

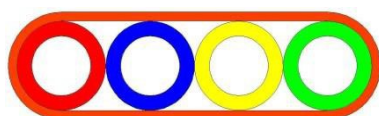
HDPE Tube Bundle FLAT Direct Bury (DB) 4-way

1. Design

This document specifies the properties for HDPE FLAT Tube Bundle 4-ways 14/10mm for Direct Bury (DB) application.

A bundle of micro- or mini-tubes (strengthened wall size) is surrounded by single thin HDPE sheath. The design makes the duct assemblies suitable for outdoor direct buried or other existing ducts or cable trays. The micro ducts are optimized for best cable blowing performance.

The inner micro duct is designed to be flexible and light weight, yet durable and easy to handle. The micro duct has suitable low friction characteristics on the inside surface. The micro duct has colors according to figures 1.



(Figure 1)

The dimension of tube bundle shall be:

1)	Inner Micro Duct	14/10mm
2)	Outer Diameter:	58.4mm * 16.4mm (±1.1mm)
3)	Thickness of sheathing:	1.2mm (±0.2mm)

Remarks: Ripcord and tracing wire are optional.

2. Raw materials:

HDPE of a high-molecular type with the following parameters is used for production of the Tube Bundle:

- | | | |
|--|---|-------------|
| ● Melt flow index: | 0.1 ~ 0.4 g/10 minutes
(190 °C, 2.16 KG) | EN ISO 1133 |
| ● Density: | Min. 0.940 g/cm ³ | ISO 1183 |
| ● Tensile strength at yield: | Min. 20MPa | ISO 527 |
| ● Elongation at the break: | Min 350% | ISO 527 |
| ● Environmental stress crack resist (F ₅₀) | Min. 96 hours | ISO 4599 |

3. Construction:

3.1 PE sheath

The outer sheath is manufactured from colored HDPE, halogen free. Normal outer sheath color is orange. Other color is possible upon customer request.

3.2 Micro duct

The 14/10mm micro duct is manufactured from HDPE, extruded from 100% virgin material. The color shall be red, blue, and green, or other customized.

Outer diameter shall be 14.0mm $\pm$ 0.10mm. Wall thickness shall be 2.0mm $\pm$ 0.1mm.

Maximum installation pressure amounts to 25 bar.

The inner surface of micro duct is ribbed and shall exhibit low friction characteristics.

4. Technical data of Tube Bundle:

Table 1: Mechanical performance of inner micro duct Φ 14/10mm

Pos.	Mechanical performance	Performance	Standard	Test conditions
1	Tensile strength at yield	IEC 60794-1-2 Method E1	Rate of extension: 100mm/min	$\geq 1400\text{N}$
2	Crush	IEC 60794-1-2 Method E3	Sample length: 250mm Load: 1400N Duration of Max. load: 1 minutes Recovery time: 1 hour	The outer and inner diameter shall show, under visual examination without magnification no damage and no reduction of diameter greater than 15%.
3	Kink	IEC 60794-1-2 Method E10	$\leq 140\text{mm}$	-
4	Impact	IEC 60794-1-2 Method E4	Striking surface radius: 10mm Impact Energy: 1J Number of impact: 3 times Recovery time: 1 hour	Under visual examination, without magnification, there shall be no damage to the micro duct.
5	Bend radius	IEC 60794-1-2 Method E11	Number of turns: 5 Mandrel diameter: 144mm Number of cycles: 3	The outer and inner diameter shall show, under visual examination without magnification no damage and no reduction of diameter greater than 15%.
6	Friction	Optowire	/	≤ 0.1

Table 2: Mechanical performance of Tube Bundle

Pos.	Item	Specification	
1	Appearance	Smooth outer wall (UV-stabilized) without visible impurities; well-proportioned color, no bubbles or cracks; with defined markings on outer wall.	
2	Tensile strength	Use Pull socks to tension a sample in accordance with table below: Sample length: 1m Tensile speed: 20mm/min Load: 4440N Duration of the tension: 5 min.	No visual damage or residual deformation greater than 15% of the duct assembly outer diameter.
3	Crush Resistance	A 250mm sample after 1 minute load time and 1 hour recovery time. Load (plate) shall be 2250N. The imprint of the plate on the sheath is not considered as mechanical damage.	No visual damage or residual deformation greater than 15% of the duct assembly outer diameter.
4	Impact	Striking surface radius shall be 10mm and impact energy 5J. Recovery time shall be one out. The imprint of the striking surface on the microduct is not considered as mechanical damage.	No visual damage or residual deformation greater than 15% of the duct assembly outer diameter.
5	Bend	Diameter of mandrel shall be 40X OD of sample, 4 turns, 3 cycles.	No visual damage or residual deformation greater than 15% of the duct assembly outer diameter.

5. Storage:

Completed packages of the HDPE Tube Bundle on drums can be stored outdoor max. 12 months upon the date of production.

Storage temperature: -40°C ~ +70°C
 Installation temperature: -30°C ~ +50°C
 Operating temperature: -40°C ~ +70°C