LEONI Sea*Line*®

Cables for Commercial Shipbuilding

The Quality Connection

LEONI

Cable Solutions

for Shipbuilding · Naval vessels · Marine engineering · Offshore

A consistent focus on the market, in-depth sector and product knowledge, decades of manufacturing experience and innovative products – that's LEONI, one of world's largest producers of special cable solutions. The Marine Technologies business unit supplies the shipbuilding industry with LEONI Sea*Line* cables.

What sets LEONI apart:

Research & Development
We invite you to benefit from the globally interlinked know-how of the LEONI Group and the work done by our Corporate Research & Development department. By conducting research projects that transcend individual sectors we tap synergies within the Group and thereby provide additional potential for innovation.

A high degree of vertical integration in cable production
This is something virtually no other cable manufacturer can boast: from ultra thin copper wire through to hybrid cable thick as an arm, everything is done in our own production plants. Optimised results are achieved by using components which are matching up.

Cable systems
We also offer ready-to-connect and ready-to-fit assembled cable systems and fully wired modules.

Global presence
We have our own production facilities in all of the world's key industrial regions and are therefore always in close proximity to you.

At a Glance

Issue: February 2008
Subject to change and error.

The right cable for any application.

LEONI has been developing customised cable solutions for many years.

Commercial shipbuilding

- Communications and LAN cable
- Bus cable
- CCTV camera cable
- Fire resistant cable
- Coaxial cable
- Special solutions

Naval technology

- Laterally watertight cable
- Laterally and longitudinally watertight cable for outboard applications
- Inboard cable
- Self-extinguishing submarine cable
- Spiral cable
- Special solutions

Oceanography

- Towing cable with either steel or aramide cores for rated loads of several tons
- Neutrally buoyant and floating cable for marine research
- Cable for fixed installation

Offshore platforms

- Communications and LAN cable
- Bus cable
- CCTV camera cable
- Fire resistant cable
- Coaxial cable
- Special solutions

LEONI – The Quality Connection

One of LEONI's most important success factors is the globally consistent high quality of its products.

LEONI quality management

The quality management of LEONI's wire and cable facilities around the world is ISO 9001:2000 certified. Furthermore, we concentrate on preventive quality assurance in which error-preventing tools like FMEA as well as machinery and process capability analyses have their firm places.

During the manufacturing process we constantly measure, monitor and control the diameter and the properties of the insulation of our cables and conductors using state-of-the-art equipment. Production control carries out regular examination of random samples to ensure that the stipulated tolerances are observed.

All quality assurance measures combined enable ongoing optimisation in line with our ambitious quality targets.

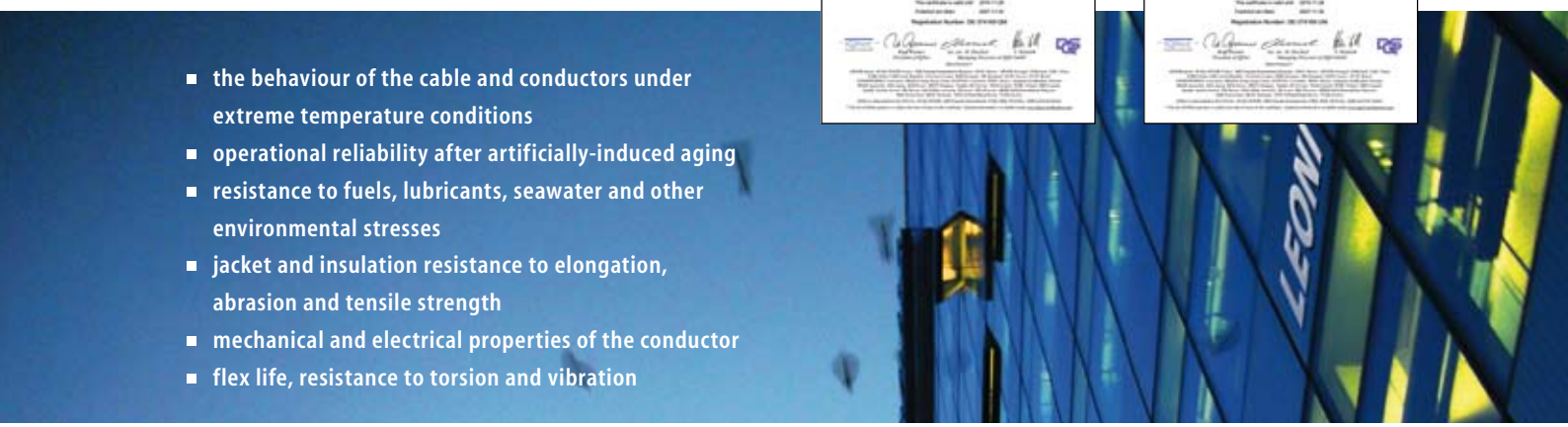
LEONI products are tested in accordance with customer requirements as well as national and foreign regulations:

- the behaviour of the cable and conductors under extreme temperature conditions
- operational reliability after artificially-induced aging
- resistance to fuels, lubricants, seawater and other environmental stresses
- jacket and insulation resistance to elongation, abrasion and tensile strength
- mechanical and electrical properties of the conductor
- flex life, resistance to torsion and vibration

LEONI environmental management

Business success and ecological responsibility are no contradiction in terms for us. As a company engaged in production around the world, we acknowledge that we share a special responsibility for safeguarding the natural essentials of life. It is our aim to strike a balance between environmental concerns and the interests of our company. Environmental protection consequently is a mandatory element of our business activity. We encourage our business partners to follow environmental guidelines comparable to our own and we advise our customers on environmentally friendly ways to handle and dispose of our products.

We ensure, with our DIN EN ISO 14001 certified environmental management system, that our environmental policy is applied effectively.



Quality and Performance

Inside our cables

Our development engineers ensure that only those materials are used for LEONI-Sea*Line* cables that have been carefully optimised for the special demands of ship and marine engineering. For instance, we use specially adapted polyethylene (PE), thermoplastic copolymers (FRNC/LSZH),polypropylene (PP) and polyurethane (PUR), SHF1 and SHF2 for the jacket.

Depending on customer requirements, LEONI-Sea*Line* cables can be made with the following properties:

- resistant to seawater
- flame retardant
- halogen free, non-corrosive
- neutrally bouyant
- resistant to chemicals
- transversally water blocked
- resistant to oil
- fireproof
- pressure resistant
- applicabel for towing
- longitudinally water blocked
- resistant to the process of hydrolysis

Using a variety of shielding technologies and special materials provides **optimum EMC screening properties**.

- foil, braided and served wire shields that can be combined
- shielding materials: bare, tin-plated and silver-plated copper wires

High tensile strength due to either steel or aramide strain relief elements

Cables designed as …

- round, flat or profile-extruded cables
- hybrid cable integrating control, data and power cables; integration of fiber optic cables and media hoses
- spiral cables with powerful recoil action and extension lengths of many time the closed block length
- fiber optic cables
- coaxial cables for video and data recording

Approvals

We test the electrical, mechanical and chemical properties of our LEONI-Sea*Line* cables using highly sophisticated testing equipment and methods. Upon customer request, we have our products certified to national and international standards by well-known classification bodies such as:

Germanischer Lloyd

Lloyds Register of Shipping

ABS Europe LTD

Bureau Veritas

Det Norske Veritas

VDE Prüf- und Zertifizierungs-institut

You will find an up-to-date overview on our website **www.leoni-marine-technologies.com**

AWG dimensions

for copper wires used in the shipbuilding industry

The dimensions and cross-sections of conductors used in information and data cables are frequently quoted in AWG (American Wire Gauge).

The following standards are of particular importance:

- **ASTM B258**
  Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires as Electrical Conductors
- **ASTM B8**
  Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- **ASTM B174**
  Bunch-Stranded Copper Conductors for Electrical Conductors

These regulations show the key specifications for the design of most of the copper conductors for data cables included in this catalogue.

It should be noted that all AWG-compliant copper conductors are standardised in their geometric dimensions. The AWG standard does not cover either electrical conductance of the copper conductor used or any possible coating.

Measurements Dimensions according to ASTM

AWG	Ø of wire	Ø of wire	cross-section
Single wire	mils	mm	mm²
38	4.0	0.102	0.0082
37	4.5	0.144	0.0163
36	5.0	0.127	0.0127
35	5.6	0.142	0.0158
34	6.3	0.160	0.0201
33	7.1	0.180	0.0254
32	8.0	0.203	0.0324
31	8.9	0.226	0.0401
30	10.0	0.254	0.0507
29	11.3	0.287	0.0647
28	12.6	0.320	0.0804
27	14.2	0.361	0.1024
26	15.9	0.404	0.1282
25	17.9	0.455	0.1626
24	20.1	0.511	0.2051
23	22.6	0.574	0.2588
22	25.3	0.643	0.3247

AWG	Construction	cross-section	
Conductor	no. of wires/AWG	cmils	mm²
26	7/AWG 34	253	0.128
24	7/AWG 32	404	0.205
	19/AWG 36		
22	7/AWG 30	640	0.324
	19/AWG 34		

Colour code

according to Standard DIN 47100

Specification of the core colours for instrumentation/control cables

pair no.	colour*
1	white/brown
2	green/yellow
3	grey/pink
4	blue/red
5	black/purple
6	grey-pink/red-blue
7	white-green/brown-green
8	white-yellow/yellow-brown
9	white-grey/grey-brown
10	white-pink/pink-brown
11	white-blue/brown-blue
12	white-red/brown-red
13	white-black/brown-black
14	grey-green/yellow-grey
15	pink-green/yellow-pink
16	green-blue/green-red
17	green-red/yellow-red
18	green-black/yellow-black
19	grey-blue/pink-blue
20	grey-red/pink-red
21	grey-black/pink-black
22	blue-black/red-black
23	white/brown
24	green/yellow

* a twin colour designation such as “white/green” means a two-colour core with white as the base colour and green as the additional colour.

Abbreviation of the core colours

according to standard IEC 60757

Abbreviation of the core colours in technical specifications

colour german	short mark german	colour english	short mark english
schwarz	sw	black	BK
braun	bn	brown	BN
rot	rt	red	RD
orange	or	orange	OR
gelb	ge	yellow	YE
grün	gn	green	GN
blau	bl	blue	BU
violett	vi	violet (purple)	VT
grau	gr	gray (slate)	GY
weiß	ws	white	WH
lila	li	pink	PK
gold	–	gold	GD
türkis	tk	turquoise	TQ
silber	–	silver	SR
grün-gelb	gnge	green-and-yellow	GNYE
transparent	tr	transparent	–
natur	nt	nature	–

Core colours pursuant to the DIN VDE 0293-308 standard

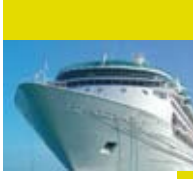
Since 2003, the core colours for cable and conductors for current loads of 220 V and above have been specified in this standard.

	former colour code		current colour code	
	with GNYE	without GNYE	with GNYE	without GNYE
2 cores		BK/BU		BU/BN
3 cores	BK/BU/GNYE	BK/BU/BN	BU/BN/GNYE	BN/BK/GY
4 cores	BK/BU/GNYE/BN	BK/BK/BU/BN	GNYE/BN/BK/GY	BU/BN/BK/GY
5 cores	BK/BK/BU/GNYE/BN	BK/BK/BK/BU/BN	GNYE/BU/BN/BK/GY	BU/BN/BK/GY/BK

Product overview

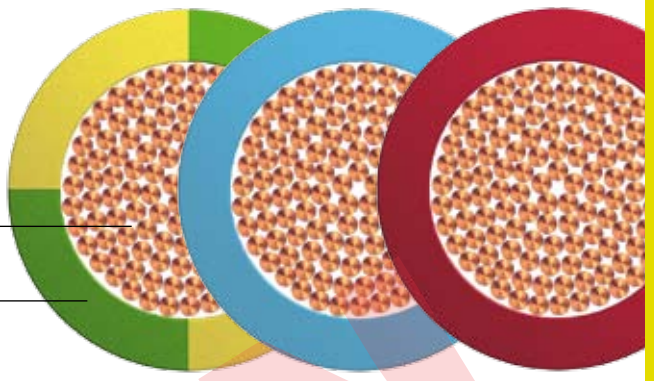
Marine Technologies

Cable markings
In the catalogue, the markings are always shown on one example of a cable type (this applies to all the cables shown).



Installation wire betatherm145

Germanischer Lloyd · DNV · BUREAU VERITAS · Lloyd's Register



Copper, tin-plated, finely stranded

acc. to VDE 0295/IEC 60228 class 5

Insulation

Polyolefin copolymer**,** cross-linked

Application

Fixed installation in switch cabinets, terminal boxes, control panels, devices and other connecting elements within the equipment on commercial ships without constant exposure to oil, grease and other lubricants. The cables conform to the technical requirements of IEC 60092-350, IEC 60029-351, and are in line with both IEC 60092-352 and IEC 60092-353.

Marking

STUDERCABLES.COM SWITZERLAND 040315 BETATHERM 145 HALOGEN FREE 2,5 mm² VDE-REG.-NR. 9887

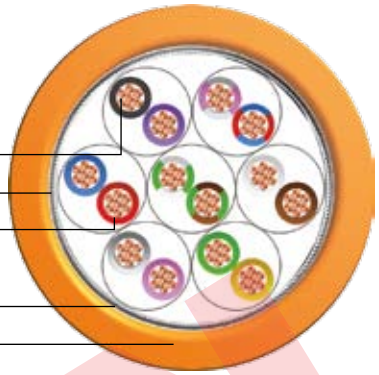
Technical data		
	$U_0/U \leq 1$ mm²	$U_0/U \geq 1.5$ mm²
Rated voltage	300/500 V	450/750 V (600/1000 V for fixed installation)
Mechanical properties		
Temperature range	during operation during installation	**–55 °C** to **+145 °C** **–40 °C** to **+90 °C**
Bending radius	during operation during installation	5 x D 4 x D
Burning characteristics		
IEC 60754-1, IEC 60754-2, Def-St. 02-713, IEC 61034, IEC 60332-1-2, IEC 60332-3-2		

Cable construction and types

Desig-nation	Core-Ø [mm]	Weight [kg/km]	Reference												
	nom.	nom.	green/ yelow	black	light blue	brown	red	white	grey	dark blue	purple	orange	yellow	green
MH 0.25	1.6	5	190799	190792	190794	190797	190798	190793	215088	215089	219355	212324	190796	190795
MH 0.33	1.7	6		213862		212378	212377	214206				212376	212379	
MH 0.5	1.9	8	190815	190808	190810	190813	190814	180809	211454	191558	213414	219356	190812	190811
MH 0.75	2.2	11	190823	190816	190818	190821	190822	190817	211399	191676	211663	211662	190820	190819
MH 1.0	2.5	14	190831	190824	190826	190829	190830	190825	191551	191548	191550	191549	190828	190827
MH 1.5	3.0	21	190839	190832	190834	190837	190838	190833	191554	191553	191552	191555	190836	190835
MH 2.5	3.7	33	190847	190840	190842	190845	190846	190841	211400	211700	212277	212276	190844	190843
MH 4	4.2	49	190855	190848	190850	190853	190854	190849	211401	215767			190852	190851
MH 6	4.8	69	190863	190856	190858	190861	190862	190857	211864	216824			190860	190859
MH 10	6.3	120	191557	190864	191556	218311	217184	218511	211865			214486	215651	
MH 16	7.3	180	211335	190865	211334	212169	211333	211332	211866				214781	215348
MH 25	9.6	290	212373	190866	213563		213564		211867				213565	
MH 35	10.7	400	211496	190867	215266		211716							
MH 50	13.0	570	211574	190868	215265		217185							
MH 70	15.0	800	211984	190869				220111						
MH 95	17.3	1040	213697	190870										

Copper Cable fire resistant / signal cable

Germanischer Lloyd DNV



Application
Fixed installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. These cables withstand the effects of fire for at least 90 minutes. The cables meet the technical requirements of IEC 60092-350, IEC 60092-359, IEC 60092-370.

Marking
LEONI SeaLine L MFCH-FE90 2x2x0,75 mm² 250V <<Year of production>> <<internal production number>> <<meter marking>>

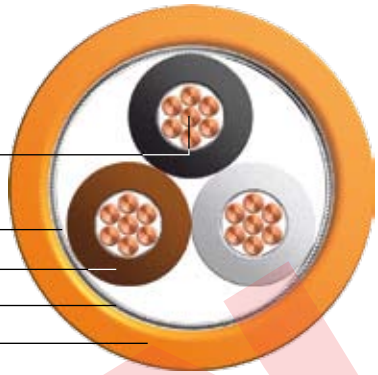
Technical data		
Conductor resistance	≤ 25 Ω/km	
Insulation resistance	≥ 20 MΩ · km	
Operating voltage U_0/U	150 V/250 V acc. to IEC 60092-376 4 rated voltage	
Testing voltage (wire/core)	2000 V	at rms 50 Hz 1 min
Testing voltage (core/shield)	2000 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation during installation	**–40 °C** to **+90 °C** **–10 °C** to **+50 °C**
Bending radius	during operation during installation	min. 10 x D min. 5 x D
Burning characteristics		
IEC 60331-21, IEC 60332-1-2, IEC 60332 3-22, IEC 61034-2, IEC 60754-1 & -2, Def St. 02-713, IEC 60695-7-1		

Cable construction and types

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
1x2x0.75	2.7	7.9	8.9	96	acc. to DIN 47100, pairs twisted together	**MFHCH-FE90 1x2x0.75**
2x2x0.75		8.9	9.9	123		**MFHCH-FE90 2x2x0.75**
4x2x0.75		13.5	14.5	241		**MFHCH-FE90 4x2x0.75**
7x2x0.75		16.0	17.0	352		**MFHCH-FE90 7x2x0.75**
10x2x0.75		20.5	21.5	498		**MFHCH-FE90 10x2x0.75**
14x2x0.75		23.2	24.2	645		**MFHCH-FE90 14x2x0.75**
19x2x0.75		26.0	27.0	822		**MFHCH-FE90 19x2x0.75**
24x2x0.75		29.9	30.9	1040		**MFHCH-FE90 24x2x0.75**

Copper Cable fire resistant / power cable

Germanischer Lloyd DNV



Copper, bare, finely stranded
class 2 + 5 (IEC 60228, VDE 0295)
Fire protection
Insulation thermoplastic copolymer FRNC
Shield tin-plated copper braid
Outer jacket SHF1

Application
Fixed installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. These cables withstand the effects of fire for at least 90 minutes. The cables meet the technical requirements of IEC 60092-350, IEC 60092-352, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
LEONI SeaLine L MHCH-FE90 3G1,5 0,6/1 kV
<<Year of production>> <<internal production number>>
<<meter marking>>

Technical data		
Conductor resistance	≤ 13.5 Ω/km	
Insulation resistance	≥ 20 MΩ · km	
Operating voltage U_0/U	0.6/1 kV	
Testing voltage (core/core)	3500 V	at rms 50 Hz 1 min
Testing voltage (core/shield)	3500 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation during installation	**–40 °C** to **+90 °C** **–10 °C** to **+50 °C**
Bending radius	during operation during installation	min. 10 x D min. 5 x D
Burning characteristics		
IEC 60331-21, IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

Cable construction and types

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
2x1.5	3.4	9.5	10.5	144		**MHCH-FE90 2x1.5**
3x1.5✖	3.4	9.5	10.5	156	/	**MHCH-FE90 3x1.5 / MHCH-FE90 3G1.5**
4x1.5✖	3.4	11.0	12.0	194	/	**MHCH-FE90 4x1.5 / MHCH-FE90 4G1.5**
5x1.5✖	3.4	12.0	13.0	233	/	**MHCH-FE90 5x1.5 / MHCH-FE90 5G1.5**
7x1.5	3.4	13.6	14.6	321		**MHCH-FE90 7x1.5**
10x1.5	3.4	17.2	18.2	474		**MHCH-FE90 10x1.5**
12x1.5	3.4	17.9	18.9	505		**MHCH-FE90 12x1.5**
14x1.5	3.4	18.8	19.8	564	■ with white numbers	**MHCH-FE90 14x1.5**
16x1.5	3.4	19.8	20.8	628		**MHCH-FE90 16x1.5**
19x1.5	3.4	21.0	22.0	719		**MHCH-FE90 19x1.5**
24x1.5	3.4	24.7	25.7	918		**MHCH-FE90 24x1.5**
2x2.5	3.8	10.3	11.3	175		**MHCH-FE90 2x2.5**
3x2.5✖	3.8	11.0	12.0	213	/	**MHCH-FE90 3x2.5 / MHCH-FE90 3G2.5**
4x2.5	3.8	12.0	13.0	245	/	**MHCH-FE90 4x2.5**
5x2.5✖	3.8	13.7	14.7	335	/	**MHCH-FE90 5x2.5 / MHCH-FE90 5G2.5**
7x2.5	3.8	15.0	16.0	417	■ with white numbers	**MHCH-FE90 7x2.5**

✖ Also available as nGm with gn/ye wire.

LAN Cable CAT 5e

Germanischer Lloyd DNV


L45467-J17-B26


L45467-J16-B76


L45467-J16-B86

Application

Fixed installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376 as well as EN 50288-2-1.

Marking

LEONI SeaLine 9Y(ST)CH …. + meter marking

Transmission properties

Frequency [MHz]	1	4	10	16	20	31.25	62.5	100
Next [dB]	65.3	56.3	50.3	47.2	45.8	42.9	38.4	35.3
PSNext [dB]	62.3	53.3	47.3	44.2	42.8	39.9	35.4	32.3
ELFext [dB]	63.8	51.8	43.8	39.7	37.8	33.9	27.9	23.8
PSELfext [dB]	60.8	48.8	40.8	36.7	34.8	30.9	24.9	20.8
Attenuation [dB/100 m]	2.1	4.0	6.3	8.0	9.0	11.4	16.5	21.3
Return loss [dB]	23.0	24.5	25	25	25	23.6	21.5	20.1

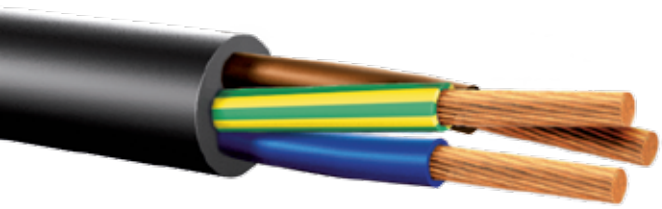
Technical data

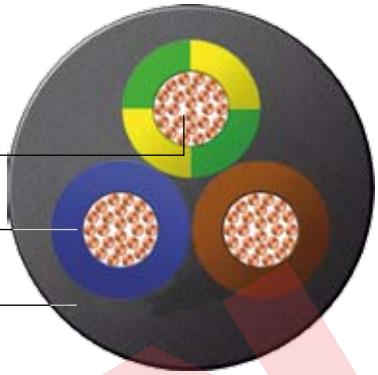
Loop resistance (AWG 24/7)	≤ 180 Ω/km	
Loop resistance (AWG 22/7)	≤ 120 Ω/km	
Transit time	≤ 5.3 ns/m	
Charac. impedance (4–100 MHz)	100 ± 15 Ω	
Testing voltage (core/core/shield)	700 V at rms 50 Hz 1 min	
Mechanical properties		
Temperature range	during operation	–25 °C to +80 °C
	during installation	–10 °C to +50 °C
Bending radius	during operation	10 x D
	during installation	5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def St. 02-713, IEC 60695-7-1		

Cable construction and types

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Reference
	nom.	min.	max.	nom.	
9Y(ST) CH 4x2xAWG 24/7 LI GN FRNC	1.2	7.5	8.1	79	**L45467-J816-B6**
9Y(ST) CH 4x4xAWG 24/7 LI GN FRNC	1.25	11.0	11.6	160	**L45467-J17-B26**
9Y(ST) CH 4x4x2xAWG 24/7 LI GN FRNC	1.2	15.1	15.7	232	**L45467-J16-B76**
9Y(ST) CH 8x4x2xAWG 24/7 LI GN FRNC	1.2	20.6	21.2	471	**L45467-J16-B86**
9Y(ST) CH 4x2xAWG 22/7 LI GN FRNC	1.5	8.7	9.3	103	**L45467-J817-B6**
9Y(ST) CH 4x4xAWG 22/7 LI GN FRNC	1.7	13.4	14	224	**L45467-J817-B16**
9Y(ST) CH 4x4x2xAWG 22/7 LI GN FRNC	1.5	18.4	19	351	**L45467-J817-B46**
9Y(ST) CH 8x4x2xAWG 22/7 LI GN FRNC	1.5	24.6	25.2	627	**L45467-J817-B56**
LI09YS(ST)CH 4X2X0.15/0.98 GN	4.4	6.2	6.5	54	**L45581-B42-Y269**

Flexible Wiring Cable S05Z1Z1-F





Copper, bare finely stranded
class 5 (IEC 60228, VDE 0295)
Insulation
halogen free polymeric coumpound
Outer jacket
halogen free polymeric coumpound

Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
LEONI SeaLine S05Z1Z1-F Marine Cable 3x1,5 300/500 V

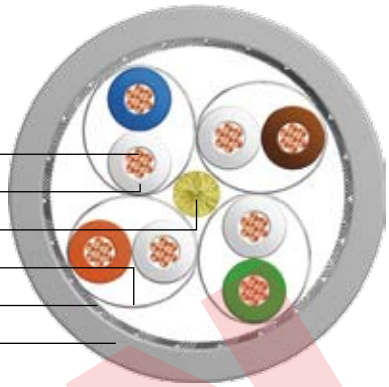
Technical data		
Operating voltage	300/500 V	
Mechanical properties		
Temperature range	during operation	**–40 °C** to **+70 °C**
	during installation	**–5 °C** to **+50 °C**
Bending radius	during operation	3 x D
	during installation	5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

Cable construction and types

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
S05Z1Z1-F 3x1.5	3.0	8.0	8.6	100		**S05Z1Z1-F Marine Cable 3x1.5**
S05Z1Z1-F 3x2.5	3.7	9.9	10.5	150		**S05Z1Z1-F Marine Cable 3x2.5**

LAN Cable CAT 7

Germanischer Lloyd



Copper bare, 7 strands
Insulation foamed PE
Strain relief element
Screen Alu-laminated foil
Shield tin-plated copper braid
Outer jacket SHF1

Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-359 as well as EN 5288-1 & -4-2.

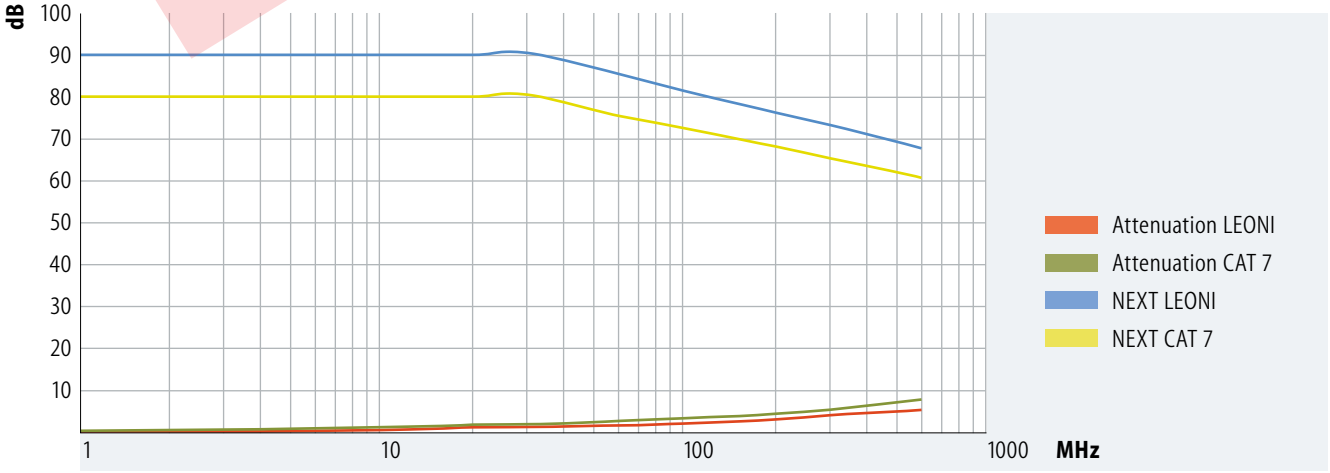
Marking
LEONI SeaLine KERPEN MegaLine 724 flex Heavy Duty *H*
<order ref.> <length marking>

Technical data		
DC restistance	≤ 84 Ω/km	
Insulation resistance	≥ 5 GΩ · km	
Capacity	42.5 nF/km nom.	
Operating voltage	125 V max.	
Characteristic impedance [100 MHz]	100 ± 5Ω	
Testing voltage (core/core)	1000 V	at rms 50 Hz 1 min
Testing voltage (core/shield)	1000 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation during installation	**–20 °C** to **+75 °C** **0 °C** to **+55 °C**
Bending radius	during operation during installation	5 x D 10 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-24, IEC 61034-1 & -2, IEC 60754-1 & -2, EN 50286-1 & -4-2		

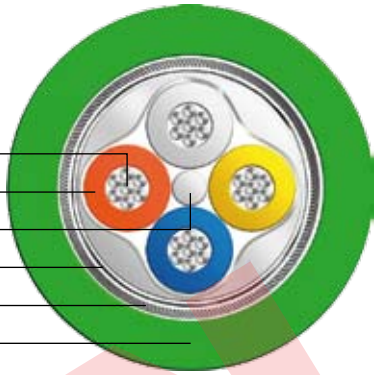
Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]	Weight [kg/km]	Colour code	Reference
	nom.	nom.	nom.		
KS-02YSCH 4 x 2 x AWG 24/7 PiMF	1.4	9.0	85	□■/□■/□■/□■	**L45467-J415-C6**

Frequency	Attenuation		NEXT		ACR		PS-NEXT		PS-ACR		EL-FEXT		PS-ELFEXT		RL (ffs)	
	LEONI nom.	CAT 7 max.	LEONI nom.	CAT 7 min.	LEONI nom.	CAT 7 min.	LEONI nom.	CAT 7 min.	LEONI nom.	CAT 7 min.	LEONI nom.	CAT 7 min.	LEONI nom.	CAT 7 min.	LEONI nom.	CAT 7 min.
MHz	dB/10m		dB/10m		dB/10m		dB/10m		dB/10m		dB/10m		dB/10m		dB/10m	
1	0.23	0.29	90	80.0	89.8	79.7	87	77.0	86.8	76.7	90		87			
4	0.4	0.55	90	80.0	89.6	79.4	87	77.0	86.6	76.4	90	80.0	87	77.0	25.0	23.0
10	0.63	0.85	90	80.0	89.4	79.2	87	77.0	86.4	76.2	90	74.0	87	71.0	30.0	24.5
16	0.79	1.08	90	80.0	89.2	78.9	87	77.0	86.2	75.9	90	69.9	87	66.9	30.0	25.0
20	0.91	1.21	90	80.0	89.1	78.8	87	77.0	86.1	75.8	85	68.0	82	65.0	30.0	25.0
31.25	1.13	1.52	90	80.0	88.9	78.5	87	77.0	85.9	75.5	83	64.1	80	61.1	28.0	23.6
62.5	1.61	2.17	85	75.1	83.4	72.9	82	72.5	80.4	70.3	73	58.1	70	55.1	25.0	21.5
100	2.07	2.78	81	72.4	78.9	69.6	78	69.4	75.9	66.6	64	54.0	61	51.0	24.0	20.1
155	2.63	3.5	78	69.6	75.4	66.1	75	66.6	72.4	63.1	59	50.2	56	47.2	24.0	18.8
200	3.07	4.01	76	67.9	72.9	63.9	73	64.9	69.9	60.9	57	48.0	54	45.0	24.0	18.0
300	3.81	5	73	65.3	69.2	60.3	70	62.3	66.2	57.3	52	44.5	49	41.5	24.0	17.3
600	5.23	7.33	68	60.8	62.8	53.4	65	57.8	59.8	50.5	46	38.4	43	35.4	21.0	17.3



Ethernet Cable CAT 5e ES



Copper, bare, 7 strands
Insulation PP
Strain relief element
Screen alu-laminated foil
Shield tin-plated copper braid
Outer jacket SHF1

Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
Continuous meters INDUSTRIAL ETHERNET ES ITP MARINE CABLE CAT 5 PLUS * 22AWG (SHIELDED) (UL) E119100 Verified CAT 5E Patch Cable CMG 75°C
or PLTC FT4 Sun Res * LEONI L L-9YH(ST)CH 2X2X0.34/ 1.5-100 GN VZN FRNC 60V

Transmission properties

Frequency [MHz]	1	4	10	16	20	31,25	62,5	100
Next [dB–100 m]	80	76	70	65	63	60	55	50

Frequency [MHz]	1	4	10	16	20	31.25	62.5	100
Attenuation [dB–100 m]	1.8	3.6	6.0	7.6	8.7	11	16	21
Attenuation [dB–100 ft]	0.5	1.1	1.8	2.3	2.7	3.4	4.9	6.4

Technical data		
Loop resistance	≤ 120 Ω/km	
Transit time	≤ 5.3 ns/m	
Insulation resistance	≥ 500 MΩ · km	
Charac. impedance (1–100 MHz)	100 ± 15 Ω	
Testing voltage (core/core/shield)	700 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation	**–25 °C** to **+80 °C**
	during installation	**0 °C** to **+50 °C**
Bending radius	during operation	10 x D
	during installation	7.5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

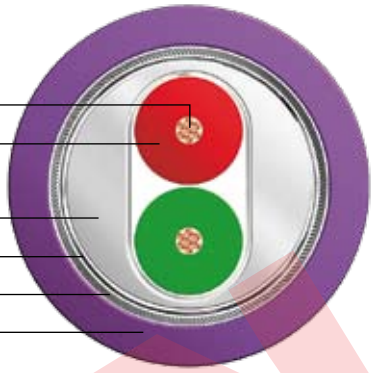
Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
9YH(ST)CH 2x2x0.75/1.5-100 LI GN VZN	1.5	6.1	6.9	68	□ ■ ■ ■	**L45467-J16-B26**

Profibus Cable

Germanischer Lloyd · DNV · BUREAU VERITAS · Lloyd's Register · ABS

Copper bare, 7 strands
Insulation PE foamed with skin
Inner jacket
thermoplastic copolymer FRNC
Screen alu-laminated foil
Shield tin-plated copper braid
Outer jacket SHF1/SHF2



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
Continuous meters LEONI SeaLine Profibus 02YSH(ST)CH 1x2x0,75/2,55-150 LI VI FRNC

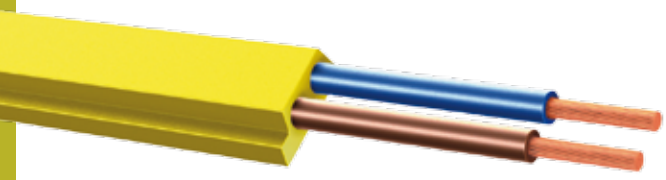
Technical data		
Loop resistance	≤ 110 Ω/km	
Insulation resistance	≥ 16,000 MΩ · km	
Charac. impedance [3–20 MHz]	150 ± 15 Ω	
Capacity [1KHz]	≈ 28.5 nF/km	
Operating voltage	≤ 60 V	
Testing voltage (core/core/shield)	1000 V	
Mechanical properties		
Temperature range	during operation during installation	**–25 °C** to **+80 °C** **–10 °C** to **+50 °C**
Bending radius	during operation during installation	5 x D 10 x D
Burning characteristics		
IEC 60332-1-2-2, IEC 61034, IEC 60754-1 & -2, IEC 60332-3-22		

Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]	Weight [kg/km]	Colour code	Reference
	nom.	nom.	nom.		
02YSH(ST)CH 1x2x0.75/2.55-150 LI VI FRNC	2.55	8.0	84	■■	**L45467-G17-C46 (SHF2)**
02YSH(ST)CHX 1X2X0.75/2.55-150 LI VI FRNC	6.2	8.0	84	■■	**L45467-G17-C56 (SHF2)**

AS-Interface-Cable

Germanischer Lloyd · DNV · Bureau Veritas · Lloyd's Register · ABS



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
ASI-Logo LEONI L VDE-REG.-NR. 9971 FLI-9Y11Y 2x1,5 VZN FRNC OIL RESISTANT 24V + meter marking

Burning characteristics
IEC 60332-2-1

Electrical and mechanical properties
According to AS-I KO1E, Version 12.09.96 /speci_4E

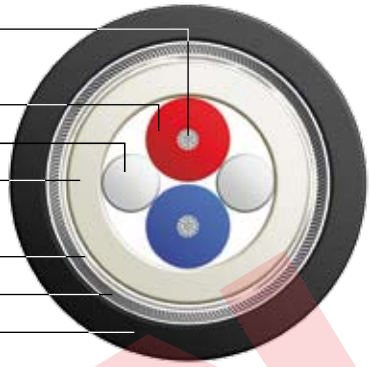
Cable construction

Designation	Core-Ø [mm]	Dimensions nom. [mm]		Weight [kg/km]	Colour code	Reference
	nom.	thickness	width	nom.		
LI9Y11Y 1x1.5/2.5 black	2.5 (bare strand)	4.0	10.0	67	■■	**L45587-M21-B48**
LI9Y11Y 1x1.5/2.5 yellow	2.5 (tin-plated strand)	4.0	10.0	67	■■	**L45587-M21-B38**

CAN Bus Cable

Germanischer Lloyd DNV

Copper tin-plated, 19 strands
AWG 21 (0.48 mm²)
Insulation polypropylene, foamed with skin
Filler
Inner jacket
thermoplastic copolymer FRNC
Screen alu-laminated foil
Shield tin-plated copper braid
Outer jacket SHF1



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

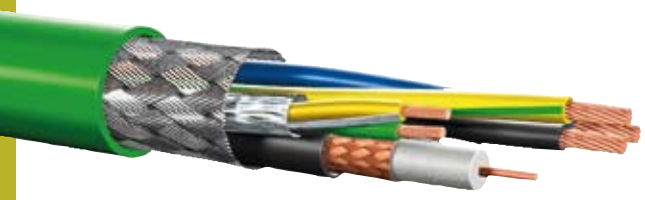
Marking
LEONI L SeaLine CAN Marine Cable *09YSH(ST)CH 1x2x0,9/2,4 120 LI*L45467-F19-C16 continuous meters

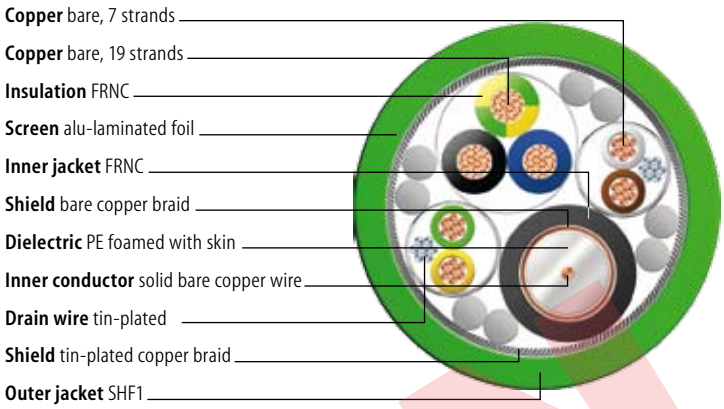
Technical data		
Conductor resistance	≤ 44 Ω/km	
Insulation resistance	≥ 5 GΩ · km	
Capacity	~36 nF/km	
Characteristic impedance [1 MHz]	120 ± 18 Ω	
Operating voltage (max.)	300 V	
Testing voltage (core/core/shield)	2000 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation	–30 °C to +80 °C
	during installation	–5 °C to +50 °C
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

Cable construction and types

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
09YSH(ST)CH 1x2x0.9/2.4 black	2.4	7.5	7.9	79		**L45467-F19-C16**
09YSH(ST)CH 2x2x0.9/2.2 black	2.2	8.2	8.6	90		**L45467-F19-C26**
09YSH(ST)CH 1x2x0.9/2.4 violett	2.4	7.5	7.9	79		**L45467-F19-C6**

CCTV Camera Cable





Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
CCTV FRNC IEC 332-3 continuous meters

Approval
Customer approval

Transmission properties (typical values)

Frequency [MHz]	10	50	100	200	500
[dB–100 m]	2.8	6.2	8.9	12.8	23
[dB–100 ft]	0.9	1.9	2.7	3.9	7.0

Technical data	Coaxial element
Conductor resistance	≤ 36 Ω/km
Insulation resistance	≥ 10 GΩ · km
Capacity [1 kHz]	~54 nF/km
Characteristic impedance	75 ± 4 Ω
Testing voltage (core/shield)	2000 V at rms 50Hz 1min

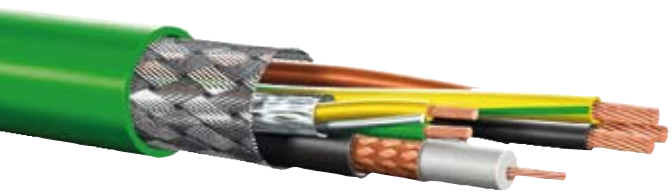
Technical data	Data pairs 0,56 mm²	Power supply wires 1,5 mm²
Conductor resistance	≤ 33 Ω/km	≤ 13 Ω/km
Insulation resistance	≥ 20 MΩ · km	≥ 20 MΩ · km
Testing voltage (core/core)	1000 V at rms 50 Hz 1 min	1000 V at rms 50 Hz 1 min
Testing voltage (core/shield)	500 V at rms 50 Hz 1 min	500 V at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation during installation	**–25 °C** to **+70 °C** **–10 °C** to **+50 °C**
Bending radius	during operation during installation	10 x D 7.5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-24, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

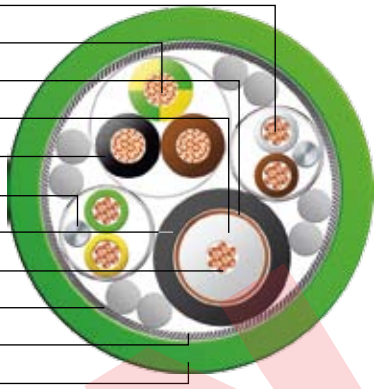
Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
02YSCH 0.86/3.5-75LI+ L-H3x1.5+ LHCH2x2x0.56 PiMF GN FRNC	1.5 mm²: 2.2 mm 0.56 mm²: 1.6 mm	11.6	12.2	206	■ ■ ■ □ ■ / ■ ■	**L45466-D114-W36**

CCTV Camera Cable

Germanischer Lloyd





Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
LEONI L CCTV Camera Cable 02YSCH 0.86/3.5-75 LI L-H (3x1.5)+(2x2x0.56 PIMF) CH GN FRNC 230V IEC 60332-22 + meter marking

Approval
Customer approval

Transmission properties (typical values)

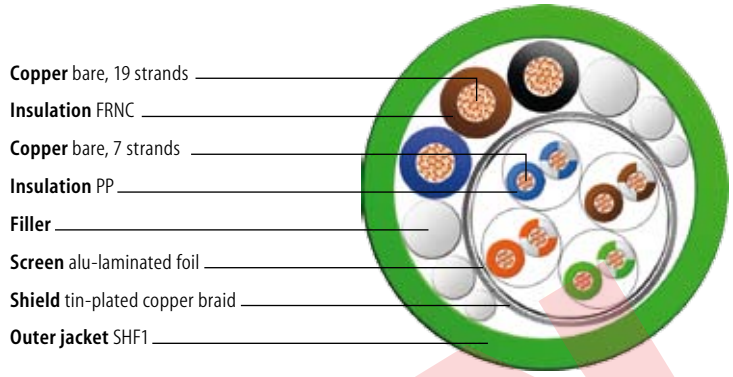
Frequency [MHz]	10	50	100	200	500
[dB–100 m]	3.4	7.5	10.8	15.4	27.5
[dB–100 ft]	1.0	2.3	3.3	4.7	8.4

Technical data	**Coaxial element**	
Conductor resistance	≤ 42 Ω/km	
Insulation resistance	≥ 10 GΩ · km	
Capacity [1 kHz]	~54 nF/km	
Characteristic impedance	75 ± 4 Ω	
Testing voltage (core/shield)	2000 V at rms 50Hz 1min	
Technical data	**Data pairs 0,56 mm²**	**Power supply wires 1,5 mm²**
Conductor resistance	≤ 33 Ω/km	≤ 13 Ω/km
Insulation resistance	≥ 20 MΩ · km	≥ 20 MΩ · km
Testing voltage (core/core)	1000 V at rms 50Hz 1min	1000 V at rms 50Hz 1min
Testing voltage (core/shield)	500 V at rms 50Hz 1min	500 V at rms 50Hz 1min
Mechanical properties		
Temperature range	during operation during installation	**–25 °C** to **+70 °C** **–10 °C** to **+50 °C**
Bending radius	during operation during installation	15 x D 7.5 x D
Burning characteristics		
IIEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
02YSCH 0.86/3.5-75 LI+LH3x1.5+ L-HCH2x2x0.56 PiMF GN FRNC	1.5 mm²: 2.2 mm 0.56 mm²: 1.6 mm	11.6	12.2	206	■■■ □■ / ■■	**L45466-D114-W46**

Digital CCTV Cable



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
Continuous meters LEONI L SeaLine Cat5e *LI9Y(ST)C H 4x2x0.22mm²+LIH3x1.5mm² FRNC*year/internal order number

Approval
Upon request.

Transmission properties

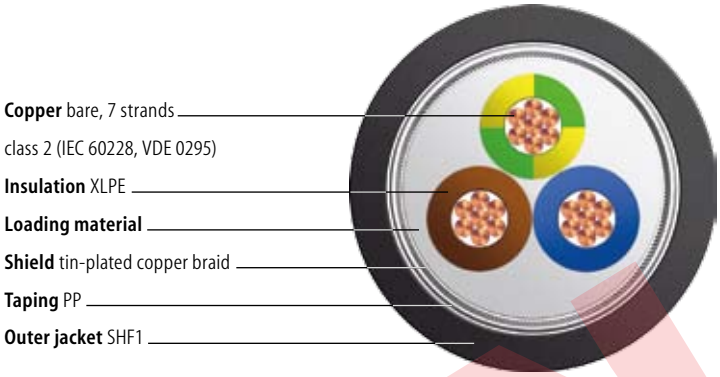
Frequency [MHz]	1	4	10	16	20	31.25	62.5	100
Next [dB]	65.3	56.3	50.3	47.2	45.8	42.9	38.4	35.3
PSNext [dB]	62.3	53.3	47.3	44.2	42.8	39.9	35.4	32.3
ELFext [dB]	63.8	51.8	43.8	39.7	37.8	33.9	27.9	23.8
PSELfext [dB]	60.8	48.8	40.8	36.7	34.8	30.9	24.9	20.8
Attenuation [dB/100 m]	2.1	4.0	6.3	8.0	9.0	11.4	16.5	21.3
Frequency [MHz]	4	8	10	16	20	31.25	62.5	100
Return loss [dB]	23.0	24.5	25	25	25	23.6	21.5	20.1

Technical data	Coaxial element	
Loop resistance	≤ 180 Ω/km	
Insulation resistance	≥ 5 GΩ · km	
Transit time	≤ 5.3 ns/m	
Capacity [1 kHz]	~57 nF/km	
Operating voltage	100 V	
Testing voltage (core/core/shield)	1000 V	at rms 50 Hz 1 min
Technical data	**Power supply**	
Conductor resistance [1,5 mm²]	≤ 14 Ω/km	
Insulation resistance	≥ 20 MΩ · km	
Operating voltage	100 V	
Testing voltage (core/core/shield)	1000 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation during installation	**–25 °C** to **+90 °C** **–10 °C** to **+50 °C**
Bending radius	during operation during installation	10 x D 5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
LI9Y(ST)C 4x2x0.6/1.2-100 + LIHH3x1.5 GN FRNC	1.5 mm²: 2.2 mm 0.22 mm²: 1.2 mm	9.9	10.5	150	■■■ ◪■ / ◪■ / ◪■ / ◪■	**L45467-J316-W6**

Installation Cable extra round / M2XCH-ER



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

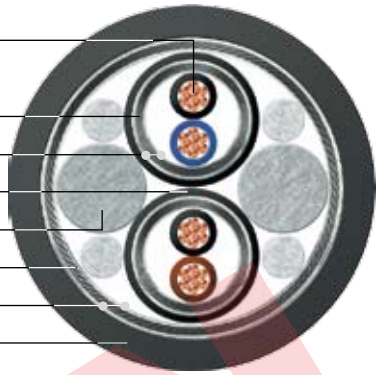
Marking
LEONI SeaLine M2XCH-ER 3x1,5 ERK 12849 300/500 V

Technical data		
Conductor resistance	≤ 14 Ω/km	
Insulation resistance	≥ 5 MΩ · km	
Operating voltage	300/500 (600) V	
Testing voltage (core/core)	3000 V	at rms 50 Hz 1 min
Testing voltage (core/shield)	2000 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation during installation	**–30 °C** to **+90 °C** **–5 °C** to **+50 °C**
Bending radius	during operation during installation	10 x D 5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
M2XCH-ER 3x1.5	3.0	10.2	11.0	200		**ERK 12849**

Control Cable with Shielded Pairs M2XC2X-CH



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-359.

Marking
LEONI SeaLine A M2XC2X-CH 2x2x0,75 250V ####m

Approval
Customer approval

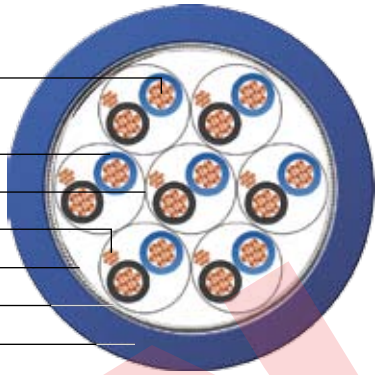
Technical data		
Operating voltage	U0/U 150/250 V // signal cable	
Testing voltage (core/core)	2000 V	at rms 50 Hz 1 min
Testing voltage (core/shield)	1200 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation	**–10 °C** to **+90 °C**
	during installation	**0 °C** to **+50 °C**
Bending radius	during operation	10 x D
	during installation	5 x D
Burning characteristics		
IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Colour code	Weight [kg/km]	Reference
	nom.	min.	max.		nom.	
M2XC2X-CH 2x2x0.75	2.0	11.6	12.4		180	**LEC 001975**

PiMF-Control Cable M-2XCH

Germanischer Lloyd DNV



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-351, IEC 60092-359, IEC 60092-376.

Marking
LEONI KERPEN * SeaLine * Size • Nom. diameter • 250 V • LSZH • Lengthmarking

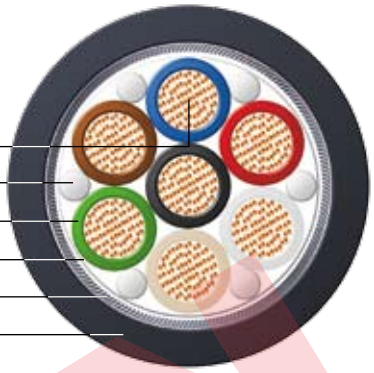
Technical data		
Conductor resistance	≤ 26 Ω/km	
Insulation resistance	≥ 5 GΩ · km	
Operating voltage	250 V	
Testing voltage (core/core)	1500 V	at rms 50 Hz 5 min
Testing voltage (core/shield)	1500 V	at rms 50 Hz 5 min
Mechanical properties		
Temperature range	during operation during installation	**–40 °C** to **+90 °C** **–20 °C** to **+50 °C**
Bending radius	during operation during installation	10 x D 5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2		

Cable construction and types

Designation	Core-Ø [mm]	Cable-Ø [mm]	Weight [kg/km]	Colour code	Reference
	nom.	nom.	nom.		
M-2XCH 2 x 2 x 0.75 PiMF	2.1	11.6	160	numbers printed on blue wires	**80820000**
M-2XCH 4 x 2 x 0.75 PiMF		13.6	240		**80820001**
M-2XCH 7 x 2 x 0.75 PiMF		16.6	370		**80820002**
M-2XCH 10 x 2 x 0.75 PiMF		20.2	530		**80820003**
M-2XCH 14 x 2 x 0.75 PiMF		22.4	640		**80820004**
M-2XCH 19 x 2 x 0.75 PiMF		25.8	860		**80820006**
M-2XCH 24 x 2 x 0.75 PiMF		28.6	1030		**80820005**

Flexible High Temperature Cable 200 °C M6YC6Y

Germanischer Lloyd



Application
Fixed installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants, and in a temperature range from –80 °C to 200 °C. The cables meet the technical requirements of the IEC 60092-350 standard.

Marking (on the spool label)
LEONI SeaLine Elocab M6YC6Y 7x2,5 300/500 V

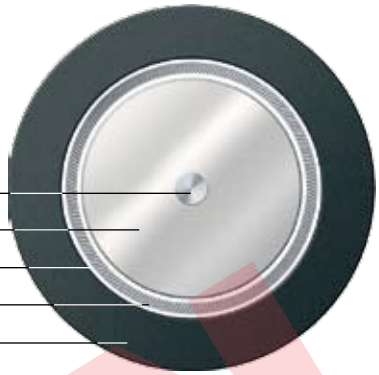
Technical data		
Operating voltage	450 V	
Testing voltage (core/core)	3600 V DC	
Testing voltage (core/shield)	2500 V DC	
Mechanical properties		
Temperature range	during operation during installation	**–80 °C** to **+200 °C** **–10 °C** to **+50 °C**
Bending radius	during operation during installation	10 x D 5 x D
Burning characteristics		
IEC 60332-1-2		

Cable construction and types

Designation	No. of cores	Single conductor		Cable-Ø nom.	Colour code	Weight nom.	Reference
		Core-Ø	No. of wires				
		mm		mm		kg/km	
M6YC6Y 2x0.75	2	1.7	19 x 0.22	5.0	■■	48	ERK 14221
M6YC6Y 2x1.5		2.2	84 x 0.15	6.2		74	ERK 14222
M6YC6Y 2x2.5		3.0	141 x 0.15	8.0		123	ERK 14369
M6YC6Y 2x4		3.7	228 x 0.15	9.4		170	ERK 14223
M6YC6Y 3x0.75	3	1.7	19 x 0.22	5.3	■■■	60	ERK 14224
M6YC6Y 3x1.5		2.2	84 x 0.15	6.8		100	ERK 14225
M6YC6Y 3x2.5		3.0	141 x 0.15	8.5		160	ERK 14226
M6YC6Y 4x0.75	4	1.7	19 x 0.22	5.9	■■■■	75	ERK 14227
M6YC6Y 4x1.5		2.2	84 x 0.15	7.4		125	ERK 14228
M6YC6Y 4x2.5		3.0	141 x 0.15	9.2		170	ERK 14229
M6YC6Y 5x0.75	5	1.7	19 x 0.22	6.4	■■■■■	90	ERK 14230
M6YC6Y 5x1.5		2.2	84 x 0.15	7.8		145	ERK 14231
M6YC6Y 5x2.5		3.0	141 x 0.15	10.0		235	ERK 14232
M6YC6Y 7x0.75	7	1.7	19 x 0.22	7.2	■■■■□■□✖	120	ERK 14233
M6YC6Y 7x1.5		2.2	84 x 0.15	8.8		200	ERK 14234
M6YC6Y 7x2.5		3.0	141 x 0.15	11.0		340	ERK 13961
M6YC6Y 8x0.75	8	1.7	19 x 0.22	7.7	■■■■□■■□✖	130	ERK 14236
M6YC6Y 8x1.5		2.2	84 x 0.15	9.8		234	ERK 14237
M6YC6Y 10x0.75	10	1.7	19 x 0.22	8.8	■■■■□■■■◪□✖	160	ERK 14238
M6YC6Y 10x1.5		2.2	84 x 0.15	11.2		280	ERK 14239
M6YC6Y 12x0.75	12	1.7	19 x 0.22	9.3	■■■■□■■■◪■■□✖	190	ERK 14240

✖ transparent

Coaxial Cable SHF1-RG (according to MIL-C17)



Application
Fixed, mechanically protected installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables with category 2 conductors (strand conductors) meet the technical requirements of the IEC 60092-350, IEC 60092-352, IEC 60092-359, IEC 60092-370, IEC 60092-373, IEC 60092-374 and IEC 60092-376 standards.

Marking
LEONI SeaLine SHF1-RG11

Approval
Customer approval

Mechanical properties		
Temperature range	during operation	–40 °C to +85 °C
	during installation	–10 °C to +50 °C
Bending radius	during operation	15 x D
	during installation	15 x D

Burning characteristics
IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1

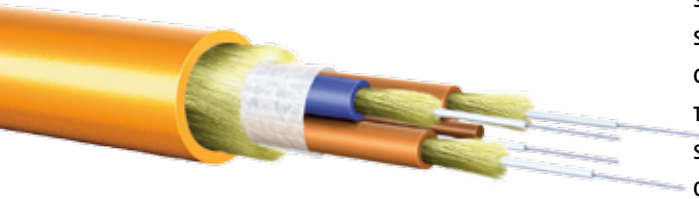
	Cable construction						Technical data				
Designation	Inner concuc-tor	Conduc-tor-Ø	Ø over dielectric nom.	Shield construc-tion	Outer-Ø nom.	Weight nom.	Conductor resistance nom.	Characte-ristic impedance [1MHz]	Capacity [1 kHz] max.	Attenua-tion [470 MHz] max.	Reference
		mm	mm		mm	kg/km	Ω/km	Ω	pF/m	dB/100 m	
SHF1-RG11	CU-LI-VZ	1.2	7.2	GB	10.3	146	20.5	75	67.0	17.0	**L45466-D18-B156**
SHF2-RG11	CU-LI-VZ	1.2	7.2	GB	10.3	146	20.5	75	67.0	17.0	**L45466-D18-B166**
SHF1-RG58	CU-LI-VZ	0.9	2.95	GV	5.0	40	40.7	50	98.0	36.5	**L45466-B13-B266**
SHF2-RG58	CU-LI-VZ	0.9	2.95	GV	5.0	40	40.7	50	98.0	36.5	**L45466-B13-B276**
SHF1-RG59	ST-DR-BL	0.58	3.7	GB	6.2	55	157	75	67.0	26.6	**L45466-D14-B136**
SHF2-RG59	ST-DR-BL	0.58	3.7	GB	6.2	55	157	75	67.0	26.6	**L45466-D14-B146**
SHF1-RG213	CU-LI-BL	2.25	7.2	GB	10.4	150	6.0	50	98.0	15.3	**L45466-B18-B56**
SHF2-RG213	CU-LI-BL	2.25	7.2	GB	10.4	150	6.0	50	98.0	15.3	**L45466-B18-B66**
SHF1-RG214	CU-LI-VS	2.25	7.2	GS+GS	10.8	185	6.0	50	98.0	13.6	**L45466-B18-B76**
SHF1-RG214	CU-LI-VS	2.25	7.2	GS+GS	10.8	185	6.0	50	98.0	13.6	**L45466-B18-B86**

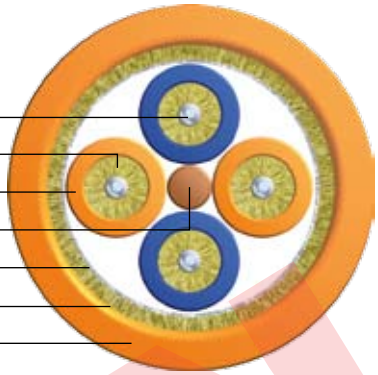
Cable construction:
ST = copper-clad-steel
CU = copper
DR = solid conductor
LI = stranded conductor
BL = bare
VZ = tin-plated
VS = silver-plated

Shield:
GB = bare copper braid
GV = tin-plated copper braid
GS = silver-plated copper braid

Fiber Optic Breakout Cable AT-V(ZN)H(ZN)H

Germanischer Lloyd DNV





Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
LEONI SeaLine AT-V(ZN)H(ZN)H

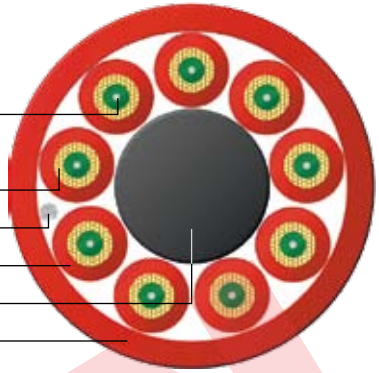
Fiber specifications
See page 34.

Technical data		
Tensile strength	1200 N	
Crush resistance during installation	4000 N/dm	
Mechanical properties		
Temperature range	during operation	–20 °C to +80 °C
	during installation	–5 °C to +50 °C
Bending radius	during operation	10 x D
	during installation	15 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

Cable construction and types

Designation	Core-Ø [mm]	Cable-Ø [mm]	Weight [kg/km]	Reference
	nom.	nom.	nom.	(see page 35)
AT-V(ZN)H(ZN)H2	0.9	10.1	85	**84950481…**
AT-V(ZN)H(ZN)H4		10.1	85	**84950478…**
AT-V(ZN)H(ZN)H6		11.8	120	**84950482…**
AT-V(ZN)H(ZN)H8		13.6	160	**84950483…**
AT-V(ZN)H(ZN)H10		15.4	200	**84950484…**
AT-V(ZN)H(ZN)H12		17.2	245	**84950485…**

Fiber Optic Indoor Cable I-V(ZN)HH



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
LEONI Q-LINE I-V(ZN)HH n fiber type <<alternating current symbol x 2>> <<order number>> <<drum number>> <<meter marking>>

Approval
Customer approval.

Fiber specifications
See page 34.

Technical data		
Tensile strength	**2 and 4 fibers** ≤ 180 Ω/km	**6 to 26 fibers** 1200 N
Mechanical properties		
Temperature range	during operation during installation transport/storage	**–5 °C** to **+70 °C** **–5 °C** to **+50 °C**
Bending radius	during operation during installation	10 x D 15 x D
Burning characteristics		
Flame retardancy	acc. to IEC 60332-1-2 and IEC 60332-3 CAT A	
Smoke density	acc. to IEC 61034-1 and 61034-2	
Halogen-free	acc. to IEC 60754-1 & -2	

No toxic and corrosive fumes.

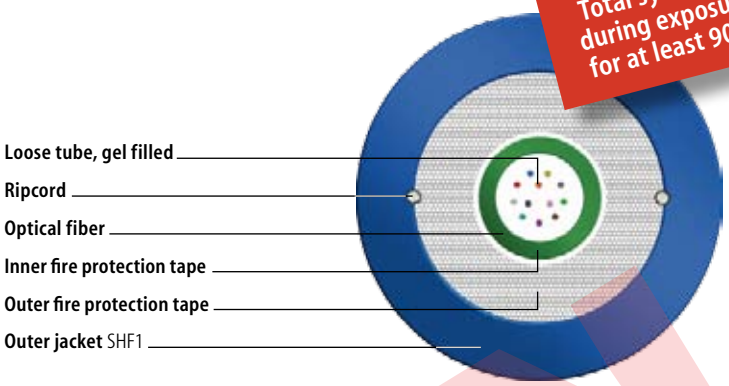
Cable construction and types

No. of fibers	Cable-Ø	Wall thickness	Weight	Fire load	Fire load	Pull force max.	Reference
	mm	mm	kg/km	MJ/m	kWh/m	N	(see page 35)
2	7.5	0.7	45	1.20	0.33	800	**84010...**
4	7.5	0.7	50	1.20	0.33	800	
6	9.0	0.8	75	1.36	0.38	1200	
8	11.0	0.9	110	1.52	0.42	1200	
10	13.0	1.0	160	1.68	0.47	1200	
12	14.5	1.0	182	1.80	0.50	1200	
16	14.0	1.0	160	1.84	0.51	1200	
18	14.5	1.0	175	1.92	0.53	1200	
20	16.0	1.0	225	2.16	0.60	1200	
24	17.5	1.0	245	2.48	0.69	1200	
26	18.0	1.0	260	2.50	0.69	1200	

Fiber Optic Cable fire resistant U-DQ(ZN)BH

Germanischer Lloyd DNV

Total system integrity during exposure to fire for at least 90 minutes



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
LEONI SeaLine fire resistant GL U-DQ(ZN)BH nfiber type

Fiber specifications
See page 34.

Technical data		
Tensile load	max. 2500 N	
Lateral pressure resistance	constant 3000 N/dm	
Mechanical properties		
Temperature range	during operation	–20 °C to +60 °C
	during installation	–5 °C to +50 °C
	Transportation/Storage	–25 °C to +70 °C
Bending radius	during operation	15 x D
	during installation	20 x D
Burning characteristics		
Flame retardancy	acc. to IEC 60332-1-2 and IEC 60332-3 CAT A	
Smoke density	acc. to IEC 61034-1 and 61034-2	
Halogen-free	acc. to IEC 60754-1 & -2	
Circuit integrity 90 min.	acc. to IEC 60331-11 and -25	

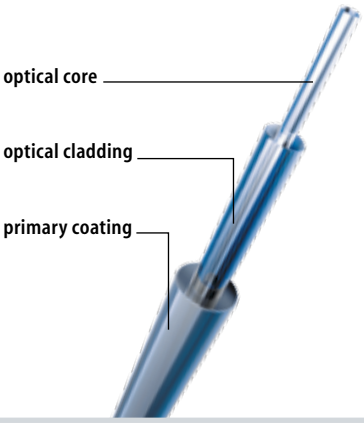
No toxic and corrosive fumes.

Cable construction and types

No. of fibers	Cable-Ø mm min.	Cable-Ø mm max.	Wall thickness mm	Weight kg/km	Fire load MJ/m	Fire load kWh/m	Colour code	Reference (see page 35)
12	10.0	10.6	0.7	115	1.03	0.29		84040...
24	10.5	11.1	0.7	125	1.28	0.36	✖ ✖✖	

✖ all coloured fibers with black ring markings
✖✖ transparent fibers without black ring marking

Fiber Specifications for fiber optic cables



Multi-mode fiber G50/125
acc. to IEC 60 793-2-10

Multi-mode fiber G62,5/125
acc. to IEC 60 793-2-10

Single-mode fiber E9/125 (matched cladding type)
acc. to ITU-T Rec. G.652 and IEC 60 793-2-50

Fiber specification						
	G50/125		G62,5/125		E9/125	
Geometry/mechanical properties						
Core diameter (µm)	50 ± 2.5		62.5 ± 3			
Mode field diameter (at 1310 nm) (µm)					9.2 ± 0.4	
Cladding diameter (µm)	125 ± 2		125 ± 1		125 ± 2	
Coating diameter (µm)	245 ± 10		245 ± 5		245 ± 10	
Core non-circularity (%)	< 5		< 5			
Cladding non-circularity (%)	< 1		< 1		< 1	
Core/Clad concentricity error (µm)	< 1.5		< 1.5		< 0.8	
Eccentricity of coating (µm)	< 10		< 10		< 10	
Screen test	≥100 kpsi		≥100 kpsi		≥100 kpsi	
Transmission properties	**Fiber type G (OM2)**		**Fiber type L (OM1)**		**Fiber type B (OS1)**	
Wavelength (nm)	850	1300	850	1300	1310	1550
Attenuation max. (dB/km)	2.7	0.8	3.2	0.9	0.36	0.22
Bandwidth min. (MHz · km)	500	1000	250	600		
Effective group of refraction	1.483	1.478	1.497	1.493	1.4695	1.4701
Numerical apperture	0.200 ± 0.015		0.275 ± 0.015			
Dispersion coefficient max. (ps/nm · km)					3.5	18
Zero dispersion wavelength (nm)					1300 – 1322	
Dispersion slope (ps/nm² · km)					≤ 0.092	
Cutoff wavelength (cabled) (nm)					≤ 1250	
Polarization mode dispersion (ps/$\sqrt{km}$)					≤ 0.1	

Order Number Coding for fiber optic cables

Cable construction	Number of fibers	Core type	Fiber type *

see product page

00	= 1 fiber
01	= 2 fibers
02	= 4 fibers
03	= 6 fibers
04	= 8 fibers
xx	= 2 x XX fibers

0	= tight buffered fiber
1	= semi-tight fiber, gel-filled
2	= loose tube with 2 fibers
3	= loose tube with 4 fibers
4	= loose tube with 6 fibers
5	= loose tube with 8 fibers
6	= loose tube with 10 fibers
7	= loose tube with 12 fibers
B	= loose tube with 16 fibers
D	= loose tube with 20 fibers
F	= loose tube with 26 fibers

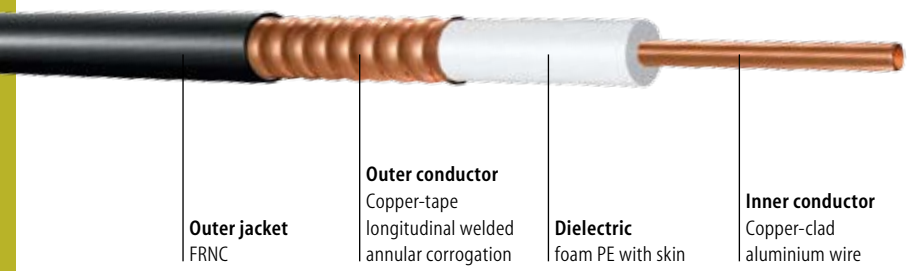
B	= 0.36F3.5/0.22H18 OS1
G	= 2.7B500/0.8F1000 OM2
L	= 3.2B250/0.9F600 OM1

* further fiber specifications on request

Ordering examples

8	4	0	1	0	0	4	0	G	I-V(ZN)HH 8G50/125
8	4	0	1	0	0	2	3	L	U-DQ(ZN)BH 4G62.5/125

Flex*Line*® 1/2" R (FRNC)



Application
Flexible antenna cable for fixed installation on board of commercial ships without constant exposure to oil, grease and other lubricants.

Marking
Sequential length in meters LEONI L * Flex*Line*® ½" R FRNC 50 Ω "internal order no." "month/year"

Approval
Customer approval.

More detailed information about the cables, connecting and installation material can be found in the special catalogue "Flex*Line*®".

Mechanical properties		
Temperature range	during operation	–55 °C to +85 °C
	during installation	–25 °C to +60 °C
Bending radius	during operation	4.5 x D
	during installation	7.5 x D

Burning characteristics
IEC 60332-3-24 (CAT C), IEC 60754-1 & -2

Frequency [MHz]	100	450	800	900	1000	1800	1900	2200	2500	2700	3000
Attenuation [dB/100 m]	2.1	4.6	6.3	6.7	7.2	9.9	10.3	11.2	12.0	12.2	13.2
Typ. value at 40 °C [kW]	3.9	1.75	1.3	1.2	1.1	0.8	0.78	0.71	0.66	0.63	0.59

Cable construction

Designation	Inner conductor-Ø	Ø over dielectric	Ø over outer conductor	Outer- Ø	Weight nom.	Reference
	mm	mm	mm	mm	kg/km	
02YSWKH 4.8/12.1-50 blank FRNC	4.8	12.1	13.7	16.0	266	**V45466-B21-C36**

Flex*Line*® 1/2" S (FRNC)

Outer jacket
FRNC

Outer conductor
Copper-tape
longitudinal welded
spiral corrugated

Dielectric
foam PE with skin

Inner conductor
Copper-clad
aluminium wire

Application
Super flexible antenna cable for fixed installation on board commercial ships without constant exposure to oil, grease and other lubricants.

Marking
Sequential length in meters LEONI L *Flex*Line*® ½"S FRNC 50 Ω >FRNC.PE< (UL)Listed 3E03 Ω "internal order no." "month/year"

Approval
Customer approval.

More detailed information about the cables, connecting and installation material can be found in the special catalogue "Flex*Line*®".

Mechanical properties		
Temperature range	during operation	–55 °C to +85 °C
	during installation	–25 °C to +60 °C
Bending radius	during operation	1.1 x D
	during installation	2.15 x D

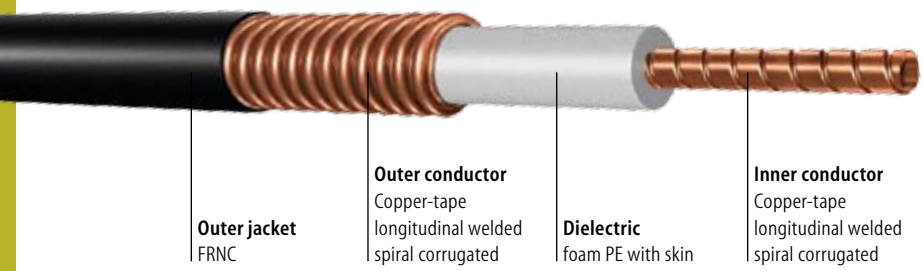
Burning characteristics
IEC 60332-3-24 (CAT C), IEC 60754-1 & -2, IEC 61034-1 & -2

Frequency [MHz]	100	450	800	900	1000	1800	1900	2200	2500	2700	3000
Attenuation [dB/100 m]	3.0	6.8	9.3	9.9	10.5	14.6	15.0	16.3	17.6	18.4	19.5
Typ. value at 40 °C [kW]	2.6	1.2	0.87	0.81	0.77	0.55	0.54	0.49	0.46	0.44	0.41

Cable construction

Designation	Inner conductor-Ø	Ø over dielectric	Ø over outer conductor	Outer- Ø	Weight nom.	Reference
	mm	mm	mm	mm	kg/km	
02YSWKH 3.9/9.1-50 ALCU FRNC	3.6	9.1	12.3	13.5	210	**L45466-B20-C6**

Flex*Line*® 7/8" S (FRNC)



Application
Super flexible antenna cable for fixed installation on board commercial ships without constant exposure to oil, grease and other lubricants.

Marking
Sequential length in meters LEONI L * Flex*Line*® 7/8" S FRNC 50 Ω "internal order no." "month/year"

Approval
Customer approval.

More detailed information about the cables, connecting and installation material can be found in the special catalogue "Flex*Line*®".

Mechanical properties		
Temperature range	during operation during installation	–55 °C to +85 °C –25 °C to +60 °C
Bending radius	during operation during installation	2.5 x D 3.75 x D

Burning characteristics
IEC 60332-3-24 (CAT C), IEC 60754-1 & -2

Frequency [MHz]	100	450	800	900	1000	1800	1900	2200	2500	2700	3000
Attenuation [dB/100 m]	1.3	2.8	3.9	4.1	4.4	6.2	6.3	6.9	7.4	7.7	8.2
Typ. value at 40 °C [kW]	7.2	3.1	2.2	2.0	1.9	1.35	1.3	1.17	1.08	1.02	0.96

Cable construction

Designation	Inner conductor-Ø	Ø over dielectric	Ø over outer conductor	Outer- Ø	Weight nom.	Reference
	mm	mm	mm	mm	kg/km	
02YSWKH 9.3/21.6-50FRNC	9.3	21.6	25.6	27.7	490	**L45466-B23-C56**

Customised Cables

Tailor-made hybrid cable solutions

For space and functionality reasons, it is often necessary to combine a wide variety of different design elements in a cable. This is a core competence of LEONI as an experienced manufacturer of special cables.

The following pages show examples of customised cable solutions…

LEONI provides a wide range of hybrid solutions for use on cargo ships, ferries, RO/RO vessels and cruise ships. They are designed and manufactured to the technical requirements of the following standards:

- **IEC 60092 Part 350**
- **IEC 60092 Part 351**
- **IEC 60092 Part 353**
- **IEC 60092 Part 359**
- **IEC 60092 Part 370**
- **IEC 60092 Part 373**
- **IEC 60092 Part 374**
- **IEC 60092 Part 375**
- **IEC 60092 Part 376**

Fire resistance requirements are met in accordance with customer demands (IEC 60332-1-x as well as 60332-3-x). Cable design and choice of materials will be done accordingly.

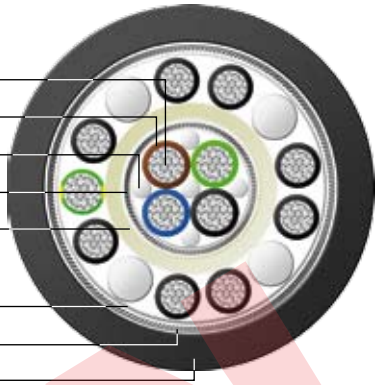
All cables can be made with the option of either SHF 1 (and cross-linked) or SHF 2 (cross-linked, oil-resistant) sheathing material.

The following components can be integrated in a hybrid cable:

- **power cores rated for voltage up to 0.6/1 kV**
- **control cores:**
  single, paired, triple or quadruple BUS elements
- **data cables up to CAT 7 transmission rates**
- **coaxial elements**
- **triaxial elements**
- **fiber optics**
- **media hoses**
- **served wire, braided and/or foil shielding**
- **intermediate jackets**
- **fillers and extruded filling compounds**
- **strain relief elements**

If required, these hybrid cables are tested and approved by approval bodies.

Wiper Cable



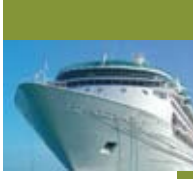
Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
LEONI L L-2X CH 1X4X0.75 (ST) (C) + 9X1X1.0 VZN FRNC 230V

Technical data		
Conductor resistance	≤ 26.7 Ω/km	at 0.75 mm²
	≤ 20.0 Ω/km	at 1.0 mm²
Insulation resistance	≥10 MΩ · km	
Testing voltage (core/core)	2000 V	at rms 50 Hz 1 min
Testing voltage (core/shield)	1000 V	at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation	**–40 °C** to **+90 °C**
	during installation	**0 °C** to **+50 °C**
Bending radius	during operation	7 x D
	during installation	4 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

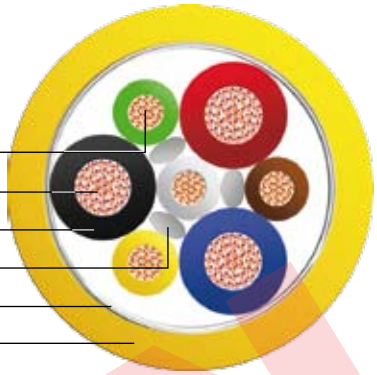
Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
L-2X(ST)C 1x4x0.75 + 2XCH 9x1x1.0 VZN FRNC	0.75 mm²: 1.7 mm 1.0 mm²: 1.8 mm	12.2	13.8	281	/ with figures 1 to 8	**L45551-W139-Y16**



Sprinkler Cable

Germanischer Lloyd



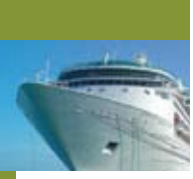
Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
L-HH (3x1x2,5)+(4x1x0,75) GE FRNC 60V IEC 60332-3-22
<<meter marking>>

Technical data		
Conductor resistance	≤ 26 Ω/km	at 0.75 mm²
	≤ 8 Ω/km	at 2.5 mm²
Insulation resistance	≥5 MΩ · km	
Operating voltage	max. 300 V	
Testing voltage (core/core)	1500 V	at rms 50Hz 1min
Mechanical properties		
Temperature range	during operation	**–25 °C** to **+70 °C**
	during installation	**–10 °C** to **+50 °C**
Bending radius	during operation	10 x D
	during installation	5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

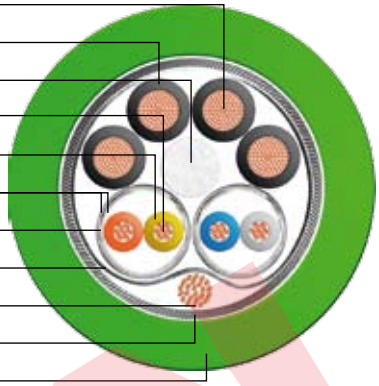
Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
LIH 3x1x2.5 + HH4x1x0.75 FRNC GE	0.75 mm²: 2.0 mm 2.5 mm²: 3.2 mm	9.8	10.4	170		**L45550-W79-Y6**



Ethernet-Link-Cable CAT 5e

Germanischer Lloyd



Application
Flexible installation on and below deck of commercial ships without constant exposure to oil, grease and other lubricants. The cables meet the technical requirements of IEC 60092-350, IEC 60029-351, IEC 60092-352, IEC 60092-353, IEC 60092-359, IEC 60092-370, IEC 60092-376.

Marking
Meter marking LEONI SeaLine EthernetLink-Cable GL32561-06HH

Near-end crosstalk attenuation

Frequency [MHz]	1	4	10	16	20	31.25	62.5	100
max. [dB–100 m]	65.3	56.3	50.3	47.2	45.8	42.9	38.4	35.3

Transmission properties

Frequency [MHz]	1	4	10	16	20	31.25	62.5	100
min. [dB–100 m]	2.1	4.0	6.3	8.0	9.0	11.4	16.5	21.3

Electrical properties acc. to EN 50288-2-1

Technical data	Data pairs 0.34 mm²	Power supply wires 1.5 mm²
Loop resistance	≤ 120 Ω/km	≤ 14 Ω/km
Transit time	≤ 4.4 ns/m	
Insulation resistance	≥ 500 MΩ · km	≥ 20 MΩ · km
Charac. impedance [1–100 MHz]	100 ± 15 Ω	
Testing voltage (core/core/shield)	700 V at rms 50 Hz 1 min	1000 V at rms 50 Hz 1 min
Mechanical properties		
Temperature range	during operation during installation	**–20 °C** to **+70 °C** **0 °C** to **+50 °C**
Bending radius	during operation during installation	10 x D 7.5 x D
Burning characteristics		
IEC 60332-1-2, IEC 60332-3-22, IEC 61034-2, IEC 60754-1 & -2, Def-St. 02-713, IEC 60695-7-1		

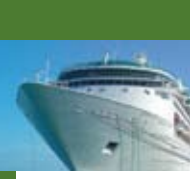
Cable construction

Designation	Core-Ø [mm]	Cable-Ø [mm]		Weight [kg/km]	Colour code	Reference
	nom.	min.	max.	nom.		
09YS(ST)C 2x2x0,75/1,5-100LI +LIH-ZCH 4x1x1,5 GN	0,34 mm²: 1,5 mm 1,5 mm²: 2,4 mm	12,9	13,4	281	□■/□■ ■ with figures 1 to 4	**L45467-J217-W16**

Everything from a Single Source

LEONI's wide range of products and services also includes products, suited particularly for use in ship-building and in marine engineering, that have stood the test of everyday use under tough conditions exceptionally well.

In particular, these include highly flexible wire ropes and copper strands as well as the range of perivox cables for the entertainment sector.



Round, Stranded Copper Flexibles (similar to DIN 46438)

Application
Earthed conductor in switch cabinets or between all metal components of ships.

Material
E-Cu/OF-Cu as well as Cu alloys;
bare, tin-plated, nickel-plated or silver-plated.

Packaging
On spools or drums.

Special variants
Highly twist-free and with a compact cutting surface. A special surface finish enables a variety of welding methods.

Direction of stranding

Reversed lay or **SZ** stranding

S ➔ left hand lay
Z ➔ right hand lay

E-Cu. OF-Cu: bare, tin-plated, nickel-plated, silver-plated

Nom. cross-section	Ø of wire	No. of wires Tol. ± 2 %	Overall-Ø	Net. Weight ±12 %
mm²	mm		approx. mm	approx. kg/km
0.06	0.05 ± 0.004	30	0.3	0.6
0.1		51	0.4	1
0.14		72	0.5	1.4
0.2		105	0.6	2
0.25		130	0.7	2.5
0.35		180	0.85	3.5
0.5		266	1	5
0.75		392	1.25	7.5
1		525	1.5	10
1.5	0.071 ± 0.004	385	1.75	15
2		525	2.1	20
2.5		651	2.4	25
3		798	2.6	30
4		1036	3	40
5.25		1372	3.5	53
6		1575	3.7	60
8		2058	4.2	80
10		2562	4.7	100
12		3108	5.2	120
16		4116	6.0	160
25	0.1 ± 0.004	3234	7.6	250
35		4508	9.0	350
50		6468	10.7	500
70		8967	12.7	700
95		12201	14.8	950
120		15435	18.0	1200
150		19110	20.0	1500
185		23580	21.0	1850
240		30600	24.9	2400
300		38200	26.0	3000
400		51000	30.0	4000
500		63700	33.0	5000
600		76430	36.5	6000

Braided Copper Tapes, flat rolled, flexible

(similar to DIN 46444)

Application
Earthed conductor in switch cabinets or between all metal components of ships.

Material
E-Cu, bare, tin-plated, nickel-plated or silver-plated.

Packaging
On spools or in coils.

Special variants
Upon request, individual dimensions can be varied slightly during the rolling process. Non standard dimensions may require design modifications.

All types can be supplied in non-rolled form as multiple tubes and for screening.

E-Cu. OF-Cu: bare, tin-plated, nickel-plated, silver-plated

Nom. cross-section	Dimensions width ± 5 % x thickness ✖	Construction	Ø of wire	Net. weight
mm²	mm		mm	approx. kg/km
0.09	1 x 0.2	16 x 3	0.05 ± 0.004	0.9
0.16	1.2 x 0.2	16 x 5		1.6
0.25	1.6 x 0.2	16 x 8		2.5
0.5	2.5 x 0.4	16 x 16		5.0
0.75	2.7 x 0.5	16 x 24		7.5
1	3.2 x 0.7	16 x 32		10
1.5	4 x 0.8	16 x 25	0.071 ± 0.004	15
2	5 x 0.8	16 x 33		20
2.5	5.8 x 0.8	24 x 27		25
3	7.5 x 0.9	24 x 33		30
4	8.2 x 1	24 x 43		40
6	10 x 1.3	24 x 66		60
8	12.3 x 1.5	24 x 88		80
10	14 x 1.5	24 x 109		100
16	17.5 x 2	24 x 85	0.1 ± 0.004	160
25	22 x 2.5	24 x 135		250
35	30 x 2.5	36 x 124		350
50	33 x 3.2	48 x 133		500
70	45 x 3.5	48 x 186		700
95	50 x 4	48 x 253		950
120	60 x 4	48 x 319		1200
140	60 x 4.5	48 x 372		1400
150	65 x 5	48 x 399		1500
168	70 x 5	48 x 446		1680
185	75 x 5	48 x 491		1850
240	80 x 6.5	48 x 637		2400
250	80 x 7	48 x 664		2500
300	90 x 7	48 x 797		3000
400	100 x 8.5	48 x 1062		4000

✖ max. 25 % below nominal value.

Assemblies / Finishing

Application
Earthed conductor in switch cabinets or between all metal components of ships.

Cross-sectional area range
0,5 – 1000 mm²

Assembling
In order to provide as much as help as possible with the processing and fitting of our copper flexibles and copper straps, we have developed techniques of finishing the end in such a way that the flexibles and straps can be easily connected and the electrical contact resistance at the connection points is kept as low as possible.

We shall be pleased to advise you about the optimum design of the corresponding connection points.

perivox®

LEONI's brand of premium entertainment cables

perivox cables, LEONI's brand of premium entertainment cables, are developed and made in Germany. Use of trusted quality materials and a sophisticated cable design guarantee "Made in Germany" products of the highest quality.

Under the perivox brand, LEONI offers a wide range of cables for audio/video, multimedia and stage equipment for example on cruise ships and ferries:

- **modulation cables**
- **microphone cables**
- **loudspeaker cables**
- **switch and signal cables**
- **video cables**
- **coaxial and multi-coaxial cables**
- **combination cables**
- **customised assemblies**

Related accessories such as connectors, anti-kink sleeves and crimping tools round off our range.

You will find more information on our website **www.perivox.com** or in the dedicated **perivox catalogue.**

perivox®
BROADCASTING CABLES

Assembled cables & cable systems

All-in solutions from a single source

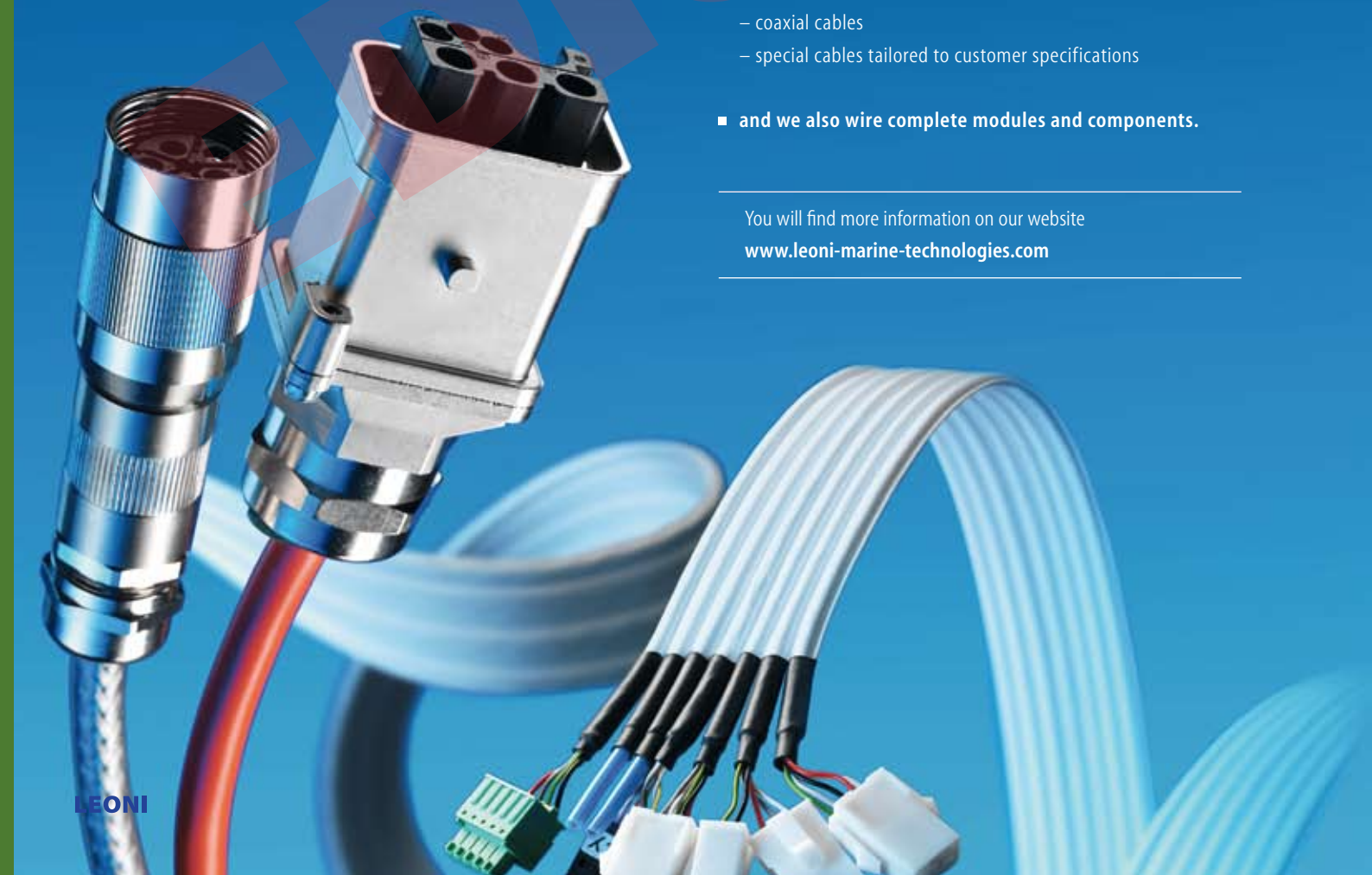
The LEONI group and of instance the Marine Technologies business unit provide measurable benefits with ready-to-fit cables and system solutions.

Close cooperation with our customers include not only precise analysis of the cable installation and the operating conditiions but also the choice of suitable copmonents and the optimisation of the existing solution. We do also prototyping and series production. We invite you to benefit from our long term experience to find the best solution for your application.

Of course we carefully record everything we do. We prepare all the required documentation and, as required, also apply for the approvals from the classification companies.

- **Among other products, we assemble**
  - round and ribbon cables
  - data cables
  - coaxial cables
  - special cables tailored to customer specifications
- **and we also wire complete modules and components.**

You will find more information on our website
www.leoni-marine-technologies.com



Social Charter

Many of our customers purchasing worldwide emphasise on their suppliers being companies with social responsibility. Child labour is an absolute taboo! LEONI can be considered exemplary especially in this matter.

The Group therefore, considering its international focus and more than 60 facilities around the world, in April 2003 issued a "Declaration on Social Rights and Industrial Relations" signed by the management board of LEONI AG, the chair of the LEONI Euro Works Council and the secretary general of the International Metalworkers' Federation (IMF), which covers matters like equal treatment of all employees and child labour. This declaration is binding on all LEONI employees.

With respect to child labour, Section 1.5 states the following: Child labour is prohibited. The minimum age for employment eligibility in line with the respective government stipulations shall be observed. Health and safety shall not be compromised. Personal dignity shall be respected. (We would be pleased to send you the full text of our Social Charter upon request).

LEONI Marine Technologies – Worldwide

Proximity to the customer is a key element of our corporate philosophy.

This is the reason why you will find LEONI close to you wherever you are.

Please don´t hesitate to make use of our strong distribution network.

Distribution network

Europe
Germany
France
UK
Switzerland
Spain
Turkey

North America
USA
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Asia
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