
Medium Voltage Cable

Cable Selection

It is essential that any design of a cable system selected for a particular project or a distribution system is suitable for its intended use. Choice needs to be based on a range of factors including installation specifications, local regulations and the required performance characteristics, some of which are shown below:

- Normal current load
- Maximum fault current and its duration under fault conditions
- Voltage grade
- Subsoil conditions for underground installations e.g., presence of water, soil temperature and thermal resistivity, possible attack of rodents, termites etc.
- Cable fire performance requirements
- Compatibility with an existing distribution system

In the tables in the next section, cable constructions and performance features correspond to AS/NZS 1429.1 Standard and Ducab's in-house quality norms.

Cable design and construction

Conductors

The Conductors of MV cables are stranded circular compacted class 2 as per AS/NZS 1125. Ducab offers both aluminium & copper conductor cables.

Conductor Screen

This is a layer of crosslinkable semi-conducting compound extruded directly over the conductor during the XLPE insulation extrusion.

Insulation

All Ducab's MV and HV cables feature DFITM XLPE insulation which is virtually discharge free, ensuring a long and trouble-free service life.

The insulation is extruded and dry cured to meet the requirements of the standards and/or customer specification. A high degree of concentricity is assured through the use of x-ray monitoring device during extrusion. The XLPE insulation is capable of operating continuously at 90°C.

Insulation Screen

This is a layer of cross-linkable semi-conducting compound extruded directly over the insulation at the same time when the conductor screen and XLPE insulation are extruded. This semi-conducting screen is cold strippable but fully bonded screens may be provided, if specified.

Metallic Screen

The metallic screen can be a helically applied copper tape or a number of copper wires applied with a lay or a combination of tape and wires applied over the semi-conducting screen. The metallic screen provides the earth fault current path and it is of a cross section designed as per customer's specification.

In case of three core cables, phase identification tapes (red/white/blue) are generally longitudinally applied under the metallic screen.

Laying up

In the case of three core cables, the three cores identified as red, white and blue are laid up together with polypropylene string fillers at the interstices between the three cores. A binder e.g., polyester tape is wrapped round the assembly to form a compact circular cable during this process.

Lead Sheath

When required, lead alloy E as per AS/NZS 2893 is provided. The lead sheath perform the mechanical function of acting as a barrier to entry of hydrocarbons. In addition, it can also be engaged to perform the electrical function of sharing the earth fault current with the armour.

Bedding Sheath

As per client's requirement, Black polyvinyl chloride (PVC) or Polyethylene (PE) Compound is extruded over the laid up 3 core cable or on the screened single core cables.

Armouring

This process is not applicable if an unarmoured cable is specified. If armour is required, then following variations are possible:

- Single Core Cables: Aluminium armour wires applied all round the cable with a lay.
- Three Core Cables: Galvanised Steel Wires applied all round the cable with a lay.

Oversheath

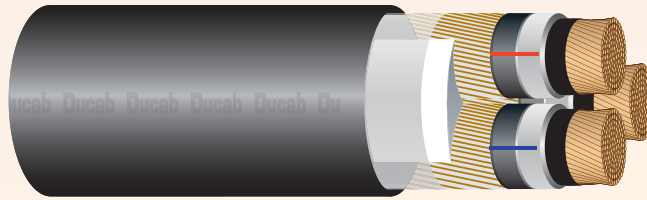
This is an extruded layer of black PVC (5V-90) or PE (LLDPE or MDPE or HDPE) as required by customer specification. The oversheath has an embossed legend in two or more lines appropriate for the cable.

Special Features

The cable as a whole or its specific cores or other design elements can vary in a number of ways to meet specific customer needs. The following are some examples, and by no means an exhaustive list of special features possible:

- Longitudinal and radial water blocking of conductors, cores or complete cable.
- Extra water-tree retardant XLPE insulation
- PVC oversheath with:
 - a) reduced flame propagation (RP) and low HCL (LHCL) emission properties
 - b) anti-termite properties
- Ducab Smokemaster Low Smoke and Fume construction using zero-halogen bedding and oversheath
- Oversheath of red colour with sulphide-resistant and/or UV resistant properties
- Graphite coated oversheath
- Embossed legend as per customer specification
- Metre length marking

Three Core, unarmoured 3.8/6.6 kV to AS/NZS 1429.1

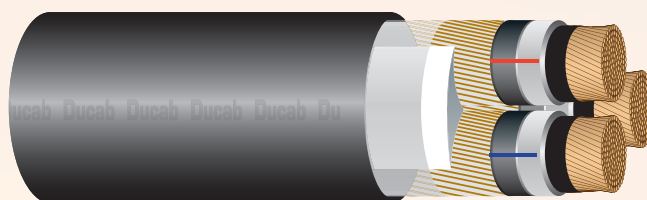


Three core circular copper conductor, 3.8/6.6 kV, XLPE insulated, Cu wires screened and PVC sheathed as per AS/NZS 1429.1

- * **Conductor** : Stranded compacted copper as per AS/NZS 1125
- * **Insulation**: XLPE as per AS/NZS 3808
- * Cu wire screen for Heavy Duty application (10.1 kA /1 second)
- * **Outer sheath**: PVC (5V-90) as per AS/NZS 3808
- * **Operating Temperature**: 90°C

Nominal Area of Conductor	mm ²	70	95	120	150	185	240	300	400
Conductor Diameter (Max)	mm	10	11.5	13	14.5	16.2	18.4	20.7	23.1
Weight of Conductor (Approx)	Kg/Km	1797	2490	3133	3847	4833	6350	7969	10176
Insulation Thickness (Nominal)	mm	2.5	2.5	2.5	2.5	2.5	2.6	2.8	3
Screen area	mm ²	26	26	26	26	26	26	26	26
Outersheath Thickness (Nominal)	mm	2.4	2.5	2.6	2.8	2.9	3	3.2	3.5
Approximate Overall Diameter	mm	50.3	53.8	57.2	60.9	64.7	70.1	77.4	84.1
Approximate Cable Weight	Kg/Km	4015	4880	5695	6620	7815	9645	11740	14450
Maximum DC resistance of Conductor at 20°C	ohm/Km	0.268	0.193	0.153	0.124	0.0991	0.0754	0.0601	0.047
Approximate AC resistance of Conductor at 90°C	ohm/Km	0.342	0.247	0.196	0.159	0.127	0.098	0.079	0.063
Approximate Reactance at 50 Hertz	ohm/Km	0.10	0.10	0.09	0.09	0.09	0.09	0.08	0.08
Approximate Impedance at 50 Hertz	ohm/Km	0.36	0.26	0.22	0.18	0.15	0.13	0.12	0.1
Approximate Capacitance of Cable	µf/Km	0.38	0.43	0.47	0.51	0.56	0.61	0.63	0.65
Sustained Current Ratings:									
1. Laid Direct, Ground Temp. 30°C & g=1.2°C m/W depth of laying = 0.8m, laid in trefoil touching	A	241	283	321	358	406	462	510	566
2. Laid in Air trefoil touching, Ambient Temp. 35°C	A	258	316	359	412	469	545	622	708
One second Short Circuit Current Rating of Conductor	kA	10.01	13.6	17.2	21.5	26.5	34.3	42.9	57.2

Three Core, unarmoured 6.35/11 kV to AS/NZS 1429.1

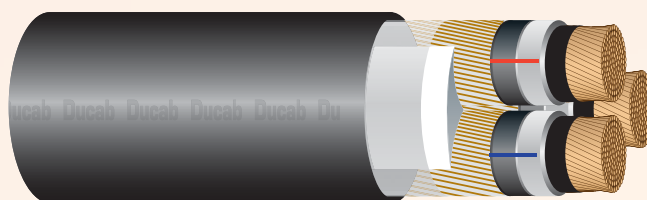


Three core circular copper conductor, 6.35/11 kV, XLPE insulated, Cu wires screened and PVC sheathed as per AS/NZS 1429.1

- * **Conductor** : Stranded compacted copper as per AS/NZS 1125
- * **Insulation**: XLPE as per AS/NZS 3808
- * Cu wire screen for Heavy Duty application (10.1 kA /1 second)
- * **Outer sheath**: PVC (5V-90) as per AS/NZS 3808
- * **Operating Temperature**: 90°C

Nominal Area of Conductor	mm ²	70	95	120	150	185	240	300	400
Conductor Diameter (Max)	mm	10	11.5	13	14.5	16.2	18.4	20.7	23.1
Weight of Conductor (Approx)	Kg/Km	1797	2490	3133	3847	4833	6350	7969	10176
Insulation Thickness (Nominal)	mm	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Screen area	mm ²	26	26	26	26	26	26	26	26
Outersheath Thickness (Nominal)	mm	2.6	2.7	2.8	2.9	3	3.2	3.3	3.6
Approximate Overall Diameter	mm	54.6	58.1	61.5	65	68.8	74	80.2	86
Approximate Cable Weight	Kg/Km	4325	5210	6045	6960	8180	10030	12040	14680
Maximum DC resistance of Conductor at 20°C	ohm/Km	0.268	0.193	0.153	0.124	0.0991	0.0754	0.0601	0.047
Approximate AC resistance of Conductor at 90°C	ohm/Km	0.342	0.247	0.196	0.159	0.127	0.098	0.079	0.063
Approximate Reactance at 50 Hertz	ohm/Km	0.11	0.10	0.10	0.09	0.09	0.09	0.09	0.08
Approximate Impedance at 50 Hertz	ohm/Km	0.36	0.27	0.22	0.18	0.16	0.13	0.12	0.1
Approximate Capacitance of Cable	µf/Km	0.29	0.35	0.38	0.41	0.47	0.51	0.54	0.58
Sustained Current Ratings:									
1. Laid Direct, Ground Temp. 30°C & g=1.2°C m/W depth of laying = 0.8m, laid in trefoil touching	A	241	283	321	358	406	462	510	566
2. Laid in Air trefoil touching, Ambient Temp. 35°C	A	258	316	359	412	469	545	622	708
One second Short Circuit Current Rating of Conductor	kA	10.01	13.6	17.2	21.5	26.5	34.3	42.9	57.2

Three Core, unarmoured 12.7/22 kV to AS/NZS 1429.1

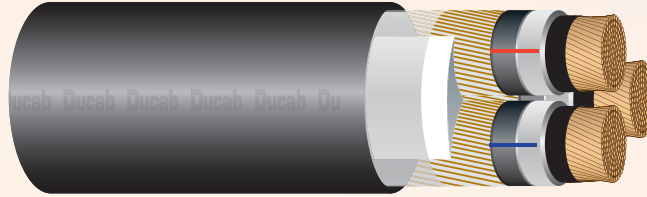


Three core circular copper conductor, 12.7/22 kV, XLPE insulated, Cu wires screened and PVC sheathed as per AS/NZS 1429.1

- * **Conductor** : Stranded compacted copper as per AS/NZS 1125
- * **Insulation**: XLPE as per AS/NZS 3808
- * Cu wire screen for Heavy Duty application (10.1 kA /1 second)
- * **Outer sheath**: PVC (5V-90) as per AS/NZS 3808
- * **Operating Temperature**: 90°C

Nominal Area of Conductor	mm ²	70	95	120	150	185	240	300	400
Conductor Diameter (Max)	mm	10	11.5	13	14.5	16.2	18.4	20.7	23.1
Weight of Conductor (Approx)	Kg/Km	1797	2490	3133	3847	4833	6350	7969	10176
Insulation Thickness (Nominal)	mm	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Screen area	mm ²	26	26	26	26	26	26	26	26
Outersheath Thickness (Nominal)	mm	2.9	3	3.1	3.2	3.3	3.5	3.6	3.9
Approximate Overall Diameter	mm	64.3	67.7	71.2	74.6	78.5	83.6	89.9	95.7
Approximate Cable Weight	Kg/Km	5095	6020	6905	7865	9135	11055	13140	15860
Maximum DC resistance of Conductor at 20°C	ohm/Km	0.268	0.193	0.153	0.124	0.0991	0.0754	0.0601	0.047
Approximate AC resistance of Conductor at 90°C	ohm/Km	0.342	0.247	0.196	0.159	0.127	0.098	0.079	0.063
Approximate Reactance at 50 Hertz	ohm/Km	0.12	0.11	0.11	0.10	0.10	0.10	0.09	0.09
Approximate Impedance at 50 Hertz	ohm/Km	0.36	0.27	0.22	0.19	0.16	0.14	0.12	0.11
Approximate Capacitance of Cable	µf/Km	0.21	0.23	0.25	0.27	0.29	0.32	0.35	0.39
Sustained Current Ratings:									
1. Laid Direct, Ground Temp. 30°C & g=1.2°C m/W depth of laying = 0.8m, laid in trefoil touching	A	241	279	316	354	396	453	500	557
2. Laid in Air trefoil touching, Ambient Temp. 35°C	A	263	316	364	412	469	545	622	708
One second Short Circuit Current Rating of Conductor	kA	10.01	13.6	17.2	21.5	26.5	34.3	42.9	57.2

Three Core, unarmoured 19/33 kV to AS/NZS 1429.1



Three core circular copper conductor, 19/33 kV, XLPE insulated, Cu wires screened and PVC sheathed as per AS/NZS 1429.1

- * **Conductor** : Stranded compacted copper as per AS/NZS 1125
- * **Insulation**: XLPE as per AS/NZS 3808
- * Cu wire screen for Heavy Duty application (10.1 kA /1 second)
- * **Outer sheath**: PVC (5V-90) as per AS/NZS 3808
- * **Operating Temperature**: 90°C

Nominal Area of Conductor	mm ²	70	95	120	150	185	240	300	400
Conductor Diameter (Max)	mm	10	11.5	13	14.5	16.2	18.4	20.7	23.1
Weight of Conductor (Approx)	Kg/Km	1797	2490	3133	3847	4833	6350	7969	10176
Insulation Thickness (Nominal)	mm	8	8	8	8	8	8	8	8
Screen area	mm ²	26	26	26	26	26	26	26	26
Outersheath Thickness (Nominal)	mm	3.3	3.4	3.5	3.6	3.7	3.9	4	4.3
Approximate Overall Diameter	mm	75.9	79.3	82.8	86.2	90.1	95.2	101.5	107.3
Approximate Cable Weight	Kg/Km	6190	7175	8110	9125	10455	12460	14640	17455
Maximum DC resistance of Conductor at 20°C	ohm/Km	0.268	0.193	0.153	0.124	0.0991	0.0754	0.0601	0.047
Approximate AC resistance of Conductor at 90°C	ohm/Km	0.342	0.247	0.196	0.159	0.127	0.098	0.079	0.063
Approximate Reactance at 50 Hertz	ohm/Km	0.13	0.12	0.12	0.11	0.11	0.11	0.10	0.10
Approximate Impedance at 50 Hertz	ohm/Km	0.37	0.28	0.23	0.2	0.17	0.14	0.13	0.12
Approximate Capacitance of Cable	µf/Km	0.16	0.18	0.19	0.2	0.22	0.24	0.26	0.29
Sustained Current Ratings:									
1. Laid Direct, Ground Temp. 30°C & g=1.2°C m/W depth of laying = 0.8m, laid in trefoil touching	A	241	283	321	358	406	462	510	566
2. Laid in Air trefoil touching, Ambient Temp. 35°C	A	258	316	359	412	469	545	622	708
One second Short Circuit Current Rating of Conductor	KA	10.01	13.6	17.2	21.5	26.5	34.3	42.9	57.2