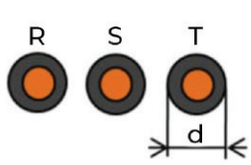
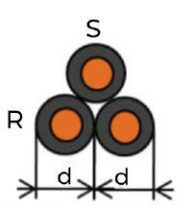
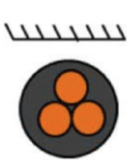
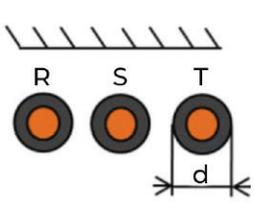
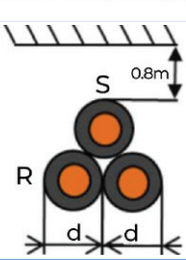
Rating Factors for XLPE/EPR Insulated MV Cables

Installation Condition Data

Maximum Conductor Temperature	XLPE	°C	90
	EPR	°C	90
Base Temperature	In Air	°C	30
	In Ground	°C	20
Soil Thermal Resistivity		Km/W	1.5
Depth of laying		m	0.8

Cable Arrangement

d = Cable Overall Diamater)

Method of Laying	Ambient Temperature	Cable Lay-out		
		1 multicore Cable	3 Single Core Cabled in 3 Phase System	
			Flat Formation	Trefoil Formation
Installed in free air	30°C			
Installed direct in ground	30°C			

Rating Factor

The following factors are used for calculation based on the current rating stated on the catalogue for XLPE and EPR Insulation with different Laying condition

A. CABLES LAID DIRECT IN GROUND

A.1 Rating Factor for Variation of Ground Temperature

Ground Temperature (°C)		10	15	20	25	30	35	40	45	50
Rating Factor	XLPE	1.07	1.04	1.00	0.96	0.93	0.89	0.85	0.80	0.76
	EPR	1.07	1.04	1.00	0.96	0.93	0.89	0.85	0.80	0.76

A.2 Rating Factor for Variation of Depth of Laying in Ground

Depth of Laying (m)	Single Core Cables		Three Cores Cables
	Nominal Conductor size (mm^2)		
	< 185 mm^2	> 185 mm^2	
0.5	1.04	1.06	1.04
0.6	1.02	1.04	1.03
1.0	0.98	0.97	0.98
1.25	0.96	0.96	0.96
1.5	0.95	0.93	0.95
1.75	0.94	0.91	0.94
2.0	0.93	0.90	0.93
2.5	0.91	0.88	0.91
3.0	0.9	0.86	0.90

A.3 Rating Factor for Thermal Resistivity of Soil for Direct Burried Single Core

Nominal Area of Conductor (mm^2)	Value of Soil Thermal Resistivity (K.m/W)							
	0.7	0.8	0.9	1.0	1.5	2.0	2.5	3.0
16	1.29	1.24	1.14	1.15	1.0	0.89	0.82	0.75
25	1.30	1.25	1.14	1.16	1.0	0.89	0.81	0.75
35	1.30	1.25	1.15	1.16	1.0	0.89	0.81	0.75
50	1.32	1.26	1 .15	1.16	1.0	0.89	0.81	0.74
70	1.33	1.27	1.15	1.17	1.0	0.89	0.81	0.74
95	1.34	1.28	1.16	1.18	1.0	0.89	0.80	0.74
120	1.34	1.28	1.16	1.18	1.0	0.88	0.80	0.74
150	1.35	1.28	1.16	1.18	1.0	0.88	0.80	0.74
185	1.35	1.29	1.17	1.18	1.0	0.88	0.80	0.74
240	1.36	1.29	1.17	1.18	1.0	0.88	0.80	0.73
300	1.36	1.30	1.17	1.19	1.0	0.88	0.80	0.73
400	1.37	1.30	1.17	1.19	1.0	0.88	0.79	0.73

A.4 Rating Factor for Thermal Resistivity of Soil for Direct Burried Three Cores

Nominal Area of Conductor (mm²)	Value of Soil Thermal Resistivity (K.m/W)							
	0.7	0.8	0.9	1.0	1.5	2.0	2.5	3.0
16	1.23	1.10	1.16	1.13	1.0	0.91	0.84	0.78
25	1.24	1.20	1.16	1.13	1.0	0.91	0.84	0.78
35	1.25	1.21	1.17	1.13	1.0	0.91	0.83	0.78
50	1.25	1.21	1.17	1.14	1.0	0.91	0.83	0.77
70	1.26	1.21	1.18	1.14	1.0	0.90	0.83	0.77
95	1.26	1.22	1.18	1.14	1.0	0.90	0.83	0.77
120	1.26	1.22	1.18	1.14	1.0	0.90	0.83	0.77
150	1.27	1.22	1.18	1.15	1.0	0.90	0.83	0.77
185	1.28	1.23	1.18	1.15	1.0	0.90	0.83	0.77
240	1.28	1.23	1.19	1.15	1.0	0.90	0.83	0.77
300	1.28	1.23	1.19	1.15	1.0	0.90	0.82	0.77
400	1.28	1.23	1.19	1.15	1.0	0.90	0.82	0.76

A.5 Rating Factor For Grouping Of Three Core Cables in Horizontal Formation Laid Direct In The Ground

Number of Cables in Group	Spacing Between Cables Centre (mm)				
	Touching	200	400	600	800
2	0.80	0.86	0.90	0.92	0.94
3	0.69	0.77	0.82	0.86	0.89
4	0.62	0.72	0.79	0.83	0.87
5	0.57	0.68	0.75	0.81	0.85
6	0.64	0.65	0.74	0.80	0.84
7	0.51	0.63	0.72	0.78	0.83
8	0.47	0.6 1	0.71	0.78	-
9	0.46	0.60	0.70	0.77	-
10	0.46	0.58	0.69	-	-
11	0.45	0.57	0.69	-	-
12	0.43	0.58	0.68	-	-

A.6 Rating Factor for Grouping of Three Phase Circuit of Single Core Cables Laid Direct in the Ground

Number of Cables in Group	Spacing Between Cables Centre (mm)				
	Touching	200	400	600	800
2	0.73	0.83	0.88	0.90	0.92
3	0.60	0.73	0.79	0.83	0.86
4	0.54	0.68	0.75	0.80	0.84
5	0.46	0.63	0.72	0.78	0.82
6	0.48	0.6 1	0.70	0.76	0.81
7	0.43	0.58	0.68	0.75	-
8	0.41	0.57	0.67	0.74	-
9	0.36	0.55	0.66	0.73	-
10	0.37	0.54	0.65	-	-
11	0.36	0.53	0.64	-	-
12	0.35	0.52	0.64	-	-

B. CABLES LAID DIRECT IN DUCT

B.1 Rating Factor for Variation of D epth of Laying in Duct

Depth of Laying (m)	Single Core Cables		Three Cores Cables
	Nominal Conductor size (mm^2)		
	< 185 mm^2	> 185 mm^2	
0.5	1.04	1.05	1.03
0.6	1.02	1.03	1.02
1.0	0.98	0.97	0.99
12.5	0.96	0.95	0.97
1.5	0.95	0.93	0.96
1.75	0.94	0.92	0.95
2.0	0.93	0.91	0.94
2.5	0.91	0.89	0.93
3.0	0.90	0.88	0.92

B.2 Rating Factor for Thermal Resistivity of Soil for Burried Duct Single Core

Nominal Area of Conductor (mm^2)	Value of Soil Thermal Resistivity (K.m/W)							
	0.7	0.8	0.9	1.0	1.5	2.0	2.5	3.0
16	1.20	1.17	1.14	1.11	1.0	0.92	0.85	0.79
25	1.21	1.17	1.14	1.12	1.0	0.91	0.85	0.79
35	1.21	1.18	1.15	1.12	1.0	0.91	0.84	0.79
50	1.21	1.18	1.15	1.12	1.0	0.91	0.84	0.79
70	1.22	1.19	1.15	1.12	1.0	0.91	0.84	0.78
95	1.22	1.19	1.16	1.13	1.0	0.91	0.84	0.78
120	1.22	1.20	1.16	1.13	1.0	0.91	0.84	0.78
150	1.24	1.20	1.16	1.13	1.0	0.91	0.83	0.78
185	1.24	1.20	1.17	1.13	1.0	0.91	0.83	0.78
240	1.25	1.21	1.17	1.14	1.0	0.90	0.83	0.77
300	1.25	1.21	1.17	1.14	1.0	0.90	0.83	0.77
400	1.25	1.21	1.17	1.14	1.0	0.90	0.83	0.77

B.3 Rating Factor for Thermal Resistivity of Soil for Three Core in Ducts

Nominal Area of Conductor (mm^2)	Value of Soil Thermal Resistivity (K.m/W)							
	0.7	0.8	0.9	1.0	1.5	2.0	2.5	3.0
16	1.12	1.11	1.09	1.09	1.0	0.94	0.89	0.84
25	1.14	1.12	1.10	1.08	1.0	0.94	0.89	0.84
35	1.14	1.12	1 .10	1.08	1.0	0.94	0.88	0.84
50	1.14	1.12	1.10	1.08	1.0	0.94	0.88	0.84
70	1.15	1.13	1.11	1.09	1.0	0.94	0.88	0.83
95	1.15	1.13	1.11	1.09	1.0	0.94	0.88	0.83
120	1.15	1.13	1.11	1.09	1.0	0.93	0.88	0.83
150	1.16	1.13	1.11	1.09	1.0	0.93	0.88	0.83
185	1.16	1.14	1.11	1.09	1.0	0.93	0.87	0.83
240	1.16	1.14	1.12	1.10	1.0	0.93	0.87	0.82
300	1.1 7	1.14	1.12	1.10	1.0	0.93	0.87	0.82
400	1.17	1.14	1.12	1.10	1.0	0.92	0.86	0.81

B.4 Rating Factor for Grouping of Three core cables in single way duct in horizontal formation

Number of Cables in Group	Spacing Between Cables Centre (mm)				
	Touching	200	400	600	800
2	0.85	0.88	0.92	0.94	0.95
3	0.75	0.80	0.85	0.88	0.91
4	0.69	0.75	0.82	0.86	0.89
5	0.65	0.72	0.79	0.84	0.87
6	0.6 2	0.69	0.77	0.83	0.87
7	0.59	0.67	0.76	0.82	0.86
8	0.57	0.65	0.75	0.81	-
9	0.55	0.64	0.74	0.80	-
10	0.54	0.63	0.73	-	-
11	0.52	0.6 2	0.73	-	-
12	0.51	0.6 1	0.7 2	-	-

B.5 Rating Factor for Grouping of Three Phase circuits of Single core cables in single way duct

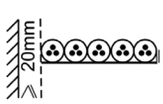
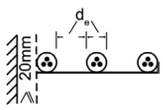
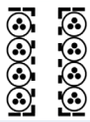
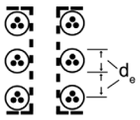
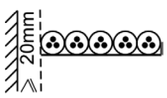
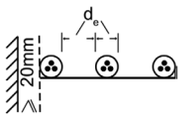
Number of Cables in Group	Spacing Between Cables Centre (mm)				
	Touching	200	400	600	800
2	0.78	0.85	0.89	0.91	0.93
3	0.68	0.75	0.81	0.85	0.88
4	0.59	0.70	0.77	0.82	0.88
5	0.55	0.66	0.74	0.80	0.84
6	0.51	0.64	0.72	0.78	0.83
7	0.48	0.6 1	0.71	0.77	0.82
8	0.46	0.60	0.70	0.76	-
9	0.44	0.58	0.69	0.76	-
10	0.43	0.57	0.68	-	-
11	0.42	0.56	0.67	-	-
12	0.40	0.55	0.6 7	-	-

C. CABLES INSTALLED IN FREE AIR

C.1 Rating Factor for Variation in Air Temperature

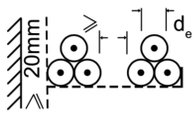
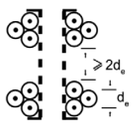
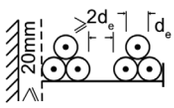
Air Temperature (°C)		20	25	30	35	40	45	50	55	60
Rating Factor	XLPE	1.08	1.04	1.00	0.96	0.91	0.87	0.82	0.78	0.71
	EPR	1.08	1.04	1.00	0.96	0.91	0.87	0.82	0.78	0.71

C.2 Rating Factor for Group of More Than One Multicore Cable in Air

Method of Installation		Number of Trays	Number of Cables					
			1	2	3	4	5	6
Cable on Perforated Trays	 Touching	1 2 3	1.00 1.00 1.00	0.88 0.87 0.86	0.82 0.80 0.79	0.79 0.77 0.76	0.76 0.73 0.71	0.73 0.68 0.66
	 Spaced	1 2 3	1.00 1.00 1.00	1.00 0.99 0.98	0.98 0.96 0.95	0.95 0.92 0.91	0.91 0.67 0.85	- - -
Cable on Vertical Perforated Trays	 Touching	1 2	1.00 1.00	0.89 0.88	0.82 0.81	0.78 0.76	0.73 0.71	0.72 0.70
	 Spaced	1 2	1.00 1.00	0.91 0.91	0.89 0.88	0.88 0.87	0.87 0.85	- -
Cables on Ladder Support, Cleats, etc	 Touching	1 2 3	1.00 1.00 1.00	0.87 0.86 0.85	0.82 0.80 0.79	0.80 0.78 0.76	0.79 0.76 0.73	0.78 0.73 0.70
	 Spaced	1 2 3	1.00 1.00 1.00	1.00 0.99 0.98	1.00 0.98 0.97	1.00 0.97 0.96	1.00 0.96 0.93	- -

Note 1: Values given are averages for the cables types and rang of conductor sizes considered. The spread of values is generally less than 5%.
Note 2: Factors apply to single layer of cable shown above and do not apply when cables are installed in more than one layer touching each other. Values for such installations may be significantly lower and should be determined by an appropriate method.
Note 3: Values are given for vertical spacing between trays of 300 mm and at least 20 mm between trays and wall. For closer spacing, the factors should be reduced.
Note 4: Values are given to horizontal spacing between trays of 225 mm with trays mounted back to back. For closer spacing the factors should be reduced.

C.3 Rating Factor for Group of More Than One CIRCUIT OF Single Core Cable

Method of Installation		Number of Trays	Number of Three Phase Circuit (Note 5)			Use as A Multiplier to Rating for
			1	2	3	
Perforated Trays (Note 3)		1 2 3	0.98 0.96 0.95	0.91 0.87 0.85	0.87 0.81 0.78	Three cables in horizontal formation
Perforated Trays (Note 3)		1 2 3	1.00 0.98 0.97	0.97 0.93 0.90	0.96 0.89 0.86	Three cables in horizontal formation
Perforated Trays (Note 3)		1 2 3	1.00 0.97 0.96	0.98 0.93 0.92	0.96 0.89 0.86	Three cables in trefoil formation
Perforated Trays (Note 3)		1 2	1.00 1.00	0.91 0.90	0.89 0.86	
Perforated Trays (Note 3)		1 2 3	1.00 0.97 0.96	1.00 0.95 0.94	01.00 0.93 0.90	

Note 1: Values given are averages for the cables types and rang of conductor sizes considered. The spread of values is generally less than 5%.
Note 2: Factors are given for single layers of cable (of trefoil groups) as shown in the table and do not apply when cables are installed in more than one layer touching each other. Values for such installations may be significantly lower and should be determined by an appropriate method.
Note 3: Values are given for vertical spacing between trays of 300 mm. For closer spacing, the factors should be reduced.
Note 4: Values are given to horizontal spacing between trays of 225 mm with trays mounted back to back. For closer spacing the factors should be reduced.
Note 5: For circuits having more than one core cable in parallel per phase, each three phase set of conductor should be considered as a circuit for the purpose of this table