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**Safe. Fast.
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DataVoice

Circular connectors STX M12x1 IP67

Connector series for Railway & Vehicle Applications

STX M12x1 IP67 connector series

With the STX M12x1 IP67 connector series for Railway and Vehicle Applications Telegärtner offers various solutions for applications in harsh environments.

The series contains M12x1 X-coded connectors as plug and socket versions which are suitable for connecting to cables with both solid and stranded conductors as well as offering 360° shielding. This shielding ensures safe and reliable data transmission.

The range is completed with factory-made cable assemblies for connections between end device and end device or end device and distribution point. The cable assemblies are available in multiple configurations and the packaging and cable printing can be individually customized.

Designed for transmitting maximum data rates in transport industry



As 8-pole, X-coded compact connectors in Cat.6_A, the M12 from Telegärtner can transmit data rates of up to 10 Gbit/s in accordance with IEC 61076-2-109:2014. Even in harsh environments, the high bandwidth is ensured by separating the four pairs with a cross shield (X-coding). Remote powering of end devices is also possible.

The expansion of communication infrastructure in rail and vehicle applications is advancing to make the on-board experience as comfortable and entertaining as possible for the passengers. In addition to real-time information about the train schedule, passengers want the flexibility to be able to work and surf on board. Besides the onboard applications for passengers, even more processes are being automated by the vehicle operators. So for example processes like security systems where the carriages will be monitored by IP cameras or traffic flows will be managed automatically by the individual trains.

Therefore the train manufacturers are obliged to constantly improve their communication network infrastructure in the vehicles so they can offer a working, safe and reliable network.



Passanger Information System



Display Board



IP-Camera

STX M12x1 Bulkhead Sockets X-coded IP67

An important part of the STX M12x1 connector series are the bulkhead sockets in Cat 6_A. These are available both with housings for front or rear mounting or as a version without housing which has a quadruple shield contact to the printed circuit board and

feature versatile mounting possibilities. The bulkhead sockets are available in both 180° and 90° versions, offering a high degree of flexibility due to the different installation possibilities.



STX M12x1 Bulkhead Socket X-coded

Mechanical Characteristics

Connectors	IEC 61076-2-109:2014
Insertion force	≤ 30 N
Durability (mating cycles)	≥ 100
Material: housing	zinc diecast nickel plated / brass nickel plated
Material: contact body	PA
Material: contacts	CuSn
Material: contact finish	Au
Material: gaskets	FKM; NBR

Environmental Requirements

Shock	50 g
Protection against particle ingress	IP6X
Protection against water / immersion	IPX7
Ambient temperature	-40° C to +85° C

Electrical Characteristics

Contact resistance	≤ 5 mΩ
Insulation resistance	≥ 100 mΩ
Voltage proof: contact-contact	≥ 500 V, DC
Voltage proof: contact-shield	≥ 500 V, DC
PoE+ acc to IEEE 802.3at	Adequate for Power over Ethernet+

Transmission Characteristics

10 Gigabit Ethernet acc. to IEEE 802.3an	Adequate for 10 Gigabit Ethernet
Category 6 _A	ISO/IEC 11801; DIN EN 50173-1
Class E _A	ISO/IEC 11801; DIN EN 50173-1

STX M12x1 Cable Plug and Cable Socket X-coded IP67

The basic structure of the new Telegärtner connector with X-coding corresponds to the M12 system used worldwide. This has found its way into many different industries with extreme conditions thanks to its compact design and industrial compatibility. The extremely

robust M12x1 connector in Category 6_A can be fitted on site without any special tools. This assembly-friendly connector also features very good shield contacting and covers a wide range of wire diameters (0.9 – 1.6mm) and cable diameters (5.5 – 9mm).



STX M12x1 X-coded Cable Plug and Cable Socket

Mechanical Characteristics

Connectors	IEC 61076-2-109:2014
Insertion force	≤ 30 N
Durability (mating cycles)	≥ 100
Material: housing	zinc diecast nickel plated / brass nickel-plated
Material: wire pair presorting	PA UL94 V0
Material: shield	German Silver
Material: pressure screw	brass nickel-plated
Material: contacts	brass
Material: contact finish	Au over Ni
Wire diameter	0.9 - 1.6 mm
Cu-Conductor diameter: stranded	0.46 - 0.76 mm (AWG27 - 22/7)
Cu-Conductor diameter: solid	0.51 - 0.64 mm (AWG24 - 22/1)
Cable diameter	5.5 - 9.0 mm

Environmental Requirements

Shock	50 g
Protection against particulate ingress	IP6X
Protection against water / immersion	IPX7
Ambient temperature	-40 °C to +85 °C

Electrical Characteristics

Contact resistance	≤ 10 mΩ
Insulation resistance	≥ 100 mΩ
Voltage proof: contact-contact	≥ 500 V, DC
Voltage proof: contact-shield	≥ 500 V, DC
PoE+ acc to IEEE 802.3at	Suitable or Power over Ethernet Plus

Transmission Characteristics

10 Gigabit Ethernet acc. to IEEE 802.3an	Suitable for 10 Gigabit Ethernet
Category 6 _A	ISO/IEC 11801; DIN EN 50173-1
Class E _A	ISO/IEC 11801; DIN EN 50173-1

STX M12x1 Connecting Cable X-coded

For connecting an IP camera, the passenger information system in carriages or other applications where data rates need to be transmitted, Telegärtner also offers factory-made Category 6_A connecting cables. The M12x1 X-coded connecting cables guarantee transmission rates of up to 10 Gbit and are available in different configurations and length variants from stock. The overmoulded connectors are tested to IP67 against particle and water ingress. The M12x1 X-coded connecting cables have an S/FTP 4x2xAWG24/19

structure and a jacket material specially developed for transport applications, the cables pass the high requirements for fire safety regulations in the transport industry. The connecting cables are supplied with Telegärtner printing on each cable and in Telegärtner packaging. If required, the packaging and printing can be adjusted to meet the customer's specific requirements. Other configurations and adapter cables such as X-coded to D-coded or A-coded are available on request.



STX M12 Connecting Cable X-coded

	Connecting Cable S/FTP Cat.7 PUR
Mechanical Characteristics	
Life M12	≥ 100
Cable construction	4x2x0,48 PiMF PUR
Cu-Conductor diameter: stranded	AWG24 (19x0,24mm)
Wire insulation	E-beam X-linked Foam-Skin Ployethylen, Ø 1,6mm
Pair screen	Al-foil, conducting side outward
Overall screen	Copper braid, tinned
Outer diameter	Ø 8.1 ±0.3 mm
Colour	RAL 6018
Environment and Security	
Smoke density	IEC 61034, LU1-085
Flame retardant	IEC 60332-1-2; IEC 60332-3-25 cat D
Fire protection in railway vehicles	EN 45545-2:2013: HL1-HL3
Fire safety performance in vehicles	ECE R118.02
Ambient temperature in °C	-40 °C to 85 °C

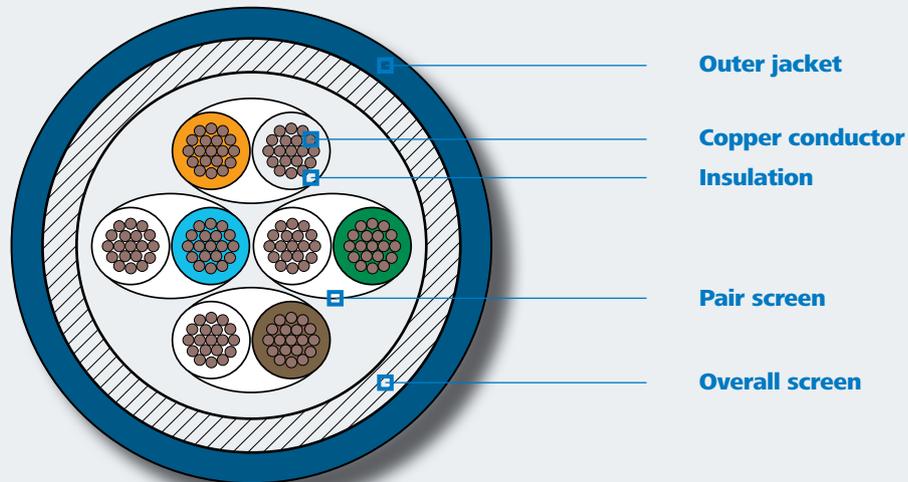
The technical data for the connectors can be extracted from the table on the left.

Patch Cable for Railway Applications

S/FTP AWG24/19 Cat.7

Telegärtner's raw cable is ideal for all applications where passenger safety and a reliable and fast data transmission are of the utmost importance. The copper data cables which are installed in vehicles must meet the strict fire protection requirements which are standard in the transport industry. If there is a fire on board, the highest priority is keeping the passengers safe. Thanks to the special X-FRNC cable

jacket, which has been developed specifically for the transportation industry, the cable is resistant to flame dispersion and in case of fire will not give off any toxic substances. The category 7 cable is designed for data transmission of up to 10 Gbit/s, halogen-free and oil-resistant. The cable construction (AWG24/19) offers more flexibility during installation as the cable can achieve very small bend radii.



Construction	
Construction	S/FTP
Conductor	stranded bare copper wire, Ø 0,61 mm (AWG24/19)
Insulation	E-beam X-linked Foam-Skin Polyethylene, max. Ø 1,6 mm
Pair screen	Aluminium-laminated plastic foil, conducting side outward
Overall screen	Copper braid, tinned, coverage ≥ 80%
Outer jacket	E-beam X-FRNC/LSNH, blue RAL 5015

Fire Behaviour	
Flame retardent	IEC 60332-1-2; IEC 60332-3-25 cat D
Smoke density	IEC 61034; LU 1-085
Preventive fire protection	DIN 5510-2 protection level 1 zu 4; EN 50305 (9.1.1):
Fire protection in railway vehicles	EN 45545-2:2013:HL1-HL3
Fire safety performance in vehicles	ECE R118.02

Mechanical Properties	
Outer diameter	8,1 ± 0,3 mm
Bending radius	during operation: ≥ 32 mm during installation: ≥ 64 mm
Tensile force	max. 80 N
Wight	78 kg/km

Environment and Safety	
Temperature range	during operation: -40 °C to +90 °C during installation: -5 °C to +50 °C
Fire load	max. 730 MJ/km

Approvals

Components installed in vehicles are subject to high requirements due to the harsh environmental conditions. Passenger safety is always the highest priority and has to be taken into account when choosing the different materials. If a secure and continuous data transmission needs to be ensured, then the connectors used must

meet the high mechanical requirements for railways and vehicles. To guarantee these points, different standards were defined specifically for the transport industry. Telegärtner's M12 components meet these standards and are therefore suitable for installation in transport applications.

Bulk cable:

DIN EN 45545 – part 2:

The bulk cable conforms to both standards EN 45545-2:2013 HL1-HL3 as well as DIN 5510-2 hazard level 1-4 and has been developed for high fire protection requirements in railway applications.

ECE R118.02:

The bulk cable also conforms to standard ECE R118.02, which defines the fire behaviour of components installed in buses. The cable thus meets the stringent requirements for ECE R118.02 cabling and is therefore ideally suited for installations in the passengers' area in buses.

Connectors:

The connectors have been tested in for mechanical strength, climatic and corrosive resistance, degree of protection and functionality in accordance to the two railway standards EN 50155 and IEC 61373. The tests included all components from Telegärtner's M12x1 connector series. The tests were performed by an external accredited test laboratory and confirmed the corrosion resistance. The test reports can be viewed on request.

The salt spray test was also successfully completed according to EN 50155 section 12.2.9 and as such the corrosion resistance can be confirmed.

EN 50155 Sections, 12.2.3, 12.2.4, 12.2.5, 12.2.9, 12.2.10

To evaluate the behaviour of the connectors in different climatic conditions, the connectors went through the climatic test procedure with cyclic stress in cold, heat and damp heat. After this, the connectors were tested for their insulation resistance and dielectric strength according to IEC 61076-2-101. Before, during and after the climatic stress no thermal defect or other changes were detected, confirming the connector series has passed the tests.

IEC 61373 Sections, 8 and 9 and 10

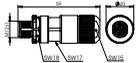
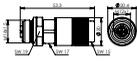
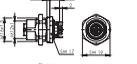
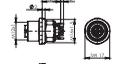
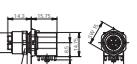
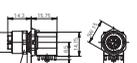
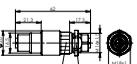
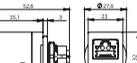
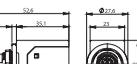
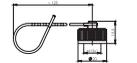
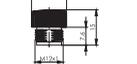
As a further test for the connectors, a simulation for long-term use in railway vehicles was undertaken with the help of a vibration and shock test. With this test the quality of the contact between the pin and the cable core with regard to its applicability in rail vehicles could also be confirmed. During the mechanical stress, the functionality of the connectors was guaranteed at all times and no interruptions were detected.

IEC 60529 Sections, 10, 13.2, 13.4, 14.2

The test to verify the IP67 protection class was carried out according to the above-mentioned standard. This test confirmed both touch protection and foreign body protection according to IP6X. The submergence test for IPX7 was carried out without any visual defects or water penetration.



Order Information

Product		Order no.	Description	Coding
M12x1 Cable Plug			J80026A0100 STX M12x1 CP X-cod. Cat.6 _A 8 pole, X-coded, straight, plug set, 360° shielding, IDC, plug length: 59 mm, field assembly	X-coded
M12x1 Bulkhead Socket			J80029A0500 STX M12x1 CS X-cod. Cat.6 _A 8 pole, X-coded, straight, plug set, 360° shielding, IDC, plug length: 53,3 mm, field assembly	
RJ45 MFP8 IE			J00026A5000 MFP8 IE T568 A Cat.6 _A AWG 24/1-22/1, AWG 27/7-22/7, incl. pre-assembled protection cap	
M12x1 Bulkhead Socket			J80020A0120 STX M12x1 BS X-cod. Cat.6 _A 8 pole, X-coded, straight, 1pc. design, screen connection quad, solder connection THR, gap to PCB 10 mm, back mounting	X-coded
			J80120A0120	
			J80020A0121 STX M12x1 BS X-cod. Cat.6 _A 8 pole, X-coded, straight, 1pc. design, screen connection quad, solder connection THR, gap to PCB 6,7 mm, back mounting	
			J80020A0122 STX M12x1 BS X-cod. Cat.6 _A 8 pole, X-coded, straight, 1pc. design, screen connection quad, solder connection THR, gap to PCB 12,7 mm, front mounting	
			J80220A0120 STX M12x1 EBB X-cod. Cat.6 _A 8 pole, X-coded, straight, without housing, screen connection quad, solder connection THR, gap to PCB customized, back mounting	
			J80320A0120 STX M12x1 EBB X-cod. Cat.6 _A 90° 8 pole, X-coded, angled, 1 pc. design, screen connection quad, solder connection THR, 8,5 mm gap to PCB, back mounting	
			J80420A0120 STX M12x1 EBB X-cod. Cat.6 _A 90° 8 pole, X-coded, angled, 2 pc. design, screen connection quad, solder connection THR, 8,5 mm gap to PCB, back mounting	
M12x1 Coupler			J80029A0100 STX M12x1-M12x1 CO X-cod. Cat.6 _A mating face 1: 8 pole, X-coded, straight; mating face 2: 8 pole, X-coded, straight; Cat.6 _A	X-coded
			J80029A0200 STX M12x1-RJ45 CO X-cod. Cat.6 _A mating face 1: 8 pole, X-coded, straight; mating face 2: RJ45, angled; Cat.6 _A	
			J80629A0200 STX M12x1-RJ45 CO X-cod. Cat.6 _A mating face 1: 8 pole, X-coded, straight; mating face 2: RJ45, angled; Cat.6 _A	
M12x1 Accessories			H80030A0008 STX M12x1 plug protective cap with wrist strap	for X-coded
			H80030A0009 STX M12x1 socket protective cap	
			H80030A0010 STX M12x1 socket protective cap with wrist strap	

Note: Illustrations may differ from the original.

Connecting cables



M12x1 X-coded	2x M12x1 cable plug black, overmoulded IP67	M12x1 cable plug black, overmoulded IP67
	cable: S/FTP, 4x2xAWG24/19, Cat.7, X-FRNC, jacket color blue	to M12x1 cable socket black IP67 cable: S/FTP, 4x2xAWG24/19, Cat.7, X-FRNC, jacket color blue
Length 0.5m	L80000A0003	L82000A0003
Length 1.0m	L80000A0004	L82000A0004
Length 2.0m	L80001A0003	L82001A0001
Length 3.0m	L80002A0001	L82002A0001
Length 5.0m	L80003A0002	L82003A0001
Length 7.5m	L80004A0002	L82004A0001
Length 10.0m	L80005A0002	L82005A0001



M12x1 X-coded	M12x1 cable plug black, overmoulded IP67 to RJ45 MFP8 IE	M12x1 cable plug black IP67
	cable: S/FTP, 4x2xAWG24/19, Cat.7, X-FRNC, jacket color blue	to M12x1 cable socket black IP67 cable: S/FTP, 4x2xAWG24/19, Cat.7, X-FRNC, jacket color blue
Length 0.5m	L80100A0003	L80400A0008
Length 1.0m	L80100A0004	L80400A0009
Length 2.0m	L80101A0001	L80401A0007
Length 3.0m	L80102A0001	L80402A0003
Length 5.0m	L80103A0001	L80403A0008
Length 7.5m	L80104A0001	L80404A0006
Length 10.0m	L80105A0001	L80405A0009

Other industrial cabling components from the STX programme



Whether for cabling in factories, machines or plants, Telegärtner offers you top class, standard compliant Industrial Ethernet solutions with variants 1, 4, 5 and 14 industrial connectors from the STX range and variant 6 industrial connectors.

More information about our STX programme is available
from your dealer or under
www.telegaertner.com/stx

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