X-VOLT TSLF

1. Object

This document defines the design and manufacturing characteristics of the cable type TSLF manufactured by Top Cable.

2. Design

This type of cable is basically designed, manufactured and tested according to HD 620-10K.

3. Applications

Cable for fixed installations. Suitable for transport and distribution of electric power in medium voltage networks. Halogen free. This cable is suitable for indoor, outdoor and buried installations.

4. Characteristics

Nominal voltage: 24, 36 kV

Minimum service temperature: -15 °C

Maximum conductor temperature: 90 ºC

Maximum short-circuit temperature: 250 °C (maximum 5 s.)

Minimum bending radius: 15 x cable Ø

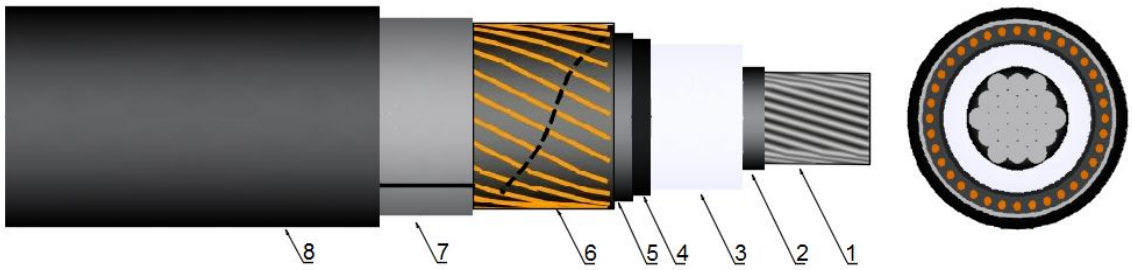
Halogen free: according to EN 60754/ IEC 60754

HCl content < 0,5 %

pH > 4,3

conductivity < 10 µS/mm

5. General make-up of the cables



5.1 Conductor (1)

Aluminium conductor, class 2 according to IEC 60228. Hygroscopic tapes applied in order to achieve longitudinal watertightness on the conductor.

5.2 Conductor screen (2)

Cross-linked semiconductor screen applied over conductor in a triple-extrussion process.

5.3 Insulation (3)

Cross-linked polyethylene insulation, type DIX8 according to HD 620; natural colour. Cross-linked in catenary line with nitrogen atmosphere.

5.4 Insulation screen (4)

Cross-linked semiconductor screen applied over insulation in a triple-extrussion process. Bonded to the insulation layer.

5.5 Longitudinal water-blocking (5)

Semi-conducting swellable tape, helically applied.

5.6 Metallic screen (6)

Metallic screen with copper wires, applied over the semi-conducting swellable tape. The metallic screen shall have a cross section of 25 mm^2 for 95 mm^2 core, 35 mm^2 for 150, 240 and 400 mm^2 core and 50 mm^2 for 630 mm^2 core.

5.7 Radial water-blocking barrier

Made up of an aluminium foil/polymer laminate (7) bonded to the outer sheath.

5.8 Outer sheath (8)

Polyethylene outer sheath, type DMP 17 according to HD 620; black colour (with conductive covering).

6.- Current-carrying capacities

6.1 Nominal current-carrying capacities

Table 1 shows the current-carrying capacities and voltage drop detailed for every cable.

Current-carrying capacities, in amperes, are calculated according to IEC 60502-2 and for the following conditions:

- Open air installation: three single-core cables in contact and ambient temperature of 30 °C with adequate ventilation (protected from direct sun radiation).
- Buried installation: three single-core cables in contact directly buried at depth of 0,8 m, 20 °C of ground temperature and soil thermal resistivity of 1,5 K·m/W.
- In all cases it is supposed a three-phase circuit.

For conditions other than this apply the adequate correction factors (point 6.3).

nº x Section (mm^2)	Open Air Inst. (A)	Buried Inst. (A)
1 x 50	184	152
1 x 95	280	221
1 x 150	368	281
1 x 240	502	367
1 x 400	673	470
1 x 630	924	615

Table 1

6.2 Short-circuit current-carrying capacities

The maximum short-circuit current that a cable can withstand depend on the time of reaction of the protection elements installed in the line. The maximum current-carrying capacity in a short-circuit accident, for a specific type of cable, is the result of multiplying the cross section of the cable for the values shown in table 2. These values are taken from IEC 949.

Time (s)	0,1	0,2	0,3	0,5	1	1,5	2	2,5	3
A/mm^2	299	211	173	134	94	77	67	60	55

Table 2

6.3 Correction factors

The current-carrying capacities must be multiplied with the adequate correction factor, when the installation conditions differs from point 6.1

Correction factors for air temperature other than 30 °C.

Air T. (ºC)	20	25	30	35	40	45	50	55	60
Factor	1,08	1,04	1	0,96	0,91	0,87	0,82	0,76	0,71

Table 3

Correction factors for ground temperature other than 20 °C.

Ground T. (ºC)	10	15	20	25	30	35	40	45	50
Factor	1,07	1,04	1	0,96	0,93	0,89	0,85	0,80	0,76

Table 4

Correction factors for thermal resistivity of the ground other than 1,5 K·m/W (calculated for 240 mm^2 cable).

Moisture degree of soil	Very damp	Slightly damp	Slightly dry	Dry	Very dry	Very dry
Thermal resist. (K·m/W)	0,8	1,0	1,5	2,0	2,5	3,0
Factor	1,29	1,18	**1**	0,88	0,80	0,73

Table 5

7. Dimensions, weights and technical data

Tables 6 and 7 show the conductor, insulation and outer diameters and weight.

Electrical data is also detailed as follows:

- Electrical resistance (R) is calculated at 20ºC according to IEC 60228 for copper conductors class 2.
- Reactance (X) is calculated at 50 Hz and considering three single-core cables in mutual contact (in triangle or trefoil formation).
- Capacitance values (C) are calculated in base to dimensional items of the cables that are in this specification.

X-VOLT TSLF

TSLF 24kV							
SECTION	ELECTRICAL DATA			DIMENSIONS AND WEIGHT			
	R	X	C	Ø cond.	Ø insl.	Ø ext.	Weight
mm²	Ω/km	Ω/km	µF/km	mm	mm	mm	kg/km
1 x 95	0,320	0,122	0,202	11,1	23,1	30,3	1.060
1 x 240	0,125	0,106	0,286	18,0	30,0	38,0	1.770
1 x 400	0,0778	0,100	0,360	23,4	36,2	44,4	2.350
1 x 630	0,0469	0,094	0,439	30,0	42,8	51,9	3.365
3 x 1 x 50	0,641	0,134	0,165	8,1	20,1	57,5	2.280
3 x 1 x 95	0,320	0,122	0,202	11,1	23,1	65,2	3.210
3 x 1 x 150	0,206	0,114	0,236	13,9	25,9	71,4	3.900
3 x 1 x 240	0,125	0,106	0,286	18,0	30,0	81,8	5.365

Table 6

TSLF 36kV							
SECTION	ELECTRICAL DATA			DIMENSIONS AND WEIGHT			
	R	X	C	Ø cond.	Ø insl.	Ø ext.	Weight
mm²	Ω/km	Ω/km	µF/km	mm	mm	mm	kg/km
1 x 150	0,206	0,124	0,179	13,9	30,9	38,9	1.640
1 x 240	0,125	0,114	0,216	18,0	35,0	43,2	2.055
1 x 400	0,0778	0,107	0,265	23,4	41,2	49,8	2.735
1 x 630	0,0469	0,100	0,320	30,0	47,8	57,3	3.785
3 x 1 x 150	0,206	0,124	0,179	13,9	30,9	83,5	4.990
3 x 1 x 240	0,125	0,114	0,216	18,0	35,0	92,7	6.265

Table 7