

**T-3**

FIRE RESISTANT CABLES

**0.6/1 kV**  
**ARMoured**

Thermosetting insulation  
low toxicity and  
corrosivity



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# FIRE RESISTANT CABLES

## SWA/M1-0.6/1 kV

Cables suitable to grant the performance requested for a determinate time period also when the flames developed by the fire in which they are involved, have modified, carbonized or destroyed the organic materials which in normal conditions, constitute the insulation, possible fillers and the sheath.

### Where to use them:

undergrounds, schools, hotels, hospitals, theatres, discoteque, offices, cinemas, supermarkets, airport, railway stations and so on and so forth.

### CONSTRUCTION

#### BS 7846

#### BS 6387 cat. CWZ

#### Conductor:

plain annealed copper class 2

#### Taping:

mica / glass fire barrier tape

#### Insulation:

cross linked insulation

#### Bedding:

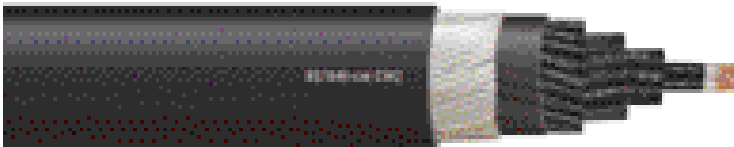
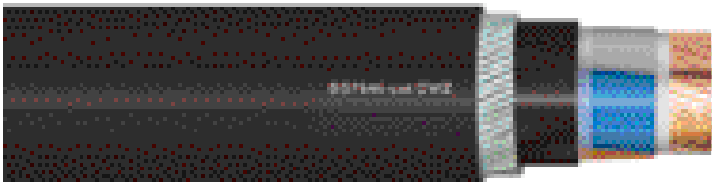
LSOH compound

#### Armour:

single layer of galvanised steel wires

#### Sheath:

LSOH compound



### Conductors identification:

- 2 blue - brown
- 3 a) brown - black - grey  
b) yellow/green - blue - brown
- 4 a) blue - brown - black - grey  
b) yellow/green - brown - black - grey
- 5 yellow/green - blue - brown - black - grey
- 7 black with white numbering

### Colour:

- black RAL 9000
- brown RAL 8003
- blue RAL 5015
- yellow RAL 1021
- green RAL 6018
- grey RAL 7001

### Outer sheath colour:

black

### Marking on outer sheath:

ELECTRIC CABLE	600/1000V	BS7846-cat CWZ	TRATOS 4X150	year of production	metric marking	CE
ELECTRIC CABLE	600/1000V	AUX BS7846-cat CWZ	TRATOS 24X2.5	year of production	metric marking	CE

## TECHNICAL REFERENCES

<b>BS 7846</b>	Electric cables - 600/1000V armoured fire-resistant cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire
<b>BS 6387 cat.CWZ</b>	Performance requirements for cables required to maintain circuit integrity under fire conditions
<b>BS EN 50265-2-1</b>	Common test methods for cables under fire conditions - Test for resistance to vertical flame propagation for a single insulated conductor or cable. Part 2-1: procedures - 1kW pre-mixed flame
<b>BS EN 50266-2-4</b>	Common test methods for cables under fire conditions - test for vertical flame spread of vertically-mounted bunched wires or cables - Part2-3:procedures - Category C
<b>BS EN 50267-2-1</b>	Common test methods for cables under fire conditions - Test on gases evolved during combustion of materials from cables. Part2-1:procedures - Determination of the amount of halogen acid gas
<b>BS EN 50268-2</b>	Common test methods for cables under fire conditions - Measurement of smoke density of cables burning under defined conditions - Part2: procedures
<b>BS 7671</b>	Installation methods

### Conductor maximum temperature

90°C on conductor

### Maximum short circuit temperature for 5 second duration max

250°C on conductor

### Minimum bending radius

- 6X overall diameter for cables with circular conductor
- 8X overall diameter for cable with shaped conductor

### Maximum applicable pull force on metal conductor

- 5 kg/mm<sup>2</sup> copper size during installation
- 1.5 kg/mm<sup>2</sup> copper size during service

### Minimum installation temperature

0°C

## QUALITY SYSTEM

Our Quality System is certified by BSI in accordance to ISO 9001/2000, for production, purchase of raw materials, design, final tests and documents typologies. Tratos Quality System management is under the constant supervision of inspectors working for the certifying institute.

# Fire resistant cables

## SWA/M1-CWZ 0.6/1 kV

Nominal section mm <sup>2</sup>	Average insulation thickness mm	Thickness of extruded bedding mm	Nominal diameter under the armouring mm	Nominal steel armour wire diameter mm	Thickness of oversheath mm	Nominal outer diameter mm	Indicative weight Kg/Km	Max cond.resist. at 20° C Ohm/Km	Current Rating (A)			Minimum bending radius mm
									30° C in air	20° C ground laying		
										ρ = 1	ρ = 1.5	

### Two-core 0.6/1kV copper conductors

1.5	0.6	0.8	8	0.9	1.3	12.8	309	12.1	22	28	25	77
2.5	0.7	0.8	9.2	0.9	1.4	14.2	381	7.41	30	38	33	85
4	0.7	0.8	10.3	0.9	1.4	15.3	463	4.61	40	49	43	92
6	0.7	0.8	11.4	0.9	1.4	16.5	545	3.08	51	62	54	99
10	0.7	0.8	12.8	0.9	1.5	18.1	688	1.83	69	82	71	109
16	0.7	0.8	13.8	1.25	1.5	19.9	946	1.15	93	107	92	119
25	0.9	0.8	18.3	1.25	1.6	24.7	1370	0.727	122	138	118	148
35	0.9	1.0	20.8	1.6	1.7	28.2	1900	0.524	151	167	143	226
50	1.0	1.0	18.3	1.6	1.8	25.9	18871	0.387	188	203	174	207
70	1.1	1.0	20.8	1.6	1.9	28.6	2411	0.268	232	245	209	229
95	1.1	1.2	23.4	2.0	2.0	32.3	3163	0.193	283	290	247	258
120	1.2	1.2	26.0	2.0	2.1	35.2	3875	0.153	327	330	281	282
150	1.4	1.2	28.9	2.0	2.2	38.4	4621	0.124	375	372	317	307
185	1.6	1.4	32.2	2.5	2.4	43.3	5796	0.0991	428	417	355	346
240	1.7	1.4	35.6	2.5	2.5	46.8	7165	0.0754	500	478	407	374
300	1.8	1.6	39.6	2.5	2.6	51.3	8682	0.0601	570	536	457	410
400	2.0	1.6	44.9	2.5	2.8	57.2	10977	0.0470	671	618	527	458

Note: up to 35mm<sup>2</sup> class 2      Circular or compacted circular stranded conductors  
above 35mm<sup>2</sup> class 2      Shaped stranded conductors

### Three-core 0.6/1kV copper conductors

1.5	0.6	0.8	8.5	0.9	1.3	13.3	341	12.1	22	28	25	80
2.5	0.7	0.8	9.7	0.9	1.4	14.7	437	7.41	30	38	33	88
4	0.7	0.8	11.0	0.9	1.4	16.1	526	4.61	40	49	43	97
6	0.7	0.8	12.1	0.9	1.4	17.2	651	3.08	51	62	54	103
10	0.7	0.8	13.6	1.25	1.5	19.7	914	1.83	70	82	71	118
16	0.7	0.8	14.7	1.25	1.6	21.0	1142	1.15	93	107	92	126
25	0.9	1.0	19.8	1.6	1.7	27.2	1870	0.727	123	138	119	163
35	0.9	1.0	20.0	1.6	1.8	28.6	2039	0.524	151	167	143	229
50	1.0	1.0	22.5	1.6	1.8	30.2	2583	0.387	188	203	174	242
70	1.1	1.0	25.6	1.6	1.9	33.6	3274	0.268	232	245	209	269
95	1.1	1.2	29.9	2.0	2.1	39.2	4521	0.193	283	290	247	314
120	1.2	1.2	32.4	2.0	2.2	42.0	5368	0.153	327	330	281	336
150	1.4	1.4	36.0	2.5	2.3	47.0	6859	0.124	377	373	317	376
185	1.6	1.4	40.1	2.5	2.4	51.4	8232	0.0991	428	417	355	411
240	1.7	1.4	44.8	2.5	2.6	56.7	10213	0.0754	500	478	407	454
300	1.8	1.6	50.4	2.5	2.7	62.6	12243	0.0601	570	536	457	501
400	2.0	1.6	54.2	2.5	2.9	67.0	15412	0.0470	671	618	527	536

Note: up to 25mm<sup>2</sup> class 2      Circular or compacted circular stranded conductors  
above 25mm<sup>2</sup> class 2      Shaped stranded conductors

### Four-core 0.6/1kV copper conductors

1.5	0.6	0.8	9.3	0.9	1.3	14.1	372	12.1	22	28	25	85
2.5	0.7	0.8	10.7	0.9	1.4	15.8	493	7.41	30	38	33	95
4	0.7	0.8	12.1	0.9	1.4	17.2	606	4.61	40	49	43	103
6	0.7	0.8	13.4	1.25	1.5	19.5	781	3.08	51	62	54	117
10	0.7	0.8	15.1	1.25	1.5	21.2	1129	1.83	70	82	71	127
16	0.7	0.8	15.3	1.25	1.6	22.7	1348	1.15	93	107	92	136
25	0.9	1.0	20.6	1.6	1.7	28.0	2065	0.727	123	138	119	168
35	0.9	1.0	22.2	1.6	1.8	29.9	2472	0.524	151	167	143	239
50	1.0	1.0	25.7	1.6	1.9	33.7	3463	0.387	188	203	174	270
70	1.1	1.2	29.6	2.0	2.1	38.9	4488	0.268	234	245	209	311
95	1.1	1.2	33.6	2.0	2.2	43.3	5672	0.193	283	290	247	346
120	1.2	1.4	37.3	2.5	2.3	48.3	7234	0.153	329	330	281	386
150	1.4	1.4	41.2	2.5	2.4	52.5	8727	0.124	377	373	317	420
185	1.6	1.4	45.6	2.5	2.6	57.5	10501	0.0991	428	417	355	460
240	1.7	1.6	51.6	2.5	2.7	63.9	12977	0.0754	500	478	407	511
300	1.8	1.6	57.6	2.5	2.9	70.5	15899	0.0601	570	536	457	564
400	2.0	1.8	64.8	3.15	3.2	79.8	20847	0.0470	671	616	525	638

Note: up to 25mm<sup>2</sup> class 2      Circular or compacted circular stranded conductors  
above 25mm<sup>2</sup> class 2      Shaped stranded conductors

# Fire resistant cables

## SWA/M1-CWZ 0.6/1 kV

Nominal section mm <sup>2</sup>	Average insulation thickness mm	Thickness of extruded bedding mm	Nominal diameter under the armouring mm	Nominal steel armour wire diameter mm	Thickness of oversheath mm	Nominal outer diameter mm	Indicative weight Kg/Km	Max cond.resist. at 20° C Ohm/Km	Current Rating (A)			Minimum bending radius mm
									30° C in air	20° C ground laying		
										$\rho = 1$	$\rho = 1.5$	

### Five-core 0.6/1kV copper conductors

1.5	0.6	0.8	10.2	0.9	1.4	15.2	415	12.1	22	28	25	122
2.5	0.7	0.8	11.9	0.9	1.4	17.0	541	7.41	30	38	33	136
4	0.7	0.8	13.4	0.9	1.5	18.7	719	4.61	40	49	43	150
6	0.7	0.8	14.8	1.25	1.5	20.9	963	3.08	51	62	54	167
10	0.7	0.8	16.8	1.25	1.6	23.2	1261	1.83	70	82	71	186
16	0.7	1.0	18.5	1.6	1.7	25.9	1810	1.15	93	108	93	207
25	0.9	1.0	24.4	1.6	1.8	32.1	2644	0.727	123	138	119	257
35	0.9	1.0	26.8	1.6	1.9	34.8	3251	0.524	151	167	143	278
50	1.0	1.2	31.6	2	2.0	40.8	4716	0.387	190	204	174	326
70	1.1	1.2	36.2	2.0	2.2	45.9	5983	0.268	234	245	209	367

Note: class 2 Circular or compacted circular stranded conductor

## Auxiliary cables

Number of cores	Nominal section mm <sup>2</sup>	Average insulation thickness mm	Thickness of extruded bedding mm	Nominal diameter under the armouring mm	Nominal steel armour wire diameter mm	Thickness of oversheath mm	Nominal outer diameter mm	Indicative weight Kg/Km	Max cond.resist. at 20° C Ohm/Km	Current Rating (A)			Minimum bending radius mm
										30° C in air	20° C ground laying		
											$\rho = 1$	$\rho = 1.5$	

### Auxiliary cables 0.6/1kV copper conductors

7	1.5	0.6	0.8	11.2	0.9	1.4	16.3	488	12.1	22	28	25	130
12	1.5	0.6	0.8	14.9	1.25	1.5	21.0	835	12.1	23	28	25	168
19	1.5	0.6	0.8	17.6	1.25	1.6	24.0	1066	12.1	23	28	25	192
27	1.5	0.6	1.0	21.7	1.6	1.7	29.1	1620	12.1	23	28	25	233
37	1.5	0.6	1.0	24.4	1.6	1.7	31.9	1940	12.1	23	28	25	255
48	1.5	0.6	1.0	28.0	1.6	1.8	35.8	2315	12.1	23	28	25	286
7	2.5	0.7	0.8	13.0	0.9	1.4	18.1	614	7.41	30	38	33	145
12	2.5	0.7	0.8	17.4	1.25	1.6	23.8	1043	7.41	31	38	33	190
19	2.5	0.7	1.0	21.0	1.6	1.7	28.4	1629	7.41	31	38	33	227
27	2.5	0.7	1.0	25.3	1.6	1.8	33.1	2073	7.41	31	38	33	265
37	2.5	0.7	1.0	26.6	1.6	1.8	34.4	2486	7.41	31	38	33	275
48	2.5	0.7	1.2	33.2	2.0	2.0	42.4	3373	7.41	31	38	33	339
7	4	0.7	0.8	14.6	1.25	1.5	20.7	916	4.61	40	49	43	166
12	4	0.7	1.0	20.0	1.6	1.6	27.2	1560	4.61	41	49	43	218
19	4	0.7	1.0	23.8	1.6	1.7	31.3	2088	4.61	41	49	43	250
27	4	0.7	1.0	28.7	1.6	1.9	36.8	2693	4.61	41	49	43	294
37	4	0.7	1.2	32.8	2.0	2.0	41.8	3741	4.61	41	50	43	334
48	4	0.7	1.2	37.6	2.0	2.1	47.2	4584	4.61	41	50	43	378

Note: class 2 Circular or compacted circular stranded conductor

# SPECIFICATIONS

## CORRECTION COEFFICIENTS OF CURRENT CARRYING CAPACITY FOR AMBIENT TEMPERATURES DIFFERENT FROM THOSE HERE INDICATED FOR REFERENCE

Type of laying	Temperature (°C)											
	10	15	20	25	30	35	40	45	50	55	60	65
in air	1.15	1.12	1.08	1.04	1.00	0.96	0.91	0.87	0.82	0.76	0.71	0.65

non directly exposed to sun light

## POSITIONING OF PHASES SINGLE-CORE CABLES CONNECTED IN PARALLEL TO ENSURE THE CORRECT CURRENT DISPOSITION

### Cables in trefoil setting

Number of triads in the same layer	2		3			4			
		T RS	T SR	T RS	T SR	T RS	T RS	T SR	T RS

### Cables distanced vertically or horizontally

Number of triads in the same layer	2		4			
		RST	TSR	RST	TSR	RST

Note: this scheme has to be repeated for every layer

## ELECTRICAL RESISTANCE AND REACTANCE

Resistance 90°C		
Nominal section mm <sup>2</sup>	Flexible copper conductor, not tinned	
	d.c. Ohm/km	a.c. Ohm/km
1.5	16.95	16.95
2.5	10.17	10.17
4	6.31	6.31
6	4.2	4.2
10	2.43	2.43
16	1.54	1.54
25	0.99	0.99
35	0.71	0.71
50	0.49	0.5
70	0.34	0.35
95	0.26	0.27
120	0.2	0.21
150	0.16	0.17
185	0.13	0.14
240	0.102	0.104
300	0.081	0.085

Reactance a 50 Hz		
Nominal section mm <sup>2</sup>	Flexible copper conductor, not tinned	
	One-pole Ohm/km	Multicore-pole Ohm/km
1.5	0.144	0.100
2.5	0.132	0.094
4	0.122	0.087
6	0.114	0.083
10	0.105	0.078
16	0.098	0.075
25	0.093	0.074
35	0.089	0.072
50	0.085	0.071
70	0.084	0.070
95	0.083	0.069
120	0.080	0.069
150	0.080	0.069
185	0.080	0.069
240	0.078	0.069
300	0.076	0.068



## VOLTAGE DROP

For the calculation of the voltage drop in alternating current(a.c.) apply the following formula:

where:

$$V = \frac{C_t \cdot I \cdot L}{1000}$$

$C_t$  (V/A/Km) = tab. factor [ $K \cdot (R \cdot \cos \varphi + X \cdot \sin \varphi)$ ]  
 $I$  (A) = carrying current  
 $L$  (m) = line length  
 $R$  (/Km) = electrical resistance at max. working temperature  
 $X$  (/Km) = phase reactance  
 $\cos \varphi$  = power factor  
 $K$  = 2 for monophasic lines  
 $K$  = 1.73 for three-phase lines

Note: the voltage drop values are valid also for the direct current (d.c.).

### Coefficients ( $C_t$ ) for calculating the voltage drop at a.c. of flexible cables with XLPE insulation at 90°C

Nominal section mm <sup>2</sup>	One-pole single-phase			One-pole three-phase			Multi-pole single-phase			Multi-pole three-phase		
	cos φ 0.8	cos φ 0.9	cos φ 1	cos φ 0.8	cos φ 0.9	cos φ 1	cos φ 0.8	cos φ 0.9	cos φ 1	cos φ 0.8	cos φ 0.9	cos φ 1
1.5	27.29	30.64	33.90	23.61	26.50	29.32	27.24	30.60	33.90	23.56	26.47	29.32
2.5	16.34	18.42	20.34	14.21	15.93	17.59	16.38	18.39	20.34	14.17	15.91	17.59
4	10.24	11.46	12.62	8.86	9.92	10.92	10.20	11.43	12.62	8.82	9.89	10.92
6	6.86	7.66	8.40	5.93	6.63	7.27	6.82	7.63	8.40	5.90	6.60	7.27
10	4.01	4.47	4.86	3.47	3.86	4.20	3.98	4.44	4.86	3.44	3.84	4.20
16	2.58	2.86	3.08	2.23	2.47	2.66	2.55	2.84	3.08	2.21	2.45	2.66
25	1.70	1.86	1.98	1.47	1.61	1.71	1.67	1.85	1.98	1.45	1.60	1.71
35	1.23	1.34	1.40	1.06	1.16	1.21	1.21	1.32	1.40	1.04	1.14	1.21
50	0.89	0.96	0.98	0.77	0.83	0.85	0.87	0.94	0.98	0.75	0.82	0.85
70	0.64	0.69	0.68	0.56	0.59	0.59	0.63	0.67	0.68	0.54	0.58	0.59
95	0.52	0.54	0.52	0.45	0.47	0.45	0.50	0.53	0.52	0.43	0.46	0.45
120	0.42	0.43	0.40	0.36	0.37	0.35	0.40	0.42	0.40	0.35	0.36	0.35
150	0.35	0.36	0.32	0.30	0.31	0.28	0.34	0.35	0.32	0.29	0.30	0.28
185	0.30	0.30	0.26	0.26	0.26	0.22	0.29	0.29	0.26	0.25	0.25	0.22
240	0.26	0.26	0.21	0.22	0.22	0.18	0.25	0.25	0.21	0.22	0.21	0.18
300	0.23	0.22	0.17	0.20	0.19	0.15	0.22	0.21	0.17	0.19	0.18	0.15

## MAXIMUM SHORT CIRCUIT CURRENT

This formula can be used to verify the section of the selected conductor:

$$S = \frac{I_{cc} \cdot t}{C}$$

This formula can be used to calculate the maximum short circuit current:

$$I_{cc \max} = \frac{S \cdot C}{t}$$

where:

$S$  = min. copper area conductor (mm<sup>2</sup>)  
 $I_{cc}$  = short circuit current (A)  
 $t$  = duration of short circuit (sec.)  
 $C$  = 143 (for XLPE cables)

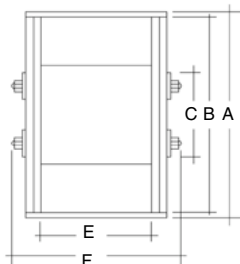
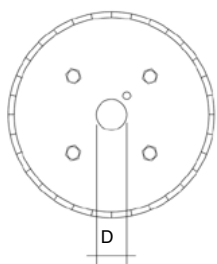
Note: the above formulas are valid for periods of max. 5 seconds.

### Values of current (C) as related to short circuit initial and final temperatures for copper conductors.

Starting temperature °C	Final temperature of short circuit °C					
	140	160	180	200	220	250
90	86	100	112	122	131	143
85	90	104	115	125	134	146
80	94	108	119	129	137	149
75	99	111	122	132	140	151
70	103	115	125	135	143	154
65	107	119	129	138	146	157
60	111	122	132	141	149	160
50	118	129	139	147	155	165
40	126	136	145	153	161	170
30	133	143	152	159	166	176

# PACKAGING

## DRUMS DIMENSION



- A - Flange diameter including circumference batten
- B - Flange diameter without circumference batten
- C - Inner barrel diameter
- D - Axis hole
- E - Inner width
- F - External width

Drum type	A mm	B mm	C mm	D mm	E mm	F mm	Weight Kg	Volume m <sup>3</sup>
BL 60	690	630	315	80	315	435	30	0.19
BL 70	770	710	355	80	400	515	35	0.28
BL 80	960	800	400	80	450	575	40	0.39
BL 90	960	900	450	80	450	575	50	0.45
BL 100	1.060	1.000	500	80	560	685	60	0.77
BL 120	1.310	1.250	630	80	630	760	100	1.27
BL 140	1.460	1.400	710	80	750	920	140	1.76
BL 160	1.660	1.600	900	80	900	1.070	250	2.80
BL 180	1.860	1.800	1.120	80	1.120	1.320	300	4.20
BL 200	2.060	2.000	1.250	125	1.120	1.320	400	5.20
BL 220	2.300	2.240	1.400	125	1.120	1.320	450	6.30
BL 250	2.510	2.450	1.500	125	1.120	1.320	500	8.20

## DRUM CAPACITIES METERS

Cable diameter mm	Drum type								
	BL 60	BL 80	BL 100	BL 120	BL 160	BL 180	BL 200	BL 220	BL 250
12	350	850	1800	—	—	—	—	—	—
14	250	650	1350	—	—	—	—	—	—
16	208	500	1000	1800	—	—	—	—	—
18	164	400	800	1350	—	—	—	—	—
20	133	320	650	1100	—	—	—	—	—
22	110	267	550	900	2000	—	—	—	—
24	97	224	450	750	1600	—	—	—	—
26	—	—	379	650	1400	—	—	—	—
28	—	—	327	550	1200	—	—	—	—
30	—	—	285	475	1000	—	1850	—	—
32	—	—	250	450	900	1420	1650	—	—
34	—	—	222	400	800	1250	1450	—	—
36	—	—	198	350	700	1200	1290	—	—
38	—	—	—	300	650	990	1160	1575	—
40	—	—	—	260	575	890	1050	1420	—
42	—	—	—	240	500	800	950	1290	—
44	—	—	—	220	475	725	865	1175	1535
46	—	—	—	200	435	660	790	1075	1405
48	—	—	—	—	400	605	725	985	1290
50	—	—	—	—	370	555	670	910	1190
52	—	—	—	—	340	510	620	840	1100
54	—	—	—	—	320	470	575	780	1020
56	—	—	—	—	295	440	535	725	950
58	—	—	—	—	275	410	500	675	885
60	—	—	—	—	255	380	465	630	825
62	—	—	—	—	240	355	435	590	775
64	—	—	—	—	225	330	410	555	725
66	—	—	—	—	212	310	385	520	685
68	—	—	—	—	200	295	360	490	640
72	—	—	—	—	139	251	323	391	491
76	—	—	—	—	—	225	289	351	441
80	—	—	—	—	—	203	261	316	398

Tratos Cavi S.p.A. reserves the right to modify at any time technical dimensional and weight characteristics shown in this catalogue to improve the features of its products. However these will still be in accordance to the mentioned standards.

There is no responsibility of the manufacturer for damages to persons and property in case of improper use and/or neglecting the recommendations for using cables and norms contained in this catalogue.

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FIRE RESISTANT CABLES

**0.6/1 kV  
ARMOURED**

Thermosetting insulation  
low toxicity and  
corrosivity