



# TOXFREE<sup>®</sup> LSZH SZ-K (AS)

Flexible LSHF power cable, for public places.

BASED ON / ACCORDING TO: IEC 60502-1 / UL 758



## B2ca

## APPLICATION

Toxfree<sup>®</sup> ZH SZ-K (AS) is a LSZH easy handling flexible cables suitable to be installed in high temperature areas inside equipment and machines.

Thanks to its silicone insulation, this cable can withstand higher conductor temperatures.

The LSHF rubber outer sheath protects the insulation against mechanical aggressions.

Flame and fire retardant cable.

## CONSTRUCTION

### Conductor

Electrolytic annealed copper, class 5 (flexible) according to EN 60228 and IEC 60228.

### Separator

Polyester tape applied over the conductor.

### Insulation

Special silicone, type EI2 according to EN 50363-1 and type SR (Silicone Rubber) 150°C/1000 V and 3000 V according to UL 758 (Style 30105 and 30106).

Natural colour.

### Outer sheath

Halogen free cross-linked elastomer, type EM8 according to EN 50363-6 and type EVA 90°C/1000 V and 3000 V according to UL 758 (Style I2022 and I2023), with improved thermal characteristics. Black colour.

## CHARACTERISTICS



### Electrical performance

Low voltage: 0,6/1 kV and 1,8/3 kV according to IEC 60502-1  
1000 V and 3000 V according to UL 758 (AWM)



### Thermal performance

Maximum conductor temperature: 150°C.  
Maximum short-circuit temperature: 350°C (max. 5 s).  
Maximum outer sheath temperature: 120°C during 50.000 h.  
Minimum service temperature: -40°C (fixed and protected installations).  
Minimum / maximum stored temperature: -40°C / 70°C.



### Fire performance

Flame non-propagation according to EN 60332-1 / IEC 60332-1.  
Fire non-propagation according to EN 60332-3-24 / IEC 60332-3-24.  
Reaction to fire CPR: B2<sub>ca</sub>-s1a,d2,a1 according to EN 50575.  
Low smoke halogen free according to EN 60754-1 / IEC 60754-1.  
Low corrosive gases emission according to EN 60754-2 / IEC 60754-2.  
Smoke density according to EN 61034 / IEC 61034:  
Light transmittance > 60%.



### Mechanical performance

Minimum bending radius: 5x cable diameter.



### Environmental performance

UV Resistant according to HD 605/A1 Ap.2.2.20 (720 h / 65 °C / 60 W/m<sup>2</sup>).  
Oil, ozone, water and moisture resistant.

## STANDARDS / COMPLIANCE



Based on / According to  
IEC 60502-1 / UL 758



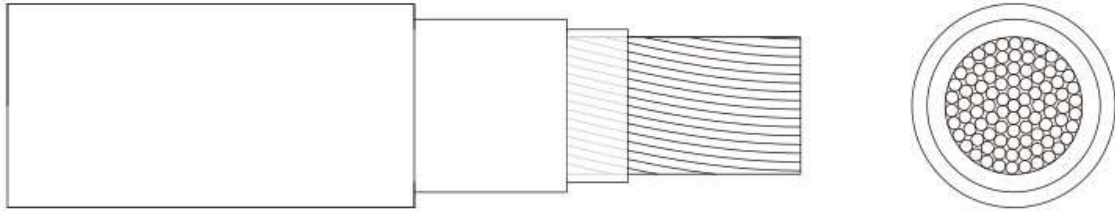
Standards and approvals  
RoHS / CE / UL LISTED



CPR (Construction Products Regulation)  
B2<sub>ca</sub>-s1a,d2,a1 (cable 1x300 mm<sup>2</sup> 0,6/1 kV)



## DIMENSIONS & ADMISSIBLE INTENSITIES



TOXFREE ZH SZ-K (AS) 0,6/1 kV (1000 V AWM)

Cross-section (mm <sup>2</sup> ) (AWG-MCM)	Conductor Diameter (mm)	Insulation thickness (mm)	Outer sheath thickness (mm)	External Diameter (mm)	Weight (kg/km)	Maximum R 20°C (Ω/km)
1 x 25 (4 AWG)	6,4	1,2	1,4	11,6	315	0,780
1 x 35 (2 AWG)	7,5	1,2	1,4	12,7	410	0,554
1 x 50 (1 AWG)	9,0	1,4	1,4	14,6	560	0,386
1 x 70 (2/0 AWG)	10,5	1,4	1,5	16,3	755	0,272
1 x 95 (3/0 AWG)	12,2	1,6	1,5	18,4	980	0,206
1 x 120 (4/0 AWG)	13,7	1,6	1,6	20,1	1.225	0,161
1 x 150 (250 MCM)	15,4	1,8	1,7	22,4	1.520	0,129
1 x 185 (350 MCM)	16,5	2,0	1,8	24,1	1.830	0,106
1 x 240 (450 MCM)	19,5	2,2	1,8	27,5	2.380	0,0801
1 x 300 (550 MCM)	22,1	2,4	2,0	30,9	3.025	0,0641
1 x 400 (750 MCM)	26,0	2,6	2,1	35,4	3.960	0,0486

TOXFREE ZH SZ-K (AS) 1,8/3 kV (3000 V AWM)

Cross-section (mm <sup>2</sup> ) (AWG-MCM)	Conductor Diameter (mm)	Insulation thickness (mm)	Outer sheath thickness (mm)	External Diameter (mm)	Weight (kg/km)	Maximum R 20°C (Ω/km)
1 x 25 (4 AWG)	6,4	2,2	1,4	13,6	370	0,780
1 x 35 (2 AWG)	7,5	2,2	1,4	14,7	475	0,554
1 x 50 (1 AWG)	9,0	2,2	1,5	16,4	625	0,386
1 x 70 (2/0 AWG)	10,5	2,2	1,5	17,9	815	0,272
1 x 95 (3/0 AWG)	12,2	2,4	1,6	20,2	1.060	0,206
1 x 120 (4/0 AWG)	13,7	2,4	1,7	21,9	1.310	0,161
1 x 150 (250 MCM)	15,4	2,4	1,7	23,6	1.585	0,129
1 x 185 (350 MCM)	16,5	2,4	1,8	24,9	1.870	0,106
1 x 240 (450 MCM)	19,5	2,4	1,9	28,1	2.420	0,0801
1 x 300 (550 MCM)	22,1	2,4	2,0	30,9	3.025	0,0641
1 x 400 (750 MCM)	26,0	2,6	2,1	35,4	3.960	0,0486

Cross-section (mm <sup>2</sup> ) (AWG-MCM)	TOXFREE ZH SZ-K (AS)							
	Maximum conductor temperature							
	150°C				120°C			
	Ampacity Cir. Monophasic (A) <sup>1</sup>	Ampacity Cir. Three phases (A) <sup>2</sup>	Voltage drop Monophasic (V/A · km) <sup>3</sup>	Voltage drop Three phases (V/A · km) <sup>3</sup>	Ampacity Cir. Monophasic (A) <sup>1</sup>	Ampacity Cir. Three phases (A) <sup>2</sup>	Voltage drop Monophasic (V/A · km) <sup>3</sup>	Voltage drop Three phases (V/A · km) <sup>3</sup>
1 x 25 (4 AWG)	210	184	2,35	2,04	189	166	2,17	1,88
1 x 35 (2 AWG)	261	230	1,67	1,45	235	207	1,54	1,33
1 x 50 (1 AWG)	315	282	1,16	1,01	284	254	1,07	0,913
1 x 70 (2/0 AWG)	405	364	0,822	0,712	364	328	0,757	0,656
1 x 95 (3/0 AWG)	492	446	0,622	0,539	443	402	0,573	0,497
1 x 120 (4/0 AWG)	570	521	0,486	0,421	513	470	0,448	0,388
1 x 150 (250 MCM)	657	605	0,390	0,337	592	545	0,359	0,311
1 x 185 (350 MCM)	750	695	0,320	0,277	675	626	0,295	0,255
1 x 240 (450 MCM)	885	827	0,242	0,210	797	744	0,223	0,193
1 x 300 (550 MCM)	1.021	960	0,194	0,168	919	864	0,178	0,154
1 x 400 (750 MCM)	1.226	1.132	0,147	0,127	1.104	1.019	0,135	0,117

Current-carrying capacities have been calculated at maximum conductor temperature and the following conditions:

<sup>1</sup> Open air (monophasic): monophasic circuit (two conductors loaded in contact), with cables on a metallic perforated tray, with good ventilation and ambient temperature of 30 °C (method F).

<sup>2</sup> Open air (three phase): three phase circuit (three conductors loaded in contact, flat), with cables on a metallic perforated tray, with good ventilation and ambient temperature of 30 °C (method F).

<sup>3</sup> Voltage drop is the maximum that may occur. It is calculated for the maximum conductor temperature and for  $\cos \varphi = 1$ .

Maximum current capacities, in amperes, can be calculated according to table B.52.12 of IEC 60364-5-52 applying a correction factor to consider the cable working temperature. This is due to the current capacities of the standard refer to cables with conductor temperature at 90°C and SZ-K (AS) cables have a maximum conductor temperature of 150°C.

Correction factor is applied according to the formula:

$$K = \sqrt{\frac{(T_{c(max)}^* - T_{ref}) \cdot (1 + 0,004 \cdot T_{c(max)}^{90})}{(T_{c(max)}^{90} - T_{ref}) \cdot (1 + 0,004 \cdot T_{c(max)}^*)}}$$

- K for 150 °C: 1,304
- K for 140 °C: 1,264
- K for 130 °C: 1,221
- K for 120 °C: 1,174

All terms in °C,

- $T_{c(max)}^*$  is the new conductor temperature (150, 140, 130 ó 120°C).
- $T_{c(max)}^{90}$  is the temperatura which intensity has been calculated (90°C).
- $T_{ref}$  is the ambient temperature which current capacity refers to (30°C).

## SHORT-CIRCUIT CURRENT-CARRYING CAPACITIES

<b>Time (s)</b>	0,1	0,2	0,3	0,5	1	1,5	2	2,5	3
<b>A/mm<sup>2</sup></b>	462	326	267	206	146	119	103	92	84

These values are taken from IEC 949 / UNE 21192 with initial temperature of 150°C and final temperature of 350°C.

## CORRECTION FACTORS FOR AIR TEMPERATURE

<b>Air T. (°C)</b>	30	40	50	60	70
<b>Factor</b>	1	0,96	0,91	0,87	0,82

Coefficients of IEC 60364-5-52 standard don't apply because they have not been calculated at conductor temperature of 150 °C. Due to this, they have been calculated with the formula:

$$\sqrt{\frac{T_{c(max)} - T}{T_{c(max)} - T_{ref}}}$$

All terms in °C,

- T<sub>c(max)</sub> is the maximum conductor temperature (150°C)
- T is the temperature which we want the correction factor
- T<sub>ref</sub> is the temperature which ampacity is calculated (30°C).

## CORRECTION FACTORS FOR CABLES GROUPING OF SEVERAL CIRCUITS

Cables position (in contact)	Number of circuits										Method
	1	2	3	4	5	6	7	8	9	>9	
One layer on perforated tray horizontal or vertical	1,00	0,88	0,82	0,77	0,75	0,73	0,73	0,72	0,72	Without additional correction factor	Methods E and F

Other correction factors (for grouping cables, for harmonic currents), that are not in this specification, can be applied. Further information can be found in IEC 60364-5-52.

It is recommended to apply forced ventilation and method G of installation according to IEC 60364-5-52 (single-core cable spaced in free air), when the conductor temperature is permanently at 150°C.