



## LT XLPE & PVC INSULATED CONTROL CABLES

## LT XLPE Control Cables

**TABLE 5.21**

**TECHNICAL DETAILS FOR ZENIUM 1.1 KV  
1.5 SQMM COPPER CONDUCTOR, XLPE INSULATED ARMoured / UN-ARMoured CABLES**

No. of Cores	Minimum Inner Sheath Thickness	Unarmoured (2XY)					Flat Strip Armoured (2XFY)						Round Wire Armoured (2XWY)					
		Nominal Outer Sheath Thickness	Approx. Overall Dia of Cable		Approx. Weight of Cable		Dimension of Armour Strip	Minimum Inner Sheath Thickness	Approx. Overall Dia of Cable		Approx. Weight of Cable		Nominal Dia of Armour Wire	Minimum Outer Sheath Thickness	Approx. Overall Dia of Cable		Approx. Weight of Cable	
			Solid Cond.	Std. Cond.	Solid Cond.	Std. Cond.			Solid Cond.	Std. Cond.	Solid Cond.	Std. Cond.			Solid Cond.	Std. Cond.	Solid Cond.	Std. Cond.
sqmm	mm	mm	mm	mm	Kg/km	Kg/km	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Kg/km	Kg/km
2	0.30	1.80	11	11	160	170	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	13	13	330	350
3	0.30	1.80	11	12	180	190	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	13	13	340	360
4	0.30	1.80	12	12	210	220	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	14	14	390	400
5	0.30	1.80	13	13	240	260	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	15	15	440	460
6	0.30	1.80	14	14	280	300	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	15	16	490	520
7	0.30	1.80	14	14	280	300	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	15	16	500	520
10	0.30	1.80	16	17	420	450	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.40	18	19	660	680
12	0.30	1.80	17	18	450	470	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.40	19	20	720	740
14	0.30	1.80	18	18	490	520	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.40	20	21	770	820
16	0.30	1.80	18	19	550	580	4 x 0.80	1.40	19	20	690	740	1.60	1.40	21	22	900	950
19	0.30	1.80	19	20	610	640	4 x 0.80	1.40	20	21	780	800	1.60	1.40	22	23	990	1030
24	0.30	2.00	23	24	830	880	4 x 0.80	1.40	23	24	960	990	1.60	1.40	25	26	1190	1250
27	0.30	2.00	23	24	870	920	4 x 0.80	1.40	24	25	1010	1060	1.60	1.40	25	26	1250	1320
30	0.30	2.00	24	25	940	990	4 x 0.80	1.40	24	26	1070	1130	1.60	1.40	26	27	1330	1400
37	0.30	2.00	25	27	1100	1150	4 x 0.80	1.40	26	27	1270	1300	1.60	1.40	28	29	1530	1600
40	0.30	2.00	26	28	1080	1240	4 x 0.80	1.40	27	28	1330	1400	1.60	1.40	29	30	1610	1700
44	0.30	2.00	28	30	1350	1430	4 x 0.80	1.40	29	30	1460	1530	1.60	1.56	31	32	1800	1890
52	0.30	2.00	30	31	1490	1570	4 x 0.80	1.56	31	32	1660	1740	1.60	1.56	32	34	1970	2080
61	0.40	2.20	32	34	1740	1830	4 x 0.80	1.56	32	34	1880	1970	2.00	1.56	35	37	2440	2550

**TABLE 5.22**

**TECHNICAL DETAILS FOR ZENIUM 1.1 KV  
2.5 SQMM COPPER CONDUCTOR, XLPE INSULATED ARMoured / UN-ARMoured CABLES**

No. of Cores	Minimum Inner Sheath Thickness	Unarmoured (2XY)					Flat Strip Armoured (2XFY)						Round Wire Armoured (2XWY)					
		Nominal Outer Sheath Thickness	Approx. Overall Dia of Cable		Approx. Weight of Cable		Dimension of Armour Strip	Minimum Inner Sheath Thickness	Approx. Overall Dia of Cable		Approx. Weight of Cable		Nominal Dia of Armour Wire	Minimum Outer Sheath Thickness	Approx. Overall Dia of Cable		Approx. Weight of Cable	
			Solid Cond.	Std. Cond.	Solid Cond.	Std. Cond.			Solid Cond.	Std. Cond.	Solid Cond.	Std. Cond.			Solid Cond.	Std. Cond.	Solid Cond.	Std. Cond.
sqmm	mm	mm	mm	mm	Kg/km	Kg/km	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Kg/km	Kg/km
2	0.30	1.80	12	12	190	200	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	13	14	390	410
3	0.30	1.80	12	13	220	230	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	14	14	400	420
4	0.30	1.80	13	13	260	270	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	15	15	450	470
5	0.30	1.80	14	14	320	330	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	16	16	520	540
6	0.30	1.80	15	16	370	390	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	17	17	590	620
7	0.30	1.80	15	16	370	390	N/A	N/A	N/A	N/A	N/A	N/A	1.40	1.24	17	17	600	630
10	0.30	1.80	18	19	560	590	4 x 0.80	1.24	19	20	650	690	1.60	1.40	21	22	890	920
12	0.30	1.80	19	20	600	630	4 x 0.80	1.40	20	21	730	770	1.60	1.40	21	22	950	990
14	0.30	1.80	20	20	660	700	4 x 0.80	1.40	20	21	820	860	1.60	1.40	22	23	1030	1080
16	0.30	2.00	21	22	770	800	4 x 0.80	1.40	22	22	910	940	1.60	1.40	23	24	1140	1180
19	0.30	2.00	22	23	850	890	4 x 0.80	1.40	23	24	1000	1050	1.60	1.40	24	25	1240	1300
24	0.30	2.00	25	26	1140	1190	4 x 0.80	1.40	26	27	1240	1300	1.60	1.40	27	29	1510	1590
27	0.30	2.00	26	27	1200	1240	4 x 0.80	1.40	26	28	1340	1390	1.60	1.40	27	29	1600	1670
30	0.30	2.00	27	28	1290	1350	4 x 0.80	1.40	27	28	1430	1490	1.60	1.40	29	30	1730	1790
37	0.30	2.00	29	30	1520	1590	4 x 0.80	1.40	29	31	1670	1730	1.60	1.56	31	32	2020	2060
40	0.30	2.00	30	31	1640	1710	4 x 0.80	1.56	31	32	1820	1890	2.00	1.56	32	35	2150	2420
44	0.40	2.20	32	34	1930	2010	4 x 0.80	1.56	33	35	2030	2100	2.00	1.56	35	37	2590	2690
52	0.40	2.20	34	36	2140	2230	4 x 0.80	1.56	34	36	2280	2360	2.00	1.56	37	39	2840	2970
61	0.40	2.20	36	36	2430	2530	4 x 0.80	1.56	36	38	2580	2660	2.00	1.56	39	41	3190	3300

The above data is approximate and subject to manufacturing tolerance

## LT PVC Control Cables

**TABLE 5.23**

Ref. Spec. : IS: 1554 Part1:1998

**TECHNICAL DETAILS FOR ZENIUM 1.1 KV  
1.5 SQMM SOLID COPPER CONDUCTOR, PVC INSULATED, ARMoured / UN-ARMoured CONTROL CABLES**

No. of Cores	Minimum Inner Sheath Thickness	Nominal Outer Sheath Thickness	Unarmoured (YY)		Flat Strip Armoured (YFY)				Round Wire Armoured (YWY)			
			Approx. Overall Dia of Cable	Approx. Weight of Cable	Dimension of Armour Strip	Minimum Inner Sheath Thickness	Approx. Overall Dia of Cable	Approx. Weight of Cable	Nominal Dia of Armour Wire	Minimum Outer Sheath Thickness	Approx. Overall Dia of Cable	Approx. Weight of Cable
			Solid Cond.	Solid Cond.			Solid Cond.	Solid Cond.			Solid Cond.	Solid Cond.
sqmm	mm	mm	mm	Kg/km	mm	mm	mm	mm	mm	mm	mm	Kg/km
2	0.30	1.80	11	160	N/A	N/A	N/A	N/A	1.40	1.24	13	350
3	0.30	1.80	12	190	N/A	N/A	N/A	N/A	1.40	1.24	13	360
4	0.30	1.80	12	220	N/A	N/A	N/A	N/A	1.40	1.24	14	410
5	0.30	1.80	13	240	N/A	N/A	N/A	N/A	1.40	1.24	15	470
6	0.30	1.80	14	270	N/A	N/A	N/A	N/A	1.40	1.24	16	530
7	0.30	1.80	14	290	N/A	N/A	N/A	N/A	1.40	1.24	16	540
10	0.30	1.80	17	410	N/A	N/A	N/A	N/A	1.40	1.40	19	720
12	0.30	2.00	18	450	4 X 0.80	1.40	18	620	1.60	1.40	20	830
14	0.30	2.00	19	500	4 X 0.80	1.40	20	700	1.60	1.40	21	900
16	0.30	2.00	19	570	4 X 0.80	1.40	20	780	1.60	1.40	22	1010
19	0.30	2.00	21	670	4 X 0.80	1.40	21	850	1.60	1.40	23	1070
24	0.30	2.00	24	820	4 X 0.80	1.40	24	1050	1.60	1.40	26	1310
27	0.30	2.00	24	880	4 X 0.80	1.40	25	1130	1.60	1.40	26	1380
30	0.30	2.00	25	950	4 X 0.80	1.40	26	1200	1.60	1.40	27	1470
37	0.40	2.20	27	1150	4 X 0.80	1.40	27	1400	1.60	1.40	29	1690
40	0.40	2.20	28	1220	4 X 0.80	1.40	29	1500	1.60	1.56	31	1830
44	0.40	2.20	30	1350	4 X 0.80	1.56	31	1670	1.60	1.56	33	2000
52	0.40	2.20	31	1600	4 X 0.80	1.56	32	1890	2.00	1.56	35	2440
61	0.40	2.20	34	1800	4 X 0.80	1.56	34	2130	2.00	1.56	37	2700

**TABLE 5.24**

**TECHNICAL DETAILS FOR ZENIUM 1.1 KV  
2.5 SQMM SOLID COPPER CONDUCTOR, PVC INSULATED, ARMoured / UN-ARMoured CONTROL CABLES**

No. of Cores	Minimum Inner Sheath Thickness	Nominal Outer Sheath Thickness	Unarmoured (YY)		Flat Strip Armoured (YFY)				Round Wire Armoured (YWY)			
			Approx. Overall Dia of Cable	Approx. Weight of Cable	Dimension of Armour Strip	Minimum Inner Sheath Thickness	Approx. Overall Dia of Cable	Approx. Weight of Cable	Nominal Dia of Armour Wire	Minimum Outer Sheath Thickness	Approx. Overall Dia of Cable	Approx. Weight of Cable
			Solid Cond.	Solid Cond.			Solid Cond.	Solid Cond.			Solid Cond.	Solid Cond.
sqmm	mm	mm	mm	Kg/km	mm	mm	mm	mm	mm	mm	mm	Kg/km
2	0.30	1.80	13	220	N/A	N/A	N/A	N/A	1.40	1.24	14	480
3	0.30	1.80	14	260	N/A	N/A	N/A	N/A	1.40	1.24	15	530
4	0.30	1.80	15	310	N/A	N/A	N/A	N/A	1.40	1.24	16	600
5	0.30	1.80	16	340	N/A	N/A	N/A	N/A	1.40	1.24	17	640
6	0.30	1.80	17	390	N/A	N/A	N/A	N/A	1.40	1.24	19	730
7	0.30	1.80	17	424	N/A	N/A	N/A	N/A	1.40	1.24	19	760
10	0.30	1.80	20	570	4 X 0.80	1.40	21	850	1.60	1.40	23	1100
12	0.30	2.00	21	670	4 X 0.80	1.40	22	950	1.60	1.40	24	1180
14	0.30	2.00	22	750	4 X 0.80	1.40	23	1050	1.60	1.40	25	1300
16	0.30	2.00	24	840	4 X 0.80	1.40	24	1120	1.60	1.40	26	1400
19	0.30	2.00	25	950	4 X 0.80	1.40	25	1250	1.60	1.40	27	1550
24	0.30	2.00	28	1200	4 X 0.80	1.40	29	1550	1.60	1.56	31	1900
27	0.30	2.00	29	1300	4 X 0.80	1.40	30	1650	1.60	1.56	32	2050
30	0.30	2.00	30	1400	4 X 0.80	1.56	31	1800	1.60	1.56	33	2200
37	0.40	2.20	33	1700	4 X 0.80	1.56	34	2100	2.00	1.56	36	2800
40	0.40	2.20	34	1850	4 X 0.80	1.56	35	2300	2.00	1.56	37	2950
44	0.40	2.20	36	2000	4 X 0.80	1.56	37	2500	2.00	1.56	40	3200
52	0.40	2.20	38	2350	4 X 0.80	1.56	39	2850	2.00	1.72	42	3600
61	0.40	2.20	40	2700	4 X 0.80	1.56	41	3250	2.00	1.72	44	4000

The above data is approximate and subject to manufacturing tolerance

## LT PVC Control Cables

**TABLE 5.25**

**TECHNICAL DETAILS FOR ZENIUM 1.1 KV  
1.5 SQMM STRANDED COPPER CONDUCTOR, PVC INSULATED ARMoured / UN-ARMoured CABLES**

No. of Cores	Minimum Inner Sheath Thickness	Nominal Outer Sheath Thickness	Unarmoured (YY)		Flat Strip Armoured (YFY)				Round Wire Armoured (A2XWY / 2XWY)			
			Approx. Overall Dia of Cable	Approx. Weight of Cable	Dimension of Armour Strip	Minimum Inner Sheath Thickness	Approx. Overall Dia of Cable	Approx. Weight of Cable	Nominal Dia of Armour Wire	Minimum Outer Sheath Thickness	Approx. Overall Dia of Cable	Approx. Weight of Cable
			Std. Cond.	Std. Cond.			Std. Cond.	Std. Cond.			Std. Cond.	Std. Cond.
sqmm	mm	mm	mm	Kg/km	mm	mm	mm	mm	mm	mm	mm	Kg/km
2	0.30	1.80	12	170	N/A	N/A	N/A	N/A	1.40	1.24	13	370
3	0.30	1.80	12	200	N/A	N/A	N/A	N/A	1.40	1.24	14	380
4	0.30	1.80	13	230	N/A	N/A	N/A	N/A	1.40	1.24	15	430
5	0.30	1.80	14	230	N/A	N/A	N/A	N/A	1.40	1.24	16	490
6	0.30	1.80	15	280	N/A	N/A	N/A	N/A	1.40	1.24	17	550
7	0.30	1.80	15	300	N/A	N/A	N/A	N/A	1.40	1.24	17	560
10	0.30	1.80	18	430	N/A	N/A	N/A	N/A	1.40	1.40	20	760
12	0.30	2.00	19	470	4 X 0.80	1.40	19	640	1.60	1.40	21	860
14	0.30	2.00	19	520	4 X 0.80	1.40	20	740	1.60	1.40	22	950
16	0.30	2.00	20	570	4 X 0.80	1.40	21	800	1.60	1.40	23	1030
19	0.30	2.00	22	700	4 X 0.80	1.40	22	900	1.60	1.40	24	1130
24	0.30	2.00	25	870	4 X 0.80	1.40	26	1110	1.60	1.40	27	1370
27	0.30	2.00	25	950	4 X 0.80	1.40	26	1190	1.60	1.40	28	1450
30	0.30	2.00	26	1000	4 X 0.80	1.40	27	1270	1.60	1.40	28	1540
37	0.40	2.20	28	1200	4 X 0.80	1.40	29	1470	1.60	1.40	30	1770
40	0.40	2.20	29	1270	4 X 0.80	1.40	30	1570	1.60	1.56	32	1910
44	0.40	2.20	31	1400	4 X 0.80	1.56	32	1760	1.60	1.56	34	2100
52	0.40	2.20	33	1650	4 X 0.80	1.56	34	1980	2.00	1.56	36	2550
61	0.40	2.20	35	1900	4 X 0.80	1.56	36	2250	2.00	1.56	38	2830

**TABLE 5.26**

**TECHNICAL DETAILS FOR ZENIUM 1.1 KV  
2.5 SQMM STRANDED COPPER CONDUCTOR, PVC INSULATED ARMoured / UN-ARMoured CABLES**

No. of Cores	Minimum Inner Sheath Thickness	Nominal Outer Sheath Thickness	Unarmoured (YY)		Flat Strip Armoured (YFY)				Round Wire Armoured (A2XWY / 2XWY)			
			Approx. Overall Dia of Cable	Approx. Weight of Cable	Dimension of Armour Strip	Minimum Inner Sheath Thickness	Approx. Overall Dia of Cable	Approx. Weight of Cable	Nominal Dia of Armour Wire	Minimum Outer Sheath Thickness	Approx. Overall Dia of Cable	Approx. Weight of Cable
			Std. Cond.	Std. Cond.			Std. Cond.	Std. Cond.			Std. Cond.	Std. Cond.
sqmm	mm	mm	mm	Kg/km	mm	mm	mm	mm	mm	mm	mm	Kg/km
2	0.30	1.80	13	230	N/A	N/A	N/A	N/A	1.40	1.24	15	440
3	0.30	1.80	14	270	N/A	N/A	N/A	N/A	1.40	1.24	16	460
4	0.30	1.80	15	320	N/A	N/A	N/A	N/A	1.40	1.24	17	530
5	0.30	1.80	16	350	N/A	N/A	N/A	N/A	1.40	1.24	18	600
6	0.30	1.80	17	420	N/A	N/A	N/A	N/A	1.40	1.24	19	670
7	0.30	1.80	17	440	N/A	N/A	N/A	N/A	1.40	1.24	19	700
10	0.30	1.80	21	660	4 X 0.80	1.40	22	900	1.60	1.40	24	1030
12	0.30	2.00	22	750	4 X 0.80	1.40	23	1000	1.60	1.40	25	1250
14	0.30	2.00	23	840	4 X 0.80	1.40	24	1035	1.60	1.40	26	1350
16	0.30	2.00	24	930	4 X 0.80	1.40	25	1150	1.60	1.40	27	1450
19	0.30	2.00	25	1050	4 X 0.80	1.40	26	1330	1.60	1.40	28	1620
24	0.30	2.00	29	1380	4 X 0.80	1.40	30	1630	1.60	1.56	32	2000
27	0.30	2.00	30	1470	4 X 0.80	1.40	31	1750	1.60	1.56	33	2100
30	0.30	2.00	31	1590	4 X 0.80	1.56	32	1920	1.60	1.56	34	2250
37	0.40	2.20	34	1900	4 X 0.80	1.56	35	2225	2.00	1.56	37	2900
40	0.40	2.20	36	1900	4 X 0.80	1.56	36	2400	2.00	1.56	39	3100
44	0.40	2.20	38	2100	4 X 0.80	1.56	37	2600	2.00	1.56	41	3350
52	0.40	2.20	40	2450	4 X 0.80	1.56	41	2950	2.00	1.72	43	3700
61	0.40	2.20	43	2800	4 X 0.80	1.56	43	3350	2.00	1.72	46	4200

The above data is approximate and subject to manufacturing tolerance

## Current Ratings of PVC & XLPE Cables

Assumption for Current Ratings for PVC & XLPE cables:

max. conductor temperature	<b>70°C</b> (for PVC insulated cables) <b>90°C</b> (for XLPE insulated cable)
ambient temperature	<b>40°C</b>
ground temperature	<b>30°C</b>
thermal Resistivity of soil	<b>150°C - cm/watt</b>
thermal Resistivity of	<b>650°C - cm/watt</b> (for PVC)
Dielectric	<b>350°C - cm/watt</b> (for XLPE)
Depth of laying	<b>75 cm</b> - upto 1.1 K.V. Cables <b>90 cm</b> - 3.3 to 11 K.V. Cables <b>105 cm</b> - 11 to 33 K.V. Cables

### Method of Installation :

Recommended to lay cable as per configuration method below:

#### SINGLE CORE CABLES

##### Laid direct in the ground

- 1) Three in close trefoil formation, or
- 2) Two touching in horizontal formation.

##### Ducts

- 3) Three in trefoil formation, or
- 4) Two in horizontal formation.

##### In Air

5) Two single core cable are installed one above the other fixed to a vertical wall as follows, the distance between the wall & the surface of the cable being 25mm in each case.

- i) Cable of sizes up to & including 185 mm<sup>2</sup> are installed at a distance between centers of twice the overall diameter of the cable.
- ii) Cables of sizes 240 mm<sup>2</sup> and above are installed at a distance between centrist of 90mm.

Note: The rating for two cables may be applied with safety in cases where such cables are installed in horizontal formation, on brackets fixed to a wall, either spaced as indicated above or touching throughout.

6) Three single core cables are installed in trefoil formation touching.

#### TWIN & MULTI CORE CABLES

##### Installed single in the ground

##### Installed single in the air

### Rating Factors

The current ratings given in various tables are based on certain assumed conditions as above. In actual practice, these conditions may be different. Therefore, to determine the current rating, the tabulated ratings shall be multiplied with appropriate rating factors.

### Circuit Protection

1. PVC insulated cables should not be operated, even for comparatively short durations, at temperature appreciably higher than that permissible for continuous operation, since the PVC insulation is liable to soften at higher temperatures and sustain serious damage.
2. It is, therefore, essential that such cables shall be continuously operated at the rated currents given in the tables only if they are suitably protected against excess currents arising out of the fault conditions. It is assumed that duration of such faults does not exceed four hours and protection is considered to be adequate if the minimum current at which the protective device is designed to operate does not exceed 1.5\* times the tabulated ratings for cables laid in air or in ducts, and not more than 1.3\* times the tabulated values for cable laid direct in the ground.
3. If by the nature of the circuit protection, it is not possible to operate the cable at the rated current under the foregoing provisions, the cable required for a given continuous load current shall be chosen to have a rating as given in the tables which shall be not less than:
  - a) The given continuous load current and
  - b) For cables in air or in ducts, 0.57\* of the minimum current at which the excess current protection is designed to operate, or For cables laid direct in the ground, 0.77\* of the minimum current at which excess current protection is designed to operate.

### Examples:

1. A 3-core aluminium conductored cable of size 185 mm<sup>2</sup> laid direct in the ground can carry a continuous load current of 235 amperes (tabulated rating) if the excess current protection is designed to operate when current exceeds  $1.3 \times 235 = 305$  amperes.
2. For a continuous load current of 100 amperes per phase, a 3-core copper conductored cable of size 35mm<sup>2</sup> installed in air (tabulated rating 110 amperes) is adequate if the excess current protection is designed to operate when current exceeds  $1.5 \times 110 = 165$  amperes. If the excess current protection is designed to operate when current exceeds say 200 amperes, a cable with a tabulated rating not less than  $0.67 \times 200 = 135$  Amperes will be necessary, that is, cable with size 50 mm<sup>2</sup>.