



- Cable Solutions
- Connectivity Solutions
- Control Solutions

# Ethernet Connectivity

Infrastructure solutions from a single source



# Efficiency in Automation

Cable • Connectivity • Cabinet • Control

## Welcome to LÜTZE

### Cable Solutions



### Connectivity Solutions



### Cabinet Solutions



### Control Solutions



### Transportation Solutions



### LÜTZE - Efficiency in Automation

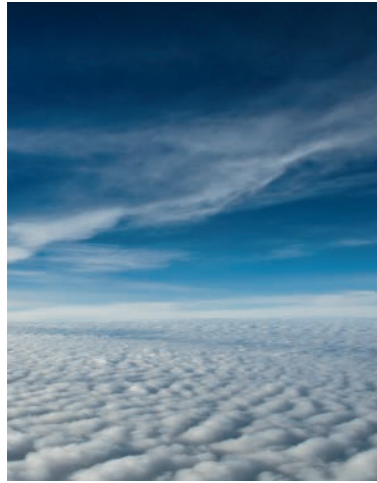
A tradition in automation for over 60 years, with countless pioneering achievements and patents, the LÜTZE INTERNATIONAL Group is today one of the leading companies in the automation industry. LÜTZE supplies very efficient electronic and electrotechnical components, system solutions for automation and high tech for rail engineering.

The comprehensive and coordinated supply program ranges from high flexing cables and cable assemblies, to energy efficient **AirSTREAM** wiring systems for control cabinets through to intelligent Industry 4.0 solutions from the fields of interface technology, current monitoring, power supply and Ethernet infrastructure.

The LÜTZE INTERNATIONAL Group has multiple locations throughout Europe, Asia and the USA and numerous distribution partners across the world to provide global product availability and service to our customers in all markets.

LÜTZE is one of the leading suppliers in the rail technology field. LÜTZE Transportation solutions are installed in numerous locomotives, city rail and underground rail systems, as well as high-speed trains across the world.

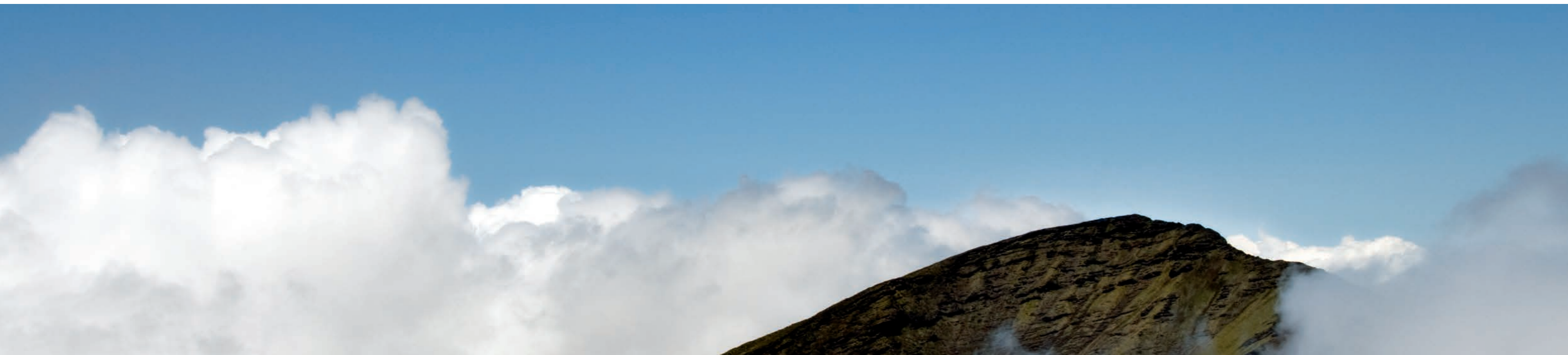




# Business Management: Sustainable and forward-looking

„The competitiveness of our industry and of its suppliers depends quite substantially on how we succeed in developing practical results. The results that we produce together today, are our competitive advantages in the future.“

Udo Lütze,  
Member of the Executive Committee of  
the Green Carbody Innovation Alliance



## The future is blue

Sustainable enterprise means thinking and planning ahead, understanding and embedding the belief that long lasting success is more important than short-term profit maximisation.

This is an attitude that has existed within LÜTZE for quite some time. Economic and environmental responsibilities complement each other well and are reflected in the sustainable management and

product policy - and from now in the SkyBLUE campaign.

We manufacture our products in a resourceful and energy-conscious manner. We use long lasting, environmentally-friendly materials.

And our products, in turn, help our customers save energy and resources.

Good for everyone: for us, for the environment, for our customers a win-win-win situation.

## Goods with real value

The value of a product or a solution from LÜTZE is determined by its sustainable qualities as well. Every innovation is only as successful in the future if it has a long-term positive effect. Therefore, we provide long lasting as well as highly efficient components.

We are incorporating the necessary knowledge and manufacturing competence in numerous joint projects with the objective of improving energy efficiency and

sustainable technologies and industries. Thus, LÜTZE provides answers and demonstrates how to handle resources responsibly, with our environment and our future in mind.



**RoHS**



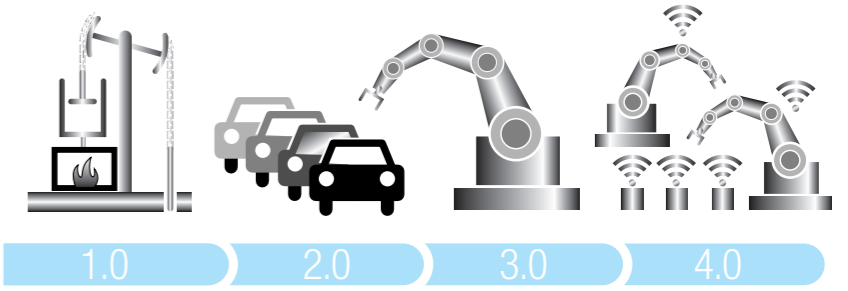
# INDUSTRY 4.0

## IIoT - Industrial Internet of Things

### What is Industry 4.0?

A German government memo released way back in 2013 was one of the first times that 'Industrie 4.0' was mentioned.

The high-tech strategy document outlined a plan to almost fully computerise the manufacturing industry without the need for human involvement.



The first industrial revolution was the one that saw the transition from farming to factory production in the 19th Century. The second ran from around the 1850s, and began with the introduction of steel, culminating in the early electrification of factories and the first signs of mass production.

The third industrial revolution that refers to the change from analogue, mechanical, and electronic technology to digital technology that took place from the late 1950s to the late 1970s.



Industry 4.0 is another area where the Internet of Things looks to play a huge role thanks to the sheer volume of sensors and "things" that have the potential to feed information into it and add value to manufacturing processes. Projections on the industry have mentioned the IoT alongside

cyber-physical systems as ways in which a combination of software, sensors, processors and communications technology will underpin the very development of Industry 4.0.

### LÜTZE Connectivity

The smart machines of the future need reliable connections. LÜTZE has a large range of industrial ethernet cables and connectors and is capable of producing cable assemblies that provide users of automation equipment with the connections they need, using either RJ45, M12 or M8 connectors.

### Smart electronic current control from LÜTZE

The control equipment on machines needs DC voltage, so the monitoring of these circuits is a logical next step as part of the IIoT concept.

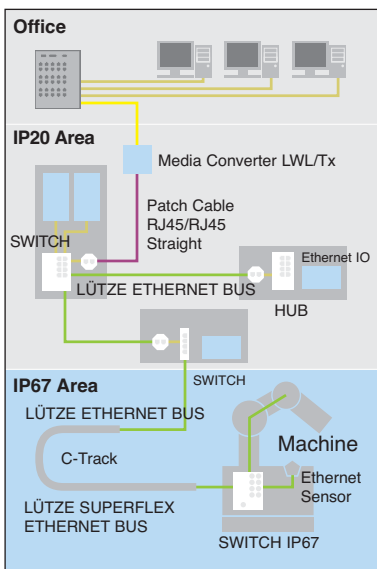
The LOCC-Box devices from LÜTZE can provide complete information from the machine load circuits and communicate this information via

Ethercat/Profinet to facilitate external monitoring at either the machine level and or remotely.

# LÜTZE – Ethernet Connectivity

## LÜTZE Ethernet Connectivity - Solutions from a single source

The requirements placed on efficient manufacturing systems are becoming more and more complex. Increased networking between production and management means that more and more automation systems are requiring the use of PC-based controllers and Ethernet communication networks. Ethernet is the name of a widely used, standardised communication infrastructure with various communication media. Together with higher-level communication software, Ethernet is today the basis for a large number of industrial local networks. In contrast to the office environment, communication in automation technology requires open, transparent system solutions. The seamlessness of information is a major priority here. This means that it is necessary to plan, install and administer industrial networks in such a way that they function reliably under the toughest conditions and in the harshest environments, while exhibiting controllable behaviour. The correct selection of suitable cables, connection technology and components is thus a significant factor in reliability. In this area LÜTZE offers a seamless system for designing network infrastructures.



Thanks to our many years of experience in the planning and implementation of industrial networks and the necessary components, we are also able to develop customer-specific solutions to satisfy your requirements optimally.

## Ethernet in industrial applications

In industry, communication takes place in a hierarchical system consisting of plant, management and field levels. The use of Ethernet is standard at plant and management levels. At field level, field buses such as Profibus DP, CAN or other protocol variants are still dominant. The reason for this is the considerably higher or differing requirements at field level. Here the network encounters interference factors that can have a significant effect on transmission quality. The risk of interference due to vibrations, dirt, moisture or harmful substances is especially high at the connection points. To meet

Switched Ethernet	INFO
In industrial applications, the following transmission requirements apply:	
<ul style="list-style-type: none"> <li>· very high network availability</li> <li>· small data packets</li> <li>· timely transmission</li> </ul>	
In order to cope with these requirements, the network has to be subdivided into logical and physical segments. This makes it possible in most cases to limit communication links between network nodes to a sub network, without affecting the bandwidth of other sub networks. The load sharing means that the full bandwidth is available in each segment.	

these requirements, LÜTZE supplies a solution that will stand up to the sometimes adverse conditions encountered in light and heavy industry, railway tunnels, on board ships, or in other environments. The simplest form of load sharing is achieved through the use of switches.

A network in which each node is assigned exactly one port of a switch is called switched Ethernet. Ethernet switches are used to resolve collision domains into simple point-to-point connections between the switch and the other network nodes (terminals, infrastructure components).

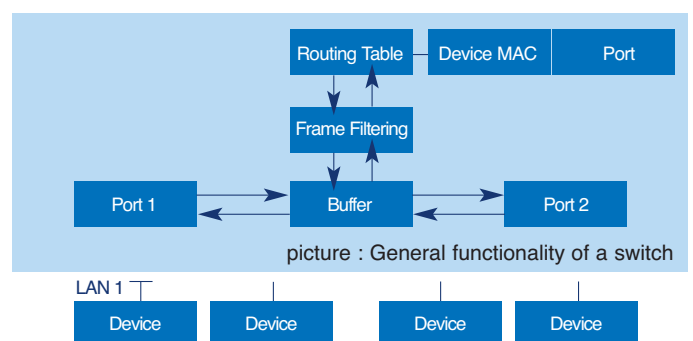
## Ethernet Switches

Simple switches work on the data link layer (OSI model, link 2), and can connect LANs with differing physical characteristics. If all of the protocols of

OSI-Layer	Classification	DoD-Layer	Classification	Protocol Example	Units	Coupling elements
7	Application	Application	End to End (Multihop)	HTTP FTP HTTPS SMTP LDAP NCP	Data	Gateway, Content-Switch, Layer 4-7-Switch
6	Presentation					
5	Session					
4	Transport	Transport	Point to Point	TCP UDP SCTP SPX	Segments	Router, Layer-3-Switch
3	Network	Internet		ICMP IGMP IP IPX	Packets	
2	Data Link	Web entry	Point to Point	Ethernet Token Ring FDDI ARCNET	Frames	Bridge, Switch
1	Physical				Bits	Hub, Repeater

picture : ISO / OSI Reference Model

the upper layers in the network are the same, then the switch is protocol-transparent. When a packet is received, the switch processes the 48-bit long MAC-address and creates an entry for it in the SAT (Source Address Table), which stores, in addition to the MAC address, the physical Port at which it is received. Each port of a switch constitutes a separate network segment, with the entire network bandwidth being available to each of these segments. Each individual port of a switch can receive and transmit data. The speed required for this is achieved via an internal high-speed bus (backplane). Data buffers ensure that as far as possible no data packets are lost. As a result, the network performance is increased not only in the network as a whole, but also in the individual segments. Switches examine each incoming data packet for the MAC address of the target segment, and can forward it there directly. The particular advantage of switches is their ability to connect ports with each other directly, i.e. being able to establish dedicated links. Switches break the Ethernet bus structure down into a bus and star structure. Sub-segments with a bus structure are now coupled in a star pattern, each via one port of the switch. Packets can be transmitted between the individual ports at the maximum Ethernet speed. Another major advantage is simultaneous data transmission between different segments. This increases the bandwidth in the entire network. However, to make use of the full performance capability of the switch technology it is necessary to implement a suitable network topology. This requires distributing the data load as evenly as possible among the individual ports. Furthermore, it is advisable to connect systems that communicate a great deal with each other to the same switch. The goal of this is to reduce the quantity of data that travels through more than one segment.





# LÜTZE – Ethernet Connectivity

## Cables - A lot depends on them

The classical Ethernet began with the coaxial cable. Today, new installations use only symmetric cables, so-called balanced cables, or fibre-optic cables.

## Copper cables

Various types of copper cable are used. The term "symmetric cable" does not refer to the structure of the cable, but rather exclusively to its electrical characteristics and the signal transmission. The symmetrical transmission of a signal requires two conductors; full duplex thus requires four conductors. A 10/100 MB Ethernet cable that is suitable for industrial use will thus have at least four conductors. The number of conductors increases by another four if the application requires 1Gbit.

## Twisted-Pair

In order to obtain the best possible interference suppression, the individual conductors have to be twisted. For different requirements, regarding the transmission, different types of twisted pair cables were developed. The difference between these cables is the shield :

### • UTP (Unshielded Twisted Pair):

The twisted signal pairs are stranded together without any screening under the outer jacket.

### • Overall shielded S/UTP or F/UTP:

The twisted pairs are stranded together and surrounded by a common screen made of a metal laminated polymer tape or a copper wire braid. The outer jacket encloses the screen.

• **Cables with shielded pairs FTP (Foiled Twisted Pair), also U/FTP, S/FTP:** Each twisted pair is wrapped by a metallic screen (mostly a metal laminated polymer tape). In Germany often called PiMF (pair in metal foil). In most cases the PiMFs are stranded together and surrounded by a copper wire braid as a common screen. This provides an optimized EMC performance

The short term for shielded twisted pair cable - S/FTP, F/FTP or SF/FTP (Screened Foiled Twisted Pair) is used in a different way from various stan-

## CAT 2 - Class B

CAT 2 cables are suitable for maximum frequencies up to 1 or 1.5 MHz; they are used, for example, for cabling in buildings with an ISDN primary multiplex connection.

## CAT 3 - Class C

The 100BASE-T4 standard allows 100 Mbit/s over existing Category 3 installations, using all four conductor pairs. CAT 3 cables are no longer used in new installations; rather at least CAT 5 cables are used.

## CAT 5 - Class D

CAT 5 cables are most often encountered in installations today; they are used for signal transmission at high data transmission rates. Their specific standardised designation is EIA/TIA-568. CAT 5 cables are intended for operating frequencies up to 100 MHz. Due to the high signal frequencies, particular care must be taken during laying and assembly, especially for the connection points of the conductors. Category 5 cables are often used in structured cabling for computer networks, such as Fast Ethernet or Gigabit Ethernet. This has been encouraged by the widespread use of 1000BASE-T (Gigabit Ethernet), because it requires only one CAT 5 cable.

## CAT 5e - Class De

The CAT 5e cable is a more specialised version of CAT 5 that is mainly used in German speaking countries in Europe for 100BASE-T network connections over long distances. Carefully executed installations, originally made and approved as CAT 5, generally also satisfy the CAT 5e standard. The designations EIA/TIA-568A and EIA/TIA-568B are also used informally to mean the two assignments for the colour-coded conductor pairs to the connecting contact of the RJ45 connector that are defined in this standard; in this case, however, this does not say anything about the transmission quality.

## CAT 6 - Class E

CAT 6 cables are defined by EN50288. CAT 6 cables are intended for operating frequencies up to 300 MHz. The transmission speed suffers at longer lengths; however, slight excess lengths may be no problem, depending on the external influences. Ultimately reliability can be ensured by testing with an appropriate test device to verify compliance with the limit values of the current versions of EN50173-1, IS 11801 and EIA/TIA 568B2.1. The fields of application for CAT 6 are voice and data transmission, multimedia and ATM networks. Greater performance is provided by CAT 6a cables (500 MHz) .

## CAT 7 - Class F

CAT 7 cables have four individually shielded pairs of conductors (Screened/Foiled shielded Twisted Pair S/FTP) within an overall shield. CAT 7 cables are intended for operating frequencies up to 600 MHz. CAT 7 cables fulfill the requirements of standard IEEE 802.3an, and are thus suitable for 10-Gigabit Ethernet.

## Wiring Tips

According to the standardised approach, the combination of components of the same category is expected to achieve the correlating class. But experience reveals that this is not the case, especially when higher transmission performance is required. Therefore it is recommended to use matched components from a single source supplier especially in a harsh industrial environment.

Components of a higher category meet all the transmission requirements of the lower classes. They therefore provide an additional performance margin. For very critical applications (environment, EMC, distances) it is recommended to use this margin applying components of a higher category as required. Transmission safety can be achieved by testing the transmission performance using a suitable cabling tester which will verify the limits of the appropriate standards EN50173-1, ISO/IEC 11801, resp. EIA/TIA-568B2.1. Sometimes the terms EIA/TIA-568A and EIA/TIA-568B are used informally to show the different assignments of the colour coded pairs to the connector pins of the RJ45, in this case this is not a statement regarding the transmission quality.

## INFO



LÜTZE Cables of the category 5e offer generally an overall shield as braid (S/UTP).



LÜTZE provides category 6 and 7 shielded pair cables with an additional all-round braided-copper shield (S/FTP).

dards and various suppliers. In the current EN50173, these cables are designated "F" for a foil shield, and "S" for a copper mesh shield. The degree of coverage of the braid should be greater than 30% in order to achieve sufficient shielding against low-frequency fields. New designation according to ISO/IEC-11801 (2002)E is also : S/FTP (meshwork), F/FTP (foil), SF/FTP (braid+foil). Therefore the letter before the slash describes the overall shield, the letter behind the pair shield.

## Categories and Classes

CAT 3,5,6 or 7 describes the categories with regard to the cable and connector requirements. The transmission bandwidth is determined by the cable class (A - 100kHz, B - 1MHz, C - 16MHz, D - 100MHz, E - 300MHz, F - 600MHz). The requirements for the cable are defined in different parts of the standard EN 50288. The EN 50173 and ISO/IEC 11801 describe the installation of cables, connectors, and net structures.

## CAT 1 - Class A

CAT 1 cables are designed for maximum operating frequencies up to 100 kHz, and are thus not suitable for data transmission. They are used for voice transmission, for example in telephone applications. Only UTP cables.

# LÜTZE – Ethernet Connectivity

## Overview Data Rate / Transmission Medium

Ethernet	Data Rate MBit/s	Transmission Medium	IEEE
10Base5	10	RG 8 Coaxial Cable 50 Ohm, 500 m segment length	802.3
10Base2	10	RG 85 Coaxial Cable 50 Ohm, 500 m segment length	802.3a
10Broad36	10	Coaxial Cable 75 Ohm, max. Expansion 3.600 m	802.3b
10BaseT	10	Twisted Pair Cable, Kat 3, 100 m segment length	802.3i
10BaseFL	10	Multi Mode Fibre, 850 nm 2.000 m segment length	
10BaseFB	10	Multi Mode Fibre 850 nm 2.000 m segment length	
1000BaseT	1000	Twisted Pair Cable, Kat 5, 100 m segment length	802.3ab
1000BaseSX	1000	Multi Mode Fibre, 830 nm 550 m segment length	802.3z
1000BaseLX	1000	Multi Mode Fibre, 1.270 nm, 5.000 m segment length	802.3z
1000BaseCX	1000	Twinax-Copper Cable 150 Ohm, 25 m segment length	802.3z

Ethernet	Data Rate MBit/s	Transmission Medium
100BaseTX	100	Twisted Pair Cable, Kat 5, 100 m segment length
100BaseT2	100	Twisted Pair Cable, Kat 3, 100 m segment length, 2 x 2 Wire
100BaseT4	100	Twisted Pair Cable, Kat 3, 100 m segment length, 4 x 2 Wire
100BaseFX	100	Multi Mode Fibre, 1.300 nm, 2.000 m segment length
10GBaseSR	10	Seriell, Multi Mode Fibre, 850 nm, 2.300 m segment length, without WAN Adjustment
10GBaseSW	10	Serial Fibre Optic, 850 nm, 2.300 m segment length, with WAN Adjustment
10GBaseLR	10	Serial Fibre Optic, 1.310 nm, 2-10.000 m segment length, without WAN Adjustment
10GBaseLW	10	Serial Fibre Optic, 1.310 nm, 2-10.000 m segment length, with WAN Adjustment
10GBaseER	10	Serial Fibre Optic, 1.550 nm, 2-40.000 m segment length, without WAN Adjustment
10GBaseEW	10	Serial Fibre Optic, 1.550 nm, 2-40.000 m segment length, with WAN Adjustment
10GBaseLX4	10	Serial Fibre Optic, 1.310 nm, 2-10.000 m WWDM-Technology with 4 Channels

## Installation instructions for copper cables

## INFO

- Strip cables for as short a length as possible
- Never kink cables by more than 90°
- Minimum bending radius is four times the diameter
- Do not subject cables to twisting, elongation or tensile loads
- Do not crush cables when fastening them
- Apply shielding on the equipotential bonding over a large area, on both ends and with low impedance
- Apply shielding for several cables at a single point of the equipotential bonding
- Do not undo twisting of the individual conductors by more than 13 mm.

The current versions of relevant national and international laws, regulations and standards will always be binding. It may also be necessary to observe company standards. This then leads to additional requirements for installation, such as: Design in accordance with DIN EN 50174-1/2/3, Compliance with EMC Directives EN 55022, EN 50310 and DIN VDE 0878, Secure isolation between data and power cables, VDE 0804/DIN57804, Shielding measures, VDE 0100, TN-S, Power supply according to TN-S method, Observance of the earthing concept according to VDE 0100, Fire regulations, Accident prevention regulations, and perhaps others.

## Pin assignment

















The most commonly used Ethernet connector is the so called RJ45 connector, which is available in shielded and unshielded variants. Of the RJ45 connector's eight pins, four are used for 10/100MBit/s, and all eight for 1000MBit/s.

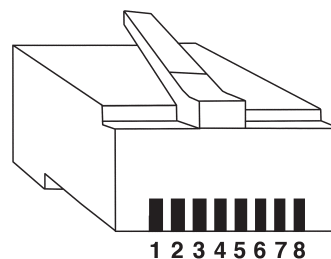
## Pin assignment RJ45:

PIN-Nr.	10BaseT	100BaseT	1000BaseT
1	TD+ (Transmit)	TD+ (Transmit)	BI_DA+ (Bidirectional)
2	TD- (Transmit)	TD- (Transmit)	BI_DA- (Bidirectional)
3	RD+ (Recieve)	RD- (Recieve)	BI_DB+ (Bidirectional)
4	-	-	BI_DC+ (Bidirectional)
5	-	-	BI_DC- (Bidirectional)
6	RD- (Receive)	RD- (Receive)	BI_DB- (Bidirectional)
7	-	-	BI_DD+ (Bidirectional)
8	-	-	BI_DD- (Bidirectional)

## Colour coded according to EN 50173 - hard wiring

In the EN 50173 standard, two colour codings are defined for installation, namely T568A and T568B. The user is free to choose between them, but should ensure during installation that the selected coding is maintained throughout the entire installation. Mixing the two codings will result in malfunctions

PIN-No.	Pair (T568A)	Pair (T568B)	Colour (T568A)	Colour (T568B)
1	3	2		
2	3	2		
3	2	3		
4	1	1		
5	1	1		
6	2	3		
7	4	4		
8	4	4		



PIN Position

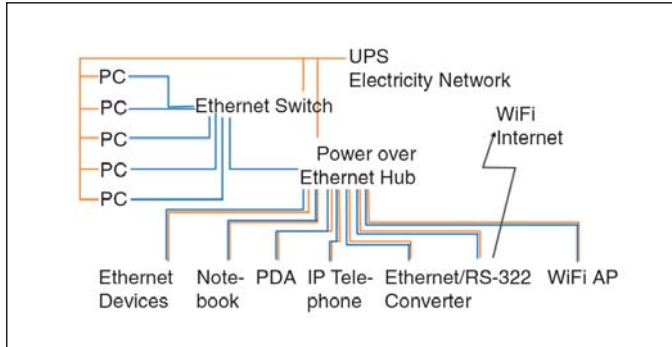
## Plug in Connector:

Plug in Connector Type	Connection	IEC	Organisation	LÜTZE
RJ45	Bajonet	Version 1	IAONA, ODVA	
RJ45	Snap in	Version 2		
RJ45	Screw	Version 3		
RJ45	Push Pull	Version 4	PNO	
RJ45	with Lock	Version 5	PNO	
RJ45	Push Pull	Version 6	IAONA, IDA	•
RJ45	with Lock	Version 7	PNO	
RJ45	Screw	Version 8		
RJ45	Screw	Version 9		
RJ45	Pulse Lock	Version 10		
M12 D kod	Screw	IEC 61076-2-101	IAONA, ODVA PNO	
LWL	LWL	IEC 60874-74	PNO	

# LÜTZE - Ethernet Connectivity

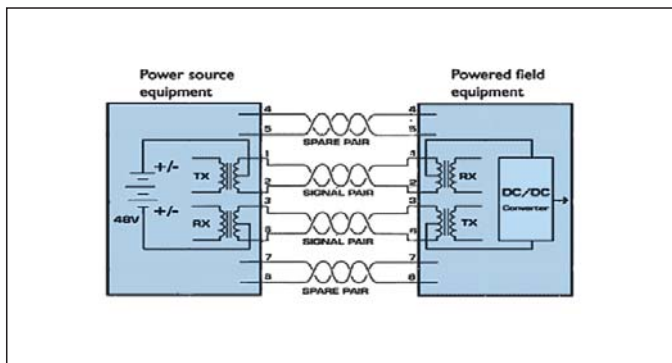
## Ethernet components need power:

The elimination of local power supplies by use of Power over Ethernet (PoE) can provide significant cost savings with systems such as VoIP, Web-Cams, embeded PCs, IP sensors, local automation and security systems.

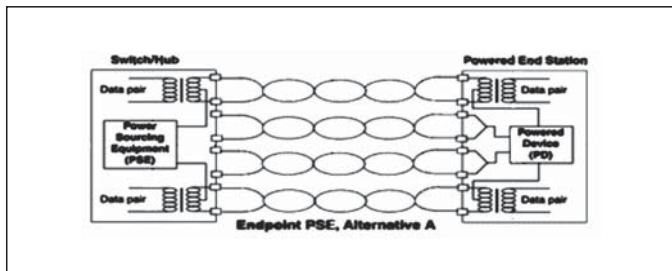


## Standardised as 802.3af:

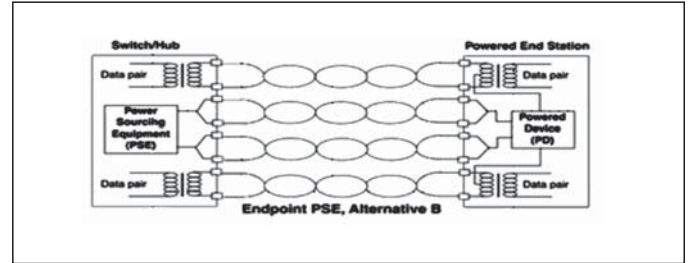
- CAT5 Infrastructure for Data and Power
- Voltage between 44 and 57 Volt
- max. Current 550 mA
- max. Trigger Current 500 mA
- typical Current 10 mA ... 350 mA
- Overload recognition 350 mA - 500 mA
- mind. 5 mA-Idle Current



## Power supply via data cables; Supply via the centre points of the isolating transformer: Endpoint PSE Alternative A.

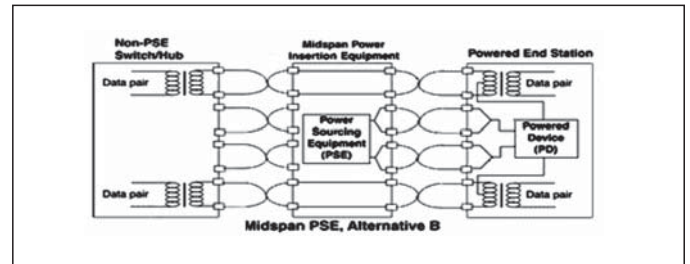


## Power supply via free conductor pairs; Positive and negative voltage sides are transmitted via two conductor pairs. Cannot be used for T4 transmission (Gbit Ethernet)



Endpoint PSE Alternative B.

## Power supply via supply sources used; the power supply is looped into the data path



Midspan PSE, Alternative C.

## Comments on wiring the variants

In order to prevent voltage drops, all 4 pairs can be used for the power supply. The current trend is to make use of the unused conductor pairs, because this provides better insulation.

Wire	Variant A MDI-X	Variant A MDI	Variant B All
1	-V Port	+V Port	
2	-V Port	+V Port	
3	+V Port	-V Port	
4			+V Port
5			+V Port
6	+V Port	-V Port	
7			-V Port
8			-V Port



# Ethernet Connectivity · Product Overview

## Unmanaged Switches



4 port  
10/100 MBit/s



8 port  
10/100 MBit/s

Page 16

Page 17

## E-CO Switches



5-Port  
10/100 MBit/s



8-Port  
10/100 MBit/s



16-Port  
10/100 MBit/s



5-Port  
10/100/1000  
MBit/s



8-Port  
10/100/1000  
MBit/s



16-Port  
10/100/1000  
MBit/s

Page 19

Page 20

Page 21

Page 22

Page 23

Page 24

## Unmanaged PoE Switches, PoE splitter



5 port  
10/100/1000  
MBit/s



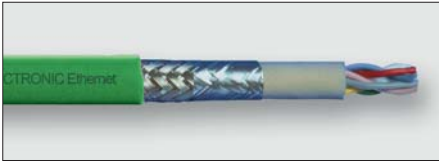
10/100/1000  
MBit/s

Page 25

Page 26

# Ethernet Connectivity · Product Overview

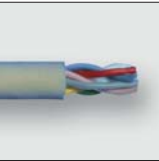
## Ethernet Bus cables



Standard

Page 32 - 36

## Actuator sensor interface network cables



C-track compatible

Page 37 - 39



PROFINET  
M12 / RJ45  
PVC cable

Page 41



PROFINET /  
ETHERNET  
RJ45 / RJ45  
PVC cable

Page 42 - 43



Patch cable  
Cat5e / Cat. 6A  
LSZH cable

Page 44



PROFINET  
M12  
PUR cable

Page 45

## Actuator sensor interface network cables



PROFINET  
M12 / M12  
PUR cable

Page 46



PROFINET  
M12 Panel  
PUR cable

Page 47



PROFINET  
RJ45 / M12  
PUR cable

Page 48



PROFINET  
RJ45 / RJ45 Cat. 5e  
PUR cable

Page 49 - 50



Ethernet  
RJ45 / RJ45 Cat. 6  
PUR cable

Page 51

## Actuator sensor interface connector



RJ45 Industrial  
connector

Page 52



RJ45 Industrial  
connector

Page 53



RJ45 Industrial  
connector,  
angled

Page 54



RJ45 Module  
holder, female /  
IDC

Page 55



M12, Male  
D coded  
gerade

Page 56



M12, Female  
D coded  
Cat 5e

Page 57



M12, Male  
X coded  
Cat. 6A

Page 58

## Actuator sensor interface panel connector and module holder



RJ45  
Control cabinet  
bushing

Page 59



M12 - RJ45 Cat. 5e  
Control cabinet  
bushing

Page 60



M12 - RJ45 Cat. 6A  
Control cabinet  
bushing

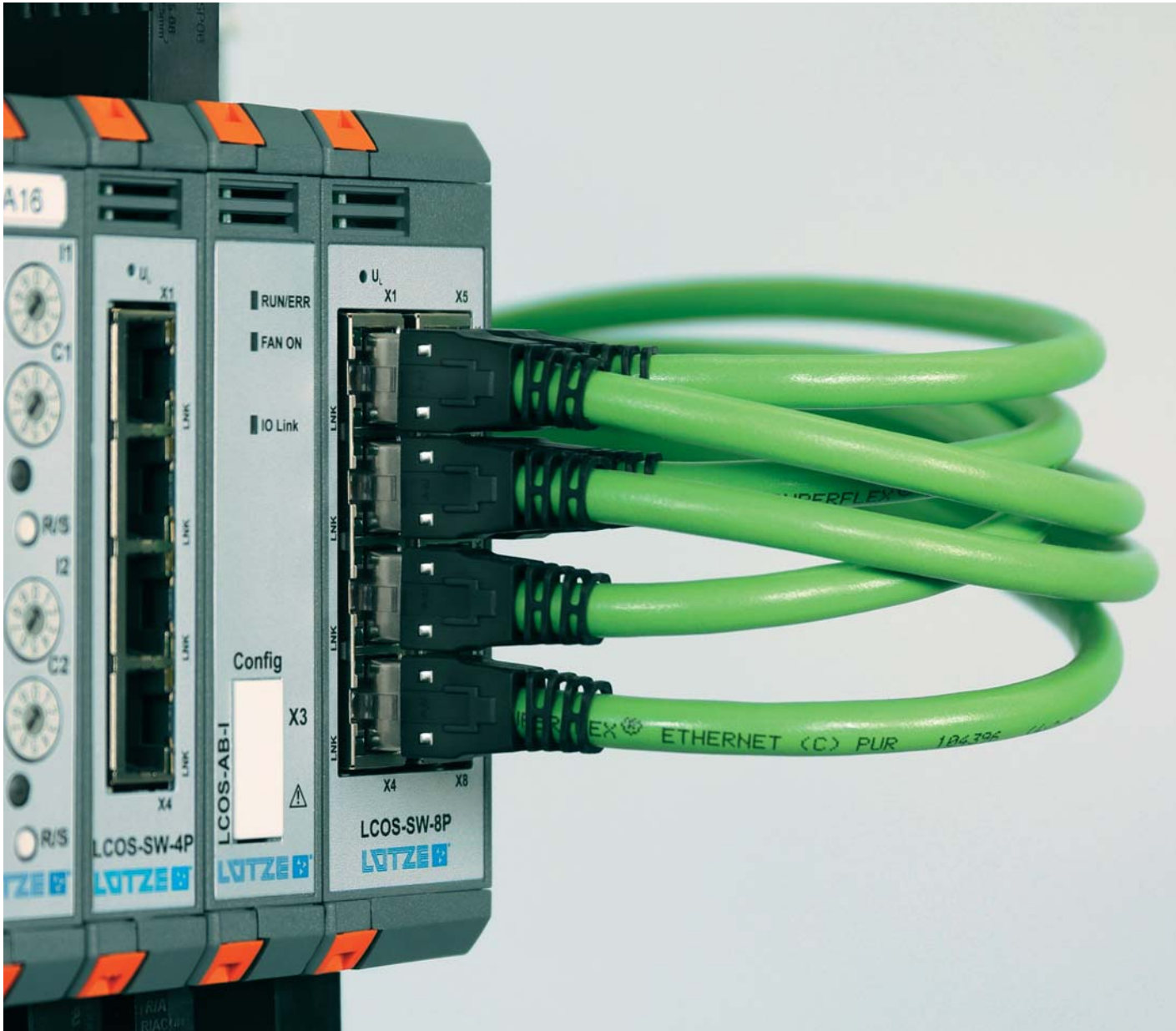
Page 61



# Notes

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# LCOS Communication



## LCOS industrial communication

- Unmanaged Switches
- 10/100 MBit/s
- QoS – Quality of Service
- PROFINET Conformance Class A
- 4 or 8 ports
- Can be used as a standalone module or in the "Lütze Communication System" - LCOS system setup
- Extended temperature range
- Fast and safe replacement thanks to 'hot swapping'
- Available with or without function carrier



# Ethernet - unmanaged switch 4 ports, 10/100 MBit/s

**QoS - Quality of Service, PROFINET Conformance Class A**  
**4 Fast Ethernet ports RJ-45, usable in the LCOS system**  
**AC/DC 24 V, compact design, extended temperature range**



## Communication

Standard	IEEE 802.3, 802.3u, 802.3x
LAN	10 / 100 Base-TX
Cable length (segment)	Max. 100 m
Transfer rate	max. 100 Mbit/s
Connection technology (data)	4 × RJ45
Status display communication	Link activity

## Certifications

CE
UKCA
cULus (E170585)
EN 61131-2:2007
IEC 61000-6-2:2016
IEC 61000-6-4:2018

## General

Rated voltage U <sub>N</sub>	AC/DC 24 V (SELV, PELV)
Operation voltage range	AC 19.2–28.8 V / DC 18–31.2 V
Connection technology (supply)	3-pin terminal clamp, push-in, RM 5.08 or via LCOS-FT Powerbus
Power consumption	1,3 W
Degree of protection	IP20 (EN 60529)
Installation position	Vertical
Over voltage category	II
Degree of pollution	2
Max. altitude operation	2000 m
Operation temperature range	-25 °C ... +70 °C
Storage temperature range	-40 °C ... +85 °C
Relative humidity (operation)	5 % – 95 % (non-condensing)
Relative humidity (storage)	0 % – 95 % (non-condensing)
Dimensions (w × h × d)	22.5 mm × 110.0 mm × 102.0 mm
Weight/unit	0,11 kg
Housing material	PA 6.6 (UL 94 V-0, NFF I2, F2)
PU (units)	1

## Equipment/Spare parts Accessories

**Function carrier 22.5 mm, cannot be expanded with modules:** Part.-No. 780201.225.1 | LCOS-FT-PE-225-00-00-1 | PU: 1 unit  
**Function carrier 22.5 mm, can be expanded with modules:** Part.-No. 780402.225.1 | LCOS-FT-PE-225-0P-02-1 | PU: 1 unit  
**Function carrier 57.5 mm, with power supply DC 24 V, no FBS, plug-and-play:** Part.-No. 780700.575.1 | LCOS-FTE-PE-575-NC-00-1 | PU: 1 unit  
**Side cover plate for function carrier:** Part.-No. 780600.000.4 | LCOS-ZB-AD-00-1 | PU: 100 units  
**Power bridge 1-pin insulated:** Part.-No. 780961.001.2 | LCOS-ZB-PB-01-00 | PU: 10 units

## Safety

Reverse voltage protection	Yes
Isolating voltage Ethernet/supply/FE	1000 V

## Notes and Comments

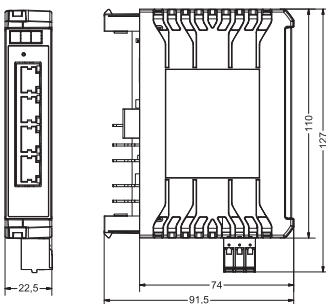
Note

For AC supply, there must be external over-voltage protection that limits the voltage between the supply and the FE to below 1000 V.

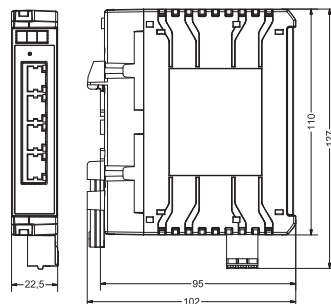
## Certifications/Standards

Part No.	Type	Included in the delivery	Not included in the delivery	Mounting
<b>without function carrier</b>				
779200.0401	S* LCOS-SW-4P	Plug-in terminal block, RM 5.08, 3-pin, 2.5 mm <sup>2</sup>	other accessories, see „accessories“	can be connected to LCOS function carrier 22.5 mm (accessories), hat rail mounting EN 60715
<b>with function carrier</b>				
779201.0401	S* LCOS-SW-4P	Function carrier 22.5 mm, cannot be expanded with modules Plug-in terminal block, RM 5.08, 3-pin, 2.5 mm <sup>2</sup>	other accessories, see „accessories“	DIN rail mounting EN 60715

## Dimensions



## Dimensions



# Ethernet - unmanaged switch 8 ports, 10/100 MBit/s

**QoS - Quality of Service, PROFINET Conformance Class A**  
**8 Fast Ethernet ports RJ-45, usable in the LCOS system**  
**AC/DC 24 V, compact design, extended temperature range**



## Communication

Standard IEEE 802.3, 802.3u, 802.3x  
 LAN 10 / 100 Base-TX  
 Cable length (segment) Max. 100 m  
 Transfer rate max. 100 Mbit/s  
 Connection technology (data) 8 × RJ45  
 Status display communication Link activity

## Certifications

CE  
 UKCA  
 cULus (E170585)  
 EN 61131-2:2007  
 IEC 61000-6-2:2016  
 IEC 61000-6-4:2018

## General

Rated voltage  $U_N$  AC/DC 24 V (SELV, PELV)  
 Operation voltage range AC 19.2–28.8 V / DC 18–31.2 V  
 Connection technology (supply) 3-pin terminal clamp, push-in, RM 5.08 or via LCOS-FT Powerbus

Power consumption 1,6 W  
 Degree of protection IP20 (EN 60529)  
 Installation position Vertical  
 Over voltage category II  
 Degree of pollution 2  
 Max. altitude operation 2000 m  
 Operation temperature range -25 °C ... +70 °C  
 Storage temperature range -40 °C ... +85 °C  
 Relative humidity (operation) 5 % – 95 % (non-condensing)  
 Relative humidity (storage) 0 % – 95 % (non-condensing)  
 Dimensions (w × h × d) 35.0 mm × 110.0 mm × 102.0 mm  
 Weight/unit 0,17 kg  
 Housing material PA 6.6 (UL 94 V-0, NFF I2, F2)  
 PU (units) 1

## Equipment/Spare parts Accessories

**Function carrier 35 mm, cannot be expanded with modules:** Part.-No. 780201.350.1 | LCOS-FT-PE-350-00-00-1 | PU: 1 unit  
**Function carrier 35 mm, can be expanded with modules:** Part.-No. 780402.350.1 | LCOS-FT-PE-350-0P-02-1 | PU: 1 unit  
**Function carrier 70 mm, with power supply DC 24 V, no FBS, plug-and-play:** Part.-No. 780700.700.1 | LCOS-FTE-PE-700-NC-00-1 | PU: 1 unit  
**Side cover plate for function carrier:** Part.-No. 780600.000.4 | LCOS-ZB-AD-00-1 | PU: 100 units  
**Power bridge 1-pin insulated:** Part.-No. 780961.001.2 | LCOS-ZB-PB-01-00 | PU: 10 units

## Safety

Reverse voltage protection Yes  
 Isolating voltage Ethernet/supply/FE 1000 V

## Notes and Comments

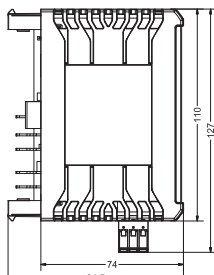
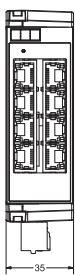
Note

For AC supply, there must be external over-voltage protection that limits the voltage between the supply and the FE to below 1000 V.

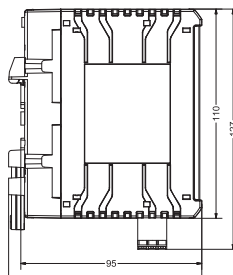
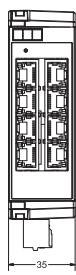
## Certifications/Standards

Part No.	Type	Included in the delivery	Not included in the delivery	Mounting
<b>without function carrier</b>				
779200.0801	S* LCOS-SW-8P	Plug-in terminal block, RM 5.08, 3-pin, 2.5 mm <sup>2</sup>	other accessories, see „accessories“	can be connected to LCOS function carrier 35 mm (accessories), hat rail mounting EN 60715
<b>with function carrier</b>				
779201.0801	S* LCOS-SW-8P	Function carrier 35 mm, cannot be expanded with modules Plug-in terminal block, RM 5.08, 3-pin, 2.5 mm <sup>2</sup>	other accessories, see „accessories“	connected to LCOS function carrier, hat rail mounting EN 60715

## Dimensions



## Dimensions





# Sustainable answers and solutions!

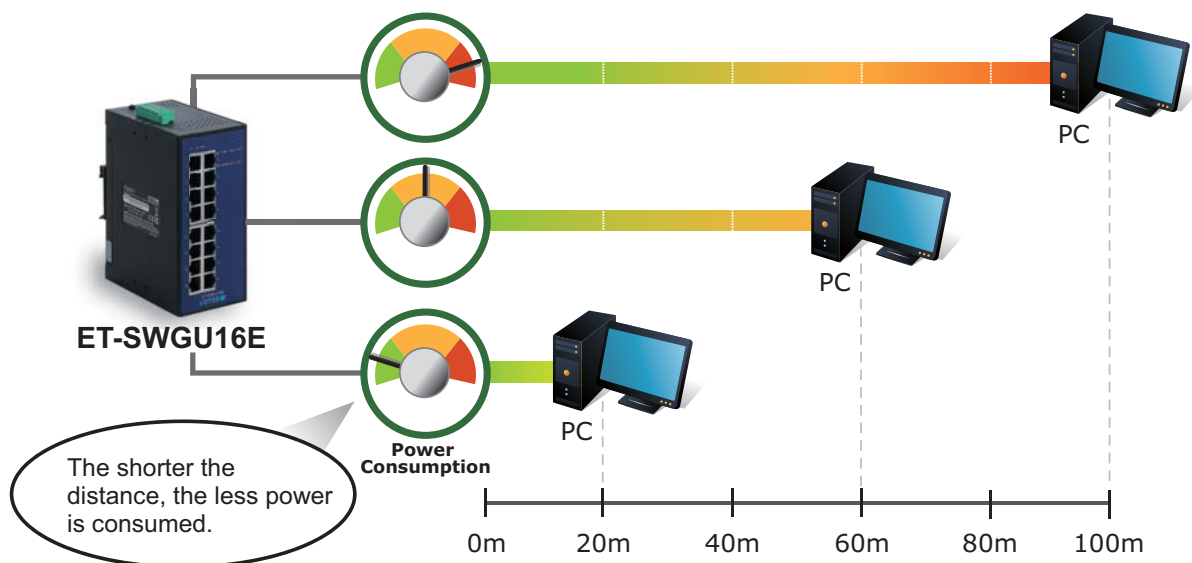


As part of the SkyBLUE sustainability initiative, LÜTZE develops and markets highly sustainable and innovative solutions.

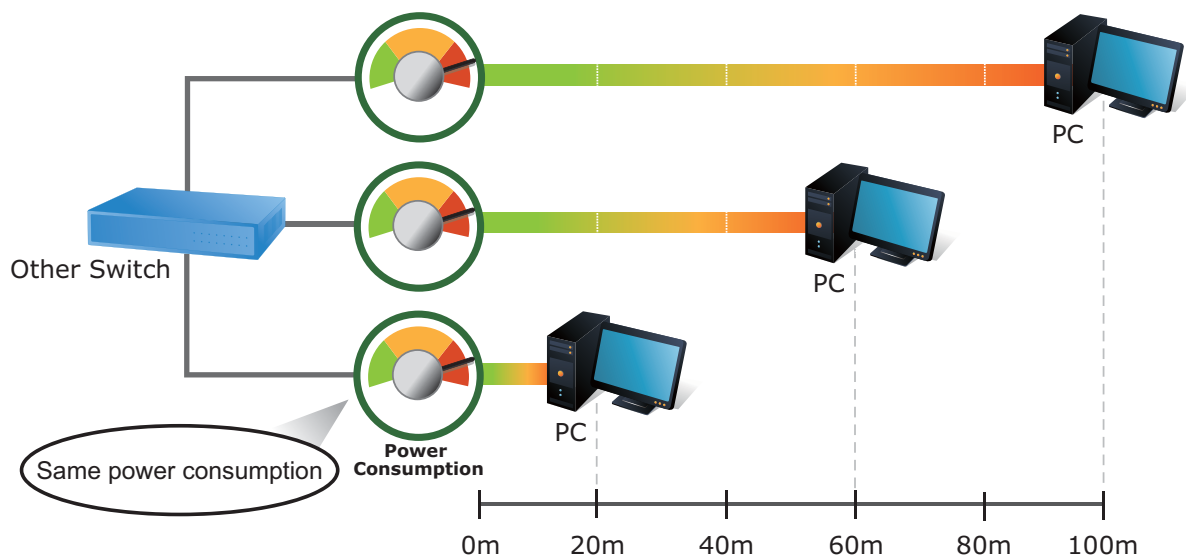
Sustainability at LÜTZE:  
<https://www.luetze.com/skyblue>

The new E-CO Switches offer intelligent expansions for creating energy-saving Ethernet networks. Energy Efficient Ethernet (EEE) is implemented in compliance with the IEEE 802.3az norm. The result: consistent energy savings.

## Intelligent energy management



## Standard application



# Ethernet - Unmanaged E-CO Switch, 5-Port, 10/100 MBit/s

**QoS - Quality of Service, PROFINET Conformance Class A**  
**5 Fast Ethernet ports RJ-45, compact design, energy management**  
**Redundant AC/DC supply, extended temperature range, ESD 6 kV**



## Communication Standard

IEEE 802.3 10BASE-T, IEEE 802.3u  
 100BASE-TX/100BASE-FX  
 IEEE 802.3x flow control and back pressure  
 IEEE 802.1p Class of Service  
 IEEE 802.3az Energy Efficient Ethernet (EEE)  
 IEC 60068-2-32 (free fall), IEC 60068-2-27 (shock), IEC 60068-2-6 (vibration)  
 10/100 Base-TX RJ45 Auto-MDI/MDI-X  
 Max. 100 m  
 max. 10/100 Mbit/s  
 5 × RJ45  
 System:  
 Power 1 (P1): green  
 Power 2 (P2): green  
 Alarm, (Fault): red  
 Per 10/100TX RJ45 Ports:  
 10/100 LNK/ACT: green

PU (units)

## Safety

ESD (Ethernet)  
 Surge (EFT for power)  
 Reverse voltage protection

## Monitoring

Error output  
 Switching voltage  
 Switching current  
 Isolation voltage

## Certifications/Standards

Standards

single wire/fine wire  
 0.25 mm<sup>2</sup> – 2.5 mm<sup>2</sup>  
 AWG 20 – AWG 14  
 fine stranded wire with ferrule  
 0.25 mm<sup>2</sup> – 1.5 mm<sup>2</sup>  
 AWG 20 – AWG 16  
 1

DC 6 kV  
 DC 4 kV  
 Yes

Relay, 1 NO contact - 1 A @ DC 24 V  
 AC 120 V / DC 28 V  
 1 A @ DC 24 V  
 DC 500 V

CE  
 FCC Part 15 Class A  
 UKCA  
 cULus (E332878)  
 EN 55032  
 EN 55035  
 IEC 61000-4-2/3/4/5/6/8  
 IEC 60068-2-27  
 IEC 60068-2-32  
 IEC 60068-2-6

LAN  
 Cable length (segment)  
 Transfer rate  
 Connection technology (data)  
 Status display communication

## General

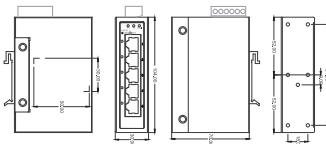
Rated voltage U<sub>n</sub>  
 Degree of protection  
 Installation position  
 Operation temperature range  
 Storage temperature range  
 Relative humidity (operation)  
 Relative humidity (storage)  
 Housing material  
 Mounting

DC 12 – 48 V redundant, AC 24 V  
 IP30  
 Any  
 -40 °C ... +75 °C  
 -40 °C ... +75 °C  
 5 % – 90 % (non-condensing)  
 0 % – 90 % (non-condensing)  
 Metal  
 DIN rail mountable TS35  
 (EN 60715)  
 Wall mounting  
 6-pole pluggable screw terminal for  
 power supply and fault diagnosis

Connection type

Part No.	Type	Dimensions (w × h × d)	Weight/unit kg
772004	ET-SWU5E	30.0 mm × 104.0 mm × 70.0 mm	0.255

## Dimensions



# Ethernet - Unmanaged E-CO Switch, 8-Port, 10/100 MBit/s

**QoS - Quality of Service, PROFINET Conformance Class A**  
**8 Fast Ethernet ports RJ-45, compact design, energy management**  
**Redundant AC/DC supply, extended temperature range, ESD 6 kV**



## Communication Standard

IEEE 802.3 10BASE-T, IEEE 802.3u  
 100BASE-TX/100BASE-FX  
 IEEE 802.3x flow control and back pressure  
 IEEE 802.1p Class of Service  
 IEEE 802.3az Energy Efficient Ethernet (EEE)  
 IEC 60068-2-32 (free fall), IEC 60068-2-27 (shock), IEC 60068-2-6 (vibration)  
 10/100 Base-TX RJ45 Auto-MDI/MDI-X  
 Max. 100 m  
 max. 10/100 Mbit/s  
 8 × RJ45  
 System:  
 Power 1 (P1): green  
 Power 2 (P2): green  
 Alarm, (Fault): red  
 Per 10/100TX RJ45 Ports:  
 10/100 LNK/ACT: green

PU (units)

## Safety

ESD (Ethernet)  
 Surge (EFT for power)  
 Reverse voltage protection

## Monitoring

Error output  
 Switching voltage  
 Switching current  
 Isolation voltage

## Certifications/Standards

Certifications

Standards

single wire/fine wire  
 0.25 mm<sup>2</sup> – 2.5 mm<sup>2</sup>  
 AWG 20 – AWG 14  
 fine stranded wire with ferrule  
 0.25 mm<sup>2</sup> – 1.5 mm<sup>2</sup>  
 AWG 20 – AWG 16  
 1

DC 6 kV  
 DC 4 kV  
 Yes

Relay, 1 NO contact - 1 A @ DC 24 V  
 AC 120 V / DC 28 V  
 1 A @ DC 24 V  
 DC 500 V

CE  
 FCC Part 15 Class A  
 UKCA  
 cULus (E332878)  
 EN 55032  
 EN 55035  
 IEC 61000-4-2/3/4/5/6/8  
 IEC 60068-2-27  
 IEC 60068-2-32  
 IEC 60068-2-6

LAN  
 Cable length (segment)  
 Transfer rate  
 Connection technology (data)  
 Status display communication

## General

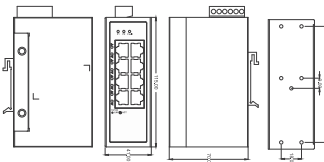
Rated voltage U<sub>N</sub>  
 Degree of protection  
 Installation position  
 Operation temperature range  
 Storage temperature range  
 Relative humidity (operation)  
 Relative humidity (storage)  
 Housing material  
 Mounting

DC 12 – 48 V redundant, AC 24 V  
 IP30  
 Any  
 -40 °C ... +75 °C  
 -40 °C ... +75 °C  
 5 % – 90 % (non-condensing)  
 0 % – 90 % (non-condensing)  
 Metal  
 DIN rail mountable TS35  
 (EN 60715)  
 Wall mounting  
 6-pole pluggable screw terminal for power supply and fault diagnosis

Connection type

Part No.	Type	Dimensions (w × h × d)	Weight/unit kg
772006	ET-SWU8E	41.0 mm × 115.0 mm × 70.0 mm	0.3

## Dimensions





# Ethernet - Unmanaged E-CO Switch, 16-Port, 10/100 MBit/s

QoS - Quality of Service, PROFINET Conformance Class A

16 Fast Ethernet ports RJ-45, compact design, energy management

Redundant AC/DC supply, extended temperature range, ESD 6 kV



## Communication Standard

IEEE 802.3 10BASE-T, IEEE 802.3u  
100BASE-TX/100BASE-FX  
IEEE 802.3x flow control and back pressure  
IEEE 802.1p Class of Service  
IEEE 802.3az Energy Efficient Ethernet (EEE)  
IEC 60068-2-32 (free fall), IEC 60068-2-27 (shock), IEC 60068-2-6 (vibration)  
10/100 Base-TX RJ45 Auto-MDI/MDI-X  
Max. 100 m  
max. 10/100 Mbit/s  
16 × RJ45  
System:  
Power 1 (P1): green  
Power 2 (P2): green  
Alarm, (Fault): red  
Per 10/100TX RJ45 Ports:  
10/100 LNK/ACT: green

PU (units)

## Safety

ESD (Ethernet)  
Surge (EFT for power)  
Reverse voltage protection

## Monitoring

Error output  
Switching voltage  
Switching current  
Isolation voltage

## Certifications/Standards

Standards

single wire/fine wire  
0.25 mm<sup>2</sup> – 2.5 mm<sup>2</sup>  
AWG 20 – AWG 14  
fine stranded wire with ferrule  
0.25 mm<sup>2</sup> – 1.5 mm<sup>2</sup>  
AWG 20 – AWG 16  
1

DC 6 kV  
DC 4 kV  
Yes

Relay, 1 NO contact - 1 A @ DC 24 V  
AC 120 V / DC 28 V  
1 A @ DC 24 V  
DC 500 V

CE  
FCC Part 15 Class A  
UKCA  
cULus (E332878)  
EN 55032  
EN 55035  
IEC 61000-4-2/3/4/5/6/8  
IEC 60068-2-27  
IEC 60068-2-32  
IEC 60068-2-6

## LAN

Cable length (segment)  
Transfer rate  
Connection technology (data)  
Status display communication

## General

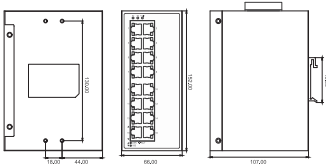
Rated voltage U<sub>n</sub>  
Degree of protection  
Installation position  
Operation temperature range  
Storage temperature range  
Relative humidity (operation)  
Relative humidity (storage)  
Housing material  
Mounting

DC 12 – 48 V redundant, AC 24 V  
IP30  
Any  
-40 °C ... +75 °C  
-40 °C ... +75 °C  
5 % – 90 % (non-condensing)  
0 % – 90 % (non-condensing)  
Metal  
DIN rail mountable TS35  
(EN 60715)  
Wall mounting  
6-pole pluggable screw terminal for power supply and fault diagnosis

## Connection type

Part No.	Type	Dimensions (w × h × d)	Weight/unit kg
772008	ET-SWU16E	66.0 mm × 152.0 mm × 107.0 mm	0.75

## Dimensions



# Ethernet - Unmanaged E-CO Switch, 5-Port, 10/100/1000 MBit/s

**QoS - Quality of Service, PROFINET Conformance Class A**

**5 RJ45 ports 1 GBit/s, compact design, energy management, ESD 6 kV**

**Redundant supply, extended temperature range, Jumbo Frames up to 9 kB**



## Communication Standard

IEEE 802.3 Ethernet, IEEE 802.3u Fast Ethernet, IEEE 802.3ab Gigabit Ethernet  
IEEE 802.3x Full-Duplex Flow Control  
IEEE 802.3az Energy Efficient Ethernet (EEE)

IEEE 802.1p Class of Service  
IEC 60068-2-32 (free fall), IEC 60068-2-27 (shock), IEC 60068-2-6 (vibration)

10/100/1000 Base-T RJ45 Auto-MDI/MDI-X, Auto Negotiation

Max. 100 m  
max. 1000 Mbit/s  
5 × RJ45

System:  
Power 1 (P1): green  
Power 2 (P2): green  
Alarm, (Fault): red  
Per 10/100TX RJ45 Ports:  
10/100 LNK/ACT: green  
100/1000 LNK/ACT: orange (/amber)

PU (units)

## Safety

ESD (Ethernet)  
Surge (EFT for power)  
Reverse voltage protection

## Monitoring

Error output  
Switching voltage  
Switching current  
Isolation voltage

## Certifications/Standards

Certifications

Standards

power supply and fault diagnosis  
single wire/fine wire  
0.25 mm<sup>2</sup> – 2.5 mm<sup>2</sup>  
AWG 20 – AWG 14  
fine stranded wire with ferrule  
0.25 mm<sup>2</sup> – 1.5 mm<sup>2</sup>  
AWG 20 – AWG 16  
1

DC 6 kV  
DC 4 kV  
Yes

Relay, 1 NO contact - 1 A @ DC 24 V  
AC 120 V / DC 28 V  
1 A @ DC 24 V  
DC 500 V

## General

Rated voltage U<sub>N</sub>  
Degree of protection  
Installation position  
Operation temperature range  
Storage temperature range  
Relative humidity (operation)  
Relative humidity (storage)  
Housing material  
Mounting

DC 9 – 48 V redundant, AC 24 V

IP30

Any

-40 °C ... +75 °C

-40 °C ... +75 °C

5 % – 90 % (non-condensing)

0 % – 90 % (non-condensing)

Metal

DIN rail mountable TS35

(EN 60715)

Wall mounting

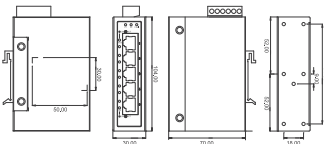
6-pole pluggable screw terminal for

CE  
FCC Part 15 Class A  
UKCA  
cULus (E332878)  
EN 55032  
EN 55035  
IEC 61000-4-2/3/4/5/6/8  
IEC 60068-2-27  
IEC 60068-2-32  
IEC 60068-2-6

Connection type

Part No.	Type	Dimensions (w × h × d)	Weight/unit kg
772013	ET-SWGU5E	30.0 mm × 104.0 mm × 70.0 mm	0.252

## Dimensions



# Ethernet - Unmanaged E-CO Switch, 8-Port, 10/100/1000 MBit/s

QoS - Quality of Service, PROFINET Conformance Class A

8 RJ45 ports 1 GBit/s, compact design, energy management, ESD 6 kV

Redundant supply, extended temperature range, Jumbo Frames up to 9 kB



## Communication Standard

IEEE 802.3 Ethernet, IEEE 802.3u Fast Ethernet, IEEE 802.3ab Gigabit Ethernet  
IEEE 802.3x Full-Duplex Flow Control  
IEEE 802.3az Energy Efficient Ethernet (EEE)

IEEE 802.1p Class of Service  
IEC 60068-2-32 (free fall), IEC 60068-2-27 (shock), IEC 60068-2-6 (vibration)

## LAN

Cable length (segment)  
Transfer rate  
Connection technology (data)  
Status display communication

10/100/1000 Base-T RJ45 Auto-MDI/MDI-X, Auto Negotiation  
Max. 100 m  
max. 1000 Mbit/s  
8 × RJ45

System:  
Power 1 (P1): green  
Power 2 (P2): green  
Alarm, (Fault): red  
Per 10/100TX RJ45 Ports:  
10/100 LNK/ACT: green  
100/1000 LNK/ACT: orange (/amber)

PU (units)

**Safety**  
ESD (Ethernet)  
Surge (EFT for power)  
Reverse voltage protection

**Monitoring**  
Error output  
Switching voltage  
Switching current  
Isolation voltage

**Certifications/Standards**  
Certifications

Standards

power supply and fault diagnosis  
single wire/fine wire  
0.25 mm<sup>2</sup> – 2.5 mm<sup>2</sup>  
AWG 20 – AWG 14  
fine stranded wire with ferrule  
0.25 mm<sup>2</sup> – 1.5 mm<sup>2</sup>  
AWG 20 – AWG 16  
1

DC 6 kV  
DC 4 kV  
Yes

Relay, 1 NO contact - 1 A @ DC 24 V  
AC 120 V / DC 28 V  
1 A @ DC 24 V  
DC 500 V

## General

Rated voltage U<sub>i</sub>  
Degree of protection  
Installation position  
Operation temperature range  
Storage temperature range  
Relative humidity (operation)  
Relative humidity (storage)  
Housing material  
Mounting

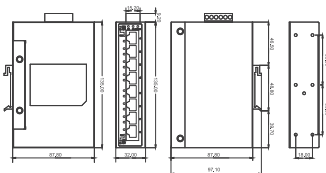
DC 12 – 48 V redundant, AC 24 V  
IP30  
Any  
-40 °C ... +75 °C  
-40 °C ... +75 °C  
5 % – 90 % (non-condensing)  
0 % – 90 % (non-condensing)  
Metal  
DIN rail mountable TS35  
(EN 60715)  
Wall mounting  
6-pole pluggable screw terminal for

CE  
FCC Part 15 Class A  
UKCA  
cULus (E332878)  
EN 55032  
EN 55035  
IEC 61000-4-2/3/4/5/6/8  
IEC 60068-2-27  
IEC 60068-2-32  
IEC 60068-2-6

Connection type

Part No.	Type	Dimensions (w × h × d)	Weight/unit kg
772015	ET-SWGU8E	32.0 mm × 135.0 mm × 88.0 mm	0.473

## Dimensions





# Ethernet - Unmanaged E-CO Switch, 16-Port, 10/100/1000 MBit/s

## QoS - Quality of Service, PROFINET Conformance Class A

16 RJ45 ports 1 GBit/s, compact design, energy management, ESD 6 kV

Redundant supply, extended temperature range, Jumbo Frames up to 9 kB



### Communication Standard

IEEE 802.3 Ethernet, IEEE 802.3u Fast Ethernet, IEEE 802.3ab Gigabit Ethernet  
IEEE 802.3x Full-Duplex Flow Control  
IEEE 802.3az Energy Efficient Ethernet (EEE)

IEEE 802.1p Class of Service  
IEC 60068-2-32 (free fall), IEC 60068-2-27 (shock), IEC 60068-2-6 (vibration)

10/100/1000 Base-T RJ45 Auto-MDI/MDI-X, Auto Negotiation

Max. 100 m  
max. 1000 Mbit/s  
16 × RJ45

System:  
Power 1 (P1): green  
Power 2 (P2): green  
Alarm, (Fault): red  
Per 10/100TX RJ45 Ports:  
10/100 LNK/ACT: green  
100/1000 LNK/ACT: orange (/amber)

PU (units)

### Safety

ESD (Ethernet)  
Surge (EFT for power)  
Reverse voltage protection

### Monitoring

Error output  
Switching voltage  
Switching current  
Isolation voltage

### Certifications/Standards Certifications

power supply and fault diagnosis  
single wire/fine wire  
0.25 mm<sup>2</sup> – 2.5 mm<sup>2</sup>  
AWG 20 – AWG 14  
fine stranded wire with ferrule  
0.25 mm<sup>2</sup> – 1.5 mm<sup>2</sup>  
AWG 20 – AWG 16  
1

DC 6 kV  
DC 4 kV  
Yes

Relay, 1 NO contact - 1 A @ DC 24 V  
AC 120 V / DC 28 V  
1 A @ DC 24 V  
DC 500 V

### LAN

Cable length (segment)  
Transfer rate  
Connection technology (data)  
Status display communication

### General

Rated voltage U<sub>N</sub>  
Degree of protection  
Installation position  
Operation temperature range  
Storage temperature range  
Relative humidity (operation)  
Relative humidity (storage)  
Housing material  
Mounting

DC 12 – 48 V redundant, AC 24 V

IP30

Any

-40 °C ... +75 °C

-40 °C ... +75 °C

5 % – 90 % (non-condensing)

0 % – 90 % (non-condensing)

Metal

DIN rail mountable TS35

(EN 60715)

Wall mounting

6-pole pluggable screw terminal for

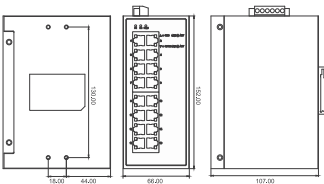
Standards

CE  
FCC Part 15 Class A  
UKCA  
cULus (E332878)  
EN 55032  
EN 55035  
IEC 61000-4-2/3/4/5/6/8  
IEC 60068-2-27  
IEC 60068-2-32  
IEC 60068-2-6

Connection type

Part No.	Type	Dimensions (w × h × d)	Weight/unit kg
772017	ET-SWGU16E	66.0 mm × 152.0 mm × 107.0 mm	0.743

### Dimensions



# Ethernet - Unmanaged PoE switches, 4 ports, 10/100/1000 MBit/s

4 RJ45 PoE ports 1Gbit/s + 1 RJ45 port 1Gbit/s + 1 SFP port 1Gbit/s

Compact design, Jumbo Frames up to 9 kB

Redundant supply, extended temperature range



## Communication

Standard	IEEE 802.3, 802.3u, 802.3x, 802.1ab, 802.1z
LAN	10 / 100 / 1000 Base-T(x), 100/1000 SFP Ports
Cable length (segment)	RJ-45 max. 100 m (4-wire Cat.5e, Cat.6 RJ45 cable) SFP max. 110 km
Transfer rate	max. 1000 Mbit/s
Connection technology (data)	5 × RJ45, 1 × SFP (mini-GBIC)
Status display communication	P1, P2, P-Fail, 10/100/1000 T(x): Link/Speed/Activity

## Safety

ESD (Ethernet)	DC 4 kV
Surge (EFT for power)	DC 3 kV
Reverse voltage protection	Yes
Rated over load protection	15 W @ 48 V (per PoE port)

## Monitoring

Power supply voltage monitoring	Relay, 1 normally open
Switching voltage	AC 120 V / DC 28 V
Switching current	1 A @ DC 24 V
Isolation voltage	DC 500 V

## Certifications/Standards

Certifications	cULus CE FCC UL 62368 FCC Class A
Standards	IEC 61000-4-2/3/4/5/6/8 IEC 60068-2-27 IEC 60068-2-32 IEC 60068-2-6

## General

Operation voltage range	DC 24–48 V, redundant
Power consumption	60 W full load PoE
Power output	15 W @ 48 V (per PoE port)
Degree of protection	IP30
Installation position	Any
Operation temperature range	-40 °C ... +75 °C
Storage temperature range	-40 °C ... +85 °C
Relative humidity (operation)	10 % – 95 % (non-condensing)
Relative humidity (storage)	10 % – 95 % (non-condensing)
Housing material	Metal
Mounting	DIN rail mountable TS35 (EN 60715)

## Connection type

Screw terminal  
plug-in  
0,20 mm<sup>2</sup> – 2,5 mm<sup>2</sup>

## Notes and Comments

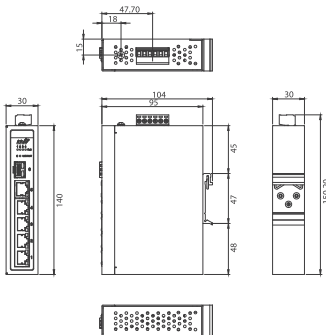
Note For more information on LED definition, see the data sheet.

PU (units)

1

Part No.	Type	Dimensions (w × h × d)	Weight/unit kg
<b>PoE 5 port, 24/48 V</b>			
772021	S* unm. PoE switch ET-PU5AST	30.0 mm × 140.0 mm × 95.0 mm	0.8

## Dimensions



# Ethernet - PoE splitter, 10/100/1000 MBit/s

1 RJ45 PoE input 1 GBit/s + 1 RJ45 data output 1 GBit/s  
 Output DC 24 V / 12.95 W, compact design  
 Extended temperature range, ESD 4 kV



## Communication Standard

LAN  
 Cable length (segment)  
 Transfer rate  
 Connection technology (data)  
 Status display communication

IEEE 802.3, 802.3u, 802.3x, 802.3af, 802.3ab  
 10 / 100 Base-TX, 10 / 1000 Base-T  
 Max. 100 m (4-wire Cat.5e)  
 max. 100 Mbit/s  
 PoE IN, OUT: RJ 45  
 Power, Link/Activity, Duplex/Collision

## Safety

ESD (Ethernet)  
 Surge (EFT for power)  
 Reverse voltage protection  
 Rated over load protection

DC 4 kV  
 DC 3 kV  
 Yes  
 0.539 A @ DC 24 V

## Certifications/Standards Certifications

## Standards

cULus  
 CE  
 FCC  
 UL 60950-1  
 CAN/CSA-C22.2 No. 60950  
 USA-FCC Part 15 CISPR22  
 EN 55011  
 EN 55022 Class A  
 EN 61000-3-2/3  
 EN 55024  
 IEC 61000-4-2/3/4/5/6/8  
 EN 61000-6-2  
 IEC 60068-2-27  
 IEC 60068-2-32  
 IEC 60068-2-6

## General

Operation voltage range  
 Power consumption  
 Power output  
 Degree of protection  
 Installation position  
 Operation temperature range  
 Storage temperature range  
 Relative humidity (operation)  
 Relative humidity (storage)  
 Housing material  
 Mounting

DC 44–57 V  
 17.8 W @ 48 V  
 12.95 W @ 24 V  
 IP20  
 Any  
 -40 °C ... +75 °C  
 -40 °C ... +85 °C  
 5 % – 95 % (non-condensing)  
 0 % – 95 % (non-condensing)

Connection type

Metal  
 DIN rail mountable TS35  
 (EN 60715)  
 Screw terminal  
 plug-in  
 0,20 mm<sup>2</sup> – 2,5 mm<sup>2</sup>

## Notes and Comments Note

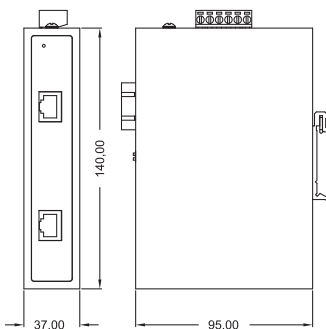
For more information on LED definition, see the data sheet.

PU (units)

1

Part No.	Type	Dimensions (w x h x d)	Weight/unit kg
772022	S* PoE Splitter ET-PSPET	37.0 mm x 140.0 mm x 95.0 mm	0.6

## Dimensions





# LÜTZE - Ethernet cables • Overview

<b>LÜTZE SUPERFLEX® Single Pair Ethernet</b>	
<b>Category</b>	
<b>Application according to</b>	
<b>Dimensions</b>	(1x2xAWG26/7)C
<b>Part-No.</b>	104450
<b>Screen</b>	S/UTP
<b>Jacket</b>	PUR
<b>UL</b>	

<b>LÜTZE SUPERFLEX® Profinet Torsion</b>			
<b>Category</b>	Cat. 6 <sub>A</sub>	Cat. 7	Cat. 5e
<b>Application according to</b>	Profinet Typ C	Profinet Typ C	Profinet Typ R
<b>Dimensions</b>	(4x2xAWG24/7)StC	(4x(2xAWG24/7)St)C	(2x2xAWG22/19)StC
<b>Part-No.</b>	104401	104404	104050
<b>Screen</b>	SF/UTP	S/FTP	SF/UTQ
<b>Jacket</b>	PUR	PUR	PUR
<b>UL</b>	AWM 21198	CMX	AWM 21238

<b>LÜTZE SUPERFLEX® Industrial Ethernet / ProfiNet / Ethercat</b>		
<b>Category</b>	Cat. 5e	Cat. 5e
<b>Application according to</b>	Profinet Typ C	Profinet Typ C
<b>Dimensions</b>	(2x2xAWG22/19)C	(2x2xAWG22/7)C
<b>Part-No.</b>	104302	104303
<b>Screen</b>	S/UTQ	S/UTQ
<b>Jacket</b>	PUR	PUR
<b>UL</b>	CMX	CMX

<b>LÜTZE SUPERFLEX® Industrial Ethernet / Ethernet IP</b>				
<b>Category</b>	Cat. 5e	Cat. 5e	Cat. 5e	Cat. 6
<b>Dimensions</b>	(2x2xAWG26/19)StC	(4x2xAWG24/19)C	(4x2xAWG26/19)StC	(4x2xAWG26/19)StC
<b>Part-No.</b>	104379	104337	104396	104347
<b>Screen</b>	S/UTQ	S/UTP	S/UTP	S/UTP
<b>Jacket</b>	PUR	PUR	PUR	PUR
<b>UL</b>	AWM 21198 300 V	AWM 21198 300 V	AWM 21198 300 V	CMX

<b>LÜTZE ELECTRONIC Industrial Ethernet / PROFINET / ETHERCAT</b>				
<b>Category</b>	Cat. 5e	Cat. 5e	Cat. 6 <sub>A</sub>	Cat. 7
<b>Application according to</b>	Profinet Typ A	Profinet Typ B	Profinet Typ A	Typ B
<b>Dimensions</b>	(2x2xAWG22/1)StC	(2x2xAWG22/7)StC	(4x(2xAWG22/1)St)C.	(4x(2xAWG23/7)St)C
<b>Part-No.</b>	104301	104307	104397	104110
<b>Screen</b>	S/UTQ	S/UTQ	S/FTP	S/FTP
<b>Jacket</b>	PVC	PVC	PVC	PVC
<b>UL</b>	CMG, PLTC, AWM 20201 600 V	CMG, PLTC, AWM 20201 600 V	CMG, PLTC, AWM 2570 600 V	AWM 2095

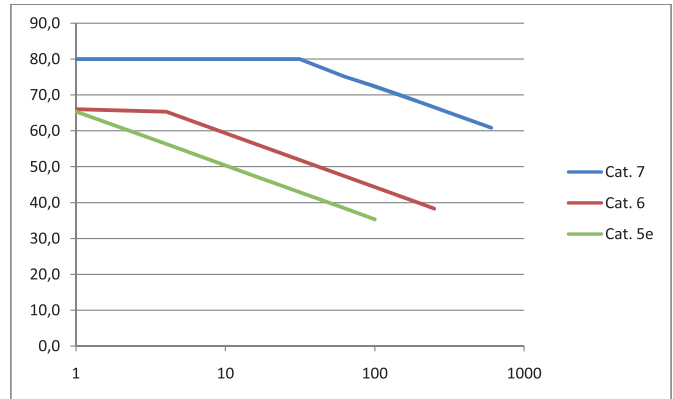
<b>LÜTZE ELECTRONIC Industrial Ethernet / Ethernet IP</b>				
<b>Category</b>	Cat. 5e	Cat. 5e	Cat. 6 <sub>A</sub>	Cat. 7
<b>Dimensions</b>	(4x2xAWG26/7)StC	(4x2xAWG24/7)StC	(4x(2xAWG24/7)St)C	(4x(2xAWG26/7)St)C
<b>Part-No.</b>	104335	104336	104338	104331
<b>Screen</b>	S/UTP	S/UTP	S/FTP	S/FTP
<b>Jacket</b>	PVC	PVC	PVC	PVC
<b>UL</b>	CMG	CMG	CMG	CMG

<b>LÜTZE ELECTRONIC Industrial Ethernet</b>	
<b>Category</b>	Cat. 5e
<b>Application according to</b>	
<b>Dimensions</b>	(4x2xAWG22/7)StC
<b>Part-No.</b>	104350
<b>Screen</b>	SF/UTP
<b>Jacket</b>	PVC
<b>UL</b>	PLTC, CMG, CMX Outdoor, AWM 2570

# LÜTZE - Ethernet Cables • Transmission Parameters

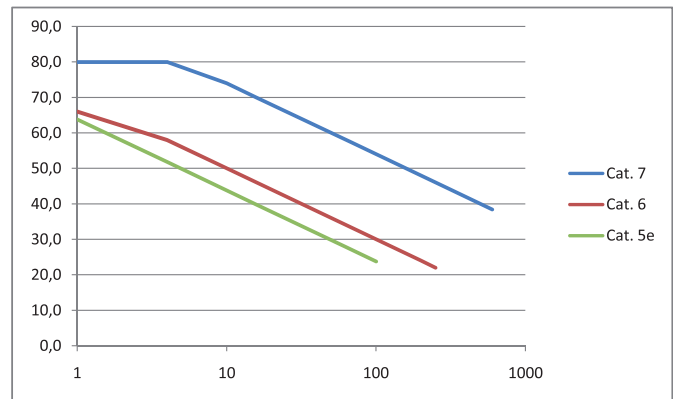
## min. Near End Crosstalk (NEXT)

Frequenz	EN 50288-2-2 EN 50288-5-2 EN 50288-4-2			[Unit]
	Cat. 5e	Cat. 6	Cat. 7	
1 MHz	65,3	66,0	80,0	dB
4 MHz	56,3	65,3	80,0	dB
10 MHz	50,3	59,3	80,0	dB
16 MHz	47,2	56,2	80,0	dB
20 MHz	45,8	54,8	80,0	dB
31,25 MHz	42,9	51,9	80,0	dB
62,5 MHz	38,4	47,4	75,1	dB
100 MHz	35,3	44,3	72,4	dB
155 MHz	-	41,4	69,6	dB
200 MHz	-	39,8	67,9	dB
250 MHz	-	38,3	66,5	dB
300 MHz	-	-	65,3	dB
600 MHz	-	-	60,8	dB



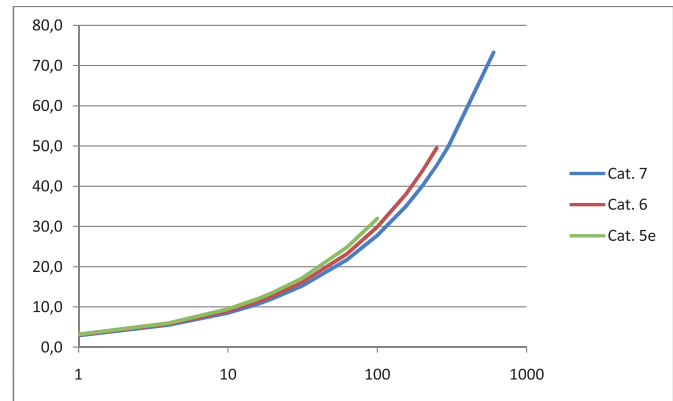
## min. Far End Crosstalk (FEXT)

Frequenz	EN 50288-2-2 EN 50288-5-2 EN 50288-4-2			[Unit]
	Cat. 5e	Cat. 6	Cat. 7	
1 MHz	63,8	66,0	80,0	dB
4 MHz	51,8	58,0	80,0	dB
10 MHz	43,8	50,0	74,0	dB
16 MHz	39,7	45,9	69,9	dB
20 MHz	37,8	44,0	68,0	dB
31,25 MHz	33,9	40,1	64,1	dB
62,5 MHz	27,9	34,1	58,1	dB
100 MHz	23,8	30,0	54,0	dB
155 MHz	-	26,2	50,2	dB
200 MHz	-	24,0	48,0	dB
250 MHz	-	22,0	46,0	dB
300 MHz	-	-	44,5	dB
600 MHz	-	-	38,4	dB



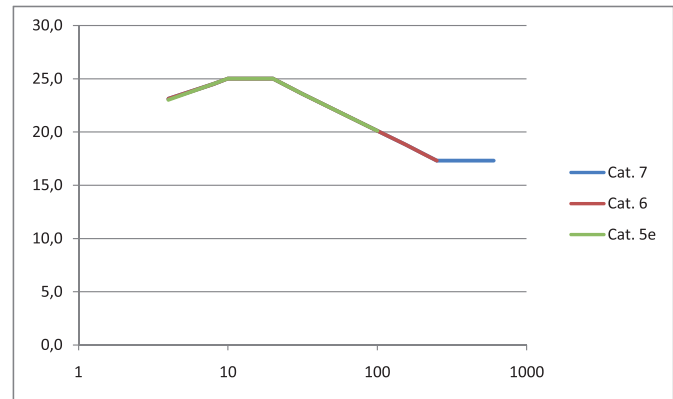
## max. Attenuation ( α )

Frequenz	EN 50288-2-2 EN 50288-5-2 EN 50288-4-2			[Unit]
	Cat. 5e	Cat. 6	Cat. 7	
1 MHz	3,2	3,1	2,9	dB/100m
4 MHz	6,0	5,8	5,5	dB/100m
10 MHz	9,5	9,0	8,5	dB/100m
16 MHz	12,1	11,4	10,8	dB/100m
20 MHz	13,6	12,8	12,1	dB/100m
31,25 MHz	17,1	16,1	15,2	dB/100m
62,5 MHz	24,8	23,2	21,7	dB/100m
100 MHz	32,0	29,9	27,8	dB/100m
155 MHz	-	38,0	35,0	dB/100m
200 MHz	-	43,7	40,1	dB/100m
250 MHz	-	49,5	45,3	dB/100m
300 MHz	-	-	50,0	dB/100m
600 MHz	-	-	73,3	dB/100m



## Return Loss (RL)

Frequenz	EN 50288-2-2 EN 50288-5-2 EN 50288-4-2			[Unit]
	Cat. 5e	Cat. 6	Cat. 7	
4 MHz	23,0	23,1	23,1	dB
8 MHz	24,5	24,5	24,5	dB
10 MHz	25,0	25,0	25,0	dB
16 MHz	25,0	25,0	25,0	dB
20 MHz	25,0	25,0	25,0	dB
31,25 MHz	23,6	23,6	23,6	dB
62,5 MHz	21,5	21,5	21,5	dB
100 MHz	20,1	20,1	20,1	dB
155 MHz	-	18,8	18,8	dB
200 MHz	-	18,0	18,0	dB
250 MHz	-	17,3	17,3	dB
350 MHz	-	-	17,3	dB
600 MHz	-	-	17,3	dB

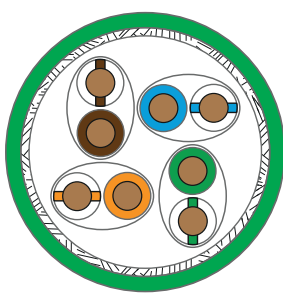


# ETHERNET – Overview

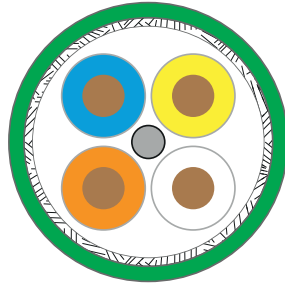
## 1. LÜTZE ETHERNET Cables

We recommend shielded industrial Ethernet cable, such as LÜTZE ETHERNET cable, for use in industrial environment to ensure secure connectivity. Motors and other electrical noise producing devices are often located in close proximity to network cabling. EMI (Electro Magnetic Interference) and RFI (Radio Frequency Interference) can distort data transmission on copper-based network cable. To lessen or eliminate interference, called alien-crosstalk, the use of shielded industrial cable and connectors is recommended.

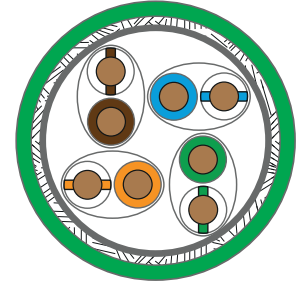
### Available LÜTZE ETHERNET Cables:



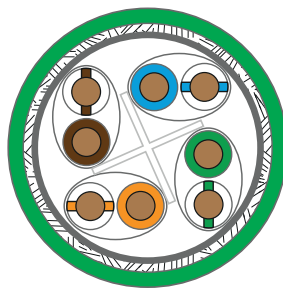
S/UTP



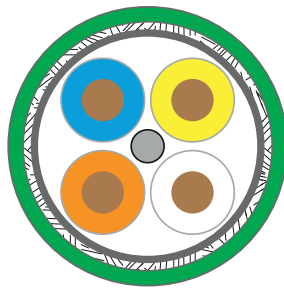
S/UTQ (Quad)



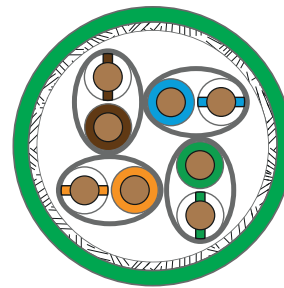
SF/UTP



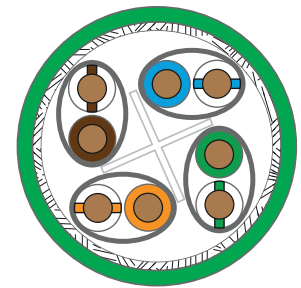
SF/UTP  
with cross element



SF/UTQ (Quad)



S/FTP



S/FTP  
with cross element

### Susceptibility for Interference

S/UTP	S/UTQ (Quad)	SF/UTP	SF/UTP with cross element	SF/UTQ (Quad)	S/FTP	S/FTP with cross element
some	some	low	low	low	low	low

## 2. Key for twisted pair cables according to ISO/IEC-11801 (2002)E

XX/YYZ

XX – outer jacket

/ Y – for the pair shielding

ZZ – wire pairing

U = unshielded

/ U = unshielded

TP = twisted pair (regular)

F = foiled shield

/ F = foiled shield

TQ = quad pair (star quad)

S = braided shield

/ S = braided shield

SF = braided and foiled shield

In order to utilize EMI/RFI shielding, the shield must be properly terminated at both ends!

# ETHERNET – Overview

## 3. ETHERNET cable selection tool

Category	Use	2- or 4-pair	Part number	Shielding	AWG	AD (mm)	UL Recognized	UL Listed Type
Cat. 5e	high flexing	2-pair	104050	SF/UTQ	22	6,5	cURus	
Cat. 5	high flexing	2-pair	104303	S/UTQ	22	6,5		CMX
Cat. 5e	high flexing	2-pair	104302	S/UTQ	22	6,6		CMX
Cat. 5e	high flexing	2-pair	104379	SF/UTQ	26	5,3	cURus	
Cat. 5e	high flexing	4-pair	104337	S/UTP	24	7,8	cURus	
Cat. 5e	high flexing	4-pair	104396	SF/UTP	26	6,7	cURus	
Cat. 5e	static	2-pair	104301	SF/UTQ	22-single wire	6,5	cURus	PLTC, CMG
Cat. 5e	static	2-pair	104307	SF/UTQ	22	6,5	cURus	PLTC, CMG
Cat. 5e	static	4-pair	104335	SF/UTP	26	6,3		CMG
Cat. 5e	static	4-pair	104336	SF/UTP	24	7,3		CMG
Cat. 5e	static	4-pair	104350	SF/UTP	22	8,6	cURus	PLTC, CMG, CMX Outdoor
Cat. 6	high flexing	4-pair	104347	SF/UTP	26	7,9		CMX
Cat. 6 <sub>A</sub>	high flexing	4-pair	104401	SF/UTP	24	8,9	cURus	
Cat. 6 <sub>A</sub>	static	4-pair	104397	S/FTP	22-single wire	9,6	cURus	PLTC, CMG
Cat. 6 <sub>A</sub>	static	4-pair	104338	S/FTP	26	6,4		CMG
Cat. 7	high flexing	4-pair	104404	S/FTP	24	9,4		CMX
Cat. 7	static	4-pair	104331	S/FTP	26	6,4		CMG
Cat. 7	static	4-pair	104110	S/FTP	23	8,7	cURus	

## 4. Correct Handling and Installation of Network Copper Cable

- Do not subject cable to tension
- Do not kink the cable
- Do not bend the cable more than 90° (See individual specifications for bending radius)
- Strip the cable as short as possible
- Do not crush cable when fastening
- Do not untwist the conductor pairs by more than 15 mm
- Terminate the shielding on both ends



# ETHERNET – Overview

## 5. ProfiNet – Star Quad Design and Termination

The star quad is a specific low-impedance cable configuration. Four conductors are twisted on a common axis. The conductors across from each other make a pair.

In Figure 1 the pairs are as follows:

**Pair 1:**  
Conductor A ←→ Conductor D

**Pair 2:**  
Conductor B ←→ Conductor C

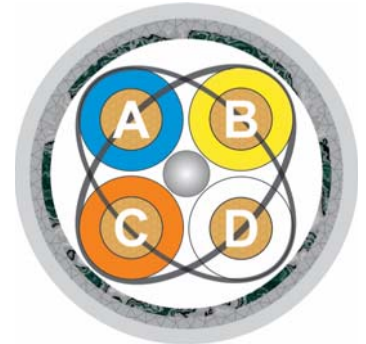


Image 1

Other terminations than in Figure 1 lead to interferences, decreased connectivity or no connectivity at all.

## 6. Pin Assignment and Installation

RJ45 is the most common Ethernet connector and is available both shielded and unshielded.

All pins of the RJ45 connector are used for 1000 Mbit/s (4-pair transmission). Four pins are used for 10/100 Mbit/s (2-pair transmission).

According to the EN 50173 standard, two color codes are defined for installation: T568A and T568B. It makes no difference which color code is used, however the same code should be used consistently throughout the entire installation. Mixing up the two color codes will result in malfunctions.

### Pin assignment RJ45 – Color code according to EN 50173 – hard wiring:

ETHERNET cables									
Star Quad (ProfiNet)				Paired					
Pin#	100BASE-TX	Colorcode	10 BASE-T, 100BASE-TX	1000BASE-T		Colorcode T568A		Colorcode T568B	
1	Transmit+	yellow	Transmit+	BI_DA+	(bidirectional)	WH/GN	WH/OR	WH/OR	WH/OR
2	Transmit-	orange	Transmit-	BI_DA-	(bidirectional)	GN	OR	OR	OR
3	Receive+	white	Receive+	BI_DB+	(bidirectional)	WH/OR	WH/GN	WH/GN	WH/GN
4	–		–	BI_DC+	(bidirectional)	BL	BL	BL	BL
5	–		–	BI_DC-	(bidirectional)	WH/BL	WH/BL	WH/BL	WH/BL
6	Receive-	blue	Receive-	BI_DB-	(bidirectional)	OR	GN	GN	GN
7	–		–	BI_DD+	(bidirectional)	WH/BN	WH/BN	WH/BN	WH/BN
8	–		–	BI_DD-	(bidirectional)	BN	BN	BN	BN

## 7. ETHERNET Categories and Classes

	ProfiNet®	Cat. 5	Cat. 5e	Cat. 6	Cat. 6A	Cat. 7
<b>Class</b>	D	D	De	E	Ea	F
<b>Construction</b>	2 pair (AWG 22)	2 pair (AWG22, AWG24, AWG26)	4 pair (AWG 24, AWG 26)	4 pair (26 AWG)	4 pair (AWG22, AWG24, AWG26)	4 pair (AWG22, AWG24, AWG26)
<b>Speed</b>	10/100 Mbit/s	10/100 Mbit/s	10/100/1000 Mbit/s	10/100/1000 Mbit/s	10/100/1000/10000 Mbit/s	10/100/1000/10000 Mbit/s
<b>LAN Applications (max.)</b>	10BASE-T (2 pair) 100BASE-TX (2 pair)	10BASE-T (2 pair) 100BASE-TX (2 pair)	10BASE-T (2 pair) 100BASE-TX (2 pair) 1000BASE-T (4 pair)	10BASE-T 100BASE-TX 1000BASE-T 10BASE-T	10BASE-T 100BASE-TX 1000BASE-T 10GBASE-T	10BASE-T 100BASE-TX 1000BASE-T 10GBASE-T
<b>Nominal Impedance</b>	100 Ohm	100 Ohm	100 Ohm	100 Ohm	100 Ohm	100 Ohm
<b>Bandwidth</b>	100 MHz	100 MHz	100 MHz	250 MHz	500 MHz	600 MHz
<b>max. length</b>	100 m (10BASE-T) 100 m (100BASE-TX)	100 m (10BASE-T) 100 m (100BASE-TX)	100 m (10BASE-T) 100 m (100BASE-TX) 100 m (1000BASE-T)	100 m (10BASE-T) 100 m (100BASE-TX) 100 m (1000BASE-T)	100 m (10BASE-T) 100 m (100BASE-TX) 100 m (1000BASE-T) 100 m (10GBASE-T)	100 m (10BASE-T) 100 m (100BASE-TX) 100 m (1000BASE-T) 100 m (10GBASE-T)
<b>Cat. compatibility</b>	Cat. 5	Cat. 5	Cat. 5	Cat. 5, Cat. 5e	Cat. 5, Cat. 6	Cat. 5, Cat. 6, Cat. 6A
<b>ISO/IEC standard</b>	–	ISO/IEC 11801	ISO/IEC 11801	ISO/IEC 11801	Modification 1 ISO/IEC 11801	ISO/IEC 11801
<b>ANSI/TIA standard</b>	–	ANSI/TIA-568-B	ANSI/TIA-568-C.2	ANSI/TIA-568-C.2	ANSI/TIA-568-C.2	Not recognized

# PUR Network cables · ETHERNET · C-track compatible

## LÜTZE SUPERFLEX® SINGLE PAIR ETHERNET (C) PUR



### Application

- For wiring of industrial field bus systems with the globally accepted TCP/IP protocol
- For continuous flexing use e.g. in c-tracks or free movement in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance (EMC)
- Silicone free
- Halogen free
- RoHS compliant

### Construction

Conductor	CU-wire bare AWG conductor
Conductor insulation	Special Polyolefin
Overall shield	plastic-laminated aluminum foil Braid shield tinned copper wires optical cover approx. 85 %

Jacket material  
Surface  
Jacket color

PUR  
matte  
green RAL 6018

### Technical data

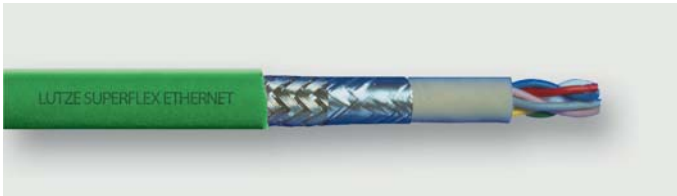
Rated voltage	300 V
Test voltage type	AC 2000 V
Impedance	nom. 100 Ω
Insulation resistance at 20 °C	≥500 MΩ×km
Operating capacitance wire-shield	approx. 50 pF/m
Temperature range moving	-30 °C ... +70 °C
Temperature range fixed	-40 °C ... +80 °C
Minimum bending radius moving	15×D
Minimum bending radius fixed	8×D
Oil resistant according to	DIN EN 50363-10-2 DIN EN 60811-404
Burning behavior according to	IEC 60332-1-2
Halogen free according to	IEC 60754-1 VDE 0472-815

Part No.	Number of conductors/cross-section	Overall stranding	Conductor marking	Outer Ø mm	Weight kg/100 m	Cu-Index kg/100 m
104450	S* (1×2×AWG26/7)	stranded pairs layer pitch optimised	white · blue	4.7	2.5	1.5

# PUR Network cables - ETHERNET - C-track compatible

## LÜTZE SUPERFLEX® ETHERNET R (C) PUR

For highest requirements



### Application

- For wiring of industrial field bus systems with the globally accepted TCP/IP protocol
- For continuous flexing use e.g. in c-tracks or free movement in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance (EMC)
- Silicone free
- RoHS compliant

### Construction

Conductor	AWG conductor CU-wire tin-plated
Conductor insulation	TPE
Overall shield	aluminium-laminated film shield optical cover approx. 100 % Braid shield tinned copper wires optical cover approx. 85 %
Jacket material	PUR
Jacket color	green RAL 6018

### Technical data

UL style	AWM 21238
Rated voltage	600 V
Test voltage type	2000 V
Impedance	nom. 100 Ω
Insulation resistance at 20 °C	5,000 MΩ×km
Operating capacitance wire-wire	approx. 50 pF/m
Temperature range moving	-20 °C ... +60 °C
Temperature range fixed	-40 °C ... +80 °C
Minimum bending radius moving	15×D
Minimum bending radius fixed	4×D
Torsion	± 180°/m
Oil resistant according to	IEC 60811-404
Burning behavior according to	DIN EN 50363-10-2 UL 1581 sec. 1100 HFT/FT2 acc. to UL 2556 sec. 9.1
Halogen free according to	IEC 60332-1-2 IEC 60754-1
Certifications	DIN 0472 Part 815 cURus

Part No.	Number of conductors/cross-section	Category	Overall stranding	Conductor marking	Outer Ø mm	Weight kg/100 m	Cu-Index kg/100 m
<b>ELECTRONIC Industrial Ethernet/Profinet/EtherCat</b>							
104050	S* (2×2×AWG22/19) StC	Cat.5e	star quad stranding layer pitch optimised	white • yellow • blue • orange	6.5	6	3.4

# PUR Network cables · ETHERNET · C-track compatible

## LÜTZE SUPERFLEX® ETHERNET (C) PUR For highest requirements



### Application

- For wiring of industrial field bus systems with the globally accepted TCP/IP protocol
- For continuous flexing use e.g. in c-tracks or free movement in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance (EMC)
- Silicone free
- Halogen free
- RoHS compliant
- Torsion-resistant

### Construction

Conductor	CU-wire bare
Conductor insulation	AWG conductor
Overall shield	Special Polyolefin
	Foil shield
	Braid shield
	tinned copper wires
	optical cover approx. 90 %
Inner jacket	FRNC
Jacket material	PUR

Surface  
Jacket color

adhesion-free, matte  
green similar to RAL 6018

### Technical data

UL style	AWM 21198
Rated voltage	300 V
Test voltage type	AC 2000 V
Impedance	nom. 100 Ω
Insulation resistance at 20 °C	≥500 MΩ×km
Temperature range moving	-30 °C ... +70 °C
Temperature range fixed	-40 °C ... +80 °C
Minimum bending radius moving	15×D
Minimum bending radius fixed	4×D
Torsion	± 180°/m
Oil resistant according to	DIN EN 60811-404
	DIN EN 50363-10-2
Burning behavior according to	IEC 60332-1-2
	Horizontal Flame Test
	UL FT2
Halogen free according to	DIN EN 60754-1
	IEC 60754-1
Certifications	cURus

Part No.	Number of conductors/cross-section	Category	Overall stranding	Conductor marking	Outer Ø mm	Weight kg/100 m	Cu-Index kg/100 m
<b>SUPERFLEX® Industrial ETHERNET, Cat. 6A, CU-wire bare</b>							
104401	S* (4×2×AWG24/7) StC	Cat.6 <sub>A</sub>	stranding with cross element	white/blue • blue • white/orange • orange • white/ green • green • white/brown • brown	8.9	8.8	4



# PUR Network cables · ETHERNET · C-track compatible

## LÜTZE SUPERFLEX® ETHERNET (C) PUR

For highest requirements



### Application

- For wiring of industrial field bus systems with the globally accepted TCP/IP protocol
- For continuous flexing use e.g. in c-tracks or free movement in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance (EMC)
- Silicone free
- Halogen free
- RoHS compliant
- Torsion-resistant

### Construction

Conductor	CU-wire tin-plated AWG conductor
Conductor insulation	Special Polyolefin
Overall shield	Braid shield tinned copper wires optical cover approx. 85 %
Jacket material	PUR

Surface  
Jacket color

adhesion-free, matte  
green similar to RAL 6018

### Technical data

Rated voltage	300 V
Test voltage type	AC 3000 V
Impedance	nom. 100 Ω
Insulation resistance at 20 °C	≥500 MΩ×km
Temperature range moving	-30 °C ... +70 °C
Temperature range fixed	-40 °C ... +80 °C
Minimum bending radius moving	15×D
Minimum bending radius fixed	8×D
Torsion	± 180°/m
Oil resistant according to	DIN EN 60811-404
Burning behavior according to	DIN EN 50363-10-2
Halogen free according to	IEC 60332-1-2 UL 1581 part 1080 VW-1 VDE 0472-815 IEC 60754-1
Certifications	CMX

Part No.	Number of conductors/cross-section	Category	Overall stranding	Conductor marking	Outer Ø mm	Weight kg/100 m	Cu-Index kg/100 m
<b>SUPERFLEX® Industrial ETHERNET, Cat. 7, CU-wire tin-plated</b>							
104404	S* (4×(2×AWG24/7) St)C	Cat.7	stranding with cross element metallized fleece	white • blue • white • orange • white • green • white • brown	9.4	9.6	4.4

# PUR Network cables · ETHERNET · C-track compatible

## LÜTZE SUPERFLEX® ETHERNET (C) PUR

For highest requirements



### Application

- For wiring of industrial field bus systems with the globally accepted TCP/IP protocol
- For continuous flexing use e.g. in c-tracks or free movement in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance (EMC)
- Silicone free
- Halogen free
- RoHS compliant

### Construction

Conductor	AWG conductor CU-wire bare
Conductor insulation	Special Polyolefin
Overall shield	Braid shield tinned copper wires optical cover approx. 85 %
Jacket material	PUR
Surface	adhesion-free, matte

Jacket color

green similar to RAL 6018

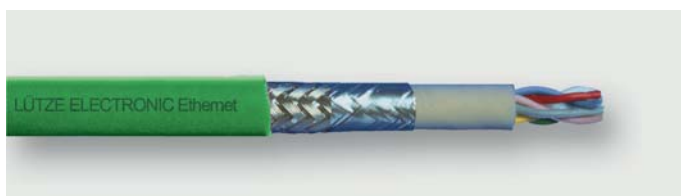
### Technical data

Rated voltage	300 V
Test voltage type	AC 1500 V
Impedance	nom.100 Ω
Operating capacitance wire-wire	approx.48 pF/m
Temperature range moving	-30 °C ... +70 °C
Temperature range fixed	-40 °C ... +80 °C
Minimum bending radius moving	12×D
Minimum bending radius fixed	6×D
Burning behavior according to	IEC 60332-1 DIN EN 60332-1-2 VDE 0482 322-1-2 UL 1581 part VW-1 Flame Test UL FT1 DIN EN 60754-1 IEC 60754-1
Halogen free according to	
Certifications	CMX cULus

Part No.	Number of conductors/cross-section	Category	Overall stranding	Conductor marking	Outer Ø mm	Weight kg/100 m	Cu-Index kg/100 m
<b>SUPERFLEX® Industrial Ethernet/ProfiNet/Ethercat, FC</b>							
104302	S* (2×2×AWG22/19)C	Cat.5e	star quad stranding	blue • white • yellow • orange	6.6	6.3	3.2
104303	S* (2×2×AWG22/7)C	Cat.5e	star quad stranding	blue • white • yellow • orange	6.5	6.5	3
<b>SUPERFLEX® Industrial Ethernet/Ethernet IP</b>							
104379	S* (2×2×AWG26/19) StC	Cat.5e	star quad stranding	white • blue • yellow • orange	5.3	3.5	1.8
104337	S* (4×2×AWG24/19)C	Cat.5e	stranded pairs	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	7.8	8.5	4.4
104396	S* (4×2×AWG26/19) StC	Cat.5e	stranded pairs	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	6.7	5.1	2.8
104347	S* (4×2×AWG26/19) StC	Cat.6	stranded pairs	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	7.8	7.4	3.4

# PVC Network cables · ETHERNET · shielded

## LÜTZE ELECTRONIC ETHERNET (C) PVC



### Application

- For wiring of industrial field bus systems with the globally accepted TCP/IP protocol
- For fixed installation or moving use without compulsory guide in the automation technology, transport and conveyor technology, machine tool manufacture
- Cable design for harsh industrial environments and operating conditions with high noise levels
- Applicable in automation technology, transport and conveyor technology, machine tool manufacture
- Based on NFPA 79 standards

### Properties

- High active and passive interference resistance (EMC)
- Talc free and silicone free
- RoHS compliant

### Construction

Conductor	AWG conductor CU-wire bare
Conductor insulation	Special Polyolefin plastic-laminated aluminum foil
Overall shield	Braid shield tinned copper wires optical cover approx. 80 %
Inner jacket	TPE
Jacket material	PVC
Surface	adhesion-free, matte
Jacket color	green similar to RAL 6018

### Technical data

UL style	AWM 20201
Rated voltage	300 V
Test voltage type	2000 V
Impedance	nom. 100 Ω
Insulation resistance at 20 °C	5,000 MΩ×km
Operating capacitance wire-wire	approx. 50 pF/m
Temperature range fixed	-40 °C ... +80 °C
Minimum bending radius moving	15×D
Minimum bending radius fixed	10×D
Oil resistant according to	Oil Res I
Burning behavior according to	UL 1581 part 480 UL FT4 UL Vertical-Tray UL 1685 part 1164 UL 1581 section 1061 Flame-Test IEC 60332-3-24 DIN EN 60332-3-24

### Certifications

cULus  
CMG 75 °C acc. UL 444  
PLTC  
cURus  
Class I and II, Div. 2  
Class 1 Div. 2 per NEC  
501, 502, 505

Part No.	Number of conductors/cross-section	Category	Overall stranding	Conductor marking	Outer Ø mm	Weight kg/100 m	Cu-Index kg/100 m
<b>ELECTRONIC Industrial Ethernet/Profinet/EtherCat</b>							
104301	S* (2×2×AWG22/1) StC	Cat.5e	star quad stranding	white • yellow • blue • orange	6.5	6.8	3.2
104307	S* (2×2×AWG22/7) StC	Cat.5e	star quad stranding	white • yellow • blue • orange	6.5	6.9	3.2
104397	S* (4×(2×AWG22/1) St)C	Cat.6 <sub>A</sub>	stranded pairs	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	9.6	9.6	5.3
<b>ELECTRONIC Industrial Ethernet/Ethernet IP</b>							
104335	S* (4×2×AWG26/7) StC	Cat.5e	stranded pairs	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	6.3	5.5	3
104336	S* (4×2×AWG24/7) StC	Cat.5e	stranded pairs	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	7.3	6.9	3.8
104338	S* (4×(2×AWG26/7) St)C	Cat.6 <sub>A</sub>	stranded pairs	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	6.4	5.8	3.3
104331	S* (4×(2×AWG26/7) St)C	Cat.7	stranded pairs	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	6.4	5.8	3.3

# PVC Network cables - ETHERNET - shielded

## LÜTZE ELECTRONIC ETHERNET (C) PVC



### Application

- For wiring of industrial field bus systems with the globally accepted TCP/IP protocol
- For fixed installation or moving use without compulsory guide in the automation technology, transport and conveyor technology, machine tool manufacture
- Cable design for harsh industrial environments and operating conditions with high noise levels
- Applicable in automation technology, transport and conveyor technology, machine tool manufacture
- Based on NFPA 79 standards

### Properties

- High active and passive interference resistance (EMC)
- Talc free and silicone free
- RoHS compliant

### Construction

Conductor	AWG conductor CU-wire tin-plated
Conductor insulation	Special Polyolefin
Overall shield	aluminium-laminated film shield Braid shield tinned copper wires optical cover approx. 85 %
Jacket material	PVC

Surface  
Jacket color

matte, adhesion-free  
green similar to RAL 6018

### Technical data

UL style	AWM 2570
Rated voltage	300 V
Test voltage type	AC 1000 V
Impedance	nom. 100 Ω
Insulation resistance at 20 °C	≥5,000 MΩ×km
Operating capacitance wire-wire	approx. 50 pF/m
Temperature range moving	-25 °C ... +70 °C
Temperature range fixed	-40 °C ... +80 °C
Minimum bending radius moving	12×D
Minimum bending radius fixed	6×D
Oil resistant according to	Oil Res I
Burning behavior according to	DIN EN 60332-1-2 DIN EN 60332-3-24

### Certifications

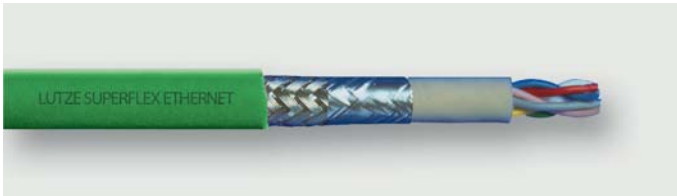
cULus  
CMG  
CMX Outdoor  
PLTC  
cURus

Part No.	Number of conductors/cross-section	Category	Conductor marking	Outer Ø mm	Weight kg/100 m	Cu-Index kg/100 m
104350	S* (4×2×AWG22/7)	Cat.5e	white/blue • blue • white/orange • orange • white/green • green • white/brown • brown	8.6	9.2	4.8



# PVC Network cables · ETHERNET · shielded

## LÜTZE ELECTRONIC ETHERNET (C) PVC



### Application

- For wiring of industrial field bus systems with the globally accepted TCP/IP protocol
- Suitable for static laying and slight movement of machine components (not C-track)

### Properties

- High active and passive interference resistance (EMC)
- Silicone free
- RoHS compliant

### Construction

Conductor	AWG conductor CU-wire tin-plated
Conductor insulation	foamed TPE
Overall shield	Braid shield tinned copper wires optical cover approx. 85 %
Jacket material	PVC

Jacket color

green RAL 6018

### Technical data

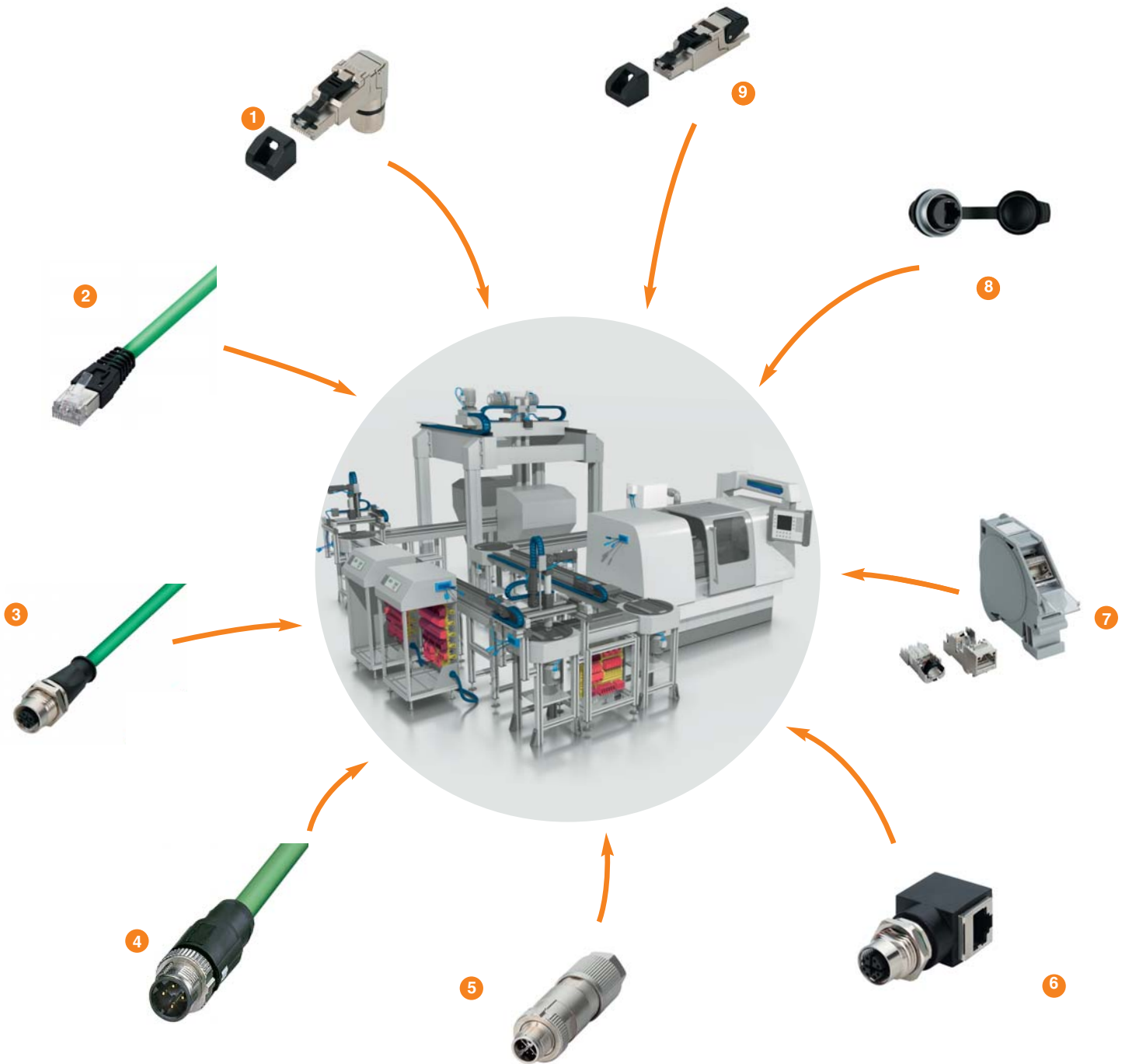
UL style	AWM 2095
Rated voltage	300 V
Test voltage type	2000 V
Impedance	100 Ω
Insulation resistance at 20 °C	5,000 MΩ×km
Operating capacitance wire-wire	50 pF/m
Temperature range moving	-10 °C ... +70 °C
Temperature range fixed	-40 °C ... +80 °C
Minimum bending radius moving	8×D
Minimum bending radius fixed	4×D
Burning behavior according to	UL 1581 sec. 1100 HFT/FT2 acc. to UL 2556 sec. 9.1 IEC 60332-1-2

Certifications

cURus  
UL 758 - AWM

Part No.	Number of conductors/cross-section	Category	Overall stranding	Conductor marking	Outer Ø mm	Weight kg/100 m	Cu-Index kg/100 m
<b>ELECTRONIC Industrial Ethernet/Ethernet IP</b>							
104110	S* (4×(2×AWG23/7) St)C	Cat.7	conductors layered construction	Twisted pair • blue/white • orange/white • green/white • brown/white	8.7	10.1	5

# Internet of Things



1 RJ45 industrial connector, angled

2 RJ45 connector

3 M12 panel connector

4 M12 connector

5 M12 Male X-coded

6 M12 / RJ45 control cabinet bushing

7 RJ45 Module holder

8 RJ45 panel connector for front installation

9 RJ45 connector

# Actuator sensor interface - Network cables PROFINET

## Male RJ45 straight to female M12 straight with PVC cable shielded, Cat 5e Self-locking screw connection M12



### Construction

Number of conductors/cross-section (2×2×AWG22/7)  
 Number of conductors 4  
 Jacket material PVC  
 Jacket color green RAL 6018  
 Minimum bending radius fixed 6×D  
 Minimum bending radius moving 12×D

### Technical data

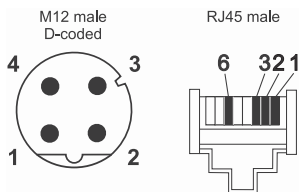
Operating voltage max. 50 V  
 Rated current 1.5 A

Form male 1  
 Form male 2  
 Degree of protection  
 Color of the housing  
 Mounting  
 Temperature range connector  
 Temperature range fixed  
 Temperature range moving  
**Accessories**

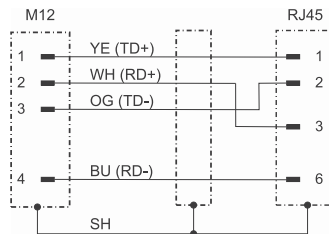
RJ45  
 M 12  
 IP20  
 black  
 Breakaway torque 0.4 Nm  
 -25 °C ... +85 °C  
 -30 °C ... +80 °C  
 -5 °C ... +70 °C  
**Torque setting tool M 12:** Part-No. 490091 | DM-SET M12 | PU: 1 unit

Part No.	Type	Pole number	Coding	Cable length m	Cable diameter mm	PU (units)
192014.0030	S* STG4-RJ45/STG4-M12/ PN PVC 0,3M	4	D	0.3	6.5	1
192014.0060	S* STG4-RJ45/STG4-M12/ PN PVC 0,6M	4	D	0.6	6.5	1
192014.0100	S* STG4-RJ45/STG4-M12/ PN PVC 1,0M	4	D	1.0	6.5	1
192014.0150	S* STG4-RJ45/STG4-M12/ PN PVC 1,5M	4	D	1.5	6.5	1
192014.0200	S* STG4-RJ45/STG4-M12/ PN PVC 2,0M	4	D	2.0	6.5	1
192014.0500	S* STG4-RJ45/STG4-M12/ PN PVC 5,0M	4	D	5.0	6.5	1
192014.1000	S* STG4-RJ45/STG4-M12/ PN PVC 10,0M	4	D	10.0	6.5	1
192014.1500	A* STG4-RJ45/STG4-M12/ PN PVC 15,0M	4	D	15.0	6.5	1
192014.2000	A* STG4-RJ45/STG4-M12/ PN PVC 20,0M	4	D	20.0	6.5	1

### Pin layout



### Circuit diagram



# Actuator sensor interface - Network cables PROFINET

## Male RJ45 straight to female RJ45 straight with PVC cable shielded, Cat 5e 4-pin



### Construction

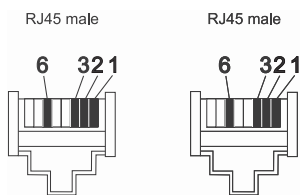
Number of conductors/cross-section	(2×2×AWG22/7)
Number of conductors	4
Jacket material	PVC
Jacket color	green RAL 6018
Minimum bending radius fixed	6×D
Minimum bending radius moving	12×D

Operating voltage max.	50 V
Rated current	1.5 A
Form male 1	RJ45 male straight
Form male 2	RJ45 male straight
Degree of protection	IP20
Color of the housing	black
Temperature range connector	-25 °C ... +85 °C
Temperature range fixed	-30 °C ... +80 °C
Temperature range moving	-5 °C ... +70 °C

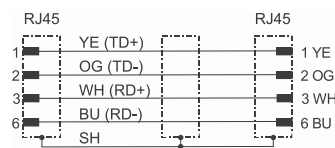
### Technical data

Part No.	Type	Pole number	Cable length m	Cable diameter mm	PU (units)
192016.0030	S* STG4-RJ45/STG4-RJ45/PN PVC 0,3M	4	0.3	6.5	1
192016.0060	S* STG4-RJ45/STG4-RJ45/PN PVC 0,6M	4	0.6	6.5	1
192016.0100	S* STG4-RJ45/STG4-RJ45/PN PVC 1,0M	4	1.0	6.5	1
192016.0150	S* STG4-RJ45/STG4-RJ45/PN PVC 1,5M	4	1.5	6.5	1
192016.0200	S* STG4-RJ45/STG4-RJ45/PN PVC 2,0M	4	2.0	6.5	1
192016.0500	S* STG4-RJ45/STG4-RJ45/PN PVC 5,0M	4	5.0	6.5	1
192016.1000	S* STG4-RJ45/STG4-RJ45/PN PVC 10,0M	4	10.0	6.5	1
192016.1500	S* STG4-RJ45/STG4-RJ45/PN PVC 15,0M	4	15.0	6.5	1
192016.2000	S* STG4-RJ45/STG4-RJ45/PN PVC 20,0M	4	20.0	6.5	1

### Pin layout



### Circuit diagram





# Actuator sensor interface - Network cables Ethernet

## Male RJ45 straight to female RJ45 straight with PVC cable shielded, Cat 5e 8-pin



### Construction

Number of conductors/cross-section (4×2×AWG26/7)  
 Number of conductors 8  
 Jacket material PVC  
 Jacket color green RAL 6018  
 Minimum bending radius fixed 6×D  
 Minimum bending radius moving 12×D

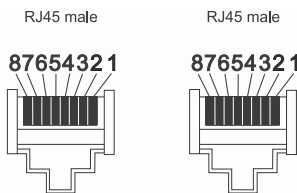
Operating voltage max. 50 V

Rated current 1.5 A  
 Form male 1 RJ45 male straight  
 Form male 2 RJ45 male straight  
 Degree of protection IP20  
 Color of the housing black  
 Temperature range connector -25 °C ... +85 °C  
 Temperature range fixed -30 °C ... +70 °C  
 Temperature range moving -5 °C ... +70 °C

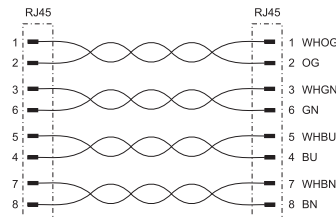
### Technical data

Part No.	Type	Pole number	Cable length m	Cable diameter mm	PU (units)
192018.0030	S* STG8-RJ45/STG8-RJ45/ET PVC 0,3M	8	0.3	6.3	1
192018.0060	S* STG8-RJ45/STG8-RJ45/ET PVC 0,6M	8	0.6	6.3	1
192018.0100	S* STG8-RJ45/STG8-RJ45/ET PVC 1,0M	8	1.0	6.3	1
192018.0150	S* STG8-RJ45/STG8-RJ45/ET PVC 1,5M	8	1.5	6.3	1
192018.0200	S* STG8-RJ45/STG8-RJ45/ET PVC 2,0M	8	2.0	6.3	1
192018.0500	S* STG8-RJ45/STG8-RJ45/ET PVC 5,0M	8	5.0	6.3	1
192018.1000	S* STG8-RJ45/STG8-RJ45/ET PVC 10,0M	8	10.0	6.3	1
192018.1500	S* STG8-RJ45/STG8-RJ45/ET PVC 15,0M	8	15.0	6.3	1
192018.2000	S* STG8-RJ45/STG8-RJ45/ET PVC 20,0M	8	20.0	6.3	1

### Pin layout



### Circuit diagram



# Actuator sensor interface - Patch cable, shielded

## Patch cable Cat.5e/Cat.6/Cat.6<sub>A</sub>



### Application

- Ethernet network wiring

### Properties

- Straight connector
- Assignment according to EIA/TIA 568B
- Moulded sleeve with length imprint (not suitable for drag chain and industrial design)
- Various colors available

- catch protection

### Technical data

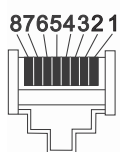
Operating voltage max.  
Connector  
Wiring  
Compatibility  
Ethernet Key  
Burning behavior according to

50 V  
Shielded RJ45, 1,27µm AU  
1:1  
Fully plug compatible to IEC 60603-7  
SF/UTP  
IEC 60332-1

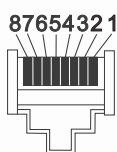
Part No.	Number of conductors/cross-section	Jacket color	Sleeve color	Wiring	Temperature range fixed	Cable length m
<b>Cat.5e PVC</b>						
192000.0100	S* (4x2xAWG26/7)	grey	grey	1:1	-5 °C ... +70 °C	1.0
192022.0100	S* (4x2xAWG26/7)	blue	blue	1:1	-5 °C ... +70 °C	1.0
192030.0100	S* (4x2xAWG26/7)	green	green	1:1	-5 °C ... +70 °C	1.0
192050.0100	S* (4x2xAWG26/7)	grey	red	Crossover	-5 °C ... +70 °C	1.0
<b>Cat.5e PVC UL</b>						
192010.0100	S* (4x2xAWG26/7)	grey	grey	1:1	-5 °C ... +70 °C	1.0
<b>Cat.6A LSZH</b>						
192353.0100	S* (4x2xAWG26/7)	grey	grey	1:1	-20 °C ... +75 °C	1.0
192355.0100	S* (4x2xAWG26/7)	blue	blue	1:1	-20 °C ... +75 °C	1.0
192342.0100	S* (4x2xAWG26/7)	yellow	yellow	1:1	-20 °C ... +75 °C	1.0
192352.0100	S* (4x2xAWG26/7)	green	green	1:1	-20 °C ... +75 °C	1.0
192354.0100	S* (4x2xAWG26/7)	red	red	1:1	-20 °C ... +75 °C	1.0
<b>Cat.6 industrial version PUR</b>						
192201.0100	S* (4x2xAWG27/7)	red	black	1:1	-30 °C ... +75 °C	1.0

### Pin layout

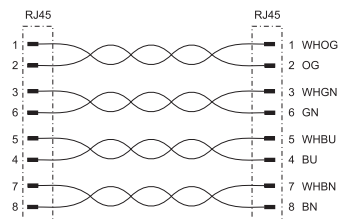
RJ45 male



RJ45 male



### Circuit diagram



# Actuator sensor interface - Network cables PROFINET

**Male M12 straight with PUR cable, shielded 360°, open end**  
**Cat.5e, D-coded, self-locking screw connection**  
**C-track compatible, halogen free**



**Construction**

Number of conductors/cross-section 1 × 4 × AWG 22/7  
 Number of conductors 4  
 Jacket material PUR  
 Jacket color green RAL 6018  
 Minimum bending radius moving 12×D

**Technical data**

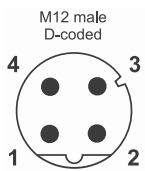
Rated voltage  $U_N$  AC/DC 24 V  
 Operating voltage max. 60 V  
 Rated current 4 A

Form male 1  
 Form male 2  
 Degree of protection  
 Color of the housing  
 Mounting  
 Storage temperature range  
 Temperature range connector  
 Temperature range fixed  
 Temperature range moving  
**Accessories**

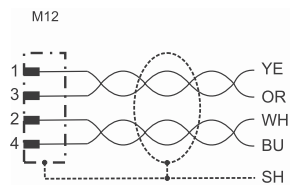
M 12 male straight  
 line end open  
 IP65/67  
 black  
 Breakaway torque 0.4 Nm  
 -40 °C ... +90 °C  
 -25 °C ... +90 °C  
 -40 °C ... +70 °C  
 -30 °C ... +70 °C  
**Torque setting tool M 12:** Part-No. 490091 | DM-SET M12 | PU: 1 unit

Part No.	Type	Pole number	Coding	Cable length m	Cable diameter mm	PU (units)
475300.0200	S* STG4-M12/PN 2M-PUR	4	D	2.0	6.5	1
475300.0500	S* STG4-M12/PN 5M-PUR	4	D	5.0	6.5	1
475300.1000	S* STG4-M12/PN 10M-PUR	4	D	10.0	6.5	1
475300.1500	S* STG4-M12/PN 15M-PUR	4	D	15.0	6.5	1
475300.2000	S* STG4-M12/PN 20M-PUR	4	D	20.0	6.5	1

**Pin layout**



**Circuit diagram**



# Actuator sensor interface - Network cables PROFINET

Male M12 straight on male M12 straight with PUR cable, shielded 360°  
 Cat.5e, D-coded, self-locking screw connection  
 C-track compatible, halogen free



### Construction

Number of conductors/cross-section 1 × 4 × AWG 22/7  
 Number of conductors 4  
 Jacket material PUR  
 Jacket color green RAL 6018  
 Minimum bending radius moving 12×D

### Technical data

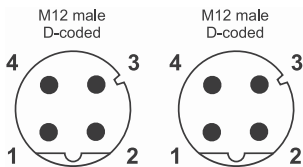
Rated voltage  $U_N$  AC/DC 24 V  
 Rated voltage max. 30 V  
 Operating voltage max. 48 V  
 Rated current 4 A

Form male 1  
 Form male 2  
 Degree of protection IP65/67  
 Color of the housing black  
 Mounting Breakaway torque 0.4 Nm  
 Storage temperature range -30 °C ... +90 °C  
 Temperature range connector -25 °C ... +90 °C  
 Temperature range fixed -40 °C ... +80 °C  
 Temperature range moving -30 °C ... +70 °C  
**Accessories**

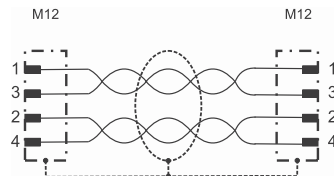
M 12 male straight  
 M 12 male straight  
 IP65/67  
 black  
 Breakaway torque 0.4 Nm  
 -30 °C ... +90 °C  
 -25 °C ... +90 °C  
 -40 °C ... +80 °C  
 -30 °C ... +70 °C  
**Torque setting tool M 12:** Part-No. 490091 | DM-SET M12 | PU: 1 unit

Part No.	Type	Pole number	Coding	Cable length m	Cable diameter mm	PU (units)
475400.0030	S* STG4-M12/STG4-M12/ PN 0,3M PUR	4	D	0.3	6.5	1
475400.0060	S* STG4-M12/STG4-M12/ PN 0,6M PUR	4	D	0.6	6.5	1
475400.0100	S* STG4-M12/STG4-M12/ PN 1,0M PUR	4	D	1.0	6.5	1
475400.0150	S* STG4-M12/STG4-M12/ PN 1,5M PUR	4	D	1.5	6.5	1
475400.0200	S* STG4-M12/STG4-M12/ PN 2,0M PUR	4	D	2.0	6.5	1
475400.0500	S* STG4-M12/STG4-M12/ PN 5,0M PUR	4	D	5.0	6.5	1
475400.1000	S* STG4-M12/STG4-M12/ PN 10,0M PUR	4	D	10.0	6.5	1
475400.1500	S* STG4-M12/STG4-M12/ PN 15,0M PUR	4	D	15.0	6.5	1
475400.2000	S* STG4-M12/STG4-M12/ PN 20,0M PUR	4	D	20.0	6.5	1

### Pin layout



### Circuit diagram



# Actuator sensor interface - Network cables PROFINET

M12 panel connectors using PG9 thread for rear panel installation, PUR cable, open end  
 Cat.5e, female - D coded  
 C-track compatible, halogen free



**Construction**

Number of conductors/cross-section 1×4×AWG22/7  
 Jacket material PUR  
 Jacket color green RAL 6018  
 Minimum bending radius moving 10×D

**Technical data**

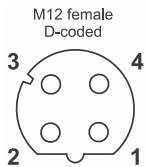
Rated voltage  $U_N$  AC/DC 24 V  
 Rated voltage max. 30 V  
 Operating voltage max. 48 V

Rated current  
 Form male 1  
 Degree of protection  
 Storage temperature range  
 Temperature range connector  
 Temperature range fixed  
 Temperature range moving  
**Accessories**

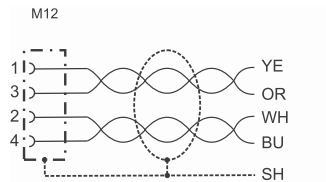
4 A  
 M 12 female  
 IP65/67  
 -40 °C ... +90 °C  
 -25 °C ... +90 °C  
 -40 °C ... +80 °C  
 -30 °C ... +70 °C  
**Torque setting tool M 12:** Part-No. 490091 | DM-SET M12 | PU: 1 unit

Part No.	Type	Pole number	Coding	Cable length m	Cable diameter mm	PU (units)
475500.0200	S* KUGE4-M12/PN 2M PUR	4	D	2.0	6.5	1
475500.0500	S* KUGE4-M12/PN 5M PUR	4	D	5.0	6.5	1
475500.1000	S* KUGE4-M12/PN 10M PUR	4	D	10.0	6.5	1

**Pin layout**



**Circuit diagram**





# Actuator sensor interface - Network cables PROFINET

**Male RJ45 straight to female M12 straight with PUR cable shielded 360°  
Cat.5e, D-coded, self-locking screw connection  
C-track compatible, halogen free**



**Construction**

Number of conductors/cross-section (2×2×AWG22/7)  
Number of conductors 4  
Jacket material PUR  
Jacket color green RAL 6018  
Minimum bending radius fixed 6×D  
Minimum bending radius moving 12×D

**Technical data**

Rated voltage  $U_N$  DC 24 V  
Operating voltage max. 50 V

**Rated current**

Form male 1  
Form male 2  
Degree of protection  
Color of the housing  
Mounting  
Temperature range connector  
Temperature range fixed  
Temperature range moving  
**Accessories**

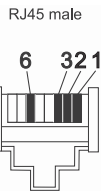
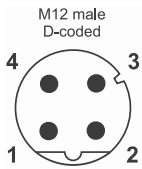
1.5 A

RJ45 male straight  
M 12 male straight  
IP20  
black  
Breakaway torque 0.4 Nm  
-25 °C ... +85 °C  
-40 °C ... +80 °C  
-30 °C ... +70 °C

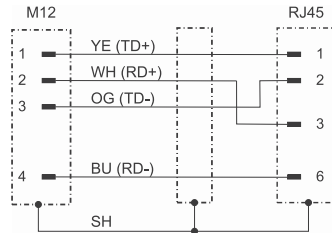
**Torque setting tool M 12:** Part-No. 490091 | DM-SET M12 | PU: 1 unit

Part No.	Type	Pole number	Coding	Cable length m	Cable diameter mm	PU (units)
192013.0030	S* STG4-RJ45/STG4-M12/ PN PUR 0,3M	4	D	0.3	6.5	1
192013.0060	S* STG4-RJ45/STG4-M12/ PN PUR 0,6M	4	D	0.6	6.5	1
192013.0100	S* STG4-RJ45/STG4-M12/ PN PUR 1,0M	4	D	1.0	6.5	1
192013.0150	S* STG4-RJ45/STG4-M12/ PN PUR 1,5M	4	D	1.5	6.5	1
192013.0200	S* STG4-RJ45/STG4-M12/ PN PUR 2,0M	4	D	2.0	6.5	1
192013.0500	S* STG4-RJ45/STG4-M12/ PN PUR 5,0M	4	D	5.0	6.5	1
192013.1000	S* STG8-RJ45/STG4-M12/ PN CAT5 10,0M PUR	4	D	10.0	6.5	1
192013.1500	S* STG4-RJ45/STG4-M12/ PN PUR 15,0M	4	D	15.0	6.5	1
192013.2000	S* STG4-RJ45/STG4-M12/ PN PUR 20,0M	4	D	20.0	6.5	1

**Pin layout**



**Circuit diagram**



# Actuator sensor interface - Network cables PROFINET

## Male RJ45 straight to female RJ45 straight with PUR cable shielded, Cat.5e C-track compatible, halogen free



### Construction

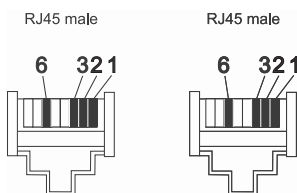
Number of conductors/cross-section	(2x2xAWG22/7)
Number of conductors	4
Jacket material	PUR
Jacket color	green RAL 6018
Minimum bending radius fixed	6xD
Minimum bending radius moving	12xD

Operating voltage max.	50 V
Rated current	1.5 A
Form male 1	RJ45 male straight
Form male 2	RJ45 male straight
Degree of protection	IP20
Color of the housing	black
Temperature range connector	-25 °C ... +85 °C
Temperature range fixed	-30 °C ... +80 °C
Temperature range moving	-30 °C ... +70 °C

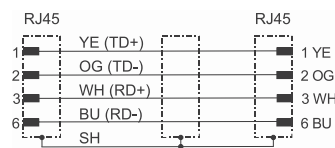
### Technical data

Part No.	Type	Pole number	Cable length m	Cable diameter mm	PU (units)
192015.0030	S* STG4-RJ45/STG4-RJ45/PN PUR 0,3M	4	0.3	6.5	1
192015.0060	S* STG4-RJ45/STG4-RJ45/PN PUR 0,6M	4	0.6	6.5	1
192015.0100	S* STG4-RJ45/STG4-RJ45/PN PUR 1,0M	4	1.0	6.5	1
192015.0150	S* STG4-RJ45/STG4-RJ45/PN PUR 1,5M	4	1.5	6.5	1
192015.0200	S* STG4-RJ45/STG4-RJ45/PN PUR 2,0M	4	2.0	6.5	1
192015.0500	S* STG8-RJ45/STG8-RJ45/PN 5,0M PUR	4	5.0	6.5	1
192015.1000	S* STG8-RJ45/STG8-RJ45/PN CAT5 10,0M PUR	4	10.0	6.5	1
192015.1500	S* STG8-RJ45/STG8-RJ45/PN 15,0M PUR	4	15.0	6.5	1
192015.2000	S* STG8-RJ45/STG8-RJ45/PN 20,0M PUR	4	20.0	6.5	1

### Pin layout



### Circuit diagram



# Actuator sensor interface - Network cables Ethernet

## Male RJ45 straight to female RJ45 straight with PUR cable shielded 360°, Cat.5e C-track compatible, halogen free



### Construction

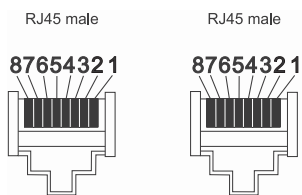
Number of conductors/cross-section	(4×2×AWG26/19)
Number of conductors	8
Jacket material	PUR
Jacket color	green RAL 6018
Minimum bending radius fixed	6×D
Minimum bending radius moving	12×D

Operating voltage max.	50 V
Rated current	1.5 A
Form male 1	RJ45 male straight
Form male 2	RJ45 male straight
Degree of protection	IP20
Color of the housing	black
Temperature range connector	-25 °C ... +85 °C
Temperature range fixed	-40 °C ... +80 °C
Temperature range moving	-30 °C ... +70 °C

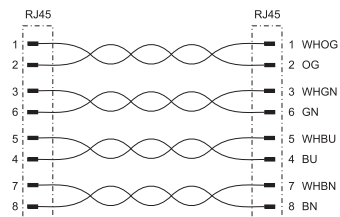
### Technical data

Part No.	Type	Pole number	Cable length m	Cable diameter mm	PU (units)
192017.0030	S* STG8-RJ45/STG8-RJ45/ET PUR 0,3M	8	0.3	6.7	1
192017.0060	S* STG8-RJ45/STG8-RJ45/ET PUR 0,6M	8	0.6	6.7	1
192017.0100	S* STG8-RJ45/STG8-RJ45/ET PUR 1,0M	8	1.0	6.7	1
192017.0150	S* STG8-RJ45/STG8-RJ45/ET PUR 1,5M	8	1.5	6.7	1
192017.0200	S* STG8-RJ45/STG8-RJ45/ET PUR 2,0M	8	2.0	6.7	1
192017.0500	S* STG8-RJ45/STG8-RJ45/ET PUR 5,0M	8	5.0	6.7	1
192017.1000	S* STG8-RJ45/STG8-RJ45/ET PUR 10,0M	8	10.0	6.7	1
192017.1500	S* STG8-RJ45/STG8-RJ45/ET PUR 15,0M	8	15.0	6.7	1
192017.2000	S* STG8-RJ45/STG8-RJ45/ET PUR 20,0M	8	20.0	6.7	1

### Pin layout



### Circuit diagram



# Actuator sensor interface - Network cables Ethernet

**Male RJ45 straight to female RJ45 straight with PUR cable shielded 360°, Cat.6  
C-track compatible, halogen free, flame-retardant**



### Construction

Number of conductors/cross-section (4×2×AWG26/19)StC  
Number of conductors 8  
Jacket material PUR  
Jacket color green RAL 6018  
Minimum bending radius fixed 4×D  
Minimum bending radius moving 12×D

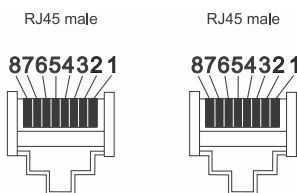
Operating voltage max. 50 V  
Rated current 1.5 A  
Form male 1 RJ45 male straight  
Form male 2 RJ45 male straight  
Degree of protection IP20  
Color of the housing black  
Temperature range connector -25 °C ... +85 °C  
Temperature range fixed -40 °C ... +80 °C  
Temperature range moving -30 °C ... +70 °C

50 V  
1.5 A  
RJ45 male straight  
RJ45 male straight  
IP20  
black  
-25 °C ... +85 °C  
-40 °C ... +80 °C  
-30 °C ... +70 °C

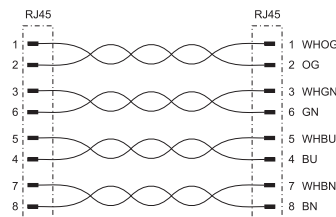
### Technical data

Part No.	Type	Pole number	Cable length m	Cable diameter mm	PU (units)
192766.0030	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 0,3M	8	0.3	7.9	1
192766.0060	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 0,6M	8	0.6	7.9	1
192766.0100	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 1,0M	8	1.0	7.9	1
192766.0150	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 1,5M	8	1.5	7.9	1
192766.0200	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 2,0M	8	2.0	7.9	1
192766.0500	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 5,0M	8	5.0	7.9	1
192766.1000	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 10,0M	8	10.0	7.9	1
192766.1500	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 15,0M	8	15.0	7.9	1
192766.2000	S* STG8-RJ45/STG8-RJ45/ET CAT6 PUR GN 20,0M	8	20.0	7.9	1

### Pin layout



### Circuit diagram



# Actuator sensor interface - RJ45 connector

## Industrial connector RJ45

Solid metal housing, quick-connect technology AWG 27–22

Cat.6<sub>A</sub>, protective cover pre-assembled



### Technical data

Rated voltage $U_N$	30 V
Connection type	8-pin RJ45 Push-through contacts IPC
Rated current	≤1 A per contact
Design	RJ45
Degree of protection	IP20
Color of the housing	silver
Cable diameter	5.5 mm – 10 mm
Operation temperature range	-40 °C ... +85 °C

Mechanical service life  
Dimensions (w × h × d)  
Certifications

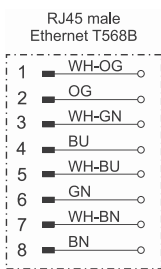
>750 insertion cycles  
13.9 mm × 16.3 mm × 53.8 mm

Flamability according to UL 94  
Comments

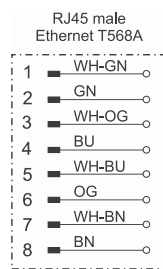
cULus Listed (E326112)  
V0  
Suitable for Profinet, SERCOS3, Ethercat, Ethernet/IP, Powerlink, VARAN, Power over Ethernet+ (PoE+IEEE 802.3at)  
Suitable cables, see overview assignment Ethernet cables to connectors

Part No.	Type	Pole number	Bandwidth	Transfer rate	Category	Strand diameter	Cross-section AWG	PU (units)
<b>8-pin RJ45 Push-through contacts IPC</b>								
490174	S* RJ45-M 8pol. Cat.6A T568B	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1 mm – 1.6 mm	24-22/1, 24-22/7, 19	1
490175	S* RJ45-M 8pol. Cat.6A T568A	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1 mm – 1.6 mm	24-22/1, 24-22/7, 19	1
490176	S* RJ45-M 8pol. Cat.6A T568B AWG 26	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	0.85 mm – 1.1 mm	26-24/1, 27-24/7, 26/19	1
<b>4-pin RJ45 Push-through contacts IPC</b>								
490177	S* RJ45-MS 4pol. PROFINET	4	100 MHz	1 Gbit/s	Cat.5e	1 mm – 1.6 mm	24-22/1, 24-22/7, 19	1

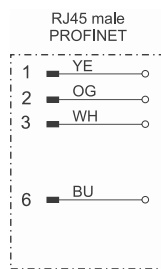
### Connection assignment



### Connection assignment



### Connection assignment





# Actuator sensor interface - RJ45 connector

## Industrial connector RJ45

Solid metal housing, quick-connect technology AWG 27–22

Cat.6<sub>A</sub>, 4 levels cable clamp, protective cover pre-assembled



### Technical data

Rated voltage $U_N$	30 V
Connection type	8-pin RJ45 Push-through contacts IPC
Rated current	≤1 A
Contact type	Penetration contact
Design	RJ45
Degree of protection	IP20
Color of the housing	silver
Cable diameter	5 mm – 9 mm
Operation temperature range	-40 °C ... +70 °C

Mechanical service life  
Dimensions (w × h × d)  
Certifications

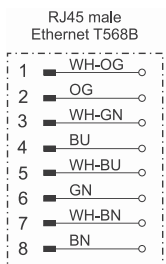
>750 insertion cycles  
13.8 mm × 16.2 mm × 53.1 mm

Flamability according to UL 94  
Comments

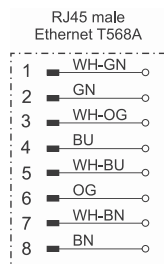
cULus Listed (E326112)  
V0  
Suitable for Profinet, SERCOS3, Ethercat, Ethernet/IP, Powerlink, VARAN, Power over Ethernet+ (PoE+IEEE 802.3at)  
Suitable cables, see overview assignment Ethernet cables to connectors

Part No.	Type	Pole number	Bandwidth	Transfer rate	Category	Strand diameter	Cross-section AWG	PU (units)
<b>8-pin RJ45 Push-through contacts IPC</b>								
490128	S* RJ45-M 8pol. Cat.6A T568B	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1 mm – 1.6 mm	24/1-22/1, 27/7-22/7	1
490129	S* RJ45-M 8pol. Cat.6A T568A	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1 mm – 1.6 mm	24/1-22/1, 27/7-22/7	1
490138	S* RJ45-M 8pol. Cat.6A T568B AWG 26/19	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	0.85 mm – 1.1 mm	26/1, 26/7, 26/19	1

### Connection assignment



### Connection assignment



# Actuator sensor interface - RJ45 connector

## Industrial connector RJ45, angled

Solid metal housing, quick-connect technology AWG 27–22

Cat.6<sub>A</sub> / Cat 5e



### Technical data

Rated voltage $U_N$	30 V
Connection type	8-pin RJ45 Push-through contacts IPC
Rated current	≤1 A per contact
Design	RJ45 angled connector
Degree of protection	IP20
Color of the housing	silver
Cable diameter	5.5 mm – 10 mm
Operation temperature range	-40 °C ... +85 °C

Mechanical service life  
Dimensions (w × h × d)  
Certifications

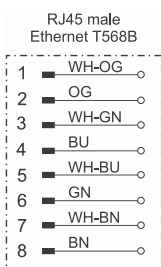
>750 insertion cycles  
13.9 mm × 38.0 mm × 45.7 mm

Flamability according to UL 94  
Comments

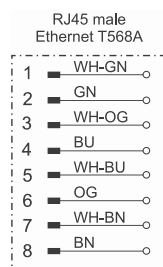
cULus Listed (E326112)  
V0  
Suitable for Profinet, SERCOS3, Ethercat, Ethernet/IP, Powerlink, VARAN, Power over Ethernet+ (PoE+IEEE 802.3at)  
Suitable cables, see overview assignment Ethernet cables to connectors

Part No.	Type	Pole number	Bandwidth	Transfer rate	Category	Strand diameter	Cross-section AWG	PU (units)
<b>8-pin RJ45 Push-through contacts IPC</b>								
490151	S* RJ45-MR 8pol. Cat.6A T568B	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1 mm – 1.6 mm	24-22/1, 24-22/7, 19	1
490152	S* RJ45-MR 8pol. Cat.6A T568A	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1 mm – 1.6 mm	24-22/1, 24-22/7, 19	1
490153	S* RJ45-MR 8pol. Cat.6A T568B AWG 26/19	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	0.85 mm – 1.1 mm	26-24/1, 27-24/7, 26/19	1
<b>4-pin RJ45 Push-through contacts IPC</b>								
490178	S* RJ45-MR 4pol. PROFINET	4	100 MHz	1 Gbit/s	Cat.5e	1 mm – 1.6 mm	24-22/1, 24-22/7, 19	1

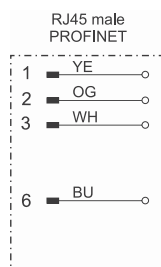
### Connection assignment



### Connection assignment



### Connection assignment



# Actuator sensor interface

## Module holder, RJ45, female / IDC

For TS35 DIN rail

Cat.6<sub>A</sub>



### Technical data

Rated voltage  $U_N$  AC/DC 24 V  
 Connection type Compliant terminal  
 Rated current  $\leq 1$  A per contact  
 Contact type IDC  
 Design RJ45 female  
 Degree of protection IP20 (EN 60529)  
 Color of the housing grey

Operation temperature range  
 Mechanical service life  
 Dimensions (w × h × d)  
 Certifications

-40 °C ... +70 °C  
 >750 insertion cycles  
 18.0 mm × 70.5 mm × 65.7 mm

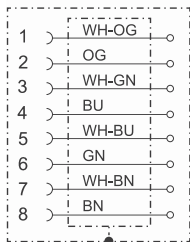
Flamability according to UL 94  
 Comments

cULus Listed (E326112)  
 V0  
 Suitable cables, see overview assignment Ethernet cables to connectors

Part No.	Type	Pole number	Bandwidth	Transfer rate	Category	Strand diameter	Cross-section AWG	PU (units)
<b>Compliant terminal</b>								
490209	S* MDT-RJ45 F 8pol. Cat.6A TIA 568B	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	0.9 mm – 1.6 mm	27-22/7, 26-22/1	1
<b>Compliant terminal AWG 27-22/7 AWG 26-22/1</b>								
490238	S* MDT-RJ45 F 8pol. Cat.6A TIA 568A	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	0.9 mm – 1.6 mm	27-22/7	1

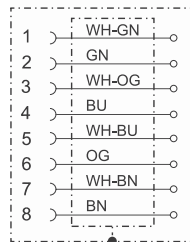
### PIN assignment

RJ45 female  
 Ethernet T568B



### PIN assignment

RJ45 female  
 Ethernet T568A



# Actuator sensor interface - M12 - connector

Field wireable connector, M12 straight, shielded  
 Female / Male D-coded (Ethernet, Profinet)  
 Spring terminal: Push-in connection technology



**Technical data**

Rated voltage  $U_N$   
 Connection type

Degree of protection  
 Color of the housing  
 Cross-section, metric

Cross-section AWG

Cable diameter

AC/DC 24 V  
 Spring terminal  
 Push-In  
 IP65, IP67 inserted and tightened  
 silver  
 without ferrule: 0.14–0.75 mm<sup>2</sup>  
 with ferrule: 0.08–0.5 mm<sup>2</sup>  
 without ferrule: AWG26–AWG18  
 with ferrule: AWG28–AWG20  
 4 mm – 8 mm

Tightening torque

Temperature range connector  
 Mechanical service life  
 Certifications

Standards

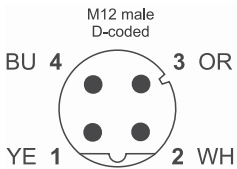
Flamability according to UL 94

M12-knurled nut: 0.4 Nm  
 sleeve housing: 0.8 Nm  
 pressure nut: 3 Nm  
 -40 °C ... +85 °C  
 >100 insertion cycles

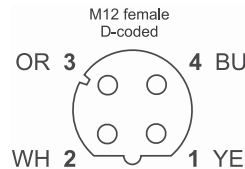
cULus Listed (E224249)  
 IEC 61076-2-101  
 EN 50155 (2001) vibration and shock  
 V0

Part No.	Type	Pole number	Coding	Operating voltage max. V	Rated current A	PU (units)
<b>M 12 male straight</b>						
490212	S* STGK4-M12 (C)-D FK	4	D	60	4	1
<b>M 12 female straight</b>						
490213	S* KUGK4-M12 (C)-D FK	4	D	60	4	1

**Pin layout**



**Pin layout**



# Actuator sensor interface - M12 - connector

**Field wireable connector, M12 angled, shielded, CAT5e (100 MBit/s)**  
**Male D-coded (Ethernet, Profinet, Sercos)**  
**Spring terminal: Push-in connection technology**



**Technical data**

Rated voltage  $U_N$   
 Connection type

Mounting

Degree of protection  
 Color of the housing  
 Cross-section, metric

Cross-section AWG

AC/DC 24 V  
 Spring terminal  
 Push-In  
 Coding  
 can be rotated in the 45° increments  
 IP65, IP67 inserted and tightened  
 silver  
 without ferrule: 0.14–0.75 mm<sup>2</sup>  
 with ferrule: 0.08–0.5 mm<sup>2</sup>  
 without ferrule: AWG26–AWG18  
 with ferrule: AWG28–AWG20

Cable diameter  
 Tightening torque

Temperature range connector  
 Mechanical service life  
 Certifications

Standards

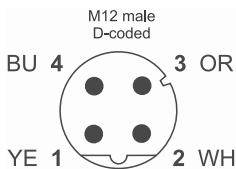
Flamability according to UL 94

4 mm – 8 mm  
 M12-knurled nut: 0.4 Nm  
 sleeve housing: 0.8 Nm  
 pressure nut: 3 Nm  
 -40 °C ... +85 °C  
 >100 insertion cycles

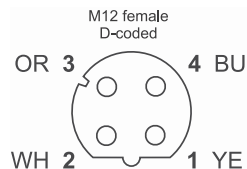
cULus Listed (E224249)  
 IEC 61076-2-101  
 EN 50155 (2001) vibration and shock  
 V0

Part No.	Type	Pole number	Coding	Operating voltage max. V	Rated current A	PU (units)
<b>M 12 male angle connector</b>						
490214	S* STWK4-M12 (C)-D FK	4	D	60	4	1
<b>M 12 female angle connector</b>						
490215	S* KUWK4-M12 (C)-D FK	4	D	60	4	1

**Pin layout**



**Pin layout**





# Actuator sensor interface - M12 - connector

Field wireable connector, M12 straight shielded  
**Male - X coded Cat.6<sub>A</sub>** (Ethernet, Profinet)  
 Fast connection method, IDC termination



**Technical data**

Rated voltage  $U_N$   
 Connection type

AC/DC 24 V  
 Compliant terminal  
 IDC  
 IP65/67  
 26-22

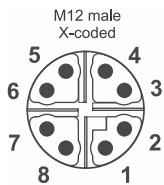
Cable diameter  
 Temperature range connector  
 Mechanical service life  
 Flamability according to UL 94  
 Comments

5 mm – 9.7 mm  
 -40 °C ... +85 °C  
 >100 insertion cycles  
 V0  
 Suitable cables, see overview assignment Ethernet cables to connectors

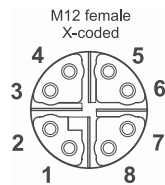
Degree of protection  
 Cross-section AWG

Part No.	Type	Pole number	Coding	Operating voltage max. V	Rated current A	PU (units)
<b>M 12</b>						
490167	S* STGK8-M12(C) 8pol. X-kod. Cat.6A	8	X	60	0.5	1
490168	S* KUGK8-M12(C) 8pol. X-kod. Cat.6A	8	X	60	0.5	1

**Pin layout**



**Pin layout**



# Actuator sensor interface - RJ45 Panel Pass through devices

## RJ45 panel connector with M22 thread for front installation

Female/female 1:1

Cat.6<sub>A</sub> / Cat 5e



### Technical data

Rated voltage  $U_N$  AC 24 V  
 Operating voltage max. 50 V  
 Rated current 1.5 A  
 Contact type 1 : 1  
 Shielding connected through  
 Form male 1 RJ45  
 Degree of pollution 3  
 Insulation resistance >100 MΩ  
 Contact resistance <30 mΩ  
 Degree of protection IP65 UL50E Typ 2, 3R, 4, 4X, 12, 13 in closed and IP20 in inserted position  
 Housing material PA, PBT

Cover  
 Contact material  
 Mounting  
 Installation depth  
 Temperature range connector  
 Operation temperature range  
 Storage temperature range  
 PU (units)  
 Mechanical service life  
 Certifications

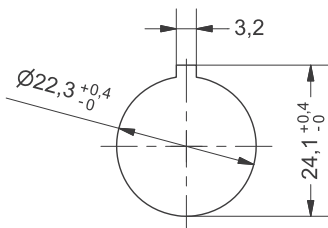
TPU  
 CuSn, gold-plated  
 Front installation approx. 70 mm  
 -25 °C ... +70 °C  
 -25 °C ... +70 °C  
 -25 °C ... +80 °C  
 1  
 >750 insertion cycles

### Accessories

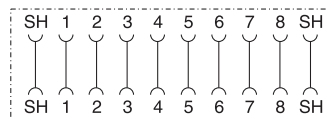
cULus Listed (E326112)  
 Included in the delivery:  
 captive safety cap

Part No.	Type	Pole number	Bandwidth	Transfer rate	Category	PU (units)
<b>RJ45</b>						
492075	S* RJ45 F/F 8/8 Cat.5e	8	100 MHz	1 Gbit/s	Cat.5e	1
492076	S* RJ45 F/F 8/8 Cat.6A	8	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1

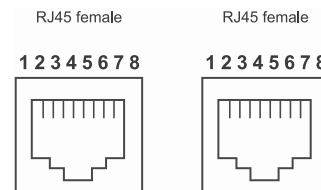
### Mounting diagram



### Circuit diagram



### Pin layout



# Actuator sensor interface - RJ45 panel connector

## Control cabinet bushing M12 - RJ45

Female/female 1:1

Cat 5e (Ethernet, Profinet)



### Technical data

Rated voltage  $U_N$   
Operating voltage max.  
Contact type  
Shielding  
Form male 1  
Insulation resistance  
Contact resistance  
Degree of protection  
Housing material

24 V  
50 V  
1 : 1  
360°  
RJ45 M 12 female  
>100 M $\Omega$   
<30 m $\Omega$   
IP67  
PA

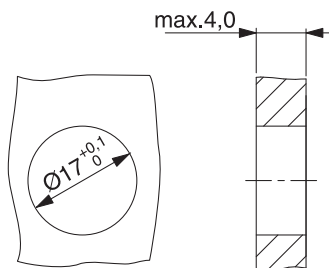
Contact material  
Mounting

Installation depth  
Temperature range connector  
Operation temperature range  
Storage temperature range  
PU (units)  
Mechanical service life  
Flamability according to UL 94

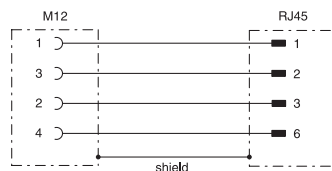
Phosphor Bronze, gold-plated  
Rear wall assembly  
Fastening thread M16  $\times$  1,5  
approx.70 mm  
-25 °C ... +85 °C  
-25 °C ... +85 °C  
-25 °C ... +85 °C  
1  
>750 insertion cycles  
V0

Part No.	Type	Pole number	Coding	Bandwidth	Transfer rate	Category	PU (units)
<b>RJ45/M 12x1</b>							
490105	S* M12-RJ45 F/F 90° 4/4 Cat.5e Profinet	4	D	100 MHz	1 Gbit/s	Cat.5e	1
490106	S* M12-RJ45 F/F 180° 4/4 Cat.5e Profinet	4	D	100 MHz	1 Gbit/s	Cat.5e	1

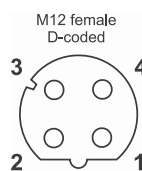
### Mounting diagram



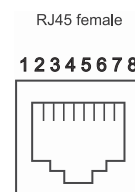
### Circuit diagram



### Pin layout



### Pin layout



# Actuator sensor interface - RJ45 panel connector

## Control cabinet bushing M12 CAT6A X encoded - RJ45

Female/female 1:1

Cat.6<sub>A</sub> (Ethernet, Profinet)



### Technical data

Operating voltage max.	60 V
Shielding	360°
Form male 1	RJ45 M 12 female
Insulation resistance	>100 MΩ
Contact resistance	<5 mΩ
Degree of protection	IP67 IP68
Contact material	CuSnZn

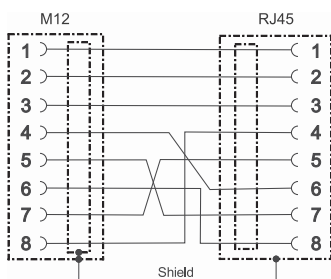
### Mounting

Installation depth	
Temperature range connector	-40 °C ... +85 °C
Operation temperature range	-40 °C ... +85 °C
Storage temperature range	-40 °C ... +85 °C
PU (units)	1
Mechanical service life	>500 insertion cycles

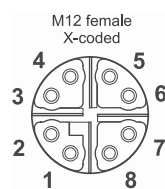
Rear wall assembly	
Fastening thread	M16 × 1,5
approx. depth	47 mm
Temperature range	-40 °C ... +85 °C
Operation temperature range	-40 °C ... +85 °C
Storage temperature range	-40 °C ... +85 °C
PU (units)	1
Mechanical service life	>500 insertion cycles

Part No.	Type	Pole number	Coding	Bandwidth	Transfer rate	Category	PU (units)
<b>RJ45/M 12x1</b>							
490230	M12-RJ45 F/F 90° 8/8 Cat.6A	8	X	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1
490231	M12-RJ45 F/F 180° 8/8 Cat.6A	8	X	500 MHz	10 Gbit/s	Cat.6 <sub>A</sub>	1

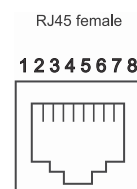
### Circuit diagram



### Pin layout



### Pin layout





# Product Overview: Classification Ethernet Cables and Connectors

## Ethernet cables

Art.no	Description	C-track compatible	Cat	Jacket	AWG						PROFINET	EtherCAT® / POWERLINK	SERCOS	CC-Link IE Field™	EtherNet/IP™			
					490128 - 490174	490151 AWG 27 - 22	490129 - 490175	490152 AWG 27 - 22	490138 - 490176	490153 AWG 26						490177 - 490178	AWG 27 - 22	490209, 490238
104301	Prof. (2X2XAWG22/1) UL		Type A	PVC														
104302	Prof. (2X2XAWG22/19) UL	•	Type C	PUR														
104303	Prof. (2X2XAWG22/7) UL	•	Type C	PUR														
104307	Prof. (2X2XAWG22/7) UL		Type B	PVC														
104331	Eth. (4X2XAWG26/7) UL		7	PVC														
104335	Eth. (4X2XAWG26/7) UL		5e	PVC														
104336	Eth. (4X2XAWG24/7) UL		5e	PVC	•	•												
104337	Eth. (4X2XAWG24/19) UL	•	5e	PUR	•	•												
104338	Eth. (4X2XAWG26/7) UL		6A	PVC														
104347	Eth. (4X2XAWG26/19) UL	•	6	PUR														
104350	Eth. (4X2XAWG22/7) UL		5e	PVC	•	•												
104379	Prof. (2X2XAWG26/19) UL	•	5e	PUR														
104396	Eth. (4X2XAWG26/19) UL	•	5e	PUR														
104397	Eth. (4X2XAWG22/1) UL		6A	PVC	•	•												
104401	Eth. (4X2XAWG24/7) UL	•	6A	PUR	•	•												
104404	Eth. (4x2xAWG24/7) UL	•	7	PUR	•	•												

## Ethernet connector RJ45 / M12

RJ45 T568B			RJ45 T568A			RJ45 T568B AWG26		
490128 with cable clamp	490174 with cable fitting	490151 with cable fitting	490129 with cable clamp	490175 with cable fitting	490152 with cable fitting	490138 with cable clamp	490176 with cable fitting	490153 with cable fitting
1 white / orange			1 white / green			1 white / orange		
2 orange			2 green			2 orange		
3 white / green			3 white / orange			3 white / green		
4 blue			4 blue			4 blue		
5 white / blue			5 white / blue			5 white / blue		
6 green			6 orange			6 green		
7 white / brown			7 white / brown			7 white / brown		
8 brown			8 brown			8 brown		

RJ45 T568A/B		M12		Profinet RJ45	
490238 Module holder	490209 Module holder	490212 D-cod. pin	490213 D-cod. female	490167 X-cod. pin	490168 X-cod. female
		490214 D-cod. pin	490215 D-cod. female		
		1 yellow		1 white/orange	
		2 white		2 orange	
		3 orange		3 white / green	
		4 blue		4 green	
				5 white / brown	
				6 brown	
				7 white / blue	
				8 blue	
					1 yellow
					2 orange
					3 white
					4
					5
					6 blue
					7
					8



# LÜTZE - Ethernet Connectivity • Glossary

AC Access Client	Radio-supported communication unit that has to log onto the Access Point (-> AP). Only after successful authentication is it possible for the Access Client to transmit data to the network, or to receive data from the network. (-> Wireless LAN)
ACK	Acknowledge Designates a positive confirmation of receipt. ACK is part of the communication protocol and is responsible for the confirmation of receipt of the transmission
ACR attenuation to crosstalk ratio	corresponds to a signal-to-disturbance signal distance for interference from other pairs. Is determined by simple subtraction of the dB values
ADSL Asymmetric Digital Subscriber Line	Long-distance access
AES Advanced Encryption Standard	Encryption standard with 128-, 192- and 256-bit encryption. This symmetrical encryption is intended to replace the previous DES standard
Aging	Process (algorithm) for updating data, especially address memory. After a time elapses, an address is marked as "old" and deleted in the next pass, if it is not detected at a port before that
AP Access Point	In wireless networks the Access Point is the -> bridge to the wire-bound networks. It can be connected directly to Ethernet, Token Ring or ATM. The access point is connected with all of the network accounts ("access clients"), and performs central functions such as roaming or security. (-> Wireless LAN)
API	Application Programming Interface
ARP Address Resolution Protocol	requests the associated MAC address via the IP address. -> RARP
ARS Automatic Rate Selection	Independent selection of the transmission speed by the access point (-> AP) depending on the connection quality (distance)
ASN.1 Abstract Syntax Notation One	Programming language of the -> MIB
ATM Asynchronous Transfer Mode	Based on cells of 53 bytes. Suitable for telephone, video and other data transmission. Is primarily used in WAN applications
AUI Attachment Unit Interface	Interface for physical isolation of transceivers from Ethernet controllers (cable up to a max. of 50 m)
Autocrossing	A function that allow automatic crossing of the transmission and reception conductors at twisted pair interfaces. Switches that support this function can be connected to each other via a 1:1 wired cable instead of a crossover cable.
Autopolarity	A function of devices with a 10 BASE-T or 100 BASE-TX interface for automatic correction of wiring errors in twisted pair cables, which leads to a polarity reversal of the data signals
Autosensing	A function that allows a device to automatically detect the data rate (10 Mbit/s or 100 Mbit/s, 1 Gbit/s), and to transmit and receive using this data rate
Backpressure	Simulates a collision in HDX mode by generating a jam signal. -> Flow-Control
Bandwidth	Amount of data that can be transferred in one second. For a single connection this is the same as the speed
Bandwidth-length product	Used to estimate what distance a multimode fibre supports with a certain data rate (speed). The gross rate must be used here
BFOC Bajonett Fiber Optical Connector	Also known as an ST Connector (AT&T brand). Fibre-optic connector with bayonet connector. The only standardised connector for 10 Mbit/s Ethernet. Available for multimode and single mode glass fibres and also for -> POF
BGNW	The BGNW (Benutzergruppe Netzwerke / Network User Group) is a manufacturer-neutral, independent interest group for leading international users and manufacturers of Network systems. The goal of the association is to promote its participants and to facilitate the exchange of information among them, as well as developing recommendations for the planning, installation, and operation of networks
BGP Border Gateway Protocol	Routing protocol in the -> WAN
BLP	Bandwidth Length Product
BNC Bajonet Neill Concelmann	Connector for connection of 10 Base2 coax cables to a -> MAU
BOOTP Bootstrap Protocol	Supplies the statically assigned IP address for an assigned MAC address. In comparison to -> RARP rootbar
Bridge	Switch
Broadcast	data packet that is address to everyone in a network. Hubs and switches are transparent for broadcasts. Only routers limit a broadcast, if necessary. -> Multicast and Unicast
BT Bit Time	duration of a bit
CCITT	Comité Consultatif International Téléphonique et Télégraphique. Now -> ITU-T
CC-Link	Control and Communication Link, Industrial automation network based on Ethernet
CCK Complementary Code Keying	CCK is used in the 11 Mbit/s-version of the 802.11 LAN (80211b), and can pack a number of bits in a single symbol. This allow a higher transmission rate
CD	Collision Detect
CHAP	Challenge Handshake Authentication Protocol. PPP authentication method. Passwords are transmitted with a random number. Comparison -> PAP
Cheapernet	coax cable according to Ethernet partial standard 10BASE2. Synonyms: ThinWire, RG58
CoS Class of Service	A network with class of service makes it possible to transfer data with minimal delay in an environment in which a network is shared by many users, CoS classifies the data data traffic into categories such a high, medium and low (gold, silver and bronze)
CRC Cyclic Redundancy Check	Error check mechanism in which the recipient performs a polynomial calculation. The result is compared with a value saved in the frame that is determined by the transmitter using the same procedure. See also FCS
CSMA/CD Carrier Sense Multiple Access Collision Detect	Access procedure for Ethernet. A station that wants to transmit listens whether the network is free (carrier sense) After that it begins to transmit, and at the same time check whether other stations have also begun to transmit (multiple access), which could lead to collisions (collision detection). The collision is detected by the station and they cancel the transmission. They start a new transmission attempt after a time determined by a random generator
Cut-Through	Switching method in which a packet is forwarded as soon as the target address is recognised. This means that the latency is short, but faulty packets are still forwarded. This is also known as "on-the-fly packet switching". Also see Store & Forward
DA	Destination address
DBPSK	Differential Binary Phase Shift Keying. DBPSK is a modulation process for systems with 1 Mbit/s that is used with the -> DSSS transmission process according to the 802.11 standard

# LÜTZE - Ethernet Connectivity • Glossary

DCE	Data Communication Equipment, e.g. printers, modems. --> DTE
DES	Data Encryption Standard. Systematic encryption algorithm. The same secret key is used for encryption and decryption; i.e. all instances that have to be able to encrypt and decrypt have to know the key. DES encodes with a 56-bit key. 3DES increases the security of the normal DES method by encrypting the data with a key that is three times longer (168 bits)
Destination Address	Destination address in Ethernet, IP, etc. "Address on the data packet"
DeviceNet	DeviceNet is a low cost industrial network that uses CAN technology. It links industrial components such as limit switches, valves, motor switches and drives with a PLC or a PC
DHCP	Dynamic Host Configuration Protocol. On request informs a device as to its IP address, which is fixed via the associated MAC address, or is assigned dynamically
Dispersion	Signal spreading through propagation time differences, especially in optical fibres: Mode dispersion in multimode, chromatic dispersion in single mode)
DNS	Domain Name System. Resets host name in IP addresses per DNS server or statically per "hosts" file
Domain	Broadcast domain: Network area that is only limited by routers, i.e. within which a broadcast can propagate freely. --> Collision domain: Network area that is delimited by switches or routers, and in which collisions can propagate freely
DQPSK	Differential Quaternary Phase Shift Keying. DQPSK is a modulation process for systems with 1 Mbit/s or 2 Mbit/s, which is used with the DSSS transmission process, standard 802.11
DSC	Duplex straight connector. See also SC
DSL	Digital Subscriber Line. Technology to operate the Internet with 1.5 Mbit/s over copper cables
DSSS	Direct Sequence Spread Spectrum. DSSS is a transmission method according to standard 802.11. By means of encoding, this method converts the narrowband signal into a broadband signal. In this way it is possible to use the entire frequency band, thus achieving a higher data transmission rate and lower susceptibility to interference
DTE	Data Terminal Equipment, e.g. computers. See also difference from DCE PIN assignment
Dual Homing	Network technology in which a device is linked to a network via two independent points of attachment. One point of attachment is the primary connection, while the other is standby connection that is activated if the primary connection fails
DVMRP	Distance Vector Multicast Routing Protocol: Internetwork gateway protocol, largely based on RIP. DVMRP uses IGMP to exchange routing datagrams with its neighbours
DWDM	Dense Wavelength Division Multiplex.
Dynamic DNS	Assigns the same name when there is a changing IP address
EMC	electromagnetic compatibility
EtherCat	Industrial Ethernet system from the company Beckhoff
ETHERNET	Data network, standardised in IEEE 802.3 since 1983. Based on the access procedure --> CSMA/C. Variable packet length from 64 bytes to 1518 bytes (1522 with TAG field). Speeds/bandwidth: 10 Mbit/s, 100 Mbit/s (Fast Ethernet), 1000 Mbit/s (Gigabit Ethernet) and 10000 Mbit/s (10-gigabit Ethernet)
EtherNet/IP	is a protocol stack for Ethernet that has been developed for industrial applications. EtherNet/IP is based on the standard TCP/IP protocol, and uses a common application layer with DeviceNet. It thus makes it easier to exchange information between device level networks and information systems at the plant level. Industrial Ethernet system of the --> ODVA
ETHERNET	Packet Designation for a data packet. Besides the actual user data, it also contains the destination and source address fields (DA and SA), the TAG field (4 bytes, optional) and the Length/Type field
FCS	Frame Check Sequence. Checksum at the end of an Ethernet packet; is calculated and entered by the sender. The recipient calculates the checksum based on the received packet and compares it with the entered value. See also CRC
FDB	Forwarding Data Base. Address table of a switch that it uses to decide what port a packet has to be sent to. In the address table, a MAC address is assigned to the port that is used to reach the corresponding device. The table is updated regularly (--> Aging)
FDDI	Fiber Distributed Data Interface. Data network, standardised in ISO 9314, ANSI X3T9.5 and X3T1 2
FDX	Full Duplex. Transmission mode of a component: simultaneous transmitting and receiving is possible. No access procedure necessary. See also HDX
FEXT	Far End Crosstalk: Crosstalk at the far end in symmetrical copper cables
Flame-retardant	Characteristic of a cable not to spread a flame (wicking effect) and/or to extinguish it
Flow-Control	Strategy in case of overload at the output port and the start of a memory overflow: discarding of packets at the input port or signalling to connected devices that they should stop transmitting by simulating a collision in HDX mode or by transmitting special "Pause" packets in FDX mode
F/O	Fiber optics
Frame Relay	Modified version of X.25 packet switching in a WAN
FTP	Foiled Twisted Pair, foil-shielded symmetrical data cable
FTP 1	File Transfer Protocol. Protocol on Layer 5, uses TCP for transfer, therefore used in WANs. 2. Foiled Twisted Pair
FTTD	Fiber To The Desk Office wiring with fibre-optic cables as far as the end node
Full Duplex	--> FDX
GARE	Generic Attribute Registration Protocol. Protocol family for exchanging parameters between switches on Layer 2, at present there exist --> GMRP and --> GVRP
Gateway	Component above Layer 2 of the ISO/OSI Reference Model. On Layer 3 usually called a router. Converts protocols of these layers into each other
GBIC	Gigabit interface converter. See under SFP
Gbps	Gigabits per second, Gbit/s

# LÜTZE - Ethernet Connectivity • Glossary

GMRP	GARP Multicast Registration Protocol
GVRP	GARP VLAN Registration Protocol
Half Duplex	HDX
Halogen-free	In the event of a fire, halogen-free cables do not form any acidic fumes, which are very dangerous for both people and electronic devices
HASH	Checksum that ensures the integrity of information
HCS®	Hard Polymer Clad Silica. Plastic fibre with a core of fuses quartz. --> PCF --> POF
HDX	Half Duplex. Transmission mode of a component: Either transmitting or receiving is possible. In Ethernet, the access procedure CSMA/CD is required for this. --> FDX
HiRRP	Protocol for controlling redundant routers. If one of the two routers fails, then within 800 ms the remaining router completely assumes the tasks of the other one
Hops	Maximum number of router steps possible for a data packet. See also TTL
HSRP	Hot Standby Routing Protocol. Protocol for controlling redundant routers. See also VRRP
HTML	HyperText Markup Language
HTTP	Hypertext Transfer Protocol. Protocol used by web browsers and web servers for transmitting data, such as text and images
HTTPS	HTTP Secure. HTTP communication encrypted in packets
Hub	Component on Layer 1 of the ISO/OSI Reference Model. Regenerates the amplitude and the signal shape of the incoming signal and forwards it to all of the other ports. Synonyms: Star coupler, con-centrator
IAONA	(Industrial Automation Open Networking Alliance Europe e.V) Europe was founded in 1999 at the SPS/IPC/Drives trade fair Nuremberg. IAONA is an association that now includes more than 130 leading international manufacturers and users of automation systems. The association's goal is to establish Ethernet on the international level as the standard application in all industrial environments. The purpose of this is to bring about uniform, interface-free communication through all levels of a company. This relates to all areas of factory, process and building automation. For further information: <a href="http://www.iaona-eu.com">http://www.iaona-eu.com</a>
ICMP	Internet Control Message Protocol. Best-known command: Ping
ID	Identifier
IDA	Interface for Distributed Automation. Open interface based on the TCP/IP stack, for automation applications
IEC	International Electrotechnical Commission. international standardisation body
IEEE	Institute of Electrical and Electronics Engineers. Standardisation body for LANs with the important standards 802.3 for Ethernet, 802.1 for switches
IETF	Internet Engineering Task Force
IFG	Inter Frame Gap. Minimum gap between two packets. Synonym: Inter Packet Gap (IPG)
IGMP	Internet Group Management Protocol. Layer 3 protocol for multicast transport, see also GMRP
IGMP	Snooping Internet Group Management Protocol Snooping. A function in which the switches examine IGMP packets and assign the membership of a node to a multicast group to the respective port. In this manner it possible to send multicasts specifically to those segments that contain nodes of a group
IGP	Interior Gateway Protocol. IGRP Interior Gateway Routing Protocol. Internet Protocol see IP
IP	Internet Protocol. Transmission protocol on Layer 3, widely used (> 80%). IPv4: Vers. 4=4-byte addresses; IPv6: Vers. 6 =16-byte addresses, IPnG=IPv6
IP address	Logical address, assigned by the network operator. Address format (v4): 4 bytes in decimal code, separated by dots, e.g. 192.178.2.1. See also net mask
IPnG	IP next generation. Transmission protocol, see IP
IPsec	IP Security. Standard that makes it possible to ensure the authenticity of the sender, confidentiality and the integrity of data in IP datagrams by means of encryption. With IPsec a -> VPN can be set up on Layer 3. For encryption IPsec uses -> 3DES, for example
IPv4	IP Version 4. Transmission protocol, see IP
IPv6	IP Version 6. Transmission protocol, see IP
IPX	Internet Packet Exchange. Protocol stack from Novell, comparable to TCP/IP
ISDN	Integrated Services Digital Network. WAN transmission protocol
ISO	International Organization for Standardization. Global standardisation body
ISO/OSI	OSI reference model
ISP	Internet Service Provider
Jabber	In Ethernet, a faulty frame with more than 1518 bytes
Jitter	Time variation of the signal edge
Kbps	Kilobits per second, kbit/s
L2TP	Layer 2 Tunneling Protocol. For setting up a --> VPN tunnel on Layer 2. --> IPsec
LACP	Link Aggregation Control Protocol
LAN	Local Area Network. Local network, e.g. Ethernet, FDDI and token ring. --> WLAN
LAP	Link Access Protocol
Latency	Time difference between the receipt and forwarding of data, generally between the last bit received and the first bit sent. Skew Difference in propagation delays on various pairs, extremely important in full duplex parallel operation. Propagation Delay Time that an electromagnetic signal requires for a particular transmission line, inverse of the signal velocity
Link Aggregation	Combination of several ports (maximum 4) into one virtual port. Parallel connection transmission with redundancy in case of failure of a port. Standard IEEE 802.3. Colloquially also called "trunking"
LLC	Logical Link Control. Layer 2b
LSB	Least Significant Bit. Fibre-optic cable Optical transmission medium
LX	Long Wavelength (Gbit Ethernet)
MAC	Medium Access Control. MAC address, hardware address of a component in the network. The MAC address is assigned by the manufacturer. Address format: 6 bytes in hex code, separated by colons, e.g. 00:80:63:01:A2:B3
MAN	Metropolitan Area Network. For connecting various --> LANs within a city
Management Administration	configuration and monitoring of network components. The management agent of the components being managed communicates with the management station (computer) via the management protocol SNMP

# LÜTZE - Ethernet Connectivity • Glossary

MAU	Medium Attachment Unit. --> Transceiver
Mbps	Megabits per second, Mbit/s
MD5	Message Digest 5. See also Hash Algorithm
MDI	Medium Dependent Interface
MDI-X	MDI-Crossover, see also MDI
MIB	Management Information Base. Contains the description of the objects and functions connected in a network
MII	Media Independent Interface
Mini-GBIC	Mini gigabit interface converter. --> SFP
MLPPP	Multi Link PPP. --> PPP
Modbus TCP	industrial Ethernet system based on the Modbus protocol
Modes	Propagation paths of the light in an optical fibre
MPLS	Multiprotocol Label Switching. Layer 3 protocol
MSB	Most Significant Bit
MTBF	Mean Time Between Failure
MTTR	Max Time To Repair
Multicast	Data packet directed to a group of devices, e.g. to all Lütze devices
Multimode fibres	Optical fibres with relatively large core diameters. In them, the light propagates over multiple paths - multiple modes. Typical core diameters are 100µm for step index fibres, for glass fibres, 200µm for PCS/HCS® fibres and 980 µm for POF fibres. Gradient index fibres are generally made of glass, and have a typical core diameter of 50 µm or 62.5 µm. Conditionally through these --> Single mode fibre
NAT	Network Address Translation
NAT-T	NAT Traversal. Normally --> IPsec does not function if there is a --> NAT Gateway between the two IPsec end points, because the IP address of the end point is also encrypted. This problem can be circumvented using NAT-T. If supported, NAT-T is switched on automatically if necessary when establishing a connection (handshake)
NetBEUI	NetBIOS Extended User Interface. Extended version of the NetBIOS protocol, which is used by network software such as LAN Manager, LAN Server, Windows for Workgroups and Windows NT
Net Mask	The net mask marks all bits of an IP address that serve to identify the network and the subnetwork. --> IP address
Binary depiction	IP address 10010101.11011010.00010011.01011010 Net mask 11111111.11111111.11111111.00000000 --> Subnetwork 10010101.11011010.00010011.00000000
Decimal depiction	IP address 149.218.19.90 Net mask 255.255.255.0 -> Subnetwork 149.218.19.0
Available address range	Node addresses 149.218.19.1 to 149.218.19.254 Broadcast address 149.218.19.255
NEXT	Near End Cross Talk
NIC	Network Interface Card. Network interface in the compute
NMS	Network management system
Node	Node in a data network (computer, printer, hub, switch, etc.), is sometimes erroneously used with the meaning "hub" or "switch"
NRZ	Non Return to Zero. Signal code. --> NRZI
NRZI	Non Return to Zero Invert. Signal code. --> NRZ
NVRAM	Non-Volatile RAM. Non-volatile memory
ODVA	Open Device Vendor Association is an organisation that promotes the worldwide use of DeviceNet and Ethernet/IP network technologies and standards in industrial automation
OID	Object ID
OLE	Object Linking and Embedding is a technology for transmitting different data between devices
OPC	OLE for Process Control. Protocol in process automation for standardised data exchange between Windows applications
OSI	Open Systems Interconnection. International standardisation programme, originated by --> ISO and --> ITU-T, in order to create standards for data networks to ensure the compatibility of devices from various manufacturers
OSI	Model Model describing communication in a network. The functionality of the hardware is subdivided into 7 layers. In the lowest layer (physical layer), adaptation to the medium is performed
OSPF	Open Shortest Path First. Protocol for the exchange of routing information between routers. Faster than --> RIP and suitable for larger networks
OTDR	Optical Time Domain Reflectometer Versatile optical measuring device for fibre-optic networks
OUI	Organizationally Unique Identifier. The first three bytes of the --> MAC address indicate the manufacturer of the components. Packet size Frame size. Ethernet: 64 ... 1518 bytes (1522 with VLAN tag, FDDI:... 4500 bytes
PAP	Password Authentication Protocol. PPP authentication method. Passwords are transmitted in unencrypted form. PAP is based on usernames
Parallel Detection	Subfunction of -->autonegotiation, to adjust settings for a partner that does not support autonegotiation. A port detects the speed based on FLP or NLP and sets itself to 100 Mbit/s or 10 Mbit/s accordingly. HDX is always used as the duplex mode
PCF	Plastic Cladding Silica Fiber. Plastic fibre with a core of fuse quartz. -> POF --> HCS®
PD	Powered Device. Describes the end device (e.g. an IP telephone, in the draft standard IEEE P802.3af (DTE Power via MDI). IEEE P802.3af defines how a power supply can be provided via an Ethernet twisted pair cable
PDU	Protocol Data Unit
PHY	Physical sublayer. Physical layer/components (on Level 1 b)
PIMF	Pair in Metal Foil (data cable). --> STP
PLC	Programmable Logic Control. --> PLC - Programmable Logic Control

# LÜTZE - Ethernet Connectivity • Glossary

PDM	Physical Medium Dependent. Physical layer/components on Level 1 a
POE	Power over Ethernet
POF	Polymer Optical Fiber. Plastic optical fibre --> HCS® --> PCF
POL	Power over LAN
Port Mirroring	The data traffic of a port (In/Out) is mirrored (copied) on another port, for example to allow it to be examined with an analyzer
Port Trunking	Link Aggregation
PowerLink	Industrial Ethernet system from the company B&R
PLC	Programmable Logic Controller
PPP	Point-to-Point Protocol. Creates router-to-router and host-to-network connections. PPP works with protocols from various level, such as IP, IPX and ARA. PPP has integrated security mechanisms such as CHAP and RAR
PPPoE	Point-to-Point-Protocol over Ethernet
PPS	Packets Per Second. Data packets per second
PPTP	Point-to-Point Tunneling Protocol. Prioritisation Data packets are given priority handling based on defined criteria. Identification on Layer 2 with inserted --> tag field, on Layer 3 in the --> TOS field of --> IP
Private Key	Private/Public Key: In asymmetrical encryption algorithms, two keys are used: one public one (public key) and one private one (private key). The public key is made available by the future recipient of data to those who will be sending the data to him. The private key is kept only by the recipient. It is used to decrypt the received data. ProfiNet, industrial Ethernet system from Siemens
PS	Power Supply. --> PSU
PSE	Power Sourcing Equipment. Describes the device supplying power (e.g. a switch) in the draft standard IEEE P802.3af (DTE Power via MDI). IEEE P802.3af defines how a power supply can be provided via an Ethernet twisted pair cable
PSU	Power Supply Unit. --> PS
PTP	Precision Time Protocol. Protocol for time synchronisation acc. to IEEE 1588, with a precision of less than 1µs
Public Key	Private/Public Key
PUR	Polyurethane, high-quality jacket material for cables
PVC	Polyvinyl chloride, economical insulation and jacket material for cables
PVV	Path Variability Value. Specified in bit times
QoS	Quality of Service. Quality of the transmission, e.g. speed, bandwidth, delay, reliability or priority. In Level 2 for IEEE 802.1D implemented only for priority. --> Prioritisation
RADIUS	Remote Authentication Dial In User Service. A RADIUS server authenticates access for a client that logs on with its name and password. Passwords are transmitted in encrypted form
RAM	Random Access Memory. Volatile memory
RARP	Reverse Address Resolution Protocol. Supplies the statically assigned IP address for an assigned MAC address. See also BOOTP and DHCP
RAS	Remote Access System
Repeater	Components for signal regeneration on Level 1. Regenerates the amplitude, signal edge and cycle. Repeaters with more than 2 ports are also called hubs
RFC	Request For Comments. Pseudo-standard for the Internet, protocols and applications, issued by IETF
RG58	Coax cable with 50 characteristic impedance, also called ThinWire or 10BASE2
RIP	Routing Information Protocol. For exchanging routing information between routers in a LAN. There are two versions: RIP V1 and RIP V2. --> OSPF
RJ45	Connector for twisted pair. Typical for --> Ethernet and --> ISDN
RMON	Remote Monitoring
Router	Components on Layer 3 of the - ISO/OSI Reference Model. Connects networks on Layer 3. By means of additional paths to the destination, provides a choice of paths depending on de
RS 232	Recommended Standard. Serial interface, also designated V.24. Strictly speaking, the supplement to V.24 according to à CCITT
RSTP	Rapid Reconfiguration Spanning Tree Protocol
RSVP	Resource Reservation Protocol. Reserves bandwidths in a àWAN
RTCP	Realtime Transport Control Protocol. finable criteria, such as path costs
RTP	Real Time Protocol. Return Loss Ratio of disruptive reflection to the transmitted signal power
Rx	Receive (received)
SA	Source Address
SAN	Storage Area Network. Network for connecting servers and memory subsystems, such as hard disks, RAID and tape systems. Generally based on Fibre Channel.
SAP 1	Service Access Point. 2. Service Advertising Protocol
SC	Straight Connector. Connector --> DSC
SCADA	Supervision Control And Data Acquisition. Process visualisation system for process control and visualisation. Windows-based
Shielding attenuation	Ratio between the power of electromagnetic interference outside and inside of a shield. A measure of the effectiveness of the shielding, e.g. for cables or also connector housings. Transfer impedance Current/voltage ratio on cable shields for assessing the shielding effect
Suitability for drag chains	special cable designs have to be used for operation in energy supply chains. Noise, broadband electromagnetic interference
SD	Starting Delimiter
SDH	Synchronous Digital Hierarchy. Is related to the American SONET (Synchronous Optical Network) standard; with a basic SDH rate of 155.52 Mbit/s (STM-1) and multiples thereof
SERCOS III	industrial Ethernet system based on the SERCOS interface
SFD	Start Frame Delimiter
SFP	Small form-factor pluggable. A --> transceiver for 1 Gbit/s_ networks that converts serial electric signals into optical signals and vice versa, see also GBIC
SHA-1	Secure Hash Algorithm 1. --> Hash
Single mode fibre	Fibre-optic cable in which, due to its small core diameter (max. 10 µm), the light can only propagate along one path starting with the cut-off wavelength. _ Multimode fibre



# LÜTZE - Ethernet Connectivity • Glossary

SLA	Service Level Agreement
SLIP	Serial Line Internet Protocol. Standard protocol for serial point-to-point connections, uses a serial interface (e.g. V24) for IP traffic
SMON	Switch Monitoring
SMTP	Simple Mail Transfer Protocol. Internet protocol that provides e-mail services
SNTP	Simple Network Time Protocol. Protocol for time synchronisation, based on NTP, with a precision of 1ms to 50ms. For higher precision, --> PTP (Precision Time Protocol acc. to IEEE 1588) is used
SNAP	Subnetwork Access Protocol
SNMP	Simple Network Management Protocol. Protocol standardised by IETF for communication between agents and the management station in network management. Used in more than 99% of LANs
SOHO	Small Office Home Office. Networks for small offices/branches and telecommuting workstations
Spanning Tree	Protocol that automatically dissolves network loops. When installed with switches, implements redundant paths for additional reliability if a connection fails. Change-over time 30 s to 60 s
SQE	Signal Quality Error. Signal that is sent back by a transceiver to the LAN controller (processor) in order to report that the packet was sent properly. Also called heartbeat
SSH	Secure Shell. Allows cryptographically secured communication over non-secure networks by means of authentication of the partners, and integrity and confidentiality of the data exchanged
Star coupler	Active star coupler --> Hub. A passive star coupler is a component in fibre-optic equipment with n inputs and m outputs without amplification of the signal
Store & Forward	Switching method in which a packet is first saved completely and only then forwarded. --> Cut-Through
STP 1	Shielded Twisted Pair. Cable with shielded twisted wire pairs. --> PIMF, UTP. 2. - Spanning Tree Protocol
Switch	Component of Layer 2 of the OSI Reference Model. Synonym: Bridge. Unlike a --> hub, forwards a packet only to the port to which the destination station is connected, which leads to switch disconnection of individual segments. Then no access procedure is required between two switches in full duplex operation. So-called Layer-3 and Layer-4 switches are now available that have also implemented sub-functions of these levels
Symmetry	Symmetrical attenuation Ratio between the power of the normal-mode wave and that of the common-mode wave as a measure of the EMC properties of symmetrical copper cables (for shielded cables additionally --> shielding attenuation)
SX	Short Wavelength (Gigabit Ethernet)
Tag Field	Optional field in the Ethernet packet, inserted after the so
TCO	Total Cost of Ownership
TCP	Transmission Control Protocol. Connection-oriented transmission protocol on Layer 4 of the TCP/IP protocol family. --> UDP
TCP/IP	Transmission Control Protocol/Internet Protocol. Most widely-used protocol family, from Layer 3 upwards. Standardised by --> IETF. Protocols that build upon each other: Layer 3: IP; Layer 4: TCP, UDP; Layer 5: TFTP, SMTP, FTP, etc. Layer 5 contains Layers 5 to 7 of the OSI model
Telnet	Virtual terminal program of the TCP/IP stack for remote access via network to the user interface of the serial interface
TFTP	Trivial File Transfer Protocol. Protocol on Layer 5, uses --> UDP for transfer, therefore used in --> LANs
Token Ring	Data network standardised in IEEE 802.5, but also proprietary solutions by IBM
TOS	Type Of Service. Field in IP packet for --> Prioritisation
TPE	Thermoplastic elastomers, a category of plastics with special characteristics as an insulating and jacket material for cables
TP	Twisted Pair. Symmetrical copper data cable
Transceiver Converts	data signals from AUI interfaces to another medium, e.g. twisted pair. New components have transceivers already implemented. For older components there are plug-on transceivers for multimode, twisted pair or coax
Trunking	Aggregation
TTL	Time To Live. Field in the IP protocol header that specifies how many hops are allowed for a packet before it is automatically deleted
Tx	Transmit. Transmission rate; speed of the transmission, also --> Bandwidth, Ethernet: 10, 100, 1000, 10000Mbit/s Token Ring: 4 Mbit/s, 16 Mbit/s FDDI: 100 Mbit/s
UDP	User Datagram Protocol. Connectionless transport protocol on Layer 4 of the TCP/IP protocol family. --> TCP
Unicast	Data packet that is addressed to only one recipient, as opposed to multicast and broadcast
UPS	Uninterruptible Power Supply. --> USV
URL	Universal Resource Locator. Standardised addressing scheme for access to hypertext documents and other services via a browser Z.B. <a href="http://www.luetze.de">www.luetze.de</a>
USV	Uninterruptible power supply
UTP	Unshielded Twisted-Pair. Cable with unshielded twisted pairs of wires, generally with 4 pairs. --> STP
VLAN	Virtual LAN, set up with switches. Goal: Limiting broadcasts to the network areas where the broadcast is useful. Is also used to subdivide networks for security reasons
VPN	Virtual Private Network A VPN joins a number of separate private networks (subnetworks) into a common network via a public network, e.g. the Internet. Confidentiality and authenticity is protected through the use of cryptographic protocols. A VPN thus offers a cost-effective alternative to dedicated lines when setting up a trans-regional company network
VRRP	Virtual Redundant Router Protocol. Protocol for controlling redundant routers. See also HSRP
WAN	Wide Area Network Public data and transfer network for connecting local networks. Transmission protocols: ISDN, frame relay, X.21 SDH, SONET, ATM
WDM	Wavelength Division Multiplex
WEP	Wired Equivalent Privacy. WEP is an encryption method in wireless LANs according to 802.11 for protecting the transmitted data
WFQ	Weighted Fair Queuing. Method for processing the priority queues in a switch. For example, the highest queue receives 50% of the bandwidth, the next 25%, etc
WiFi	Wireless Fidelity. WiFi is a certification for wireless LANs (WLANs) according to standard 802.11, implemented by the WECA (Wireless Ethernet Compatibility Alliance). This certification confirms the interoperability of WLAN products. --> <a href="http://www.wi-fi.net">http://www.wi-fi.net</a>



# LÜTZE - Ethernet Connectivity • Glossary

Wireless LAN	Local Networks, that operate without cable connections
Wire-speed	forwarding of the data packets with line speed
WLAN Wireless	LAN. According to IEEE 802.11, .15, .16 (Bluetooth)
WWDM	With the WWDM system (Wide Wavelength Division Multiplex) it is possible to increase the transmission capacity of the optical fibres in fibre-optic networks. To do this, the system multiplexes a number of single-mode optical signals of various wavelengths to form a composite optical signal. In this manner several applications can be transmitted at the same time over a single fibre-optic cable pair. This means that it is not necessary to install additional fibre-optic cables, thus significantly reducing costs
WWW	World Wide Web
X.25	Data Packet Control Protocol, that is used in Datex-P, for example
XML	Extended Markup Language
XNS	Xerox Network Systems

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[Page Bottom](#)

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**FRIEDRICH LUETZE GMBH** E332878  
 Bruckwiesenstrasse 17-19  
 71384 Weinstadt, GERMANY

**Industrial PoE Splitter**, Model(s) ET-PSPET

**Industrial Switch**, Model(s) ET-SWGU1B5T, ET-SWGU5ET, ET-SWGSUSST, ET-SWU4-15TC, ET-SWU4-25TC, ET-SWU5ET, ET-SWUSST, ET-SWUBET, ET-SWURST, MC-2030, MC-2031, MC-2032, MC-2033

**Industrial Switch Hub**, Model(s) ET-SWGU5ST

**PoE Injector Industrial Switch**, Model(s) ET-PUSST

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**FRIEDRICH LUETZE GMBH** E332878  
 Bruckwiesenstrasse 17-19  
 71384 Weinstadt, GERMANY

**Industrial PoE Splitter**, Model(s) ET-PSPET

**Industrial Switch**, Model(s) ET-SWGU1B5T, ET-SWGU5ET, ET-SWGSUSST, ET-SWU4-15TC, ET-SWU4-25TC, ET-SWU5ET, ET-SWUSST, ET-SWUBET, ET-SWURST, MC-2030, MC-2031, MC-2032, MC-2033

**Industrial Switch Hub**, Model(s) ET-SWGSUSST

**PoE Injector Industrial Switch**, Model(s) ET-PUSST

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[Page Bottom](#)

---

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**FRIEDRICH LUETZE GMBH** E326112  
 Bruckwiesenstrasse 17-19  
 71384 Weinstadt, GERMANY

**R345 Angle Plugs**, Model(s) 490151, 490152, 490153, 490178

**R345/R345 Coupler Module**, Model(s) R345 F/F 8/B Cat. 5e (P/N 492075) (\*12)

**R345/R345 Coupler Module**, Model(s) R345 F/F 8/B Cat. 6 (P/N 490075) (\*12)

**R345/R345 Coupler Module**, Model(s) R345 F/F 8/B Cat.3 (P/N 490075) (\*12)

**STP Plug**, Model(s) 490128, 490129, 490174, 490175, 490176, 490177

**USB Coupler Module**, Model(s) USB-3.0 A/A F/F (P/N 490112) (\*12)

**USB Patch Cord**, Model(s) USB-3.0 A/A F/M x.xM (P/N 490113.xxxx) (\*12), where suffixes denote cable length in meters.

(\*12) - Denotes additional rating of Type 12

NOTE - Models are intended for indoor use in telecommunication loop circuits or for use in Industrial Ethernet applications. circuits, such as Industrial Ethernet applications.

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[Page Bottom](#)

---

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**FRIEDRICH LUETZE GMBH** E326112  
 Bruckwiesenstrasse 17-19  
 71384 Weinstadt, GERMANY

**Modular Jacks**, Model(s) 490166 / MDT-R345 F 8pol. CAT6A

**R345 Angle Plugs**, Model(s) 490151, 490152, 490153, 490178

**R345/R345 Coupler Module**, Model(s) R345 F/F 8/B Cat. 5e (P/N 492075) (\*12)

**R345/R345 Coupler Module**, Model(s) R345 F/F 8/B Cat. 6 (P/N 490075) (\*12)

**R345/R345 Coupler Module**, Model(s) R345 F/F 8/B Cat.3 (P/N 490075) (\*12)

**STP Plug**, Model(s) 490128, 490129, 490174, 490175, 490176, 490177

**USB Coupler Module**, Model(s) USB-3.0 A/A F/F (P/N 490112) (\*12)

**USB Patch Cord**, Model(s) USB-3.0 A/A F/M x.xM (P/N 490113.xxxx) (\*12), where suffixes denote cable length in meters.

(\*12) - Denotes additional rating of Type 12

NOTE - Models are intended for indoor use in telecommunication loop circuits or for use in Industrial Ethernet applications. circuits, such as Industrial Ethernet applications.

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# Part number index

Part-No	Page	Part-No	Page	Part-No	Page	Part-No	Page	Part-No	Page	Part-No	Page
104050	33	475300.1000	45								
104110	39	475300.1500	45								
104301	37	475300.2000	45								
104302	36	475400.0030	46								
104303	36	475400.0060	46								
104307	37	475400.0100	46								
104331	37	475400.0150	46								
104335	37	475400.0200	46								
104336	37	475400.0500	46								
104337	36	475400.1000	46								
104338	37	475400.1500	46								
104347	36	475400.2000	46								
104350	38	475500.0200	47								
104379	36	475500.0500	47								
104396	36	475500.1000	47								
104397	37	490105	60								
104401	34	490106	60								
104404	35	490128	53								
104450	32	490129	53								
192000.0100	44	490138	53								
192010.0100	44	490151	54								
192013.0030	48	490152	54								
192013.0060	48	490153	54								
192013.0100	48	490167	58								
192013.0150	48	490168	58								
192013.0200	48	490174	52								
192013.0500	48	490175	52								
192013.1000	48	490176	52								
192013.1500	48	490177	52								
192013.2000	48	490178	54								
192014.0030	41	490209	55								
192014.0060	41	490212	56								
192014.0100	41	490213	56								
192014.0150	41	490214	57								
192014.0200	41	490215	57								
192014.0500	41	490230	61								
192014.1000	41	490231	61								
192014.1500	41	490238	55								
192014.2000	41	492075	59								
192015.0030	49	492076	59								
192015.0060	49	772004	19								
192015.0100	49	772006	20								
192015.0150	49	772008	21								
192015.0200	49	772013	22								
192015.0500	49	772015	23								
192015.1000	49	772017	24								
192015.1500	49	772021	25								
192015.2000	49	772022	26								
192016.0030	42	779200.0401	16								
192016.0060	42	779200.0801	17								
192016.0100	42	779201.0401	16								
192016.0150	42	779201.0801	17								
192016.0200	42										
192016.0500	42										
192016.1000	42										
192016.1500	42										
192016.2000	42										
192017.0030	50										
192017.0060	50										
192017.0100	50										
192017.0150	50										
192017.0200	50										
192017.0500	50										
192017.1000	50										
192017.1500	50										
192017.2000	50										
192018.0030	43										
192018.0060	43										
192018.0100	43										
192018.0150	43										
192018.0200	43										
192018.0500	43										
192018.1000	43										
192018.1500	43										
192018.2000	43										
192022.0100	44										
192030.0100	44										
192050.0100	44										
192201.0100	44										
192342.0100	44										
192352.0100	44										
192353.0100	44										
192354.0100	44										
192355.0100	44										
192766.0030	51										
192766.0060	51										
192766.0100	51										
192766.0150	51										
192766.0200	51										
192766.0500	51										
192766.1000	51										
192766.1500	51										
192766.2000	51										
475300.0200	45										
475300.0500	45										



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