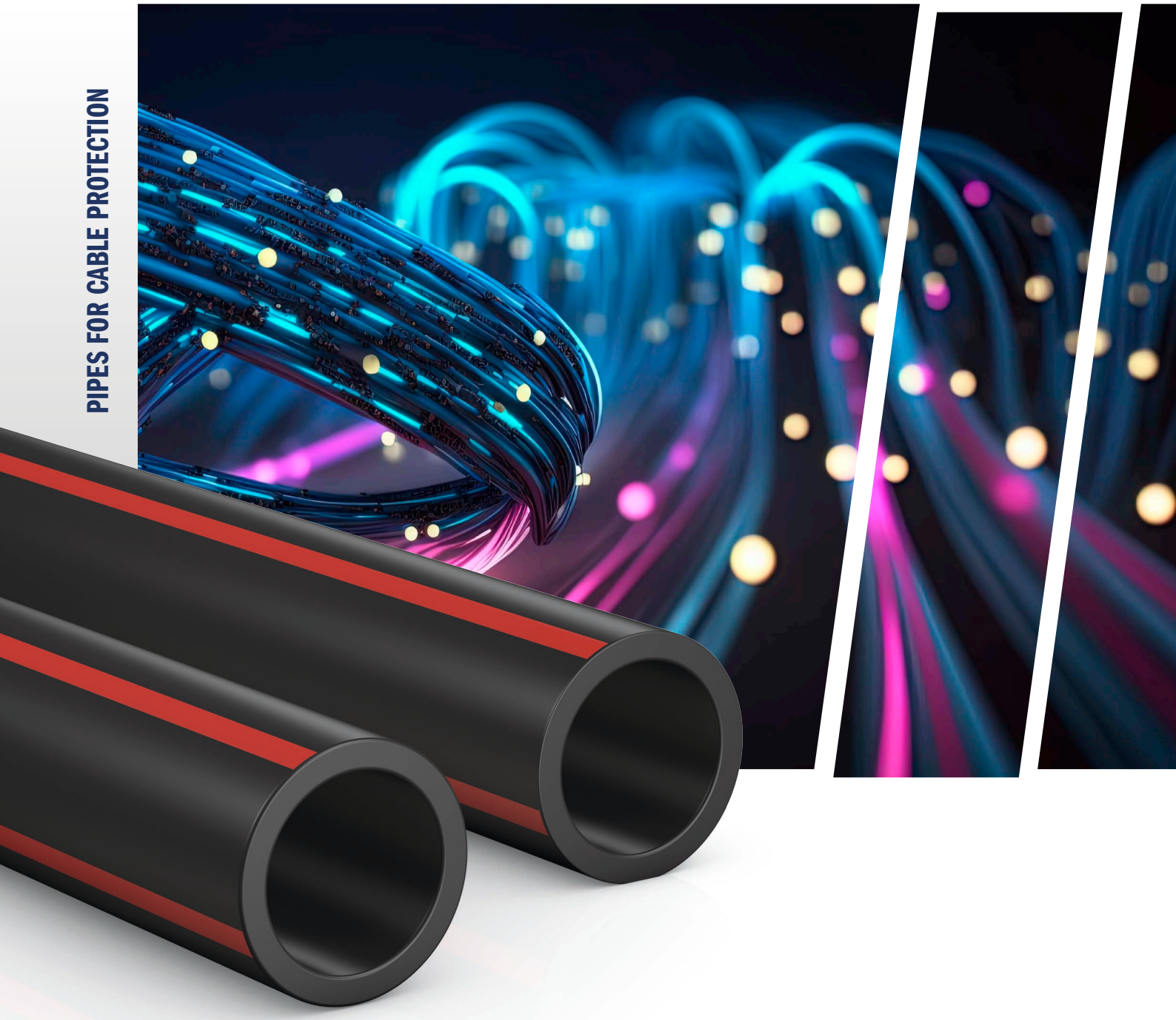
# EUROCAVI PLUS

EURO TUBI

EN

Black polyethylene PE100 (MRS 10) pipes with red identification stripes and a smooth surface for underground laying, including by trenchless techniques, to protect cables for electrical installations, in accordance with DIN 8074/75, CEI EN 61386-24 and UNI EN ISO 15494.

PIPES FOR CABLE PROTECTION



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## PROPERTIES

The main mechanical characteristics of a cable protection tube are crush strength and impact resistance. Crush resistance is critical in view of the burying of pipes subjected to the overlying static loads and the stresses caused by dynamic loads, while impact resistance is necessary to ensure the integrity of the cable duct during laying.
Tubes in the Eurocavi Plus range meet the requirements of IEC EN 61386-24 for both properties.

## RESISTANCE TO CRUSHING

This property is critical considering that the pipe must be installed underground and consequently is subjected to the overlying static loads, to which stresses due to dynamic loads may be added. In accordance with what is specified in IEC EN 61386-24, samples of the Eurocavi Plus pipe with a length of 200 mm are subjected to compression so as to reduce the inner diameter by 5 percent. The force required to achieve this crushing must be above predetermined values (250, 450 or 750 N).

## WELDING AND JOINING

Connections between Eurocavi Plus pipes can be made by butt-welding, by electrofusion or by mechanical joining with quick and easy to use sleeves that can guarantee maximum tightness.

## IDENTIFICATION

For Eurocavi Plus pipes, modern identification systems for buried networks, also in accordance with the reference practice UNI/PdR 38 (2018), based on modern simple or two-dimensional bar-code technology (with information related to product code, batch number, etc.) are available, if necessary.

## PACKAGING AND TRANSPORTATION

Eurocavi Plus pipes are available in bars (for all diameters) and in coils (up to DN 160) of lengths varying from the DN and the customer's specifications.

## IMPACT RESISTANCE

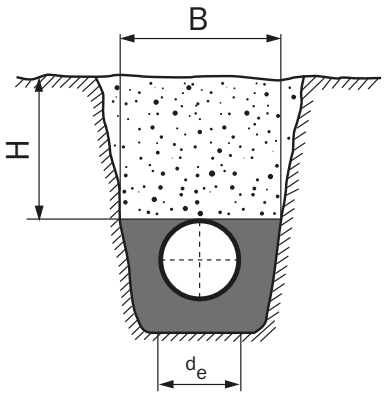
This property is basic for evaluating the behaviour of the pipe during the installation phase, since accidental stresses that may involve the outer surface of the pipeline during installation are simulated (for this purpose, the adjacent soil should be free of rocks with an average size greater than 80 mm). As specified in IEC EN 61386-24, samples of the Eurocavi Plus pipe cooled to -5 °C for at least 2 hours are subjected to the impact of a 5 kg weight dropped from a height dependent on the pipe diameter. The test must end without cracking for at least 9 out of 12 specimens.
The table below summarizes the main properties of the Eurocavi Plus range of pipes.

| Properties | Value |
|---|---|
| Density | ≥ 0,950 g/cm³ |
| Yield strength (23°C) | ≥ 23 N/mm² |
| Modulus of elasticity (23°C) | > 1000 MPa |
| Elongation at break (23 °C) | ≥ 350% |
| Compressive strength (23 °C) | ≥ 250 N (type 250) |
| | ≥ 450 N (type 450) |
| | ≥ 750 N (type 750) |
| Coefficient of linear thermal expansion | ~0.2 mm/m-K |
| Specific heat capacity | 2300-2900 J/kg·K |
| Thermal conductivity | ~0.4 W/m-K |
| Surface resistance | > $10^{13}$ Ω |

## INSTALLATION

The choice of excavation type for conduit networks depends on the nature of soil and the resulting stresses on the installed pipes.
Excavations can be classified according to their respective geometric dimensions, mainly the backfill height (H) and width (B) of the trench, measured at the level of the upper generatrix of the pipe and placed in relation to the outside diameter (de) of the installed pipe.
The "narrow" trench type is the best for laying pipelines because the overlying load is discharged onto the walls of the excavation, so it should be used as much as possible consistent with the nature of the subsoil.

| Type of trench | Conditions | |
|---|---|---|
| Tight | H≥ 2B | B ≤ 3 $d_e$ |
| Wide | H≥ 2B | 3 DN ≤ B ≤ 10 $d_e$ |
| H≥ 2B | H ≤ 2B | B > 10 $d_e$ |




On the other hand, the "wide" trench excavation, which is mainly adopted when the soil has a gravelly or sandy texture, results in a heavier load on the cable pipeline than the previous case, which should be taken into account at the design stage.
The bedding bed, preferably consisting of sand mixed with gravel (with a maximum diameter of the crushed stone less than 10 mm) should be compacted very carefully, so as to allow uniform distribution of loads over the entire pipeline, while the backfill should be made with sand, excluding clay materials that prevent proper compaction.
Backfilling is, in fact, the most critical phase of the laying process since it must ensure perfect interaction between the pipeline and the soil, allowing the pipe to react to both deformations due to subsurface settlements and to the loads on the excavation. The best backfilling technique is to proceed through successive layers so as not to damage the conduit. Eurocavi Plus pipes are suitable for laying by trenchless (no-dig) technologies.
Some installation techniques (including TOT remote-controlled horizontal drilling) involve laying the pipe by drag, by applying an axial force to one end of the pipe.

It is, in this case, necessary to verify that the force exerted is less than a maximum allowable value, dependent on the pipe geometry and the yield stress value of the high-density polyethylene. The maximum tensile load $F_t$, applied in the axial direction, must be less than:

| Temperature (°C) | $\sigma_y$ (MPa) |
|---|---|
| -20 | 34 |
| -10 | 32 |
| 0 | 30 |
| 10 | 28 |
| 20 | 24 |
| 40 | 18 |

$$F_t < 0{,}35 \cdot \pi \cdot \sigma_y \cdot d_e^2 \cdot \left( \frac{1}{SDR} - \frac{1}{SDR^2} \right)$$

where $\sigma_y$ is the yield stress of high-density polyethylene at the laying temperature.

Alternatively, "microtunnelling" is a "no dig" technology by thrust, suitable for the installation of new pipelines, allowing tunnel crossings of roads, railways, waterways, and areas subject to environmental protection, without the need for trenching. The technology involves drilling using a full-section milling head, and its use is mainly directed toward underground networks that require a high degree of accuracy.
In particular, thanks to the special format in coils of high lengths up to DN 160, Eurocavi Plus pipe can also be used in railway and other transport line crossings, in accordance with the technical standards of M.D. 4/4/14.

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PIPES FOR CABLE PROTECTION

| | SDR 17,6 $S_{calc}$ = 18,2 | | SDR 17 $S_{calc}$ = 20,3 | | SDR 13,6 $S_{calc}$ = 41,7 | | SDR 11 $S_{calc}$ = 83,3 | | SDR 7,4 $S_{calc}$ = 317,9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| **DN** | $e_n$ | DI [mm] | $e_n$ | DI [mm] | $e_n$ | DI [mm] | $e_n$ | DI [mm] | $e_n$ | DI [mm] |
| 40 | - | - | 2,4 | 35,2 | 3,0 | 34,0 | 3,7 | 32,6 | 5,5 | 29,0 |
| 50 | 3,0 | 44,0 | 3,0 | 44,0 | 3,7 | 42,6 | 4,6 | 40,8 | 6,9 | 36,2 |
| 63 | 3,6 | 55,8 | 3,8 | 55,4 | 4,7 | 53,6 | 5,8 | 51,4 | 8,6 | 45,8 |
| 75 | 4,3 | 66,4 | 4,5 | 66,0 | 5,6 | 63,8 | 6,8 | 61,4 | 10,3 | 54,4 |
| 90 | 5,2 | 79,6 | 5,4 | 79,2 | 6,7 | 76,6 | 8,2 | 73,6 | 12,3 | 65,4 |
| 110 | 6,3 | 97,4 | 6,6 | 96,8 | 8,1 | 93,8 | 10,0 | 90,0 | 15,1 | 79,8 |
| 125 | 7,1 | 110,8 | 7,4 | 110,2 | 9,2 | 106,6 | 11,4 | 102,2 | 17,1 | 90,8 |
| 140 | 8,0 | 124,0 | 8,3 | 123,4 | 10,3 | 119,4 | 12,7 | 114,6 | 19,2 | 101,6 |
| 160 | 9,1 | 141,8 | 9,5 | 141,0 | 11,8 | 136,4 | 14,6 | 130,8 | 21,9 | 116,2 |
| 180 | 10,3 | 159,4 | 10,7 | 158,6 | 13,3 | 153,4 | 16,4 | 147,2 | 24,6 | 130,8 |
| 200 | 11,4 | 177,2 | 11,9 | 176,2 | 14,7 | 170,6 | 18,2 | 163,6 | 27,4 | 145,2 |
| 225 | 12,8 | 199,4 | 13,4 | 198,2 | 16,6 | 191,8 | 20,5 | 184,0 | 30,8 | 163,4 |
| 250 | 14,2 | 221,6 | 14,8 | 220,4 | 18,4 | 213,2 | 22,7 | 204,6 | 34,2 | 181,6 |
| 280 | 15,9 | 248,2 | 16,6 | 246,8 | 20,6 | 238,8 | 25,4 | 229,2 | 38,3 | 203,4 |
| 315 | 17,9 | 279,2 | 18,7 | 277,6 | 23,2 | 268,6 | 28,6 | 257,8 | 43,1 | 228,8 |
| 355 | 20,2 | 314,6 | 21,1 | 312,8 | 26,1 | 302,8 | 32,2 | 290,6 | 48,5 | 258,0 |
| 400 | 22,8 | 354,4 | 23,7 | 352,6 | 29,4 | 341,2 | 36,3 | 327,4 | 54,7 | 290,6 |
| 450 | 25,6 | 398,8 | 26,7 | 396,6 | 33,1 | 383,8 | 40,9 | 368,2 | 61,5 | 327,0 |
| 500 | 28,4 | 443,2 | 29,7 | 440,6 | 36,8 | 426,4 | 45,4 | 409,2 | - | - |
| 560 | 31,9 | 496,2 | 33,2 | 493,6 | 41,2 | 477,6 | 50,8 | 458,4 | - | - |
| 630 | 35,8 | 558,4 | 37,4 | 555,2 | 46,3 | 537,4 | 57,2 | 515,6 | - | - |

Other formats available upon request

DN = nominal diameter DI = inner diameter $e_n$ = nominal thickness

$S_{calc}$ = calculated initial annular stiffness expressed in kN/m².

Sizes from DN 40 to DN 250 conform to IEC EN 61386-24.

Classification of crushing strength calculated according to IEC EN 61386-24

- Type 250
- Type 450
- Type 750

The designer of a piping system shall consider and carefully evaluate the implications of the parameters of each specific project with technical or law regulations.



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