

UNISTAR®

PVC INSULATED WINDING WIRES FOR SUBMERSIBLE MOTORS.

1.0 INTRODUCTION :

Unistar PVC Insulated Winding Wires are manufactured from best annealed high conductivity electrolytic Copper Wires and special grade of PVC compound, specially designed for the high performance under submerged condition. These Wires are characterised by high electrical strength, superior space factor, very low water absorption, high abrasion resistance and mechanical strength. These wires are suitable for operation at 85°C conductor temperature and have excellent resistance to heat ageing. Unistar Winding wires are ideally suited for long, trouble-free operation of submersible motors of all ratings.

For heavy duty application, Winding Wires with Polyethylene insulation and Nylon Sheath are also available from Unistar range.

Unistar Winding Wires are specially subjected to long-term-life-cycle test to ensure compliance to the designed life of submersible motors.

2.0 CONSTRUCTION :

Type 'A' : Annealed Bare Copper Conductor Insulated with special PVC Compound to dimensions indicated in Table 1 & 2 suitable for operation at 85°C maximum conductor temperature.

Type 'B' : Annealed Bare Copper Conductor insulated with Polyethylene and Nylon jacketed to dimensions given in Table 3, suitable for operation at 105°C maximum conductor temperature.

3.0 SPECIFICATION :

Unistar Winding Wires are made to comply with IS-8783. NSW and to various customers specification.

4.0 TECHNICAL SERVICES :

Unistar Winding Wires are being used by all major manufacturers of submersible pumps in the country. Our Technical Service Department will be pleased to advise on design and application of these wires specially under different environmental conditions.

Special power leads for submersible motors are available in both Round and Flat construction from Unistar range of cables.

TABLE - 1

Popular sizes of PVC Insulated Winding Wires

Sl. No.	Dia. of Copper Wire (mm)	Tol. on wire dia (mm)	Max. overall diameter of insulated wire (mm)	Nominal Conductor Resistance at 20°C (Ohm/KM)
1.	0.5	0.005	1.1	87.81
2.	0.6	0.006	1.2	61.00
3.	0.6	0.006	1.3	61.00
4.	0.6	0.006	1.4	61.00
5.	0.7	0.007	1.4	44.80
6.	0.7	0.007	1.5	44.80
7.	0.8	0.008	1.5	34.30
8.	0.8	0.008	1.6	34.30
9.	0.9	0.009	1.6	27.10
10.	0.9	0.009	1.65	27.10
11.	0.9	0.009	1.7	27.10
12.	0.9	0.009	1.8	27.10
13.	1.0	0.010	1.7	21.95
14.	1.0	0.010	1.8	21.95
15.	1.1	0.011	1.8	18.10
16.	1.1	0.011	1.9	18.10
17.	1.2	0.012	1.9	15.20
18.	1.2	0.012	2.2	15.20
19.	1.3	0.013	2.0	13.00
20.	1.3	0.013	2.2	13.00
21.	1.4	0.014	2.2	11.20
22.	1.4	0.014	2.4	11.20
23.	1.5	0.015	2.3	9.757
24.	1.5	0.015	2.5	9.757
25.	1.6	0.016	2.4	8.576
26.	1.6	0.016	2.6	8.576
27.	1.7	0.017	2.5	7.596
28.	1.7	0.017	2.7	7.596
29.	1.7	0.017	2.8	7.596
30.	1.8	0.018	2.6	6.775
31.	1.8	0.018	2.8	6.775
32.	1.9	0.019	2.7	6.081
33.	1.9	0.019	2.9	6.081

TABLE-1 (Contd.)

Popular sizes of PVC Insulated Winding Wires.

Sl. No.	Dia of Copper Wire (mm)	Tol. on wire dia (mm)	Max. overall diameter of insulated wire (mm)	Nominal Conductor Resistance at 20°C (Ohm/KM)
34.	2.0	0.02	3.0	5.488
35.	2.0	0.02	3.14	5.488
36.	2.0	0.02	3.2	5.488
37.	2.0	0.02	3.22	5.488
38.	2.1	0.021	3.3	5.0
39.	2.2	0.022	3.4	4.6
40.	2.26	0.0226	3.6	4.3
41.	2.3	0.023	3.5	4.2
42.	2.4	0.024	3.7	3.9
43.	2.5	0.025	3.6	3.512
44.	2.5	0.025	3.8	3.512
45.	2.6	0.026	3.9	3.24
46.	2.7	0.027	4.0	3.0
47.	2.8	0.028	4.1	2.8
48.	2.9	0.029	4.0	2.61
49.	3.0	0.030	4.6	2.439
50.	3.5	0.035	5.2	1.79
51.	3.8	0.038	5.5	1.52

Dimensions of PVC Insulated Winding Wires ⁺

Sl. No.	Dia of Copper Wire (mm)	Tol. on Wire dia (± mm)	P.V.C. thickness (mm)	Overall diameter (mm)	Tol. on Overall diameter (mm)	Nominal Conductor Resistance at 20°C (Ohm/KM)
1.	0.6	0.006	0.35	1.3	±0.05*	61.0
2.	0.7	0.007	0.35	1.4	±0.05*	44.8
3.	0.8	0.008	0.35	1.5	±0.05*	34.3
4.	0.9	0.009	0.35	1.6	±0.05*	27.1
5.	1.0	0.01	0.35	1.7	±0.05*	21.95
6.	1.1	0.011	0.35	1.8	±0.05*	18.1
7.	1.2	0.012	0.35	1.9	±0.05*	15.2
8.	1.3	0.013	0.4	2.1	±0.05*	13.0
9.	1.4	0.014	0.4	2.2	±0.05*	11.2
10.	1.5	0.015	0.4	2.3	±0.05*	9.757
11.	1.6	0.016	0.4	2.4	±0.05*	8.575
12.	1.7	0.017	0.4	2.5	±0.05*	7.596
13.	1.8	0.018	0.4	2.6	±0.1	6.775
14.	1.9	0.019	0.4	2.7	±0.1	6.081
15.	2.0	0.02	0.5	3.0	±0.1	5.488
16.	2.1	0.021	0.5	3.1	±0.1	5.0
17.	2.2	0.022	0.5	3.2	±0.1	4.6
18.	2.3	0.023	0.5	3.3	±0.1	4.2
19.	2.4	0.024	0.6	3.6	±0.1	3.9
20.	2.5	0.025	0.6	3.7	±0.1	3.512
21.	2.6	0.026	0.6	3.8	±0.1	3.24
22.	2.7	0.027	0.6	3.9	±0.1	3.0
23.	2.8	0.028	0.6	4.0	±0.1	2.8
24.	3.0	0.030	0.75	4.5	±0.1	2.439
25.	3.2	0.032	0.6	4.4	±0.1	2.144
26.	3.2	0.032	0.75	4.7	±0.1	2.144
27.	3.4	0.034	0.8	5.0	±0.1	1.899
28.	3.6	0.036	0.8	5.2	±0.1	1.694

* Tol. of ±0.05 mm shall be maintained for 80 to 90% quantity. However 10 to 20% quantity can be supplied with ±0.1 mm tolerance.

+ Dimensions fully conform to NSW specification.

Dimensions of Polyethylene Insulated and Nylon Sheathed Winding Wires

Sl. No.	Dia of Copper Wire (mm)	Tol. on Wire dia (± mm)	Poly-ethylene thick-ness (mm)	Dia over Poly-ethylene (mm)	Nylon Jacket thick-ness (mm)	Overall dia of Winding Wire (mm)	Tol. on Overall dia (mm)	Nominal Conductor Resistance at 20°C (Ohm/KM)
1.	0.6	0.006	0.3	1.2	0.10	1.4	± 0.05*	61.0
2.	0.7	0.007	0.35	1.4	0.10	1.6	± 0.05*	44.8
3.	0.8	0.008	0.35	1.5	0.10	1.7	± 0.05*	34.3
4.	0.9	0.009	0.35	1.6	0.10	1.8	± 0.05*	27.1
5.	1.0	0.01	0.35	1.7	0.10	1.9	± 0.05*	21.95
6.	1.2	0.012	0.4	2.0	0.10	2.2	± 0.05*	15.2
7.	1.3	0.013	0.4	2.1	0.10	2.3	± 0.05*	13.0
** 8.	1.4	0.014	0.4	2.2	0.10	2.4	± 0.05*	11.2
** 9.	1.5	0.015	0.4	2.3	0.10	2.5	± 0.05*	9.757
**10.	1.6	0.016	0.4	2.4	0.10	2.6	± 0.1	8.575
**11.	1.7	0.017	0.4	2.5	0.10	2.7	± 0.1	7.596
**12.	1.8	0.018	0.4	2.6	0.10	2.8	± 0.1	6.775
**13.	1.9	0.019	0.4	2.7	0.10	2.9	± 0.1	6.081
**14.	2.0	0.020	0.45	2.9	0.15	3.2	± 0.1	5.488
**15.	2.1	0.021	0.45	3.0	0.15	3.3	± 0.1	5.0
**16.	2.2	0.022	0.45	3.1	0.15	3.4	± 0.1	4.6
**17.	2.3	0.023	0.45	3.2	0.15	3.5	± 0.1	4.2
**18.	2.4	0.024	0.5	3.4	0.15	3.7	± 0.1	3.9
**19.	2.5	0.025	0.5	3.5	0.15	3.8	± 0.1	3.512
**20.	2.6	0.026	0.5	3.6	0.15	3.9	± 0.1	3.24
**21.	2.7	0.027	0.55	3.8	0.15	4.1	± 0.1	3.0
22.	2.8	0.028	0.55	3.9	0.15	4.2	± 0.1	2.8
**23.	2.9	0.029	0.55	4.0	0.15	4.3	± 0.1	2.6
**24.	3.0	0.03	0.6	4.2	0.20	4.6	± 0.1	2.439
**25.	3.2	0.032	0.6	4.4	0.15	4.7	± 0.1	2.14
**26.	3.4	0.034	0.65	4.7	0.15	5.0	± 0.1	1.9
27. ✓	3.5	0.035	0.65	4.8	0.20	5.2	± 0.1	1.79
**28.	3.6	0.036	0.65	4.9	0.15	5.2	± 0.1	1.69
29.	3.8	0.038	0.65	5.1	0.20	5.5	± 0.1	1.52
30. ✓	4.0	0.04	0.70	5.4	0.25	5.9	± 0.1	1.372

* Tol. of ± 0.05 mm shall be maintained for 80 to 90% quantity. However 10 to 20% quantity can be supplied with ± 0.1 mm tolerance.

** Dimensions fully conform to NSW Standards.



FLAT MOTOR LEADS FOR SUBMERSIBLE PUMPS.

'UNISTAR' Flat Cables for submersible pump motors are designed to render long trouble free service in combination with UNISTAR Winding Wires for the pump motors. These cables are suitable for operation upto 85°C and the insulation material used has high dielectric values in addition to being highly resistant to moisture absorption, thus ensuring uninterrupted operation of submersible pumps in onerous installations.

There is no Indian Standard for these flat cables used as submersible pump leads. However, the materials used in these cables conforms to IS:5831/1984 for PVC insulation & Sheath, while copper conductor conforms to IS:8130/1984 Class 5 flexible. Cables are tested to IS:694 in general. Design parameters are given under:

TABLE - 4

Cable data of 3 core Flat Cables.

Nom. area of copper conductor (Sq. mm.)	1.5	2.5	4	6	10
Nom. thickness of PVC insulation (mm)	0.8	0.9	1.0	1.0	1.0
Nom. core dia (mm)	3.2	3.8	4.6	5.3	6.6
Core identification	Colours Red, Yellow & Blue				
Nom. thickness of PVC Outer Sheath (mm)	1.1	1.1	1.2	1.2	1.4
Colour of sheath	Black				
Approx. overall dimensions Width (Nom.)	12.8	14.6	17.2	18.7	23.7
Thickness (Nom)	6.0	6.4	7.4	7.9	9.9
Recommended Current rating in Air at 40°C. (Amps)	14	18	24	30	39

Use 'UNISTAR' PVC Winding wires for Submersible pump motors for long trouble free service. Special designs of other types of cables will be supplied on request.

Motorleads with earth continuity conductors are also supplied on specific request.

TABLE - 5

Recommended Winding Wire sizes and Motor leads for Horse Power ratings of Pump Motors

415 V-3 Phase Motor HP range	PVC Winding Wire size	Motor lead size
2 - 4 HP	0.6/1.2 to 0.7/1.5	3x1.5 Sq.mm.Cu.
4 - 5 HP	0.8/1.6 to 0.9/1.7	-do-
5 - 10 HP	1.0/1.7 to 1.1/1.9	3x2.5 Sq.mm.Cu.
10 - 20 HP	1.2/2.2 to 1.5/2.8	3x4 Sq.mm.Cu.
20 - 30 HP	1.6/2.6 to 1.8/2.8	3x6 Sq.mm.Cu.
30 - 40 HP	1.9/2.9 to 2.1/3.3	3x10 Sq.mm.Cu.
40 - 75 HP	2.2/3.4 to 2.6/3.9	3x35 Sq.mm.Cu.
Above 75 HP	2.7/4.0 to 4.6/6.7	3x50 Sq.mm.Cu.