 200$
- $SN \geq 8$ Kpa per/for $DN/OD \leq 200$

Under these conditions, table 1 of EN 1046 is applicable (se extracted below)

Tab. 1- Fitness for installation for conduits in different installation conditions

Compaction class	Filling soil group	Trafficked areas 				Non trafficked areas 			
		un-disturbed native soil group				un-disturbed native soil group			
		1	2	3	4	1	2	3	4
W <i>Good, in compacted layers</i>	Installation depth 1 - 3 m								
	1	✓	✓	DN≤160	DN≤160	✓	✓	✓	✓
	2		DN≤160	DN≤160			✓	✓	✓
	Installation depth 3 - 6 m								
	1	✓	✓	✓	✓	✓	✓	✓	✓
	2		✓	✓	DN≤160		✓	✓	DN≤160

tab. 15 Soils classification according to ENV 1046

Soil	#	Typical name	Cod.	Soil group		Use for backfilling
				characteristics	Examples	
Granular	1	Single-sized gravel	(G) (GU)	Steep granulation line, predominance of one-grain-size zone		YES
		WG gravel, gravel-sand mixtures	(GW)	Continuous granulation line, several grain-size zones	Crushed rock, river and beach gravel, morainic gravel, volcanic ash	
		PG gravel-sand mixtures	(G) (GP)	Steplike granulation line, one or more absent grain zones		
	2	Single-sized sands	(S) (SU)	Steep granulation line, predominance of one grain size zones	Valley sand, drift and basin sand, dune, beach sand	YES
		WG sands, sand-gravel mixtures	(SW)	Continuous granulation line, several grain size zones	Morainic sand, terrace sand, beach sand	
		PG sand-gravel mixtures zones	(S) (SP)	Steplike granulation line, one or more absent grain zones		
	3	Silty gravel, PG gravel-sand-silt mixtures	(GM) (GU)	Broad/intermittent granulation line with fine grained silt	Weathered gravel slope debris, clayey gravel	YES
		Clayey gravels, PG gravel-sand-clay mixtures	(GC) (GI)	Broad/intermittent granulation line with fine grained clay		
		Silty sands, PG sand-silt mixtures	(SM) (SU)	Broad/intermittent granulation line with fine grained silt	Liquid sand, loam, sand loess	
		Clayey sands, PG sand-clay mixtures	(SC) (SI)	Broad/intermittent granulation line with fine grained clay	Loamy sand, alluvial clay, alluvial marl	
Cohesive	4	Inorganic silts, very fine sands, silty or clayey fine sands	(M) (U)	Low stability, rapid reaction, nil to slight plasticity	Loess, loam.	YES
		Inorganic clay, plastic clay	(CI) (IA) (IL) (IM)	Medium to very high stability, no to slow reaction, low to medium plasticity	Alluvial marl, clay	
Organic	5	Mixed grained soils with admixtures of humus or chalk	(OK)	Admixtures of plant or non-plant type, decay smell, light weight, large porosity	Top soils, chalky sand, tuff sand	NO
		Organic silt and organic silt clay	(OL) (OU)	Medium stability, slow to very quick reaction, low to medium plasticity	Sea chalk, top soil	
	6	Organic clay, clay with organic admixtures	(OH) (OI)	High stability, nil reaction, medium to high plasticity	Mud, loam	NO
		Peat, other highly organic soil	(Pi) (Hi) (Hz)	Decomposed peats, fibrous, brown to black coloured	Peat	
		Muds	(F)	Sludges deposited under water, often interspersed with sand/clay/chalk, very soft	Muds	

The symbols used are taken from two sources. Symbols in square brackets [...] are taken from British Standard BS 5930. Symbols in rounded brackets (.) are taken from the German Standard DIN 18196.