

TOXFREE MARINE XTCuZ1-K (AS) 0,6/1 kV

1. Object

This document defines the design and manufacturing characteristics of the TOXFREE Marine XTCuZ1-K (AS) 0,6/1 kV type manufactured by Top Cable.

2. Design

This type of cable is designed, manufactured and tested according to IEC 60092-353.

Approvals: DNV, Bureau Veritas, Lloyd's Register, Germanischer Lloyd and ABS.

3. Applications

For fixed installations on ships and offshore units in all locations. Cables for power circuits where shielding is required or areas that require additional protection against possible shock. All cable materials are free of halogens, with low fumes emission and fire retardant. These cables are especially suitable for the installation in ships in power, lighting and control circuits.

4. Characteristics

Nominal voltage: 0,6/1 kV

Lowest installation temperature: -15 °C

Lowest ambient temperature for fixed installation: -40°C

Maximum conductor operating temperature: 90 °C

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

Minimum bending radius: 6D

No flame propagation: according to IEC 60332-1-2

No fire propagation: according to IEC 60332-3-22 (Category A)

Halogen free: acid gas emission < 0,5 % according to IEC 60754-1

pH > 4,3 according to IEC 60754-2

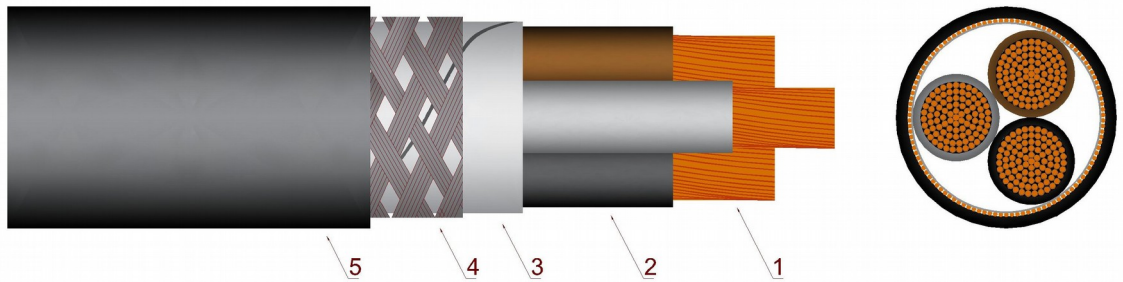
conductivity < 10 µS/mm according to IEC 60754-2

Smoke emission: according to IEC 61034-2

light transmittance > 60 %

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5. General make-up of the cable



5.1 Conductor (1)

Electrolytic annealed copper conductor, class 5 according to IEC 60228

5.2 Insulation (2)

Cross-linked polyethylene insulation, type HF XLPE-90 °C according to IEC 60092-360.

The standard identification is the following:

- 2 cond.....blue + brown
- 3 cond.....brown + black + grey
- 4 cond.....brown + black + grey + blue
- ≥ 5 cond.....white numbered

Others colours under request.

5.3 Assembly of cores

The cores are twisted together.

5.4 Inner covering (3)

Halogen free material and compatible with others components. Aluminium-polyester tape.

5.5 Braid/Armour (4)

Braiding-armour of tinned copper wires over aluminium-polyester tape.

5.6 Outer sheath (5)

Thermoplastic polyolefin, black colour, with low smoke and halogen free under fire conditions, type SHF1 according to IEC 60092-360.

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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 ampere, are calculated according to IEC 60092-352 and for the following conditions:

- Open air installation: one cable with adequate ventilation and ambient temperature of 45°C, supported by cleats and hangers or on perforated tray. Reference method F (three conductors trefoil) for single-core and E for multi core cables.
- For cables having 2 conductors and 3 conductors up to 10 mm², it is supposed a single-phase circuit. For cables having more of 5 conductors is supposed that all are loaded. For the rest of the cables it is supposed a three-phase circuit.

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

Voltage drop is the maximum that may occur. It is calculated for the maximum service temperature and for $\cos \varphi = 1$.

n° x Section (mm ²)	Open Air Inst. (A)	Max. Conductor Resistance at 20°C (Ω/Km)	Voltage drop (V/A·km)	n° x Section (mm ²)	Open Air Inst. (A)	Max. Conductor Resistance at 20°C (Ω/Km)	Voltage drop (V/A·km)
2 x 1,5	23	13,3	34,0	3 x 16	87	1,21	2,68
2 x 2,5	31	7,98	20,4	3 x 25	110	0,78	1,73
2 x 4	43	4,95	12,7	3 x 35	137	0,554	1,23
2 x 6	55	3,3	8,45	3 x 50	167	0,386	0,860
2 x 10	75	1,91	4,89	3 x 70	214	0,272	0,603
2 x 16	100	1,21	3,10	3 x 95	259	0,206	0,457
3 x 1,5	23	13,3	34,0	3 x 120	301	0,161	0,357
3 x 2,5	31	7,98	20,4	3 x 150	347	0,129	0,286
3 x 4	43	4,95	12,7	3 x 185	397	0,106	0,235
3 x 6	55	3,3	8,45	3 x 240	468	0,0801	0,178
3 x 10	75	1,91	4,89	4 x 1,5	20	13,3	29,5

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n° x Section (mm ²)	Open Air Inst. (A)	Max. Conductor Resistance at 20°C (Ω/Km)	Voltage drop (V/A·km)	n° x Section (mm ²)	Open Air Inst. (A)	Max. Conductor Resistance at 20°C (Ω/Km)	Voltage drop (V/A·km)
4 x 2,5	28	7,98	17,7	5 x 10	65	1,91	4,23
4 x 4	37	4,95	11,0	5 x 16	87	1,21	2,68
4 x 6	47	3,3	7,32	5 x 25	110	0,78	1,73
4 x 10	65	1,91	4,23	5 x 35	137	0,554	1,23
4 x 16	87	1,21	2,68	5 x 50	167	0,386	0,860
4 x 25	110	0,78	1,73	7 x 1,5	11	13,3	29,5
4 x 35	137	0,554	1,23	7 x 2,5	15	7,98	17,7
4 x 50	167	0,386	0,860	14 x 1,5	8,5	13,3	29,5
4 x 70	214	0,272	0,603	16 x 1,5	8	13,3	29,5
4 x 95	259	0,206	0,457	19 x 1,5	7,5	13,3	29,5
4 x 120	301	0,161	0,357	19 x 2,5	11	7,98	17,7
4 x 150	347	0,129	0,286	24 x 1,5	7	13,3	29,5
4 x 185	397	0,106	0,235	27 x 1,5	6,5	13,3	29,5
4 x 240	468	0,0801	0,178	27 x 2,5	9	7,98	17,7
5 x 1,5	20	13,3	29,5	37 x 1,5	5,5	13,3	29,5
5 x 2,5	28	7,98	17,7	10 x 1,5	10	13,3	29,5
5 x 4	37	4,95	11,0	12 x 1,5	9	13,3	29,5
5 x 6	47	3,3	7,32	12 x 2,5	12,5	7,98	17,7

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.

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Time (s)	0,1	0,2	0,3	0,5	1	1,5	2	2,5	3
A/mm ²	452	320	261	202	143	117	101	90	83

Table 2

6.3 Correction factors for air temperature other than 45 °C.

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

Air T. (°C)	35	40	45	50	55	60	65	70	75	80
Factor	1,10	1,05	1	0,94	0,88	0,82	0,74	0,67	0,58	0,47

Table 3

Other correction factors are in IEC 60092-352.

7. Dimensions

n° x Section (mm ²)	Diameter (mm)	Weight (Kg/km)
2 x 1,5	8,7	105
2 x 2,5	9,5	130
2 x 4	10,7	170
2 x 6	11,9	220
2 x 10	14,4	350
2 x 16	16,0	470
3 x 1,5	9,4	125
3 x 2,5	10,2	160
3 x 4	11,5	220
3 x 6	12,7	280
3 x 10	15,5	455
3 x 16	17,7	645
3 x 25	21,4	950
3 x 35	24,4	1.265
3 x 50	28,2	1.740
3 x 70	30,9	2.330

n° x Section (mm ²)	Diameter (mm)	Weight (Kg/km)
3 x 95	37,3	3.145
3 x 120	41,2	3.935
3 x 150	45,9	4.830
3 x 185	51,7	5.870
3 x 240	58,1	7.575
4 x 1,5	10,2	150
4 x 2,5	11,2	200
4 x 4	12,6	270
4 x 6	14,6	390
4 x 10	17,1	575
4 x 16	19,8	825
4 x 25	24,0	1.220
4 x 35	26,3	1.620
4 x 50	31,7	2.255
4 x 70	36,6	3.155
4 x 95	41,5	4.090

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n° x Section (mm ²)	Diameter (mm)	Weight (Kg/km)
4 x 120	45,6	5.095
4 x 150	51,0	6.330
4 x 185	57,4	7.700
4 x 240	64,5	9.945
5 x 1,5	10,9	180
5 x 2,5	12,3	240
5 x 4	14,4	360
5 x 6	15,9	470
5 x 10	18,6	700
5 x 16	21,7	1.010
5 x 25	26,3	1.515
5 x 35	29,5	2.025
5 x 50	34,9	2.810

n° x Section (mm ²)	Diameter (mm)	Weight (Kg/km)
7 x 1,5	11,9	220
7 x 2,5	14,0	335
10 x 1,5	14,5	330
12 x 1,5	15,2	370
12 x 2,5	18,1	520
14 x 1,5	16,2	420
16 x 1,5	17,5	475
19 x 1,5	18,2	530
19 x 2,5	21,1	745
24 x 1,5	20,4	665
27 x 1,5	21,6	720
27 x 2,5	25,4	1.025
37 x 1,5	24,1	945

Table 4