

GigaLine® cabling systems in FO
for DataCenter · Office · Industry

The Quality Connection

LEONI



GigaLine® Cabling Systems

Whenever broadband data transmission in combination with large transmission lengths in LAN or MAN is required, fiber optic cable and connection technology is the best choice.

With GigaLine® fiber optic cables and GigaLine® FO connectivity, LEONI offers high-speed data motorways for backbone networks.

LEONI products and solutions are used wherever the highest reliability, quality and durability are a must – even in harsh and unfavourable conditions.

Welcome to the megastore for cable and sys- tem solutions

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All necessary planning documentation available online:
www.leoni-data.com
Subject to technical modifications, misprints and errors.

Safety instructions
Cables are to be used for the designated applications only.

Waiver
The specifications in this document are provided according to our best current knowledge. However, these specifications may not be considered an assurance of specific properties or suitability for specific purposes of the respective products. Such indications may not be interpreted as a misguidance for the violation of property rights or as an assurance of a corresponding license. The suitability of each product for any particular purpose must be checked beforehand with our specialists. Our policy is to continuously improve our materials and products. Therefore, we reserve the right to offer alternatives consistent with our manufacturing programme at the time of enquiry.
All information concerning material properties, fire performance, construction, electrical and technical data, prices etc. reflects our current level of knowledge and is provided on a non-binding basis. Dimensions and weights are indicative only. All specifications can be changed at any time without prior notification.

General conditions of sale and delivery
We refer to the currently valid General Conditions of Sale and Delivery which can be obtained from the respective companies.

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Keeping you connected tomorrow

Business Unit Datacom

LEONI's Business Unit Datacom ensures first-class, reliable data cabling in buildings and data centers. Numerous innovations and developments of today are already setting the standards of tomorrow.

Copper and fiber optic cabling combined with specifically adapted system technology create data networks that maximise the operational performance of our customers. By always keeping the benefit and value for our customers in mind, we create solutions that facilitate next-generation technology migrations.

As globalisation, urbanisation and networking continue to expand, the technical requirements for materials, manufacturing processes and logistics grow more demanding. Last but not least, project cost pressures are also increasing. Cost-saving potential is tapped into throughout the entire planning and implementation process. and the sooner this

is incorporated into the process, the greater the volume of potential savings. LEONI is your partner here, helping to achieve optimisation from the earliest project phases such as planning, through to implementation and commissioning.

Put your trust in the best partner to suit your needs. Cabling, connectivity and complete cabling solutions from a single source – for investors, integrators, designers, installers and dealers.

This includes copper and fiber optic system solutions supplemented with LEONI-branded halogen-free energy cables.

Continuous innovations in safety, environmental compatibility and energy efficiency complete the list of customer benefits. Offering on-site consultations and a wealth of experience, LEONI is your internationally-recognised project partner.

For further information, see www.leoni-data.com



Great brands, great service

Rely on the best partner to meet your needs

Our commitment to developing innovative products proves our dedication to our responsibility. In conjunction with our consulting services, we establish trust as we help our partners accomplish maximum safety for people and infrastructure.

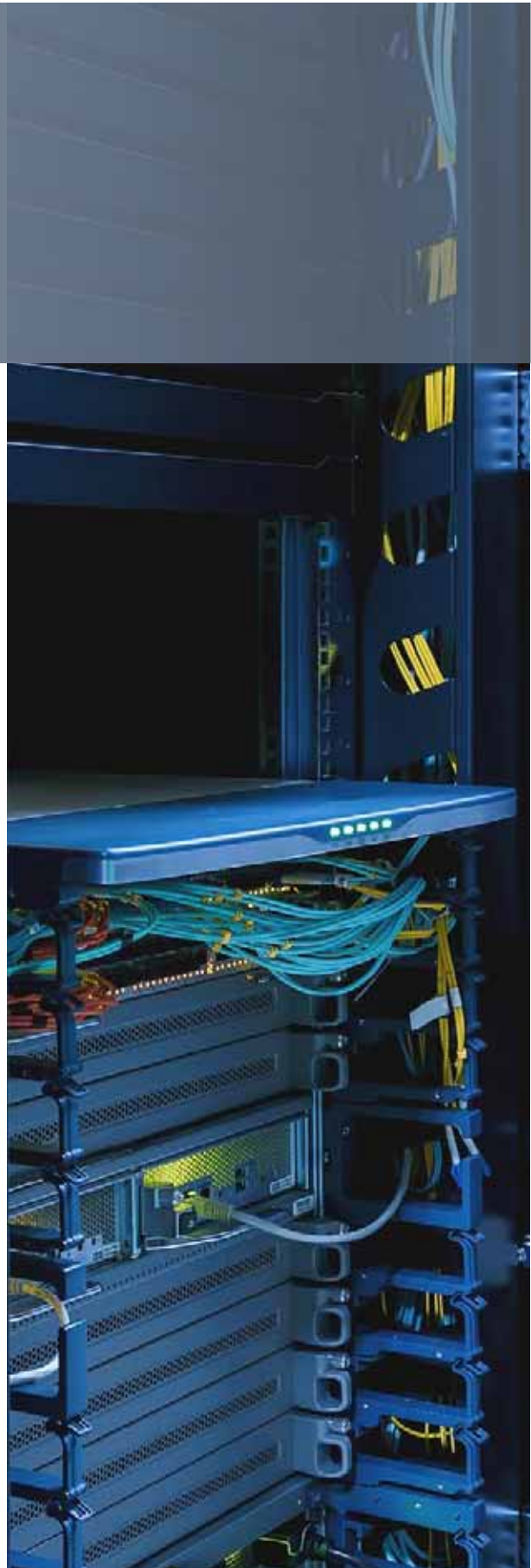
Installers and retail receive their cabling, connectivity and complete cabling solutions from a single source. This includes system solutions in copper, aluminium and fiber optic technology as well as halogen-free energy cables with or without circuit integrity. Continuous innovations in safety, environmental compatibility and energy efficiency complete the list of customer benefits.

A global presence and consulting on site during all stages of a project as well as extensive experience gained from numerous projects and far-reaching synergies inside and outside the LEONI Group make us one of the most highly regarded partners in the field of building and infrastructure cabling at the international level.

Datacom – for maximum data integrity and bandwidth

From the very beginning of the digital data era, we have fulfilled data networking requirements for both the short term and the far future by using great innovation and a forward-looking approach. The profound expertise of the Datacom Business Unit in copper and fiber optical cabling technologies represents a powerful advantage in structured cabling for industry, data centers and offices – the sustainable copper and glass fiber cables produced by us are among the safest and most innovative products in the primary to tertiary cabling market.

- **MegaLine®**
copper cables and passive system components
- **GigaLine®**
fiber optic cables and passive system components
- **VarioLine®**
modular system periphery



Green Technology

Combining innovation with sustainability is one of our central company goals.



Our vision is to create sustainable connections in technological harmony with the natural resources. The cycle of nature gives us the best model to emulate. It is our responsibility to learn from nature and make use of it while conserving it and treating it with care. The growing scarcity of the natural resources and the increasing burden on the environment require a rethink at all levels of society. For LEONI, sustainability is an integral part of group policy. We were the first cable manufacturer in the world to develop an integrated Green Technology programme.

While trends such as globalisation, mobility and urbanisation are crucial for market movements, our core principles are sustainability and global responsibility. This is why we have set ourselves the goal of becoming an innovative producer of cables for ecotechnology. Other points of vital interest to us are to detect the needs and requirements of tomorrow today and to supply the markets of the future with sustainable, future-proof solutions. We also view it as our responsibility to take an active role in shaping the markets for environmentally friendly energy production – such as solar thermal technology.

Green Technology is the resource-conserving and low-emission production of sustainable quality cables made with low-pollution elements. We constantly work to optimise the efficiency

with which resources are used in the manufacturing process by deploying energy-efficient machines or implementing heat recovery measures. More and more locations in our global production network are environmentally certified according to the ISO 14001 standard.

In our worldwide operations as a leading European supplier of wires, optical fiber, cables and cable systems for communication and infrastructure projects, it is our responsibility to continuously optimise the sustainability and durability of our products, system solutions and services so as to reduce their impact on the environment. Our aim is to increase the volume of environmentally compatible raw materials in our cable products as well as the recyclability of processed materials or components, thereby creating end products that are developed to meet the environmental standards of the future.

In conjunction with ecological compatibility, future technologies are measured in terms of efficiency, service life, emissions reduction and the conservation of natural resources. Innovative cable products and systems, holistic solutions and maximum performance in project management are the added value which we offer to our customers and business partners. These are also our cornerstones for strong connections into the future.



There are various environmental directives in the European Union (EU). Directive 2012/19/EU WEEE (Waste Electrical and Electronic Equipment) regulates the disposal of electrical and electronic equipment and components. The use of certain hazardous materials in electrical and electronic devices is defined by Directive 2011/65/EURoHS 2 (Restriction of Hazardous Substances). Chemicals and materials in general are regulated by the law on chemical substances 1907/2006/EC REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals).

This means avoiding the following substances, among others:

- Polybrominated diphenyl ether (PBDE)
- Decabromodiphenyl ether (DecaBDE)
- Perfluorooctane sulfonate (PFOS)
- Pentabromodiphenyl ether (PentaBDE)
- Octabromodiphenyl ether (OctaBDE)
- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent chromium (Cr VI)
- Polybrominated biphenyls (PBB)



Cables and conductors and their associated connectors are only affected by Directive 2012/19/EU WEEE where they are an internal part of the equipment and components listed.

Cables and conductors are regulated separately in 2011/65/EU RoHS 2 since 2013 (category 11 or defined as an internal component of the respective product). This does not pertain to optical fiber cables, energy cables (> 250 V) and cables with fixed installation, e.g. in buildings. The only identification permissible according to RoHS 2 is the CE mark, which is printed on the product package.

EU Directive 2012/19/EU on waste electrical and electronic equipment.

EU Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

EU Regulation 1907/2006/EC (REACH) – the EU chemicals regulation.



REACH

What does REACH mean?

REACH stands for Registration, Evaluation, Authorisation and Restriction of Chemicals.

REACH represents a fundamental harmonisation and simplification of previous chemicals law and applies in all EU Member States.

REACH introduced a so-called candidate list for substances of very high concern (SVHC), which are subject to certain information obligations and should be substituted in the long term. The list of candidate substances is updated twice yearly by the European Chemicals Agency (ECHA) in Helsinki.

Fire protection cable in accordance with the EU Construction Products Regulation

Maximum safety with B2_{ca} cables by LEONI

**Fire provides heat, light and
a comforting sense of security.**

**But it can also be potentially fatal
and result in horrific devastation.**



Safety in the event of a fire

Where fires occur



One-third of all fires occur in buildings. Numerous deaths due to gas and smoke poisoning are the consequence. The average length of time from the development of a fire until the rollover (pyrolysis gases) has decreased drastically in recent years.

- 1950: 15 minutes
- 1985: 5 minutes
- 2010: 3 minutes



As a result, the available time for a possible escape from the building has also been drastically reduced.

This situation has prompted construction material manufacturers to produce increasingly better and more flame-retardant products.



Fire safety of cable systems

Save lives, impede fires, minimise consequential damage



Saving lives, impeding fires and minimising consequential damages are the priorities when fires break out. Electrical and optical cables must also do their part – cable density in modern buildings is constantly increasing. How can cable contribute to a positive behaviour in the event of a fire and/or what dangers are posed by obsolete, insufficiently fire-resistant cables? These questions can be assigned to three categories:

1. The cable must not make a significant contribution to fire propagation. In particular, it must not propagate the fire from one storey to the next. It must also be ensured that there are no droplets and particles that contribute to fire propagation.

2. Smoke and toxic gases must be avoided, because they make safe building evacuation and impede the efforts of rescue or make them impossible. Most cases of death in the event of a fire can be traced to smoke and toxic gases, not to the fire itself. Therefore, this aspect should actually be given top priority.

3. The rebuilding phase comes after the fire. This is complicated when large quantities of corrosive combustion gases have developed from the fire, because these gases build corrosive acids (e.g. hydrochloric acid) when combined with extinguishing water. Such acids are finely dispersed well beyond the location of the fire throughout the entire building, causing damage to all metallic objects. Potential examples include: structural steel, metal constructions, electrical installations, electronics and IT systems.

Saving lives

Impeding fires

Minimising consequential damages

These three requirements have been incorporated in the fire classification of the new EU Construction Products Regulation.

CE marking and declaration of performance

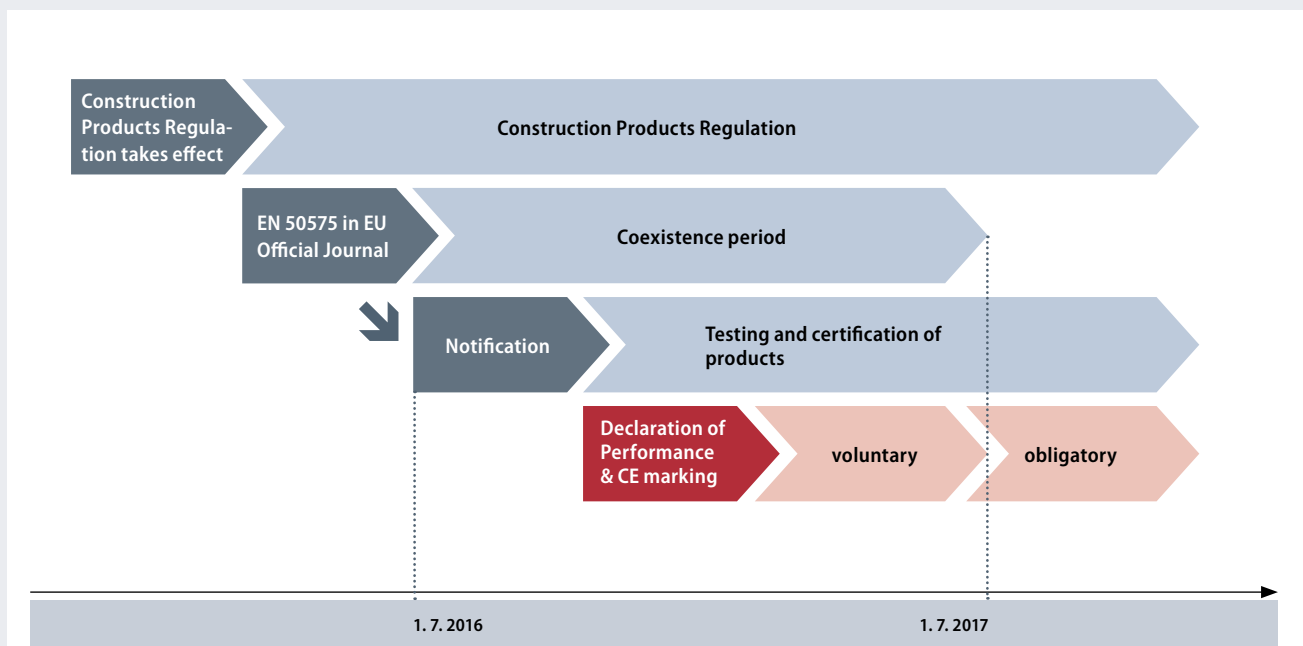
EU Construction Products Regulation

Power, control and communication cables that are permanently installed in structures fall under EU Regulation 305/2011 (Construction Products Regulation). Excluded from this: lift cables, cables inside machinery and cables for use in industrial plants.

The EU Construction Products Regulation defines the conditions for the CE marking and requires a declaration of performance of the manufacturer on the following essential product features derived from the protective goals: fire safety (flame propagation, heat development, smoke production, acid formation, flaming droplets) and the absence of harmful substances. In addition, the Construction Products Regulation specifies how conformity with the requirements is permanently ensured.

With the publication of the harmonised standard EN 50575:2014 in the Official Journal of the European Union, the requirement for implementation of the Construction Products Regulation has now been established for all market participants. This standard describes: 'Power, control and communication cables, cables for general applications in construction works terms of fire behaviour requirements'. Effective 1 July 2016, a cable manufacturer must provide a CE marking on products that have been tested and certified by a notified body and issue a corresponding Declaration of Performance.

After expiry of the coexistence period, which is one year, the CE marking and creation of a Declaration of Performance are mandatory.



The Declaration of Performance certifies compliance with the fire classes defined below and is thus a requirement for use of the cable for the applications defined by the EU Member States.

Comment: Cables with circuit and system integrity (resistance to fire) are handled separately in a different standard to be harmonised in the future. Therefore, they are not the subject of the current implementation of the Construction Products Regulation. Application of the Construction Products Regulation for these cables is not expected prior to 2017.

Fire classifications and proof of conformity

EU Construction Products Regulation

The classes of fire response are shown in the following table, with a classification of requirements ranging from A_{ca} (non-flammable) and B1_{ca} or B2_{ca} (very high) to C_{ca} (high),

D_{ca} (moderate), E_{ca} (low) and F_{ca} (no requirement).

This classification from A to F generally applies to all construction products. The index 'ca' stands for cable.

Classes of fire behaviour of electrical cabins according to DIN EN 13501-6

Classification								
Test method	Parameter	A _{ca}	B1 _{ca}	B2 _{ca}	C _{ca}	D _{ca}	E _{ca}	F _{ca}
EN ISO 1716	PCS (MJ/kg)	≤ 2.0	–	–	–	–	–	–
EN 60332-1	H (mm)	–	≤ 425	≤ 425	≤ 425	≤ 425	≤ 425	–
EN 50399	Flame source (kW)	–	30	20.5	20.5	20.5	–	–
EN 50399	FS (m)	–	≤ 1.75	≤ 1.5	≤ 2.0	–	–	–
EN 50399	THR (MJ)	–	≤ 10	≤ 15	≤ 30	≤ 70	–	–
EN 50399	max. HRR (kW)	–	≤ 20	≤ 30	≤ 60	≤ 400	–	–
EN 50399	FIGRA (W/s)	–	≤ 120	≤ 150	≤ 300	≤ 1300	–	–
Additional classification								
EN 50399/EN 61034	Smoke development	–	s1, s1a, s1b, s2, s3	s1, s1a, s1b, s2, s3	s1, s1a, s1b, s2, s3	s1, s1a, s1b, s2, s3	no	no
EN 60754 -2	Corrosiveness	–	a1, a2, a3	a1, a2, a3	a1, a2, a3	a1, a2, a3	no	no
EN 50399	Burning droplets	–	d0, d1, d2	d0, d1, d2	d0, d1, d2	d0, d1, d2	no	no

H: Flame Spread, vertical flame propagation (mm)

FS: Flame Spread, vertical flame propagation (m)

PCS: Pouvoir Calorifique Supérieur, gross calorific value

THR: Total Heat Release (MJ)

HRR: Heat Release Rate, maximum heat release rate (kW)

FIGRA: Fire Growth Rate, index of heat release rate (W/s)

TSP: Total Smoke Production, (m²)

SPR: Smoke Production Rate, max. (m²/s)

Explanation

s1 = TSP ≤ 50 m² and max. SPR ≤ 0.25 m²/s

s1a = **s1** and transmission value according to EN 61034-2 ≥ 80 %

s1b = **s1** and transmission value according to EN 61034-2 ≥ 60 % < 80 %

s2 = TSP ≤ 400 m² and max. SPR ≤ 1.5 m²/s

s3 = neither s1 nor s2

d0 = no flaming droplets/particles

d1 = no flaming droplets/particles for longer than 10 s

d2 = neither d0 nor d1

EN 60754-2:

a1 = electrical conductivity < 2.5 µS/mm and pH value > 4.3

a2 = electrical conductivity < 10 µS/mm and pH value > 4.3

a3 = neither a1 nor a2. No data = no performance determined.

Conformity monitoring is also set out in detail in the Construction Products Regulation and defined by EN 50575.

The following is a simplified summary of the obligations for the notified approval body and the manufacturer:

Class of fire behaviour	A _{ca}	B1 _{ca}	B2 _{ca}	C _{ca}	D _{ca}	E _{ca}	F _{ca}
System of conformity monitoring	1+				3		4
Obligations of the notified body	Sample testing and recurring factory auditing with random sampling				Sample testing		–
Obligations of the manufacturer	Production monitoring				Production monitoring		–

Overview of fire testing

These are the goals when using safety cables.

1. >> **Save lives**
2. >> **Impede fires**
3. >> **Minimise consequential damage**

The fire test according to EN 50399 covers Goals 1 and 2 because reduced fire propagation, smoke and flaming droplets make an essential contribution to fire safety.

The cables (number used dependent on cable diameter) are mounted onto a ladder in a vertical tube furnace and a flame is applied to them for 20 minutes using an air gas burner (20.5 kW / 30 kW). The flue gases are collected with a defined air current (nominal value 8000 l/min) and conducted into an exhaust air duct in which the speed of the air current, the oxygen and CO₂ content, the light absorption and the temperature are measured. This allows the above values to be determined. As many parameters differ from those occurring in the test according to IEC 60332-3, the results cannot be transferred. In particular, the installation of the cable with the distance and elevated air current make the fire scenario more demanding than in IEC 60332-3.

The test according to EN 50399 clearly demonstrates the difference between a cable with high fire safety (below) and a cable of lower quality. The fire propagation, smoke and flaming droplets can be clearly seen (above).

Fire classes according to the Construction Products Regulation

Cables for energy, control and communication. The fire performance of power, control and communication cables for fixed installation in buildings is analysed and classified according to EU Regulation 305/2011. For this purpose, the heat release and the flame spread are measured via the above test method according to EN 50399 and evaluated in order to classify the cables according to the relevant fire class. The cables can also achieve additional classification according to the Construction Products Regulation if smoke production, flaming droplets and acidity are determined.

The test according to EN 50399 allows flame propagation, heat release, smoke production and flaming droplets/particles to be determined.



The majority of the parameters required for cables in the Construction Products Regulation are determined by means of the test according to EN 50399.

A heavily burning cable with increased smoke and flaming droplets/particles.



A cable that meets the requirements of B2_{ca} s1 d1 a1.



The 4 m high fire cabin according to EN 50399, in which the cables are installed vertically on a ladder.

Smoke production in the test according to EN 61034: this fire test was carried out with a heavily smoking cable.



Smoke production in the test according to EN 61034: This fire test was carried out on a cable that meets the requirements.



Flame test on individual cable according to EN 60332-1, the basic requirement.



Smoke production is subject to especially strict evaluation in the test according to EN 61034.

Reduced smoke generation is a key factor in meeting Objective 1 when evacuating buildings with a high density of people and difficult evacuation conditions.

Evaluation of corrosiveness and acidity (EN 50267) is important not just in order to avoid the damage resulting from corrosion (Objective 3), but also to avoid their toxic effect on people attempting to escape in the event of a fire (Objective 2).

The flame test on a single cable according to EN 60332-1 provides the basis for less demanding requirements.

These objectives are met by the Construction Products Regulation in that the safety levels defined by the fire tests are applied in relation to the building in question. The German Electrical and Electronic Manufacturers' Association (ZVEI) has drafted a proposal for the effective application of these safety levels. This is presented below and on the following pages.



Corrosiveness is assessed in accordance with EN 50267 by means of a chemical analysis of the combustion gases.

Depending on the safety requirement in buildings, the ZVEI recommends the use of fire protection cables. The use of class B_{2ca} cables is effective in buildings with very high safety requirements, while the use of class C_{ca} cables makes sense in buildings with high safety requirements. A recommendation for the building classification according to the German Model Building Code (MBO) was also drafted on this basis. Finally, these recommendations are also being incorporated in new versions of installation requirements for energy and communications cabling (DIN EN 50174 Part 1-3, DIN VDE 0100-520 and DIN VDE 0100-420).

Cable types with Euroclass B2_{ca} s1a d1 a1

Overview of the areas of application

Recommendation of the ZVEI for the fire classes to be applied for cable under the Construction Products Regulation

Fire classes				Safety requirements in buildings
Flame propagation Heat development	Smoke development / density	Flaming droplets	Acid formation / corrosiveness	
A _{ca}	–	–	–	Very high
B1 _{ca}	–	–	–	Very high
B2 _{ca}	s1	d1	a1	Very high
C _{ca}	s1	d1	a1	High
D _{ca}	s2	d2	a1	Moderate
E _{ca}	–	–	–	Low
F _{ca}	–	–	–	None

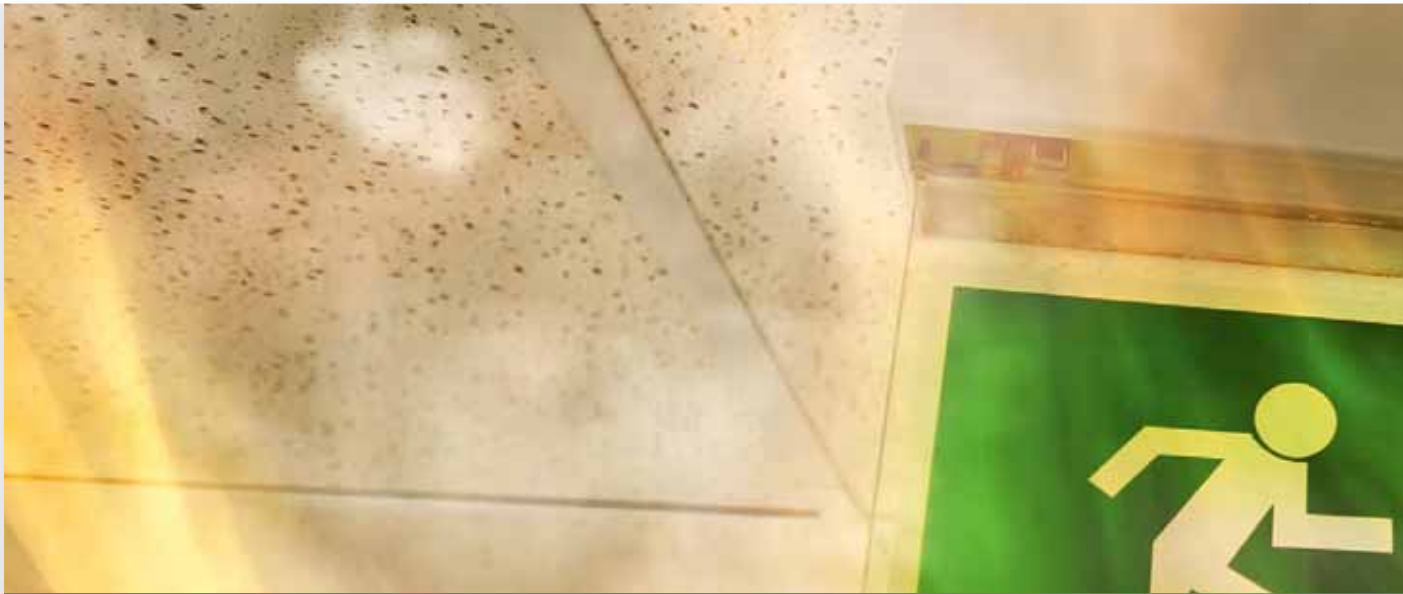
Proposal of the ZVEI for building classification

Building classes according to the German Model Building Code				ZVEI proposal	
Class	Description			Minimum requirement	
				Building (except escape route)	Escape route
1	Free-standing buildings and free-standing buildings used for agricultural or forestry purposes	up to 7 m high	with a total surface area or no more than 400 m ²	E _{ca}	–
2	Building	up to 7 m high	with a total surface area or no more than 400 m ²	E _{ca}	–
3	Other buildings	up to 7 m high	–	E _{ca}	B2 _{ca} s1 d1 a1
4	Other buildings	up to 13 m high	up to n × 400 m ²	E _{ca}	B2 _{ca} s1 d1 a1
5	Other buildings including underground buildings	–	–	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1

Special structures			ZVEI proposal	
S1	High-rise buildings	Higher than 22 m	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S2	Construction systems	Higher than 30 m	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S3	Buildings	more than 1600 m ² largest storey, excluding residential buildings and garages	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S4	Retail buildings	larger than 800 m ²	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S5	Office/administration	rooms larger than 400 m ²	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S6	Building with rooms	individual rooms – use by more than 100 persons	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S7	Assembly buildings	more than 200 persons	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S8	Restaurants/hotels	more than 40 guests in buildings, more than 12 beds, amusement halls larger than 150 m ²	C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S9	Buildings with units for care or dependants	more than 6 persons, intensive care requirement	B2 _{ca} s1 d1 a1	B2 _{ca} s1 d1 a1
S10	Hospitals		B2 _{ca} s1 d1 a1	B2 _{ca} s1 d1 a1
S11	Other facilities for accommodation of persons also residential homes		C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S12	Day care facilities for children, disabled and elderly persons		B2 _{ca} s1 d1 a1	B2 _{ca} s1 d1 a1
S13	Schools, universities and similar facilities		C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S14	Correctional facilities / involuntary treatment		C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S16	Leisure / amusement parks		C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
S18	Warehouse with top edge of loaded goods higher than 7.5 m		E _{ca}	B2 _{ca} s1 d1 a1
S19	Construction systems for storage of materials with an increased risk of fire		B2 _{ca} s1 d1 a1	B2 _{ca} s1 d1 a1

Additional specified structures		ZVEI proposal	
Industry		C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1
Server rooms		B2 _{ca} s1 d1 a1	B2 _{ca} s1 d1 a1
Road tunnels		B2 _{ca} s1 d1 a1	B2 _{ca} s1 d1 a1
Railway tunnels		B2 _{ca} s1 d1 a1	B2 _{ca} s1 d1 a1
Underground garages		C _{ca} s1 d2 a1	B2 _{ca} s1 d1 a1

On the safe side with LEONI



LEONI has been one of the world's leading providers of safety cables for many years. Whether infrastructure, energy, data or communication cables:

LEONI offers the best cable technology that is currently available for fire protection.

In addition to standard cables corresponding to the new fire classes D_{ca} and E_{ca}, LEONI also provides fire class B2_{ca} cables. Euroclass B2_{ca} s1 d1 a1 fire-resistant cables offer increased safety due to:

- **Reduced fire propagation**
- **Reduced heat development**
- **Low smoke density**
- **Low acid production**
- **Reduced droplet formation**

The quality of these cable products is assured by:

- **Conformity verification 1+**
- **Declaration of Performance**
- **CE mark**



B2_{ca}

B2_{ca}

C_{ca}

Sheath colour code for FO cables

The sheath colour of GigaLine® cables indicates the fiber category and shows its transmission properties.

As such, a marking or distinction between fire classes cannot be indicated by a sheath colour code.

Examples:

GigaLine® I-B(ZN)BH central B2_{ca}

GigaLine® I-B(ZN)BH stranded B2_{ca}

GigaLine® I-B(ZN)BH stranded C_{ca}



GigaLine®
FO data cables

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	GigaLine® indoor cable, central	KL-I-B(ZN)BH 1 x n G/E	Class B2 _{ca}	31
	GigaLine® indoor cable, stranded	KL-I-B(ZN)BH n x m G/E	Class B2 _{ca}	32
	GigaLine® indoor cable, stranded	KL-I-B(ZN)BH n x m G/E	Class C _{ca}	33
	GigaLine® universal cable, central 2500 N	KL-U-DQ(ZN)BH 1xn G/E	Class D _{ca}	34
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	GigaLine® outdoor cable, central 1750 N	KL-A-DQ(ZN)B2Y 1xn G/E		40
	GigaLine® outdoor cable, stranded 4000 N	KL-A-DQ(ZN)B2Y nxm G/E		41
	Office cables			
	Data center cables			
	Industrial cables			

GigaLine® FO data cables

The fiber

The steady increase in internet and intranet traffic, multi-media applications and the establishment of central storage networks (SAN or Storage Area Networks) in companies have fundamentally changed the traffic and load distribution in networks. New media require new, more powerful passive network infrastructures.

LEONI offers a future-proof cabling system with reserves well beyond those stipulated in the standards.



The right fiber

LEONI offers a comprehensive range of optical fibers tailored to the various network requirements such as future-proof high-performance transmission in data centers, reliable office networks and stable industrial networks .

Made in Germany → j-BendAble fibers are manufactured by the LEONI subsidiary j-fiber GmbH in Jena – Germany's only specialists for fiber production.

The optimum multi-mode fiber for every application:

	OM2	OM1 OM2e OM3	OM1 OM2e OM4	OM1 OM2e OM5
LAN Datacenter				
LAN Office				
LAN Industry				

j-BendAble OM3 for 10 GbE networks

The sophisticated IT cabling in data centers and office buildings, with a 10 Gigabit Ethernet compatible network, is based on the laser-optimised j-BendAble OM3 fiber.

j-BendAble OM4 – future-proof without compromise

The j-BendAble OM4 multi-mode fiber meets the requirements of the OM4 standard for the serial transmission of 10 Gbit/s and 25 Gbit/s with an EMB of 4,700 MHz x km over 550 m. The fiber has been optimised for applications with 850 nm VCSEL and offers the possibility of use at higher transmission rates such as 40 Gbit/s or 100 Gbit/s going into the future. j-BendAble OM4 is the first choice when it comes to speed and high data rates.



OM5 – The new multi-mode fiber generation

100 Gbit/s over one fiber or one fiber pair with SWDM

The new multi-mode fiber OM5 opens up a whole new range of possibilities to increase data rates.

100 Gbit/s can be transmitted using the well-established LC connector technology over one fiber, for example.

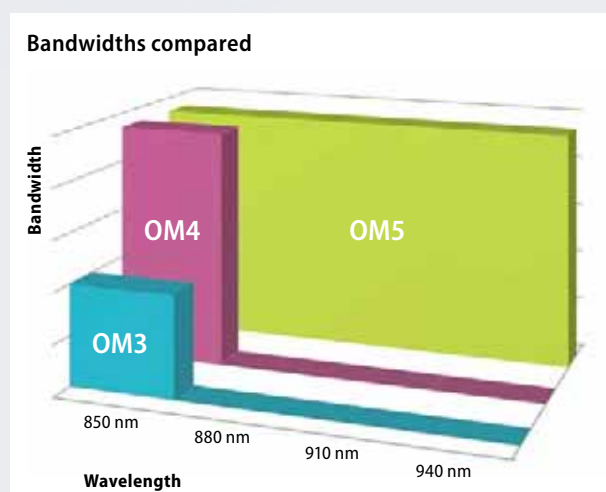
What is an OM5 fiber?

OM5 is not simply a better version of OM4. OM5 is a broadband multi-mode fiber with usable optical properties up to 953 nm. The optical and mechanical specifications are the same as those of OM4, with additional specifications of effective modal bandwidth (EMB) and attenuation at 953 nm. OM5 is designed for operation with VCSEL transmitters across the entire wavelength range from 846 nm to 953 nm.

What is the difference between OM5 and OM4?

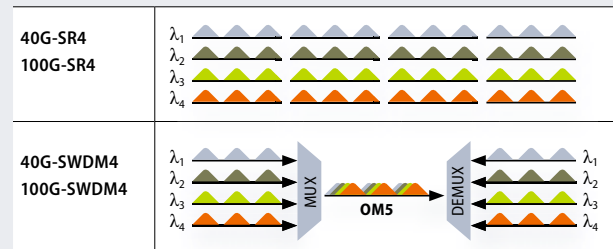
- Geometrically and mechanically the same as OM4
- Attenuation and bandwidth at 850 nm and 1300 nm, additionally specified at 953 nm
- EMB at 850 nm, additionally specified at 953 nm
- More rigorous values for chromatic dispersion
- Full backward compatibility with OM3 and OM4

➤ All the benefits of OM4 and comparable properties even at higher wavelengths



What are the advantages of the OM5 fiber?

This can be used for SWDM systems (Shortwave Wavelength Division Multiplexing). Based on low-cost VCSELs, this technology can be used with an OM5 fiber for parallel transmission of four wavelengths with up to 25 Gbit/s on a single fiber. This means that 100 Gbit/s can be transmitted on one fiber pair instead of eight (2x4) fibers, for example.



What colour are the OM5 cables?

In February 2017, TIA TR-42 defined lime green as the outer sheath colour for OM5 cables.

What applications are conceivable in the future?

SWDM and OM5 technology opens a whole range of unprecedented possibilities. For example, systems up to 400 Gbit/s are possible with the already commonly available 12/8-fiber MPO technology. What is more, this paves the way for the next generations, e.g. 1.6 Tbit/s with 2x16 fibers.

Overview of technical specifications

OM5 fiber, bend-insensitive G50/125 2.5B3500/0.7F500 j-BendAble complies with IEC 60793-2-10 type A1a.4b and ITU G651.1		
	Optical fiber G50/125 µm	
Construction	Fiber core	Ø 50 µm ± 2.5 µm
	Cladding	Ø 125 µm ± 1 µm
	Primary coating	Ø 242 µm ± 7 µm
Attenuation coefficient	at 850 nm	2.3 dB/km (unwired) 2.5 dB/km (wired)
	at 953 nm	1.7 dB/km (unwired) 1.8 dB/km (wired)
	at 1,300 nm	0.6 dB/km (unwired) 0.7 dB/km (wired)
Bandwidth	at 850 nm	min. 3500 MHz x km
	at 953 nm	min. 1850 MHz x km
	at 1,300 nm	min. 500 MHz x km
Laser bandwidth	at 850 nm	min. 4700 MHz x km
	at 953 nm	min. 2470 MHz x km
Refraction index	at 850 nm	1.483
	at 953 nm	1.478

Summary

- Designed for SWDM4
- 100 Gbit/s on one fiber or one fiber pair
- Backward compatible with OM4 and OM3
- The LEONI OM5 fiber is bend-insensitive
- Cable colour: lime green

GigaLine® fiber qualities

Fiber specifications	G50/125	G50/125	G50/125	E9/125	E9/125	E9/125
IEC 11801 / EN 50173	OM3	OM4	OM5	OS2	OS2 SMF 28 ultra	OS2 low bend
IEC 60793-2	A1a.2	A1a.3	A1a.4b	B1.3		B6_a
ITU-T	G651	G651	G651.1	G652.D	G652.D + G657.A1	G657.A2
Attenuation coefficient						
dB/km at 850 nm	max. 2.5	max. 2.5	max. 2.5			
dB/km at 953 nm			max. 1.8			
dB/km at 1,300 nm	max. 0.7	max. 0.7	max. 0.7			
dB/km at 1,310 nm				max. 0.36	max. 0.36	max. 0.36
dB/km at 1,383 nm				max. 0.36	max. 0.36	max. 0.36
dB/km at 1,550 nm				max. 0.23	max. 0.23	max. 0.23
dB/km at 1,625 nm				max. 0.23	max. 0.23	max. 0.23
Bandwidth						
MHz x km at 850 nm	min. 1,500	min. 3,500	min. 3,500			
MHz x km at 953 nm			min. 1850			
MHz x km at 1300 nm	min. 500	min. 500	min. 500			
Laser bandwidth						
MHz x km at 850 nm	min. 2,000	min. 4,700	min. 4,700			
MHz x km at 953 nm			min. 2470			
Dispersion						
at 1,310 nm				max. 3.5 ps/nm x km	max. 3.5 ps/nm x km	max. 3.5 ps/nm x km
at 1,550 nm				max. 18 ps/nm x km	max. 18 ps/nm x km	max. 18 ps/nm x km
Zero-dispersion wavelength				$1302 \leq \lambda_0 \leq 1322$	$1302 \leq \lambda_0 \leq 1322$	$1302 \leq \lambda_0 \leq 1322$
Zero-dispersion slope				$\leq 0.092 \text{ ps/nm}^2 \times \text{km}$	$\leq 0.092 \text{ ps/nm}^2 \times \text{km}$	$\leq 0.092 \text{ ps/nm}^2 \times \text{km}$
PMD						
Fiber				$< 0.1 \text{ ps}/\sqrt{\text{km}}$	$< 0.1 \text{ ps}/\sqrt{\text{km}}$	$< 0.1 \text{ ps}/\sqrt{\text{km}}$
Link				$< 0.06 \text{ ps}/\sqrt{\text{km}}$	$< 0.06 \text{ ps}/\sqrt{\text{km}}$	$< 0.06 \text{ ps}/\sqrt{\text{km}}$
Segment length with Gigabit Ethernet						
at 850 nm (1000 BASE SX)	900 m	1000 m	1000 m			
at 1300 nm (1000 BASE LX)	550 m	550 m	550 m	5000 m	5000 m	5000 m
Segment length with 10 Gigabit Ethernet						
at 850 nm (10G BASE-SR/SW)	300 m	550 m	550 m			
at 1300 nm (10G BASE-LX4)	300 m	300 m	300 m	10,000 m	10,000 m	10,000 m
at 1550 nm (10G BASE-ER/EW)				40,000 m	40,000 m	40,000 m
Segment length with 40 Gigabit Ethernet						
at 850 nm 40 GBASE-SR4	100 m	150 m	150 m			
at 1310 nm 40 GBASE-LR4				10,000 m	10,000 m	10,000 m
at 850 nm – 953 nm 40G-SWDM4*	240 m	350 m	440 m			
Segment length with 100 Gigabit Ethernet						
at 850 nm 100 GBASE-SR10	100 m	150 m	150 m			
at 1310 nm 100 GBASE-LR4				10,000 m	10,000 m	10,000 m
100 GBASE-ER4				40,000 m	40,000 m	40,000 m
at 850 nm – 953 nm 100G-SWDM4**	75 m	100 m	150 m			
Numerical aperture						
Nominal value	0.20	0.20	0.20	0.12	0.12	0.12
Refractive index (nominal value)						
at 850 nm	1.483	1.483	1.483			
at 1,300 nm	1.478	1.478	1.478			
at 1,310 nm				1.467	1.467	1.467
at 1,550 nm				1.467	1.467	1.467
Proof load						
	$\geq 100 \text{ kpsi}$ $\geq 8.8 \text{ N}$	$\geq 100 \text{ kpsi}$ $\geq 8.8 \text{ N}$	$\geq 100 \text{ kpsi}$ $\geq 8.8 \text{ N}$	$\geq 100 \text{ kpsi}$ $\geq 8.8 \text{ N}$	100 kpsi $\geq 8.8 \text{ N}$	100 kpsi $\geq 8.8 \text{ N}$

* Source: 40G SWDM4 MSA Technical Specifications Rev 2, Table 2-2: 100G-SWDM4 operating range

** Source: 100G SWDM4 MSA Technical Specifications Rev 2, Table 2-2: 100G-SWDM4 operating range

Jacketing material for fiber optic cables

GigaLine® colour codes

Balancing application and fire prevention criteria

The sheath around the cable protects the optical fibers from the effects of mechanical, thermal and chemical action as well as the ingress of moisture. In the event of a fire, however, the cable sheath should prevent a fire from spreading and stop toxic and corrosive gases from being produced.

The use of halogen-free, flame-retardant materials is advisable in order to protect equipment and buildings but above all to protect people. In harsh environments, PUR and PVC, in particular, are used owing to their high resistance to oils and their abrasion resistance. PE is also commonly used as a sheath material for outdoor applications.

However, it is often extremely difficult to meet all the requirements using just one sheath material. To best satisfy the prevailing local operating conditions, LEONI offers a choice of different materials.

Please contact us if the criteria for your particular application are not met by the cable constructions in this catalogue. Additional requirements can often be met through customised measures when making the sheath, e.g. aluminium tape or special mixtures of sheaths.

Cable sheath material

Material characteristics	FRNC	PUR	PVC	PE
Resistance to ageing	+	+	+	+
Halogen-free	+	+	--	+
Flame retardancy	+	●	+	--/●
Elasticity	-	+	●	-
Abrasion resistance	-	++	+	+/-
Low smoke gas generation	++	●	-	--/●
Low emission of corrosive gases	++	●	--	+/-●
Low smoke gas toxicity	++	●	--	+/-●
No toxicological risk	++	●	-	+/-●

++ excellent
+ good
● depends on recipe
- weak
-- unsatisfactory

1) Increased resistance due to the addition of black colour pigments/UV stabilisers
2) Permeation depends on type of gas, e.g. Ar, CH₄, N₂, O₂, low gas permeation, CO₂, H₂, He higher gas permeation
3) Low swelling in saturated hydrocarbons; significant swelling in aromatic hydrocarbons. Aliphatic esters cause swelling, highly polar organic solvents dissolve under the effect of extreme swelling
4) Swelling in aliphatic and aromatic hydrocarbons and in chlorinated hydrocarbons

Cable sheath material

General resistance to	FRNC	PUR	PVC	PE
UV light	1)	1)	1)	1)
Water absorption	-	-	+	+
Gas diffusion	-	2)	-	●
Fuels	-	+	+/-	+
Petroleum/lubricants	-	++	●	+
Organic solvents	-	3)	-	4)
Alcohol	-	-	+	+
Oxidants	-	-	+	-
Acids	+	--	+	++
Alkaline solutions	+	--	+	+
Saline solutions	+	-	+	+

Colour codes

Wires (with stranded loose tubes)	
Counting wire	Red
Counting direction wire	White
Other wires	Green for G50/125 Blue for G62,5/125 Yellow for E9/125
Dummy elements	Natural colours
The wires are consecutively counted, starting with the wire closest to the counting element. The dummy elements are not counted.	

Mini-breakout cable EIA/TIA 598C	
Fiber no.	Colour
1	Blue
2	Orange
3	Green
4	Brown
5	Grey
6	White
7	Red
8	Black
9	Yellow
10	Violet
11	Pink
12	Turquoise

Fibers (in loose tubes) IEC 60304	
Fiber no.	Colour
1	Red
2	Green
3	Blue
4	Yellow
5	White
6	Grey
7	Brown
8	Violet
9	Turquoise
10	Black
11	Orange
12	Pink
13	Red/black
14	Green/black
15	Blue/black
16	Yellow/black
17	White/black
18	Grey/black
19	Brown/black
20	Violet/black
21	Turquoise/black
22	Natural/black
23	Orange/black
24	Pink/black

GigaLine® type codes

for easy assignment of the construction elements in fiber optic cables

		GigaLine®								
Cable type		1	2	3	4	5	6	7	8	9
Communication cable	KL									
Area of application										
Indoor cable	I									
Universal cable	U									
Outdoor cable	A									
Breakout outdoor cable	AT									
Core type										
Tightly buffered fiber	V									
Gel-filled loose tube	D									
Dry loose tube	B									
Constructional composition										
Swelling material, dry, longitudinally watertight	Q									
Water-blocking gel-filled, longitudinally watertight	F									
Non-metallic strain relief	(ZN)									
Steel strain relief	(ZS)									
Armour	B									
Corrugated steel tape	(SR)									
Cable sheath										
PE Polyethylene sheath	2Y									
Al + PE Aluminium laminated sheath	(L)2Y									
FRNC Halogen-free/flame-retardant sheath	H									
PVC Polyvinyl chloride sheath	Y									
PA Polyamide sheath	4Y									
PUR Polyurethane sheath	11Y									
Fiber number and fiber bundling										
No. of fibers	n									
Number of loose tubes x No. of fibers per tube	nxm									
Miscellaneous										
n Field diameter/sheath diameter in...	E9/125									
n Core diameter/sheath diameter in...	G50/125 or G62.5/125									
Wavelength										
850 nm	B									
1,300/1,310 nm	F									
1,550 nm	H									
Bandwidth/dispersion coefficient										
in MHz · km with multi-mode fibers, dispersion parameters										
in ps/nm·km with single-mode fibers										

Rodent protection in FO cables / pictograms

Fiber optic cables are relatively thin and therefore very susceptible to rodent damage. Depending on the application it can be important for fiber optic cables to be able to offer protection from this type of damage. There are no national or even international standards or test specifications covering the corresponding requirement for rodent protection.

The following construction has been customary in the market in Europe (particularly in Germany, Austria and Switzerland) since the early 1990s:

For outdoor cables, the usual aramid yarns for strain relief are replaced with glass rovings. These glass yarns shatter and get into the mouth and throat of the rodents. The animals associate gnawing on cables with pain and usually stop.

The general rule is: The more glass rovings, the greater the protection for the cable.

The overall diameter should also be as large as possible.

Constructions with stranded loose tubes give even less favourable leverage in combination with the larger core diameter. The cable then acts like a gag bit. Before the rodent reaches the glass rovings, however, it first has to gnaw through the outer sheath. Constructions with an additional polyamide sheath (thickness 0.5 mm) have also proven effective here as polyamide is very hard and smooth.

This combination of plastic, glass and moisture-absorbing swelling material has to be gnawed through before rodent reaches the loose tubes containing the internal optical fibers. Metal armouring is highly recommended as rodent protection for all applications where rodent damage is to be expected. This is the case, for example, with installation in shafts or conduits with a correspondingly large diameter, e.g. along railway lines or motorways.

The following types of metal armouring are available:

Corrugated steel tape

The most common metal armouring is the 0.155 mm thick corrugated steel cladding due to its good flexibility.

■ Steel wire armour

Steel wire armour is a very robust option, consisting of wires with a thickness of 1.25 mm.

■ Steel band

Steel band sheathing consists of two overlapping layers of steel band that are wound around the cable.

In the case of cables with two sheaths with sheathing between them, the ingress of water into the cable core is also prevented provided the internal sheath is not damaged.

Despite all precautions, however, damage to the outer sheath can never be fully ruled out.

Overview of pictograms



Flame-retardant and halogen-free sheath

The outer sheath of the cable is self-extinguishing and does not propagate fire. The halogen-free sheath material forms neither toxic nor corrosive combustion gases in the event of fire.



Chemical resistance

Generally good resistance to oil, petrol, acids and alkaline solutions



Rodent proof

The cable core is protected from damage by rodents by means of glass rovings.

Note: Despite all precautions, damage to the outer sheath can never be fully ruled out.



Rodent protection

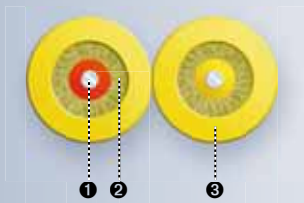
The cable core is more heavily protected from rodent damage with two sheaths and metal armouring. Enhanced rodent protection.

Note: Despite all precautions, damage to the outer sheath can never be fully ruled out.



The cable outer sheath is resistant to UV rays.

GigaLine® indoor cable, Duplex Fig. 8



Advantages

- low space requirements
- very flexible
- fiber type indicated by sheath colour

Type KL-I-V(ZN)H 2 G/E

Use

Connection cable and patch cord for structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition).

Ideal for all applications from Class OF 300 to OF 10000 according to fiber type. Suitable for direct connector assembly.

Installation in dry rooms, in cable ducts, on cable trays or in conduits.

Construction

- Two single cables (2.8 mm with semi-light buffered loose tubes 900 µm) with strain relief in fig. 8 sheath with separator
- Strain relief Non-metallic (aramid yarns)
- Cable sheath Halogen-free, flame-retardant compound

Sheath colour	OS2	● Yellow
	OM2	● Orange
	OM3	● Aqua
	OM4	● Heather violet
	OM5	● Lime green

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temp.	–10 °C to +70 °C

Mechanical characteristics

Min. bend radius	static	30 mm
	(over flat side) dynamic	60 mm
Max. crush strength	long-term	600 N/dm
	short-term	1000 N/dm

Fire behaviour

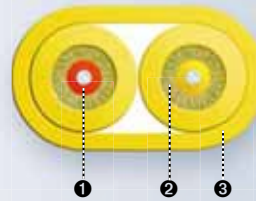
Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22, Cat. A

No. of fibers	Core type	Outside		Max. strain relief	Fire load approx.		Order no.			
		Ø approx.	Weight approx.				OM2e G50/125	OM3 bendable G50/125	OM4 bendable G50/125	OS2 SMF28 ultra E9/125
2	900	2.8x5.7	15.8	600	0.36	0.10	LKD 8DA2 0003 0000	LKD 8DA5 2000 0000	LKD 8DA7 2000 0000	LKD 8DC7 2001 0000
2	600	1.8x3.7	7	400	0.14	0.04	LKD 8XA2 0013 0000	LKD 8XA5 2013 0000	LKD 8XA7 0013 0000	LKD 8XC7 0013 0000

GigaLine® indoor cable, Duplex Fig. 0



BauPVo / CPR

D_{ca}

Advantages

- robust construction
- fiber type indicated by sheath colour

Type KL-I-V(ZN)HH 2 G/E

Use

Connection cable and patch cord for structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition).

Ideal for all applications from Class OF 300 to OF 10000 according to fiber type. Suitable for direct connector assembly.

Installation in dry rooms, in cable ducts, on cable trays or in conduits.

Construction

- ❶ Two single cables with strain relief (2.1 mm with semi-light buffered loose tubes 900 µm) in parallel under one sheath
 - ❷ Strain relief Non-metallic (aramid yarns)
 - ❸ Cable sheath Halogen-free, flame-retardant compound
- | | | |
|---------------|-----|------------------|
| Sheath colour | OS2 | ● Yellow |
| | OM2 | ● Orange |
| | OM3 | ● Aqua |
| | OM4 | ● Heather violet |
| | OM5 | ● Lime green |

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temp.	–10 °C to +70 °C

Mechanical characteristics

Min. bend radius	static	35 mm
	dynamic	65 mm
	for single elements	30 mm
Max. pulling force		600 N
Max. crush strength	long-term	500 N/dm
	short-term	750 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22, Cat. A
Class	D _{ca} s2 d2 a2 acc. to EN 50575 / EN 50390
DoP	CDERF00000001

Other characteristics

Cable bending	IEC 60794-1-2 E11
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Certificates and approvals

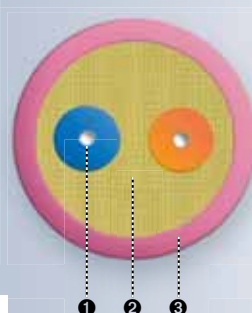
Compliant with Construction Products Regulation (EU/305/2011): **CE**

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.				
	mm	kg/km	N	MJ/m	kWh/m	OM2e G50/125	OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 SMF28 ultra E9/125
2	3.2x5.2	19	600	0.63	0.18	LKD 8DA2 0011 0000	LKD 8DA5 2001 0000	LKD 8DA7 2005 0000	LKD 8DA9 2001 0000	LKD 8DC7 0010 0000

GigaLine® indoor cable for Uniboot connector



Type KL-I-V(ZN)H n G/E 2.8 mm



Advantages

- very low space requirements
- very flexible
- bendable in every direction
- fiber type indicated by sheath colour

Use

Uniboot connection cable and patch cord for structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition).

Ideal for all applications from Class OF 300 to OF 10000 according to fiber type.

Suitable for direct connector assembly. Installation in dry rooms, in cable ducts, on cable trays or in conduits.

Construction

- 2 buffered loose tubes (600 µm) under an outer sheath
- Strain relief Non-metallic (aramid yarns)
- Cable sheath Halogen-free, flame-retardant compound

Sheath colour	OS2	● Yellow
	OM3	● Aqua
	OM4	● Heather violet

Thermal properties

Transport/storage	-25 °C to +70 °C
Installation	-5 °C to +50 °C
Operating temp.	-10 °C to +70 °C

Mechanical characteristics

Min. bend radius	static	30 mm
	dynamic	60 mm
Max. pulling force		300 N
Max. crush strength	long-term	100 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22, Cat. A

Other characteristics

Cable bending	IEC 60794-1-2 E11
---------------	-------------------

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.		
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OS2 SMF28 ultra E9/125
2	2.8	7.5	300	0.20	0.06	LKD 8DA5 2004 0000	LKD 8DA7 2006 0000	LKD 8DA7 2004 0000

GigaLine® indoor cable, mini-breakout



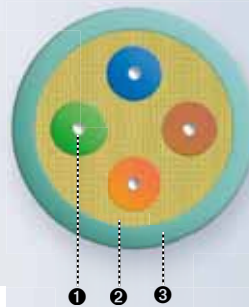
BauPVo / CPR

D_{ca}

Type KL-I-V(ZN)H n G/E

Advantages

- low space requirements
- very flexible
- bendable in every direction
- fiber type indicated by sheath colour



Use

Campus/backbone cabling, suitable for direct connector assembly. Connection cable and patch cord for structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition). Ideal for all applications from Class OF 300 to OF 10000 according to fiber type. Installation in dry rooms, in cable ducts, on cable trays or in conduits.

Construction

- Max. 12 buffered loose tubes (900 µm) stranded under an outer sheath
- Strain relief Non-metallic (aramid yarns)
- Cable sheath Halogen-free, flame-retardant compound

Sheath colour	OS2	Yellow
	OM2	Orange
	OM3	Aqua
	OM4	Heather violet
	OM5	Lime green

Thermal properties

Transport/storage -25 °C to +70 °C
 Installation -5 °C to +50 °C
 Operating temp. -5 °C to +70 °C

Mechanical characteristics

Min. bend radius	static	10 x outer Ø
	dynamic	15 x outer Ø
	for single elements	30 mm
Max. pulling force		800 N
Max. crush strength	long-term	500 N/dm
	short-term	1000 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22, Cat. A
Class	D _{ca} s2 d2 a2 acc. to EN 50575 / EN 50390
DoP	CDERF00000018

Other characteristics

Cable bending	IEC 60794-1-2 E11
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Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief		Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m		OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 SMF28 ultra E9/125
4	5.6	21	800	0.47	0.13		LKD 8MA5 2012 0000	LKD 8MA7 0012 0000	LKD 8MA9 0012 0000	LKD 8MC7 0012 0000
6	5.9	25	800	0.50	0.14		LKD 8MA5 2013 0000	LKD 8MA7 0013 0000	LKD 8MA9 0013 0000	LKD 8MC7 0013 0000
8	6.1	30	800	0.52	0.14		LKD 8MA5 2014 0000	LKD 8MA7 0014 0000	LKD 8MA9 0014 0000	LKD 8MC7 0014 0000
10	7.0	38	800	0.53	0.14		LKD 8MA5 2015 0000	LKD 8MA7 0015 0000	LKD 8MA9 0015 0000	LKD 8MC7 0015 0000
12	7.0	38	800	0.55	0.15		LKD 8MA5 2016 0000	LKD 8MA7 0016 0000	LKD 8MA9 0016 0000	LKD 8MC7 0016 0000

GigaLine® indoor cable, breakout



BauPVo / CPR

E_{ca}

Advantages

- robust, non-crushable
- each fiber is strain-relieved
- fiber type indicated by sheath colour

Type KL-I-V(ZN)HH n G/E

Use

Connection cable and patch cord for structured cabling according to ISO/IEC 11801 and EN 50173 (2nd Edition). Ideal for all applications from Class OF 300 to OF 10000 according to fiber type. Suitable for direct connector assembly. Installation in dry rooms, in cable ducts, on cable trays or in conduits.

Construction

- Max. 12 single cables with strain relief as breakout elements (2.1 mm with semi-light buffered loose tubes 900 µm) stranded under an outer sheath
 - Tear thread under the outer sheath
 - Strain relief Non-metallic (aramid yarns)
 - Cable sheath Halogen-free, flame-retardant compound
- Sheath colour
- | | |
|-----|----------------|
| OS2 | Yellow |
| OM2 | Orange |
| OM3 | Aqua |
| OM4 | Heather violet |
| OM5 | Lime green |

Thermal properties

Transport/storage -25 °C to +70 °C

Installation -5 °C to +50 °C

Operating temp. -5 °C to +70 °C

Mechanical characteristics

Min. bend radius	static	10 x outer Ø
	dynamic	15 x outer Ø
	for single elements	30 mm
Max. crush strength	long-term	1000 N/dm
	short-term	1500 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22, Cat. A
Class	E _{ca} acc. to EN 50575 / EN 50390
DoP	CDERF00000025

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

Other characteristics

Cable bending IEC 60794-1-2 E11

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.			
	mm	kg/km		N	MJ/m kWh/m	OM2e G50/125	OM3 bendable G50/125	OM4 bendable G50/125	OS2 SMF28 ultra E9/125
2	7.0	40	800	1.10	0.30	LKD 8BA2 0011 0000	LKD 8BA5 2011 0000	LKD 8BA7 0011 0000	LKD 8BC7 0011 0000
4	7.0	45	800	1.10	0.30	LKD 8BA2 0012 0000	LKD 8BA5 2012 0000	LKD 8BA7 0012 0000	LKD 8BC7 0012 0000
6	8.2	65	1000	1.18	0.32	LKD 8BA2 0013 0000	LKD 8BA5 2013 0000	LKD 8BA7 0013 0000	LKD 8BC7 0013 0000
8	9.8	95	1000	1.31	0.36	LKD 8BA2 0014 0000	LKD 8BA5 2014 0000	LKD 8BA7 0014 0000	LKD 8BC7 0014 0000
10	11.0	135	1000	1.42	0.39	LKD 8BA2 0015 0000	LKD 8BA5 2015 0000	LKD 8BA7 0015 0000	LKD 8BC7 0015 0000
12	12.5	155	1000	1.57	0.44	LKD 8BA2 0016 0000	LKD 8BA5 2016 0000	LKD 8BA7 0016 0000	LKD 8BC7 0016 0000

GigaLine® indoor cable, central



BauPVo / CPR

B2_{ca}

Advantages

- meets highest level of fire safety
- low space requirements
- fiber type indicated by sheath colour

Type KL-I-B(ZN)BH 1 x n G/E

Use

FO indoor cable, central loose tube, unfilled, with non-metallic armouring (rodent protection).

Ideal for applications from Class OF 300 to OF 10000. Suitable for splicing. Installation in dry areas, in cable ducts, on cable trays or in conduits.

Construction

- 1 Fiber: Single-mode fiber E9/125 µm, bend-insensitive multi-mode fiber G50/125, Colour code: DIN VDE 0888-3 red, green, blue, yellow, white, grey, brown, violet, turquoise, black, orange, pink
- 2 Dry loose tube Ø 3.0 mm Colour code: yellow (E9/125), green (G50/125), blue (G62,5/125)
- 3 Strain relief Glass rovings
- 4 Cable sheath Halogen-free, flame-retardant compound
Sheath colour OS2 ● Yellow
OM3 ● Aqua
OM4 ● Heather violet
OM5 ● Lime green

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temp.	–25 °C to +60 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	1500 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-24 Cat. C
Class	B2 _{ca} s1a d0 a1 acc. to EN 50575 / EN 50390
DoP	CDERF00000042

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 SMF28 ultra E9/125
1x6	6.5	46	1500	0.62	0.17	LKD 8IA5B0Q3 0000	LKD 8IA7 B0Q3 0000	LKD 8IA9 B0Q3 0000	LKD 8IC3 B0Q3 0000
1x12	6.5	46	1500	0.62	0.17	LKD 8IA5B0Q6 0000	LKD 8IA7 B0Q6 0000	LKD 8IA9 B0Q6 0000	LKD 8IC3 B0Q6 0000
1x24	7	51	1500	0.68	0.19	LKD 8IA5B0Q9 0000	LKD 8IA7 B0Q9 0000	LKD 8IA9 B0Q9 0000	LKD 8IC3 B0Q9 0000

GigaLine® indoor cable, stranded



BauPVo / CPR

B2_{ca}

Type KL-I-B(ZN)BH n x m G/E

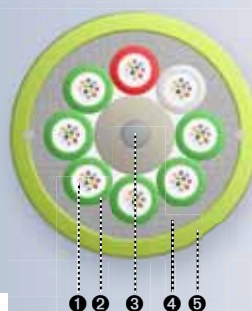
Use

FO indoor cable, stranded loose tube, unfilled, with non-metallic armouring (rodent protection).

Ideal for all applications from Class OF 300 to OF 10000. Suitable for splicing. Installation in dry rooms, in cable ducts, on cable trays or in conduits.

Construction

- ❶ Fiber: Single-mode fiber E9/125 µm, bend-insensitive multi-mode fiber G50/125, Colour code: DIN VDE 0888-3 red, green, blue, yellow, white, grey, brown, violet, turquoise, black, orange, pink
 - ❷ Dry loose tube Ø 1.6 mm
Colour code: yellow (E9/125), green (G50/125), blue (G62,5/125)
 - ❸ Central glass fiber-reinforced supporting element
 - ❹ Strain relief Glass rovings
 - ❺ Cable sheath Halogen-free, flame-retardant compound
- | | | |
|---------------|-----|------------------|
| Sheath colour | OS2 | ● Yellow |
| | OM3 | ● Aqua |
| | OM4 | ● Heather violet |
| | OM5 | ● Lime green |



Advantages

- meets highest level of fire safety
- low space requirements
- fiber type indicated by sheath colour

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temp.	–25 °C to +60 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	2000 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22 Cat. A
Class	B2 _{ca} s1a d0 a1 acc. to EN 50575 / EN 50390
DoP	CDERF00000061

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 SMF28 ultra E9/125
4x12	8.8	85	2500	0.83	0.23	LKD 8IA5 BQ08 0000	LKD 8IA7 BQ08 0000	LKD 8IA9 BQ08 0000	LKD 8IC3 BQ08 0000
6x12	9.1	90	2500	0.90	0.25	LKD 8IA5 BQ10 0000	LKD 8IA7 BQ10 0000	LKD 8IA9 BQ10 0000	LKD 8IC3 BQ10 0000

GigaLine® indoor cable, stranded



BauPVo / CPR

C_{ca}

Advantages

- excellent fire protection profile
- low space requirements
- fiber type indicated by sheath colour

Type KL-I-B(ZN)BH n x m G/E

Use

FO indoor cable, stranded loose tube, unfilled, with non-metallic armouring (rodent protection).

Ideal for all applications from Class OF 300 to OF 10000. Suitable for splicing. Installation in dry rooms, in cable ducts, on cable trays or in conduits.

Construction

- 1 Fiber: Single-mode fiber E9/125 µm, bend-insensitive multi-mode fiber G50/125, Colour code: DIN VDE 0888-3 red, green, blue, yellow, white, grey, brown, violet, turquoise, black, orange, pink
- 2 Dry loose tube Ø 1.6 mm
Colour code: yellow (E9/125), green (G50/125), blue (G62,5/125)
- 3 Central glass fiber-reinforced supporting element
- 4 Strain relief Glass rovings
- 5 Cable sheath Halogen-free, flame-retardant compound
Sheath colour OS2 ● Yellow
OM3 ● Aqua
OM4 ● Heather violet
OM5 ● Lime green

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temp.	–10 °C to +70 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	1000 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22 Cat. A
Class	C _{ca} s1a d0 a1 acc. to EN 50575 / EN 50390
DoP	CDERF000000028

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 SMF28 ultra E9/125
4x12	8.3	75	3000	0.78	0.22	LKD 8IA5 CQ08 0000	LKD 8IA7 CQ08 0000	LKD 8IA9 CQ08 0000	LKD 8IC3 CQ08 0000
8x12	9.9	105	3000	1.09	0.30	LKD 8IA5 CQ11 0000	LKD 8IA7 CQ11 0000	LKD 8IA9 CQ11 0000	LKD 8IC3 CQ11 0000
12x12	11.4	140	3000	1.57	0.43	LKD 8IA5 CQ13 0000	LKD 8IA7 CQ13 0000	LKD 8IA9 CQ13 0000	LKD 8IC3 CQ13 0000

GigaLine® universal cable, central 2500 N



BauPVo / CPR

D_{ca}

Advantages

- good fire protection profile
- low space requirements
- can be laid in the ground
- for universal use
- longitudinally watertight

Type KL-U-DQ(ZN)BH 1xn G/E

Use

Installation cable suitable for campus/backbone cabling and structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition). Ideal for all Class OF 300, OF 500, OF 2000, OF5000 and OF 10000 applications.

Suitable for installation in applications involving more rigorous mechanical requirements as well as risk of rodent damage.

Suitable for splicing. House connections possible without additional interconnection points (splices).

Installation indoors and outdoors in dry conduits, on covered cable trays, in cable ducts or directly in the ground (in a sand bed). Mechanical pulling in with winches is only permitted using force measuring devices with a logging function.

Construction

- 1 Central filled loose tube with max. 24 fibers, up to 12 fibers Ø 2.9 mm, up to 24 fibers Ø 3.5 mm, fiber colour code acc. to IEC 60304

Loose tube colour: yellow (E9/125), green (G50/125), blue (G62,5/125)

- 2 Swellable threads
- 3 Strain relief Non-metallic (glass rovings)
- 4 Cable sheath Halogen-free, flame-retardant compound
Sheath colour ● Black

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temp.	–25 °C to +60 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	1500 N/dm
	short-term	3000 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-24 Cat. C
Class	D _{ca} s2 d2 a1 acc. to EN 50575 / EN 50390
DoP	CDESK0000038

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 E9/125
1x4	7.7	65	2500	0.95	0.26	LKD 8UA500M2 0000	LKD 8UA7 00M2 0000	LKD 8UA9 00M2 0000	LKD 8UC7 00M2 0000
1x6	7.7	65	2500	0.95	0.26	LKD 8UA500M3 0000	LKD 8UA7 00M3 0000	LKD 8UA9 00M3 0000	LKD 8UC7 00M3 0000
1x8	7.7	65	2500	0.95	0.26	LKD 8UA500M4 0000	LKD 8UA7 00M4 0000	LKD 8UA9 00M4 0000	LKD 8UC7 00M4 0000
1x12	7.7	65	2500	0.95	0.26	LKD 8UA500M6 0000	LKD 8UA7 00M6 0000	LKD 8UA9 00M6 0000	LKD 8UC7 00M6 0000
1x24	8.1	72	2500	1.06	0.30	LKD 8UA500M9 0000	LKD 8UA7 00M9 0000	LKD 8UA9 00M9 0000	LKD 8UC7 00M9 0000

GigaLine® universal cable, stranded 4000 N



BauPVo / CPR

E_{ca}

Type KL-U-DQ(ZN)BH nxm G/E



Advantages

- good fire protection profile
- low space requirements
- can be laid in the ground
- for universal use
- longitudinally watertight

Use

Installation cable suitable for campus/backbone cabling and structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition). Ideal for applications from Class OF 300 to OF 10000. Suitable for installation in applications involving more rigorous mechanical requirements as well as risk of rodent damage. Suitable for splicing. House connections possible without additional interconnection points (splices). Installation indoors and outdoors in conduits, on covered cable trays, in cable ducts or directly in the ground (in a sand bed). Mechanical pulling in with winches is only permitted using force measuring devices with a logging function.

Construction

- ① Stranded filled loose tube with max. 12 fibers and dummy elements, where applicable fiber colour code acc. to IEC 60304
Loose tube colour: counting wire red, counting direction wire white, yellow (E9/125), green (G50/125), blue (G62,5/125)
- ② Central glass fiber-reinforced supporting element
- ③ Swellable threads
- ④ Strain relief Non-metallic (glass rovings)
- ⑤ Cable sheath Halogen-free, flame-retardant compound
Sheath colour ● Black

Thermal properties

Transport/storage	–40 °C to +80 °C
Installation	–20 °C to +60 °C
Operating temp.	–40 °C to +80 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	3000 N/dm
	short-term	4000 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22 Cat. A
Class	E _{ca} acc. to EN 50575 / EN 50390
DoP	CDESK0000037

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 E9/125
2x12	11.2	130	4000	1.7	0.47	LKD 8UA5 1K06 0000	LKD 8UA7 1K06 0000	LKD 8UA9 1K06 0000	LKD 8UC7 1K06 0000
4x12	11.2	130	4000	1.7	0.47	LKD 8UA5 1K08 0000	LKD 8UA7 1K08 0000	LKD 8UA9 1K08 0000	LKD 8UC7 1K08 0000
8x12	13.1	175	4000	2.2	0.61	LKD 8UA5 1K11 0000	LKD 8UA7 1K11 0000	LKD 8UA9 1K11 0000	LKD 8UC7 1K11 0000
12x12	16	240	4000	3.8	1.05	LKD 8UA5 1K13 0000	LKD 8UA7 1K13 0000	LKD 8UA9 1K13 0000	LKD 8UC7 1K13 0000

other types on request

GigaLine® universal cable, central 2500 N



BauPVo / CPR

D_{ca}

Advantages

- optimal rodent armouring
- good fire protection profile
- low space requirements
- can be laid in the ground
- for universal use
- longitudinal and transverse waterproofing

Type KL-U-DQ(ZN)H(SR)H 1xn G/E

Use

Installation cable suitable for campus/backbone cabling and structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd Edition). Ideal for all applications of Classes OF 300, OF 500, OF 2000, OF 5000 and OF 10000. Suitable for installation in applications involving more rigorous mechanical requirements as well as risk of rodent damage. Suitable for splicing. House connections possible without additional interconnection points (splices). Installation indoors and outdoors in dry conduits, on covered cable trays, in cable ducts or directly in the ground. Mechanical pulling in with winches is only permitted using force measuring devices with a logging function.

Construction

- ① Central filled loose tube with max. 24 fibers, up to 12 fibers Ø 2.9 mm, up to 24 fibers Ø 3.5 mm, fiber colour code according to IEC 60304, loose tube colour: yellow (E9/125), green (G50/125), blue (G62,5/125)
- ② Strain relief Non-metallic (glass rovings)
- ③ Inner sheath Halogen-free, flame-retardant compound
Inner sheath colour ● Black
- ④ Armouring Corrugated steel cladding
- ⑤ Cable sheath Halogen-free, flame-retardant compound
Sheath colour ● Black

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temperature	–20 °C to +60 °C

Mechanical characteristics

min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	2500 N/dm
	short-term	3500 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22 Cat. A
Class	D _{ca} s2 d2 a1 acc. to EN 50575 / EN 50390
DoP	CDERF00000059

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 SMF28 ultra E9/125
1x4	12.5	215	2500	2.8	0.78	LKD 8UA5 01K2 0000	LKD 8UA7 01K2 0000	LKD 8UA9 01K2 0000	LKD 8UC3 01K2 0000
1x6						LKD 8UA5 01K3 0000	LKD 8UA7 01K3 0000	LKD 8UA9 01K3 0000	LKD 8UC3 01K3 0000
1x8						LKD 8UA5 01K4 0000	LKD 8UA7 01K4 0000	LKD 8UA9 01K4 0000	LKD 8UC3 01K4 0000
1x12						LKD 8UA5 01K6 0000	LKD 8UA7 01K6 0000	LKD 8UA9 01K6 0000	LKD 8UC3 01K6 0000
1x24						LKD 8UA5 01K9 0000	LKD 8UA7 01K9 0000	LKD 8UA9 01K9 0000	LKD 8UC3 01K9 0000

LEONI "fire secured" FO data cable

with a fire barrier to protect the fibers in the event of a fire



A functioning communication system is of vital importance in the event of a fire. It is therefore vital for a fiber optic cable to maintain its system integrity. The results of fire testing confirm that the "fire secured" FO data cable provides system and circuit integrity in the event of a fire for the duration of 90 or 120 minutes.



In particular in public facilities and buildings where large numbers of people gather (e.g. tunnels, airports, hotels, etc.), fire alarm, SOS telephone and video monitoring systems are used to coordinate rescue measures and fire fighting efforts as efficiently as possible. Also in industrial facilities, processes have to be terminated in a controlled manner in order to avoid more extensive secondary damage to people and the environment.

Modern communication systems are increasingly using optical data transmission systems for transmitting data. These are often the only option given the high requirements for data rates and transmission paths.

With its "fire secured" universal cables, LEONI offers products which are tested according to IEC 60331-25 and EN 50200 and protect the fibers from exposure to fire thanks to their special construction with a fire barrier.



GigaLine® "fire secured" universal cable, central with CI



BauPVo / CPR

D_{ca}

Advantages

- good fire protection profile
- low space requirements
- for universal use

System integrity on exposure to fire for at least

90 minutes

Type KL-U-D(ZN)BH 1xn G/E

Use

Installation cable suitable for campus/backbone cabling and structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition). Ideal for all applications from Class OF 300 to OF 10000. Suitable for installation in applications involving more rigorous mechanical requirements as well as risk of rodent damage.

Suitable for splicing. House connections possible without additional interconnection points (splices). Installation in dry rooms, in cable ducts, on cable trays or in conduits.

Construction

- 1 Central filled loose tube with max. 24 fibers, up to 12 fibers Ø 3.5 mm, up to 24 fibers Ø 4.0 mm,
- 2 With fire barrier
fiber colour code acc. to IEC 60304, loose tube colour: yellow (E9/125), green (G50/125), blue (G62,5/125)
- 3 Strain relief Non-metallic (glass rovings)
- 4 Cable sheath Halogen-free, flame-retardant compound
- 5 Tear threads under the outer sheath
Sheath colour ● Yellow

Thermal properties

Transport/storage –40 °C to +70 °C
Installation –5 °C bis +50 °C
Operating temp. –40 °C to +60 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	3000 N/dm
	short-term	4500 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22 Cat. A
Class	D _{ca} s2 d2 a1 acc. to EN 50575 / EN 50390
DoP	CDERF00000006

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

Other characteristics

System and acc. to IEC 60331-11 and –25
circuit integrity EN 50200 / DIN VDE 0482 Part 1 (90 minutes)
Max. attenuation change 3.0 dB

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief		Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m		OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 E9/125
1x4	10.3	127	2500	1.03	0.29		LKD 8UA5 00B2 0000	LKD 8UA7 00B2 0000	LKD 8UA9 00B2 0000	LKD 8UC7 00B2 0000
1x6	10.3	127	2500	1.03	0.29		LKD 8UA5 00B3 0000	LKD 8UA7 00B3 0000	LKD 8UA9 00B3 0000	LKD 8UC7 00B3 0000
1x8	10.3	127	2500	1.03	0.29		LKD 8UA5 00B4 0000	LKD 8UA7 00B4 0000	LKD 8UA9 00B4 0000	LKD 8UC7 00B4 0000
1x12	10.3	127	2500	1.03	0.29		LKD 8UA5 00B6 0000	LKD 8UA7 00B6 0000	LKD 8UA9 00B6 0000	LKD 8UC7 00B6 0000
1x24	10.8	134	2500	1.28	0.36		LKD 8UA5 00B9 0000	LKD 8UA7 00B9 0000	LKD 8UA9 00B9 0000	LKD 8UC7 00B9 0000

GigaLine® "fire secured" universal cable, central with CI



BauPVo / CPR

D_{ca}

Type KL-U-DQ(ZN)H(SR)H 1xn G/E



Advantages

- optimum rodent armouring
- longitudinal and transverse waterproofing
- good fire protection profile
- low space requirements
- for universal use

System integrity on exposure to fire for at least.

120 minutes

Use

Installation cable suitable for campus/backbone cabling and structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition). Ideal for applications from Class OF 300 to OF 10000. Suitable for installation in applications involving more rigorous mechanical requirements as well as risk of rodent damage. Suitable for splicing. House connections possible without additional interconnection points (splices). Installation indoors and outdoors in dry conduits, on covered cable trays or in cable ducts. Mechanical pulling in with winches is only permitted using force measuring devices with a logging function.

Construction

- Central filled loose tube with max. 24 fibers, up to 12 fibers Ø 3.5 mm, up to 24 fibers Ø 4.0 mm, fiber colour code acc. to IEC 60304, loose tube colour: yellow (E9/125), green (G50/125), blue (G62,5/125)
- Strain relief Non-metallic (glass rovings)
- Inner sheath Halogen-free, flame-retardant compound
- Armouring Corrugated steel cladding as fire barrier Suitable for splicing.
- Cable sheath Halogen-free, flame-retardant compound
- Sheath colour ● Yellow

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temp.	–20 °C to +70 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	2500 N/dm
	short-term	3500 N/dm

Fire behaviour

Smoke density	IEC 61034
Halogen free	IEC 60754-1
Flame retardancy	IEC 60332-1-2, IEC 60332-3-22 Cat. A
Class	D _{ca} s2 d2 a1 acc. to EN 50575 / EN 50390
DoP	CDERF00000015

Certificates and approvals

Compliant with Construction Products Regulation (EU/305/2011): **CE**

Other characteristics

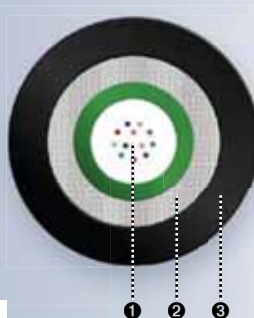
System and	acc. to IEC 60331-11 and –25
circuit integrity	EN 50200: 2000 Class PH120 & BS 8434:2003 Part 2 (120 minutes)

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.			
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OM5 bendable G50/125	OS2 E9/125
1x4	12.5	218	2500	2.80	0.78	LKD 8UA5 00C2 0000	LKD 8UA7 00C2 0000	LKD 8UA9 00C2 0000	LKD 8UC7 00C2 0000
1x6	12.5	218	2500	2.80	0.78	LKD 8UA5 00C3 0000	LKD 8UA7 00C3 0000	LKD 8UA9 00C3 0000	LKD 8UC7 00C3 0000
1x8	12.5	218	2500	2.80	0.78	LKD 8UA5 00C4 0000	LKD 8UA7 00C4 0000	LKD 8UA9 00C4 0000	LKD 8UC7 00C4 0000
1x12	12.5	218	2500	2.80	0.78	LKD 8UA5 00C6 0000	LKD 8UA7 00C6 0000	LKD 8UA9 00C6 0000	LKD 8UC7 00C6 0000
1x24	12.5	218	2500	2.80	0.78	LKD 8UA5 00C9 0000	LKD 8UA7 00C9 0000	LKD 8UA9 00C9 0000	LKD 8UC7 00C9 0000

GigaLine® outdoor cable, central 1750 N



Type KL-A-DQ(ZN)B2Y 1xn G/E



Advantages

- economical solution for outdoor installation
- longitudinally watertight
- low space requirements

Use

Outdoor cable for direct installation in the ground, in conduits and where there is increased risk of rodent damage in MAN (city networks) and LAN (campus/backbone). Suitable for use in structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition). Ideal for all applications from Class OF 300 to OF 10000 according to fiber type. Easy to install due to grease-free, dry cable core. Suitable for splicing.

Installation indoors and outdoors in conduits, on covered cable trays or directly in the ground. Mechanical pulling in with winches is only permitted using force measuring devices with a logging function.

Construction

- ① Central filled loose tube with max. 24 fibers
fiber colour code acc. to IEC 60304
Loose tube colour: yellow (E9/125), green (G50/125), blue (G62,5/125)
- ② Strain relief Non-metallic (glass rovings)
- ③ Cable sheath PE, UV resistant
Sheath colour ● Black

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temp.	–25 °C to +60 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	1500 N/dm
	short-term	3000 N/dm

Fire behaviour

Halogen free	IEC 60754-1
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Other characteristics

Longitudinal waterproofing	IEC 60794-1-2 F5
Impact resistance	IEC 60794-1-2 E4
Cable bending	IEC 60794-1-2 E11

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.		
	mm	kg/km	N	MJ/m	kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OS2 E9/125
1x4	7.1	39	1750	1.21	0.34	LKD 8AA5 00A2 0000	LKD 8AA7 00A2 0000	LKD 8AC7 00A2 0000
1x6	7.1	39	1750	1.21	0.34	LKD 8AA5 00A3 0000	LKD 8AA7 00A3 0000	LKD 8AC7 00A3 0000
1x8	7.1	39	1750	1.21	0.34	LKD 8AA5 00A4 0000	LKD 8AA7 00A4 0000	LKD 8AC7 00A4 0000
1x12	7.1	39	1750	1.21	0.34	LKD 8AA5 00A6 0000	LKD 8AA7 00A6 0000	LKD 8AC7 00A6 0000
1x24	7.3	45	1750	1.39	0.39	LKD 8AA5 00A9 0000	LKD 8AA7 00A9 0000	LKD 8AC7 00A9 0000

GigaLine® outdoor cable, stranded 4000 N



Advantages

- economical solution for outdoor installation
- longitudinally watertight
- low space requirements



Type KL-A-DQ(ZN)B2Y nxm G/E



Use

Outdoor cable for direct installation in the ground, in conduits and where there is a risk of rodent damage in MAN (city networks and LAN (campus/backbone). Suitable for use in structured cabling acc. to ISO/IEC 11801 and EN 50173 (2nd edition). Ideal for all applications from Class OF 300 to OF 10000 according to fiber type. Easy to install due to grease-free, dry cable core. Suitable for splicing.

Installation indoors and outdoors in conduits, on covered cable trays or directly in the ground. Mechanical pulling in with winches is only permitted using force measuring devices with a logging function.

Construction

- ① Stranded filled loose tube Ø 2.4 mm with max. 12 fibers and dummy elements, where applicable fiber colour code acc. to IEC 60304
Loose tube colour: counting wire red, counting direction wire white, yellow (E9/125), green (G50/125), blue (G62,5/125)
- ② Central supporting element
- ③ Swelling nonwoven
- ④ Strain relief Non-metallic (glass rovings)
- ⑤ Cable sheath PE, UV resistant
Sheath colour ● Black

Thermal properties

Transport/storage	–40 °C to +70 °C
Installation	–15 °C to +50 °C
Operating temp.	–40 °C to +60 °C

Mechanical characteristics

Min. bend radius	static	15 x outer Ø
	dynamic	20 x outer Ø
Max. crush strength	long-term	3000 N/dm
	short-term	5000 N/dm

Fire behaviour

Halogen free	IEC 60754-1
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Other characteristics

Longitudinal waterproofing	IEC 60794-1-2 F5
Impact resistance	IEC 60794-1-2 E4
Cable bending	IEC 60794-1-2 E11

No. of fibers	Outside Ø approx.	Weight approx.	Max. strain relief	Fire load approx.		Order no.		
	mm	kg/km		N	MJ/m kWh/m	OM3 bendable G50/125	OM4 bendable G50/125	OS2 E9/125
2x12	11.2	105	4000	2.4	0.66	LKD 8AA5 0K06 0000	LKD 8AA7 0K06 0000	LKD 8AC7 0K06 0000
4x12	11.2	105	4000	2.4	0.66	LKD 8AA5 0K08 0000	LKD 8AA7 0K08 0000	LKD 8AC7 0K08 0000
8x12	13.1	145	4000	3.1	0.86	LKD 8AA5 0K11 0000	LKD 8AA7 0K11 0000	LKD 8AC7 0K11 0000
12x12	16.0	200	4000	4.9	1.36	LKD 8AA5 0K13 0000	LKD 8AA7 0K13 0000	LKD 8AC7 0K13 0000







other types on request




GigaLine® FO patch cords

GigaLine® FO patch cords

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	FO patch cord MPO	• 1x12 • 2x12 KL-I-F(ZN)H	48
	FO patch cord LC MPO	• 1x12 • 1x8 KL-I-F(ZN)H	49

	Office
	DataCenter
	Industry

GigaLine® FO patch cord Fig. 0

Type KL-I-V(ZN)HH



Breakout patch cord OS2
Equipped with LC Duplex, SC Duplex,
SC Simplex, E-2000 Simplex

Advantages

- robust due to dual cable sheath
- fiber type indicated by sheath colour
- excellent optical properties

GigaLine® Patch Figure 0

Construction

Buffered fiber	Two compact cores with strain relief as breakout elements (Ø 2.1 mm), in parallel under one outer sheath Colour: orange (multi-mode), yellow (single-mode)
Strain relief	Aramid
Cable sheath	Halogen-free, flame-retardant compound
Sheath colour	OS2 ● Yellow OM3 ● Aqua OM4 ● Heather violet OM5 ● Lime green
Dimensions	Outer cable diameter 3.1 x 5.2 mm
Assignment	A to B

Thermal properties

Transport/storage	-25 °C to +70 °C
Installation	-5 °C to +50 °C
Operating temperature	-10 °C to +70 °C

Mechanical characteristics

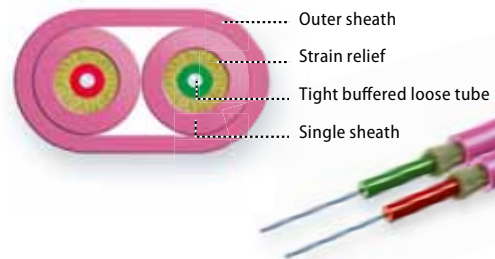
Bending radius	static	35 mm
(over flat side)	dynamic	65 mm
	Single element	30 mm

Optical characteristics (typical)

Insertion loss	for all fiber types	0.15 dB
Return loss	G50/125 OM3	> 35 dB
	G50/125 OM4	> 35 dB
	E9/125 OS2	> 50 dB
	E9/125 OS2 APC	> 65 dB

Fire behaviour

Flame retardancy	IEC 60332-1 / IEC 60332-3-22, Cat. A
Halogen-free	IEC 60754-1
Smoke density	IEC 61034



Length m	OM3 G50/125 µm	OM4 G50/125	OS2 SMF 28 ultra E9/125
Configuration LC Duplex-SC Duplex (IEC 61754-20 / IEC 61754-4)			
1.0	LKD 9A11 1290 0000	LKD 9A11 1278 0000	LKD 9A13 1061 0000
2.0	LKD 9A11 1291 0000	LKD 9A11 1158 0000	LKD 9A13 1659 0000
3.0	LKD 9A11 1120 0000	LKD 9A11 1159 0000	LKD 9A13 16550000
5.0	LKD 9A11 1171 0000	LKD 9A11 1279 0000	LKD 9A13 1657 0000
7.5	LKD 9A11 1342 0000	LKD 9A11 1570 0000	LKD 9A13 1650 0000
10.0	LKD 9A11 1253 0000	LKD 9A11 1161 0000	LKD 9A13 1665 0000

Configuration LC Duplex-LC Duplex (IEC 61754-20)			
1.0	LKD 9A11 1051 0000	LKD 9A11 1103 0000	LKD 9A13 0759 0000
2.0	LKD 9A11 1053 0000	LKD 9A11 1105 0000	LKD 9A13 0761 0000
3.0	LKD 9A11 1055 0000	LKD 9A11 1107 0000	LKD 9A13 0763 0000
5.0	LKD 9A11 1056 0000	LKD 9A11 1108 0000	LKD 9A13 0764 0000
7.5	LKD 9A11 1057 0000	LKD 9A11 1109 0000	LKD 9A13 0765 0000
10.0	LKD 9A11 1058 0000	LKD 9A11 1110 0000	LKD 9A13 0766 0000

Configuration SC Duplex-SC Duplex (IEC 61754-4)			
1.0	LKD 9A11 1042 0000	LKD 9A11 1111 0000	LKD 9A13 0768 0000
1.5	LKD 9A11 1043 0000	LKD 9A11 1112 0000	LKD 9A13 0769 0000
2.0	LKD 9A11 1044 0000	LKD 9A11 1113 0000	LKD 9A13 0770 0000
2.5	LKD 9A11 1045 0000	LKD 9A11 1114 0000	LKD 9A13 0771 0000
3.0	LKD 9A11 1046 0000	LKD 9A11 1115 0000	LKD 9A13 0772 0000
5.0	LKD 9A11 1047 0000	LKD 9A11 1116 0000	LKD 9A13 0773 0000
7.5	LKD 9A11 1048 0000	LKD 9A11 1117 0000	LKD 9A13 0774 0000
10.0	LKD 9A11 1049 0000	LKD 9A11 1118 0000	LKD 9A13 0775 0000

GigaLine® FO patch cord Fig. 8

Type KL-I-V(ZN)H



Breakout patch cord OS2
Equipped with LC Duplex, SC Duplex,
SC Simplex, E-2000 Simplex

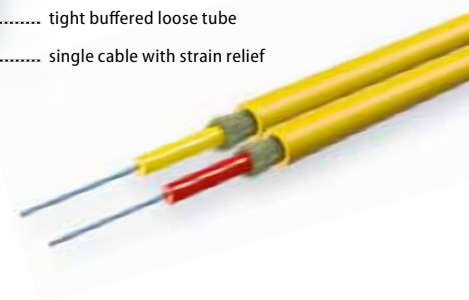
Advantages

- fiber type indicated by sheath colour
- for standard applications

GigaLine® Patch Figure 8

Construction

Buffered fiber	Two compact cores with strain relief as breakout elements (Ø 2.1 mm), in parallel under one outer sheath Colour: orange (multi-mode), yellow (single-mode)
Strain relief	Aramid
Cable sheath	Halogen-free, flame-retardant compound
Sheath colour	OS2 ● Yellow OM3 ● Aqua OM4 ● Heather violet OM5 ● Lime green
Dimensions	Outer cable diameter 2.8 x 5.7 mm
Assignment	A to B



Thermal properties

Transport/storage	-25 °C to +70 °C
Installation	-5 °C to +50 °C
Operating temperature	-10 °C to +70 °C

Mechanical characteristics

Bending radius	static	35 mm
(over flat side)	dynamic	65 mm
	Single element	30 mm

Optical characteristics (typical)

Insertion loss	for all fiber types	0.30 dB
Return loss	G50/125 OM3	> 20 dB
	G50/125 OM4	> 20 dB
	E9/125 OS2	> 40 dB
	E9/125 OS2 APC	> 50 dB

Fire behaviour

Flame retardancy	IEC 60332-1 / IEC 60332-3-22, Cat. A
Halogen-free	IEC 60754-1
Smoke density	IEC 61034

	OM3 G50/125 µm	OM4 G50/125	OS2 SMF 28 ultra E9/125
Length m	Configuration LC Duplex-LC Duplex (IEC 61754-20)		
1.0	LKD 9A18 9777 0010	LKD 9A18 9788 0010	LKD 9A18 9766 0010
2.0	LKD 9A18 9777 0020	LKD 9A18 9788 0020	LKD 9A18 9766 0020
3.0	LKD 9A18 9777 0030	LKD 9A18 9788 0030	LKD 9A18 9766 0030
5.0	LKD 9A18 9777 0050	LKD 9A18 9788 0050	LKD 9A18 9766 0050

GigaLine® FO patch cord LC/PC Uniboot

Type KL-I-V(ZN)H

Uniboot patch cord OS2
Equipped with 2 x LC Duplex Uniboot

Uniboot patch cord OM4
Equipped with 2 x LC Duplex Uniboot

Uniboot patch cord OM3
Equipped with 2 x LC Duplex Uniboot

Advantages

- very low space requirements
- for high packing densities
- very flexible
- no preferred bending direction
- fiber type indicated by sheath colour
- excellent optical properties

GigaLine® Patch LCD Uniboot OS2
GigaLine® Patch LCD Uniboot OM3
GigaLine® Patch LCD Uniboot OM4

Description

Ready-to-use pre-assembled GigaLine® patch cord with LC Duplex Uniboot connectors. The LCDU HD connector is specially designed for panels with very high packing density.

Construction

Cable type	KL-I-V(ZN)H	
Buffered fiber	Two compact cores with strain relief under a common sheath (round, Ø 2.8 mm)	
Strain relief	Aramid	
Cable sheath	Halogen-free, flame-retardant compound	
Sheath colour	OS2	● Yellow
	OM3	● Aqua
	OM4	● Heather violet
	OM5	● Lime green
Cable diameter	2.8 mm	
Wiring	A to B	

Thermal properties

Transport/storage	-25 °C to +70 °C
Installation	-5 °C to +50 °C
Operating temperature	-10 °C to +70 °C

Mechanical characteristics

Bending radius	static	30 mm
	dynamic	60 mm
Tensile strength	300 N	

Optical characteristics

Insertion loss	< 0.3 dB	0.15 dB (typical)
Return loss	OS2	> 50 dB (PC)
	OM3/OM4	> 65 dB (APC)
		> 35 dB

Fire behaviour

Flame retardancy	IEC 60332-1 / IEC 60332-3-22, Cat. A
Halogen-free	IEC 60754-1
Smoke density	IEC 61034

Configuration

LC Duplex Uniboot

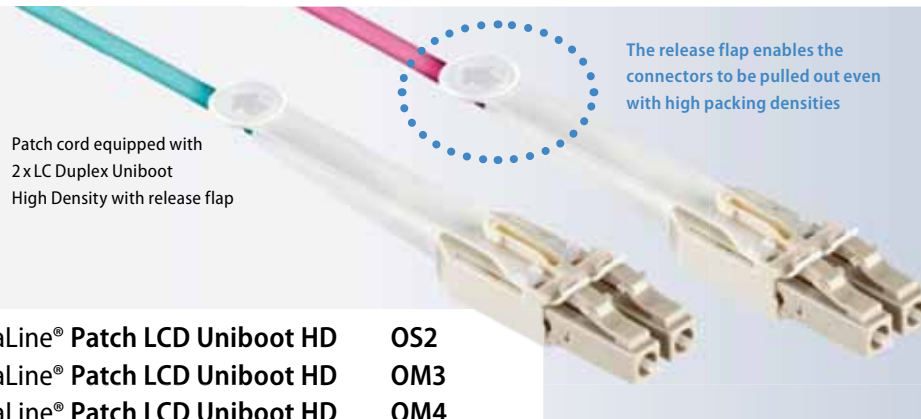
Cable length

see table, other connector types and lengths on request

	OM3 G50/125	OM4 G50/125	OS2 SMF28 ultra E9/125
Length m	Configuration 2 x LC Duplex Uniboot	Configuration 2 x LC Duplex Uniboot	Configuration 2 x LC Duplex Uniboot
1.0	LKD 9A19 98LL 0010	LKD 9A19 98MM 0010	LKD 9A19 98KK 0010
2.0	LKD 9A19 98LL 0020	LKD 9A19 98MM 0020	LKD 9A19 98KK 0020
3.0	LKD 9A19 98LL 0030	LKD 9A19 98MM 0030	LKD 9A19 98KK 0030
5.0	LKD 9A19 98LL 0050	LKD 9A19 98MM 0050	LKD 9A19 98KK 0050
7.5	LKD 9A19 98LL 0075	LKD 9A19 98MM 0075	LKD 9A19 98KK 0075
10.0	LKD 9A19 98LL 0100	LKD 9A19 98MM 0100	LKD 9A19 98KK 0100

GigaLine® patch cord 10/25 Gbit/s

LC Duplex Uniboot or LC Duplex Uniboot high density with release flap



Advantages

- very low space requirements
- for very high packing densities
- very flexible
- no preferred bending direction
- fiber type indicated by sheath colour
- excellent optical properties

GigaLine® Patch LCD Uniboot HD OS2
GigaLine® Patch LCD Uniboot HD OM3
GigaLine® Patch LCD Uniboot HD OM4

Description

Ready-to-use pre-assembled GigaLine® patch cord with LC Duplex Uniboot HD connectors.

The LCDU HD connector is specially designed for panels with very high packing density. The 64 mm long integrated release flap enables the connectors to be pulled out even when the connectors are very densely packed.

Construction

Cable type	KL-I-V(ZN)H		
Buffered fiber	Two compact cores with strain relief under a common sheath (round, Ø 2.8 mm)		
Strain relief	Aramid		
Cable sheath	Halogen-free, flame-retardant compound		
Sheath colour	OS2	● Yellow	
	OM3	● Aqua	
	OM4	● Heather violet	
	OM5	● Lime green	
Cable diameter	2.8 mm		
Wiring	A to B		

Thermal properties

Transport/storage	–25 °C to +70 °C
Installation	–5 °C to +50 °C
Operating temperature	–10 °C to +70 °C

Mechanical characteristics

Bending radius	static	30 mm
	dynamic	60 mm
Tensile strength	300 N	

Optical characteristics

Insertion loss	< 0.3 dB	0.15 dB (typical)
Return loss	OS2	> 50 dB (PC)
	OM3/OM4	> 65 dB (APC)
		> 35 dB

Fire behaviour

Flame retardancy	IEC 60332-1 / IEC 60332-3-22, Cat. A	
Halogen-free	IEC 60754-1	
Smoke density	IEC 61034	

Configuration

LC Duplex Uniboot

Cable length

see table, other connector types and lengths on request

	OM3 G50/125	OM4 G50/125	OS2 SMF28 ultra E9/125
Length m	Configuration GigaLine® Patch LCDU HD with 2 LC Duplex Uniboot HD connectors with flap 64 mm (logically crossed)		
1.0	LKD 9A11 1872 0000	LKD 9A11 1796 0000	LKD 9A13 1614 0000
2.0	LKD 9A11 1873 0000	LKD 9A11 1797 0000	LKD 9A13 1615 0000
3.0	LKD 9A11 1874 0000	LKD 9A11 1798 0000	LKD 9A13 1616 0000
5.0	LKD 9A11 1875 0000	LKD 9A11 1870 0000	LKD 9A13 1617 0000
10.0	LKD 9A11 1876 0000	LKD 9A11 1871 0000	LKD 9A13 1618 0000

GigaLine® patch cord MPO

1 fold or 2 fold, MPO/f – MPO/f

For data rates
40/100
Gbit/s



GigaLine® Patch MPO 1x12
GigaLine® Patch MPO 2x12

Description

Ready-to use pre-assembled GigaLine® MPO patch cord with 1x12 or 2x12 MPO/f – MPO/f. Pre-assembled at both ends with 1 or 2 MPO female connectors for configuring transmission links with DClint MPO modules and trunks for 10, 25, 40 or 100 Gbit/s applications.

Applications

For cabling in data centers and office applications acc. to ISO/IEC 11801 and EN 50173.

Optical characteristics

Insertion loss	0.10 dB (typ.)
	0.30 dB (max.)
Return loss	> 60 dB (SM APC)
	> 30 dB (MM)

Construction

Connection	an DClint module 8x MPO ½ HP
	on DClint module 6x LC Quad – 2x MPO 7 HP
	on DClint module 3x LC Quad – 1x MPO ½ HP
	on DClint module 3x LC Quad – 1x MPO ⅓ HP
Cable type	GigaLine® I-F(ZN)H 1x12 OS2
	GigaLine® I-F(ZN)H 1x12 OM3 bendable
	GigaLine® I-F(ZN)H 1x12 OM4 bendable
	GigaLine® I-F(ZN)H 2x12 OS2
	GigaLine® I-F(ZN)H 2x12 OM3 bendable
	GigaLine® I-F(ZN)H 2x12 OM4 bendable
Sheath colour	OS2 ● Yellow
	OM3 ● Aqua
	OM4 ● Heather violet
Plug colour	OS2 ● APC Mustard yellow
	OM3 ● Aqua
	OM4 ● Heather violet
Assignment	KBG00004 / TIA–568-B.1-7 Type B

Article	Fiber category	PU	Order no.
GigaLine® patch MPO 1x12 1xMPO/f – 1xMPO/f	OS2 (APC)	1 pc.	LKD 9SPM 2FB0 XXXX*
	OM3	1 pc.	LKD 9SPM 3DB0 XXXX*
	OM4	1 pc.	LKD 9SPM 4DB0 XXXX*
GigaLine® patch MPO 2x12 2xMPO/f – 2xMPO/f	OS2 (APC)	1 pc.	LKD 9SPM 2FC0 XXXX*
	OM3	1 pc.	LKD 9SPM 3DC0 XXXX*
	OM4	1 pc.	LKD 9SPM 4DC0 XXXX*

* XXX = length in dm (from plug to plug) Example:: 1.5 m = 015

GigaLine® patch cord LC-MPO

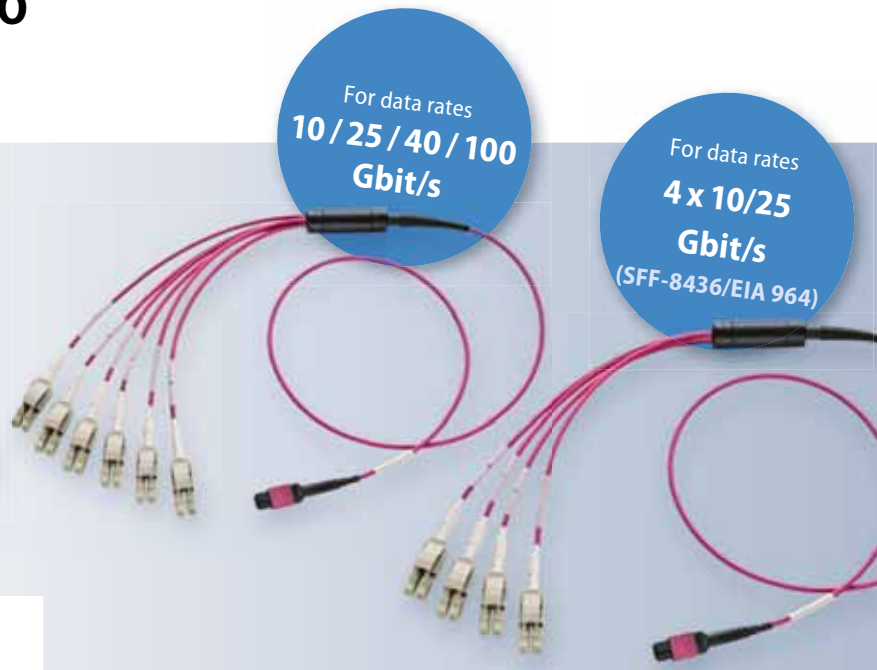
6xLC Duplex Uniboot – 1xMPO/f

4xLC Duplex Uniboot – 1xMPO/f



GigaLine® Patch LCDU-MPO 1x12

GigaLine® Patch LCDU-MPO 1x8



Description

Ready-to use pre-assembled GigaLine® MPO patch cord with a divider for LC connectors on one MPO female connector.
For simple adaptation of MPO cabling systems (12-fiber systems) to ≤ 10 Gbit/s cabling systems (6 Duplex fiber systems).
Both a dividing patch cord 1:1 and X-X are required to set up of complete links.

Construction

Connection on DCLink module 8 x MPO ½ HP

Cable type GigaLine® I-F(ZN)H 1x12 OS2
GigaLine® I-F(ZN)H 1x12 OM3 bendable
GigaLine® I-F(ZN)H 1x12 OM4 bendable

Sheath colour OS2 ● Yellow
OM3 ● Aqua
OM4 ● Heather violet

Applications

For cabling in data centers and office applications
acc. to ISO/IEC 11801 and EN 50173.

Optical characteristics

MPO insertion loss	0.10 dB (typ.)	
	0.30 dB (max.)	
MPO return loss	> 60 dB (SM APC)	> 30 dB (MM)
LC insertion loss	0.25 dB (typ.) (SM PC)	
	0.35 dB (max.) (SM PC)	
	0.25 dB (typ.) (MM)	
	0.40 dB (max.) (MM)	
LC return loss	> 50 dB (SM PC)	> 35 dB (MM)

Article	Configuration	Category	Assignment	PU	Order no.	
GigaLine® patch LC MPO 1x12 6xLC Duplex Uniboot – 1xMPO/f	6xLCDU/PC – 1xMPO/f APC	OS2	KBG00009 1:1	1 pc.	LKD 9SP1 2BB0 0XXX*	
	6xLCDU – 1xMPO/f	OM3			LKD 9SP1 3AB0 0XXX*	
	6xLCDU – 1xMPO/f	OM4			LKD 9SP1 4AB0 0XXX*	
	6xLCDU/PC – 1xMPO/f APC	OS2	KBG00006 X-X		LKD 9SPX 2BB0 0XXX*	
	6xLCDU – 1xMPO/f	OM3			LKD 9SPX 3AB0 0XXX*	
	6xLCDU – 1xMPO/f	OM4			LKD 9SPX 4AB0 0XXX*	
GigaLine® patch LC MPO 1x8 4xLC Duplex – 1xMPO/f	4xLCDx – 1xMPO/f APC	OS2	KBG00011	1 pc.	LKD 9SPW 2BA2 0XXX*	
	4xLCDx – 1xMPO/f	OM3			LKD 9SPW 3AA2 0XXX*	
	4xLCDx – 1xMPO/f	OM4			LKD 9SPW 4AA2 0XXX*	
GigaLine® patch LC MPO 1x8 4xLC Duplex Uniboot – 1xMPO/f	4xLCDU – 1xMPO/f APC	OS2	SFF-8436/EIA 964		LKD 9SPW 2BA0 0XXX*	
	4xLCDU – 1xMPO/f	OM3			LKD 9SPW 3AA0 0XXX*	
	4xLCDU – 1xMPO/f	OM4			LKD 9SPW 4AA0 0XXX*	

* XXX = length in dm (from plug to plug) Example: 1.5 m = 015



GigaLine® FO connectivity



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o	Office
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o	Industry

GigaLine® FO cabling systems

High-performance components for building a fiber optic infrastructure



GigaLine® is a perfectly coordinated system made up of components optimised for performance and quality.

The interplay of high-quality fibers and skilfully crafted connectors ensures maximum performance and range for the respective application.

The requirements for fibers and connectors differ depending on the field of application.

	OM2	OM2e	OM3	OM4	OM5	OS2	
Industry							SC, ST
Office							LC, SC
DataCenter							LC, MTP / MPO
Campus							LC, SC

The system components are optimised to meet the requirements in terms of both distance and data rate. This is why LEONI consistently uses its own j-fiber fibers (cables, pigtails, patch cords).

The appropriate GigaLine® components are available to meet the requirements of each application.

	GigaLine® wall outlets	GigaLine® wall distributor	GigaLine® Trunk and splice boxes	GigaLine® DClink	GigaLine® Compact
Industry					
Office					
DataCenter					
Campus					

The GigaLine® system is determined by the application, required link length and transmission protocol.

The table below shows the protocol-dependent attenuation budget according to EN 50173-1 for the 10 Gigabit Ethernet protocol. From this is derived the number of possible connections based on the overall link. The following harmonised components were taken into consideration when putting together the system:

- FO cable (GigaLine®) with laser/dispersion-optimised multi-mode fibers that offer appropriate performance reserves (for fiber specifications see section on GigaLine® FO data cables)
- Fiber optic connectors with low insertion losses and high return losses

Maximum transmission lengths for 10 Gigabit Ethernet system solutions.

	OM2e	OM3 bendable	OM4 bendable	OS2
max. link length*	150	300	550	10,000
Attenuation budget**	1.8 dB	2.6 dB	2.6 dB	6.2 dB
max. fiber attenuation	0.37 dB	0.75 dB	1.37 dB	3.6 dB
Number of possible connectors	6	8	6	12
Recommended connectors	LC, MPO, SC	LC, MPO, SC	LC, MPO, SC	LC, SC

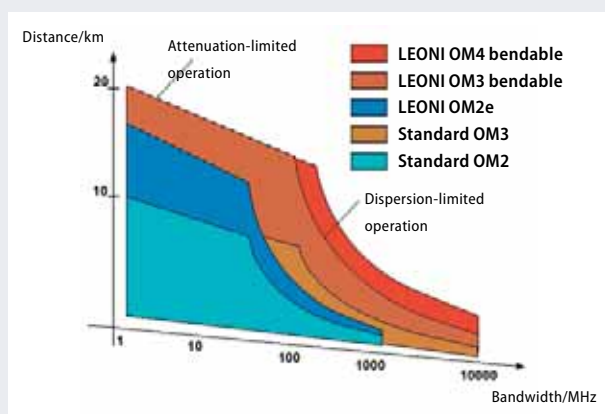
* based on 10 GbE

** all specifications are based on 850 nm or 1,310 nm

Graph 1 shows the system reserves afforded by the high-quality fibers and connectors in relation to EN 50173.

The key advantages of these system reserves are:

- Longer transmission lengths for certain applications (100 Mb/s, 1 GbE, 10 GbE, 40 GbE, 100 GbE)
- The option to insert more patch cords or splices
- Additional attenuation caused by ageing processes can be curtailed
- Network extensions can be realised with ease and a certain level of assurance within the link lengths



Graph 1: System reserves of GigaLine® 150, 300 and 550 relative to the standard

GigaLine® BIMMF with patch and trunk cable – the perfect combination

GigaLine® FO cables are fitted with bend-insensitive OM3, OM4 and OM5 fibers (j-BendAble). This means significant added value for you:

- Greater reliability with higher packing density and installation in constricted areas due to the low bending loss.
- Low-risk patching in operation – the data transmission remains constantly stable despite significant bending.
- Maximum security for a mix and match with fibers of other manufacturers due to minimal transition damping.

Quality is our benchmark

Assembly of fiber optic connectors involves both adjustment of the fibers in the ferrule as well as time-consuming grinding and polishing. The aim here is to machine the connector with such precision using optimised processes that the insertion loss and reflections are kept to a minimum. This is done by means of PC polishing (PC = physical contact). Spherical polishing of the ferrule spring mounted in the connector housing produces a fiber/fiber transition at the end faces. In other words when two connectors are plugged into one coupling, the spring pressure pushes out all the air between the mating fibers of both connectors. The glass/glass transition then has very low reflections and low attenuation.

To maximise the performance of a PC connector, the surface parameters of the connectors must be carefully checked during the polishing process. The interferometer is an indicative measuring instrument for this. The overlaps of coherent light waves are used to measure the quality of optical surfaces (ferrule surfaces).

The most important parameters are:

- Apex offset (offset between the highest point and the centre of the fiber)
- Radius of the connector interface (fiber/ferrule)
- Fiber height (undercut, protrusion)

These parameters determine the long-term behaviour and therefore the quality of a fiber optic connector.

Insertion loss

of the connectors used in GigaLine® system components.

Fiber type		Insertion loss typ.	Return loss
G50/125	OM2e	0.15 dB	> 35 dB
G50/125	OM3 bendable	0.15 dB	> 35 dB
G50/125	OM4 bendable	0.15 dB	> 35 dB
E9/125	OS2	0.15 dB	> 50 dB
E9/125	OS2 APC	0.15 dB	> 65 dB



GigaLine® Trunk – pre-assembled trunk cables

Safely through "thick and thin"

Ready-to-connect units are at the heart of our fiber optic system technology. The pre-assembled cables (GigaLine® trunk cables) guarantee rapid, reliable and economical installation. The quality of the pathway is assured by the careful coordination of the system components used. Installation times can be readily calculated.

A lasting solution

Conditions are often unfavourable during on-site installation. Moisture, dirt and poorly accessible areas are by no means uncommon. This is why we use an IP 67 protection class wire ripple tube for our GigaLine® trunk cables with universal or outdoor cable. Thanks to their particularly strong construction with an encapsulated cable divider and bolted-on wire ripple tube, our trunk cables are protected from water spray and are non-crush. They are ideal for harsh construction site environments and outdoor cabling systems. Indoor cables are fitted with dust protection without strain relief to prevent soiling of the plugs.

GigaLine® trunk cables are designed to ensure that ambient conditions do not affect the quality of the transmission lines – either during or after installation. The cable pull is flexible and has a small cross-section. This enables pre-assembled trunk cables to be easily fed into tight, twisty manholes and installation channels. A frictional connection is formed with the divider head. It acts on the strain relief elements and the sheaths.

The fibers thereby remain free of tension. The distribution head design guarantees the stability of the physical parameters while also ensuring a long service life.

Time is money

GigaLine® trunk cables offer reliable and calculable installation. Installation times are short. All GigaLine® 19" trunk cable housings have recesses on the back in which the divider head is mounted to prevent rotation. The fast assembly minimises any downtime e.g. as a result of temporary IT system shutdown. On-site cable splicing and connector fitting, which often has to be performed under adverse conditions, is not required. Customers also save the cost of buying in splicing machinery and deploying specially-trained personnel. GigaLine® trunk cables can also be pre-assembled at one end.

Fields of application

GigaLine® trunk cables are ideal for backbone cabling in the primary and secondary segments as well as for collapsed backbone cabling.

Quality means maximum safety

The plugs are assembled with high quality ceramic ferules under clean conditions. The plug faces are polished to the highest standard, thereby ensuring outstanding plug transitions in reproducible quality (input and return attenuation). A test certificate with the attenuation readings of each fiber is supplied with the product. There is also the option of having OTDR measurements carried out.



GigaLine® FO truck cable universal

Type KL-U-DQ(ZN)BH, pre-assembled at both ends

Advantages

- robust design
- easy assembly
- high crush resistance and tensile strength
- excellent optical properties

GigaLine® Trunk U-DQ(ZN)BH IP67

Construction

Single elements	up to 144 buffered fibers with strain relief under one sheath, diameter 1.8 mm		
Colour code	Acc. to IEC 60304		
Strain relief	Non-metallic (glass rovings)		
Cable sheath	Halogen-free, flame-retardant compound		
	Colour: black		
Divider head	Aluminium		
Protection class	acc. to IP67		
Strain relief	600 N		
Patch element	Ø 1.8 mm, assorted colours acc. to IEC 60304, shortest patch element 55 cm, gradation 4 cm		
Strain relief	100 N		
Dust protection	Protective tube		
Feeder Ø	up to 12 fibers	34 mm	
max.	up to 48 fibers	52 mm	
	up to 144 fibers	68 mm	

Thermal properties

Transport/storage	-25 °C to +70 °C
Installation	-5 °C to +50 °C
Operating temperature	-25 °C to +60 °C

Optical characteristics

Insertion loss typ.	for all fiber types		0.2 dB
Return loss typ.	G50/125	OM3	> 35 dB
	G50/125	OM4	> 35 dB
	E9/125	OS2	> 50 dB
	E9/125	OS2 APC	> 65 dB

Mechanical characteristics

Bending radius	static	15 x outer Ø
	dynamic	20 x outer Ø

Fire behaviour

Flame retardancy	IEC 60332-1 / IEC 60332-3-24 Cat. C
Halogen-free	IEC 60754-1
Smoke density	IEC 61034

Other characteristics

Longitudinal waterproofing	IEC 60794-1-2 F5
----------------------------	------------------

Connector	SC	E2000	E2000HRL	LC
Single-mode OS2 E9/125				
12	LKD 9VXX X61Q 0000	LKD 9VXX X61W 0000	LKD 9VXX X622 0000	LKD 9VXX X60L 0000
24	LKD 9VXX X61R 0000	LKD 9VXX X61X 0000	LKD 9VXX X623 0000	LKD 9VXX X60M 0000
48	LKD 9VXX X61S 0000	LKD 9VXX X61Y 0000	LKD 9VXX X624 0000	LKD 9VXX X60N 0000
Multi-mode OM3 G50/125				
12	LKD 9VXX X61D 0000	*	*	LKD 9VXX X618 0000
24	LKD 9VXX X61E 0000	*	*	LKD 9VXX X619 0000
48	LKD 9VXX X61F 0000	*	*	LKD 9VXX X60A 0000
Multi-mode OM4 G50/125				
12	LKD 9VXX X60X 0000	*	*	LKD 9VXX X612 0000
24	LKD 9VXX X60Y 0000	*	*	LKD 9VXX X614 0000
48	LKD 9VXX X60Z 0000	*	*	LKD 9VXX X613 0000

xxx = Length in metres, measured from plug side A to plug side B

* further plug types and fiber numbers on request



GigaLine® trunk and splice boxes

Multifunctional housing technology, 19"

GigaLine® trunk and splice boxes can be used in all areas of building data cabling. The construction of the components ensures speed and reliability during initial installation, maintenance and extension.

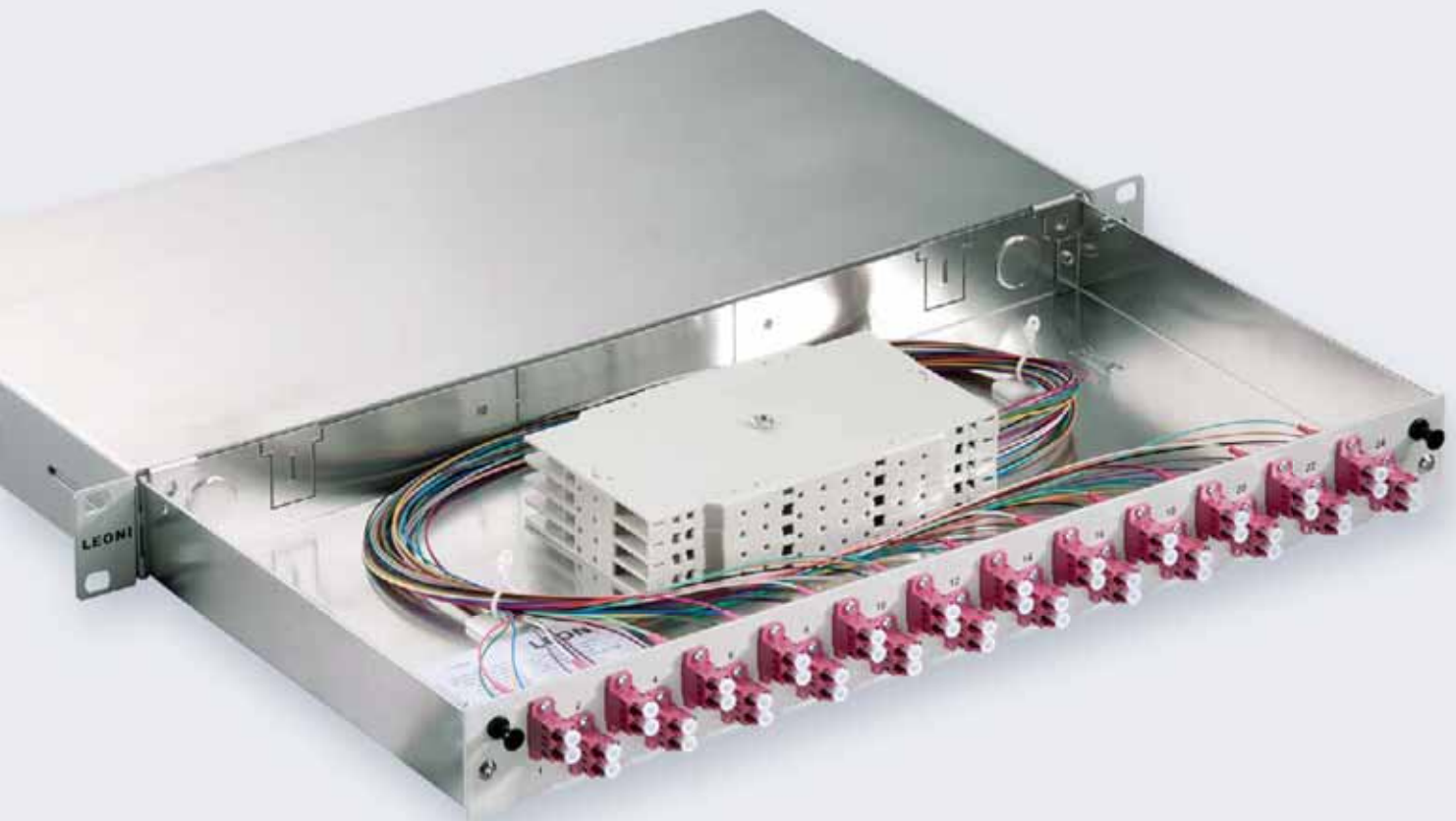
All boxes are pre-assembled ready to install and constructed so that two cables can be inserted via cable glands or two divider heads can be inserted from above. A breakout panel to which the cables can be secured using cable ties is available as an alternative.

Your guarantee for quick and reliable installation:

- The box body is made of aluminium and therefore very light
- The boxes are assembled ready to install
- The permissible bending radii as well as ease of installation are guaranteed even with high packing densities
- The telescopic version offers the advantage that all components are easily accessible for testing and maintenance work

GigaLine® trunk and splice boxes:

- Boxes with one rack unit for fixed installation or as a telescopic version
- Boxes with two rack units are always telescopic
- The front panel is made of galvanised steel panel and light grey RAL 7035, powder coated
- One rack unit can be equipped with up to:
24 x SC Duplex, 24x LC Quad, 24 x LC Duplex, 24 x MT-RJ,
24 x E 2000, 24 x ST, 24 x FC couplings



GigaLine® FO splice box

Box 19" / 1 RU, telescopic



Advantages

- extremely light
- easy to install
- excellent optical properties

GigaLine® splice box telescopic

Description

Telescopic fiber optic patch panel for max. 48 optical fibers.
For terminating fiber optic transmission links with pigtails.

Construction

Housing	Aluminium, with dust protection cover telescopic and removable drawer depth continuously adjustable by up to 50 mm
Front panel and fixation angle	Galvanised steel panel, powder coated, colour: grey RAL 7035
Pigtails	Pigtails ready for splicing and plugged in (colours according to DIN IEC 60304)
Labelling	Channel 1–12 / 1–24 (screen printing) A/B coding with SC/ST/FC configuration
Dimensions	19" / 1 RU 44 mm x 483 mm x 220 mm (HxWxD)
Weight	approx. 1.8 kg

Single-mode OS2 E9/125

No. of fibers	E2000HRL, green plastic/cer
12	LKD 9D31 A022 0000
24	LKD 9D31 A023 0000

Single-mode OS2 E9/125

No. of fibers	SC Duplex, blue plastic/cer	LCD, blue plastic/cer	E2000, blue plastic/cer
12	LKD 9D31 A004 0000	LKD 9D31 A015 0000	LKD 9D31 A019 0000
24	LKD 9D31 A005 0000	LKD 9D31 A016 0000	LKD 9D31 A020 0000
48	LKD 9D31 A006 0000	LKD 9D31 A017 0000	

Multi-mode OM3 G50/125

No. of fibers	SC Duplex, aqua plastic/cer	LCD, aqua plastic/cer	E2000, aqua plastic/cer
12	LKD 9D31 A043 0000	LKD 9D31 A199 0000	LKD 9D31 A058 0000
24	LKD 9D31 A044 0000	LKD 9D31 A186 0000	LKD 9D31 A059 0000
48	LKD 9D31 A045 0000	LKD 9D31A281 0000	

Optical characteristics

Insertion loss	for all fiber types	0.2 dB (typ.)
Return loss	G50/125 OM2e	> 35 dB
	G50/125 OM3	> 35 dB
	G50/125 OM4	> 35 dB
	E9/125 OS2	> 50 dB
	E9/125 OS2 APC	> 65 dB

Configuration

Equipment	available with up to 24 slots
Couplings	SC Duplex, FC-PC/FC-APC, ST, E2000/E2000 HRL, LC Duplex

Accessories

1 x M20 cable gland, splice cassette, crimp splice protective holder

optional >

Breakout panel for attaching cables with cable ties

(Order no. LKD 9D60 0000 0000)

Multi-mode OM2e G50/125

No. of fibers	SC Duplex, beige plastic/cer	LCD, beige plastic/cer	E2000, beige plastic/cer
12	LKD 9D31 A025 0000	LKD 9D31 A036 0000	LKD 9D31 A040 0000
24	LKD 9D31 A026 0000	LKD 9D31 A037 0000	LKD 9D31 A041 0000
48	LKD 9D31 A027 0000	LKD 9D31 A038 0000	

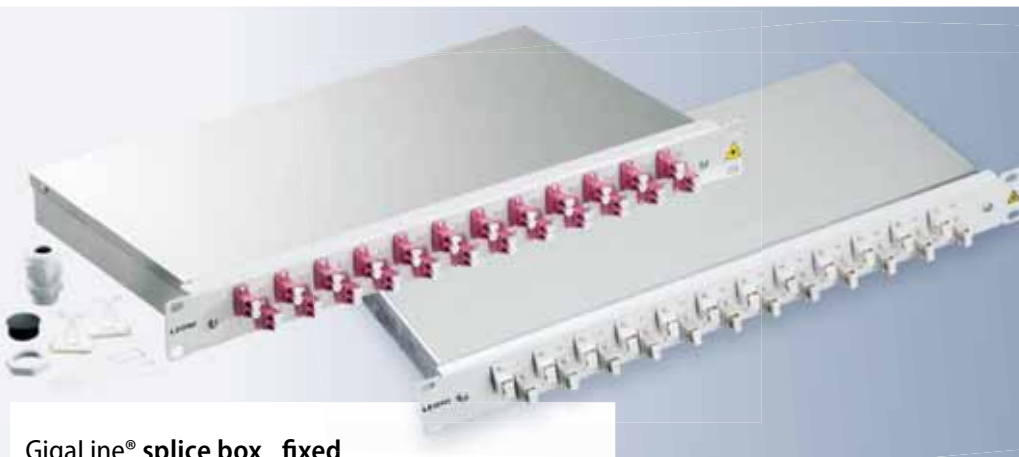
Multi-mode OM4 G50/125

No. of fibers	SC Duplex, heather violet plastic/cer	LCD, heather violet plastic/cer	E2000, heather violet plastic/cer
12	LKD 9D31 A061 0000	LKD 9D31 A295 0000	LKD 9D31 A076 0000
24	LKD 9D31 A062 0000	LKD 9D31 AXXX 0000	LKD 9D31 A077 0000
48	LKD 9D31 A063 0000	LKD 9D31 AXXX 0000	

other configurations available on request

GigaLine® FO splice box

Box 19" / 1 RU, fixed



Advantages

- extremely light
- easy to install
- excellent optical properties

GigaLine® splice box fixed

Description

Fiber optic patch panel, for max. 48 glass fibers.
For terminating fiber optic transmission links with pigtails.

Construction

Housing	Aluminium, with dust protection cover
Front panel	galvanised steel panel, colour: grey RAL 7035
Pigtails	Pigtails ready for splicing and plugged in (colours acc. to DIN IEC 60304)
Labelling	Channel 1–12 / 1–24 (screen printing) A/B coding with SC/ST/FC configuration
Dimensions	19" / 1 RU 44 mm x 483 mm x 220 mm (HxWxD)
Weight	approx. 1.5 kg

Optical characteristics

Insertion loss	for all fiber types 0.2 dB (typ.)		
Return loss	G50/125	OM2e	> 35 dB
	G50/125	OM3	> 35 dB
	G50/125	OM4	> 35 dB
	E9/125	OS2	> 50 dB
	E9/125	OS2 APC	> 65 dB

Configuration

Equipment	available with up to 24 slots
Couplings	SC Duplex, FC-PC/FC-APC, ST, E2000/E2000 HRL, LC Duplex

Accessories

1 x M20 cable gland, splice cassette, crimp splice protective holder

optional >

Breakout panel for attaching cables with cable ties
(Order no. LKD 9D60 0000 0000)

Single-mode OS2 E9/125			
No. of fibers	SC Duplex, blue plastic/cer	E2000, blue plastic/cer	E2000HRL, green plastic/cer
6	LKD 9D41 AXXX 0000	LKD 9D41 A018 0000	LKD 9D41 A021 0000
12	LKD 9D41 AXXX 0000	LKD 9D41 A019 0000	LKD 9D41 A022 0000
24	LKD 9D41 AXXX 0000	LKD 9D41 A020 0000	LKD 9D41 A023 0000
48	LKD 9D41 AXXX 0000		

Multi-mode OM3 G50/125			
No. of fibers	SC Duplex, aqua plastic/cer	LCD, aqua plastic/cer	E2000, aqua plastic/cer
6	LKD 9D41 A002 0000	LKD 9D41 A229 0000	LKD 9D41 A047 0000
12	LKD 9D41 A006 0000	LKD 9D41 A230 0000	LKD 9D41 A048 0000
24	LKD 9D41 A010 0000	LKD 9D41 A231 0000	LKD 9D41 A049 0000
48	LKD 9D41 AXXX 0000	LKD 9D41 A232 0000	

Multi-mode OM2e G50/125			
No. of fibers	SC Duplex, beige plastic/cer	LCD, beige plastic/cer	E2000, beige plastic/cer
6	LKD 9D41 A024 0000	LKD 9D41 A035 0000	LKD 9D41 A039 0000
12	LKD 9D41 A025 0000	LKD 9D41 A036 0000	LKD 9D41 A040 0000
24	LKD 9D41 A026 0000	LKD 9D41 A037 0000	LKD 9D41 A041 0000
48	LKD 9D41 A147 0000	LKD 9D41 A166 0000	

Multi-mode OM4 G50/125			
No. of fibers	SC Duplex, heather violet plastic/cer	LCD, heather violet plastic/cer	E2000, heather violet plastic/cer
6	LKD 9D41 A050 0000	LKD 9D41 AXXX 0000	LKD 9D41 A062 0000
12	LKD 9D41 A051 0000	LKD 9D41 A238 0000	LKD 9D41 A063 0000
24	LKD 9D41 A052 0000	LKD 9D41 A233 0000	LKD 9D41 A064 0000
48	LKD 9D41 AXXX 0000	LKD 9D41 A234 0000	

other configurations available on request

GigaLine® FO trunk box

Box 19" / 1 RU, telescopic



Advantages

- extremely light
- easy to install

GigaLine® trunk box telescopic

Description

Telescopic fiber optic patch panel for pre-assembled trunk cables. Suitable for termination of up to 48 glass fibers.

Construction

Housing	Aluminium, with dust protection cover telescopic and removable drawer depth continuously adjustable by up to 50 mm
Front panel and fixation angle	galvanised steel panel, powder coated colour: grey RAL 7035
Capacity	Installation of up to 2 trunk cables
Labelling	Channel 1–12 / 1–24 (screen printing) A/B coding with SC/ST/FC configuration
Dimensions	19" / 1 RU 44 mm x 483 mm x 220 mm (HxWxD)
Weight	approx. 1.7 kg

Configuration

Equipment	available with up to 24 slots
Couplings	SC Duplex, FC-PC/FC-APC, ST E2000/E2000 HRL, LC Duplex

Accessories (optional)

Breakout panel for attaching cables with cable ties
(Order no. LKD 9D60 0000 0000)

Single-mode						
No. of fibers	LC Duplex blue, plastic/cer	LSH Compact Duplex blue, plastic/cer	SC Duplex blue, plastic/cer	LC Duplex green, plastic/cer	LSH Compact Duplex green, plastic/cer	SC Duplex green, plastic/cer
12		LKD9D32A2050000	LKD9D32A0040000		LKD9D32A1860000	LKD9D32A2270000
24	LKD9D32A0010000	LKD9D32A2060000	LKD9D32A0050000	LKD9D32A2180000	LKD9D32A2070000	
48	LKD9D32A0160000		LKD9D32A0060000		LKD9D32A2260000	
Multi-mode						
No. of fibers	LC Duplex aqua, plastic/cer	LC Duplex aqua, plastic/cer	LC Duplex aqua, plastic/cer	LC Duplex heather violet, plastic/cer	LC Duplex heather violet, plastic/cer	LC Duplex heather violet, plastic/cer
12	LKD9D32A1790000	LKD9D32A2100000	LKD9D32A2140000	LKD9D32A1820000	LKD9D32A2120000	LKD9D32A2020000
24	LKD9D32A1800000	LKD9D32A2110000	LKD9D32A2150000	LKD9D32A1830000	LKD9D32A2130000	LKD9D32A2030000
48	LKD9D32A1770000		LKD9D32A2010000	LKD9D32A1840000		LKD9D32A2040000

other configurations available on request

GigaLine® FO trunk box

Box 19" / 1 RU, fixed



Advantages

- extremely light
- easy to install

GigaLine® trunk box fixed

Description

FO distributor box for pre-assembled trunk cables.
Suitable for termination of up to 48 glass fibers.

Construction

Housing	Aluminium, with dust protection cover
Front panel	Galvanised steel panel, powder coated Colour: grey RAL 7035
Capacity	Installation of up to 2 trunk cables
Labelling	Channel 1–12 / 1–24 (screen printing) A/B coding with SC/ST/FC configuration
Dimensions	19" / 1 RU 44 mm x 483 mm x 220 mm (HxWxD)
Weight	approx. 1.4 kg

Configuration

Equipment	available with up to 24 slots
Couplings	SC Duplex, FC-PC/FC-APC, ST E2000/E2000 HRL, LC Duplex

Accessories (optional)

Breakout panel for attaching cables with cable ties
(Order no. LKD 9D60 0000 0000)

Single-mode						
No. of fibers	LC Duplex blue, plastic/cer	LSH Compact Duplex blue, plastic/cer	SC Duplex blue, plastic/cer	LC Duplex green, plastic/cer	LSH Compact Duplex green, plastic/cer	SC Duplex green, plastic/cer
12	LKD9D42A0130000	LKD9D42A1360000	LKD9D42A0040000		LKD9D42A1380000	
24	LKD9D42A0330000	LKD9D42A1370000	LKD9D42A0050000		LKD9D42A1390000	
48	LKD9D42A0010000		LKD9D42A1460000			
Multi-mode						
No. of fibers	LC Duplex aqua, plastic/cer	LC Duplex aqua, plastic/cer	LC Duplex aqua, plastic/cer	LC Duplex heather violet, plastic/cer	LC Duplex heather violet, plastic/cer	SC Duplex heather violet, plastic/cer
12	LKD9D42A1140000	LKD9D42A1420000	LKD9D42A1300000	LKD9D42A1180000	LKD9D42A1440000	LKD9D42A1330000
24	LKD9D42A1150000	LKD9D42A1430000	LKD9D42A1310000	LKD9D42A1190000	LKD9D42A1450000	LKD9D42A1340000
48	LKD9D42A1160000		LKD9D42A1320000	LKD9D42A1200000		LKD9D42A1350000

other configurations available on request



GigaLine® Compact – FO distribution system

for maximum packing density and flexibility

GigaLine® Compact is a user-friendly fiber optic distribution system that can be configured with up to 144 fibers with conventional couplings such as SC, ST, E 2000 and with 288 fibers with LC Duplex couplings.

Despite being compact, the system offers optimum FO management. GigaLine® Compact is used where space is limited and maximum flexibility is required.

GigaLine® Compact rack with excess-length drawer 3+1 RU

- Width: 19" / 84 HP
- Height 4 RU (3 RU rack + 1 RU excess-length drawer)
- can be fitted with up to 12 modules
- Excess-length drawer blade can be pulled out to the rear, for holding loose tube reserves and securing FO cables, alternatively: with cable glands up to 6 pre-assembled trunk cables can be attached with up to 48 fibers
- Marshalling panel for patch cord routing and adherence to bend radii.



GigaLine® rack with excess-length draw 3+1 RU

GigaLine® Compact module 3 RU / 7 HP

- for up to 24 fibers
- available with up to 12 couplings
- fitted with SC Duplex, ST, E2000, FC-PC or LC Duplex couplings
- Front panel: Aluminium, with mounting screws
- including splice cassette and excess-length cassette
- Buffered fiber pigtails are inserted, stripped and coloured acc. to the DIN IEC 60304 colour code (primary and secondary coating) for fast and reliable installation
- Fiber qualities: OM2e, OM3, OM4 and OS2
- The couplings can be retrofitted at any time



GigaLine® Compact module 3 RU, 7 HP

GigaLine® Compact FO rack

with mounted excess-length drawer 3+1 RU



- Advantages
- for high packing densities
 - clearly laid out cable management

GigaLine® Compact rack

Description

Rack with 84 HP. The excess-length drawer for the loose tubes can be pulled out to the rear. Max. 6 trunk cables with 48 fibers each can be inserted from above or up to 12 loose tube cables with max. 288 fibers can be inserted from the front.

Construction

Housing	Aluminium with permanently installed runners for the installation modules
Excess-length drawer	For clear organisation of the loose tube reserves and securing, can be pulled out to the rear
Dimensions	19" / 4 RU 176 mm x 483 mm x 295 mm (HxWxD)

Accessories

- 1 x M20 cable gland
- 5 x patch cord routing

Accessories (optional)

Loose tube guide plate	To protect loose tubes on the rear, especially in open racks
Dummy front panel 7HP	To close off unused module slots



Rack – rear view



Rack for GigaLine® trunk cables – rear view

Name	Order no.
GigaLine® Compact rack	LKD 9D50 0000 0000
Loose tube guide plate	LKD 9D50 0005 0000
Dummy front panel 7HP	LKD 9D50 0004 0000

GigaLine® Compact FO module

Installation module for splicing solutions



Advantages

- excellent optical properties



GigaLine® Compact splice module

Description

Installation module, available with 3, 6 and 12 slots.
Including splice cassette and excess-length cassette.
The buffered fiber pigtails are inserted, stripped and coloured (primary and secondary coating) acc. to the DIN IEC 60304 colour code ready for splicing for fast and secure installation.

Construction

Module rack	Aluminium
Front panel	Aluminium, with mounting screws
Pigtails	Up to 24 pigtails ready for splicing and plugged in (colours according to DIN IEC 60304)
Dimensions	7 HP / 1 RU 128 mm x 35 mm x 240 mm (H x W x D)

Optical characteristics

Insertion loss typ.	for all fiber types		0.2 dB
Return loss typ.	G50/125	OM2e	> 35 dB
	G50/125	OM3	> 35 dB
	G50/125	OM4	> 35 dB
	E9/125	OS2	> 50 dB
	E9/125	OS2 APC	> 65 dB

Configuration

Couplings	The couplings can be retrofitted at any time
-----------	--

Accessories

Labelling strips
Cable ties for securing the loose tubes
Crimp splice protective holder
Protective tube for loose tubes 90 cm

Single-mode OS2 E9/125

No. of fibers	SC Duplex, blue plastic/cer	LCD, blue plastic/cer	E2000, blue plastic/cer
12	LKD 9D51 0085 0000	LKD 9D51 0011 0000	LKD 9D51 0015 0000
24		LKD 9D51 0012 0000 (LC Quad)	

Multi-mode OM3 G50/125

No. of fibers	SC Duplex plastic/cer	LC Duplex, aqua plastic/cer
12	LKD 9D51 0040 0000	LKD 9D51 0096 0000
24		LKD 9D51 0092 0000 (LC Quad)

other configurations available on request

Multi-mode OM2e G50/125

No. of fibers	SC Duplex plastic/cer	LC Duplex plastic/cer
12	LKD 9D51 0024 0000	LKD 9D51 0030 0000
24		LKD 9D51 0031 0000 (LC Quad)

Multi-mode OM4 G50/125

No. of fibers	SC Duplex plastic/cer	LC Duplex, heather violet plastic/cer
12	LKD 9D51 0056 0000	LKD 9D51 XXXX 0000
24		LKD 9D51 0093 0000 (LC Quad)

GigaLine® Compact FO module

Installation module for pre-assembled breakout cables, 3 RU / 7 HP



GigaLine® Compact trunk module

Description

Installation module, available with 3, 6 and 12 slots.
Includes excess length cassette.

Construction

Module rack	Aluminium
Front panel	Aluminium, with mounting screws
Capacity	for up to 24 fibers
Dimensions	7 HP / 1 RU 128 mm x 35 mm x 240 mm (H x W x D)

Configuration

Couplings	SC Duplex, ST, E2000, FC-PC, LC Duplex, LC Quad
-----------	--

Accessories

Labelling strips
Cable ties

Single-mode			
Number of fibers	SC Duplex, blue plastic/cer	LCD, blue plastic/cer	E2000, blue plastic/cer
12	LKD 9D52 0001 0000	LKD 9D52 0009 0000	LKD 9D52 0012 0000
24		LKD 9D52 0010 0000 (LC Quad)	

Multi-mode				
Number of fibers	SC Duplex, beige plastic/cer	LC Duplex, beige plastic/cer	LC Duplex, aqua plastic/cer	LC Duplex, heather violet plastic/cer
12	LKD 9D52 0017 0000	LKD 9D52 0025 0000	LKD 9D52 0038 0000	LKD 9D52 0050 0000
24		LKD 9D52 0026 0000 (LC Quad)	LKD 9D52 0036 0000 (LC Quad)	LKD 9D52 0037 0000 (LC Quad)

other connectors available on request

GigaLine® office and floor distributors

Multifunctional housing for FTTD/FTTO cabling

Network installations are increasingly being implemented with disturbance-proof fiber optic systems technology with future capabilities. This allows EMC problems as well as different earthing potentials to be avoided for cabling across whole buildings.

When a fiber optic cabling system with a star structure is used in a building, the long ranges involved make it possible to dispense with active components on the individual floors. 19" distributor cabinets and separate security areas (rooms) including the associated power supply are no longer necessary.

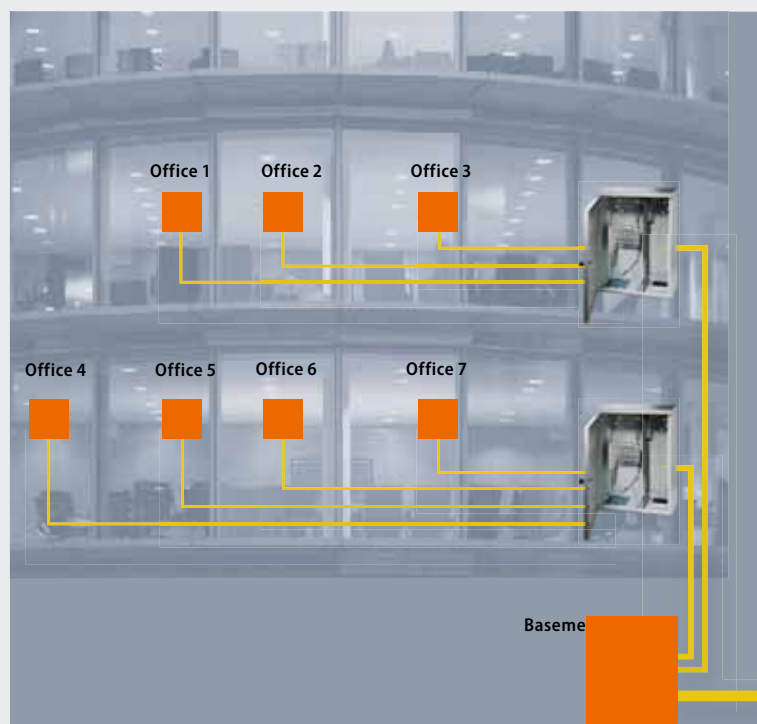
The space-saving office and floor distributors are perfectly suited for the transitions from high-fiber backbone cables to breakout cables for workplace cabling. They are easy to install and offer space-saving organisation as well as optimum protection for fiber optic systems engineering.

GigaLine® provides a high degree of flexibility:

- GigaLine® office and floor distributors can be optionally equipped with splice cassettes and/or distributor plates for holding fiber optical couplings
- Later modifications to the components used are possible at any time
- Can hold up to 288 fibers
- The buffered fiber pigtails are coloured acc. to the DIN IEC 60304 colour code for fast and reliable installation
- The pigtail buffered fibers in the splice cassette are stripped and ready for splicing
- The incoming and outgoing fiber optic cables are fixed to a strain relief strip in the housing
- The cable entries are sealed via brush strips or PG cable glands
- Housings have one removable/lockable swing door
- Housing colour: light grey, RAL 7035

GigaLine® office and floor distribution board

- tailored to customer's requirements and supplied fully assembled
- available in 2 sizes



GigaLine® FO office and floor distributor

Wall distributor for up to 4 or 24 splice cassettes



Advantages

- space-saving
- universal use

GigaLine® wall distributor

size A

Application

Space-saving distributor cabinets for Fiber-To-The-Office or Fiber-To-The-Desk cabling systems. Suitable for distribution of up to 24 channels (48 fibers).

Performance

For up to 4 splice cassettes with a total of 48 fibers. The buffered fiber pigtails are inserted, stripped and coloured acc. to the DIN IEC 60304 colour code (primary and secondary coating), for fast and secure installation.

Construction

- Powder-coated steel panel, colour: light grey RAL 7035
- Cable entry from above and below possible
- 4 cable entries either as M20 / M25 or brush strip
- Door with lock or bolt
- Weight approx. 4 kg

Dimensions

Size A 300 mm x 300 mm x 85 mm (H x W x D)

Configuration

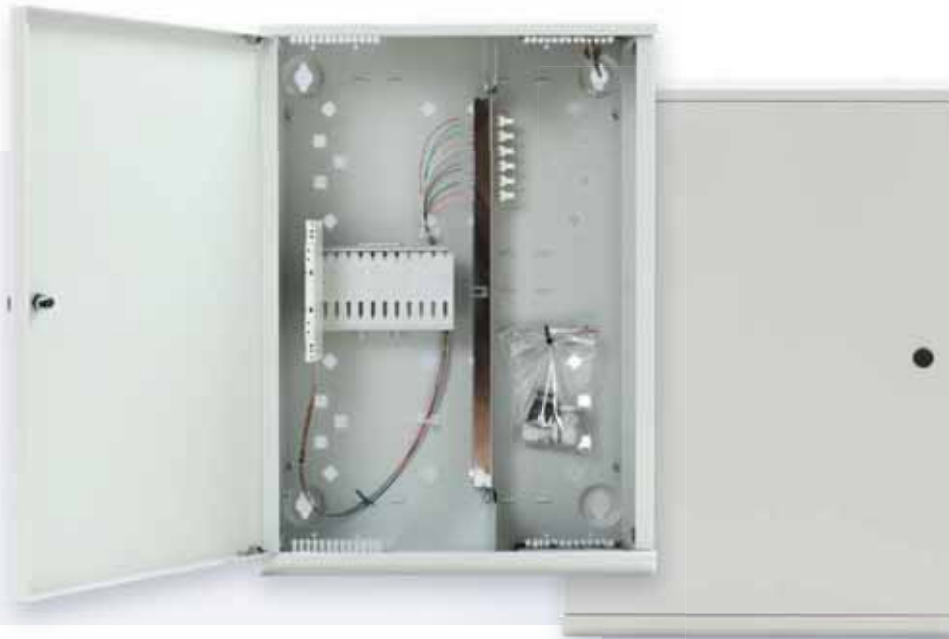
Optionally with couplings for pre-assembled trunks only, purely as a splice box or combined

Accessories

max. 4 splice cassettes
with crimp splice protective holder, buffered fiber strain relief
and cover max. 24 couplings: LCD, SCD or E2000

Name	Order no.
GigaLine® wall distributor, size A with 4 splice cassettes and 4 strips	LKD 9D71 0009 0000

additional equipment on request



Advantages

- space-saving
- universal use

GigaLine® wall distributor size B

Application

Space-saving distributor cabinets for Fiber-To-The-Office or Fiber-To-The-Desk cabling systems. Suitable for distribution of up to 144 channels (288 fibers).

Performance

For up to 24 splice cassettes for up to 288 fibers. The buffered fiber pigtails are inserted, stripped and coloured acc. to the DIN IEC 60304 colour code (primary and secondary coating), for fast and secure installation.

Construction

- Powder-coated steel panel, colour: light grey RAL 7035
- Cable entry from above and below possible
- 4 cable entries either as M20 / M25 or brush strip
- Door with lock or bolt
- Weight approx. 7 kg

Dimensions

Size B 600 mm x 425 mm x 220 mm (H x W x D)

Configuration

See distributor A

Accessories

max. 24 splice cassettes
with crimp splice protective holder, buffered fiber strain relief and cover
or up to 96 ST or LCD couplings
or up to 48 SCD couplings with the corresponding number of splice cassettes

Name	Order no.
GigaLine® wall distributor size B with 12 splice cassettes, 4 strips and an insertion plate	LKD 9D71 0163 0000

additional equipment on request



GigaLine® Fiber-To-The-Desk (FTTD) wall outlets

Compact FO connectivity –

high performance, immunity to disturbances, future capabilities

Of course, the GigaLine® system also includes comprehensive solutions for fiber-to-the-desk. Here, customers can choose from a wide range of connection boxes, together with corresponding installation materials for wall mounting and installation in dado ducts.

As a result of the specific outlet design, bending never goes below the admissible bending radii of the fibers. This ensures the fiber retains its full functionality even in the long term:

- A defined bend radius for the fiber ensures a long service life
- Effective strain relief for cables and pigtails and clean guidance within the outlet ensure minimum strain on the fiber and preservation of the physical characteristics
- The dimensions of the outlets are as small as possible

GigaLine® flush-mounted outlet

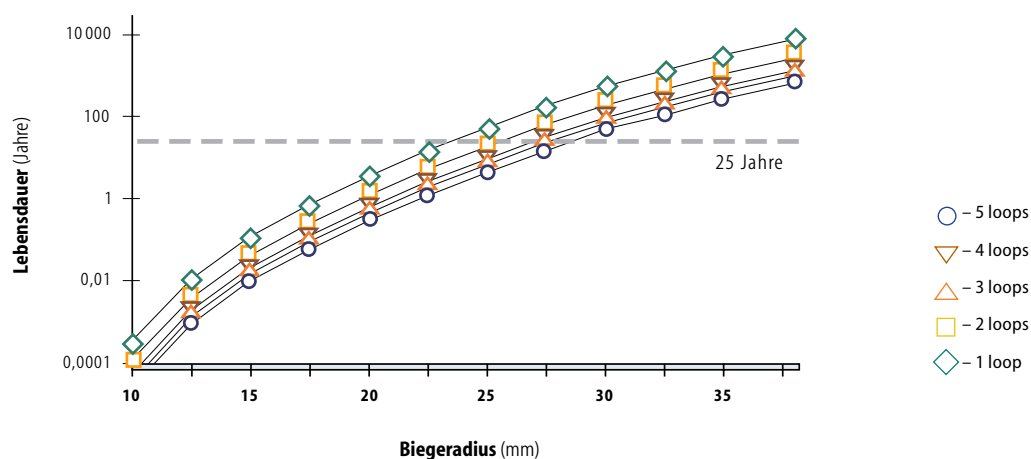
The flush-mounted outlet can be installed in ducts or, as the name suggests, mounted flush.

Special features:

- Can be equipped with up to two Duplex or four Simplex adapters
- Possible types of adapter: SC Duplex, ST Simplex, E 2000, LC Duplex
- The fiber bend radius is at least 30 mm, ensured by the cable reservoir and the cableguide
- The outlet has a downward inclination of 10 degrees, thereby ensuring optimum protection from mechanical stress
- The universal carrying frame is compatible with commonly available mounting cups
- All current connecting techniques are supported:
 - On-site assembly of fiber-optic connectors
 - Use of pre-assembled cables
 - Splicing of core pigtails



GigaLine® flush-mounted outlet



GigaLine® FTTD wall outlets

for surface / flush mounting



GigaLine® wall outlet for surface mounting

Performance

Wall outlet for surface mounting.

- Downward outlet direction
- Splice storage for 4 splices
- For 2 SC Duplex or LC Quad adapters
- Cover with screw as access protection
- Cable entry for 3–10 mm cables
- Maintenance of bend radii of approx. 30 mm by means of guided fiber paths

Optical characteristics

Insertion loss	G50/125	OM3/4	0.2 dB
typ.	E9/125	OS2	0.2 dB
Return loss	G50/125	OM3/4	> 35 dB
typ.	E9/125	OS2	> 50 dB (PC) > 65 dB (APC)

Dimensions

120 mm x 80 mm x 25 mm (H x W x D)

Accessories

Cable ties, adapter protection, wall mounting set

Name	Configuration	Order no.	
		OS2 E9/125	OM3 G50/125
GigaLine® wall outlet AP (1 pc.)	SC Duplex plastic/cer	LKD 9D71 0020 0000	LKD 9D71 0021 0000
	LC Quad plastic/cer	LKD 9D71 0022 0000	LKD 9D71 0023 0000
without pigtails			
GigaLine® wall outlet for surface mounting (1 pc.)	SC Duplex plastic/cer	LKD 9D72 0020 0000	
	SC Duplex plastic/cer	LKD 9D72 0021 0000	
	LC Quad plastic/cer	LKD 9D72 0022 0000	
	LC Quad plastic/cer	LKD 9D72 0023 0000	



GigaLine® wall outlet for flush mounting

Performance

Wall outlet for mounting in ducts and for underfloor mounting.

- Downward outlet direction (at an angle of 10°)
- Termination of up to 4 fibers
- Bend radius > 30 mm in combination with cable reservoir KR or cable guide KF
- Colour: Pure white, RAL 9010

Optical characteristics

Insertion loss	G50/125	OM3/4	0.2 dB
typ.	E9/125	OS2	0.2 dB
Return loss	G50/125	OM3/4	> 35 dB
typ.	E9/125	OS2	> 50 dB (PC) > 65 dB (APC)

Dimensions

114 mm x 85 mm x 41 mm (H x W x D)

Scope of delivery

Equipped with 2 fiber optic couplings

With labelling insert (enclosed)

Name	Configuration	Order no.
GigaLine® Concealed installation connection box (1 pc.)	2 SC Duplex Met/Cer	LKD 9FK0 3006 0000
	4 ST Simplex Met/Cer	LKD 9FK0 3001 0000

GigaLine® FTTD wall outlets

Cable reservoir / splice tray



GigaLine® cable reservoir KR

Performance

For flush-mounted outlet to hold excess cable lengths in the duct and/or safety reserves (up to 4 x 1 m for an overall diameter of 3 mm).

- Min. bend radius > 30 mm
- Entrance/exit side omnidirectional cable inlet with cable tie strain relief
- Colour oyster white, RAL 1013

Dimensions

76 mm x 151 mm x 50 or 55 mm (H x B x D)

50 mm installation depth (KR50), 55 mm installation depth (KR55)

Name	Order no.
GigaLine® cable reservoir KR50 (1 pc.)	LKD 9FK0 3007 0000
GigaLine® cable reservoir KR55 (1 pc.)	LKD 9FK0 3008 0000

GigaLine® splice tray for cable reservoir KR

Performance

For storing fiber optic splices when splicing plug pigtails. By keeping the splicing and working reserve physically separate, optimum protection is ensured for the sensitive splice area.

- Can be equipped with one or two splice holders
For 4 fusion splices or mechanical splice connectors
- Can be snapped into cable reservoir KR

Name	Order no.
GigaLine® splice tray for cable reservoir KR (1 pc.)	LKD 9FK0 3029 0000

GigaLine® DCLink hybrid solutions

› Development, standards, trends Requirements of future-proof cabling systems

Modern data centers are very complex entities which are subject to constant changes in both their technical and organisational environments. The focal requirements are availability, flexibility and future-proofing at increasingly higher data rates. At the same time, planners and operators have to manage a growing system density as server and storage systems are generally installed in small spaces.

Hyperscale, cloud and other virtualised data centers are causing a constant increase in data transfer rates. New switch generations for 25, 40, 50 and 100 GbE (Gigabit Ethernet) are now available or are being planned and demand correspondingly high-performance cable systems.

Requirements for data center IT cabling are set out in the DIN EN 50173–5 and ISO/IEC 11801–5 standards. The base requirement here is for structured and generic cabling. In terms of standards, a response has already been made to the increasing data rates with new Ethernet standards for 40 and 100 Gbit/s, such as IEEE 802.3ba. Further standards, such as 25 and 50 GbE for passive network infrastructure, are being planned.

Additionally, switches and servers with fiber optic and copper ports for 25, 40 and 50 GbE will also be increasingly deployed. With cabling, hybrid solutions are required which are also capable of migration. Only upgradable systems can ensure permanent transmission with future generations of active components.

There is now a trend towards pre-assembled systems for copper and glass fiber. Plug&Play solutions are tested under laboratory conditions before shipment and can be quickly and safely used in data centers. Complex and error-prone assembly on site is not necessary.

Range of products and services

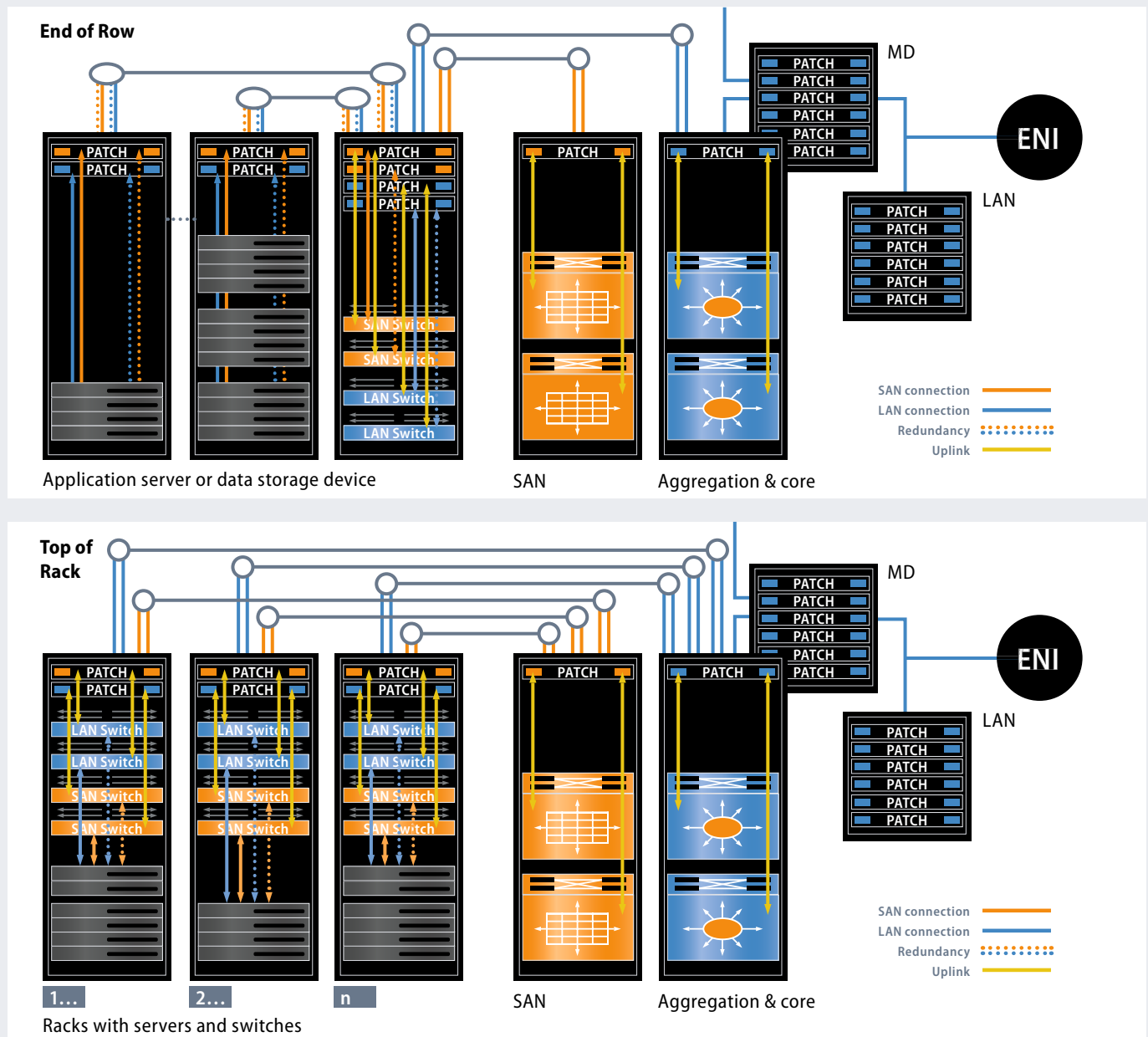
LEONI is there for you right from the very beginning

LEONI offers coherent, future-oriented concepts for cabling infrastructure requirements in data centers. The services offered range from advice for the planning of data centers to standardised and customised cabling systems as well as after-sales services. With LEONI's high-performance and migration-capable DCLink Plug&Play solutions, data centers are ready to cope with the management of complex server and storage environments both today and into the future.

LEONI supports you in the selection and installation of high-performance cable solutions for your IT topologies. You benefit not only from the LEONI specialist expertise but also from tried-and-tested cabling systems that can be continually adapted to

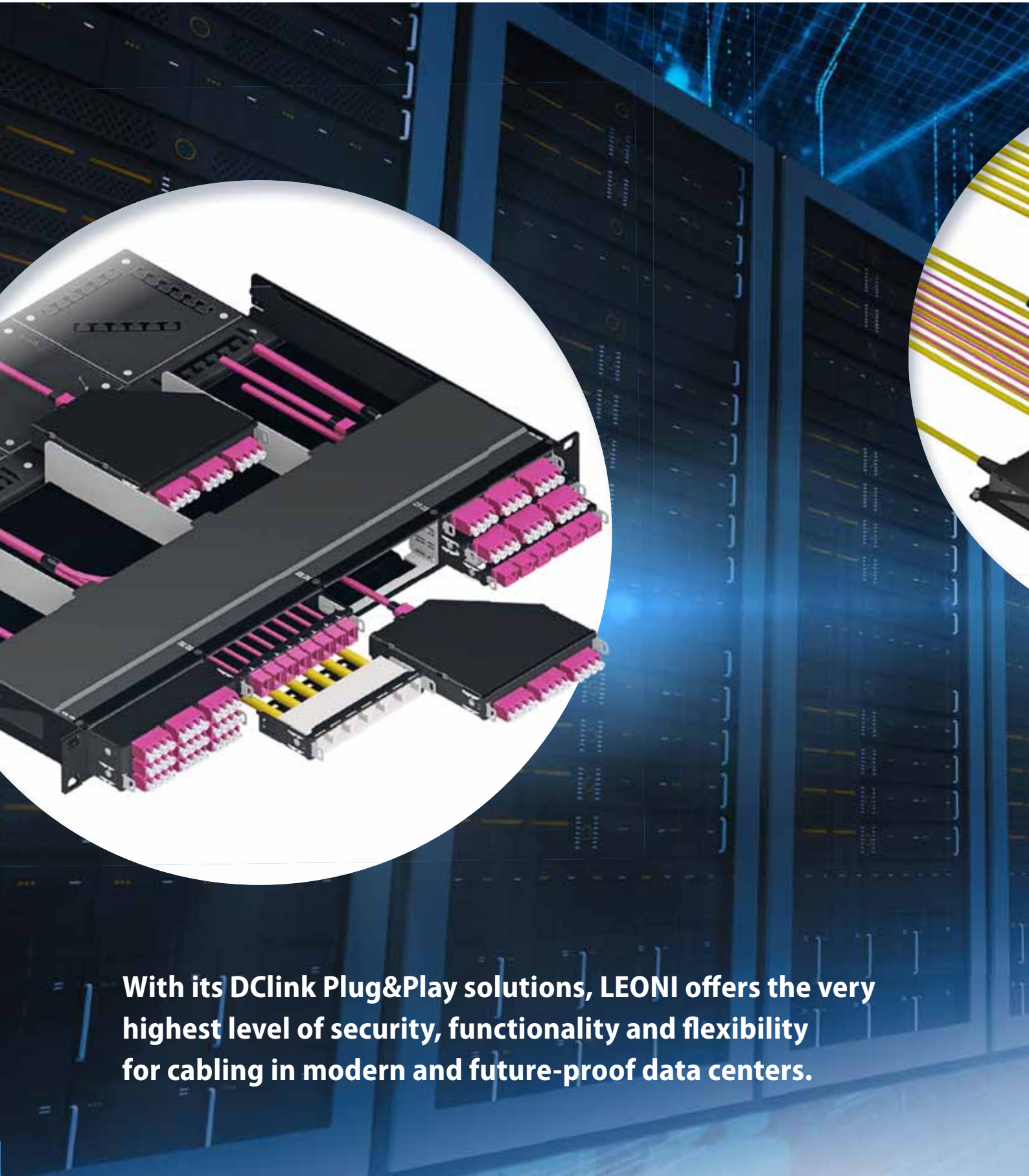
increasing data rates. Straightforward handling for all higher system densities is a fundamental requirement of all LEONI developments.

LEONI's DCLink Plug&Play solutions are easy to scale and are thus oriented towards the expansion and migration of IT infrastructures in the long term. This therefore gives you a high level of investment protection. Whether End-of-Row or Top-of-Rack – DCLink Plug&Play solutions from the Business Unit Datacom combine technologically-advanced fiber optic and copper systems to ensure that data centers are able to meet the full spectrum of requirements for structured cabling.



DCLink – The real Plug&Play solution

Cabling systems with guaranteed future-proofing



With its DCLink Plug&Play solutions, LEONI offers the very highest level of security, functionality and flexibility for cabling in modern and future-proof data centers.



DCLink products ensure a high system/port density and thus optimum use of space. DCLink firstly allows both glass fiber and copper cabling to be installed in one rack unit, and secondly the LC Uniboot patch cords contained have a maximum cable diameter of 2.8 mm.

With the DCLink solutions, LEONI provides pre-assembled, pre-tested and ready-to-connect transmission links that merely need to be laid and then "clicked" the pre-installed frames. Optimum handling simplicity ensures minimum installation times. Not only are moves, adds and changes (MACs) easier, DCLink

Plug&Play solutions also enable simple migration up to 100 Gbit/s.

These accessories supplement LEONI's DCLink product range:

- **DCLink cable tray with removable front**
- **Various labelling fields**
- **Rear-mounted cable trays**
- **Document drawers**
- **CP housing for two ½ HP modules**
- **CP housing for three ⅓ HP modules**
- **CP housing for one 7 HP module**



The solution for your challenges

DCLink guarantees true future-proofing in data centers and storage area networks.

MegaLine® Connect100
Trunk cable

MegaLine®
copper
trunk cables

DCLink
patch panels
& accessories

DCLink
Cable tray

DCLink
Module rack

DCLink
Patch cord tray
with removable front

DCLink
Module rack
closed

DCLink
Labelling strips

DCLink
Blind module ½ HP

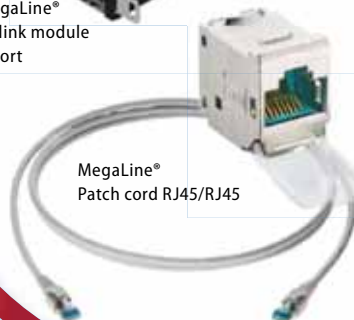
GigaLine® DCLink
Trunk cable MPO/m

GigaLine®
FO
trunk cable

MPO: we use MTP® plugs for our MPO assemblies. MTP® is a registered trademark of USConec Ltd.



MegaLine®
DCLink module
6 port



MegaLine®
Patch cord RJ45/RJ45

MegaLine®
Connect100
Jack module RJ45

MegaLine®
copper
systems
technology

MegaLine®
DCLink module
6 port



MegaLine®
Jack module ARJ45



MegaLine®
Connect100
Interface

MegaLine®
copper
systems
technology

for data rates up to...

10 Gbit/s

25 Gbit/s

40 Gbit/s

100 Gbit/s

GigaLine® patch cord
LC Duplex Uniboot
page 46



GigaLine® patch cord
LC MPO 1x12
page 49



GigaLine®
DCLink module
7 1/2 HP
8xMPO

GigaLine®
FO
systems
technology

GigaLine®
Trunk cable MPO/m



GigaLine®
Module MPO 7 1/2 HP

GigaLine®
FO
systems
technology

VarioLine®

modular system periphery



VarioLine® modular system periphery

page

• VarioLine® CP – Consolidation Point programme

o dc	DIN rail housing	84
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o dc	Consolidation Point housing	<ul style="list-style-type: none"> • with DIN rail clip • for 6, 12, 24-port module panel 	85
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• VarioLine® UF – underfloor systems

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o	System overview	based on GigaLine® adapters	88
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o	Support plates for underfloor systems	<ul style="list-style-type: none"> • for installation of wall boxes 	90
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o	Adapter plates for underfloor systems	<ul style="list-style-type: none"> • for installation of adapter plates 	91
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o	Adapter plates for underfloor systems	for installation in VarioLine® UF support plates	92
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o	Excess-length module for underfloor systems		93
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o	Splice storage for underfloor systems		93
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o	Office	
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dc	DataCenter	
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o	Industry	
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VarioLine® DIN rail housing



Assembly example:
housing with mounted
rail clip

VarioLine® DIN rail housing

Application

For installation on 34 mm top-hat rails in industry, office and home applications.

Performance

The buffered fiber pigtails are coloured acc. to the DIN IEC 60304 colour code. Up to 12 SC Simplex, LSH Simplex, 6 SC Duplex or 3 LC Quad adapters.

Optical characteristics

Insertion loss typ.	for all fiber types		0.2 dB
Return loss typ.	G50/125	OM3	> 35 dB
	G50/125	OM4	> 35 dB
	E9/125	OS2	> 50 dB

Construction

- Powder-coated steel panel, colour: light grey RAL 7035
- Cable entry PG11 (Ø 6–9 mm) possible from above and below

Dimensions

125 mm x 34 mm x 132.5 mm (H x W x D)
(from DIN rail, without adapter)

Accessories

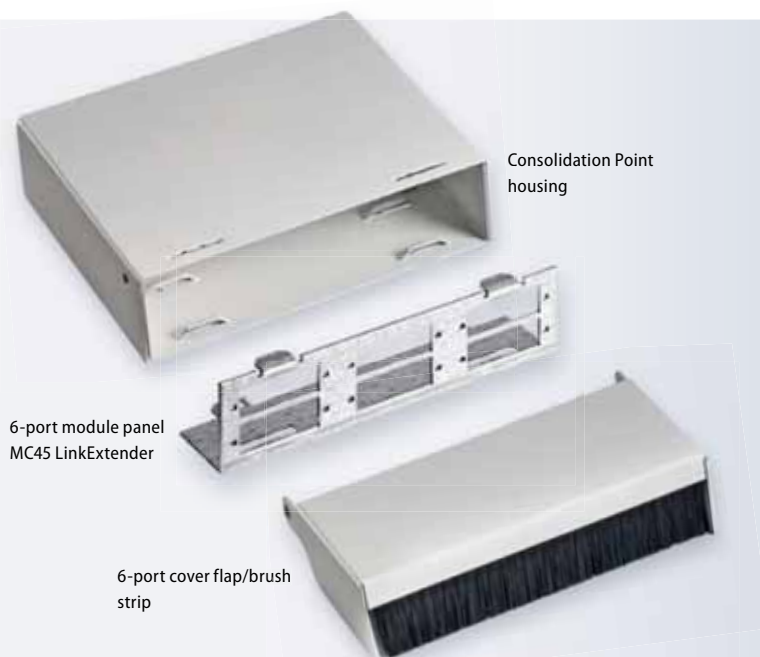
- 1 splice cassette
- 1 crimp splice protective holder
- 1 PG cable gland
- 1 strain relief set
- 1 installation clip for DIN rail

Name	Fiber type	Configuration					Order no.
VarioLine® DIN rail housing (1 pc.)	G50/125 OM4	6 SC Duplex	Heather violet	plastic/cer	12xPigtails	1x PG11	LKD 9D70 0023 0000
	G50/125 OM3		Aqua				LKD 9D70 0020 0000
	E9/125 OS2		Blue				LKD 9D70 0026 0000
	G50/125 OM4	3 LC Quad	Heather violet	plastic/cer	12xPigtails	1x PG11	LKD 9D70 0029 0000
	G50/125 OM3		Aqua				LKD 9D70 00XX 0000
	E9/125 OS2		Blue				LKD 9D70 0021 0000

additional equipment on request

VarioLine® Consolidation Point housing

with DIN rail clip



Assembly example:
housing with mounted
rail clip

VarioLine® CPx-B Consolidation Point housing
VarioLine® CPLx-B module panel SC Duplex / LC Quad
VarioLine® CPx-B cover flap / brush strip

Description

For installation in a double floor or false ceiling.
CP housing with strain relief by means of cable ties (not included). Can be equipped with SC Duplex or LC Quad couplings.

A cover flap with integrated brush strip
can be optionally inserted on the patch side.

- Modular (exchangeable module panel)
- Optionally with 6 / 12 or 24 ports
- Rugged housing, powder-coated steel panel, colour: white
- Free of hazardous substances

Installation

- CP housing is attached by rail clip (matching clip included)
- Alternative attachment using screws or impact dowels (not included).
- Module panel is attached by snapping into housing
- Couplings are attached to the module panel by means of screws

Housing	Cover flap / brush strip	Module panel for SC Duplex / LC Quad couplings

Number Couplings	Dimensions (lxbxh)	Order no.	Dimensions (lxbxh)	Order no.	Order no.
6	34.5 x 121 x 100 mm	LKD 9ZE6 1007 0000	34.5 x 121 x 51 mm	LKD 9ZE6 1008 0000	LKD 9ZE6 1095 0000
12	34.5 x 233 x 100 mm	LKD 9ZE6 1074 0000	34.5 x 233 x 51 mm	LKD 9ZE6 1073 0000	
24	34.5 x 455 x 100 mm	LKD 9ZE6 1075 0000	34.5 x 455 x 51 mm	LKD 9ZE6 1076 0000	



VarioLine® UF – underfloor systems

Support plate solution – modular & universal

The VarioLine® UF underfloor systems (floor outlet solutions) offer an efficient and low-cost solution for completing copper and FO systems.

They provide a high degree of flexibility in offices. Workplaces can be connected to the energy and IT grid without the usual cable tangle. The modular and universal support plate solutions are available for all commonly available underfloor systems (e.g. Ackermann or Electraplan).

The support plate replaces device carrier, thereby offering maximum space for cable feed. The slanted feed and exit ensures secure ducting even in very low intermediate floors.

The use of adapter plates allows low-cost, efficient installation of the entire range of LEONI connection technology in both copper and FO technology.



Example of an underfloor solution by LEONI in an Ackermann floor outlet

VarioLine® UF – underfloor systems / floor outlet solutions

System overview

based on GigaLine® couplings



**VarioLine®
UF AP4-SCD**
for max. 4 FO adapters
page 92



**VarioLine®
adapter plate**

VarioLine® support plate and strain relief

VarioLine® UF TA2
for Ackermann
GES 2, 4, 6, R4, R7
page 91

VarioLine® UF TA3
for Ackermann
GES 9, R7, R9
Page 91

VarioLine®
UF K1

VarioLine®
UF K2

VarioLine® UF TEK3
for Electraplan KDR series
(old design)
Page 91

VarioLine® UF HPV3
for Electraplan VQ12,
VR12, VR10
Page 91

VarioLine®
excess-length
module with splice
storage

VarioLine® UF O2
for support plates T2
page 93

VarioLine® UF-SC2
for excess-length module
UM2
page 93

Support plate solution

VarioLine®
excess-length
module with splice
storage

VarioLine® UF O3
for support plates T3
page 93

VarioLine® UF-SC3
for excess-length module
UM3
page 93

The excess-length module with splice storage is optional.

VarioLine® support plates

for underfloor systems, for installation of wall boxes



Fig. 1
Support plate VarioLine® UF TOA2-2
for Ackermann GES 2, 4, 6, R4, R7

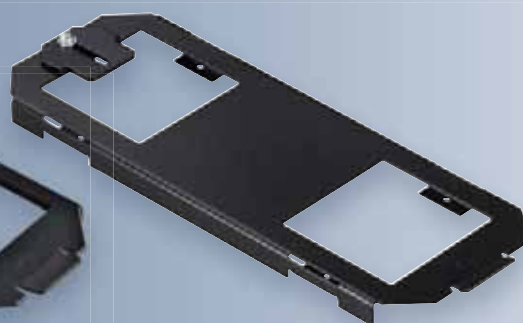


Fig. 2
Support plate VarioLine® UF TOA3-2
for Ackermann GES 9, R7, R9



Fig. 3
Support plate VarioLine® UF TOA3-3
for Ackermann GES 9, R7, R9

VarioLine® UF TOA2-2 / UF TOA3-2

Description

UF TOA2-2 → for installation of max. 2 wall boxes with central plate 50 mm x 50 mm and side attachment or one wall box with surrounding ring.

UF TOA3-2 → for installation of max. 2 wall boxes with central plate 50 mm x 50 mm and side attachment or two wall boxes with surrounding ring.

- For installation in Ackermann device inserts

Housing

Support plate	Powder-coated sheet metal, 1.5 mm
Colour	Jet black, RAL 9005

VarioLine® UF TOA3-3

Description

For installation of max. 3 wall boxes with central plate 50 mm x 50 mm and side attachment or 2 wall boxes with surrounding ring.

- For installation in Ackermann device inserts

Housing

Support plate	Powder-coated sheet metal, 1.5 mm
Colour	Jet black, RAL 9005

Fig.	Name	Order no.
1	VarioLine® UF TOA2-2 (1 pc.)	LKD 9ZE6 0014 0000
2	VarioLine® UF TOA3-2 (1 pc.)	LKD 9ZE6 0012 0000

Fig.	Name	Order no.
3	VarioLine® UF TOA3-3 (1 pc.)	LKD 9ZE6 0013 0000

VarioLine® support plates

for underfloor systems, for installation of adapter plates



Fig. 1
Support plate VarioLine® UF TA2
for Ackermann
GES 2, 4, 6, R4, R7

Fig. 2
Support plate VarioLine® UF TA3
for Ackermann
GES 9, R7, R9

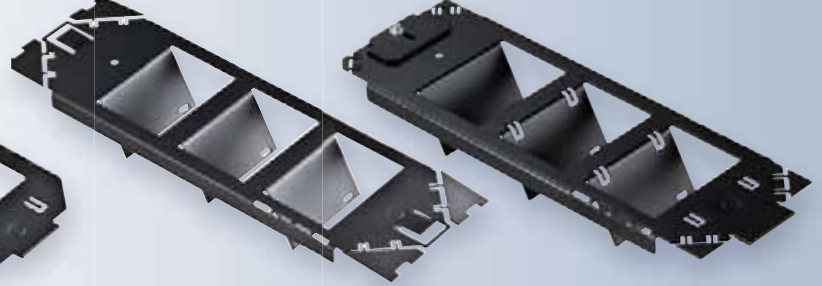


Fig. 1
Support plate VarioLine® UF TEK3
for Electraplan KDR series
(old design)

Fig. 2
Support plate VarioLine® UF TEV3
for Electraplan
VQ12, VR12, VR10

VarioLine® UF TA2 / UF TA3

Description

For installation of max. 2 or 3 adapter plates.

- For installation in Ackermann device inserts.

Compatibility

UF TA2	Ackermann GES 2, 4, 6, R4, R7
UF TA3	Ackermann GES 9, R7, R9

Housing

Support plate	Powder-coated sheet metal, 1.5 mm
Colour	Jet black, RAL 9005

Accessories (optional)

Cable tray VarioLine® UF K1 / VarioLine® UF K2
Adjustable cable strain relief for up to 9 individual cables

VarioLine® UF TEK3 / UF TEV3

Description

For installation of max. 3 adapter plates.

- For installation in Electraplan device inserts.

Compatibility

UF TEK3	Electraplan KDR series (old design)
UF TEV3	Electraplan VQ12, VR12, VR10

Housing

Support plate	Powder-coated sheet metal, 1.5 mm
Colour	Jet black, RAL 9005

Accessories (optional)

Cable tray VarioLine® UF K1 / VarioLine® UF K2
Adjustable cable strain relief for up to 9 individual cables

Fig.	Name	Order no.
1	VarioLine® UF TA2 (1 pc.)	LKD 9ZE6 0001 0000
2	VarioLine® UF TA3 (1 pc.)	LKD 9ZE6 0002 0000

Fig.	Name	Order no.
1	VarioLine® UF TEK3 (1 pc.)	LKD 9ZE6 0008 0000
2	VarioLine® UF TEV3 (1 pc.)	LKD 9ZE6 0042 0000

VarioLine® adapter plates

for underfloor systems, for installation in VarioLine® UF support plates



Fig. 1
Adapter plate VarioLine® UF AP4-SCD
for max. 4 SC Duplex adapters



Fig. 2
Adapter plate VarioLine® UF AP4-LCD
for max. 4 LC Duplex adapters



Fig. 3
Blind cover VarioLine® UF BP-T

VarioLine® UF AP4-SCD / UF AP4-LCD

Description

Adapter plate for installation in VarioLine® UF support plates.
For installation of max. 4 SC or LC Duplex adapters and blind cover.

- With self-adhesive labelling strips for personal labelling.
- 2 nut and washer assemblies incl.

Compatibility

UF AP4-SCD	for max. 4 SC Duplex or SC Duplex/ ST adapters
UF AP4-LCD	for max. 4 LC Duplex, SC Simplex or E-2000 adapters
UF BP-T	Blind cover

Construction

Adapter plate	Sheet metal, 1,5 mm
Surface	ZN – black, conductive

matching jacks	GigaLine® SC Duplex	LC Quad	GigaLine® SC Simplex	GigaLine® LC Duplex	GigaLine® E-2000
VarioLine® UF AP4-SCD					
VarioLine® UF AP4-LCD					

Fig.	Name	Order no.
1	VarioLine® UF AP4-SCD (1 pc.)	LKD 9FZZ 0078 0000
2	VarioLine® UF AP4-LCD (1 pc.)	LKD 9FZZ 0079 0000
3	VarioLine® UF BP-T (1 pc.)	LKD 9ZE6 0050 0000

VarioLine® excess-length module

for underfloor systems



Fig. 1
Excess-length module
for support plates T2

Fig. 2
Excess-length module
for support plates T3

VarioLine® UF O2
VarioLine® UF O3

Description

Excess-length module for installation in VarioLine®UF support plates. Can be installed without tools.

Compatibility / dimensions (available in two sizes)

UF O2	for support plates T2 61 mm x 75 mm x 135 mm (H x W x D)
UF O3	for support plates T3 61 mm x 75 mm x 176 mm (H x W x D)

Housing

Excess-length module	Powder-coated sheet metal, 1.5 mm
Colour	Jet black, RAL 9005

Accessories (optional)

A cable tray is required for installation of the excess-length module

Fig.	Name	Order no.
1	VarioLine® UF O2 (1 pc.)	LKD 9FZZ 0080 0000
2	VarioLine® UF O3 (1 pc.)	LKD 9FZZ 0018 0000

VarioLine® splice storage

for underfloor systems



Fig. 3
Splice storage
for excess-length module UM2

Fig. 4
Splice storage
for excess-length module UM3

VarioLine® UF SC2
VarioLine® UF SC3

Description

Splice storage with cover and splice holder for 12 crimp splices. For installation on the bottom of the appropriate excess-length module.

Compatibility / dimensions (available in two sizes)

UF SC2	for excess-length module UM2 10 mm x 75 mm x 113 mm (H x W x D)
UF SC3	for excess-length module UM3 10 mm x 75 mm x 154 mm (H x W x D)

Housing

Splice storage	Powder-coated sheet metal, 1.5 mm
Colour	Jet black, RAL 9005

Fig.	Name	Order no.
3	VarioLine® UF SC2 (1 pc.)	LKD 9FZZ 0020 0000
4	VarioLine® UF SC3 (1 pc.)	LKD 9FZZ 0081 0000



Acceptance measurement

of GigaLine® cabling systems

Acceptance measurement for GigaLine® cabling systems is carried out according to the requirements of ISO/IEC 11801 and EN 50173–2011. Details of how the measurements are carried out are stipulated by ISO/IEC 14763-3.

Special attention is paid to inspecting all connector faces according to EN 61300-3-35 making a connection – a description of how to clean connector faces is provided in IEC/TR 62627-01.

Acceptance involves determining insertion loss per transmission link by means of a performance measurement. Here the extended procedure is recommended with three test cords – a measurement set-up using the encircled flux measurement method according to IEC 61280-4-1 is to be preferred and attenuation should be measured at both ends for each fiber.

In addition, an OTDR measurement can be carried out with appropriate leader and trailer fibers which document the progress of attenuation along the entire transmission link. Here it is necessary to apply a bidirectional measurement so as to avoid or eliminate measurement errors due to differing backscatter coefficients if the link as a whole is made up of several spliced or patched sections.

The measurement range must be set at twice the transmission link being measured. The pulse width of the OTDR measuring device should be selected to be as short as possible, since this keeps the dead zones at reflective events to a minimum.

Budget 850nm		OM2	OM3	OM4
1000BASE-S	Attenuation [dB]	3.6	4.5	4.8
	Length [m]	550	550	550
10GBASE-S	Attenuation [dB]	2.3	2.6	2.9
	Length [m]	80	300	400
40GBASE-SR4	Attenuation [dB]		1.9	1.5
	Length [m]		100	150
100GBASE-SR10	Attenuation [dB]		1.9	1.5
	Length [m]		100	150

Highest attenuation of the transmission link in dB

Class	Multi-mode		Single-mode	
	850 nm	1300 nm	1310 nm	1,550 nm
OF 300	2.55	1.95	1.80	1.80
OF 500	3.25	2.25	2.00	2.00
OF 2000	8.50	4.50	3.50	3.50
OF 5000			4.00	4.00
OF 10000			6.00	6.00



Attenuation measuring devices



OTDR



Fiber identifier

Both attenuation devices and OTDR are indispensable for professional fiber optic installation. Together with a video microscope with certification function to evaluate the connector faces and using suitable cleaning equipment, it is possible to carry out a fiber optic installation in compliance with the standards. When measuring attenuation, particular care must be taken to use high-quality measuring cords.

Office

Field of application

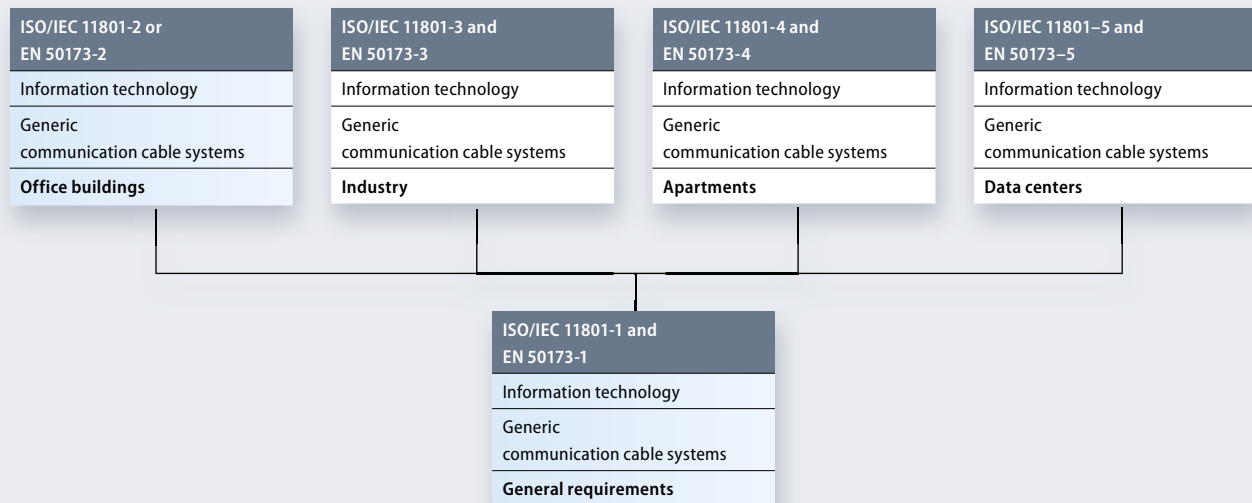
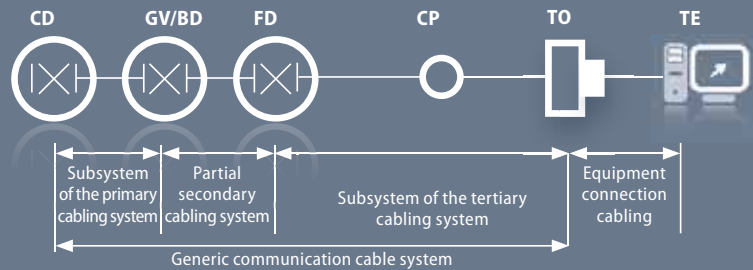


Generic cabling in office buildings

The complete cable system, from distribution equipment to workstation

Structure of a generic communication cable system ISO/IEC 11801 and DIN EN 50173-1/2

CD	Campus distributor
BD	Building distributor
FD	Floor distributor
CP	Consolidation point
TO	Telecommunications outlet
TE	Terminal equipment



A company's future success is now heavily dependent on having a reliable and modern data processing infrastructure.

The rapid development of data bit rates and the wide range of applications require a very flexible, high-performance network infrastructure that will be able to meet demands for the next ten years.

High-quality generic IT networks form the backbone of the business in research & development, banks, insurance companies, universities, hospitals, hotels, airports and many other sectors, ensuring smooth operation and financial success.

The smart use of fiber optics and copper data technologies for backbone and horizontal wiring to the user enables cost-effective networking of standard resources such as PCs and printers, with an extension to IP telephony and multimedia applications. Other applications such as Power-over-Ethernet (PoE) support the powering of devices such as web cameras, wireless LAN access points, IP phones and laptops via the copper data cabling.

These structured, generic communication cable systems meet both the international and European standards set by ISO/IEC 11801 and DIN EN 50173.

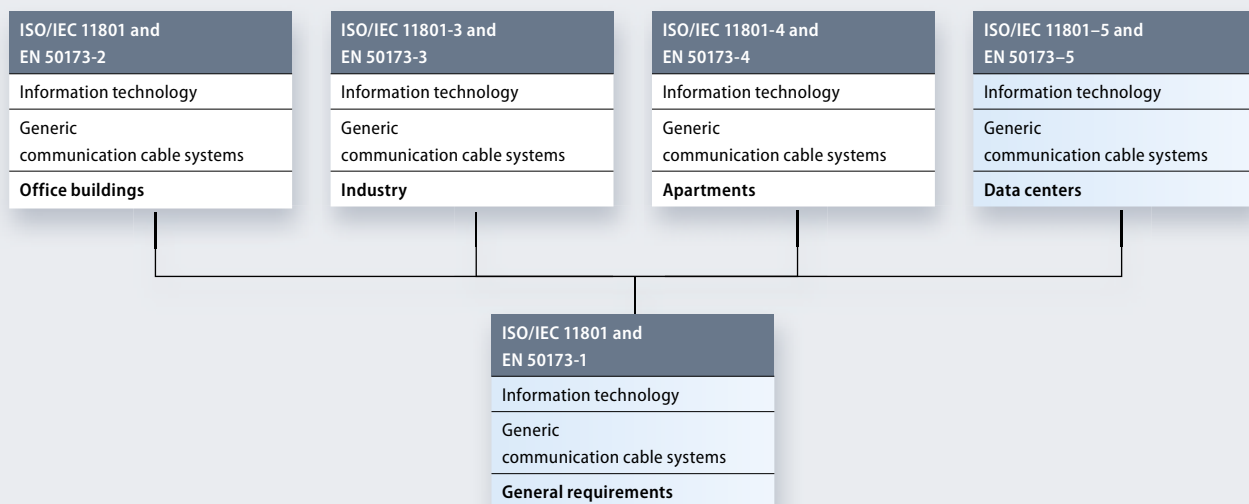
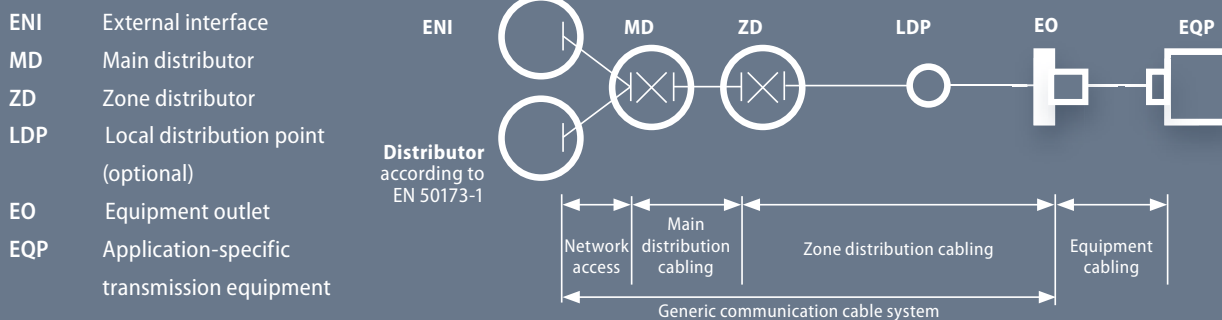


DataCenter

Field of application

Generic cabling in data centers

Structure of a generic communication cable system



Structure

The maximum extension is 2,000 metres. In data centers the main distribution cabling is frequently designed using fiber optic technology, while in smaller networks the external network interface (ENI) is connected directly to the zone distributor (ZD). The standards describe various models for flexible and fixed connections in and between the subsystems.

According to ISO/IEC 11801-5, cabling of the main and zone distribution must meet the requirements of Class E_x for copper technology and transmission classes OF-300, OF-500 and OF-2000 for FO technology as a minimum.

Standards

Generic communication cable systems are defined in the standards EN 50173-1 and ISO/IEC 11801.

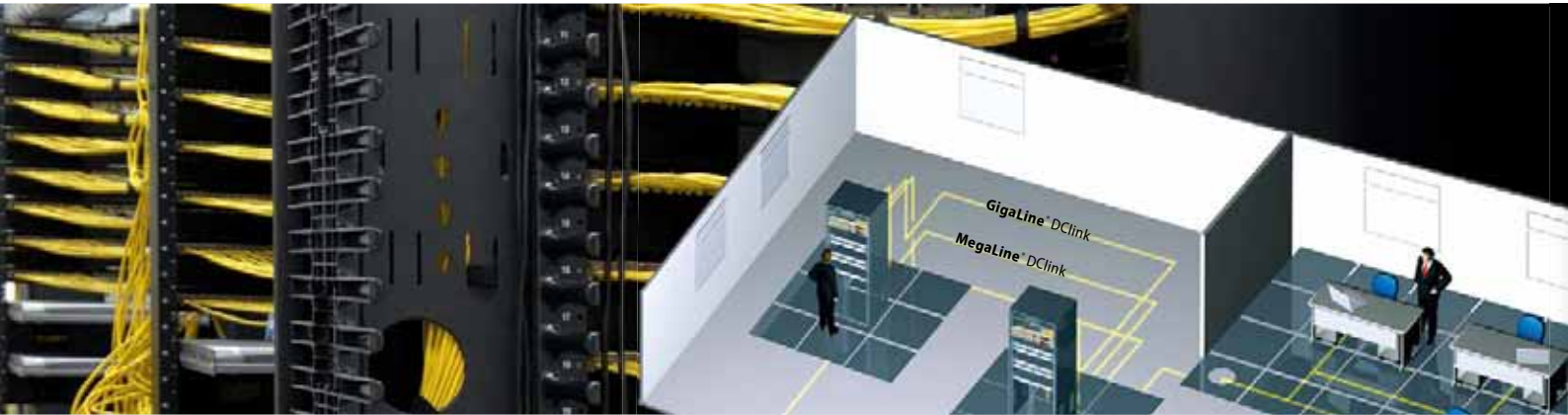
In addition, specific requirements for data centers are defined in EN 50173-5 and ISO/IEC 11801-5.

The cabling used in data centers consists of three subsystems:

- Network access cabling
- **Main distribution cabling**
- **Zone distribution cabling**

Requirements and solutions

Fast – high-quality – cost-optimised



Data centers

The data center – the heart of a business – controls production and administrative processes. Failure here can have catastrophic consequences, so the availability of a data center must be guaranteed more or less round the clock. The cabling system is a key factor in terms of operational reliability.

Performance requirements for modern data centers

- Maximum availability, zero downtime → max. reliability
- Short installation times
- Maximum performance
- Low space requirements – high packing density
- Cost efficiency
- Environmental compatibility – Green IT

The diverse requirements for data centers cannot be considered separately. For example, optimising environmental performance will lead to a reduction in costs. Investing in industrially pre-assembled components usually involves higher costs but enables installation and testing times to be reduced, thereby cutting the costs incurred by downtime.

→ High quality

With quality testing carried out at the factory, LEONI products offer built-in performance and safety.

→ Minimise downtime

Installation and commissioning take a very short time, with no need for special tools or assembly skills. This keeps downtime to a minimum.

Benefits

LEONI is able to offer a high-quality range of products that far surpasses currently valid standards and conventional data center requirements:

FO cable systems, assembled with LEONI cables, offer enormous reserves in terms of attenuation and bandwidth.

Installation

Plug & Play solutions for copper and FO applications comprise ready-to-use pre-assembled links or DCLink modules with the appropriate MPO trunks and DCLink racks in the sizes 1RU and 3RU. The DCLink modules can be inserted at the front or rear and audibly click into place.

DCLink system solutions

DCLink allows the use of FO, copper or mixed set-ups in different categories. This makes on-site assembly entirely superfluous.

Environmentally aware cabling

Environmentally sound materials and production methods, the possibility of recycling or ecologically viable recovery and, last but not least, the reusability of products if required – these are the factors that guarantee maximum environmental compatibility. Cables and components are free of hazardous substances.

The LEONI Group

Intelligent solutions for energy and data management



LEONI is a global provider of products, solutions and services for energy and data management in the automotive sector and other industries. The group of companies, listed on the German MDAX index, has more than 86,000 employees in 31 countries and generated consolidated sales of EUR 4.9 billion in 2017.

LEONI's largest customer group comprises the global car, commercial vehicle and component supply industry. LEONI furthermore supplies products and services to these markets: data communication & networks, healthcare, process industry, transportation, energy & infrastructure, factory automation, machinery & sensors as well as marine. An integrated network for research & development, production as well as distribution and service gives customers the assurance of tailor-made support at more than 90 locations around the globe. LEONI operates as a solutions provider with pronounced development and systems expertise.

Innovative solutions based on development and systems partnership

Especially in the automotive industry, LEONI offers substantial added value to motor vehicle manufacturers in both technological and commercial terms by being an innovation partner based on profound understanding of the overall system and by being involved in the early stages of development. In addition to standard and special cables as well as custom-developed wiring systems and related components, the Company's offering also

includes software solutions and such services as architecture design and simulation. LEONI concentrates its automotive research and development work on the sector's major trends such as electromobility, autonomous driving and connectivity – enhanced by lightweight construction solutions, multi-voltage and function integration, but also by logistics and engineering expertise.

Digital transformation thanks to intelligent products and smart services

LEONI pursues the aim of becoming a leading solutions provider of intelligent systems for the megatrends of energy transmission and data management. To achieve this, the Company's offering will in the future also include intelligent cables, cable systems and components – which is gaining importance particularly in the wake of digitalization and the development of fail-safe systems with a high level of connectivity. The Company is consequently enhancing its know-how in such fields as electronics, sensor technology and big data, and provides such customised smart services as predictive maintenance and error analyses. The digital transformation within LEONI manifests itself in digital processes and software expertise, which is used, for instance, to implement more automated production. Together with international customer networks and strategic partnerships, this is creating new, digital business models – individually tailored to customers' requirements.

For further information, please visit www.leoni.com

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LEONI news

Additional catalogues for MegaLine®, GigaLine® and VarioLine® connection systems are available online.

We keep you up-to-date on the latest LEONI news and market developments with current information services such as the LEONI newsletter.

Visit us at www.leoni-data.com



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