EL-SEWEDY INDUSTIES

Power Cables Division

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- Technical Data
- Overhead Conductors
- Control Cables
- Low Voltage Cables
- Medium Voltage Cables
- High Voltage Cables
- Handling & Laying Instructions

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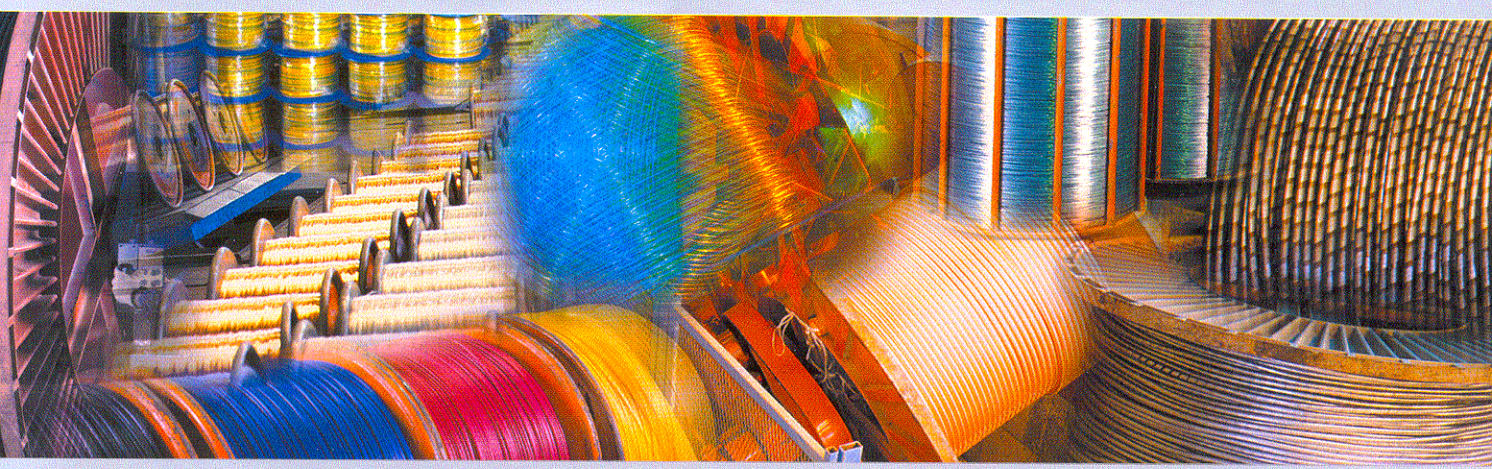
El Sewedy Industries



In a global economy only the best companies survive and they only by an aggressive approach to their mission.

Egypt is currently highly ranked for its positive economic growth, and due to the language and cultural links became a gateway to business in the Arab Countries.

El Sewedy Industries from humble beginnings has been a significant force in creating the growth in Egypt whilst becoming itself a well-established group with extensive holdings in Egypt and the Arab Countries.

Even through the lean economic years The Group has improved: Building new factories, employing qualified staff, providing technological training and always encouraging employee's participation in their given sphere of activity.

El Sewedy Industries will provide products and services to satisfy the needs and exceed the expectations of its customer; this is the primary tenet of all our enterprises.

The result of these endeavors is that El Sewedy Industries is one of Egypt's and the Middle East's leading groups in the fields of Cables, Plastics, Electric, Steel, and Construction, and continuing efforts will lead to further successes in the industrial arena.

Egytech Cables

Egytech Cables Co. is a new contributor to the El Sewedy Power Cables Group comprising additionally Arab Cables Co. and Jeddah Cables Co.

Egytech power cables factory is a state of the art created by the fusion latest technologies from worldwide sources. El Sewedy Group invested L.E. 60 million in capital as part of a total of L.E. 180 million to realize a wish to put Egypt at the forefront of world class cable manufacturers.

The principal products are low, Medium and High Voltage Cables with Solid dielectric up to 220 kV. and the product range is enhanced by Control Cables, Flexible Cables and Cords, Indoor Wires and Overhead Lines.

Material options are copper or aluminum conductors, PVC or XLPE insulation with protection of steel tape/ wire or aluminum tape/ wire and jackets of PVC or HDPE.

The capability to provide lead coverings also allows the production of Submarine Cables.

The Factory is located on Zone A3 of the 10th of Ramadan city and occupies 50,000 square meters.

In February 1999, Egytech became the fourth group member to be accredited ISO 9002 registration.

General Information

Selecting A Power Cable

The following factors are important when selecting a suitable cable construction which is required to transport electrical energy from the power station to the consumer :

- Maximum operating voltage.
- Insulation level.
- Frequency.
- Load to be carried.
- Magnitude and duration of possible overload.
- Magnitude and duration of short-circuit current.
- Voltage drop.
- Length of line.
- Mode of installation.
  - *Underground (direct or in ducts).*
  - *In air.*
- Chemical and physical properties of soil.
- Max. and min. ambient air temperatures and soil temperature.
- Specification and requirements to be met.

Voltage

The strandard rated voltage of a cable is denoted by Uo/U (Um),

where

Uo : is the rated power-frequency voltage between conductor and earth or metallic screen.

U : is the rated power-frequency voltage between conductors.

Um : is the maximum continuously permissible operating voltage of a cable at time or in any part of the network.

Uo/U (kV)	0.6/1	1.8/3	3.6/6	6/10	8.7/15	12/20	18/30	38/66
Um (kV)	1.2	3.6	7.2	12	17.5	24	36	72.5

Note: Cable design for 6/10 and 18/30 kV is applicable for 6.35/11 & 19/33 kV respectively.

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Standards

The cables described in this catalogue are all standard types, and their performance has been proved in operation. Construction and tests are in accordance with the recommendation of IEC publications where applicable.

Power cables in accordance to other standard (e.g. BS, VDE, NEMA) can be manufactured upon customer's request.

Weight and Dimension

Weight and dimension characteristics are approximate.
The deviations are due to manufacturing tolerance.

Jacket Marking

Standard embossed outer Jacket Marking consisting of :

1- Name of manufacturer. "Egytech Cables (El Sewedy)"
2- Type designation, size of conductor, rated voltage.
3- Continous length marking every meter.
4- Year of manufacture.
5- Any special part no. on request.

IEC Publications Related to Power Cables

S/N	No. of IEC	Subject
1.	6028	International Standard of Resistance for Copper.
2.	6060-1	High-Voltage Test Techniques
3.	60104	Aluminum-Magnesium-Silicon Alloy Wire for Overhead Line Conductors
4.	60121	Recommendation for commercial annealed aluminum electrical conductor wire.
5.	60137	Insulated bushings for alternating voltage above 1000 V.
6.	60173	Colours of the cores of flexible cables and cores.
7.	60183	Guide to the selection of high voltage cables.
8.	60227	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V
9.	60228	Conductors of insulated cables.
10.	60229	Tests on cable over-sheaths which have a special protection function and are applied by extrusion.
11.	60230	Impulse tests on cables and their accessories.
12.	60245	Rubber insulated cables - Rated voltages up to and including 450/750 V
13.	60270	Partial discharge measurements
14.	60287	Current rating equations (100% load factor) and calculation of losses
15.	60331	Tests for electric cables under fire conditions circuit integrity.
16.	60332	Test on electric cables under fire conditions.
17.	60502	Cables for rated voltages of 0.6 kV (U_m=1kV) up to and including 30kV (Um=36kV).
18.	60719	Calculation of the lower and upper limits for the average outer dimensions of cables with circular copper conductors and of rated voltages up to and including 450/750 V.
19.	60724	Guide to the short-circuit temperature limits of electric cables with a rated voltage not exceeding 0.6/1 kV.
20.	60754	Test on gases evolved during combustion of materials from cables
21.	60811	Common test methods for insulating and sheathing materials of electric cables
22.	60840	Test method and requirements Power cables with extruded insulation and their accessories for rated voltages above 30 kV (U_m=36kV) up to 150 kV (U_m=170kV).

cont'd

IEC Publications Related to Power Cables

S/N	No. of IEC	Subject
23.	60853	Calculation of the cyclic and emergency current rating of cables.
24.	60885	Electrical test for electric cables
25.	60888	Zinc-Coated steel wires for stranded conductors
26.	60889	Hard drawn aluminum wire for overhead line conductors
27.	60949	Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effects.
28.	60986	Guide to the short-circuit temperature limits of electric cables with a rated voltage from 1.8/3 (3.6) kV to 18/30 (36) kV.
29.	61034	Measurement of smoke density of cables burning under defined conditions.
30.	61089	Round wire concentric lay overhead electrical stranded conductors.
31.	61232	Aluminum - clad steel wires for electrical purposes.
32.	61597	Overhead electrical conductors - calculation methods for stranded bare conductors.
33.	61443	Short circuit temperature limits of electric cables with rated voltages above 30 kV (U_m=36 kV).

Definitions

Definitions of dimensional values

(thickness, cross-sections, etc.)

1. Nominal value

Value by which a quantity is designated and which is often used in tables. Usually, in IEC standard, nominal values give rise to values to be checked by measurements taking into account specified tolerances.

2. Approximate value

Value which is neither guaranteed nor checked; it is used, for example, for the calculation of other dimensional values.

3. Median value

When several test results have been obtained and ordered in an increasing (or decreasing) succession, the median value is the middle value if the number of available values is odd, and the mean of the two middle values if the number is even.

4. Fictitious value

Value calculated according to the "fictitious method" described in annex A In IEC 60502.

Definitions concerning the Tests

1. Routine tests

Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

2. Sample tests

Tests made by the manufacturer on samples of completed cable or components taken from a completed cable at a specified frequency, so as to verify that the finished product meets the specified requirements.

3. Type tests

Test made before supplying on a general commercial basis, a type of cable covered by this standard, in order to demonstrate satisfactory performance characteristics to meet the intended application. These tests are of such a nature that, after they have been made, they need not be repeated, unless changes are made in the cable materials or design or manufacturing process, which might change the performance characteristics.

4. Electrical test after installation

Tests made to demonstrate the integrity of the cable its accessories as installed.

Technical data & Cables Parameters

1. Resistance

The values of conductor DC resistance given in the following tables are based on 20 °C. In case the DC resistance is required at any other temperature the following formula is used

$$R_\theta = R_{20} \times [\,1+\alpha\,(\theta - 20)$$ Ω/km

Where

R_θ	: Conductor DC resistance at θ ° C	Ω/km
R_{20}	: Conductor DC resistance at 20 ° C	Ω/km
θ	: Operating temperature	°C
α	: Resistance temperature coefficient = 0.00393 for Copper = 0.00403 for Aluminium	1/°C

To get AC resistance of the conductor at its operating temperature the following formula is used

$$R_{AC} = R_\theta \times (\,1+ y_p + y_s\,)$$

Where

y_p and y_s are proximity and skin effect factors respectively which depend on operation frequency and cable laying.

2. Inductance

Self and mutual inductance are formulated as follow:

$$L = K + 0.2\, ln\, (\tfrac{2S}{d})$$ mh/km

Where

L	: Inductance	
K	: Constant depends on the conductor's number of wires	
d	: Conductors diameter	mm
S	: Axial spacing between cables in trefoil formation	mm
S	: 1.26 x axial spacing between cables in flat formation	mm

3. Capacitance

$$C = \frac{\epsilon_r}{18 ln \frac{D}{d}}$$ μf/Km

Where

C	: Operating capacitance	μf/Km
ϵ_r	: Relative permittivity of insulation material	
D	: Diameter over insulation	mm
d	: Conductor diameter	mm

4. Insulation Resistance

$$R = K\, ln\, (\tfrac{D}{d})$$

Where

R	: Insulation resistance	MΩ/km
K	: Constant depends on the insulation material	
d	: Diameter of the conductor (including the semiconducting layer)	mm
D	: Diameter of the insulated core	mm

5. Charging Current

The charging current is the capacitive current which flows when AC voltage is applied to the cables as a result of the capacitance between the conductor and earth, and for a multicore cable in which cores are not screened, between conductors. The value can be derived from the equation.

$$I_C = U_0 \omega\, C\, 10^{-6}$$ A/km

Where

U_0	: Voltage between phase and earth.	V
ω	: 2π f	
f	: Frequency	Hz
C	: Capacitance to neutral	μf/km

6. Dielectric losses

The dielectric losses of an AC cable are proportional to the capacitance, the frequency, the phase voltage and the power factor They are given by :

$$D = 2\,\pi\, f\, C\, Uo^2\, tan\,\delta\, 10^{-6}$$ watt/km/phase

Where

f	: Frequency	Hz
C	: Capacitance to neutral	μf/km
Uo	: Voltage between phase and earth	V
tan δ	: Dielectric power factor	

7. Cable Ampacity

Cable ampacity or current carrying capacity is defined as the continuous maximum current the cable can carry at its maximum operating temperature.
In the technical information tables the following installation conditions were assumed during the current calculation:

• Ambient air temperature	= 40	°C
• Ground temperature	= 35	°C
• Ground thermal resistivity	= 120	°C. Cm/Watt
• Burial depth	= 0.5	Mt.

- In case of your installation conditions are different from the stated, the derating factors tabulated in tables 2 to 11 must be used in calculating the new current carrying capacity.
- All the cable ampacities are based on IEC 60287

cont'd

8. Cable short circuit capacity

Tables 13-17 give the short circuit current for conductor and screen based on the following conditions

A- Short circuit starts from the maximum operating conductor temperature.

B- Maximum temperature during short circuit

XLPE = 250 °C
PVC = 160 °C for C.S.A ≤ 300 mm^2
PVC = 140 °C for C.S.A > 300 mm^2

C- Maximum short circuit current duration is 5 seconds.

If the short circuit current is required at duration not metioned in the catalogue, it is obtained by dividing the short circuit current for 1 second by the square root of the required duration as follows :

$$I_{s.c.t} = \frac{I_{s.c.1}}{\sqrt{t}}$$

Where

$I_{s.c.t}$	: Short circuit current for t second	kA
$I_{s.c.1}$	: Short circuit current for 1 second	kA
t	: Duration	Sec.

9. Voltage Drop

When current flows in a cable conductor there is a voltage drop between the ends of the conductor which is the product of the current and the impedance.

The following equations should be used to calculate the voltage drop :

A. Single phase circuit.

$$V_d = 2\,I\,l\,(R\cos\phi + X\sin\phi) \quad V$$

B. Three phase circuit.

$$V_d = \sqrt{3}\,I\,l\,(R\cos\phi + X\sin\phi) \quad V$$

Where

V_d	: Voltage drop	V
I	: Load current	A
R	: AC Resistance	Ω/km
X	: Reactance	Ω/km
cos ϕ	: Power factor	
l	: Length	km
$X = \omega\,L\,10^{-3}$		Ω/km
$\omega = 2\,\pi\,f$		
L = from tables		mh/km

Relation between cos ϕ and sin ϕ

Cos ϕ	1.0	0.9	0.8	0.71	0.6	0.5
Sin ϕ	0.0	0.44	0.6	0.71	0.8	0.87

** L.V. cable systems should be planned so as not to exceed voltage drop 3-5 % in normal operating conditions.*

** Data voltage drop for L.V. Cable (Single & Multi Core) are tabulated in Tables 18 & 19.*

Metals Used for Cables

Table 1

Electrical properties

Metal	Relative conductivity Copper 100	Electrical resistivity at 20 °C ohm. m (10^{-8})	Temperature coefficient of resistance per °C
Copper (*annealed*)	100	1.724	0.00393
Copper (*hard drawn*)	97	1.777	0.00393
Tinned copper	95 - 97	1.741 - 1.814	0.00393
Aluminium	61	2.826	0.00403
Lead	8	21.40	0.0045

Physical properties

Property	Unit	Copper	Aluminium	Lead
Density at 20 °C	kg / m^3	8890.0	2703.0	11340.00
Coeff. thermal expansion	Per °C x 10^{-6}	17.0	23.0	29.00
Melting point	°C	1083.0	659.0	327.00
Thermal conductivity	W/cm °C	3.8	2.4	0.34
Ultimate tensile strength	Mn/m^2	225.0	70-90.0	-

Derating factors

Table 2

Ground temperature derating factor

Ground temperature °C	25	30	35	40	45	50	55
PVC cables rated 70 °C	1.13	1.07	1.00	0.93	0.85	0.76	0.65
XLPE cables rated 90 °C	1.09	1.04	1.00	0.95	0.90	0.85	0.80

Table 3

Air temperature derating factor

Air temperature °C	25	30	35	40	45	50	55
PVC cables rated 70 °C	1.22	1.15	1.08	1.00	0.95	0.82	0.71
XLPE cables rated 90 °C	1.14	1.10	1.05	1.00	0.90	0.89	0.84

Derating Factors

Table 4

Burial depth derating factor

Depth of laying mt.	Cables cross section		
	Up to 70 mm^2	95 upto 240 mm^2	300 mm^2 & above
0.50	1.00	1.00	1.00
0.60	0.99	0.98	0.97
0.80	0.97	0.96	0.94
1.00	0.95	0.93	0.92
1.25	0.94	0.92	0.89
1.50	0.93	0.90	0.87
1.75	0.92	0.89	0.86
2.00	0.91	0.88	0.85

Table 5

Soil thermal resistivity derating factor

Soil thermal resistivity in °C. Cm/Watt	80	90	100	120	150	200	250
Rating factor	1.17	1.12	1.07	1.0	0.91	0.80	0.73

Table 6

PVC rated temperature derating factor

Type of PVC rated temperature °C	70	85	95	105
Rating factor	1.000	1.195	1.309	1.414

Derating Factors

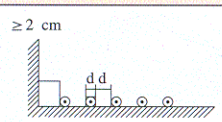
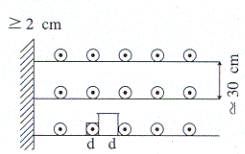
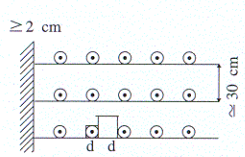
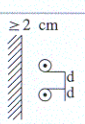
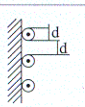
Table 7

Trefoil or flat formation derating factors for three single core cables laid direct in ground

Number of circuits	Trefoil formation (Spacing, Spacing)		Flat formation (Spacing, Spacing)			
	Touching		Spacing = 0.15 M		Spacing = 0.30 M	
nr	Trefoil	Flat	Trefoil	Flat	Trefoil	Flat
2	0.77	0.80	0.82	0.85	0.88	0.91
3	0.66	0.69	0.73	0.76	0.80	0.83
4	0.60	0.63	0.68	0.71	0.74	0.77
5	0.56	0.59	0.64	0.67	0.72	0.75
6	0.53	0.57	0.61	0.64	0.70	0.73

Table 8

Flat formation derating factors for three single core cables laid in free air

Clearance = cable diameter (d) Clearance from the wall ≥ 2 cm	Number of circuits 1	2	3	Laying form
Laid on the ground	0.92	0.89	0.88	
Laid cables troughs (circulation of air is restricted)				
Number of troughs				
1	0.92	0.89	0.88	
2	0.87	0.84	0.83	
3	0.84	0.82	0.81	
6	0.82	0.80	0.79	
Laid on cables racks				
Number of racks				
1	1.00	0.97	0.96	
2	0.97	0.94	0.93	
3	0.96	0.93	0.92	
6	0.94	0.91	0.90	
Arranged near the wall	0.94	0.91	0.89	
Arranged on the wall	0.89	0.86	0.84	

Derating Factors

Table 9

Trefoil touching formation derating factors for three single core cables laid in free air

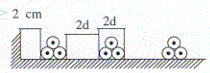
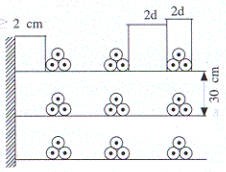
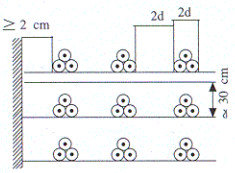
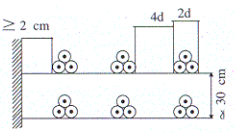
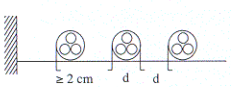
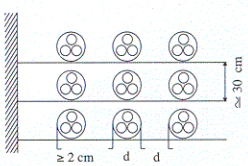
Clearance = (2d) Clearance from the wall ≥ 2 cm	Number of circuits 1	 2	 3	Laying form
Laid on the ground	0.95	0.90	0.88	
Laid cables troughs (circulation of air is restricted)				
Number of troughs				
1	0.95	0.90	0.88	
2	0.90	0.85	0.83	
3	0.88	0.83	0.81	
6	0.86	0.81	0.79	
Laid on cables racks				
Number of racks				
1	1.00	0.98	0.96	
2	1.00	0.95	0.93	
3	1.00	0.94	0.92	
6	1.00	0.93	0.90	
Arrangements for which reduction of the current is not necessary				

Table 10

Horizontal or vertical formation derating factors for multicore cables laid in free air

Clearance = cable diameter (d) Clearance from the wall ≥ 2 cm	Number of circuits 1	 2	 3	 6	 9	Laying form
Laid on the ground	0.95	0.90	0.88	0.85	0.84	
Laid cables troughs (circulation of air is restricted)						
Number of troughs						
1	0.95	0.90	0.88	0.85	0.84	
2	0.90	0.85	0.83	0.81	0.80	
3	0.88	0.83	0.81	0.79	0.78	
6	0.86	0.81	0.79	0.77	0.76	

cont'd

Derating Factors

Horizontal or Vertical Formation Derating Factors for Multicore Cables laid in Free Air

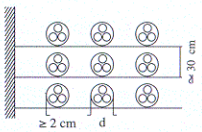
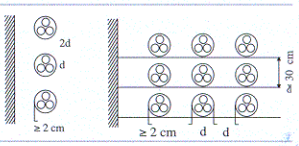
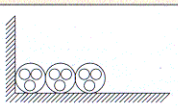
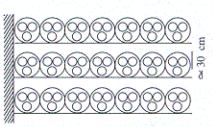
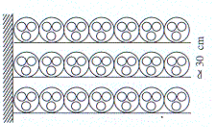
Clearance = cable diameter (d) Clearance from the wall ≥ 2 cm	Number of circuits 1	2	3	6	9	Laying form
Laid on cables racks						
Number of racks						
1	1.00	0.98	0.96	0.93	0.92	
2	1.00	0.95	0.93	0.90	0.89	
3	1.00	0.94	0.92	0.89	0.88	
6	1.00	0.93	0.90	0.87	0.86	
Arranged near the wall	1.00	0.93	0.90	0.87	0.86	
Arrangements for which reduction of the current is not necessary	Clearance from the wall ≥ 2 cm		Clearance between cables ≥2d			

Table 11

Derating factors for multicore cables touching and in contact with the wall in air

Clearance touching troughout and contact with the wall	Number of cables 1	2	3	6	9	Laying form
Laid on the ground	0.90	0.84	0.80	0.75	0.73	
Laid cables troughs (circulation of air is restricted)						
Number of troughs						
1	0.95	0.84	0.80	0.75	0.73	
2	0.95	0.80	0.76	0.71	0.69	
3	0.95	0.78	0.74	0.70	0.68	
6	0.95	0.76	0.72	0.68	0.66	
Laid on cables racks						
Number of racks						
1	0.95	0.84	0.80	0.75	0.73	
2	0.95	0.80	0.76	0.71	0.69	
3	0.95	0.78	0.74	0.70	0.68	
6	0.95	0.76	0.72	0.68	0.66	
Arranged on the wall	0.95	0.78	0.73	0.68	0.66	

Short Circuit Current

Table 12

Max. short circuit temperature for cable components

Material	Item	Temp. °C
Insulation	PVC insulation	140 For C.S.A > 300 mm2 160 For C.S.A ≤ 300 mm2
	XLPE insulation	250
Sheathing	PVC sheathing	200
	LDPE sheathing	150
	HDPE sheathing	180
	Lead sheath	170
	Lead sheath - alloy	*200

** Temp. = 210 °C for cables with rated voltages above 30kV (U_m=36 kV),*

Table 13

kA short circuit current - Copper conductor - PVC insulated

C.S.A. mm²	Duration sec.									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
16	5.8	4.1	3.4	2.9	2.6	1.8	1.3	1.1	0.9	0.8
25	9.1	6.4	5.2	4.5	4.1	2.9	2.0	1.7	1.4	1.3
35	12.7	9.0	7.3	6.4	5.7	4.0	2.8	2.3	2.0	1.8
50	18.2	12.9	10.5	9.1	8.1	5.8	4.1	3.3	2.9	2.6
70	25.5	18.0	14.7	12.7	11.4	8.1	5.7	4.6	4.0	3.6
95	34.5	24.4	19.9	17.3	15.5	10.9	7.7	6.3	5.5	4.9
120	43.6	30.9	25.2	21.8	19.5	13.8	9.8	8.0	6.9	6.2
150	54.5	38.6	31.5	27.3	24.4	17.3	12.2	10.0	8.6	7.7
185	67.3	47.6	38.8	33.6	30.1	21.3	15.0	12.3	10.6	9.5
240	87.3	61.7	50.4	43.6	39.0	27.6	19.5	15.9	13.8	12.3
300	109.1	77.1	63.0	54.5	48.8	34.5	24.4	19.9	17.3	15.4
400	130.0	91.9	75.1	65.0	58.2	41.1	29.1	23.7	20.6	18.4
500	162.5	114.9	93.8	81.3	72.7	51.4	36.3	29.7	25.7	23.0
630	204.8	144.8	118.2	102.4	91.6	64.8	45.8	37.4	32.4	29.0

Short Circuit Current

Table 14

kA short circuit current - Aluminium conductor - PVC insulated

C.S.A. mm²	Duration sec.									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
16	3.8	2.7	2.2	1.9	1.7	1.2	0.9	0.7	0.6	0.5
25	6.0	4.2	3.5	3.0	2.7	1.9	1.3	1.1	1.0	0.8
35	8.4	5.9	4.9	4.2	3.8	2.7	1.9	1.5	1.3	1.2
50	12.0	8.5	6.9	6.0	5.4	3.8	2.7	2.2	1.9	1.7
70	16.8	11.9	9.7	8.4	7.5	5.3	3.8	3.1	2.7	2.4
95	22.8	16.1	13.2	11.4	10.2	7.2	5.1	4.2	3.6	3.2
120	28.8	20.4	16.7	14.4	12.9	9.1	6.4	5.3	4.6	4.1
150	36.0	25.5	20.8	18.0	16.1	11.4	8.1	6.6	5.7	5.1
185	44.5	31.4	25.7	22.2	19.9	14.1	9.9	8.1	7.0	6.3
240	57.7	40.8	33.3	28.8	25.8	18.2	12.9	10.5	9.1	8.2
300	72.1	51.0	41.6	36.0	32.2	22.8	16.1	13.2	11.4	10.2
400	86.0	60.8	49.7	43.0	38.5	27.2	19.2	15.7	13.6	12.2
500	107.5	76.0	62.1	53.8	48.1	34.0	24.0	19.6	17.0	15.2
630	135.5	95.8	78.2	67.7	60.6	42.8	30.3	24.7	21.4	19.2

Table 15

kA short circuit current - Copper conductor - XLPE insulated

C.S.A. mm²	Duration sec.									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
16	7.2	5.1	4.2	3.6	3.2	2.3	1.6	1.3	1.1	1.02
25	11.3	8.0	6.5	5.7	5.1	3.6	2.5	2.1	1.8	1.6
35	15.8	11.2	9.1	7.9	7.1	5.0	3.5	2.9	2.5	2.24
50	22.6	16.0	13.1	11.3	10.1	7.2	5.1	4.1	3.6	3.2
70	31.7	22.4	18.3	15.8	14.2	10.0	7.1	5.8	5.0	4.5
95	43.0	30.4	24.8	21.5	19.2	13.6	9.6	7.8	6.8	6.1
120	54.3	38.4	31.3	27.1	24.3	17.2	12.1	9.9	8.6	7.7
150	67.8	48.0	39.2	33.9	30.3	21.5	15.2	12.4	10.7	9.6
185	83.7	59.2	48.3	41.8	37.4	26.5	18.7	15.3	13.2	11.8
240	108.5	76.7	62.7	54.3	48.5	34.3	24.3	19.8	17.2	15.3
300	135.7	95.9	78.3	67.8	60.7	42.9	30.3	24.8	21.5	19.2
400	180.9	127.9	104.4	90.4	80.9	57.2	40.4	33.0	28.6	25.6
500	226.1	159.9	130.5	113.1	101.1	71.5	50.6	41.3	35.8	32.0
630	284.9	201.4	164.5	142.4	127.4	90.1	63.7	52.0	45.0	40.3
800	361.8	255.8	208.9	180.9	161.8	114.4	80.9	66.0	57.2	51.2
1000	452.2	319.8	261.1	226.1	202.2	143.0	101.1	82.6	71.5	64.0
1200	542.6	383.7	313.3	271.3	242.7	171.6	121.3	99.1	85.8	76.7

Short Circuit Current

Table 16

kA Short circuit current - Aluminium conductor - XLPE insulated

C.S.A. mm²	Duration sec.									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
16	4.7	3.4	2.7	2.4	2.1	1.5	1.1	0.9	0.75	0.67
25	7.4	5.2	4.3	3.7	3.3	2.3	1.7	1.4	1.2	1.0
35	10.4	7.3	6.0	5.2	4.6	3.3	2.3	1.9	1.6	1.5
50	14.8	10.5	8.6	7.4	6.6	4.7	3.3	2.7	2.3	2.1
70	20.7	14.7	12.0	10.4	9.3	6.6	4.6	3.8	3.3	2.9
95	28.1	19.9	16.3	14.1	12.6	8.9	6.3	5.1	4.5	4.0
120	35.6	25.1	20.5	17.8	15.9	11.2	8.0	6.5	5.6	5.0
150	44.4	31.4	25.7	22.2	19.9	14.1	9.9	8.1	7.0	6.3
185	54.8	38.8	31.6	27.4	24.5	17.3	12.3	10.0	8.7	7.8
240	71.1	50.3	41.1	35.6	31.8	22.5	15.9	13.0	11.2	10.1
300	88.9	62.9	51.3	44.4	39.8	28.1	19.9	16.2	14.1	12.6
400	118.5	83.8	68.4	59.3	53.0	37.5	26.5	21.6	18.7	16.8
500	148.2	104.8	85.5	74.1	66.3	46.9	33.1	27.0	23.4	21.0
630	186.7	132.0	107.8	93.3	83.5	59.0	41.7	34.1	29.5	26.4
800	237.0	167.6	136.9	118.5	106.0	75.0	53.0	43.3	37.5	33.5
1000	296.3	209.5	171.1	148.2	132.5	93.7	66.3	54.1	46.9	41.9
1200	355.6	251.4	205.3	177.8	159.0	112.4	79.5	64.9	56.2	50.3

Table 17

kA Short circuit current - Copper screen

C.S.A. mm²	Duration sec.									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
16	7.5	5.3	4.3	3.7	3.3	2.4	1.7	1.4	1.2	1.1
25	11.7	8.3	6.8	5.9	5.2	3.7	2.6	2.1	1.9	1.7
35	16.4	11.6	9.5	8.3	7.3	5.2	3.7	3.0	2.6	2.3

Conductor temperature before short circuit = 90 °C
Maximum conductor temperature during short circuit = 250 °C
Maximum screen temperature before short circuit = 80 °C

Voltage Drop

Table 18

Voltage drop for single core L.V cables

C.S.A mm²	Copper conductor			
	Voltage drop (mv / AMP / Meter)			
	PVC insulation & PVC sheathed		XLPE insulation & PVC sheathed	
	Flat ○○○	Trefoil	Flat ○○○	Trefoil
4	7.83	7.770	8.337	8.277
6	5.287	5.226	5.628	5.568
10	3.184	3.124	3.401	3.341
16	2.068	2.008	2.203	2.142
25	1.357	1.297	1.440	1.380
35	1.034	0.971	1.085	1.024
50	0.793	0.732	0.836	0.776
70	0.595	0.534	0.624	0.564
95	0.469	0.408	0.490	0.430
120	0.410	0.349	0.417	0.357
150	0.354	0.294	0.366	0.305
185	0.312	0.252	0.322	0.262
240	0.272	0.211	0.278	0.218
300	0.247	0.187	0.253	0.192
400	0.224	0.164	0.220	0.159
500	0.208	0.148	0.211	0.150
630	0.194	0.134	0.191	0.131

C.S.A mm²	Aluminium conductor			
	Voltage drop (mv / AMP / Meter)			
	PVC insulation & PVC sheathed		XLPE insulation & PVC sheathed	
	Flat ○○○	Trefoil	Flat ○○○	Trefoil
16	3.343	3.283	3.561	3.500
25	2.161	2.100	2.296	2.235
35	1.602	1.542	1.700	1.640
50	1.222	1.162	1.291	1.230
70	0.890	0.830	0.937	0.877
95	0.686	0.623	0.719	0.655
120	0.569	0.509	0.594	0.534
150	0.490	0.430	0.511	0.451
185	0.420	0.360	0.437	0.377
240	0.353	0.293	0.367	0.307
300	0.312	0.252	0.322	0.262
400	0.274	0.214	0.278	0.218
500	0.245	0.185	0.260	0.199
630	0.222	0.162	0.223	0.163

The above data are based on:
- *Max. operating temp: 90 °C for XLPE & 70 °C for PVC*
- *Power factor: 0.8 Rated frequency: 50 HZ*
- *Cables are touched in flat formation*

Voltage Drop

Table 19

Voltage drop for multi core L.V cables

C.S.A mm^2	Copper conductor	
	Voltage drop (mv / AMP / Meter)	
	PVC insulation & PVC sheathed	XLPE insulation & PVC sheathed
1.5	20.345	20.341
2.5	12.397	13.197
4	7.741	7.731
6	5.199	5.191
10	3.101	3.094
16	1.988	1.982
25	1.280	1.276
35	0.959	0.955
50	0.720	0.715
70	0.524	0.520
95	0.398	0.394
120	0.341	0.337
150	0.285	0.282
185	0.244	0.241
240	0.204	0.201
300	0.180	0.177
400	0.157	0.155

C.S.A mm^2	Aluminium conductor	
	Voltage drop (mv / AMP / Meter)	
	PVC insulation & PVC sheathed	XLPE insulation & PVC sheathed
16	3.263	3.479
25	2.084	2.218
35	1.527	1.624
50	1.150	1.217
70	0.819	0.865
95	0.613	0.645
120	0.500	0.524
150	0.421	0.442
185	0.352	0.369
240	0.286	0.299
300	0.245	0.255
400	0.208	0.211

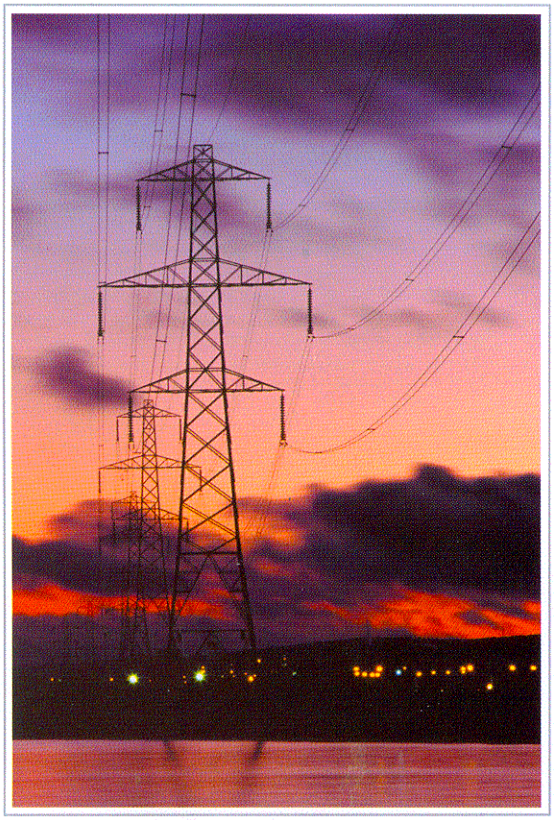
The above data are based on:
Max. operating temp: 90 °C for XLPE & 70 °C for PVC
Power factor : 0.8 Rated frequency: 50 HZ
Cables are touched in flat formation

Conversion Table

Multiply	By	To obtain
Weight-Imperial		
Ounces	28.3495	grams
Pounds (Av)	453.59	grams
Pounds (Av)	0.45359	Kilograms
Tons (short)	907.19	Kilograms
Tons (long)	1016.05	Kilograms
Weight-Metric		
Grams	0.03527	Ounces
Grams	0.002205	Pounds
Kilograms	35.274	Ounces
Kilograms	2.2046	Pounds
Kilograms	0.001102	tons (short)
Kilograms	0.0009842	tons (long)
Miscellaneous-Imperial		
Pounds per 1000 feet	1.48816	Kg/Km
Pounds per mile	0.28185	Kg/Km
Pounds per square inch	0.0007031	Kg. per square mm.
Pounds per square inch	0.07031	Kg. per square cm.
Pounds per cubic	27.68	grams per cubic cm.
Feet per second	18.288	meters per minute.
Feet per second	1.09728	Kilometers per hour.
Miles per hour	1.60935	Kilometers per hour.
Ohms per 1000 feet	3.28083	ohms per Kilometer.
Ohms per mile	0.62137	ohms per Kilometer.
Decibels per 1000 feet	3.28083	decibels per Kilometer.
Decibels per mile	0.62137	decibels per Kilometer.
Decibels	0.1153	nepers.
Miscellaneous-Metric		
Kg/Km	0.67197	pounds per 100 feet.
Kg/Km	3.54795	pounds per mile.
Kg.per square mm	1422.34	pounds per square inch.
Kg.per square cm	14.2234	pounds per square inch.
Grams per cubic cm	0.03613	pounds per cubic inch.
Meters per minute	0.05468	feet per second.
Kilometers per hour	0.91134	feet per second.
Kilometer per hour	0.62137	miles per hour.
Ohms per Kilometer	0.3048	ohms per 1000 feet.
Ohms per Kilometer	1.6093	ohms per mile.
Decibels per kilometer	0.3048	decibels per 1000 feet.
Decibels per kilometer	1.6093	decibels per mile.
Temperature		
° Fahrenheit	5/9(°F)-32	°Celsius
° Celsius	9/5(°C)+32	°Fahrenheit
Length-Imperial		
Mils	0.001	inches.
Mils	0.0254	mm.

Multiply	By	To obtain
Inches	1000	mils.
Inches	25.40	mm.
Inches	2.54	cm.
Feet	30.48	cm.
Feet	0.3048	meters.
Feet (thousands of)	0.3048	kilometers.
Yards	0.9144	meters.
Miles	1.6093	kilometers
Length-Metric		
Millimeters	39.37	mils.
Millimeters	0.03937	inches.
Centimeters	0.3937	inches.
Centimeters	0.032808	feet.
Meters	39.37	inches.
Meters	3.2808	feet.
Meters	1.0936	yards.
Kilometers	3280.83	feet.
Kilometers	0.62137	miles.
Area-Imperial		
Square mils	1.2732	circular mils
Square mils	0.000001	square inches
Circular mils	0.7854	square mils
Circular mils	0.0000007854	square inches
Square mils	0.0005067	square mm.
Square inches	1000000	square mils
Square inches	1273240	circualr mils
Square inches	645.16	square mm.
Square inches	6.4516	square cm.
Square feet	0.09290	square meters
Square yards	0.8361	square meters
Area-Metric		
Square millimeters	1973.52	circular mils
Square millimeters	0.00155	square inches
Square centimeters	0.155	square inches
Square meters	10.7638	square feet
Square meters	1.19599	square yards
Volume-Imperial		
Cubic inches	16.38716	cubic cm.
Cubic feet	0.028317	cubic meters
Volume-U.S.		
Quarts (liquid)	0.9463	liters
Gallons	3.7854	liters.
Volume-Metric		
Cubic cm	0.06102	cubic inches.
Cubic meters	35.3145	cubic feet.
Liters	1.05668	quarts (liquid U.S)
Liters	0.26417	gallons (U.S.)

Overhead Conductors



Product Range

1- Bare hard drown Copper

2- All Aluminium conductor (*A.A.C*)

3- All Aluminium alloy conductor (*A.A.A.C.*)

4- Aluminium conductor steel reinforced (*A.C.S.R*)

5- Service drop cables.

Cable Construction

1. Conductor

Copper, Aluminium or Aluminium alloy conductors consist of wires concentrically applied in successive layers in opposite direction.
In case of A.C.S.R conductor a core of solid or stranded galvanized steel is applied first.

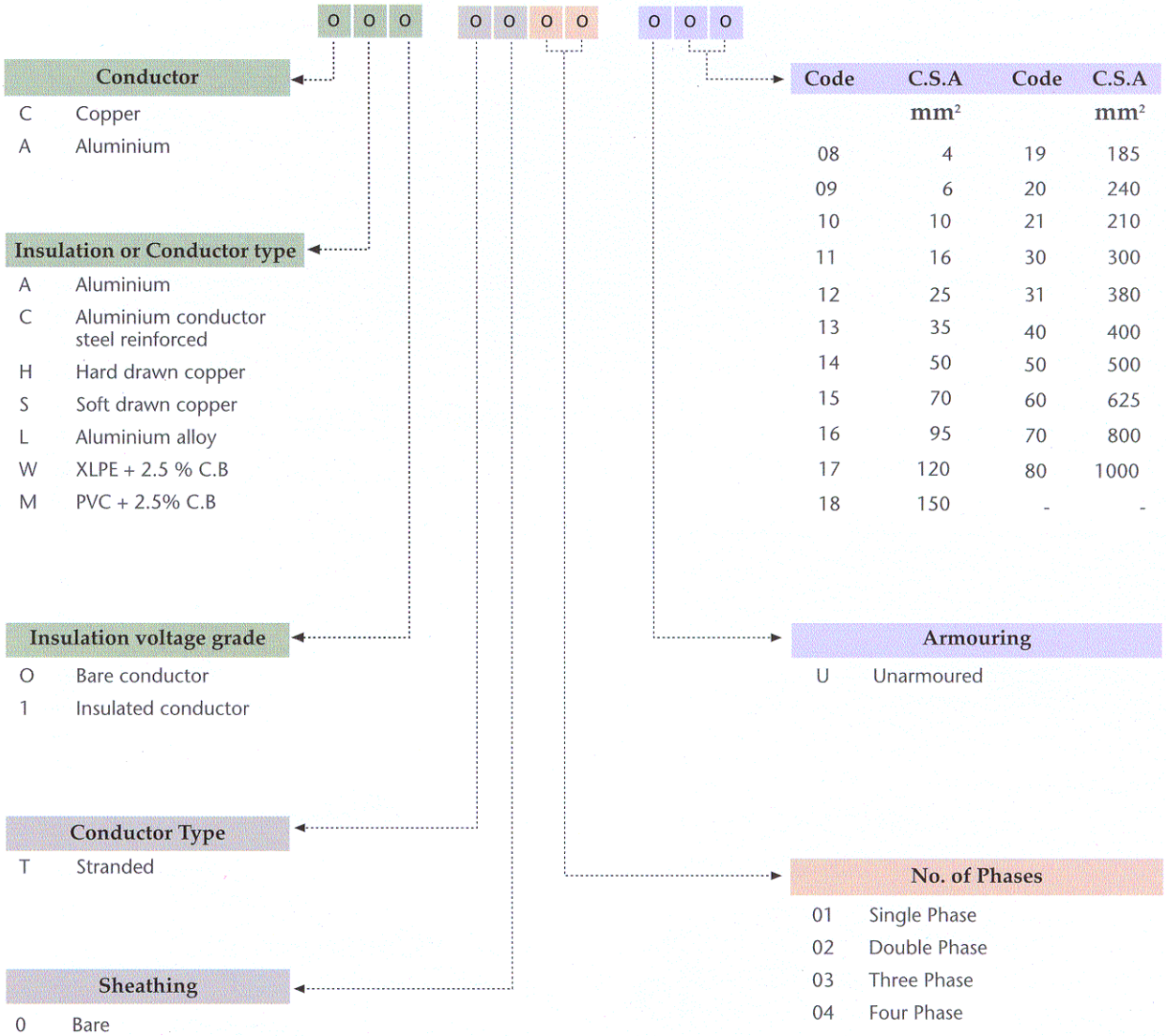
2. Insulation

In case of service drop cables, an extruded layer of *PVC* or *XLPE* with 2.5 % Of Carbon black as sun resistant is applied upon the conductor.

System for Cable Designation for Over Head Conductor

You can order our product by giving the following information :

1. Cable code as per the catalogue.
2. If your required cable/conductor is out of our catalogue range, you can use the following codes to determine your cable.



Code	C.S.A mm²	Code	C.S.A mm²
08	4	19	185
09	6	20	240
10	10	21	210
11	16	30	300
12	25	31	380
13	35	40	400
14	50	50	500
15	70	60	625
16	95	70	800
17	120	80	1000
18	150	-	-

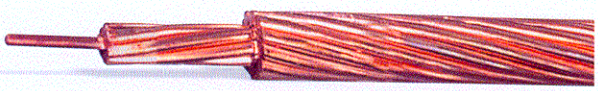
Bare Soft and Hard Drawn Stranded

Description

- Plain bare soft drawn Copper conductors as per IEC 60228 class 2.
- Plain bare hard drawn Copper conductors as per DIN 48201

Application

- Soft drawn Copper conductors are used for grounding electical systems, where high conductivity and flexibility are required.
- Hard drawn Copper conductors are used in overhead electrical distribution networks.



Egytech - code	Nominal cross sectional area	Number and nominal diameter of wires	Max. DC. resistance at 20 °C	Approx. overall diameter	Approx. weight
	mm^2	No x ∅ (mm)	Ω/km	mm	kg/km
a - Bare soft drawn					
CS0-T001-U06	2.5	7 x 0.67	7.4100	2.1	23
CS0-T001-U08	4	7 x 0.84	4.6100	2.5	36
CS0-T001-U09	6	7 x 1.04	3.0800	3.1	54
CS0-T001-U10	10	7 x 1.33	1.8300	4.0	91
CS0-T001-U11	16	7 x 1.68	1.1500	5.1	145
CS0-T001-U12	25	7 x 2.12	0.7270	6.3	227
CS0-T001-U13	35	7 x 2.48	0.5240	7.4	318
CS0-T001-U14	50	19 x 1.80	0.3870	9.0	455
CS0-T001-U15	70	19 x 2.10	0.2680	10.5	635
CS0-T001-U16	95	19 x 2.48	0.1930	12.4	862
CS0-T001-U17	120	37 x 2.00	0.1530	14.0	1089
CS0-T001-U18	150	37 x 2.22	0.1240	15.5	1362
CS0-T001-U19	185	37 x 2.48	0.0991	17.3	1679
CS0-T001-U20	240	61 x 2.22	0.0754	19.9	2179
CS0-T001-U30	300	61 x 2.48	0.0601	22.3	2723
CS0-T001-U40	400	61 x 2.81	0.0470	25.2	3631
CS0-T001-U50	500	61 x 3.18	0.0366	28.6	4539
b - Bare hard drawn					
CH0-T001-U10	10	7 x 1.35	1.8060	4.5	93
CH0-T001-U11	16	7 x 1.70	1.1385	5.1	146
CH0-T001-U12	25	7 x 2.10	0.7461	6.4	231
CH0-T001-U13	35	7 x 2.50	0.5264	7.5	324
CH0-T001-U14	50	19 x 1.80	0.3759	9.0	463
CH0-T001-U15	70	19 x 2.10	0.2762	10.5	648
CH0-T001-U16	95	19 x 2.50	0.1949	12.5	880
CH0-T001-U17	120	37 x 2.00	0.1554	14.0	1111
CH0-T001-U18	150	37 x 2.25	0.1238	15.7	1389
CH0-T001-U19	185	37 x 2.50	0.1003	17.5	1713
CH0-T001-U20	240	61 x 2.25	0.0753	20.2	2222
CH0-T001-U30	300	61 x 2.50	0.0610	22.5	2778
CH0-T001-U40	400	61 x 2.89	0.0456	26.0	3704
CH0-T001-U50	500	61 x 3.23	0.0365	29.0	4630

- The above data is approximate and subjected to manufacturing tolerance.
- Delivery length tolerance is ± 5%

All Aluminium Conductors

(A.A.C.)

Description

- Hard drawn Aluminium wires, stranded in successive layers, in opposite direction to form the Aluminium stranded A.A.C. conductor. As per DIN 48201 & BS 215.

Application

- All Aluminium bare conductors are used for aerial distribut lines having relatively short spans, aerial feeders and bus bars of substations.

Egytech - code	Nominal cross sectional area	Number and nominal diameters of wires	Max. DC. resistance at 20 °C	Calculated breaking load	Approx. overall diameter	Approx. weight
	mm^2	no x ∅ (mm)	Ω/km	kn	mm	kg/km
a - According to DIN 48201						
AA0-T001-U11	16	7 x 1.70	1.80170	2.80	5.10	44
AA0-T001-U12	25	7 x 2.10	1.18070	4.12	6.30	69
AA0-T001-U13	35	7 x 2.50	0.83310	5.71	7.50	96
AA0-T001-U14	50	7 x 3.00	0.57860	7.86	9.00	138
AA0-T001-U14	50	19 x 1.80	0.59490	8.60	9.00	133
AA0-T001-U15	70	19 x 2.10	0.43710	11.40	10.50	193
AA0-T001-U16	95	19 x 2.50	0.30840	15.60	12.50	262
AA0-T001-U17	120	19 x 2.80	0.24590	18.37	14.00	330
AA0-T001-U18	150	37 x 2.25	0.19600	25.10	15.70	413
AA0-T001-U19	185	37 x 2.50	0.15870	30.31	17.50	509
AA0-T001-U20	240	61 x 2.25	0.11910	39.25	20.20	661
AA0-T001-U30	300	61 x 2.50	0.09649	47.15	22.50	826
AA0-T001-U40	400	61 x 2.89	0.07220	60.35	26.00	1102
AA0-T001-U50	500	61 x 3.23	0.05781	74.27	29.00	1377
AA0-T001-U60	625	91 x 2.96	0.04625	95.05	32.50	1721
AA0-T001-U70	800	91 x 3.35	0.03611	118.19	36.80	2203
AA0-T001-U80	1000	91 x 3.74	0.02897	145.35	41.10	2754

Cables - code name	Nominal cross sectional area	Number and nominal diameters of wires	Max. DC. resistance at 20 °C	Calculated breaking load	Approx. overall diameter	Approx. weight
	mm^2	no x ∅ (mm)	Ω/km	kn	mm	kg/km
b - According to BS 215						
Midge	22	7 x 2.06	1.22700	3.99	6.18	64
Ant	50	7 x 3.10	0.54190	8.28	9.30	145
Fly	60	7 x 3.40	0.45050	9.90	10.20	174
Wasp	100	7 x 4.39	0.27020	16.00	13.17	290
Hornet	150	19 x 3.25	0.18250	24.70	16.25	434
Chafer	200	19 x 3.78	0.13490	32.40	18.90	587
Cockroach	250	19 x 4.22	0.10830	40.40	21.10	731
Butterfly	300	19 x 4.65	0.08916	48.75	23.25	888
Centipede	400	37 x 3.78	0.06944	63.10	26.46	1145

- The above data is approximate and subjected to manufacturing tolerance.
- Delivery length tolerance is ± 5%

All Aluminium Alloy Conductors

(A.A.A.C.)

Description

- All Aluminium alloy (ALMELEC) conductors, stranded in successive layers to form the stranded A.A.A.C. conductor. As per IEC 61089 & BS 3242.

Application

- A.A.A.C. are mainly used for overhead lines, in transmission and distribution electrical networks, having relatively long spans. They are also used a messenger to support overhead electrical cables.

Egytech - code	Nominal cross sectional area	Number and nominal diameters of wires	Max. DC. resistance at 20 °C	Calculated breaking load	Approx. overall diameter	Approx. weight
	mm^2	nr x ∅ (mm)	Ω/km	kn	mm	kg/km
a - According to IEC 61089						
AL0-T001-U11	16	7 x 1.70	2.0910	4.50	5.10	44
AL0-T001-U12	25	7 x 2.10	1.3703	6.80	6.30	67
AL0-T001-U13	35	7 x 2.50	0.9669	9.60	7.50	94
AL0-T001-U14	50	7 x 3.00	0.6714	13.80	9.00	135
AL0-T001-U14	50	19 x 1.80	0.6905	13.50	9.00	133
AL0-T001-U15	70	19 x 2.10	0.5073	18.40	10.50	181
AL0-T001-U16	95	19 x 2.50	0.3580	26.10	12.50	256
AL0-T001-U17	120	19 x 2.80	0.2854	32.70	14.00	322
AL0-T001-U18	150	37 x 2.25	0.2274	41.10	15.70	406
AL0-T001-U19	185	37 x 2.50	0.1842	50.70	17.50	501
AL0-T001-U20	240	61 x 2.25	0.1383	67.80	20.20	670
AL0-T001-U30	300	61 x 2.50	0.1120	83.60	22.50	827
AL0-T001-U40	400	61 x 2.89	0.0838	111.80	26.00	1105
AL0-T001-U50	500	61 x 3.23	0.0671	139.60	29.10	1381
AL0-T001-U60	625	91 x 2.96	0.0537	174.90	32.60	1733
AL0-T001-U70	800	91 x 3.35	0.0419	224.00	36.80	2219
AL0-T001-U80	1000	91 x 3.74	0.0336	279.20	41.10	2766

Cables - code name	Nominal cross sectional area	Number and nominal diameters of wires	Max. DC. resistance at 20 °C	Calculated breaking load	Approx. overall diameter	Approx. weight
	mm^2	nr x ∅ (mm)	Ω/km	kn	mm	kg/km
b - According to BS 3242						
Almond	25	7 x 2.34	1.09400	8.40	7.02	82
Cedar	30	7 x 2.54	0.92810	9.90	7.62	97
Fir	40	7 x 2.95	0.68800	13.40	8.85	131
Hazel	50	7 x 3.30	0.54980	16.80	9.90	164
Oak	100	7 x 4.65	0.27690	33.30	13.95	325
Ash	150	19 x 3.48	0.18300	50.60	17.40	497
Elm	175	19 x 3.76	0.15680	59.10	18.80	580
Upas	300	37 x 3.53	0.09155	101.50	24.71	997

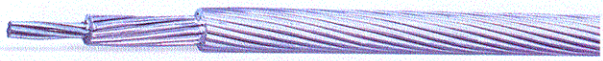
- The above data is approximate and subjected to manufacturing tolerance.
- Delivery length tolerance is ± 5%

Aluminium Conductor Steel Reinforced

(A.C.S.R.)

Description

- An outer layer of Aluminium conductor concentrically stranded over the central core of galvanized solid or stranded steel wires to form Aluminium steel reinforced conductor. As per DIN 48204, BS 215 or ASTM B 232.



Application

- A.C.S.R conductors are widely used for electrical power transmission over long distances, since they are ideal for long overhead lines spans. They are also used as a messenger for supporting overhead electrical cables.

Egytech - code	Nominal cross sectional area	Number and nominal diameters of wires		Max. DC. resistance at 20 °C	Calculated breaking load	Approx. overall diameter	Approx. weight
		Aluminium	Steel				
	mm^2	nr x ∅ (mm)	nr x ∅ (mm)	Ω/km	kn	mm	kg/km
a - According to DIN 48204							
AC0-T001-U11	16 / 2.5	6 x 1.80	1 x 1.80	1.8750	5.62	5.4	62
AC0-T001-U12	25 / 4	6 x 2.25	1 x 2.25	1.2060	8.39	6.8	97
AC0-T001-U13	35 / 6	6 x 2.70	1 x 2.70	0.8365	11.92	8.1	139
AC0-T001-U14	50 / 8	6 x 3.20	1 x 3.20	0.5941	16.72	9.6	196
AC0-T001-U15	70 /12	26 x 1.80	7 x 1.45	0.4130	24.97	11.6	276
AC0-T001-U16	95 /15	26 x 2.10	7 x 1.65	0.3058	32.19	13.4	369
AC0-T001-U17	120 /21	26 x 2.45	7 x 1.95	0.2530	41.43	15.7	507
AC0-T001-U18	150 / 25	26 x 2.70	7 x 2.15	0.1939	52.34	17.3	630
AC0-T001-U19	185 / 32	26 x 3.00	7 x 2.40	0.1640	64.78	19.2	762
AC0-T001-U21	210 / 36	26 x 3.20	7 x 2.55	0.1410	73.44	20.5	865
AC0-T001-U20	240 / 40	26 x 3.40	7 x 2.70	0.1188	82.58	21.7	974
AC0-T001-U31	380 / 50	54 x 3.00	7 x 3.00	0.0757	120.90	27.0	1448

Cables - code name	Nominal cross sectional area	Number and nominal diameters of wires		Total cross-sectional area	Max. DC. resistance at 20 °C	Calculated breaking load	Approx. overall diameter	Approx. weight
		Aluminium	Steel					
	mm^2	nr x ∅ (mm)	nr x ∅ (mm)	mm^2	Ω/km	kn	mm	kg/km
b - According to BS 215								
Gopher	25	6 / 2.36	1 / 2.36	30.62	1.0930	9.61	7.08	106
Weasel	30	6 / 2.59	1 / 2.59	36.88	0.9077	11.45	7.77	128
Ferret	40	6 / 3.00	1 / 3.00	49.48	0.6766	15.20	9.00	172
Rabbit	50	6 / 3.35	1 / 3.35	61.70	0.5426	18.40	10.05	214
Horse	70	12 / 2.79	7 / 2.79	116.20	0.3936	61.20	13.95	538
Dog	100	6 / 4.72	7 / 1.57	118.50	0.2733	32.70	14.15	394
Wolf	150	30 / 2.59	7 / 2.59	194.90	0.1828	69.20	18.13	726
Dingo	150	18 / 3.35	1 / 3.35	167.50	0.1815	35.70	16.75	506
Lynx	175	30 / 2.79	7 / 2.79	226.20	0.1576	79.80	19.53	842
Caracal	175	18 / 3.61	1 / 3.61	194.50	0.1563	41.10	18.05	587
Panther	200	30 / 3.00	7 / 3.00	261.50	0.1363	92.25	21.00	974
Jaguar	200	18 / 3.86	1 / 3.86	222.30	0.1367	46.60	19.30	671
Zebra	400	54 / 3.18	7 / 3.18	484.50	0.0674	131.90	28.62	1621

- The above data is approximate and subjected to manufacturing tolerance.
- Delivery length tolerance is ± 5%

cont'd

Aluminium Conductor Steel Reinforced

(A.C.S.R.)

Cables - code name	Nominal cross sectional area	Number and nominal diameters of wires		Calculated DC resistance at 20 °C	Calculated rated tensile strength	Approx. overall diameter	Approx. weight	
		Aluminium	Steel				Aluminium	Steel
	mm^2	nr x ∅ (mm)	nr x ∅ (mm)	Ω/km	kn	mm	kg/km	kg/km
c - According to ASTM B 232								
Grouse	40.5	8 X 2.54	1 X 4.24	0.7112	23.1	9.3	112	110
Petrel	51.6	12 X 2.34	7 X 2.34	0.5614	46.2	11.7	143	235
Minorca	56.1	12 x 2.44	7 x 2.44	0.5163	50.2	12.2	156	256
Leghorn	68.2	12 x 2.69	7 x 2.69	0.4248	60.7	13.5	189	311
Guinea	80.4	12 x 2.92	7 x 2.92	0.3605	71.1	14.6	223	367
Dotterel	89.4	12 x 3.08	7 x 3.08	0.3240	76.7	15.4	248	409
Dorking	96.5	12 x 3.20	7 x 3.20	0.3002	82.8	16.0	268	441
Brahma	102.8	16 x 2.86	19 x 2.48	0.2819	126.5	18.1	285	722
Cochin	107.1	12 x 3.37	7 x 3.37	0.2707	91.8	16.9	297	488
Turkey	13.3	6 x 1.68	1 x 1.68	2.1570	5.3	5.0	36	17
Swan	21.2	6 x 2.12	1 x 2.12	1.3545	8.3	6.4	58	27
Swanate	21.1	7 x 1.96	1 x 2.61	1.3583	10.5	6.5	58	42
Sparrow	33.6	6 x 2.67	1 x 2.67	0.8530	12.7	8.0	92	44
Sparate	33.5	7 x 2.47	1 x 3.30	0.8553	16.1	8.3	92	67
Robin	42.4	6 x 3.00	1 x 3.00	0.6764	15.8	9.0	117	55
Raven	53.5	6 x 3.37	1 x 3.37	0.5364	19.5	10.1	147	69
Quail	67.4	6 x 3.78	1 x 3.78	0.4255	23.6	11.4	185	87
Pigeon	85.1	6 x 4.25	1 x 4.25	0.3370	29.5	12.7	233	110
Penguin	107.2	6 x 4.77	1 x 4.77	0.2676	37.1	14.3	294	139
Waxwing	135.0	18 x 3.09	1 x 3.09	0.2133	30.3	15.5	373	59
Partridge	134.9	26 x 2.57	7 x 2.00	0.2142	50.2	16.3	373	172
Ostrich	152.2	26 x 2.73	7 x 2.12	0.1906	56.6	17.3	421	193
Merlin	170.2	18 x 3.47	1 x 3.47	0.1692	38.2	17.4	470	74
Linnet	170.6	26 x 2.89	7 x 2.25	0.1699	62.8	18.3	472	217
Oriole	170.5	30 x 2.69	7 x 2.69	0.1704	77.4	18.8	473	311
Chickadee	200.9	18 x 3.77	1 x 3.77	0.1432	44.3	18.9	555	87
Brant	201.6	24 x 3.27	7 x 2.18	0.1437	64.7	19.6	558	204
Ibis	201.3	26 x 3.14	7 x 2.44	0.1438	72.1	19.9	558	256
Lark	200.9	30 x 2.92	7 x 2.92	0.1442	88.7	20.5	559	367
Pelican	242.3	18 x 4.14	1 x 4.14	0.1193	52.3	20.7	667	105
Flickler	241.6	24 x 3.58	7 x 2.39	0.1199	76.8	21.5	670	245
Hawk	241.7	26 x 3.44	7 x 2.67	0.1199	86.4	21.8	670	308
Hen	241.3	30 x 3.20	7 x 3.20	0.1202	105.9	22.4	672	440
Osprey	282.5	18 x 4.47	1 x 4.47	0.1022	61.0	22.3	777	122
Parakeet	282.3	24 x 3.87	7 x 2.58	0.1026	88.3	23.2	782	285
Dove	282.6	26 x 3.72	7 x 2.89	0.1025	101.1	23.5	781	359
Eagle	282.1	30 x 3.46	7 x 3.46	0.1030	122.9	24.2	783	514
Peacock	306.1	24 X 4.03	7 X 2.69	0.0945	095.9	24.2	850	311
Squab	305.8	26 X 3.87	7 X 3.01	0.0945	108.1	24.5	849	390
Wood Duck	307.1	30 x 3.61	7 x 3.61	0.0947	129.0	25.3	851	559
Teal	307.1	30 x 3.61	19 x 2.16	0.0947	133.4	25.3	851	547
Swift	323.0	36 x 3.38	1 x 3.38	0.0893	60.7	23.7	888	70
Kingbird	323.0	18 x 4.78	1 x 4.78	0.0894	69.7	23.9	889	139
Rook	323.1	24 x 4.14	7 x 2.76	0.0899	101.0	24.8	893	326

- The above data is approximate and subjected to manufacturing tolerance.
- Delivery length tolerance is ± 5%

cont'd

Aluminium Conductor Steel Reinforced

(A.C.S.R.)

Cables - code name	Nominal cross sectional area	Number and nominal diameters of wires		Calculated DC resistance at 20 °C	Calculated rated tensile strength	Approx. overall diameter	Approx. weight	
		Aluminium	Steel				Aluminium	Steel
	mm^2	nr x ∅ (mm)	nr x ∅ (mm)	Ω/km	kn	mm	kg/km	kg/km
c - According to ASTM B 232								
Grosbeak	321.8	26 x 3.97	7 x 3.09	0.0900	111.9	25.2	893	409
Scoter	322.6	30 x 3.70	7 x 3.70	0.0900	135.5	25.9	895	588
Egret	322.6	30 x 3.70	19 x 2.22	0.0900	140.6	25.9	895	575
Flamingo	337.3	24 x 4.23	7 x 2.82	0.0859	105.5	25.4	936	342
Gannet	338.3	26 x 4.07	7 x 3.16	0.0857	117.3	25.8	936	429
Stilt	363.3	24 x 4.39	7 x 2.92	0.0798	113.3	26.3	1005	367
Starling	361.9	26 x 4.21	7 x 3.28	0.0800	126.0	26.7	1004	461
Redwing	362.1	30 x 3.92	19 x 2.35	0.0801	154.0	27.5	1006	646
Cuckoo	402.3	24 x 4.62	7 x 3.08	0.0720	124.5	27.7	1116	408
Drake	402.6	26 x 4.44	7 x 3.45	0.0720	139.7	28.1	1117	511
Tern	403.8	45 x 3.38	7 x 2.25	0.0720	97.5	27.0	1115	217
Coot	401.9	36 x 3.77	1 x 3.77	0.0717	74.7	26.4	1111	87
Condor	402.3	54 x 3.08	7 x 3.08	0.0720	124.3	27.7	1115	407
Mallard	403.8	30 x 4.14	19 x 2.48	0.0721	171.2	29.0	1119	718
Ruddy	455.5	45 x 3.59	7 x 2.40	0.0636	109.4	28.7	1263	246
Canary	456.3	54 x 3.28	7 x 3.28	0.0635	141.0	29.5	1263	461
Rail	483.8	45 x 3.70	7 x 2.47	0.0599	116.1	29.6	1339	261
Catbird	484.6	36 x 4.14	1 x 4.14	0.0595	87.9	29.0	1335	105
Cardinal	484.5	54 x 3.38	7 x 3.38	0.0599	149.7	30.4	1338	490
Ortlan	523.9	45 x 3.85	7 x 2.57	0.0553	123.3	30.8	1450	283
Tanager	522.8	36 x 4.30	1 x 4.30	0.0551	94.8	30.1	1444	113
Curlew	522.5	54 x 3.51	7 x 3.51	0.0553	161.8	31.6	1450	529
Bluejay	565.5	45 x 4.00	7 x 2.66	0.0513	132.7	32.0	1562	304
Finch	565.0	54 x 3.65	19 x 2.19	0.0516	174.6	32.8	1571	558
Bunting	605.8	45 x 4.14	7 x 2.76	0.0479	142.4	33.1	1674	326
Grakcle	602.8	54 x 3.77	19 x 2.27	0.0483	186.9	34.0	1681	599
Bittern	644.4	45 x 4.27	7 x 2.85	0.0450	151.6	34.2	1786	348
Pheasant	645.1	54 x 3.90	19 x 2.34	0.0452	194.1	35.1	1795	639
Skylark	643.3	36 x 4.77	1 x 4.77	0.0448	116.7	33.4	1777	140
Dipper	684.2	45 X 4.40	7 X 2.93	0.0423	160.7	35.2	1897	370
Martin	685.4	54 X 4.02	19 x 2.41	0.0425	206.1	36.2	1906	679
Bobolink	725.2	45 x 4.53	7 x 3.02	0.0399	170.5	36.3	2010	392
Plover	726.9	54 x 4.14	19 x 2.48	0.0401	218.4	37.2	2019	719
Nuthatch	746.2	45 x 4.65	7 x 3.10	0.0379	177.6	37.2	2120	413
Parrot	766.1	54 x 4.25	19 x 2.55	0.0380	230.5	38.2	2129	758
Lapwing	807.5	45 x 4.77	7 x 3.18	0.0359	187.4	38.2	2232	435
Falcon	806.2	54 x 4.36	19 x 2.62	0.0361	243.0	39.2	2242	799

- The above data is approximate and subjected to manufacturing tolerance.
- Delivery length tolerance is ± 5%

Service Drop Cables

Copper Conductors & XLPE Insulated

Description

- They are composed of one or more insulated conductors and one neutral (bare of insulated) conductor. They are required as two (Duplex) or three (Triplex) or four (Quadruplex) conductors, XLPE with 2.5 % Carbon black insulated.
- As per NEMA ICEA S - 66 - 524 / IEC 60228.

Application

- They are used for secondary over head lines (in circuits not exceeding 600 volts phase to phase) on poles or as feeders to residential premises.

Copper conductors with bare neutral adopted from NEMA (ICEA S-66-524) / IEC 60228.

Egytech - code	Phase			Neutral		Approx. overall diameter	Approx. weight
	Nominal cross sectional area	Max. DC resistance at 20 °C	Insulation thickness	Nominal cross sectional area	Max. DC. resistance at 20 °C		
	mm^2	Ω/km	mm	mm^2	Ω/km	mm	kg/km
Two conductors (Duplex)							
CW1-T002-U10	10	1.8060	1.2	10	1.830	10.7	198
CW1-T002-U11	16	1.1385	1.2	16	1.150	12.8	307
CW1-T002-U12	25	0.7461	1.2	25	0.727	15.3	469
CW1-T002-U13	35	0.5264	1.2	35	0.524	17.6	650
CW1-T002-U14	50	0.3759	1.5	50	0.387	21.2	898
CW1-T002-U15	70	0.2762	1.5	70	0.268	24.5	1247
CW1-T002-U16	95	0.1949	1.5	95	0.193	28.3	1736
CW1-T002-U17	120	0.1554	1.5	120	0.153	31.4	2170
Three conductors (Triplex)							
CW1-T003-U10	10	1.8060	1.2	10	1.830	13.7	305
CW1-T003-U11	16	1.1385	1.2	16	1.150	15.8	471
CW1-T003-U12	25	0.7461	1.2	25	0.727	18.5	719
CW1-T003-U13	35	0.5264	1.2	35	0.524	20.7	991
CW1-T003-U14	50	0.3759	1.5	50	0.387	25.0	1357
CW1-T003-U15	70	0.2762	1.5	70	0.268	28.7	1900
CW1-T003-U16	95	0.1949	1.5	95	0.193	32.4	2631
CW1-T003-U17	120	0.1554	1.5	120	0.153	35.7	3285
Four conductors (Quadruplex)							
CW1-T004-U10	10	1.8060	1.2	10	1.830	16.3	413
CW1-T004-U11	16	1.1385	1.2	16	1.150	18.8	634
CW1-T004-U12	25	0.7461	1.2	25	0.727	22.0	970
CW1-T004-U13	35	0.5264	1.2	35	0.524	24.6	1332
CW1-T004-U14	50	0.3759	1.5	50	0.387	29.8	1821
CW1-T004-U15	70	0.2762	1.5	70	0.268	34.2	2553
CW1-T004-U16	95	0.1949	1.5	95	0.193	38.6	3526
CW1-T004-U17	120	0.1554	1.5	120	0.153	42.5	4579

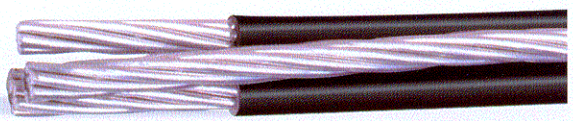
- The above data is approximate and subjected to manufacturing tolerance.
- Delivery length tolerance is ± 5%

Service Drop Cables

Aluminium Conductors & XLPE Insulated

Description

- They are composed of one or more insulated conductors and one neutral (bare of insulated) conductor. They are required as two (Duplex) or three (Triplex) or four (Quadruplex) conductors, XLPE with 2.5 % Carbon black insulated.
- As per NEMA ICEA S - 66 - 524 / IEC 60228.



Application

- They are used for secondary over head lines (in circuits not-exceeding 600 volts phase to phase) on poles or as feeders to residential premises.

Aluminium conductors with bare neutral adopted from NEMA (ICEA S-66-524) / IEC 60228.

Egytech - code	Phase			Neutral		Approx. overall diameter	Approx. weight
	Nominal cross sectional area	Max. DC resistance at 20 °C	Insulation thickness	Nominal cross sectional area	Max. DC. resistance at 20 °C		
	mm^2	Ω/km	mm	mm^2	Ω/km	mm	kg/km
Two conductors (Duplex)							
AW1-T002-U11	16	1.8017	1.2	16	1.910	12.9	115
AW1-T002-U12	25	1.1807	1.2	25	1.200	15.3	168
AW1-T002-U13	35	0.8331	1.2	35	0.868	17.7	229
AW1-T002-U14	50	0.5949	1.5	50	0.641	21.4	322
AW1-T002-U15	70	0.4371	1.5	70	0.443	24.4	428
AW1-T002-U16	95	0.3084	1.5	95	0.320	28.4	626
AW1-T002-U17	120	0.2459	1.5	120	0.253	31.4	734
Three conductors (Triplex)							
AW1-T003-U11	16	1.8017	1.2	16	1.910	15.6	185
AW1-T003-U12	25	1.1807	1.2	25	1.200	18.0	267
AW1-T003-U13	35	0.8331	1.2	35	0.868	20.4	364
AW1-T003-U14	50	0.5949	1.5	50	0.641	25.2	519
AW1-T003-U15	70	0.4371	1.5	70	0.443	28.2	674
AW1-T003-U16	95	0.3084	1.5	95	0.320	32.2	928
AW1-T003-U17	120	0.2459	1.5	120	0.253	35.3	1245
Four conductors (Quadruplex)							
AW1-T004-U11	16	1.8017	1.2	16	1.910	19.0	256
AW1-T004-U12	25	1.1807	1.2	25	1.200	22.0	367
AW1-T004-U13	35	0.8331	1.2	35	0.868	24.9	499
AW1-T004-U14	50	0.5949	1.5	50	0.641	30.3	710
AW1-T004-U15	70	0.4371	1.5	70	0.443	33.9	920
AW1-T004-U16	95	0.3084	1.5	95	0.320	38.8	1263
AW1-T004-U17	120	0.2459	1.5	120	0.253	42.5	1556

- The above data is approximate and subjected to manufacturing tolerance.
- Delivery length tolerance is ± 5%

High Voltage Cables

Operating Voltage (66 kV)

Cable Construction

1. Conductor:
Round stranded and compacted or milliken annealed copper conductors as per IEC 60228 - class 2.

2. Conductor Screen:
An extruded layer of semi conducting material is applied over conductor as voltage stress control layer.

3. Insulation:
An extruded layer of XLPE is applied over the inner semi conductor layer.

4. Insulation Screen:
An extruded layer of strippable or firmly bonded to the insulation, Conductor screen, XLPE insulation and insulation screen are applied at the same time using triple head extruder.

5. Metallic Screen:

a. *Copper Tape : applied helically on the core with a suitable over lap.*
b. *Copper Wire : applied helically on the core and binded with a narrow copper tape to achieve electrical contact.*
c. *Copper tape and wire : are applied in case of high earth fault current.*
d. *Lead : an extruded layer with suitable thickness to withstand earth fault current.*

6. Water Tightness:
The screen area is longitudinally water blocked and the whole cable is radially water blocked

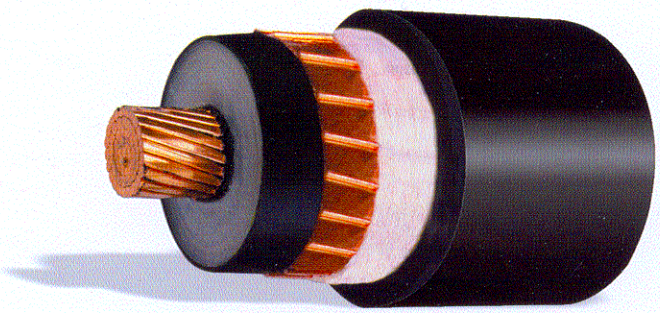
7. Sheath:
An extruded layer of HDPE is applied as an outer sheath.

38/66 (72.5) kV

Single Core Copper Conductors, XLPE Insulated, Copper Screened and HDPE Sheathing

Description

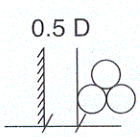
- Stranded circular compacted copper conductor, semiconducting layer as conductor screen, XLPE insulated, semiconducting layer as non metallic insulation screen, copper tape, wire or both as metallic insulation screen to achieve the required cross sectional area to withstand the earth fault current, longitudinal water blocking tapes to protect the screen area from any longitudinal water penteration, copolymer aluminium tape to protect the cable from any radial water penteration and HDPE sheathed.
- Cables are designed and tested to comply generally with IEC 60502, 60228, 60840 and 60811.



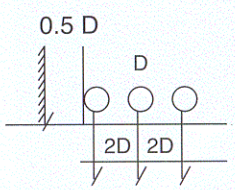
Egytech - code	Nominal cross sectional area	Max. conductor resistance		Operating capacitance	Inductance		Current rating				Approx. overall diameter	Approx. weight
							Laid in ground		Laid in free air			
		DC at 20 °C	AC at 90 °C		Trefoil	Flat	Trefoil	Flat	Trefoil	Flat		
	mm^2	Ω/km	Ω/km	μf/km	mh/km	mh/km	A	A	A	A	mm	kg/km
Single core cable												
CX6-TX01-K19	185	0.0991	0.127	0.133	0.475	0.522	386	402	509	572	69.5	5260
CX6-TX01-K20	240	0.0754	0.097	0.139	0.463	0.510	444	463	591	666	70.9	5865
CX6-TX01-K30	300	0.0601	0.078	0.150	0.444	0.490	501	523	678	767	73.5	6570
CX6-TX01-K40	400	0.0470	0.062	0.161	0.427	0.525	568	594	779	885	75.9	7515
CX6-TX01-K50	500	0.0366	0.049	0.176	0.408	0.501	675	643	900	1027	79.3	8690
CX6-TX01-K60	630	0.0283	0.039	0.190	0.393	0.482	725	764	1033	1185	82.7	10185
CX6-TX01-K70	800	0.0221	0.029	0.210	0.374	0.458	846	896	1235	1426	87.7	12330

Notes :

1. This data is based on 17 mm insulation thickness and metallic screen is designed to carry 31.5 kA short circuit current per 3-phase
2. Our calculation for Free air ampacities are based on cables are protected from solar radiation
3. For sizes above and including 800 mm^2 will be segmented (Milliken Conductor).
4. The above data is approximate and subjected to manufacturing tolerance.
5. Delivery length tolerance is ± 5%



Cables laid in trefoil formation



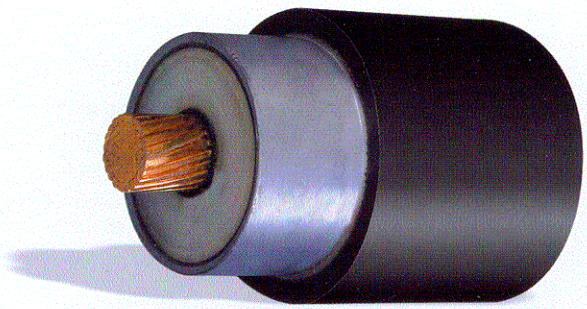
Cables laid in flat formation

38/66 (72.5) kV

Single Core Copper Conductors, XLPE Insulated, Lead Screened and HDPE Sheathing

Description

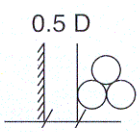
- Stranded circular compacted copper conductor, semiconducting layer as conductor screen, XLPE insulated, semiconducting layer as non metallic insulation screen, semiconducting water blocking tape applied helically, lead screened with suitable thickness to withstand the earth fault current and HDPE sheathed.
- Cables are designed and tested to comply generally with IEC 60502, 60228, 60840, and 60811.



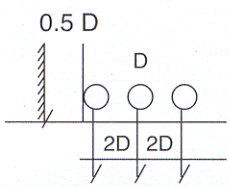
Egytech - code	Nominal cross sectional area	Max. conductor resistance		Operating capacitance	Inductance		Current rating				Approx. overall diameter	Approx. weight
							Laid in ground		Laid in free air			
		DC at 20 °C	AC at 90 °C		Trefoil	Flat	Trefoil	Flat	Trefoil	Flat		
	mm^2	Ω/km	Ω/km	μf/km	mh/km	mh/km	A	A	A	A	mm	kg/km
Single core cable												
CX6-TX01-N19	185	0.0991	0.127	0.133	0.472	0.518	388	403	510	574	68.4	9185
CX6-TX01-N20	240	0.0754	0.097	0.139	0.460	0.507	447	465	593	668	69.8	9900
CX6-TX01-N30	300	0.0601	0.078	0.150	0.441	0.487	505	526	681	770	72.4	10820
CX6-TX01-N40	400	0.0470	0.062	0.161	0.473	0.519	573	598	784	889	74.8	12058
CX6-TX01-N50	500	0.0366	0.049	0.176	0.406	0.452	651	681	907	1033	78.2	13380
CX6-TX01-N60	630	0.0283	0.039	0.190	0.390	0.436	736	773	1044	1193	81.6	15150
CX6-TX01-N70	800	0.0221	0.032	0.290	0.371	0.417	863	910	1251	1438	86.6	17615
CX6-TX01-N80	1000	0.0176	0.024	0.241	0.350	0.397	967	1023	1430	1653	93.6	20335
CX6-TX01-N81	1200	0.0151	0.021	0.253	0.343	0.389	1045	1110	1582	1839	96.6	22290

Notes :

1. This data is based on 17 mm insulation thickness and metallic screen is designed to carry 31.5 kA short circuit current.
2. Our calculation for Free air ampacities are based on cables are protected from solar radiation
3. For sizes above and including 800 mm^2 will be segmented (Milliken Conductor).
4. The above data is approximate and subjected to manufacturing tolerance.
5. Delivery length tolerance is ± 5%



Cables laid in trefoil formation



Cables laid in flat formation

Cables Clarification Sheet

Rated Voltage

- ☐ 300/500 V
- ☐ 450/750 V
- ☐ 0.6/1 kV
- ☐ 1.8/3 kV
- ☐ 3.6/6 kV
- ☐ 6/10 kV (6.35/11 kV)
- ☐ 8.7/15 kV
- ☐ 12/20 kV
- ☐ 18/30 kV (19/33 kV)
- ☐ 38/66 kV
- ☐ 76/132 kV
- ☐ 127/220 kV

Conductor

C.S.A = mm^2

- ☐ Aluminum
- ☐ Solid
- ☐ Stranded
- ☐ Flexible
- ☐ Copper
- ☐ Solid
- ☐ Stranded

Insulation

- ☐ PVC
- ☐ PVC - F.R
- ☐ XLPE

Copper Screen

Short circuit current = kA

- ☐ Copper Wire + Binder
- ☐ Copper Tape
- ☐ Copper (Tape + Wire)

Metallic Sheath

- ☐ Lead
- ☐ Lead Alloy

Armour

- ☐ Steel
- ☐ Tape
- ☐ Galvanized Tape
- ☐ Wire
- ☐ Aluminum
- ☐ Tape
- ☐ Wire

Sheathing (Overall jacket)

- ☐ PVC
- ☐ PVC-F.R
- ☐ HDPE
- ☐ LSOH
- ☐ CPE
- ☐ Other ...

** For Any Further Information Don't Hesitate To Contact Us.*

132 and 220 kV XLPE Cables

• *Leaping into the 21st Century*

El Sewedy Industries has made advanced marketing activities that quickly respond to customer demands, promoted new product development, concentrated efforts on expanding orders and aggressively invested management resources in promising fields of growth.

Supported on sharp expansion in Egypt, El Sewedy Industries Has again proved that they do today what others do tomorrow by becoming exclusively in Egypt the manufacturers of 132 kV. and 220 kV. XLPE insulated cable.

The Group have also signed a **Technical Assistance Agreement** with the **Furukawa Electric Co. Ltd. of Japan** for the production of up to 220 kV. cables.

The Furukawa Electric Co. Ltd. is pre-eminent in Japan where for over a century it has designed, manufactured and installed power cables. Recently is has moved the threshold for di-electric cables up to 500 kV.

The Agreement will span 10 years and guarantees the highest technological standards for 220 kV. cables made at Egytech Cables, Arab Cables and Jeddah Cables.

Here Below the construction of the above mention cables.

Cable Construction

1. Conductor
Round stranded and compacted or Milliken annealed copper conductors as per IEC 60228 - class 2.

2. Conductor Screen
An extruded layer of super smooth semi conducting material is applied over conductors as voltage stress control layer.

3. Insulation
An extruded layer of super clean XLPE is applied over the inner semi conducting layer.

4. Insulation Screen
An extruded layer of supper smooth semi conducting material, conductor screen, XLPE insulation and insulation screen are applied at the same time using triple crosshead extruder.

5. Metallic Screen

a. Copper wire and tape : applied helically on the core and binded with a narrow copper tape to achieve electrical contact. The total cross section area are calculated based on the earth fault current.

b. Lead Alloy : an extruded layer with suitable thickness to withstand earth fault current.

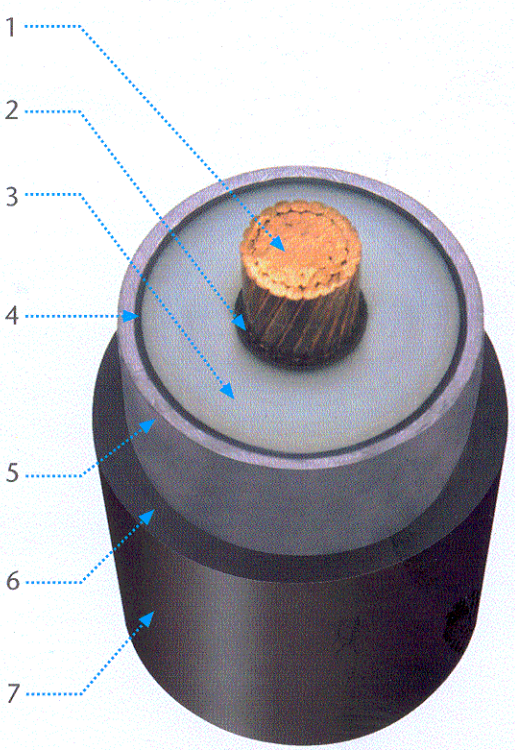
Water Tightness
The screen area is longitudinally water blocked and the whole cables is radially water blocked.

6. Sheath
An extruded layer of HDPE is applied as outer sheath.

7. Graphite Coating
high voltage cables coated with very thin layer of graphite coating to test the sheath after installation.

Fire resistance tape or coating
High voltage Cables portion inside substation must be protected against fire by using fire resistance tape or coating.

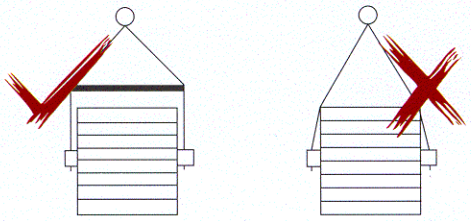
Testing
Routing, special and type tests are according to IEC 60840.



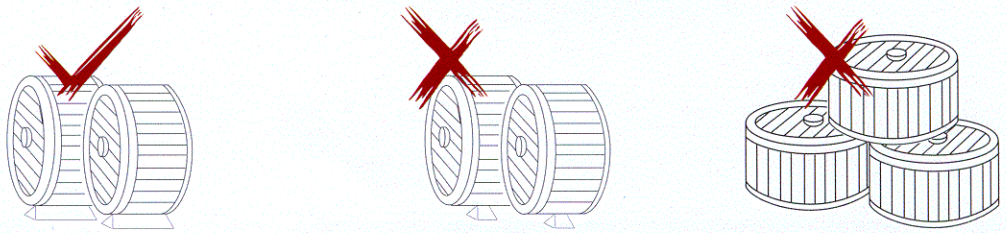
Handling & Laying Instructions

Handling Instructions

Cables should be installed and stored according to International regulation by trained persons with good engineering practice. Cable are supplied on heavy wooden drum and handling these drums can constitute a real hazardous. Indicated some of the common mistakes can be committed during the handling, care should be taken during loading and unloading.

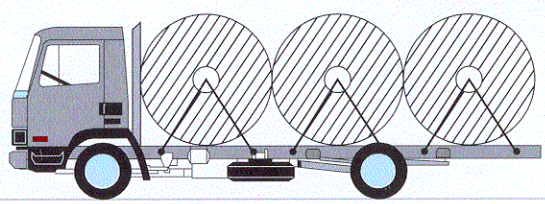


Lifting cable drums using

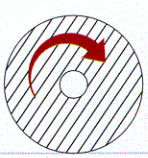


Don't lay drums flat on their sides, use proper stops to prevent drums rolling

Lift drums on fork trucks



Secure drums adequately before



Roll in the direction shown by the arrow

Laying of power cables

Applied Laying Depth

Type of Cable	*Used Depth Cm*
L.V	50 - 80
M.V	80 - 100
H.V	100 - 120
E.H.V	120 - 140

**Cable laying is a major factor affecting the cable life.*
** Our Catalogue and technical offers based on 50 cm.*

Laying Methods

1. Paying out from a trailer

This method may apply only if there are no obstacles in the trench.
Care has to be taken that the cable drum is rotated by hand and braked if necessary, to prevent excessive tensile strength or kinking of the cable.

2. Laying by Hand

((Equipment needed)) →
- (a) Cable Rollers [placed at distances 3 meters]
- (b) Corner Rollers [placed at bends]
- (c) Rollers for drawing cables in pipes
- (d) Cable stocking (Grip)
- (e) Brakes at the drum

the cable shall be pulled by men standing 4 to 6 m apart along the route.
The cable shall be supported on rollers during pulling. If kinking happens to the cable, the cable drum should be braked.

3. Laying by motor-driven Rollers

The cable is pulled off the jacked-up drum by motor driven rollers set up the trench 20 to 30m apart.
Normal rollers are distributed 3m apart between motor-driven rollers at sharp bends, it may be necessary to set up one motor. Driven rollers before and one after the bend.

All rollers are connected to the main switch box via smaller distribution boxes and switched on & off jointly.
With motor driven rollers the pull is evenly distributed over the whole length of the cable.

Laying of power cables

4. Pulling by Winch

The cable shall be equipped with a pulling eye or cable stocking the winch shall be equipped with.

(a) Dynamometer for continuous check of pulling force.
(b) Rupture device to interrupt the pulling if the maximum permissible pulling force is exceeded.
(c) Swivel at the pulling wire end to prevent twisting of cable during pulling.

5. Laying part of cables in a figure of eight (8) temporarily

The coils of figure eight shape must never be smaller than the minimum bending radius (60D). This radius should be noticed with much care during uncoiling the figure of eight.

Maximum Tensile Forces During Laying

• *Maximum tensile force when pulling by cable stocking*

$F = A \times 10$ ---------15 N/mm^2
(cables with aluminium conductor)

$F = A \times 10$ --------- 20 N/mm^2
(cables with copper conductor)
But the maximum value is 8500 N

• *Maximum tensile force when pulling by eye attached to the conductors*

$F = A \times 15$ N/mm^2
(cables with aluminium conductor)

$F = A \times 50$ N/mm^2
(cables with copper conductor)
But the maximum value is 20000 N

Where:
A is Cable Cross Section mm^2

Earthing of power cables

General rules for earthing are given below, in practice cases arise where other methods are appropriate. In principle Lead, Aluminium sheath, copper screen, armouring, base plates and metal casings of cable end boxes should be earthed. Since sheaths and armouring of all cable contain endured voltage and currents when there is a short circuit or earth fault, and this also occur during normal operation of single core cable.

The sheaths must be earthed in such away as to prevent the incidence of dangerous voltages and to prevent excessive heating because of induced currents.

Single core cables

Short sections up to 500 m to be earthed at end boxes at one end of the section only the cross section of earthing conductor is usually half the cable conductor size and minimum 16 mm^2 the single core cable end boxes should be insulated at the other end of the cable section with contact resistance exceeding 100 ohms. This prevents the formation of sheath or screen currents.

Long sheath and screen sections to be earthed at both ends at cable end boxes which should be connected together at each end and earthed.

Three-core cables

The metal sheath, armour and screen to be earthed at both ends at cable end boxes.

Routine maintenance for cables

1. Visual inspection of cable system.
2. Periodical testing of cable jacket for H.V cables
3. Periodical inspection of cable terminations and earthing.
4. Inspection of maintenance spare parts at stores.

Electrical tests after installation

D.C. voltage If tests after installation are required. a D.C. voltage equal to :

a) 4Uo shall be applied for 15 minutes for cables of rated voltage up to 30 kV.

b) 3Uo shall be applied for 15 minutes for cables of rated voltage above 30kV up to 150 kV.

And as an alternative and by agreement between the contractor and the purchaser, an A.C voltage test at power frequency can be used as follows :

a) Test for 5 minutes with the phase to phase voltage of the system applied between the conductor and the metallic screen.

b) Test for 24 hours with the normal operating voltage of the system applied

All above tests are according to IEC 60502 and IEC 60840

Preventive Maintenance

For installation which have been in use, a lower D.C. voltage may be applied, the value of which will be negotiated, taking into account the age, environment, history to breakdown and the purpose of carrying out the test.


EGYTECH
CABLES
KOMATSU
EKP 100
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