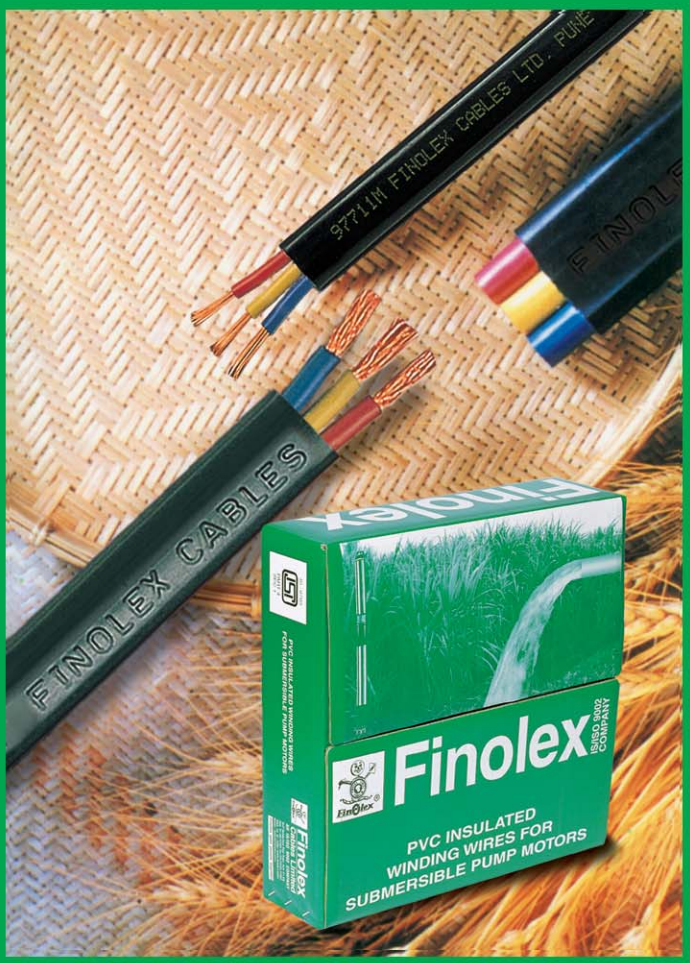
Finolex

An IS / ISO 9001 Company



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Winding Wires and 3 Core Flat Cables

PVC INSULATED WINDING WIRES & 3 CORE FLAT CABLES for Submersible Pump Motors

Finolex Cables Limited is India's leading manufacturer of a wide range of electrical and communication cables. The company enjoys an enviable reputation as a quality manufacturer of a large variety of products in different market segments.

Finolex was among the first in the country to manufacture PVC insulated wires for winding of submersible pump motors and 3 core flat cables for connecting the motor to the power source. These time tested products have become the first choice of more than 400 submersible pump manufacturers and thousands of rewinders all over the country. They are also used in the Middle East, Asia and Africa. Years of experience, modern PVC compounding plant and the corporate commitment to make quality products have earned Finolex this reputation.

PVC INSULATED WINDING WIRES

Manufactured at the modern, well equipped plant, Finolex Winding Wires are insulated with a very superior grade of HR PVC compound formulated and manufactured in-house, to give it the necessary electrical strength and resistance to abrasion. Technical collaboration with world leaders, M/s. Norddeutsche Seekabel Werke (NSW) of Germany, further helped us upgrade our technology.

The copper conductor of required purity and conductivity is drawn and annealed to stringent specifications. The automatic on-line controls in our extrusion process consistently give high quality to Finolex Winding Wires.

SPECIAL RANGE

Finolex has developed a special range of winding wires with stranded copper conductor insulated with HR PVC compound for higher HP submersible pump motors. These are also manufactured to individual customer specifications. The standard range of these winding wires is given in Table 2.

IS : 8783
PART 4
SEC 1

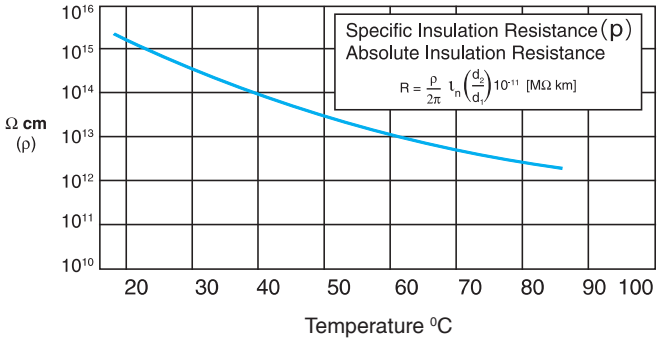
Table 1 - HR PVC Insulated Winding Wires as per IS : 8783 (Part 4/Sec 1) : 1995 (Solid Copper Conductor)

Nom. Conductor Diameter (mm.)	Nom. Cross-Sectional Area (sq.mm.)	Min. Insulation Thickness (mm.)	Approx. Overall Diameter (mm.)	Max. Conductor Resistance at 20°C (Ohms/km)
0.60	0.283	0.25	1.15	62.20
0.70	0.385	0.30	1.35	45.70
0.80	0.502	0.30	1.45	35.00
0.90	0.638	0.30	1.55	27.60
1.00	0.785	0.30	1.65	22.40
1.10	0.950	0.30	1.75	18.50
1.20	1.13	0.30	1.85	15.50
1.30	1.33	0.30	1.95	13.20
1.40	1.54	0.35	2.15	11.40
1.50	1.77	0.35	2.25	9.95
1.60	2.01	0.35	2.35	8.75
1.70	2.27	0.35	2.45	7.75
1.80	2.54	0.35	2.55	6.91
1.90	2.84	0.35	2.65	6.20
2.00	3.14	0.45	2.95	5.60
2.10	3.46	0.45	3.05	5.08
2.20	3.80	0.45	3.15	4.63
2.30	4.15	0.45	3.25	4.23
2.40	4.52	0.50	3.45	3.89
2.50	4.91	0.50	3.55	3.58
2.60	5.31	0.50	3.65	3.31
2.70	5.73	0.50	3.75	3.07
2.80	6.19	0.55	3.95	2.86
3.00	7.07	0.55	4.15	2.49

Table 2 - HR PVC Insulated Winding Wires (Multi-Stranded Copper Conductor)

No. of strands/ Nom. strand dia. (mm.)	Nom. Conductor Diameter (mm.)	Min. Insulation thickness (mm.)	Max. Outside Diameter (mm.)	Max. Conductor resistance at 20°C (Ohms/km)
19/0.68	3.40	0.50	4.60	2.60
19/0.78	3.90	0.60	5.20	1.98
19/0.82	4.10	0.60	5.40	1.79
19/0.90	4.50	0.60	5.90	1.48
19/0.97	4.85	0.70	6.40	1.28
19/1.04	5.20	0.80	6.90	1.11

Table 3 - Specific Insulation Resistance Vs. Temperature



Physical Properties : The limiting values of solid copper conductor diameter, Elongation at Break and other technical details are as given in IS 8783 (Part 1) : 1995

The properties of PVC compound are as given in IS 8783 (Part 2) : 1995

The Winding Wires are tested as per IS 8783 (Part 3) : 1995

Instructions for Use

- All due care is taken in handling of "Winding Wires" from manufacturing to packing stage. This product being delicate and its application being critical for trouble-free performance of the pump, proper care should be taken during handling, storage and its insertion into stator slots to ensure desired product performance.
- These wires are subjected to stringent quality checks. High Voltage Test is carried out on each and every coil produced. Repeated tests at customer's end should therefore be avoided. Only megger test is recommended to be carried out at customer's end.
- Do not stack more than 4 to 5 coils as the bottom-most coil is likely to get damaged by weight.
- Do not store these wires near objects having sharp edges, or high temperatures, to avoid unintentional damage.
- Do not use hammer to give shape to the bunch of coils to fit them into the motor. These wires lend themselves easily to be manually moulded into any desired shape.
- Ensure proper jointing with 3 Core Flat Cable to avoid failure.
- Ensure that these wires are stored at normal room temperature.

PVC INSULATED THREE CORE ROUND DOUBLE SHEATHED CABLES FOR SUBMERSIBLE PUMPS

Double sheathed round 3 core cables are popularly used in overseas markets as an alternative to 3 core flat cables. The double sheath not only offers better mechanical protection from abrasion, but also prevents ingress of water along the interstices of the cable. Bright annealed flexible copper conductor used in these cables, is insulated and sheathed with special grades of in-house formulated and manufactured PVC compounds.

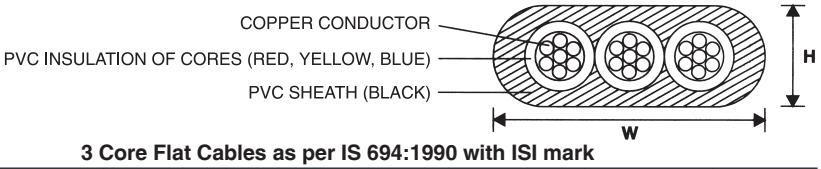
Size (mm^2)	Conductor Construction No. / Nom. Dia. (No./mm)	Max.Conductor Resistance at 20 °C (ohm/km)	Insulation Thickness (Nom.) (mm)	Total Thickness of Double Sheath (Nom.) (mm)	Overall Diameter (Approx.) (mm)
1.5	30/0.25	13.3	0.6	1.6	9.9
2.5	50/0.25	7.98	0.7	1.6	11.5
4	56/0.3	4.95	0.8	1.6	13.5
6	84/0.3	3.30	0.8	1.8	15.0
10	140/0.3	1.91	1.0	2.0	18.6
16	226/0.3	1.21	1.0	2.2	21.8
25	354/0.3	0.780	1.2	2.4	25.9
35	495/0.3	0.554	1.2	2.6	28.8
50	703/0.3	0.386	1.4	2.6	33.6
70	360/0.5	0.272	1.4	2.8	38.4
95	475/0.5	0.206	1.6	2.8	42.6

3 CORE FLAT CABLES

For trouble-free working, these connecting cables are just as important as winding wires are for the submersible pump motors. Finolex 3 core Flat Cables are manufactured keeping in mind the severe and difficult conditions in which they are required to perform. The individual conductors are made from bright electrolytic grade copper. The wires are drawn, annealed and bunched properly to ensure flexibility and uniform resistance. Each of the three copper conductors is insulated with a special PVC compound formulated and manufactured in-house. The cores are laid up in flat parallel position. The outer sheath of the cable is made from a special grade of abrasion resistant PVC compound impervious to water, grease, oil, etc.

The cables are now available with sequential marking, company's name, size and voltage printed on them.

Technical Data



IS : 694

3 Core Flat Cables as per IS 694:1990 with ISI mark

Conductor		Insulation	Sheath	Overall Dimensions		Conductor Resistance @20°C (max) ohms/km.	Current Carrying Capacity @ 40°C Amps
Area sq.mm.	No./Dia. of Strands mm	Thickness (Nom) mm	Thickness (Nom) mm	Width (Approx) 'W' mm	Height (Approx) 'H' mm		
1.5	22/0.30*	0.6	0.9	10.30	4.9	12.10	14
2.5	36/0.30*	0.7	1.0	12.60	5.8	7.41	18
4.0	56/0.30**	0.8	1.0	14.80	6.6	4.95	26

Note:
The strand diameter is nominal. However, construction of conductor is designed to satisfy the requirements of conductor resistance as per IS 8130 : 1984.

* As per Conductor Class 2 of IS 8130 : 1984

** As per conductor Class 5 of IS 8130 : 1984

3 Core Flat Cables generally conforming to IS 694:1990

Conductor		Insulation	Sheath	Overall Dimension		Conductor Resistance @20°C (max) ohms/km.	Current Carrying Capacity @ 40°C Amps
Area sq.mm.	No.of Strands / Dia. mm	Thickness (Nom) mm	Thickness (Nom) mm	Width (Approx.) 'W' mm	Height (Approx.) 'H' mm		
6.0	84/0.30	0.8	1.15	16.50	7.40	3.30	31
10.0	140/0.30	1.0	1.40	21.00	9.25	1.91	42
16.0	226/0.30	1.0	1.40	24.50	10.70	1.21	57
25.0	354/0.30	1.2	2.00	30.60	13.50	0.780	72
35.0	495/0.30	1.2	2.00	34.40	14.70	0.554	90
50.0	703/0.30	1.4	2.20	41.20	17.20	0.386	115
70.0	360/0.50	1.4	2.20	46.60	19.00	0.272	143
95.0	475/0.50	1.6	2.40	53.00	21.40	0.206	165

Note :
The number of wires and strand diameter will be such as to satisfy the requirements of conductor resistance as per IS 8130 : 1984

SELECTION GUIDE FOR 3 CORE FLAT CABLES

1) HP Vs Current : The full load current for submersible pump motors, 3 phase, 50 cycles, 415 - 425 V.

HP	5.0	7.5	10.0	12.5	15.5	17.5	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0
Amp	7.5	11.0	14.9	18.9	22.5	25.2	28.4	35.6	42.3	50.4	58.1	62.1	67.5	73.8	81.0	87.3	93.6	100.8	108.0

2) Derating Factors : Multiply the current carrying capacity of the cable by factors given below for various ambient temperatures.

Ambient Temperature °C	30	35	40	45	50
Rating Factor	1.09	1.04	1.00	0.95	0.77

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