

# Cables for marine applications

## CCTV camera cables



**The Quality Connection**

**LEONI**



# LEONI solutions for Marine applications



With the market Marine, LEONI provides the customers with all the expertise of a global enterprise, focused on the needs of the shipbuilding industry. With an extensive portfolio of products and services, LEONI will assist you across the entire lifecycle of your projects – worldwide.

As a strong partner, LEONI offers application-specific cables and cable system solutions meeting national and international standards. You can trust in the well-founded sector and product knowledge as well as many years of experience.

Innovative quality products, proven and project-related system solutions, as well as highest availability and sustainable service management are matter of course for LEONI.

## The LEONI group

LEONI is a global provider of products, solutions and services for energy and data management in the automotive sector and other industries. The value chain encompasses wires, optical fibers, standardised cables, special cables and assembled systems as well as intelligent products and smart services. As an innovation partner and solutions provider, LEONI supports its customers with pronounced development and systems expertise. The market-listed group of companies employs more than 92,000 people in 31 countries and generated consolidated sales of EUR 5.1 billion in 2018.

Further informations [www.leoni.com](http://www.leoni.com)

# CCTV camera cables

for video applications



With the knowledge of customer's special requirements in CCTV camera cable applications, LEONI is able to offer cables with halogen content sheathing materials or alternatively with halogen-free cross-linked material. The cables can be designed for fixed installation or for flexible application.

## Technical competence

LEONI is able to include in the CCTV camera cables

- Power cores
- Signal cores
- Coaxial elements
- Data pairs Cat 5e, Cat 6, Cat 6A and Cat 7
- Bus elements like PROFIBUS or CAN-Bus
- Fiber optic cabling elements
- Special designed electrical screens

Wire design can be

- Solid
- Stranded
- Bare copper
- Tin plated
- Nickel plated
- Silver plated

For sheathing materials, LEONI can offer cables for different temperature ranges and technical requirements

- Halogen-free FRNC material for a temperature range from  $-40\text{ }^{\circ}\text{C}$  up to  $+80\text{ }^{\circ}\text{C}$
- Marine approved halogen-free SHF1 material for a temperature range from  $-40\text{ }^{\circ}\text{C}$  up to  $+90\text{ }^{\circ}\text{C}$
- Marine approved halogen-free SHF2 material for a temperature range from  $-50\text{ }^{\circ}\text{C}$  up to  $105\text{ }^{\circ}\text{C}$
- Marine approved halogen-free SHF2 mud resistant material (NEK 606) for a temperature range from  $-50\text{ }^{\circ}\text{C}$  up to  $+105\text{ }^{\circ}\text{C}$
- Halogen-free silicone material for a temperature range from  $-55\text{ }^{\circ}\text{C}$  up to  $+180\text{ }^{\circ}\text{C}$  (20.000 h according to Arrhenius behaviour)
- ETFE material for a temperature range from  $-65\text{ }^{\circ}\text{C}$  up to  $+130\text{ }^{\circ}\text{C}$  (20.000 h according to Arrhenius behaviour)
- FEP material for a temperature range from  $-65\text{ }^{\circ}\text{C}$  up to  $+200\text{ }^{\circ}\text{C}$  (20.000 h according to Arrhenius behaviour)
- PTFE material for a temperature range from  $-65\text{ }^{\circ}\text{C}$  up to  $+260\text{ }^{\circ}\text{C}$  (20.000 h according to Arrhenius behaviour)
- Polyurethane material for a temperature range from  $-50\text{ }^{\circ}\text{C}$  up to  $+90\text{ }^{\circ}\text{C}$
- Rodent and termite protection

The final temperature range of the cables depends on the materials used for insulation, taping and sheathing. If required, other special approvals are also possible.



CCTV camera cable



CCTV camera cable

<b>Application</b>	Video monitoring		Video monitoring	
<b>Technical data</b>	<p><b>Coaxial element</b></p> <p>Conductor resistance <math>\leq 36 \Omega/\text{km}</math>  Insulation resistance <math>\geq 10 \text{ G}\Omega \cdot \text{km}</math>  Capacity [1 kHz] <math>\sim 54 \text{ nF}/\text{km}</math>  Characteristic impedance <math>75 \pm 4 \Omega</math>  Test voltage (core/shield) 2000 V at rms 50Hz 1min</p> <p><b>Data pairs 0,56 mm<sup>2</sup></b>      <b>Power supply wires 1,5 mm<sup>2</sup></b></p> <p>Conductor resistance <math>\leq 33 \Omega/\text{km}</math>      <math>\leq 13 \Omega/\text{km}</math>  Insulation resistance <math>\geq 20 \text{ M}\Omega \cdot \text{km}</math>      <math>\geq 20 \text{ M}\Omega \cdot \text{km}</math>  Nominal Voltage (effective value) <math>\leq 100 \text{ V}</math>      <math>\leq 100 \text{ V}</math>  Test voltage (core/core) 1000 V at rms 50 Hz 1min      1000 V at rms 50 Hz 1min  Test voltage (core/shield) 500 V at rms 50 Hz 1min      500 V at rms 50 Hz 1min</p>		<p><b>Coaxial element</b></p> <p><math>\leq 42 \Omega/\text{km}</math>  <math>\geq 10 \text{ G}\Omega \cdot \text{km}</math>  <math>\sim 54 \text{ nF}/\text{km}</math>  <math>75 \pm 4 \Omega</math>  2000 V at rms 50Hz 1min</p> <p><b>Data pairs 0,56 mm<sup>2</sup></b>      <b>Power supply wires 1,5 mm<sup>2</sup></b></p> <p><math>\leq 33 \Omega/\text{km}</math>      <math>\leq 13 \Omega/\text{km}</math>  <math>\geq 20 \text{ M}\Omega \cdot \text{km}</math>      <math>\geq 20 \text{ M}\Omega \cdot \text{km}</math>  <math>\leq 100 \text{ V}</math>      <math>\leq 100 \text{ V}</math>  1000 V at rms 50Hz 1min      1000 V at rms 50 Hz 1min  500 V at rms 50Hz 1min      500 V at rms 50 Hz 1min</p>	
<b>Core-Ø nom.</b>	1.5 mm <sup>2</sup> : 2.2 mm 0.56 mm <sup>2</sup> : 1.6 mm		1.5 mm <sup>2</sup> : 2.2 mm 0.56 mm <sup>2</sup> : 1.6 mm	
<b>Outer jacket</b>	SHF1		SHF1	
<b>Cable-Ø min. / max.</b>	11.6/12.2 mm		11.6/12.2 mm	
<b>Weight nom.</b>	206 kg/km		206 kg/km	
<b>Mechanical properties</b>	<p>Temperature range during operation <math>-25 \text{ }^\circ\text{C}</math> to <math>+70 \text{ }^\circ\text{C}</math>  during installation <math>-10 \text{ }^\circ\text{C}</math> to <math>+50 \text{ }^\circ\text{C}</math></p> <p>Bending radius during operation <math>8 \times \emptyset</math>  during installation <math>4 \times \emptyset</math></p>		<p>during operation <math>-25 \text{ }^\circ\text{C}</math> to <math>+70 \text{ }^\circ\text{C}</math>  during installation <math>-10 \text{ }^\circ\text{C}</math> to <math>+50 \text{ }^\circ\text{C}</math></p> <p>during operation <math>7.5 \times \emptyset</math>  during installation <math>3.75 \times \emptyset</math></p>	
<b>Burning characteristics</b>	IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		IEEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1	
<b>Type designation</b>	02YSCH 0.8/3.5-75 L-H 3X1.5 L-H CH 2X2X0.56 PIMF GN FRNC		02YSCH 0.86/3.5-75 LI L-H 3X1.5 L-H CH 2X2X0.56 PIMF GN FRNC	



Digital CCTV cable

CCTV camera cable  
with functional integrity during fire

<b>Application</b>	Video monitoring	Video monitoring in case of fire
<b>Technical data</b>	<p><b>LI9Y(ST)C 4X2X0.6/1.2-100 (Cat5)</b></p> <p>Loop resistance ≤ 180 Ω/km            Insulation resistance ≥ 5 GΩ*km            Transit time ≤ 5.3 ns/m            Capacity [1 kHz] ~ 50 nF/km            Operating voltage 100 V            Test voltage (core/core/shield) 1000 V at rms 50 Hz 1 min</p> <p><b>Wire LIH 1.5/2.2 (Power)</b></p> <p>Conductor resistance [1,5 mm<sup>2</sup>] ≤ 14 Ω/km            Insulation resistance ≥ 20 MΩ*km            Operating voltage 100 V            Test voltage (core/core/shield) 1000 V at rms 50Hz 1min</p>	<p><b>02YS(FE)C(FE) 4X2X0.60/1.67-100 PIMF (Cat5)</b></p> <p>Loop resistance ≤ 180 Ω/km            Insulation resistance ≥ 5 GΩ*km            Capacity [1 kHz] ~ 50 nF/km            Operating voltage 30 V            Test voltage (core/core/shield) 1000 V at rms 50 Hz 1 min</p> <p><b>Wire LI(FE)H 1.5/3.2</b></p> <p>Conductor resistance [1,5 mm<sup>2</sup>] ≤ 14 Ω/km            Insulation resistance ≥ 20 MΩ*km            Operating voltage 100 V            Test voltage (core/core/shield) 1000 V at rms 50Hz 1min</p>
<b>Core-Ø nom.</b>	1.5 mm <sup>2</sup> : 2.2 mm 0.22 mm <sup>2</sup> : 1.2 mm	1.5 mm <sup>2</sup> : 3.2 mm 0.22 mm <sup>2</sup> : 1.7 mm
<b>Outer jacket</b>	SHF1	SHF1
<b>Cable- Ø min. / max.</b>	9.9/10.5 mm	14.8/15.8 mm
<b>Weight nom.</b>	150 kg/km	282 kg/km
<b>Mechanical properties</b>	<p>Temperature range during operation -25 °C to +90 °C            during installation -10 °C to +50 °C</p> <p>Bending radius during operation 7 × Ø            during installation 5 × Ø</p>	<p>Temperature range during operation -40 °C to +80 °C            during installation -10 °C to +50 °C</p> <p>Bending radius during operation 8 × Ø            during installation 4 × Ø</p>
<b>Burning characteristics</b>	IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1	IEC 60332-3-22, EN 50200 (≥ PH120), EN 50289-4-16, IEC 61156-5 (Cat5) (must be testified)
<b>Type designation</b>	LI9Y(ST)C 4X2X0.6/1.2-100 LIH H 3X1X1.5 GN FRNC	02YS(FE)C(FE) 4X2X0.60/1.67-100 PIMF LI(FE)H H 3X1X1.5 GN





CCTV camera cables  
for explosive atmospheres



PROFINET

<b>Application</b>	Video monitoring in explosive atmospheres	Video monitoring with PoE characteristics
<b>Technical data</b>	<p><b>02YSFC 4X2X0.60/1.43-100 PIMF (Cat6)</b></p> <p>Loop resistance ≤ 140 Ω/km            Insulation resistance ≥ 20 MΩ*km            Transit time ≤ 5.3 ns/m            Capacity [1 kHz] ~ 50 nF/km            Characteristic impedance 100 MHz (100 ± 5) Ω            Surface transfer impedance 10 MHz ≤ 100 m Ω/m            Operating voltage 100 V            Test voltage (core/core/shield) 1000 V at rms 50 Hz 1 min</p> <p><b>Wire LIH 1.5/2.2 (Power)</b></p> <p>Conductor resistance [1,5 mm<sup>2</sup>] ≤ 14 Ω/km            Insulation resistance ≥ 20 MΩ*km            Operating voltage 240 V            Test voltage (core/core/shield) 1000 V at rms 50Hz 1min</p> <p>Signal run time</p>	<p>≤ 180 Ω/km            ≥ 500 MΩ*km</p> <p>80 V            700 V at rms 50 Hz 1 min</p> <p>≤ 5.13 ns/m</p>
<b>Core-Ø nom.</b>	1.5 mm <sup>2</sup> : 2.2 mm 0.22 mm <sup>2</sup> : 1.43 mm	AWG 24: 1.05 mm
<b>Outer jacket</b>	SHF1	SHF2, mud resistant acc. to NEK606
<b>Cable- Ø min. / max.</b>	12.1/12,7 mm	8.4/9.0 mm
<b>Weight nom.</b>	210 kg/km	91 kg/km
<b>Mechanical properties</b>	<p>Temperature range during operation -30 °C to +80 °C            during installation -30 °C to +80 °C</p> <p>Bending radius during operation 8 × Ø            during installation 4 × Ø</p>	<p>during operation -40 °C to +80 °C            during installation -25 °C to +80 °C</p> <p>during operation 8 × Ø            during installation 4 × Ø</p>
<b>Burning characteristics</b>	IEC 60332-1-2	IEC 60332-1-2
<b>Type designation</b>	02YSFC 4X2X0.60/1.43-100 PIMF LIH H11Y 3X1X1.5 GN	2YH(ST)C11Y 4X2X0.6/1.05-100 LI GN



Customised CCTV camera cable



Customised CCTV camera cable with fiber optic elements

<b>Application</b>	Video monitoring in harsh environments	Video monitoring in harsh environments
<b>Technical data</b>	<p><b>Coaxial element</b></p> <p>Conductor resistance <math>\leq 86 \Omega/\text{km}</math>  Insulation resistance <math>\geq 5 \text{ G}\Omega \cdot \text{km}</math>  Characteristic impedance (5 MHz) <math>(75 \pm 3) \Omega</math>  Capacity [1 kHz] <math>\sim 55 \text{ nF}/\text{km}</math>  Attenuation (5 MHz) <math>\leq 3.3 \text{ dB}/100\text{m}</math>  Operating voltage 1500 V at rms 50 Hz 1 min  Test voltage (core/shield) 100 V</p> <p><b>Wire LIH 2.5/3.3 VZN</b></p> <p>Conductor resistance <math>\leq 8.5 \Omega/\text{km}</math>  Insulation resistance <math>\geq 10 \text{ M}\Omega \cdot \text{km}</math>  Operating voltage 1500 V at rms 50Hz 1min  Test voltage 300 V</p> <p><b>Screened pair</b></p> <p>Conductor resistance <math>\leq 90 \Omega/\text{km}</math>  Insulation resistance <math>\geq 5 \text{ G}\Omega \cdot \text{km}</math>  Operating voltage 1500 V at rms 50Hz 1min  Test voltage 100 V</p>	<p><b>Optical fiber</b></p> <p>I-V(ZN)H 1G62.5/125 STB900H BU <math>\varnothing 2.8 \text{ mm}</math>  <b>Optical fiber</b>  I-V(ZN)H 1E9/125 STB900H OG <math>\varnothing 2.8 \text{ mm}</math></p> <p><b>Wire LIH 1.5/2.8 VZN</b></p> <p>Conductor resistance <math>\geq 13 \Omega/\text{km}</math>  Insulation resistance <math>\geq 20 \text{ M}\Omega \cdot \text{km}</math>  Operating voltage 300 V  Test voltage 2000 V at rms 50 Hz 1 min</p>
<b>Core-<math>\varnothing</math> nom.</b>	2.5 mm <sup>2</sup> : 3.3 mm 0.22 mm <sup>2</sup> : 1.2 mm	1.5 mm <sup>2</sup> : 2.8 mm
<b>Outer jacket</b>	SHF2, mud resistant acc. to NEK606	SHF2, mud resistant acc. to NEK606
<b>Cable-<math>\varnothing</math> min. / max.</b>	19.8/20.8 mm	12.0/13.0 mm
<b>Weight nom.</b>	611 kg/km	195 kg/km
<b>Mechanical properties</b>	<p>Temperature range during operation <math>-25 \text{ }^\circ\text{C}</math> to <math>+80 \text{ }^\circ\text{C}</math>  during operation <math>20 \times \varnothing</math>  Bending radius during installation <math>10 \times \varnothing</math></p>	<p>Temperature range during operation <math>-25 \text{ }^\circ\text{C}</math> to <math>+80 \text{ }^\circ\text{C}</math>  during operation <math>20 \times \varnothing</math>  Bending radius during installation <math>10 \times \varnothing</math></p>
<b>Burning characteristics</b>	IEC 60332-1-2, IEC 60332-3-24	IEC 60332-1-2, IEC 60332-3-24 (Cat.C) (must be testified)
<b>Type designation</b>	02YSCH 2X0.6/2.4-75 LI LI2Y 2X2X0.22 PIMF LIH (ZN)CH(Z)HX 4X1X2.5 VZN OR	I-V(ZN)H 2X1G62.5/125 STB900H I-V(ZN)H 2X1E9/125 STB900H LIH (ZN)CHX 3X1X1.5 VZN OG



**Marine**

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