



# Cables for Frequency Inverter

Eproflex 90 N/C 0,6/1 kV Cables  
VFD 0,6/1 kV Cables

Frequency inverters are widely used to control the speed of three-phase induction motors in all industrial segments in the drive of conveyor belts, elevators, pumps, air conditioning systems and so on which require smooth acceleration and braking, torque control, efficiency, energy savings and other benefits that inverters can provide.

## ***What happens inside the inverter?***

A rectifier circuit that converts the alternating to direct voltage is connected to capacitors that store energy and release it under the command of transistors, simulating, through pulse width modulation (PWM) technology, a sine wave similar to that of the network, thus changing the voltage and frequency and consequently the speed of the motor.

## ***Can a conventional cable be used for the connection between the inverter and the motor?***

**NO !!** Conventional cables are suitable for systems operating at 60 Hz, while the path between the inverter and the motor will be operated at frequencies of tens of MHz. At high frequencies a high capacitance cable passes large amount of leakage current to the earth, which can damage engine bearings, burn PLCs, and increase power consumption and cost. In addition, the electromagnetic interference generated will induce current and voltage in nearby circuits, which can damage control and communication systems and even lead to fatality.

To minimize these negative effects and prevent damage, it is necessary to create a unique path for common currents, noise and spurious disturbances, to confine the electromagnetic field, while maintaining a potential difference equal to zero between the motor and inverter housing. A good and efficient grounding system must be adopted, creating an effective current return path from the motor to the inverter.

From the above, the frequency converter cable must be constructed with low dielectric constant insulation to minimize its capacitance, be provided with an individual conductor to conduct the common currents from the motor to the inverter and be shielded along its length.

It is worth remembering that the electric resistance increases at high frequency. A small ground wire in the housing can provide higher resistance than the building's own steel structure, which has a much larger contact area and therefore less electrical resistance; this can be the easiest way for leakage currents through the bearings and motor shaft, causing grooves in bearings and maintenance problems. It is very important to create this controlled path of the return current to the inverter through terminals that maintain 360 ° contact around the shield at both ends.

To eliminate these problems, **INDUSCABOS** presents its line of **CABLES FOR FREQUENCY INVERTER: EPROFLEX 90 N/C 0,6/1 kV CABLE**, the neutral being concentrically applied under the metal shield of copper tape in its construction.

**VFD 0,6/1 kV CABLE**, recommended for larger motors and cable section above 25 mm<sup>2</sup>. In this design the neutral (or earth) is no longer concentric and becomes symmetrically embedded between the interstices of the 3-phase assembly. Since this construction is symmetrical, we have the complete cancellation of the currents induced by the phase conductors in the ground conductors, eliminating imbalances and obtaining a resultant zero. In addition to this technical advantage, this construction has a smaller external diameter, smaller weight, lower bending radius, lower cost and shorter delivery time, since the inner jacket is eliminated facilitating the installation of the cable.

# Eproflex 90 N/C Cable

Concentric Neutral - 0,6/1 kV



## Construction

- 1 **Phase conductors:** Bare copper, soft temper, flexible stranding.
- 2 **Insulation:** Ethylene Propylene Rubber thermoset compound (HEPR) for 90 °C maximum operation conductor temperature, 130 °C overload and 250 °C short-circuit.
- 3 **Separator:** Polyester non hygroscopic tape, helically applied around 100% of the assembly.
- 4 **Inner jacket:** Flame retardant polyvinylchloride PVC thermoplastic compound, lead free.
- 5 **Concentric neutral conductor:** Bare copper, soft temper.
- 6 **Metallic Shield:** Bare copper tape helically applied, with a minimum overlap of 15 %.
- 7 **Overall jacket:** Flame retardant polyvinylchloride PVC ST2 thermoplastic compound, lead free, black color.

## Identification

Insulated conductors identified by colors black, white and light blue. Cables size 50 mm<sup>2</sup> and above are supplied with phases identified by printed numbers. Other colors upon request.

## Application

**Eproflex 90 N/C Cable** is applied as variable frequency drive circuits, connecting the motor to the inverter. They are designed for fixed installations, and can be installed in trays, ducts, shelves or directly buried.

## Packing

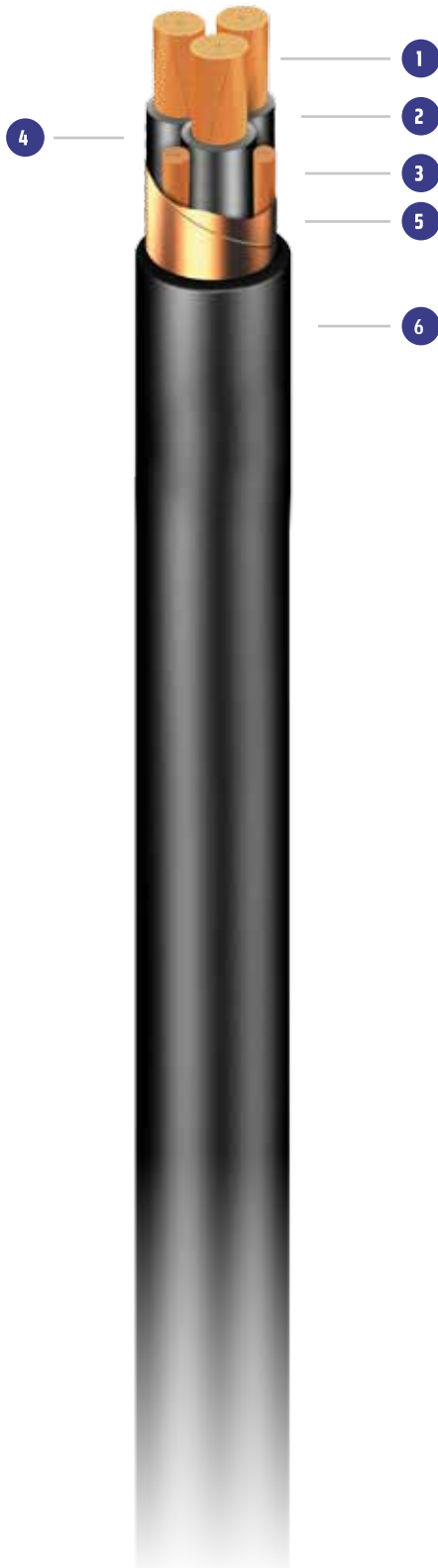
Usually supplied in wooden reels.

## Specifications

**ABNT NBR 7286** Power cables with extruded ethylene propylene rubber (EPR, HEPR or EPR 105) insulation for rated voltages from 1 kV up to 35 kV – Performance requirements.

# VFD CABLE

Symmetrical Neutral - 0,6/1 kV



## Construction

- 1 **Phase conductors:** Bare copper, soft temper, flexible stranding; class 5 – sizes from 35 to 300 mm<sup>2</sup>.
- 2 **Insulation:** Ethylene Propylene Rubber thermoset compound (HEPR) for 90 °C maximum operation conductor temperature, 130 °C overload and 250 °C short-circuit.
- 3 **Symmetrical neutral conductors:** Bare copper, soft temper, flexible stranding.
- 4 **Lay-up:** the 3 phase insulated conductors are laid up together with the 3 neutral conductors, which are placed in the interstices between adjacent phase conductors
- 5 **Metallic shield:** Bare copper tape helically applied, with a minimum overlap of 15 %.
- 6 **Overall jacket:** Flame retardant polyvinylchloride PVC ST2 thermoplastic compound, lead free, black color.

## Identification

Black insulated conductors identified by printed numbers, except size 3x35+3x6 mm<sup>2</sup>, which is identified through colors black, white and light blue.

## Application

**VFD Cables** are applied as variable frequency drive circuits, connecting the motor to the inverter. They are designed for fixed installations, and can be installed in trays, ducts, shelves or directly buried.

Benefits of **VFD Cables** for frequency inverters having symmetrical neutral in relation to frequency inverter cables having concentric neutral:

- Lower outer diameter;
- Lower weight;
- Easier handling and installation;
- Lower bending radius;
- Better electrical performance due to the greater balance of the induced voltages on the neutrals, as they will be symmetrically arranged, in order to cancel out the induced voltages.
- Suitable for higher power engines

## Packing

Usually supplied in wooden reels.

## Specifications

**ABNT NBR 7286** – Power cables with extruded ethylene propylene rubber (EPR, HEPR or EPR 105) insulation for rated voltages from 1 kV up to 35 kV – Performance requirements

EPROFLEX 90 N/C CABLE 0,6/1kV									
REFERENCE	PHASE CONDUCTORS			INSULATION	CONCENTRIC NEUTRAL SIZE	OVERALL JACKET		APPROX. MASS	CURRENT CARRYING CAPACITY
	NUMBER OF CONDUCTORS	NOMINAL SIZE	NOMINAL DIAMETER	NOMINAL THICKNESS		NOMINAL THICKNESS	NOMINAL DIAMETER		
		(mm <sup>2</sup> )	(mm)	(mm)	(mm <sup>2</sup> )	(mm)	(mm)	(kg/km)	(A)
1496.04.009	3	2,5	1,95	0,7	2,5	1,4	13,2	269	29
1496.04.010		4	2,43		4		14,4	344	39
1496.04.011		6	3,00		6		15,8	443	49
1496.04.012		10	3,90		10		18,0	625	68
1496.04.013		16	5,00		16		20,9	886	92
1496.04.114		25	6,20	0,9	25	1,5	24,4	1.229	122
1496.04.014							24,8	1.292	
1496.04.215		35	7,35	1	16	1,6	27,1	1.571	160
1496.04.115					25		27,5	1.626	
1496.04.216		50	8,8	1,1	35	1,8	36,4	2.939	249
1496.04.217		70	10,4	1,1	50	1,9	40,8	3.816	304
1496.04.218		120	13,8	1,2	70	2,0	46,1	5.019	353
1496.04.219		150	15,5	1,4		2,2	51,0	6.018	404
1496.04.220		185	16,8	1,6	95	2,3	55,6	7.302	461
1496.04.321		240	19,9	1,7	120	2,6	64,2	9.720	549

VFD CABLE (HEPR/PVC) 0,6/1kV									
REFERENCE	PHASE CONDUCTORS			INSULATION	SYMMETRICAL NEUTRAL SIZE	OVERALL JACKET		APPROX. MASS	CURRENT CARRYING CAPACITY
	NUMBER OF CONDUCTORS	NOMINAL SIZE	NOMINAL DIAMETER	NOMINAL THICKNESS		NOMINAL THICKNESS	NOMINAL DIAMETER		
		(mm <sup>2</sup> )	(mm)	(mm)	(mm <sup>2</sup> )	(mm)	(mm)	(kg/km)	(A)
1422.04.215	3	35	7,35	1,2	3x6	1,5	24,4	1337	160
1422.04.216		50	8,80	1,4	3x10	1,7	28,8	1920	197
1422.04.217		70	10,4	1,6	3x16	1,8	33,3	2678	249
1422.04.218		95	12,1			2,0	37,4	3372	304
1422.04.219		120	13,8	1,8	3x25	2,1	41,2	4473	353
1422.04.320		150	15,5			2,3	46,2	5352	404
1422.04.321		185	16,8	2,0	3x35	2,4	50,0	6529	461
1422.04.322		240	19,9	2,2	3x50	2,6	58,0	8819	549
1422.04.323		300	21,4	2,4		2,8	62,5	10193	620





*A escolha de quem conhece*



Av. Induscabos, 300  
CEP 08559-300 - Vila Jaú  
Poá - São Paulo, Brasil

Tel: +55 11 4634-9000  
Fax: +55 11 4636-2309

[induscabos@induscabos.com.br](mailto:induscabos@induscabos.com.br)  
[www.induscabos.com.br](http://www.induscabos.com.br)