



- Cable + Connectivity Solutions
- Control Solutions

Ethernet Connectivity

Infrastructure solutions from a single source

Efficiency in Automation

Cable • Connectivity • Cabinet • Control



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Welcome to LÜTZE

Cable Solutions



Efficiency in Automation - A reflection of our company philosophy

As an experienced specialist in automation technology, with solutions for flexible and high flexing cables, cable assemblies, interfaces, current control and cabinet wiring, we have had a focus on efficiency for many years.

Connectivity Solutions



LÜTZE defines Efficiency in Automation field as the use of sustainable products and solutions to further increase the performance of our products in our customers applications.

We realise this by using components for highly efficient control systems, products with above average life cycles and raising energy efficiency in control cabinets by means of the LSC wiring system.

Cabinet Solutions



Efficiency in Automation reflects our efforts in striving for efficient working relationships with our customers: in a medium sized family owned company we have short communication channels and a high level of manufacturing competence.

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

Control Solutions



Thus LÜTZE creates value through efficiency. LÜTZE provides answers and demonstrates how to handle resources responsibly, with our environment and our future in mind.
LÜTZE - Efficiency in Automation

For more information on our solutions, please visit www.luetze.com or www.lutze.com

Transportation Solutions





Business Management: Sustainable and forw



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.

ard-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*



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



Structured networks - E



Plug & Play in Industrial Ethernet

Save time, costs and stress: LÜTZE can cost-efficiently and quickly solve your assembly requirements.

LÜTZE ET Series - Reliable transmission even with Giga power

The LÜTZE ET Series of switches and media converters enable you to set up a Plug & Play network infrastructure in industrial environments - without any configuration necessary.

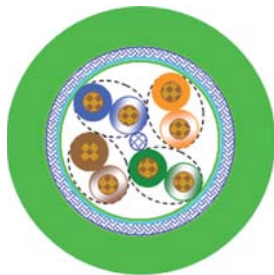
MDI/MDI-X functionality uncrossed cables can also be used between the switch and end device. Because industrial areas are synonymous with harsh environments, all of our systems feature aluminium housings, expanded temperature ranges from -40 °C / +75 °C and fibre-optic transmission..

Additional features include:

- Transfer rates of up to 1 Gbit/s

- Conforms to IEEE 802.3 and 802.3u
- Broadcast storm protection
- Auto negotiation, Auto Crossing, Auto Polarity
- Redundant infeed
- Wide range supply
- Full / half duplex data flow monitoring
- PoE variants

ethernet connectivity



Category 5e cables are generally available at LÜTZE with an all-round braided shield (S/UTP).



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



Cables – a lot depends on them

The correct transmission of process data is absolutely essential. An important requirement is the correct choice of cables, connection technology and components.

Procurement, logistics and production all need to be organised perfectly. The quality of cable must comply with the system's requirements. Whether you are looking for

standard or customised applications, C-track or torsion-resistant cables: LÜTZE delivers customised solutions for your applications in CAT5, CAT6 or CAT7.

You can also take advantage of our comprehensive portfolio of connectors, outlets and wall bushings. The connectors conform to IEC 61076-3-106.

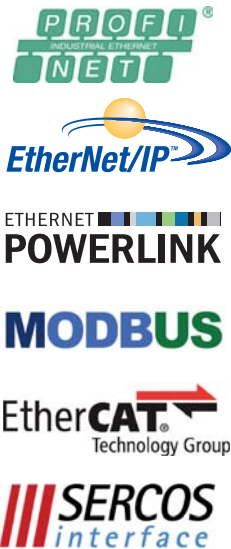
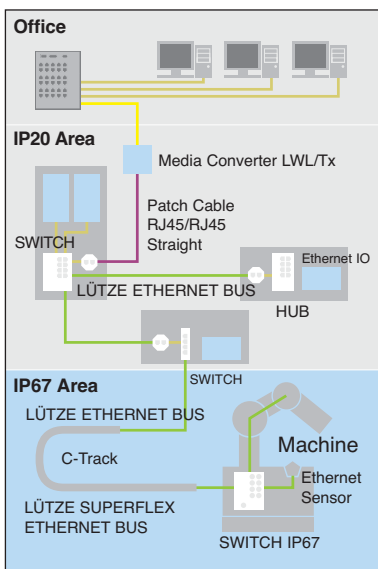
All connectors facilitate quick and easy assembly.

Customised Industrial Ethernet: Besides supplying standard products, LÜTZE can also produce customised solutions thanks to its years of expertise in Industrial Ethernet.

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"> · very high network availability · small data packets · timely transmission 	
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).

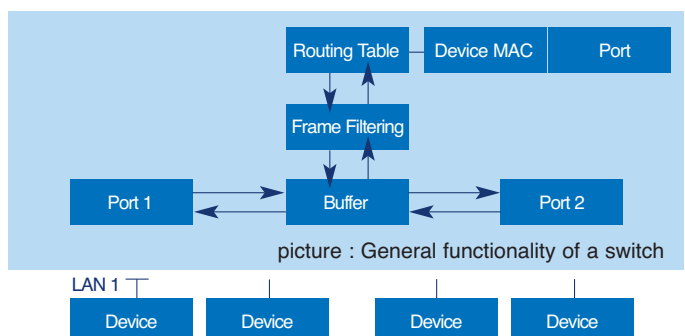
Ethernet Switches

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	
3	Network	Internet		ICMP IGMP IP IPX	Packets	Router, Layer-3-Switch
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

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.

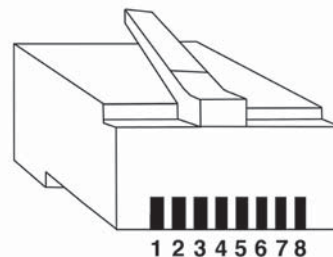
Pin assignment RJ45:

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	Green	Orange
2	3	2	Green	Orange
3	2	3	Orange	Green
4	1	1	Blue	Blue
5	1	1	Blue	Blue
6	2	3	Orange	Green
7	4	4	Brown	Brown
8	4	4	Brown	Brown



PIN Position

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.

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	
LWL	LWL	IEC 60874-74	PNO	

LÜTZE – Ethernet Connectivity

Fibre-optic cables

The advantages of fibre-optic cables are clear: wide bandwidth, data integrity, data security, immunity to interference and larger maximum length. They also offer additional interesting benefits compared to copper-based solutions, such as high quality electrical isolation between the individual components, low cable weight per meter, no electromagnetic radiation, laying directly next to high-energy cables and the immunity of the bit error rate to any type of electromagnetic disturbance.

Operation of a fibre-optic line thus requires no additional measures with regard to shielding, equipotential bonding or overvoltage protection. The main disadvantages compared to twisted pair cables are the price and the complicated assembly of the connections.

POF

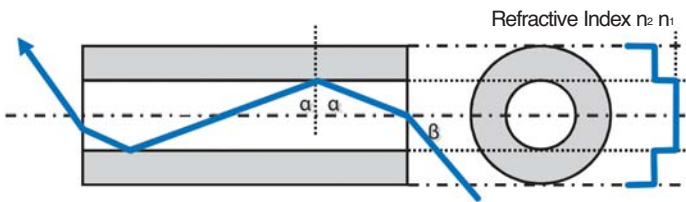
One way to bring the costs of assembly down to the same level as with twisted pairs is the use of POF (Polymer Optical Fibre) technology. This makes it possible to use economical, easy-to-assemble connectors, and preparing the connector interface is only a simple step. Although only distances of up to 50 m can be implemented, this provides adequate scope for typical practice-oriented decentralisation of active components.

HCS

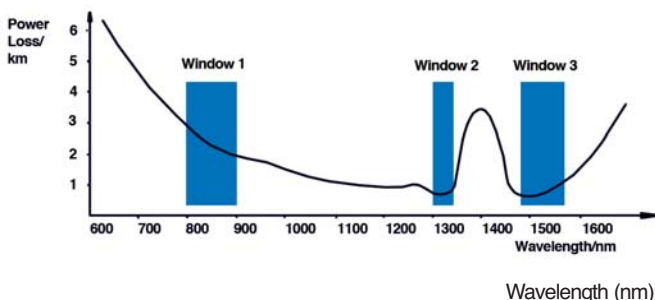
If a system requires lines longer than 50 m, HCS (Hard Clad Silica) can be used. The cable contains a 200 μm thin glass fibre core with polymer cladding, and thus has less attenuation than the polymer fibres. It is possible to achieve distances of up to 100 m, although the costs of assembly are increased due to the smaller core diameter, due to the more precise connector mechanism that is required.

Glass fibre

Glass fibre cables consist of a core and a cladding. A super-thin silicate or quartz glass fibre is used as the core, this in turn is clad in a lower-density glass. The difference in density between the two materials results in total reflection of injected light pulses, thus guiding light along the core.

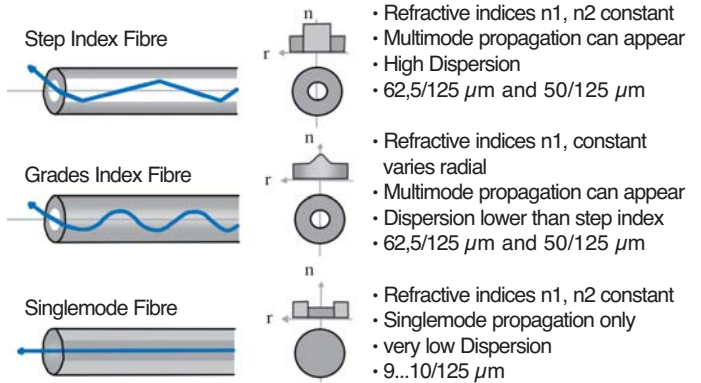


Information is transmitted using infrared light with wavelengths of 850 nm, 1300 nm or 1550 nm. With these wavelengths the attenuation is especially low - they are also called "optical windows".



The propagation velocity is directly dependent on the wavelength. This

naturally results in differences in propagation times, which are called dispersion. Likewise the entrance angles of the light beams (modes) are different, which leads to differences in the path lengths through the conductor itself. These processes change the shape of the signal that was originally fed in, which can result in transmission errors. Therefore when selecting a cable it is important to know the bit error performance that can be achieved.



Either the so-called bandwidth length product or the bit rate length product is used here. The bandwidth (B) depends on the length (L) of the fibre-optic cable, and produces the constant:

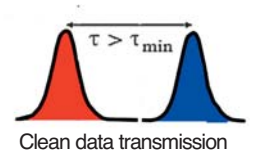
$$B \times L = \text{constant}$$

This constant can be used to calculate the usable bandwidth of a fibre-optic cable as a function of the transmission distance.

Bandwidth:

The bandwidth is defined by the time distance needed to resolve two consecutive signals.

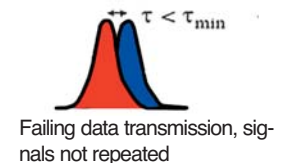
$$B = \frac{1}{\tau_{\min}} \text{ Mbps}$$



Modal Bandwidth:

Bandwidth decreases reciprocal to fibre length. Thus the modal bandwidth is a fibre specific constant unit: MHz x km.

Step Index Fibre: typ.: 5 - 10 MHz x km
 Graded Index Fibre: typ.: 200-300 MHz x km
 Singlemode Fibre: typ.: > 2 GHz x km



Multimode

Because there are multiple possible light paths, the signal is affected (there are differences in propagation times); for this reason, multimode fibres are not suitable for communication over larger distances at high bandwidths. Multimode fibres for communication have an inner core diameter of up to 62.5 μm (US standard), and for thinner versions it is only 50 μm (EU standard). However, for both versions the outer diameter is almost always 125 μm (140 μm for older models). The maximum transmission distance for multimode is approximately 550 m for a core diameter of 50 μm , and approx. 275 m for 62.5 μm . Newer fibres have lower attenuation (which has, however, in practice no significance whatsoever for the transmission distance), and allow distances of up to several kilometers (also depending on the power of the transmitter and the sensitivity of the receiver). Greater ranges cannot, however, be achieved merely with greater power, but rather there are higher technical requirements which must be met to shape the light pulses in a highly complex manner. This special shaping takes into account the modal dispersion (differences in propagation times for the individual light beams).

The thicker optical fibres for high-powered lasers (here the energy density in the core of the fibre has to be reduced, because otherwise it would be

LÜTZE – Ethernet Connectivity

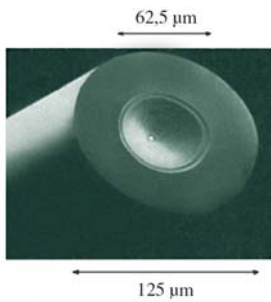
melted or torn) or for lighting (here single-mode operation is not possible due to the many different wavelengths that have to be transmitted at the same time) and measuring purposes (because here there are often short distances between the detector and the test specimen, and the handling is simpler, e.g. beam injection) are in principle multi-mode fibres.

Mono- / Singlemode

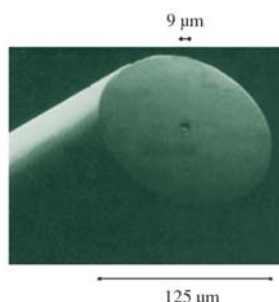
In single-mode fibres, the refractive index profile is dimensioned so that the problem of multiple-path propagation (intermodal dispersion) that arises with multi-mode fibres does not occur - in a single-mode fibre the signal light propagates in only a single guided waveguide mode, which is why it is called single-mode. This allows significantly greater transmission distances and/or bandwidths. However, there is a different dispersion which becomes significant: the material dispersion. Here it is understood that due to the wavelength-dependent index of refraction, the speed of light within the medium is also wavelength-dependent. In practice this means that the light used for transmission should be as chromatic as possible. This is provided by laser diodes, which come very close to the ideal. Single-mode fibres, which are sometimes also called mono-mode fibres, typically have a core diameter of $9\ \mu\text{m}$; their outer diameter is likewise $125\ \mu\text{m}$. The actual transmission of the information takes place in the core of the fibre.

The fact that only laser components with wavelengths greater than 1250 nm are used means that they are still expensive to use. On the other hand, the bandwidth of 10 GHz/km means that distances of more than 100 km can be covered.

62,5/125 μm
Graded Index Fibre



9/125 μm
Singlemode Fibre



Fibre-optic cables suitable for industrial use

Here two fibres are combined into a cable with a longitudinally water-tight cladding. The fibres are often clad with aramid or Kevlar yarn for strain relief. For outdoor applications the cables are often also provided with metal elements to reduce torsion and/or with protection against rodents and termites.

The following basic specifications apply here:

- Halogen-free according to IEC 60754-2
- Flame-retardant according to IEC 60332-3 (C3)
- Low smoke according to IEC 61034

Overview fibre optics:

	Singlemode	Multimode		HCS	POF
Fibre	B1	A1a	A1b	A3c	A4a
Material	glass	glass	glass	glass/ plastic	plastic
Ø Core/ fibre μm	9/125	50/125	62,5/125	200/230	980/1000
Attenuation					
max. dB/km	1,0	1,5	1,5	10	180
@nm	1.300	1.300	1300	650	650
Bandwith					
max MHz*km		500	500	70	35
Cable length					
max. phys. m	10.000	2.000	2.000	100	50

In order to prevent damage to fibre-optic cables, whether immediately or during use, great care should be taken when laying them. The VDE laying regulations always apply. In addition, further specifications for indoor and outdoor laying according to DIN VDE 0899 Part 3 must be observed.

Fibre-optic cable connectors

In day-to-day industrial applications, four different types of connector are mainly used. These are SC, (V)ST, FSMA and MTRJ connectors. Other types of connector, such as ESCON, MIC, Mini-BNC, FC/PV, LC or Volition have to date been used on a very small scale.

The connector used most often in industry is the type SC:



Power over Ethernet

Since 2003 the international standard IEEE 802.3af "DTE Power via MDI" has existed, which is also called Power over Ethernet (PoE), Power over LAN (PoL) or Active Ethernet. PoE technology makes it possible to supply power to low power consumption network nodes directly over the Ethernet cable. Furthermore, PoE devices can easily be connected to uninterruptible power supplies. This means that fewer new cables have to be laid and existing resources can be used more efficiently.

When using PoE it must be ensured that all of the infrastructure components present in the network are PoE compatible and that the transmission speed of such networks is limited to 10MBit/s and/or 100MBit/s.

IEEE 802.3af makes a distinction between two core components:

Power Sourcing Equipment (PSE)

These devices feed the required power into the network, such as active network components with direct PoE support or PoE patch panels.

Power Devices (PD)

These are units that are supplied remotely and do not have an external power connection.

For Power Sourcing Equipment, a distinction is made between two types of device:

Endspan Insertion

PSE devices supply PDs with power directly via their ports, while at the same time supplying the PDs with data. These devices are almost exclusively switches, such as the Lütze PoE switches 772020 and 772021.

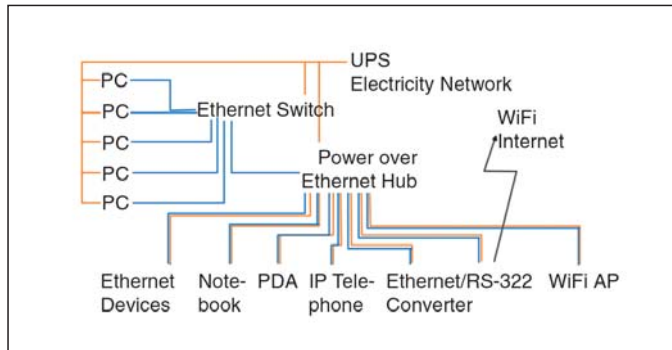
Midsan Insertion

These are devices that convey the data of the active devices, while at the same time feeding power into the Ethernet cable. This device category includes splitters, such as Lütze item 772022. These devices are mainly used to upgrade an existing network structure for use.

LÜTZE - Ethernet Connectivity

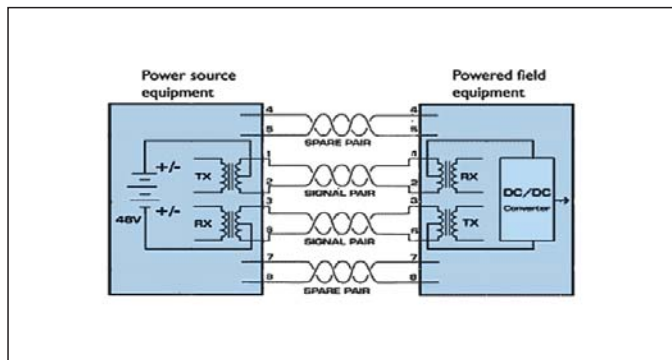
Ethernet components need power:

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.

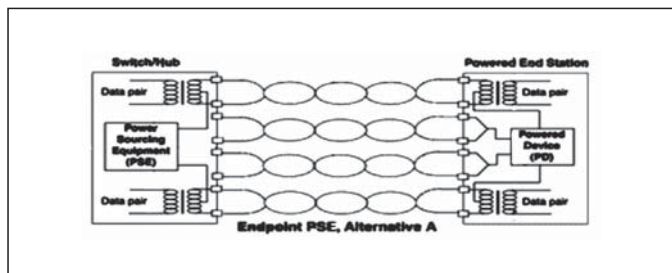


Standardised as 802.3af:

- 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

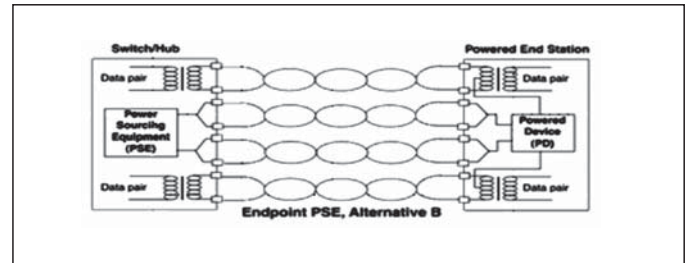


Power supply via data cables; Supply via the centre points of the isolating transformer:



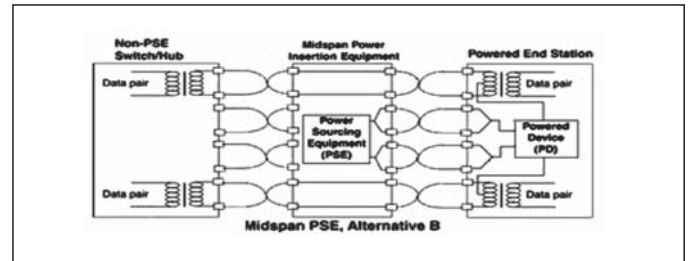
Endpoint PSE Alternative A.

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



5 port
10/100 Mbit



5 port
10/100/1000 Mbit



8 port
10/100 Mbit



8 port
10/100/1000 Mbit



16+2G port
10/100/1000 Mbit



4+1,2 FX port
10/100 Base TX

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Unmanaged PoE Switches, PoE splitter



5 port
10/100 Mbit



10/100/1000 Mbit

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Page 23

Media converter



10/100 Mbit



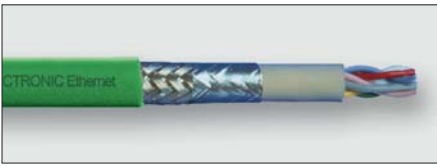
1000 Mbit

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Ethernet Connectivity · Product Overview

Ethernet Bus cables



Standard

C-track compatible

Page 28

Page 29

Actuator sensor interface network cables



PROFINET
Male M12
PUR cable

Page 30



PROFINET
Male M12
PUR cable

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PROFINET
M12 panel
connectors

Page 32

Actuator sensor interface connector



M12, Male
X coded
Cat 6A

Page 35



M12, Male
D coded
Cat 5e

Page 36



M12, Female
D coded
Cat 5e

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RJ45 straight
AWG 27-22
Cat 6A

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RJ45 gewinkelt
AWG 27-22
Cat 6A

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Actuator sensor interface panel connector and module holder



RJ45
Front installation

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M12 - RJ45
Control cabinet
bushing

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RJ45 Female /
IDC

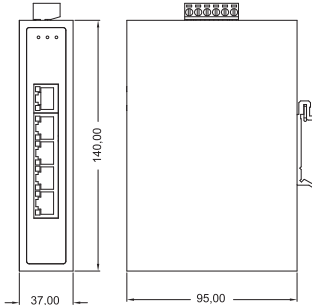
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Ethernet · Unmanaged switch 5 ports

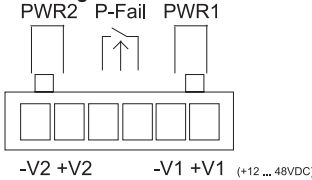
10 / 100 Mbit, autonegotiation, Auto MDI/MDI-X, DC 12 V / 24 V, redundant
 5 Fast Ethernet ports, Broadcast storm protection
 ESD 4 kV, surge 3 kV, expanded temperature range



Dimensions



PIN assignment



Description	Part-No.	Type	PU	
5 port, RJ45				
Operation temperature range	-10 °C – 60 °C	772000	ET-SWU5ST	1
	-40 °C – 75 °C	772001	ET-SWU5ET	1

Communication

Standard	772000	772001
Standard	IEEE 802.3, 802.3u, 802.3x	
LAN	10 / 100 Base-TX	
Cable length (segment)	Max. 100 m	
Rate of transmission	Max. 100 Mbps	
Connection technology (data)	5 × RJ45	
Broadcast Storm Rate Limit	200 pps (200M), 20 pps (10M)	
Status Indication	P1, P2, P-Fail, 10/100T(x): link/activity, duplex/collision	

General

Operation voltage range	DC 12 V - DC 48 V, redundant	
Power consumption	3 W	
Operation temperature range	-10 °C – 60 °C	-40 °C – 75 °C
Storage temperature range	-40 °C – 85 °C	
Relative humidity (operation)	5% - 95% (non-condensing)	
Relative humidity (storage)	0% - 95% (non-condensing)	
Protection class	IP 30	
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6	

Approvals

cULus, CE, FCC

Safety

ESD (Ethernet)	DD 4 kV
Surge (EFT for power)	DC 3 kV
Reverse voltage protection	Yes
Rated over load protection	0.9 A @ DC 12 V

Mechanics

Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm
Housing material	Metal
Field installation	Snaps on to TS 35 rail (EN 50022), wall mounting
Installation position	Any
Weight (kg/piece)	0.600
Termination	Screw terminal, plug-in: 0.2–2.5 mm ²

Monitoring

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

Note

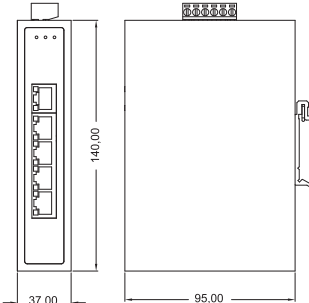
For more information on LED definition, see the data sheet.

Ethernet - Unmanaged switches 5 ports

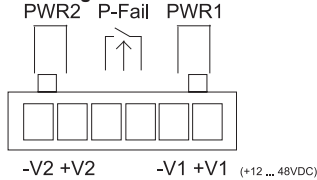
10 / 100 / 1000 Mbit, autonegotiation, Auto MDI/MDI-X, DC 12 V / 24 V, redundant
 5 Fast Ethernet ports, frame transmission up to 9 kB (Jumbo frames)
 ESD 4 kV, surge 3 kV, expanded temperature range



Dimensions



PIN assignment



Description	Part-No.	Type	PU	
5 port, RJ45				
Operation temperature range	-10 °C – 60 °C	772010	ET-SWGU5ST	1
	-40 °C – 75 °C	772011	ET-SWGU5ET	1

Communication	772010	772011
Standard	IEEE 802.3, 802.3u, 802.3x	
LAN	10 / 100 Base-TX, 10 / 1000 Base-T	
Cable length (segment)	Max. 100 m (4-wire Cat.5e, Cat.6 RJ45 cable)	
Rate of transmission	Max. 1000 Mbps	
Connection technology (data)	5 × RJ45	
Broadcast Storm Rate Limit	7926 pps	
Status Indication	P1, P2, P-Fail; 10/100T(x): Link/Activity, Duplex/Collision	
General		
Operation voltage range	DC 12 V - DC 48 V, redundant	
Power consumption	4.6 W	
Operation temperature range	-10 °C – 60 °C	-40 °C – 75 °C
Storage temperature range	-40 °C – 85 °C	
Relative humidity (operation)	5% - 95% (non-condensing)	
Relative humidity (storage)	0% - 95% (non-condensing)	
Protection class	IP 30	
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6	

Approvals	cULus, CE, FCC
Safety	
ESD (Ethernet)	DD 4 kV
Surge (EFT for power)	DC 3 kV
Reverse voltage protection	Yes
Rated over load protection	0.9 A @ DC 12 V
Mechanics	
Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm
Housing material	Metal
Field installation	rail TS 35 (EN 50022)
Installation position	Any
Weight (kg/piece)	0.600
Termination	Screw terminal, plug-in: 0.2–2.5 mm ²
Monitoring	
Power supply voltage monitoring	Relay, 1 normally open
Switching voltage	AC 120 V / DC 28 V
Switching current	1 A @ DC 24 V
Insulation voltage	DC 500 V

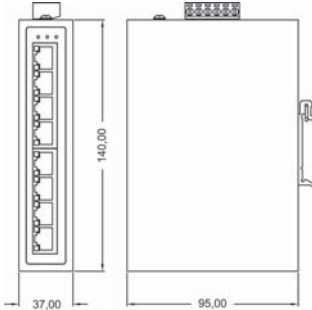
Note
 For more information on LED definition, see the data sheet.

Ethernet · Unmanaged switch 8 ports

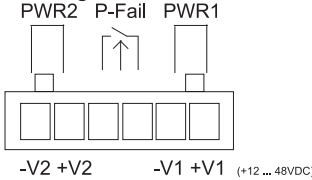
10 / 100 Mbit, autonegotiation, Auto MDI/MDI-X, DC 12 V / 24 V, redundant
 8 Fast Ethernet ports, Broadcast storm protection
 ESD 4 kV, surge 3 kV, expanded temperature range



Dimensions



PIN assignment



Description	Part-No.	Type	PU	
8 port, RJ45				
Operation temperature range	-10 °C – 60 °C	772002	ET-SWU8ST	1
	-40 °C – 75 °C	772003	ET-SWU8ET	1

Communication

	772002	772003
Standard	IEEE 802.3, 802.3u, 802.3x	
LAN	10 / 100 Base-T(X)	
Cable length (segment)	Max. 100 m	
Rate of transmission	Max. 100 Mbps	
Connection technology (data)	8 × RJ45	
Broadcast Storm Rate Limit	200 pps (200M), 20 pps (10M)	
Status Indication	P1, P2, P-Fail, 10/100T(x): link/activity, duplex/collision	

General

Operation voltage range	DC 12 V - DC 48 V, redundant	
Power consumption	5 W	
Operation temperature range	-10 °C – 60 °C	-40 °C – 75 °C
Storage temperature range	-40 °C – 85 °C	
Relative humidity (operation)	5% - 95% (non-condensing)	
Relative humidity (storage)	0% - 95% (non-condensing)	
Protection class	IP 30	
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6	

Approvals

cULus, CE, FCC

Safety

ESD (Ethernet)	DD 4 kV
Surge (EFT for power)	DC 3 kV
Reverse voltage protection	Yes
Rated over load protection	0.9 A @ DC 12 V

Mechanics

Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm
Housing material	Metal
Field installation	rail TS 35 (EN 50022)
Installation position	Any
Weight (kg/piece)	0.600
Termination	Screw terminal, plug-in: 0.2–2.5 mm ²

Monitoring

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

Note

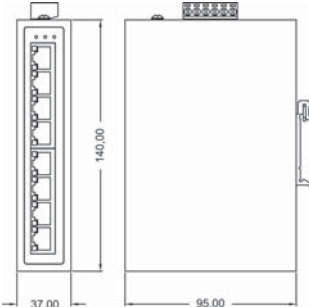
For more information on LED definition, see the data sheet.

Ethernet - Unmanaged switch 8 ports

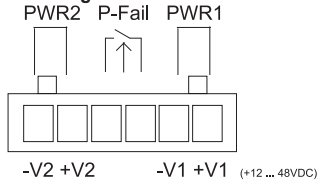
10 / 100 / 1000 Mbit, autonegotiation, Auto MDI/MDI-X, DC 12 V / 24 V, redundant
 8 Fast Ethernet ports, frame transmission up to 9 kB
 ESD 4 kV, Surge 3 kV



Dimensions



PIN assignment



Description	Part-No.	Type	PU	
Description	8 port, RJ45	772012	ET-SWGU8ST	1
Communication				
772012				
Standard	IEEE 802.3, 802.3u, 802.3x			
LAN	10 / 100 Base-TX, 10 / 1000 Base-T			
Cable length (segment)	Max. 100 m (4-wire Cat.5e, Cat.6 RJ45 cable)			
Rate of transmission	Max. 1000 Mbps			
Connection technology (data)	8 × RJ45			
Broadcast Storm Rate Limit	7926 pps			
Status Indication	P1, P2, P-Fail, 10/100T(x): link/activity, duplex/collision			
General				
Operation voltage range	DC 12 V - DC 48 V, redundant			
Power consumption	4.6 W			
Power output	-			
Operation temperature range	-10 °C – 60 °C			
Storage temperature range	-40 °C – 85 °C			
Relative humidity (operation)	5% - 95% (non-condensing)			
Relative humidity (storage)	0% - 95% (non-condensing)			
Protection class	IP 30			
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6			
Approvals	cULus, CE, FCC			
Safety				
ESD (Ethernet)	DD 4 kV			
Surge (EFT for power)	DC 3 kV			
Reverse voltage protection	Yes			
Rated over load protection	1.6 A @ DC 12 V			
Mechanics				
Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm			
Housing material	Metal			
Field installation	rail TS 35 (EN 50022)			
Installation position	Any			
Weight (kg/piece)	0.600			
Termination	Screw terminal, plug-in: 0.2–2.5 mm ²			
Monitoring				
Power supply voltage monitoring	Relay, 1 normally open			
Switching voltage	AC 120 V / DC 28 V			
Switching current	1 A @ DC 24 V			
Insulation voltage	DC 500 V			

Note

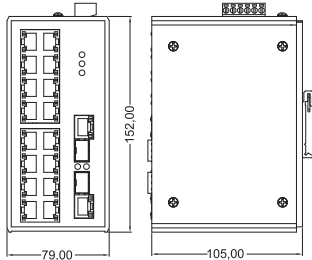
For more information on LED definition, see the data sheet.

Ethernet · Unmanaged switch 16+2G ports

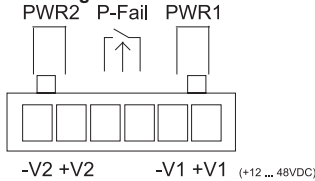
10 / 100 / 1000 Mbit, autonegotiation, Auto MDI/MDI-X, DC 12 V / 24 V, redundant
Simple and flexible expansion to fibre optic with SFP base



Dimensions



PIN assignment



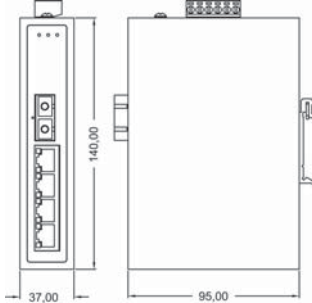
Description	Part-No.	Type	PU	
Description	16 port + 2G, RJ45/SFP	772014	ET-SWGU18ST	1
Communication				
772014				
Standard	IEEE 802.3, 802.3ab, 802.3u, 802.3x, 802.3z			
LAN	100 Base-TX, 10 / 1000 Base-T, 1000 Base-SX/LX/LHX/XD/ZX/EZX			
Cable length (segment)	Max. 100 m (4-wire Cat.5e, Cat.6 RJ45 cable)			
Rate of transmission	Ethernet : 10/100 Mbps, gigabit converter : 10/100/1000 Mbps			
Connection technology (data)	16 RJ45 + 2 RJ45/SFP (mini GBIC)			
Broadcast Storm Rate Limit	-			
Status Indication	PWR1, PWR2, P-Fail, Gigabit Chopper: Link/Activity, Speed (1000Mbps), Gigabit SFP: Link/Activity			
General				
Operation voltage range	DC 12 V - DC 48 V, redundant			
Power consumption	6.5 W			
Operation temperature range	-10 °C – 60 °C			
Storage temperature range	-40 °C – 85 °C			
Relative humidity (operation)	5% - 95% (non-condensing)			
Relative humidity (storage)	0% - 95% (non-condensing)			
Protection class	IP 30			
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6			
Approvals	cULus, CE, FCC			
Safety				
ESD (Ethernet)	DD 4 kV			
Surge (EFT for power)	DC 3 kV			
Reverse voltage protection	Yes			
Rated over load protection	3.5 A @ DC 12 V			
Mechanics				
Dimensions (w × h × d)	79.0 × 152.0 × 105.0 mm			
Housing material	Metal			
Field installation	rail TS 35 (EN 50022)			
Installation position	Any			
Weight (kg/piece)	1.100			
Termination	Screw terminal, plug-in: 0.2–2.5 mm ²			
Monitoring				
Power supply voltage monitoring	Relay, 1 normally open			
Switching voltage	AC 120 V / DC 28 V			
Switching current	1 A @ DC 24 V			
Insulation voltage	DC 500 V			
Note				
For more information on LED definition, see the data sheet.				

Ethernet · Unmanaged switches 4+1/2FX ports

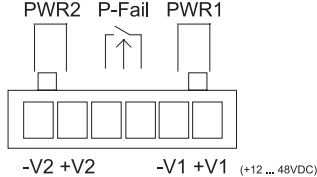
10/100Base TX, 100Base FX Multi Mode, Auto MDI/MDI-X, DC 12 V / 24 V, redundant
 4 Fast Ethernet ports, 1× Multimode SC, 2× Single Mode SC
 ESD 4 kV, surge 3 kV, full/half duplex operation, broadcast storm protection



Dimensions



PIN assignment



Description	Part-No.	Type	PU	
Description	4 port, RJ45, 1 port Multimode	772005	ET-SWU4-1STSC	1
	4 port, RJ45, 2 port single mode	772007	ET-SWU4-2STS	1

Communication	772005	772007
Standard	IEEE 802.3, 802.3u, 802.3x	
LAN	10 / 100 Base-T(X), 100 Base FX	
Cable length (segment)	Copper max. 100 m, multi-mode fibre max. 2000 m	
Rate of transmission	Max. 100 Mbps	
Connection technology (data)	4 × RJ45, 1 × SC or 4 × RJ45, 2 × SC	
Broadcast Storm Rate Limit	200 pps (200M), 20 pps (10M)	
Status Indication	P1, P2, P-Fail, 10/100T(x): link/activity, duplex/collision	

Fibre-optic cables (Multi Mode)		
Wavelength	1310 nm	-
Tx Power	-14 / -20 dBm	-
Rx sensitivity	-31 dBm	-
Parameters	50/125 µm, 62.5/125 µm	-

Fibre-optic cables (Single Mode)		
Wavelength	-	1310 nm
Tx Power	-	-8 / -15 dBm
Rx sensitivity	-	-34 dBm
Parameters	-	9 / 125 µm

General	
Operation voltage range	DC 24 V - DC 48 V, redundant
Power consumption	5 W (1SC), 6.5 W (2SC)
Operation temperature range	-10 °C - 60 °C
Storage temperature range	-40 °C - 85 °C
Relative humidity (operation)	5% - 95% (non-condensing)
Relative humidity (storage)	0% - 95% (non-condensing)
Protection class	IP 30
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6

Approvals	cULus, CE, FCC
Safety	
ESD (Ethernet)	DD 4 kV
Surge (EFT for power)	DC 3 kV
Reverse voltage protection	Yes
Rated over load protection	0.9 A @ DC 12 V (1SC), 1.6 A @ DC 12 V (2SC)

Mechanics	
Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm
Housing material	Metal
Field installation	rail TS 35 (EN 50022)
Installation position	Any
Weight (kg/piece)	0.600
Termination	Screw terminal, plug-in: 0.2-2.5 mm ²

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

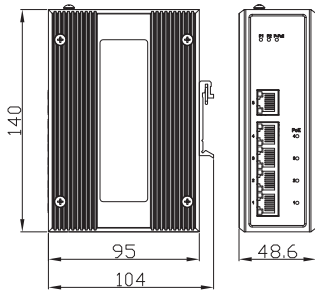
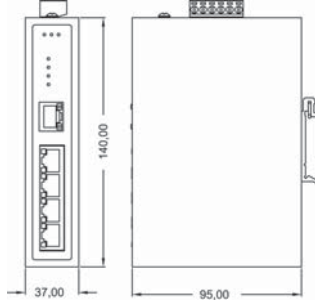
Note
 For more information on LED definition, see the data sheet.

Ethernet · Unmanaged PoE switches 5 ports

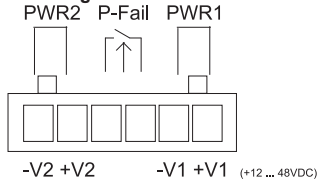
10 / 100 Mbit, Auto MDI/MDI-X, DC 48 V, redundant
5 Fast Ethernet ports, autonegotiation
ESD 4 kV, Surge 3 kV



Dimensions



PIN assignment



Description	Part-No.	Type	PU
Description	PoE 5 port, 48 V 772020	ET-PU5ST	1
	PoE 5 port, 24/48 V 772021	ET-PU5AST	1

Communication

	772020	772021
Standard	IEEE 802.3, 802.3u, 802.3x, 802.3af	
LAN	10 / 100 Base-TX	
Cable length (segment)	Max. 100 m (4-wire Cat.5e, Cat.6 RJ45 cable)	
Rate of transmission	Max. 100 Mbps	
Connection technology (data)	5 × RJ45	
Broadcast Storm Rate Limit	-	
Status Indication	P1, P2, P-Fail, 10/100T(x): link/activity, duplex/collision	

General

Operation voltage range	DC 48 V redundant	DC 24/48 V redundant
Power consumption	65 W full load PoE	62.5 W full load PoE
Operation temperature range	-10 °C – 60 °C	
Storage temperature range	-40 °C – 85 °C	
Relative humidity (operation)	5% - 95% (non-condensing)	
Relative humidity (storage)	0% - 95% (non-condensing)	
Protection class	IP 30	
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6	

Approvals

Safety

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

Mechanics

Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm	48.6 × 140.0 × 95.0 mm
Housing material	Metal	
Field installation	rail TS 35 (EN 50022)	
Installation position	Any	
Weight (kg/piece)	0.600	0.800
Termination	Screw terminal, plug-in: 0.2–2.5 mm ²	

Monitoring

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

Note

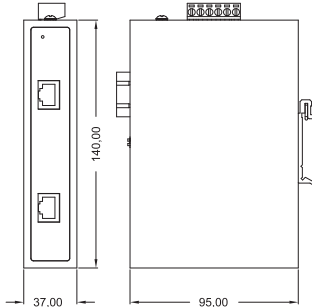
For more information on LED definition, see the data sheet.

Ethernet · PoE splitter

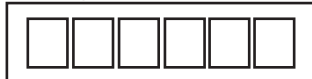
10 / 100 / 1000 Mbit, PoE input and data output
 12.95 W with DC 24 V, DC 48 V IN, DC 24 V OUT
 IEC 802.3af compatible, -40°C – +75°C, ESD 4 kV, surge 3 kV



Dimensions



PIN assignment



Output DC 24V

Description	Part-No.	Type	PU	
Description	Power splitter	772022	ET-PSPET	1
Communication		772022		
Standard	IEEE 802.3, 802.3u, 802.3x, 802.3af, 802.3ab			
LAN	10 / 100 Base-TX, 10 / 1000 Base-T			
Cable length (segment)	Max. 100 m (4-wire Cat.5e)			
Rate of transmission	Max. 100 Mbps			
Connection technology (data)	PoE IN, OUT: RJ 45			
Broadcast Storm Rate Limit	-			
Status Indication	Power, Link/Activity, Duplex/Collision			
General				
Operation voltage range	DC 44 V - DC 57 V			
Power consumption	17.8 W @ 48 V			
Power output	12.95 W @ 24 V			
Operation temperature range	-40 °C – 75 °C			
Storage temperature range	-40 °C – 85 °C			
Relative humidity (operation)	5% - 95% (non-condensing)			
Relative humidity (storage)	0% - 95% (non-condensing)			
Protection class	IP 30			
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6			
Approvals	cULus, CE, FCC			
Safety				
ESD (Ethernet)	DD 4 kV			
Surge (EFT for power)	DC 3 kV			
Reverse voltage protection	Yes			
Rated over load protection	0.539 A @ DC 24 V			
Mechanics				
Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm			
Housing material	Metal			
Field installation	rail TS 35 (EN 50022)			
Installation position	Any			
Weight (kg/piece)	0.600			
Termination	Screw terminal, plug-in: 0.2–2.5 mm ²			
Monitoring				
Power supply voltage monitoring	-			
Switching voltage	-			
Switching current	-			
Insulation voltage	-			

Note

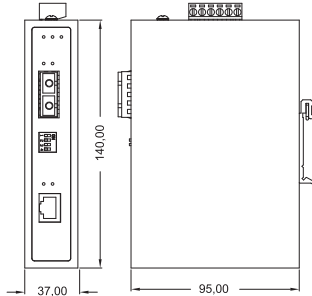
For more information on LED definition, see the data sheet.

Ethernet · Media converter

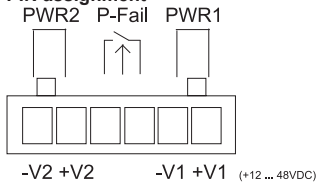
1×10/100 Mbps RJ45; 1×10/100 Mbps SC, Auto MDI/MDI-X auto crossover
 DC 12 V - DC 48 V, redundant
 Full/half duplex operation, autonegotiation, ESD 4 kV, surge 3 kV



Dimensions



PIN assignment



Description	Part-No.	Type	PU	
MM=Multimode, SM=Single Mode				
Description	Media Converter MM	772032	MC2032	1
	Media Converter SM	772033	MC2033	1

Communication	772032	772033
Standard	IEEE 802.3, 802.3u, 802.3x	
LAN	10 / 100 Base-TX, 100 Base-FX	
Cable length (segment)	Ethernet: max. 100 m, Fibre: 2000 m (multimode), 30,000 m (single mode)	
Rate of transmission	Max. 100 Mbps	
Connection technology (data)	1 × RJ45, 1 × SC, 6-pin connector	
Broadcast Storm Rate Limit	-	
Status Indication	P1, P2, P-Fail, Fibre: HDX/FDX, Link/Activity, Ethernet: 10/100 M, Link/Activity	

Fibre-optic cables (Multi Mode)		
Wavelength	850 nm	-
Tx Power	-4/-9.5 dBm	-
Rx sensitivity	-18 dBm	-
Parameters	50 / 125 µm, 62.5 / 125 µm	-

Fibre-optic cables (Single Mode)		
Wavelength	-	1310 nm
Tx Power	-	-3/-9.5 dBm
Rx sensitivity	-	-20 dBm
Parameters	-	9 / 125 µm

General		
DIP switch	Port / Power Alarm, LFP, Fibre: HDX/FDX, converter/switch	
Operation voltage range	DC 12 V - DC 48 V, redundant	
Power consumption	Max. 5 W	
Operation temperature range	-10 °C - 60 °C	
Storage temperature range	-40 °C - 85 °C	
Relative humidity (operation)	5% - 95% (non-condensing)	
Relative humidity (storage)	0% - 95% (non-condensing)	
Protection class	IP 30	
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6	

Approvals		
cULus, CE, FCC		

Safety		
ESD (Ethernet)	DD 4 kV	
Surge (EFT for power)	DC 3 kV	
Reverse voltage protection	Yes	
Rated over load protection	0.9 A @ DC 12 V, resettable	

Mechanics		
Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm	
Housing material	Metal	
Field installation	rail TS 35 (EN 50022)	
Installation position	Any	
Weight (kg/piece)	0.600	
Termination	Screw terminal, plug-in: 0.2-2.5 mm ²	

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

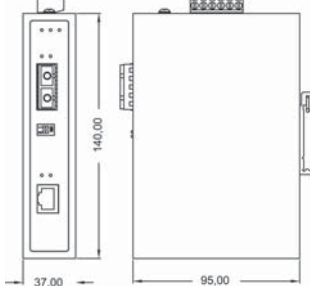
Note		
For more information on LED definition, see the data sheet.		

Ethernet - Media converter

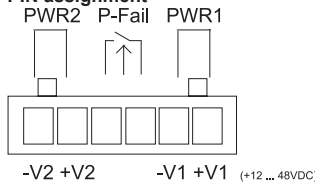
1×1000 Mbps RJ45, 1×1000 Mbps SC, Auto MDI/MDI-X auto crossover
DC 12 V - DC 48 V, redundant
Full/half duplex operation, autonegotiation, ESD 4 kV, surge 3 kV



Dimensions



PIN assignment



Description	Part-No.	Type	PU
MM=Multimode, SM=Single Mode			
Description	Media Converter MM	772030 MC2030	1
	Media Converter SM	772031 MC2031	1

Communication	772030	772031
Standard	IEEE 802.3, 802.3u, 802.3x, 802.3ab, 802.3z	
LAN	10 / 100 / 1000 Base-TX, 1000 Base-SX, 1000 Base-LX	
Cable length (segment)	Ethernet: max. 100 m, Fibre: 550 m (multimode), 10,000 m (single mode)	
Rate of transmission	Max. 1000 Mbps	
Connection technology (data)	1 × RJ45, 1 × SC, 6-pin connector	
Broadcast Storm Rate Limit	-	
Status Indication	P1, P2, P-Fail, Fibre: Link/Activity, Ethernet: 1000 M, Link/Activity	

Fibre-optic cables (Multi Mode)		
Wavelength	850nm	-
Tx Power	-4/-9.5 dBm	-
Rx sensitivity	-18 dBm	-
Parameters	50 / 125 µm, 62.5 / 125 µm	-

Fibre-optic cables (Single Mode)		
Wavelength	-	1310 nm
Tx Power	-	-3/-9.5 dBm
Rx sensitivity	-	-20 dBm
Parameters	-	9 / 125 µm

General		
DIP switch	Port Alarm, LFP	
Operation voltage range	DC 12 V - DC 48 V, redundant	
Power consumption	5.18 W	5.30 W
Operation temperature range	-10 °C – 60 °C	
Storage temperature range	-40 °C – 85 °C	
Relative humidity (operation)	5% - 95% (non-condensing)	
Relative humidity (storage)	0% - 95% (non-condensing)	
Protection class	IP 30	
Standards	UL 60950-1, CAN/CSA-C22.2 No.60950 U.S.A.: FCC Part 15 CISPR 22 EU: EN 55011, EN 61000-6-4, EN 55022 Class A, EN 61000-3-2/3, EN 55024, IEC 61000-4-2/3/4/5/6/8 EN 61000-6-2, IEC60068-2-27, IEC 60068-2-32, IEC 60068-2-6	

Approvals	
	cULus, CE, FCC

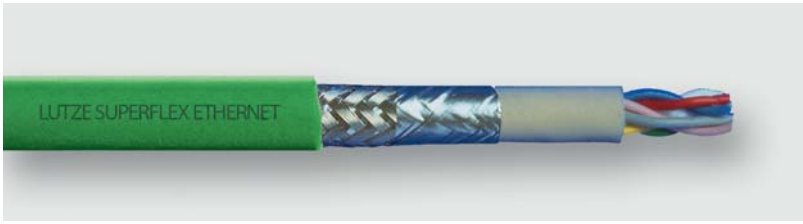
Safety	
ESD (Ethernet)	DD 4 kV
Surge (EFT for power)	DC 3 kV
Reverse voltage protection	Yes
Rated over load protection	0.9 A @ DC 12 V, resettable

Mechanics	
Dimensions (w × h × d)	37.0 × 140.0 × 95.0 mm
Housing material	Metal
Field installation	rail TS 35 (EN 50022)
Installation position	Any
Weight (kg/piece)	0.600
Termination	Screw terminal, plug-in: 0.2–2.5 mm ²

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

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

LÜTZE - Ethernet cables • Overview



ELECTRONIC Industrial Ethernet / PROFINET / ETHERCAT			
Category	Cat5	Cat5	Cat6a
Application according to	ProfiNet Typ A	Profinet Typ B	
Dimensions	2x2xAWG22/1	2x2xAWG22/7	4x2xAWG22/1
Part-No.	104301	104307	104397
Screen	SF / UTQ	SF / UTC	S / FTP
Jacket	PVC	PVC	PVC
UL	CMG, PLTC, AWM 20201 600 V	CMG, PLTC, AWM 20201 600 V	CMG, PLTC, AWM 2570 600 V

ELECTRONIC Industrial Ethernet / Ethernet IP				
Category	Cat5e	Cat5e	Cat6a	Cat7
Dimensions	4x2xAWG 26/7	4x2xAWG 24/7	4x2xAWG 26/7	4x2xAWG 26/7
Part-No.	104335	104336	104338	104331
Screen	SF / UTP	SF / UTP	S / FTP	S / FTP
Jacket	PVC	PVC	PVC	PVC
UL	CMG	CMG	CMG	CMG

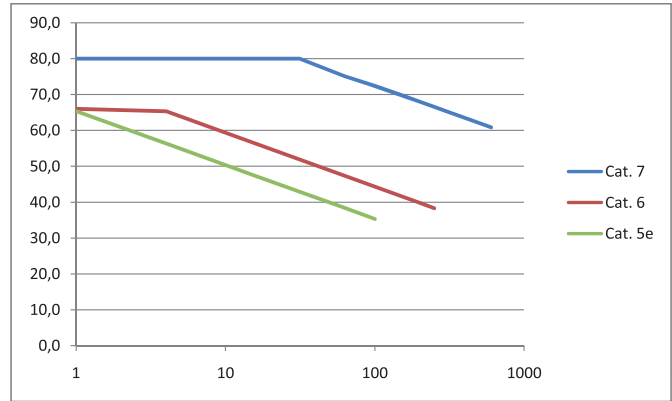
SUPERFLEX Industrial Ethernet / ProfiNet / Ethercat		
Category	Cat5	Cat5
Dimensions	2x2xAWG 22/19	2x2xAWG 22/7
Part-No.	104302	104303
Screen	SF / UTQ	SF / UTC
Jacket	PUR	PUR
UL	CMX	CMX

SUPERFLEX Industrial Ethernet / Ethernet IP				
Category	Cat5e	Cat5e	Cat5e	Cat6
Dimensions	2x2xAWG 26/19	4x2xAWG 24/19	4x2xAWG 26/19	4x2xAWG 26/19
Part-No.	104379	104337	104396	104347
Screen	SF / UTQ	SF / UTP	SF / UTP	SF / UTP
Jacket	PUR	PUR	PUR	PUR
UL	AWM	AWM	AWM	CMX

LÜTZE - Ethernet Cables • Transmission Parameters

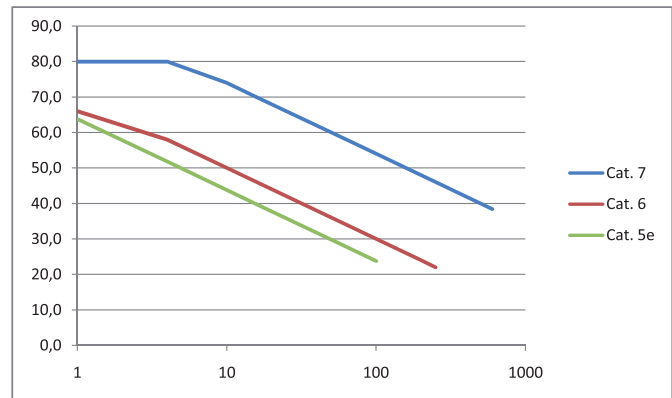
min. Near End Crosstalk (NEXT)

Frequenz	min. Near End Crosstalk (NEXT)			[Unit]
	EN 50288-2-2 Cat. 5e	EN 50288-5-2 Cat. 6	EN 50288-4-2 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



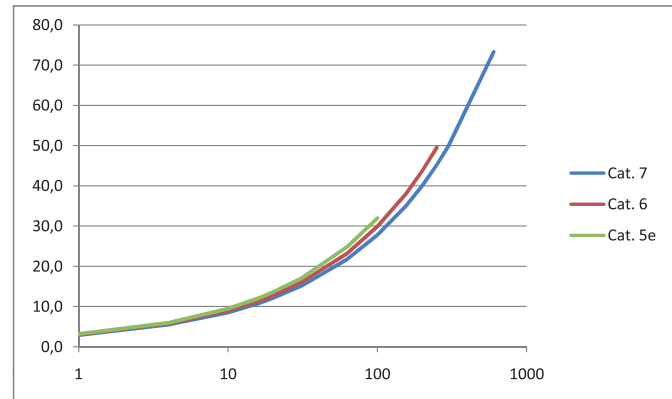
min. Far End Crosstalk (FEXT)

Frequenz	min. Far End Crosstalk (FEXT)			[Unit]
	EN 50288-2-2 Cat. 5e	EN 50288-5-2 Cat. 6	EN 50288-4-2 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



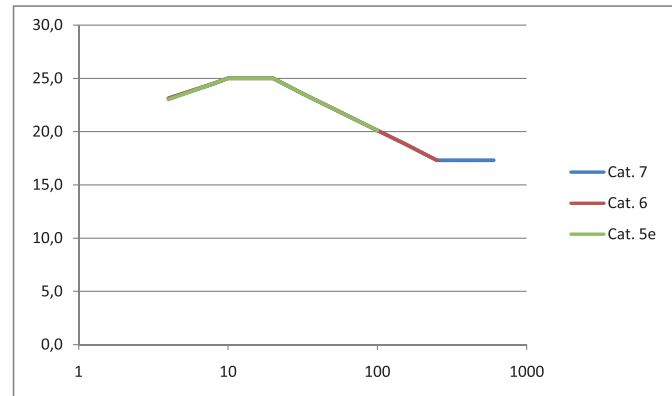
max. Attenuation (α)

Frequenz	max. Attenuation (α)			[Unit]
	EN 50288-2-2 Cat. 5e	EN 50288-5-2 Cat. 6	EN 50288-4-2 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



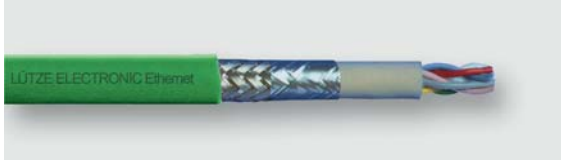
Return Loss (RL)

Frequenz	Return Loss (RL)			[Unit]
	EN 50288-2-2 Cat. 5e	EN 50288-5-2 Cat. 6	EN 50288-4-2 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



PVC Bus cables · ETHERNET

LÜTZE ELECTRONIC ETHERNET (C) PVC



Application

- For the cabling of industrial field bus systems with the globally accepted TCP/IP protocol
- For fixed installation or mobile use without continuous flexing in automation technology, transport, conveyor technology and machine tools

Properties

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

Technical data

Rated voltage	300 V
Test voltage	1500 V
Impedance	nom. 100 Ω
Loop resistance	
Wire AWG 22/1= 0.34 ²	<110 Ω/km
Wire AWG 24/7= 0.22 ²	<165 Ω/km
Wire AWG 26/7=0.14 ²	<273 Ω/km
Operating capacitance	<50 pF/m
Temperature range	
moving	-5 °C to +70 °C
run	-30 °C to +80 °C
Minimum bending radius	
moving	D × 12
fixed	D × 6
Burning behavior	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1 UL 1581 section VW-1 Flame-Test, CSA FT 4
Approvals	cULus CMG cULus PLTC cURus AWM

Construction

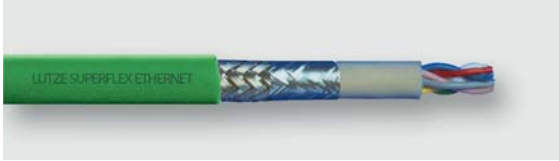
- Bare copper wire
- Wire according to AWG
- Conductor insulation Special polyolefin
- ST static shield
- Braid from tinned copper wire, optical coverage ≥ 85 %
- Jacket PVC, matte, adhesion-free surface
- Jacket color green RAL 6018

Part-No.	Number of strands/cross-section/ strand colors	Outer Ø ca. mm	Weight kg/100 m	Cu-Index kg/100 m
ELECTRONIC Industrial Ethernet/Profinet/EtherCat				
104301	(2x2xAWG22/1)StC CMG, PLTC, AWM 20201 600 V Cat5 100 MHz, SF/UTQ Star quad, FC, ProfiNet type A Transmission pair white/blue, yellow/ orange	6.5	6.9	3.2
104307	(2x2xAWG22/7)StC CMG, PLTC, AWM 20201 600 V Cat5 100 MHz, SF/UTQ Star quad, FC, ProfiNet type B Transmission pair white/blue, yellow/ orange	6.5	6.8	3.2
104397	(4x(2xAWG22/1)St)C CMG, PLTC, AWM 2570 600 V Cat6a 600 MHz, S/FTP whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	9.6	11.2	5.3
ELECTRONIC Industrial Ethernet/Ethernet IP				
104335	(4x2xAWG26/7) StC) CMG Cat5e 100 MHz, SF/UTP whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	6.3	5.5	3.0
104336	(4x2xAWG24/7) StC) CMG Cat5e 100 MHz, SF/UTP whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	7.3	6.9	3.8
104338	(4x(2xAWG26/7)St)C CMG Cat6a 500 MHz, S/FTP whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	6.4	5.8	3.3
104331	(4x(2xAWG26/7)St)C CMG Cat7 600 MHz, S/FTP whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	6.4	5.8	3.3

CE These products are in conformity with the EU Low Voltage Directive 2006/95/EC

PUR Bus cables · ETHERNET · C-track compatible

LÜTZE SUPERFLEX® ETHERNET (C) PUR For highest requirements



Application

- For the cabling of industrial field bus systems with the globally accepted TCP/IP protocol
- For fixed installation or mobile use without continuous flexing in automation technology, transport, conveyor technology and machine tools

Properties

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

Technical data

Rated voltage	250 V
Test voltage	1500 V
Impedance	nom. 100 Ω
Loop resistance	
AWG 22/7= 0.34 ²	<110 Ω/km
AWG 22/19= 0.34 ²	<110 Ω/km
AWG 24/19= 0.24 ²	<159,5 Ω/km
AWG 26/19= 0.14 ²	<280 Ω/km
Operating capacitance	<50 pF/m
Temperature range	
moving	-30 °C to +70 °C
fixed	-40 °C to +80 °C
Minimum bending radius	
moving	D × 12
fixed	D × 6
Burning behavior	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1, UL 1581 section VW-1 Flame-Test, CSA FT 1
Halogen free	according to EN 50267-2-1
Approvals	cULus CMX cURus AWM

Construction

- Bare copper wire
- Wire according to AWG
- Conductor insulation Special polyolefin
- ST static shield
- Halogen-free sub jacket
- Braid from tinned copper wire, optical coverage ≥ 85 %
- Jacket special-PUR, matte, adhesion-free surface
- Jacket color green RAL 6018

Part-No.	Number of strands/cross-section/ strand colors	Outer Ø ca. mm	Weight kg/100 m	Cu-Index kg/100 m
SUPERFLEX Industrial Ethernet/ProfiNet/Ethercat				
104302	(2×2×AWG22/19)StC CMX Cat5 100 MHz, SF/UTQ Star quad Transmission pair white/blue, yellow/ orange	6.6	6.3	3.2
104303	(2×2×AWG22/7)StC CMX Cat5 100 MHz, SF/UTQ Star quad, Profinet type C Transmission pair white/blue, yellow/ orange	6.5	6.5	3.0
SUPERFLEX Industrial Ethernet/Ethernet IP				
104379	(2×2×AWG26/19) AWM 21198 Cat5e 100 MHz, SF/UTQ white, blue, yellow, orange	5.3	3.5	1.8
104337	(4×2×AWG24/19) AWM 21198 Cat5e 100 MHz, S/UTP whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	7.8	8.5	4.4
104396	(4×2×AWG26/19) AWM 21198 Cat5e 100 MHz, SF/UTP whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	6.7	5.1	2.8
104347	(4×2×AWG26/19) CMX Cat6 350 MHz, SF/UTP whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	7.9	7.4	3.4

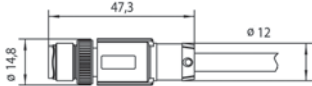
CE These products are in conformity with the EU Low Voltage Directive 2006/95/EC

Actuator sensor interface · Network cables PROFINET

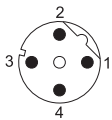
Male M12 straight with PUR cable, shielded 360°, open end
self-locking screwed connection
c-track compatible, halogen free



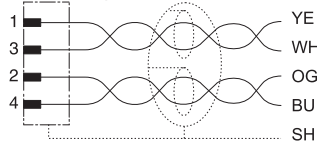
Dimensions



PIN assignment



Circuit diagram



Description	Part-No.	Type	PU	
Cable length (m)	2.0	475300.0200	STG4-M12/PN 2M-PUR	1
	5.0	475300.0500	STG4-M12/PN 5M-PUR	1
	10.0	475300.1000	STG4-M12/PN 10M-PUR	1

Technical data

Nominal voltage	AC/DC 24 V		
Nominal voltage range	max. 30 V		
Rated current	4 A		
Pol number	4		
Cable length (m)	2.0	5.0	10.0
Status Indication	-		
Current Consumption per LED	-		
Coding	D		
Shielding	360°		

General

Form	M12 × 1, male straight		
Rated insulation voltage (EN 50178)	250 V		
Test voltage	1.5 kV		
Pollution degree	3		
Insulation resistance	>10 ⁹ Ω		
Contact resistance	< 5 mΩ		
Class of flammability according to UL 94	V0		
Protection class	IP65/IP67		
Housing material	TPU black		
Contact material	CuSn, gold plated nickel		
Thread material	Zinc die-casting, nickel-plated		
Gasket	-		
Cable construction	1 × 4 × AWG 22/7		
Cable jacket	PUR, RAL 6018 green		
Conductor insulation	white/yellow/blue/orange		
Cable diameter	6.5 mm		
Bending radius	10 x cable diameter		
Storage temperature range	-40 °C – 90 °C		
Temperature range connector	-25 °C – 90 °C		
Temperature range cable fixed	-40 °C – 70 °C		
Temperature range cable moving	-40 °C – 70 °C		
Mechanical service life	-		
Weight (kg/piece)	0.140	0.330	0.640
Approvals	the cable is UL, CSA certified 80° 300V		

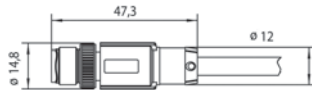
Accessories	Article number	Type	PU
Cable markers 4×23mm	499988	LB M8/M12	5
Torque setting tool M12	490091	DM-SET M12	1

Actuator sensor interface · Network cables PROFINET

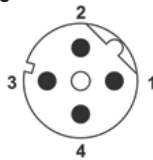
Male M12 straight on male M12 straight with PUR cable, shielded 360°
self-locking screwed connection
c-track compatible, halogen free



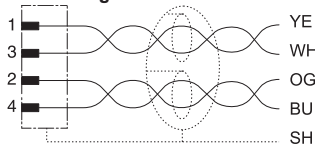
Dimensions



PIN assignment



Circuit diagram



Description		Part-No.	Type	PU
Cable length (m)	0.3	475400.0030	STG4-M12/STG4-M12/PN 0,3M PUR	1
	0.6	475400.0060	STG4-M12/STG4-M12/PN 0,6M PUR	1
	1.0	475400.0100	STG4-M12/STG4-M12/PN 1,0M PUR	1
	1.5	475400.0150	STG4-M12/STG4-M12/PN 1,5M PUR	1
	2.0	475400.0200	STG4-M12/STG4-M12/PN 2,0M PUR	1
	5.0	475400.0500	STG4-M12/STG4-M12/PN 5,0M PUR	1

Technical data

Nominal voltage	AC/DC 24 V					
Nominal voltage range	max. 30 V					
Rated current	4 A					
Pol number	4					
Cable length (m)	0.3	0.6	1.0	1.5	2.0	5.0
Status Indication	-					
Current Consumption per LED	-					
Coding	D					
Shielding	360°					

General

Form	M12 × 1, male straight / M12 × 1, male straight					
Rated insulation voltage (EN 50178)	250 V					
Test voltage	1.5 kV					
Pollution degree	3					
Insulation resistance	>10 ⁹ Ω					
Contact resistance	< 5 mΩ					
Class of flammability according to UL 94	V0					
Protection class	IP65/IP67					
Housing material	TPU black					
Contact material	CuSn, gold plated nickel					
Thread material	Tin die casting, nickel-plated					
Gasket	-					
Cable construction	1 × 4 × AWG 22/7					
Cable jacket	PUR, RAL 6018 green					
Conductor insulation	white/yellow/blue/orange					
Cable diameter	6.5 mm					
Bending radius	10 x cable diameter					
Storage temperature range	-30 °C – 90 °C					
Temperature range connector	-25 °C – 90 °C					
Temperature range cable fixed	-40 °C – 70 °C					
Temperature range cable moving	-40 °C – 70 °C					
Mechanical service life	-					
Weight (kg/piece)	0.060	0.070	0.090	0.110	0.150	0.325
Approvals	the cable is UL, CSA certified 80° 300V					

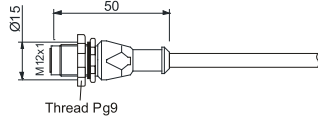
Accessories	Article number	Type	PU
Cable markers 4×23mm	499988	LB M8/M12	5
Torque setting tool M12	490091	DM-SET M12	1

Actuator sensor interface · Network cables PROFINET

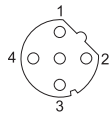
M12 panel connectors using PG9 thread for rear panel installation, open end Female - D coded (Ethernet Cat. 5e) shielded



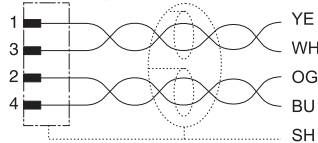
Dimensions



PIN assignment



Circuit diagram



Description	Part-No.	Type	PU	
Cable length (m)	2.0	475500.0200	KUGE-M12/PN 2M PUR	1
	5.0	475500.0500	KUGE-M12/PN 5M PUR	1
	10.0	475500.1000	KUGE-M12/PN 10M PUR	1

Technical data

Nominal voltage	AC/DC 24 V		
Nominal voltage range	max. 30 V		
Rated current	4 A		
Pol number	4		
Cable length (m)	2.0	5.0	10.0
Status Indication	-		
Current Consumption per LED	-		
Coding	D		
Shielding	360°		

General

Form	M12 × 1, female		
Rated insulation voltage (EN 50178)	250 V		
Test voltage	1.5 kV		
Pollution degree	3		
Insulation resistance	>10 ⁹ Ω		
Contact resistance	< 5 mΩ		
Class of flammability according to UL 94	-		
Protection class	IP65/IP67		
Housing material	TPU black		
Contact material	CuSn, gold plated nickel		
Thread material	nickel-plated		
Gasket	-		
Cable construction	1 × 4 × AWG 22/7		
Cable jacket	PUR, RAL 6018 green		
Conductor insulation	white/yellow/blue/orange		
Cable diameter	6.5 mm		
Bending radius	10 x cable diameter		
Storage temperature range	-40 °C – 90 °C		
Temperature range connector	-25 °C – 90 °C		
Temperature range cable fixed	-40 °C – 70 °C		
Temperature range cable moving	-40 °C – 70 °C		
Mechanical service life	-		
Weight (kg/piece)	0.140	0.330	0.640

Approvals the cable is UL, CSA certified 80° 300V

Accessories	Article number	Type	PU
Cable markers 4×23mm	499988	LB M8/M12	5
Torque setting tool M12	490091	DM-SET M12	1

Classification Ethernet Cable and - connector

Connector RJ45 and M12



RJ45 Connector straight

Page 38



RJ45 Connector angled

Page 39



M12 Connector D coded

Page 36



M12 Connector X coded

Page 35

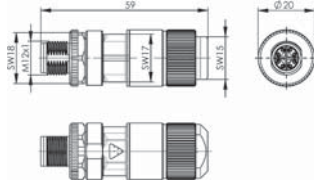
Connector	RJ45 T568B Part-No. 490129 / 490152						RJ45 T568A Part-No. 490128 / 490151						RJ45 T568B AWG26 Part-No. 490138 / 490153						M12 D coded Part-No. 490074						M12 X-coded Part-No. 490150					
	Cat 6 _A						Cat 6 _A						Cat 6 _A						Cat 5e						Cat 6 _A					
	Profinet, 2 and 4-pair, AWG 22	Ethercat, 2-pair, AWG 22-26	SERCOS, 2-pair, AWG 22	Ethernet/IP, 2 and 4-pair, AWG 22-26	Powerlink, 2-pair, AWG 22	Profinet, 2 and 4-pair, AWG 22	Ethercat, 2-pair, AWG 22-26	SERCOS, 2-pair, AWG 22	Ethernet/IP, 2 and 4-pair, AWG 22-26	Powerlink, 2-pair, AWG 22	Profinet, 2 and 4-pair, AWG 22	Ethercat, 2-pair, AWG 22-26	SERCOS, 2-pair, AWG 22	Ethernet/IP, 2 and 4-pair, AWG 22-26	Powerlink, 2-pair, AWG 22	Profinet, 2 und 4 paarig, AWG 22	Ethercat, 2-pair, AWG 22-26	SERCOS, 2-pair, AWG 22	Ethernet/IP, 2 and 4-pair, AWG 22-26	Powerlink, 2-pair, AWG 22	Profinet, 2 and 4-pair, AWG 22	Ethercat, 2-pair, AWG 22-26	SERCOS, 2-pair, AWG 22	Ethernet/IP, 2 and 4-pair, AWG 22-26	Powerlink, 2-pair, AWG 22					
	c-track compatible	Cat																												
Cables																														
Part-No. 104301 (2x2AWG22/1)StC		5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Part-No. 104302 (2x2AWG22/19)StC	•	5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Part-No. 104303 (2x2AWG22/7)StC	•	5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Part-No. 104307 (2x2AWG22/7)StC		5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
Part-No. 104331 (4x(2xAWG26/7)St)C		7														•									•					
Part-No. 104335 (4x2xAWG26/7)StC		5e														•									•					
Part-No. 104336 (4x2xAWG24/7)StC		5e				•				•															•					
Part-No. 104337 (4x2xAWG24/19)StC	•	5e				•				•															•					
Part-No. 104338 (4x(2xAWG26/7)St)C		6 _A														•									•					
Part-No. 104347 (4x2xAWG26/19)	•	6														•									•					
Part-No. 104379 (2x2xAWG26/19)	•	5e														•	•				•	•								
Part-No. 104396 (4x2xAWG26/19)StC	•	5e														•									•					
Part-No. 104397 (4x(2xAWG22/1)St)C		6 _A	•			•			•					•							•				•					

Actuator sensor interface · M12 - connector

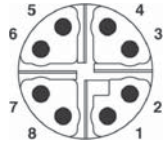
Field wireable connector, M12 straight shielded
 Male - X coded Cat 6_A (Ethernet, Profinet)
 IDC quick-connect technology



Dimensions

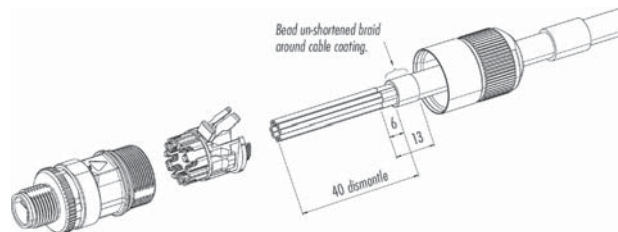


Pin layout



Description	Part-No.	Type	PU
Male			
Pol number	8	490150	STGK8-M12(C) 8pol. X-cod. Cat.6A
			1
Technical data		Male	
Nominal voltage		AC/DC 48 V	
Rated current		0.5 A	
Pol number		8	
Coding		X	
Shielding		360°	
General			
Form		M12 × 1, male	
Pollution degree		3	
Insulation resistance		>10 ¹⁰ Ω	
Class of flammability according to UL 94		V0	
Contact resistance		≤5 mΩ	
Protection class		IP 67, in screwed condition	
Housing material		Zinc die-casting, nickel-plated	
Contact material		CuZn, gold-plated	
Gasket		NBR	
Strand diameter		0.9 – 1.6 mm	
Cable diameter		5.5 – 9.0 mm	
Storage temperature range		-40 – 85 °C	
Temperature range connector		-40 °C – 85 °C	
Termination		Insulation displacement connection technology	
Cross section		AWG24/1 – AWG22/1, AWG27–AWG22/7	
Mechanical service life		≥ 100 insertion cycles	
Weight (kg/piece)		0.073	
Accessories		Article number	Type
matching cables		104338	(4x(2xAWG26/7)St)C
		104331	(4x(2xAWG26/7)St)C
		104347	(4×2×AWG26/19) CMX

Mounting diagram

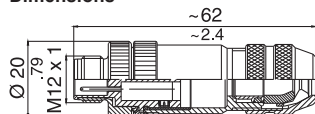


Actuator sensor interface · M12 - connector

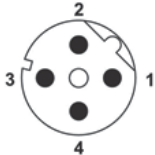
Field wireable connector, M12 straight shielded Male - D coded Cat 5e (Ethernet, Profinet) Screw terminal



Dimensions

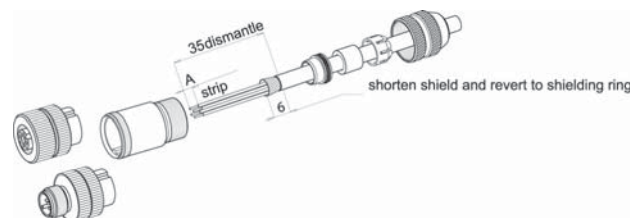


Pin layout



Description	Part-No.	Type	PU	
Male				
Pol number	4	490074	STGK4-M12 (C)-D	1
Technical data				
Nominal voltage		AC/DC 24 V		
Nominal voltage range		max. 60 V		
Rated current		4 A		
Pol number		4		
Cable length (m)		–		
Status Indication		–		
Current Consumption per LED		–		
Coding		D		
Shielding		360°		
General				
Form		M12 × 1, male		
Test voltage		2.95 kV		
Rated insulation voltage (EN 50178)		250 V		
Pollution degree		3		
Insulation resistance		>10 ¹⁰ Ω		
Contact resistance		<3 mΩ		
Class of flammability according to UL 94		HB		
Protection class		IP 67, in screwed condition		
Housing material		Zinc die-casting, nickel-plated		
Contact material		CuZn, gold-plated		
Thread material		CuSn nickel plated		
Gasket		NBR		
Cable construction		–		
Cable jacket		–		
Conductor insulation		–		
Cable diameter		6 – 8 mm		
Bending radius		–		
Storage temperature range		-40 °C – 90 °C		
Temperature range connector		-25 °C – 85 °C		
Termination		Screw terminal		
Cross section		without AE: 0.25–0.75 mm ² with AE: 0.14–0.75 mm ²		
Mechanical service life		>100 insertion cycles		
Weight (kg/piece)		0.045		
Approvals		–		
Comments				
suitable for Ethernet and Profinet, see bus cables				

Mounting diagram

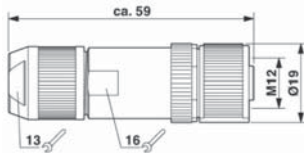


Actuator sensor interface · M12 - connector

Field wireable connector, M12 straight shielded Female - D coded Cat 5e (Ethernet, Profinet) Shield termination via iris spring, cage clamp



Dimensions



Pin layout

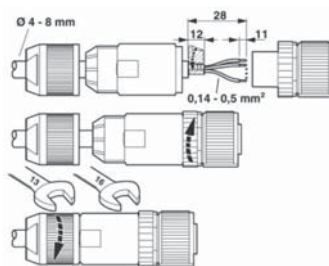


Description	Part-No.	Type	PU
Female			
Description	Female	490095	KUGK4-M12 (C)-D
			1
Technical data		4	
Nominal voltage		AC/DC 24 V	
Nominal voltage range		max. 60 V	
Rated current		Max. 4 A per contact	
Pol number		4	
Cable length (m)		–	
Status Indication		–	
Current Consumption per LED		–	
Coding		D	
Shielding		360°	
General			
Form		M12 × 1, female	
Rated insulation voltage (EN 50178)		60 V	
Test voltage		0.8 kV	
Pollution degree		3	
Insulation resistance		>10 ¹⁰ Ω	
Contact resistance		<8 mΩ	
Class of flammability according to UL 94		V0	
Protection class		IP 67, in screwed condition	
Housing material		Zinc die-casting, nickel-plated	
Contact material		CuSn, gold-plated	
Thread material		CuSn nickel plated	
Gasket		NBR	
Cable construction		–	
Cable jacket		–	
Conductor insulation		–	
Cable diameter		4 – 8 mm	
Bending radius		–	
Storage temperature range		-40 °C – 90 °C	
Temperature range connector		-40 °C – 85 °C	
Termination		Cage clamp 0.14 mm ² – 0.5 mm ² / 26 AWG – 20 AWG	
Mechanical service life		≥ 100 insertion cycles	
Weight (kg/piece)		0.042	
Approvals		–	

Comments

suitable for Ethernet and Profinet, see bus cables

Mounting diagram



Actuator sensor interface · RJ45 connector

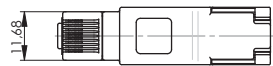
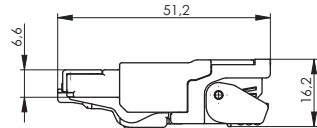
Industrial connector RJ45

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

Cat 6_A

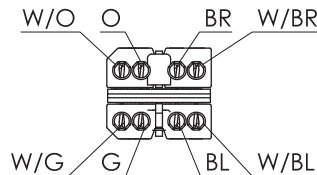


Dimensions

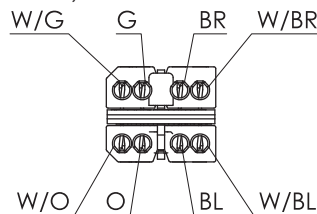


Connection assignment

490128



490129, 490138



Description	Part-No.	Type	PU	
Description	Connection according to TIA 568 B	490128	RJ45-M 8pol. Cat.6A T568B	1
	Connection according to TIA 568 A	490129	RJ45-M 8pol. Cat.6A T568A	1
	Connection according to TIA 568 B	490138	RJ45-M 8pol. Cat.6A T568B AWG26	1

Technical data	490128	490129	490138
Nominal voltage		30 V	
Nominal voltage range		–	
Rated current		Max. 1.0 A per contact	
Pol number		8	
Cable length (m)		–	
Transmission frequency		10 Gigabit/s	
Category		6 _A (ISO/IEC 11801, DIN EN 50173-1)	
Contact type		Penetration contacts	
Shielding		yes	
General			
Form		RJ45 (IEC 60603-7-51)	
Rated insulation voltage (EN 50178)		–	
Test voltage		–	
Pollution degree		1	
Insulation resistance		≥500 MΩ	
Contact resistance		≤20 mΩ	
Class of flammability according to UL 94		V0	
Protection class		IP 20	
Housing material		Zinc die-casting, nickel-plated/PBT black	
Coverage		PBT black	
Contact material		Spring steel 0.8 μm gold-plated	
Field installation		–	
Installation depth		–	
Strand diameter		0.85 – 1.6 mm	0.85 – 1.1 mm
Cable construction		–	
Cable jacket		–	
Cable diameter		5 – 9 mm	
Cross section		AWG 24/1-22/1, AWG 27/7-22/7	AWG 26/1, AWG 26/7, AWG 26/19
Operation temperature range		-40 °C – 70 °C	
Storage temperature range		-40 °C – 70 °C	
Mechanical service life		≥ 750 insertion cycles	
Dimensions (w × h × d)		13.8 × 16.2 × 53.1 mm	
Weight (kg/piece)		0.025	
Approvals		cULus	
Standards		IEC 60603-7-51	

Comments

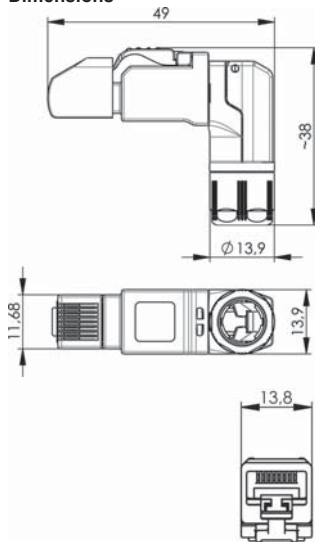
Geeignet für Profinet, SERCOS3, Ethercat, Ethernet/IP, Powerlink, VARAN, Power over Ethernet+ (PoE+IEEE 802.3at)
Geeignete Leitungen, siehe Übersicht Zuordnung Ethernetleitungen zu Stecker.

Actuator sensor interface · RJ45 connector

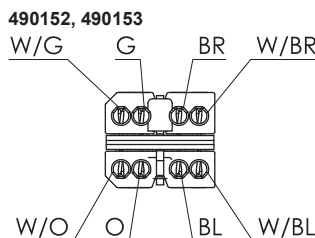
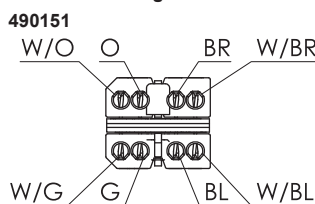
Industrial connector RJ45, angled
solid metal housing, quick-connect technology AWG 27–22
Cat 6A



Dimensions



Connection assignment



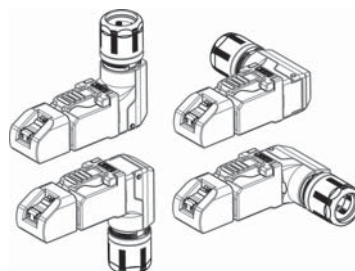
Description	Part-No.	Type	PU	
Description	Connection according to TIA 568 B	490151	RJ45-X 8pol. Cat.6A T568B	1
	Connection according to TIA 568 A	490152	RJ45-X 8pol. Cat.6A T568A	1
	Connection according to TIA 568 B	490153	RJ45-X 8pol. Cat.6A T568B AWG26	1

Technical data	490151	490152	490153
Nominal voltage		30 V	
Nominal voltage range		–	
Rated current		Max. 1.0 A per contact	
Pol number		8	
Cable length (m)		–	
Transmission frequency		10 Gigabit/s	
Category		6A (ISO/IEC 11801, DIN EN 50173-1)	
Contact type		Penetration contacts	
Shielding		yes	
General			
Form		RJ45 (IEC 60603-7-51), cable output 90° rotating	
Rated insulation voltage (EN 50178)		–	
Test voltage		–	
Pollution degree		1	
Insulation resistance		≥500 MΩ	
Contact resistance		≤20 mΩ	
Class of flammability according to UL 94		V0	
Protection class		IP 20	
Housing material		Zinc die-casting, nickel-plated/PBT black	
Coverage		PBT black	
Contact material		Spring steel 0.8 µm gold-plated	
Field installation		–	
Installation depth		–	
Strand diameter		1.0 – 1.6 mm	0.85 – 1.1 mm
Cable construction		–	
Cable jacket		–	
Cable diameter		5.5 – 10.0 mm	
Cross section		AWG 24/1-22/1, AWG 27/7-22/7	AWG 26/1-24/1, AWG 27/7-24/7, AWG 26/19
Operation temperature range		–40 °C – 85 °C	
Storage temperature range		–40 °C – 85 °C	
Mechanical service life		≥ 750 insertion cycles	
Dimensions (w × h × d)		13.9 × 41.0 × 45.7 mm	
Weight (kg/piece)		0.030	
Approvals		cULus	
Standards		IEC 60603-7-51	

Comments

Geeignet für Profinet, SERCOS3, Ethercat, Ethernet/IP, Powerlink, VARAN, Power over Ethernet+ (PoE+IEEE 802.3at)
Geeignete Leitungen, siehe Übersicht Zuordnung Ethernetleitungen zu Stecker.

Mounting diagram

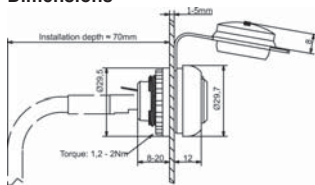


Actuator sensor interface · RJ45 panel connector

RJ45 panel connector for front installation 22.5 mm
female/female 1:1
Cat 5e/6

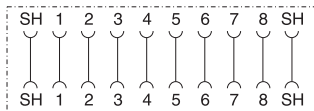


Dimensions

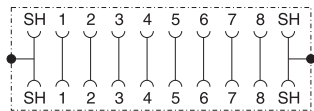


Circuit diagram

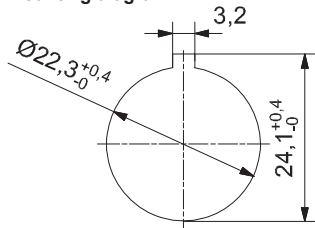
492075



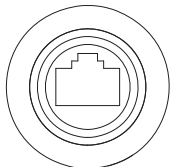
491075



Mounting diagram



front view:



Description	Part-No.	Type	PU
Category			
Cat.5e	492075	RJ45 F/F 8/8 Cat.5e	1
Cat.6	491075	RJ45 F/F 8/8 Cat.6	1

Technical data	492075	491075
Nominal voltage		AC 24 V
Nominal voltage range	AC 50 V	AC 150 V
Rated current		1.5 A
Pol number		8
Cable length (m)		–
Rate of transmission	100 MHz	250 MHz
Category	5e	6
Contact type		1 : 1
Shielding	shield connected through	360° shielding
Coding		–

General

Form	RJ45
Rated insulation voltage (EN 50178)	–
Test voltage	–
Pollution degree	3
Insulation resistance	≥100 MΩ
Contact resistance	≤30 mΩ
Class of flammability according to UL 94	V0
Protection class	IP 65 and NEMA UL Type 12 in closed and IP 20 in inserted condition
Housing material	PA-GF25; PBT GF20; Coverage TPU
Coverage	TPU
Contact material	CuSn, gold-plated
Field installation	Front plate cutout D=22.5mm
Installation depth	approx. 70 mm
Cable construction	8 (4-pair)
Cable jacket	–
Cable diameter	–
Bending radius	–
Operation temperature range	-25 °C – 70 °C
Storage temperature range	-25 °C – 80 °C
Mechanical service life	<750 insertion cycles
Dimension	(?×D) 29.5 × 29 mm
Weight (kg/piece)	0.016
Approvals	cULus
Standards	–

Actuator sensor interface - RJ45 panel connector

Control cabinet bushing M12 - RJ45 female/female 1:1 Cat 5e (Ethernet, Profinet)

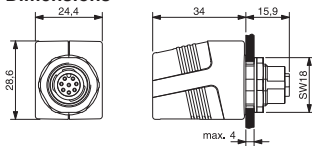


Description	Part-No.	Type	PU
4 pole 90°	490105	M12-R45 F/F 90° 4/4 Cat.5e PROFINET	1
4 pole 180°	490106	M12-R45 F/F 180° 4/4 Cat.5e PROFIL-NET	1
8 pole 90°	490107	M12-R45 F/F 90° 8/8 Cat.5e	1
8 pole 180°	490108	M12-R45 F/F 180° 8/8 Cat.5e	1

Technical data	490105	490106	490107	490108
Nominal voltage			24 V	
Nominal voltage range			50 V	
Rated current			max. 1 A per contact	
Pol number	4			8
Cable length (m)			-	
Rate of transmission		100 Mbit/s		1 Gbit/s
Category	5e			6
Contact type			1 : 1	
Shielding			360° shielding	
Coding	D			A

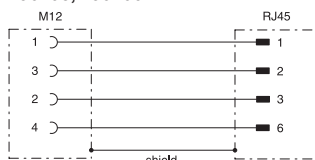
General	
Form	RJ45 / M12 x 1
Rated insulation voltage (EN 50178)	-
Test voltage	-
Pollution degree	3
Insulation resistance	≥100 MΩ
Contact resistance	≤30 mΩ
Class of flammability according to UL 94	V0
Protection class	IP 67 in screwed condition
Housing material	PA
Coverage	-
Contact material	Phosphor bronze, gold-plated
Field installation	-
Installation depth	approx. 70 mm
Cable construction	-
Cable jacket	-
Cable diameter	-
Bending radius	-
Operation temperature range	-25 °C – 85 °C
Storage temperature range	-25 °C – 85 °C
Mechanical service life	≥ 750 insertion cycles
Dimension	(?x?) 29.5 × 29 mm
Weight (kg/piece)	0.037
Approvals	-
Standards	-

Dimensions

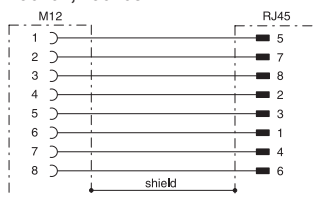


Circuit diagram

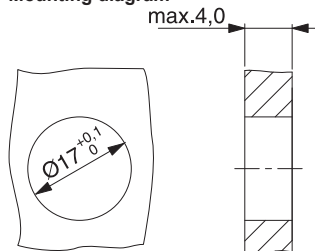
490105, 490106



490107, 490108



Mounting diagram

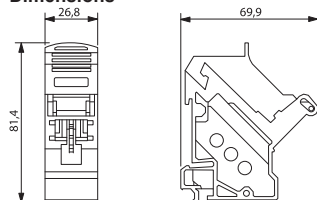


Interface Technology · Ethernet connectivity

Module holder, RJ45, female / IDC For TS35 DIN rail Cat 6



Dimensions



Connection assignment

	TIA 568A	TIA 568 B	Profinet
1	WHGN	WHOG	YE
2	GN	OG	OG
3	WHOG	WHGN	WH
4	BU	BU	-
5	WHBU	WHBU	-
6	OG	GN	BU
7	WHBR	WHBR	-
8	BR	BR	-

Description	Part-No.	Type	PU
Suitable for Ethernet applications			
Description	8-pin	MDT-RJ45 F Cat.6	1
Technical data			
		772104	
Nominal voltage	30 V		
Nominal voltage range	-		
Rated current	Max. 1.0 A per contact		
Pol number	8		
Cable length (m)	-		
Transmission frequency	250 MHz		
Category	6		
Contact type	IDC		
Shielding	yes		
General			
Form	RJ45		
Rated insulation voltage (EN 50178)	-		
Test voltage	-		
Pollution degree	1		
Insulation resistance	≥100 MΩ		
Contact resistance	≤50 mΩ		
Class of flammability according to UL 94	V0		
Protection class	IP 20		
Housing material	PC-GF grey		
Contact material	CuSn, gold-plated		
Field installation	-		
Installation depth	-		
Cable construction	-		
Cable jacket	-		
Cable diameter	4.5 – 8 mm		
Cross section	AWG 24-22		
Operation temperature range	-10 °C – 60 °C		
Storage temperature range	-40 °C – 70 °C		
Mechanical service life	≥ 750 insertion cycles		
Dimensions (w × h × d)	36.0 × 36.0 × 27.5 mm		
Weight (kg/piece)	0.063		
Approvals	-		
Standards	-		
Accessories			
Patch cable RJ45 Cat.5e	192000.xxxx	xxxx cable length from 0.5 - 30 m	1
Patch cable RJ45 Cat.6e	192100.xxxx	xxxx cable length from 0.5 - 30 m	1

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)

Access Protocol Access procedure. Governs access to the medium. Ethernet: CSMA/CD; Token Ring: Token FDDI: Append Token; WLAN: CSMA/CA

Access procedure -> Access Protocol.

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.

Agging 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.

Autonegotiation Detects on the port the transmission parameters of the connected device, such as speed, duplex mode and flow control, and automatically adjusts itself to the optimal values.

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 Bayonet 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 Bayonet Neill-Concelman. 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 See Destination address.

Attenuation Ratio of power fed to power received on a transmission line, both for copper cables and for fibre-optic cables. Specified in dB per unit of length

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.

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. -> Collisions 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.

LÜTZE - Ethernet Connectivity · Glossary

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

Electromagnetic compatibility. Interference immunity and emissions behaviour with regard to electromagnetic interference, Class A/B.

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.

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 fuse 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, concentrator.

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: <http://www.iaona-eu.com/>

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 is 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.

LÜTZE - Ethernet Connectivity · Glossary

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

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 computer.

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 user-names.

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.

PMD 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

LÜTZE - Ethernet Connectivity • Glossary

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 a 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

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.

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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. www.luetze.de

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. --> <http://www.wi-fi.net>

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).

WDM With the WDM 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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Industrial PoE Splitter, Model(s) ET-PPPET

Industrial Switch, Model(s) ET-SWGU1BST, ET-SWGUSET, ET-SWGUSET, ET-SWU4-1STC, ET-SWU4-2STC, ET-SWUSET, ET-SWUSET, ET-SWUBST, ET-SWUBST, MC-2030, MC-2031, MC-2032, MC-2033

Industrial Switch Hub, Model(s) ET-SWGUSET

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

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R345 Angle Plugs, Model(s) 49015X X = 1, wire sorting device B (white); X = 2, wire sorting device A (white); X = 3, wire sorting device B (grey)

R345/R345 Coupler Module, Model(s) R345 F/F R/B Cat. 5e (P/N 492075) (*12), R345 F/F R/B Cat. 6 (P/N 491075) (*12), R345 F/F R/B Cat. 3 (P/N 490075) (*12)

STP Plug, Model(s) 490129, 490128, 490138

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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RoHS

Germany
 Friedrich Lütze GmbH
 Postfach 12 24 (PLZ 71366)
 Bruckwiesenstrasse 17-19
 D-71384 Weinstadt
 Tel.: +49 7151 6053-0
 Fax: +49 7151 6053-277(-288)
 info@luetze.de



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United Kingdom
 LÜTZE Ltd.
 Unit 3 Sandy Hill Park
 Sandy Way, Amington
 Tamworth, Staffs, B77 4DU
 Tel.: +44 1827 31333-0
 Fax: +44 1827 31333-2
 sales.gb@luetze.co.uk

USA
 LUTZE INC.
 13330 South Ridge Drive
 Charlotte, NC 28273
 Tel.: +1 704 504-0222
 Fax: +1 704 504-0223
 info@luetze.com

Austria
 LÜTZE Elektrotechnische
 Erzeugnisse Ges.m.b.H.
 office@luetze.at

Switzerland
 LÜTZE AG
 info@luetze.ch

France
 LUTZE SASU
 lutze@lutze.fr

Spain
 LUTZE, S.L.
 info@lutze.es

China
 Luetze Trading (Shanghai) Co.Ltd.
 info@luetze.cn

