

5 – PULLING & INSTALLATION

In order to reduce pulling and installation time, Nexans has designed a cable range which offers:

- time saving on connexions by easy sheath and insulation stripping
- reduced weight, diameter and volume
- easier drawing due to low friction coefficient of polyolefin outer sheath compound.

Nexans decides to distinguish main cable circuits by different outer sheath colours:

- red for medium voltage cables (from 1.8/3 kV up to 12/20 kV)
- black for power and control cables rated 0.6/1 kV
- grey for instrumentation and control cables rated 150/250 V
- orange for all types fire resistant cables
- blue for intrinsic circuit cables

In order to avoid unwanted effects of electromagnetic interference (EMI) as far as possible, Nexans recommends to separate on different cable trays, power circuits from control, instrumentation or communication circuits.

5-1 Pulling

The process of pulling electrical cables on board of marine vessels is relatively a usual procedure. Nevertheless, Nexans would suggest some following rules to avoid any cable degradation and damage.

Prior to start, care must be taken to ensure that the pulling equipment directly attached to the cable is tightly fitted over the complete cable and not only to one cable element such as the outer sheath, armour or conductors.

The maximum pulling force exerted on the cable must not exceed 50 N/mm² (of nominal cross section area of the conductors) whether the cable is being manually pulled or with a winch or other mechanical equipment.

If the cable link is pre-cut before pulling, the cable has to be correctly coiled to avoid any over twist.

Pre-cut cable ends, in waiting position before final installation and connexion must be protected.

All cable runs must be smooth and clean or covered with a complementary protection to prevent any outer sheath damage.

When several cables are pulled together, talcum is recommended to limit friction and abrasion between cables and to ease the pulling process with better cables sliding.

Where cables have to be pulled perpendicularly to other cables already installed, it is advised to protect them to avoid abrasion damage.

Cables have to be pulled with a slow and regular speed about 20 m/minute, and with a minimum outer temperature of -15°C. It is always necessary, to store cables in warmed premises at an ambient temperature of + 10°C for 12 hours. A longer period might be necessary for large drums.

5-2 Installation

Cables installation must be in accordance with certification Bodies rules, and also with IEC 60092-352 or IEC 61892-4.

Some recommendations are given as follow about:

- special precautions for single-core cables for A.C. wiring
- minimum bending radius
- parallel cable links.

5-2-1 Precautions for single-core cables:

In order to reduce electro-dynamic forces when a short circuit appears, symmetric method for cable installation is recommended as is shown in the following table (L1, L2 and L3 indicates the location of the respective phase conductor).

See 1st template on opposite page.

5-2-2 Minimum bending radius:

To limit the stress (elongation/compression) on insulation and sheath materials when cable are bent, rules about minimum internal bending radius have to be respected:

- in fixed installations
- during pulling and installation

Values for these MBR stated in IEC 60092-352 and IEC 61892-4 are given in the following table.

See 2nd template on opposite page.

Number of conductors per phase	Number of single core cables	Recommended cable positioning
2	6	L1 L2 L3 L3 L2 L1 or L1 L2 L3 L3 L2 L1
3	9	L1 L2 L3 L2 L3 L1 L3 L1 L2
4	12	L1 L2 L3 L3 L2 L1 L3 L2 L1 L1 L2 L3 or L3 L1 L2 L3 L2 L3 L1 L2 L1 L2 L3 L1

Cables Type up to 1.8/3 kV	Minimum internal bending radius	
	Unarmoured Cables	Armoured Cables
Cables with circular class 2 conductors: outer diameter < 25 mm outer diameter > 25 mm	4D	6D
	6D	6D
Cables with sector shaped class 2 conductors	8D	8D
FLEXISHIP® cable with class 5 conductors (round or sector shaped conductors)	4D	5D
Cables Type from 3.6/6 kV to 12/20 kV		
Single core cables - class 2 conductors - FLEXISHIP®		12D 10D
3 cores cables - class 2 conductors - FLEXISHIP®		9D 7.5D

All these bending radius values must be multiplied by 2, during pulling and installation of the cables.

5-2-3 Parallel cables link:

According to certification society rules, several cables can be installed in parallel if certain conditions are respected:

- cables type must be the same (same design)
- cables must be rated for the same temperature class
- cables must have the same nominal cross section areas
- conductor cross section area > 10 mm²
- cables must have equal lengths.