

SIEMENS

SIMATIC NET

Industrial Ethernet / PROFINET Passive network components

System Manual

Preface	1
Electrical networks	2
Optical networks	3
Power supply	4
Instructions for fitting connectors, attachments and devices	5
Installing network components in cabinets	6

Legal information

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Table of contents

1	Preface	7
1.1	Note on the SIMATIC NET glossary	8
1.2	Contacts for special cables and special lengths	8
2	Electrical networks	9
2.1	Overview - electrical cables	9
2.2	General	11
2.3	The connector system M12/X coded according to IEC 61076-2-109	14
2.4	IE TP cord	15
2.4.1	Introduction to TP cord	15
2.4.2	IE TP cord 2x2	16
2.4.3	IE TP cord 4x2	17
2.5	IE FC TP cable	19
2.5.1	IE FC TP standard cable GP 2x2	21
2.5.2	IE FC TP Robust Standard Cable GP 2 x 2	22
2.5.3	IE FC TP flexible cable GP 2x2	23
2.5.4	IE FC TP Robust Flexible Cable GP 2 x 2	24
2.5.5	IE FC TP FRNC cable GP 2x2	25
2.5.6	IE FC TP trailing cable 2x2	26
2.5.7	IE FC TP trailing cable GP 2x2	27
2.5.8	IE FC festoon cable GP 2x2	28
2.5.9	IE FC TP food cable 2x2	29
2.5.10	IE FC TP marine cable 2x2 GP	30
2.5.11	IE TP Train Cable 2x2	31
2.5.12	IE FC TP torsion cable 2x2	32
2.5.13	IE TP ground cable 2x2	33
2.5.14	IE FC TP Standard Cable GP 4x2	34
2.5.15	IE FC TP flexible cable GP 4x2	35
2.5.16	IE TP train cable 4x2	36
2.6	IE connecting cable M12	38
2.7	IE Robust Connecting Cable M12	40
2.8	IE Hybrid Cable	41
2.9	Plugs	43
2.9.1	IE FC RJ-45 plugs 2x2	43
2.9.2	IE FC RJ45 Plug 180 (4x2)	46
2.9.3	IE M12 panel feedthrough 4x2	47
2.9.4	IE M12 Panel Feedthrough PRO	49
2.9.5	IE FC M12 plug PRO 2x2	50
2.9.6	IE FC M12 Plug PRO 4x2	51
2.9.7	IE FC M12 Cable Connector PRO (PROFINET)	53
2.9.8	IE FC RJ-45 plug PRO (push-pull)	54

2.9.9	IE FC RJ-45 PLUG PRO	56
2.9.10	IE RJ-45 COUPLER PRO	57
2.9.11	IP 67 hybrid cable connector	58
2.10	Outlets	60
2.10.1	IE FC RJ-45 modular outlet	60
2.10.2	IE FC outlet RJ-45.....	62
3	Optical networks	65
3.1	Optical transmission technology	65
3.2	Overview of optical cables	66
3.3	Glass FO cables.....	67
3.3.1	FOC links	67
3.3.2	FO Standard Cable GP 50/125 µm.....	69
3.3.3	MM FO robust cable GP (50/125).....	71
3.3.4	SM FO robust cable GP (4E9/125).....	73
3.3.5	FO FRNC Cable GP 50/125/OM2.....	74
3.3.6	FO FRNC Cable GP 50/125/OM4.....	76
3.3.7	INDOOR FO cable 62.5/125 µm.....	77
3.3.8	FO trailing cable 50/125 µm.....	79
3.3.9	FO Ground Cable 50/125 µm.....	81
3.3.10	Flexible FO trailing cable (62.5/125 µm).....	82
3.3.11	SIENOPYR Duplex FiberOptic Marine Cable 62.5/125 µm.....	84
3.3.12	FC FO glass fiber-optic cable 62.5/200/230 µm	86
3.3.13	FC FO standard cable GP 62.5/200/230 µm	88
3.3.14	FC FO trailing cable 62.5/200/230 µm.....	89
3.3.15	SM FO CORD 9/125	91
3.3.16	MM FO CORD 50/125	92
3.4	Plastic fiber-optic cables	94
3.4.1	Overview	94
3.4.2	POF Standard Cable GP 980/1000	94
3.4.3	POF Trailing Cable 980/1000	95
3.4.4	PCF standard cable GP 200/230	97
3.4.5	PCF trailing cable 200/230.....	98
3.4.6	PCF trailing cable GP 200/230	99
3.5	Plugs	101
3.5.1	ST/BFOC plug.....	101
3.5.2	Single mode FO LC plug.....	102
3.5.3	Multimode FO LC plug	103
3.5.4	FC FO LC Plug.....	104
3.5.5	FC FO Termination Kit for the FC FO LC Plug	105
3.5.6	FO FC SC plug.....	106
3.5.7	FO FC ST/BFOC plug.....	108
3.5.8	SC RJ plug	109
3.5.9	IE SC RJ Plug Pro.....	110
4	Power supply	113
4.1	Power cable	113
4.1.1	Energy cable 2 x 0.75	113
4.1.2	Energy cable 5 x 1.5	114
4.1.3	Power connecting cable M12-180/M12-180	116

4.1.4	Robust Power Connecting Cable.....	117
4.2	Cable connectors	119
4.2.1	Power Plug Pro	119
4.2.2	7/8" plug-in connector	120
4.2.3	Power M12 plug Pro	121
4.3	Power supply	123
4.3.1	Power supply PS791-1PRO	123
4.3.2	Power M12 cable connector PRO	124
4.3.3	7/8" Power T-Trap PRO.....	126
4.3.4	Signaling contact M12 cable connector PRO	127
5	Instructions for fitting connectors, attachments and devices.....	129
5.1	Note on the installation instructions	129
5.2	Industrial Ethernet FastConnect Stripping Tool.....	130
5.3	Electrical networks	133
5.3.1	Fitting IE FC cable 2 x 2 with an IE FC RJ-45 plug 180 2x2	133
5.3.2	Fitting IE FC cable 2 x 2 with an IE FC RJ-45 plug PRO	136
5.3.3	Fitting an IE FC cable 2 x 2 with an IE RJ-45 plug PRO	139
5.3.4	Fitting IE FC cable 2 x 2 with an IE FC RJ-45 plug 180 4x2	142
5.3.5	Fitting an IE FC cable 4 x 2 with an IE FC RJ-45 plug 180 4x2	145
5.3.6	Fitting the IE FC TP cable with an IE FC M12 plug PRO	148
5.3.7	Assembling an IE hybrid cable 2 x 2 + 4 x 0.34 with an IE IP 67 hybrid connector	151
5.3.8	Fitting the IE FC TP standard cable 4 x 2 GP to an IE IP 67 hybrid connector.....	156
5.3.9	Fitting IE FC outlet RJ-45	161
5.3.10	Fitting the IE FC RJ-45 modular outlet	162
5.3.10.1	Connecting the RJ-45 Modular Outlet	162
5.3.10.2	Assembling IE FC TP standard cable 4x2 GP and IE FC RJ-45 modular outlet.....	164
5.3.10.3	Fitting IE hybrid cable 2x2 + 4x0.34 and IE FC RJ-45 modular outlet.....	167
5.3.11	Assembly of Industrial Twisted Pair connectors	169
5.3.11.1	Assembling Industrial Twisted Pair Connectors	169
5.3.11.2	Fitting a 9-pin D-sub plug.....	171
5.3.11.3	Fitting a 15-pin D-sub plug.....	174
5.4	Optical networks	177
5.4.1	Fitting an IE FC FO cable with an ST/ BFOC plug	177
5.4.2	Fitting an SC RJ plug to a plastic FO cable (POF)	181
5.4.3	Fitting an SC RJ plug to PCF FO cable	184
5.4.4	Mounting a SIMATIC NET FC FO LC plug on an FC FO standard cable or FC FO trailing cable.....	188
5.5	Power supply	195
5.5.1	Fitting the energy cable 5 x 1.5 with a power plug PRO.....	195
5.5.2	Fitting a 7/8" energy connector to an energy cable	198
5.5.3	Connecting the 7/8" energy connector to a module.....	200
6	Installing network components in cabinets.....	201
6.1	SIMATIC NET components	201
6.2	IP degrees of protection.....	203
6.3	Guidelines for setting up networked automation systems in buildings	205
6.3.1	General notes on networking bus cables.....	205

6.3.2	Protection from electric shock.....	205
6.3.3	Mechanical protection of bus cables.....	207
6.3.4	Electromagnetic compatibility of fiberoptic cables	209
6.3.5	Connecting fiber-optic cables.....	209
6.3.6	Electromagnetic compatibility of bus cables	210
6.3.6.1	Equipotential bonding system	211
6.3.6.2	Requirements of the AC power distribution system.....	214
6.3.6.3	Shielding devices and cables.....	217
6.3.6.4	Special noise suppression measures	220
6.3.7	Arrangement of devices and cables.....	221
6.3.7.1	The influence of power distribution systems (EN 501742, 6.4.4.2)	222
6.3.7.2	Cable categories and clearances.....	222
6.3.7.3	Cabling within closets	224
6.3.7.4	Cabling within buildings	224
6.3.7.5	Cabling outside buildings	225
6.3.8	Laying bus cables	225
6.3.8.1	Installation instructions for electrical and optical bus cables	225
6.3.8.2	Additional instructions on installing fiberoptic cables.....	227
Index	229

Preface

Purpose of the system manual

The system manual explains connecting up and commissioning the passive Industrial Ethernet network components and how they work in principle.

Orientation in the documentation

Apart from the System Manual you are currently reading, the following documentation is also available from SIMATIC NET on the topic of Network Manual:

- System manual "Industrial Ethernet"

This System manual provides you with an overview of the structure and configuration of Industrial Ethernet networks with the aid of SIMATIC NET. On the one hand, the target groups are decision makers and planners; with this document, they can gain an overview of the technical principles, the SIMATIC NET product range and the most important practical applications. On the other hand, it provides configuration engineers and commissioning personnel with extensive information data to which they can refer when setting up their network systems.

- Compact operating instructions

These contain wide-ranging descriptions of the components of the product, installation and setting up of SIMATIC NET devices and the relevant dimension drawings.

- System manual "RCoax"

This system manual contains both an explanation of the fundamental technical aspects as well as a description of the individual RCoax components and their functionality. Installation/commissioning and connection of RCoax components and their operating principle are explained. The possible applications of the various SIMATIC NET components are described.

- System manual - "Passive Network Components IWLAN"

This system manual explains the entire IWLAN cabling that you require for your IWLAN application. For a flexible combination and installation of the individual IWLAN components both indoors and outdoors, a wide ranging selection of compatible coaxial accessories are available. The system manual also covers connecting cables as well as a variety of plug-in connectors, lightning protectors, a power splitter and an attenuator.

Operating Instructions and other documents

Despite every effort being made to provide a complete and thorough picture, this System manual cannot replace the Operating Instructions and reference documents of the individual devices and components. You will find the detailed documentation of the individual components on the Manual Collection DVD.

1.1 Note on the SIMATIC NET glossary

SIMATIC NET glossary

Explanations of many of the specialist terms used in this documentation can be found in the SIMATIC NET glossary.

You will find the SIMATIC NET glossary here:

- SIMATIC NET Manual Collection or product DVD
The DVD ships with certain SIMATIC NET products.
- On the Internet under the following address:
50305045 (<http://support.automation.siemens.com/WW/view/en/50305045>)

1.2 Contacts for special cables and special lengths

Contacts for special cables and special lengths

If you require special cables and special lengths of the cable types, please contact:

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Tel.: + 49 (911) 750 - 44 65
Telefax: + 49 (911) 750 - 13 44 65

Electrical networks

2.1 Overview - electrical cables

For the various topologies, requirements or areas of application the following electrical Industrial Ethernet cables are available.

Cabling	Cable type	Features	Area of application
TP Cord	IE TP Cord 2x2 IE TP XP Cord 2x2 IE TP Cord 4x2 IE TP XP Cord 4x2	Patch cable preassembled with RJ-45	For connecting nodes to network components within a cabinet. Up to 10 m cable length with IE TP Cord 2x2, up to 50 m cable length with IE TP Cord 4x2.
Fast Connect		FC installation manuals Insulation displacement method Sold by the meter	For a direct connection between node and network component for structured cabling fast and light contacting of the cables on FC contacts.
IE FC TP 2x2 4-wire cable for Fast Ethernet networks	IE FC TP standard cable GP		Standard bus cable with rigid cores and specially designed for fast assembly, 4 rigid cores stranded to form a star quad.
	IE FC TP robust standard cable GP		Rugged standard bus cable with rigid cores for universal application.
	IE FC TP flexible cable GP		Flexible bus cable for special applications with occasional movement; four wires (stranded) arranged as a star quad.
	IE FC TP robust flexible cable GP		Robust standard cable with flexible cores for machine parts that occasionally move.
	IE FC TP FRNC cable GP		Flexible, halogen-free cable for use in buildings (FRNC= Flame Retardant Non Corrosive); four cores (stranded) arranged as a star quad. for occasional movement.
	IE FC TP trailing cable GP IE FC TP trailing cable		Highly flexible bus cable for special applications with constant movement in a drag chain, for example for permanently moving machine parts; halogen-free; four cores (stranded) arranged as star quad.
	IE FC festoon cable GP		Flexible bus cable for special applications with constant movement in a drag chain/festoon; e.g. a crane system, 4 wires (stranded) arranged as a star quad.

2.1 Overview - electrical cables

Cabling	Cable type	Features	Area of application
	IE FC TP food cable		Flexible cable specially for use in the food and beverages industry, 4 cores (stranded) arranged as star quad.
	IE FC TP marine cable GP		Flexible bus cable for special applications on ships; 4 cores (stranded) arranged as a star quad.
	IE TP train cable		Flexible cable for laying in rail vehicles and buses.
	IE FC TP torsion cable		Highly flexible bus cable for special applications with constant movement, for example for use in robots; 4 cores (stranded).
	IE TP ground cable		Standard cable with rigid cores for laying in the earth.
IE FC TP 4x2 8-wire cable for Gigabit Ethernet networks	IE FC TP standard cable (22 AWG)		For setting up Industrial Ethernet networks up to 100 m in conjunction with the IE FC modular outlet and the TP cords.
	IE FC TP standard cable GP (24 AWG)		For direct connection up to 60 m without patch technology with IE FC RJ-45 plug 4x2
	IE FC TP flexible cable GP		With flexible cores suitable for applications with occasional movement.
	IE TP train cable (24/7 AWG)		For laying in rail vehicles and buses.
IE connecting cable	IE connecting cable M12-180/M12-180	Preassembled cable with two 4-pin M12 plugs	Plug-in cable with two 4-pin M12 plugs (D-coded) for connecting Industrial Ethernet nodes with degree of protection IP65/IP67
	Power connecting cable M12-180/M12-180		Plug-in cable with one 4-pin M12 plug (A-coded) and one 4-pin M12 socket (A-coded) for 24 V power supply
	IE connecting cable M12-180/IE FC RJ45 PLUG	Preassembled cable with a 4-pin M12 plug and an IE FC R-45 plug.	Plug-in cable with a 4-pin M12 plug (D-coded) and an IE FC R-45 plug with 145° cable outlet. The plug-in cable is used to connect Industrial Ethernet nodes
	IE robust connecting cable M12	Preassembled cable with one 4-pin M12 plug (A-coded) and one 4-pin M12 socket (both D-coded). Also available by the meter without connectors.	Oil and UV resistant cable in a flame retardant version that is particularly suitable for use in the food industry.
IE hybrid cable	IE hybrid cable 2x2	Hybrid cable for simultaneous transmission of data (10/100 Mbps) and power (24 V/400 mA): insulation displacement technology, Sold by the meter	Industrial and office area for IE FC RJ-45 modular outlet and access point SCALANCE W with IP67 hybrid plug

2.2 General

FastConnect (FC) Twisted Pair (TP)

For structured cabling within a factory, the FC TP cabling system is ideal. Using the FastConnect (FC) system for Industrial Ethernet, structured cabling from the office environment has been further developed for use in factories.

FC cables can be assembled fast and simply on site. This means that RJ-45 cabling technology, an existing standard, is also available in a version suitable for industry and making such cabling possible in an industrial environment.

With the IE RJ-45 plug and FC cables, runs of up to 100 m cable length are possible without patch technology.

Twisted pair (TP)cCord

The TP cord is used to connect end devices to the Industrial Ethernet FC cabling system. It is intended for use in cabinets and is used mainly as a jumper cable. The jumper cable is also now as a patch cable.

The maximum total length of the TP cord in a point-to-point connection is 50 m (IE TP cord RJ4-5/RJ-45 4x2, CAT6A).

Standards

The EN 50173 standard describes the structured cabling of office buildings. IEC 24702 describes the structured building networking of an industrial building. The generally valid description of networking an automated plant within an industrial building can be found in IEC 61918. The profile-specific networking rules for PROFINET can be found in IEC 61784-5-3.

Structured cabling

Structured cabling describes the cabling of building complexes for information technology purposes regardless of the applications used. A building is divided into the following areas:

- Primary area: Interconnection of buildings of a site
- Secondary area: Interconnection between floors of a building
- Tertiary area: Information technology connectors for the end devices of a floor

The TP cord can be used as a patch cable and connecting cable between devices and on patch panels.

The structured cabling that can be implemented with the Industrial EthernetFC system corresponds to tertiary cabling according to the ISO/IEC 11801, IEC 24702 and EN 50173 standards.

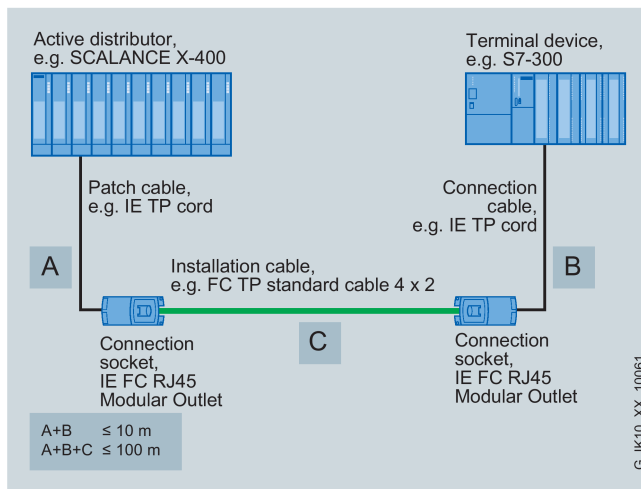


Figure 2-1 Structured cabling

Table 2- 1 Cables for structured cabling to EN 50173

Use	SIMATIC NET cable	Maximum length
Patch cable	IE TP cord	A+C max. 10 m
Tertiary cable	IE FC standard cable GP	B max. 90 m
	IE FC Flexible Cable GP	B max. 75 m
	IE FC torsion cable GP	B max. 45 m
	IE FC trailing cable GP	B max. 75 m
	IE FC trailing cable	B max. 75 m
	IE FC marine cable	B max. 75 m
	IE FC TP FRNC cable GP	B max. 75 m
	IE FC food cable	B max. 75 m
	IE FC festoon cable GP	B max. 75 m
	IE FC hybrid cable	B max. 75 m

100BASE-TX

The twisted pair interfaces of the SCALANCE products comply with the standard IEEE 802.3u: 100BASE-TX. Depending on the variant, the devices have one or more RJ-45 or M12 sockets.

Maximum lengths of twisted pair cables

The twisted pair cables to be inserted between 2 neighboring devices must not exceed the following maximum lengths:

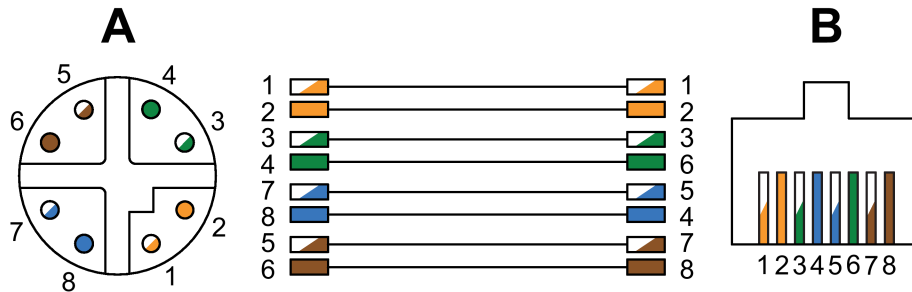
Cabling structure	Cable type	Max. length	Max. total of the patch cables (TP cord)
In one piece The setup is created without patch cable.	IE FC standard cable GP	100 m	
	IE FC Flexible Cable GP	85 m	
	IE FC torsion cable GP	55 m	
	IE FC trailing cable GP	85 m	
	IE FC trailing cable	85 m	
	IE FC marine cable	85 m	
	IE FC TP FRNC cable GP	85 m	
Structured The setup is created with patch cable and IE FC outlet RJ-45 or IE FC RJ-45 modular outlet.	IE FC standard cable GP	90 m	10 m
	IE FC Flexible Cable GP	75 m	10 m
	IE FC torsion cable GP	45 m	10 m
	IE FC trailing cable GP	75 m	10 m
	IE FC trailing cable	75 m	10 m
	IE FC marine cable	75 m	10 m
	IE FC TP FRNC cable GP	75 m	10 m
In one piece, incl. D sub plugs.	ITP standard 2 x 2	100 m	

2.3 The connector system M12/X coded according to IEC 61076-2-109

Description

M12 connectors with X coding are also suitable for transmission rates up to 210 Gbps (Cat6A) because the shields of the wire pairs can be led into the connectors. A further advantage is the availability of connectors with degree of protection IP67 with which the equipped devices are also suitable for adverse environmental conditions (dust, dampness). Due to the locking technology standardized for the M12 connectors a high resistance to vibration is achieved. Numerous SCALANCE devices therefore provide connection options for X coded M12 connectors.

Pin assignment



- A Front view of M12 connector, X coded according to IEC61076-2-109
- B Front view of RJ-45 connector, latching nose at the top, with pin assignment according to EIA/TIA 568B

Pin	M12/X coded		RJ-45 according to EIA/TIA 568B	
	Wire color	Signal	Wire color	Signal
1	White / orange	TX+	White / orange	TX+
2	Orange	TX-	Orange	TX-
3	White / green	RX+	White / green	RX+
4	Green	RX-	Blue	
5	White / brown		White / blue	
6	Brown		Green	RX-
7	White / blue		White / brown	
8	Blue		Brown	

2.4 IE TP cord

2.4.1 Introduction to TP cord

The TP cords are used inside buildings for distances up to 10 m. TP cord is also known as patch cable. A maximum of 10 m of TP cord can be used between two devices. With structured cabling using two TP cords, this length is the maximum for both patch cables together.

Compared with the IE FC TP cables, the TP cords are thinner and more flexible. Standardized RJ-45 plugs are used as the connectors.

- The TP cords 2x2 are suitable for a transmission rate of 10/100 Mbps.
- The TP cords 4x2 are suitable for a transmission rate of 10/100/1000 Mbps.

The 2 wires are twisted into a pair (PIMF). Each pair of wires is shielded by a plastic laminated aluminum foil with an external contact surface. All the pairs making up the cable are surrounded by a braided shield of tinned copper braid with coverage of approximately 88 %. The outer sheath is PVC.



IE TP cord and IE TP XP cord

The TP cords are available as straight-through cables with the name "**IE TP Cord**" and as crossover cables with the name "**IE TP XP Cord**".

To distinguish straight-through and crossover cables, the RJ-45 plugs are color-coded.

- not crossed over: RJ-45 plug, green at both ends
- crossed over: RJ-45 plug, red at both ends

2.4.2 IE TP cord 2x2

Description

The TP cord is available as preassembled cable in the following variants:

- IE TP cord RJ-45/RJ-45 and IE TP XP cord RJ-45/RJ-45
with two RJ-45 plugs.

Features and functions

Cable type ¹⁾	IE TP (XP) cord 2x2
Areas of application	Cabling between an end device and a network component
Cable specification	Cat 5e
maximum cable length ²⁾	
• with IE FC outlet RJ-45	10 m
• Device with RJ-45 connector	10 m
Cable type (standard designation)	LI 02YSCY 2x2x0.15/0.98 PIMF ICCS GN
Jacket	PVC Ø 5,8 ± 0.2 mm; green
Environmental conditions	
Operating temperature	-40 °C ... +70 °C
Transportation/storage temperature	-40 °C ... +70 °C
Installation temperature	-40 °C ... +70 °C
Resistance to fire	Flame retardant to IEC 60332-1
Resistance to oil	Conditionally resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

1) Electrical properties at 20 °C, tested to DIN 0472

2) With structured cabling with two TP cords this length must be distributed on both patch cables

Article numbers

IE TP cord RJ-45/ RJ-45	Preassembled TP installation cable 2X2 with two RJ-45 plugs.	
	• 0.5 m	6XV1850-2GE50
	• 1 m	6XV1850-2GH10
	• 2 m	6XV1850-2GH20
	• 6 m	6XV1850-2GH60
	• 10 m	6XV1850-2GN10

IE TP XP Cord RJ45/ RJ45	Preassembled crossover TP installation cable 2X2 with two RJ-45 plugs.	
	• 0.5 m	6XV1850-2HE50
	• 1 m	6XV1850-2HH10
	• 2 m	6XV1850-2HH20
	• 6 m	6XV1850-2HH60
	• 10 m	6XV1850-2HN10

2.4.3 IE TP cord 4x2

Description

The patch cable is required for Gigabit Ethernet. The IE TP cord RJ-45/RJ-45 4x2 is available as a preassembled cable with two RJ-45 plugs. With the XP version the send and receive lines are crossed over.

Features and functions

Cable type ¹⁾	IE TP cord RJ-45/RJ-45 4x2
Areas of application	Cabling between an end device and a network component
Cable specification	Cat 6A
maximum cable length ²⁾	
• with IE FC outlet RJ-45	50 m
• IE device with D-sub connector	50 m
• Device with RJ-45 connector	50 m
Cable type (standard designation)	LI 02YSCH 4x2x0.15 PIMF GN FRNC
Jacket	FRNC Ø 6.2 ± 0.3 mm; green
Permitted ambient conditions	
Operating temperature	-25 °C ... +70 °C
Transportation/storage temperature	-25 °C ... +70 °C
Installation temperature	-25 °C ... +70 °C
Resistance to fire	Flame retardant to IEC 60332-1
Resistance to oil	Conditionally resistant
Product characteristics	

Cable type ¹⁾	IE TP cord RJ-45/RJ-45 4x2
Halogen-free	Yes
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

¹⁾ With structured cabling with two TP cords this length must be distributed on both patch cables

Article numbers

IE TP cord RJ-45/ RJ-45	Preassembled TP installation cable 4x2 with two RJ-45 plugs.	
	0.5 m	6XV1870-3QE50
	1 m	6XV1870-3QH10
	2 m	6XV1870-3QH20
	3 m	6XV1870-3QH30
	4 m	6XV1870-3QH40
	6 m	6XV1870-3QH60
	10 m	6XV1870-3QN10
	15 m	6XV1870-3QN15
	20 m	6XV1870-3QN20
	25 m	6XV1870-3QN25
	30 m	6XV1870-3QN30
	35 m	6XV1870-3QN35
	40 m	6XV1870-3QN40
	45 m	6XV1870-3QN45
50 m	6XV1870-3QN50	
IE TP XP cord RJ-45/ RJ-45	Preassembled crossover TP installation cable 4x2 with two RJ-45 plugs.	
	0.5 m	6XV1870-3RE50
	1 m	6XV1870-3RH10
	2 m	6XV1870-3RH20
	6 m	6XV1870-3RH60
	10 m	6XV1870-3RN10

2.5 IE FC TP cable

The FastConnect (FC) twisted-pair (TP) cables are shielded cables with a symmetrical radial design and 100 ohms characteristic impedance.

The combination of twisted cores, foil screen and braided shield makes the FC cables especially suitable for installation in industrial environments subject to electromagnetic interference. When installed, the design also ensures a high degree of stability of electrical and mechanical data.

Using the IE FC stripping tool, the outer jacket and shield of the FC TP cables can be stripped to correct lengths in a single action.

All FC TP cables are UL-listed products and suitable for use in the USA and Canada. Cables with this certification have the letters GP (General Purpose) in their names.

IE FC TP cable 2x2

The 4-wire FC TP cables are suitable for a transmission rate of 10 / 100 Mbps. The 4 wires are twisted into a star quad.

Cable cross-section



Figure 2-2 IE FC TP CABLE 2X2

The IE FC TP standard cable and the IE FC TP food cable have solid wires, the other cables have stranded wires.

Note

You will find information about PROFINET conformity for the electrical cable types of the IE FC cable 2x2 in the PROFINET Installation Guide. This document can be downloaded from the portal www.profibus.com/downloads.

IE FC TP cable 4x2

To operate 1 gigabit Ethernet networks, 8-wire FC TP cables are required. The 8-wire FC TP cables are category 6 (CAT6) according to the international cabling standards ISO/IEC 11801 and EN 50173.

The 8-wire FC TP cable can also be operated at lower data rates, for example 100 Mbps.

Cable cross-section

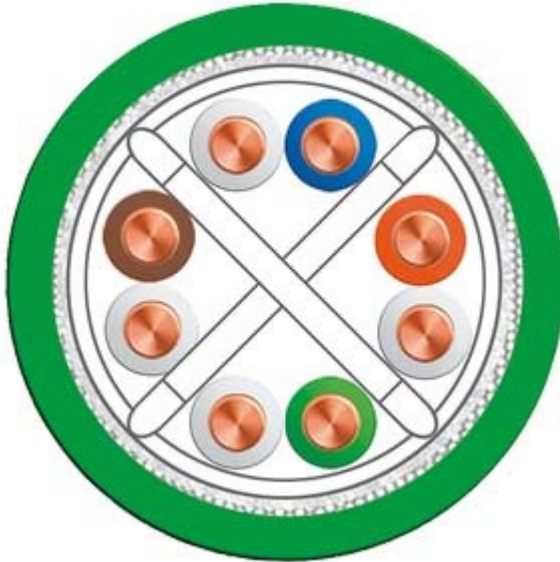


Figure 2-3 IE FC TP 4x2 22 AWG

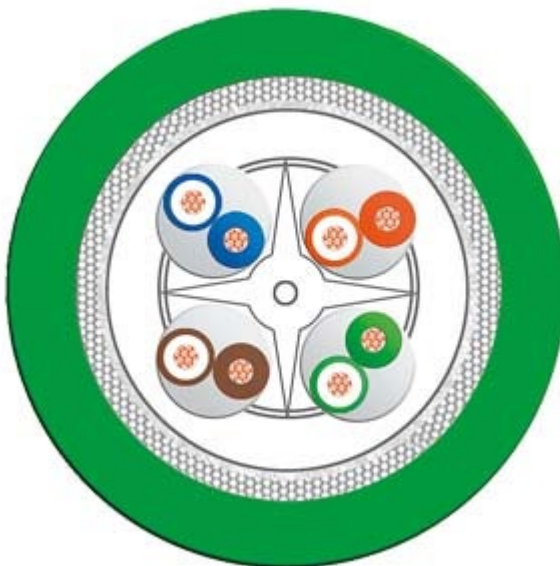


Figure 2-4 IE FC TP 4x2 27 AWG

2.5.1 IE FC TP standard cable GP 2x2

Description

The cable IE FC TP standard cable GP is the standard cable for Fast Ethernet cabling. The cable with solid copper cores (AWG 22) is intended for fixed installation.

Features and functions

Cable type ¹⁾	IE FC TP standard cable GP 2x2 (PROFINET type A)
Areas of application	Universal application
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	100 m
• with IE FC outlet RJ-45	90 m
Cable type (standard designation)	2YY (ST) CY 2x2x0.64/1.5-100 GN
Jacket	PVC Ø 6.5 ± 0.2 mm; green
Permitted ambient conditions	
Operating temperature	-40 °C to +75 °C
Transportation/storage temperature	-40 °C to +75 °C -20 °C to +60 °C
Installation temperature	
Resistance to fire	Flame retardant to UL 1685 (CSA FT 4)
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tests according to DIN 47 250, Part 4, or DIN VDE 0472

Article number

IE TP standard cable GP 2x2 (PROFINET type B)	4-wire, shielded TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug PROFINET-compliant, with UL approval.	6XV1840-2AH10
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2.5.2 IE FC TP Robust Standard Cable GP 2 x 2

Description

The IE FC TP robust standard cable GP 2 x 2 (type A) is a standard cable with rigid cores for fast installation. The cable with solid copper cores (22 AWG) is intended for fixed installation.

Features and functions

Cable type ¹⁾	IE FC TP robust standard cable GP 2x2 (PROFINET type A)
Areas of application	Universal application
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	100 m
• with IE FC outlet RJ-45	90 m
Cable type (standard designation)	2YH (ST) C99Y 2x2x0.64/1.5-100 GN SF/UTP
Jacket	TPE (FR-TPE), Ø 6.5 ± 0.2 mm, green
Permitted ambient conditions	
Operating temperature	-40 °C ... +75 °C
Transportation/storage temperature	-40 °C ... +75 °C
Installation temperature	-20 °C ... +60 °C
Resistance to fire	Flame retardant to IEC 60332-1-2
Resistance to oil	Oil-resistant to DIN EN 50290-2-22, (7 x 24 h / 90 °C) UL 13 Sec.40 (96 h / 100 °C)
UV resistance	Resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tests according to DIN 47 250, Part 4, or DIN VDE 0472

Article number

IE FC TP robust standard cable GP 2x2 (PROFINET type A)	Standard cable. 4-core suitable for fast installation. Sold by the meter, minimum order 20 m, maximum order 2000 m.	6XV1841-2A
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2.5.3 IE FC TP flexible cable GP 2x2

Description

The IE FC flexible cable GP 2x2 with its flexible wires is suitable for applications in which occasional movement is required.

Features and functions

Cable type ¹⁾	IE FC TP flexible cable GP 2x2 (PROFINET type B)
Areas of application	Occasional movement
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	85 m
• with IE FC outlet RJ-45	75 m
Cable type (standard designation)	2YY (ST) CY 2x2x0.75/1.5-100LI GN
Jacket	PVC Ø 6.5 ± 0.2 mm
Permitted ambient conditions	
Operating temperature	-25 °C ... +75° C
Transportation/storage temperature	-25 °C ... +75 °C
Installation temperature	-10 °C to +60 °C
Resistance to fire	Flame retardant to UL 1685 (CSA FT 4)
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article number

IE FC TP flexible cable GP 2x2 (PROFINET type B)	4-wire, shielded TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug for occasional movement; PROFINET-compliant; with UL approval;	6XV1870-2B
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2.5.4 IE FC TP Robust Flexible Cable GP 2 x 2

Description

The IE FC robust flexible cable GP 2 x 2 (Type B) is a standard cable for Fast Ethernet cabling with flexible cores for machine parts of move occasionally.

Features and functions

Cable type ¹⁾	IE FC TP robust flexible cable GP 2x2 (PROFINET type B)
Areas of application	Occasional movement
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	85 m
• with IE FC outlet RJ-45	75 m
Cable type (standard designation)	2YH (ST) C99Y 2x2x0.75/1.5-100 LI GN SF/UTP
Jacket	TPE (FR-TPE), Ø 6.5 ± 0.2 mm
Permitted ambient conditions	
Operating temperature	-40 °C ... +75° C
Transportation/storage temperature	-40 °C ... +75 °C
Installation temperature	-20 °C ... +60 °C
Resistance to fire	Flame retardant to IEC 60332-1-2
Resistance to oil	Oil-resistant to DIN EN 50290-2-22 (VDE 0819), (7 x 24 h / 90 °C) UL 13 Sec.40 (96 h / 100 °C)
UV resistance	Resistant
Product characteristics	
Halogen-free	no
Silicone-free	yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article number

IE FC TP robust flexible cable GP 2 x 2 (PROFINET type B)	Standard cable with 4 flexible cores for machine parts that occasionally move. Sold by the meter, minimum order 20 m, maximum order 1000 m.	6XV1841-2B
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2.5.5 IE FC TP FRNC cable GP 2x2

Description

The halogen-free IE FC TP FRNC cable is suitable for installation in areas in which special fire prevention conditions prevail, for example in buildings open to the public.

The jacket is FRNC (Flame Retardant Non Corrosive): FRNC materials are halogen-free, flame-retardant or self-extinguishing and do not release any aggressive gases or acids when burned.

Features and functions

Cable type ¹⁾	IE TP FRNC cable GP2x2 (PROFINET type B)
Areas of application	Occasional movement
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	85 m
• with IE FC outlet RJ-45	75 m
Cable type (standard designation)	02YS (ST) C11Y 1 x 4 x 0.75/1.5-100LI GN VZN FRNC
Jacket	FRNC Ø 6.5 ± 0.2 mm, green
Permitted ambient conditions	
Operating temperature	-25 °C ... +70 °C
Transportation/storage temperature	-45 °C ... +75 °C
Installation temperature	0 °C ... +50 °C
Resistance to fire	Flame retardant to IEC 60332-3-22 Category A/F
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	Yes
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tests according to DIN 47 250, Part 4, or DIN VDE 0472

Article number

IE TP FRNC cable GP 2x2 (PROFINET type B)	4-wire, shielded, halogen-free TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug for occasional movement. PROFINET compliant, with UL approval.	6XV1871-2F
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2.5.6 IE FC TP trailing cable 2x2

Description

In contrast to the IE FC TP standard cable 2x2, with the IE FC TP trailing cable 2x2, the wires are stranded copper. In conjunction with the special combination of braid shield, fleece foil shield, and the sheath material of polyurethane (PUR), the cable achieves a bending radius of 100 mm and highly constant electrical characteristics. The cable is designed for 4,000,000 bending cycles with a bending RADIUS of 100 mm, a speed of 4 m/s and an acceleration of 4m/s².

Features and functions

Cable type ¹⁾	IE FC TP trailing cable 2x2 (PROFINET type C)
Areas of application	Use in drag chains
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	85 m
• with IE FC outlet RJ-45	75 m
Cable type (standard designation)	2YH (ST) C11Y 2 x 2 x 0.75/1.5-100 LI GN VZN FRNC
Jacket	PUR Ø 6.5 ± 0.2 mm
Permitted ambient conditions	
Operating temperature	-40 °C to +75 °C
Transportation/storage temperature	-40 °C to +75 °C
Installation temperature	-20 °C to +60 °C
Resistance to fire	Flame retardant to IEC 60332-1-2
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	Yes
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article number

IE FC TP trailing cable 2x2 (PROFINET type C)	4-wire, shielded TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug 180/90 for use in drag chains; PROFINET-compliant; with UL approval	6XV1840-3AH10
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2.5.7 IE FC TP trailing cable GP 2x2

Description

In contrast to the IE FC TP standard cable 2x2, with the IE FC TP trailing cable GP 2x2, the wires are stranded copper. The cable is designed for 3,000,000 bending cycles with a bending RADIUS of 100 mm, a speed of 4 m/s and an acceleration of 4m/s².

Features and functions

Cable type ¹⁾	IE FC TP trailing cable GP 2x2 (PROFINET type C)
Areas of application	Use in drag chains
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	85 m
• with IE FC outlet RJ-45	75 m
Cable type (standard designation)	2YY (ST) CY 2x2x0.75/1.5-100 LI GN
Jacket	PVC Ø 6.5 ± 0.2 mm
Permitted ambient conditions	
Operating temperature	-25 °C to +75 °C
Transportation/storage temperature	-25 °C to +75 °C -10 °C to +60 °C
Installation temperature	
Resistance to fire	Flame retardant to UL 1685 (CSA FT 4)
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article number

IE FC TP trailing cable 2x2 (PROFINET type C)	4-wire, shielded TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug for use with drag chains; PROFINET-compliant; with UL approval;	6XV1870-2D
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2.5.8 IE FC festoon cable GP 2x2

Description

The IE FC festoon cable GP 2x2 with its stranded wires and a PUR outer jacket is specifically designed for festoon applications on cranes.

Features and functions

Cable type ¹⁾	IE FC festoon cable GP 2x2 (PROFINET type B)
Areas of application	Use in festoons
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	85 m
• with IE FC outlet RJ-45	75 m
Cable type (standard designation)	2YY(ST)CY 2X2X0.75/1.5 LI GN
Jacket	FRNC Ø 6.5 ± 0.2 mm
Permitted ambient conditions	
Operating temperature	-40 °C to +75 °C
Transportation/storage temperature	-50 °C to +75 °C
Installation temperature	-20 °C to +60 °C
Resistance to fire	Flame retardant to UL 1685 (CSA FT 4)
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	Yes
Silicone-free	Yes

Article numbers

IE FC TP festoon cable GP 2x2 (PROFINET type C)	4-wire, shielded TP installation cable for connection to IE FC outlet RJ-45/IE FC RJ-45 plug 180/90 for food, beverages and tobacco industry; PROFINET-compliant; sold in meters; maximum length available 1000 m, minimum length available 20 m	6XV1871-2L
IE FC TP festoon cable GP 2x2 (PROFINET type B)	4-wire, shielded TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug 180/90 for use in festoon applications; PROFINET-compliant; with UL approval	6XV1871-2S

2.5.9 IE FC TP food cable 2x2

Description

The IE FC TP food cable 2x2 with its PE outer jacket and stranded wires is specifically designed for use in the food, beverages and tobacco industry.

Features and functions

Cable type ¹⁾	IE FC TP food cable 2x2 (PROFINET type C)
Areas of application	Food, beverages and tobacco industry
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	85 m
• with IE FC outlet RJ-45	75 m
Cable type (standard designation)	2YH(ST)C2Y 2X2X0.75/1.5-100 LI
Jacket	PUR Ø 6.5 ± 0.2 mm
Permitted ambient conditions	
Operating temperature	-40 °C to +75 °C
Transportation/storage temperature	-50 °C to +75 °C
Installation temperature	-20 °C to +60 °C
Resistance to fire	Flammable
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	Yes
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article number

IE FC TP food cable GP 2x2 (PROFINET type B)	4-wire, shielded TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug 180/90 for use in festoon applications; PROFINET-compliant; with UL approval	6XV1871-2S
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2.5.10 IE FC TP marine cable 2x2 GP

Description

The halogen-free IE FC TP marine cable has the following shipbuilding certifications:

- American Bureau of Shipping Europe Ltd. (ABS)
- Bureau Veritas (BV)
- Det Norske Veritas (DNV)
- Germanischer Lloyd (GL)
- Lloyds Register of Shipping (LRS)

The jacket is FRNC (Flame Retardant Non Corrosive): FRNC materials are halogen-free, flame-retardant or self extinguishing and do not release any aggressive gases or acids when burned.

Features and functions

Cable type ¹⁾	IE FC TP marine cable 2x2 (PROFINET type B)
Areas of application	Marine and offshore use
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	85 m
• with IE FC outlet RJ-45	75 m
Cable type (standard designation)	L-9YH (ST) CH 2 x 2 x 0.34/1.5-100 GN VZN FRNC
Jacket	FRNC Ø 6.5 ± 0.2 mm
Permitted ambient conditions	
Operating temperature	-25 °C to +70 °C
Transportation/storage temperature	-40 °C to +70 °C
Installation temperature	0 °C to +50 °C
Resistance to fire	Flame retardant to IEC 60332-3-22 Category A/F
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	Yes
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article number

IE FC TP marine cable 2x2 (PROFINET type B) ²⁾	4-wire, shielded, halogen-free TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug 180/90, certified for shipbuilding;	6XV1840-4AH10
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2.5.11 IE TP Train Cable 2x2

Description

The IE TP train cable 2x2 (type C, 22/7 AWG) is a flexible cable for laying in rail vehicles and buses.

Features and functions

Cable type ¹⁾	IE TP train cable 2x2 (type C, 22/7 AWG)
Areas of application	Railway applications
Cable specification	Cat 5
Maximum cable length	
• with IE FC RJ-45 plug	100 m
• with IE FC outlet RJ-45	90 m
Cable type (standard designation)	SF/UTP
Jacket	Elastomer electron-beam cross-linked Ø 6.6 ± 0.2 mm, black
Permitted ambient conditions	
Operating temperature	-40 °C to +80 °C
Transportation/storage temperature	-40 °C to +80 °C -20 °C ... +60 °C
Installation temperature	
Note: Briefly in short-circuit situation	160 °C
Resistance to fire	Flame resistant according to BS6853 DIN 5510-2 fire protection level 1 - 4 prEN 45545-2 hazard level HL1 - HL3 EN 50306-4 NF F 16-101, NFPA130
Resistance to oil	Resistant acc. to EN 50306-4 (72 h / 100 °C, IRM 902, 168 h / 70 °C, IRM 903)
UV resistance	Resistant

Cable type ¹⁾	IE TP train cable 2x2 (type C, 22/7 AWG)
Product characteristics	
Halogen-free	Yes
Silicone-free	Yes

¹⁾ Electrical properties measured at 20 °C, tested to EN 50288-2-1

Article number

IE TP train cable 2x2 (type C, 22/7 AWG)	Flexible cable for rail applications. Sold by the meter, minimum order 20 m, maximum order 1000 m.	6XV1871-2T
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2.5.12 IE FC TP torsion cable 2x2

Description

In contrast to IE FC TP Standard Cable 2x2 with the IE FC TP torsion cable 2x2, the wires are stranded copper. In conjunction with the special combination of braid shield, fleece foil shield, and the sheath material of polyurethane (PUR), the cable achieves a torsional strength of $\pm 180^\circ$ and highly constant electrical characteristics. The cable has been tested for 5,000,000 torsion movements on 1 m cable length ($\pm 180^\circ$).

The cable is suitable for networking moving parts of plant, for example robots. For applications using festoon supports the cable is not suitable.

Features and functions

Cable type ¹⁾	IE FC TP torsion cable GP 2x2 (PROFINET type C)
Areas of application	Constant motion when used with robots
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	55 m
• with IE FC outlet RJ-45	45 m
Cable type (standard designation)	2YY (ST) CY 2x2x0.75/1.5-100 LI GN
Jacket	PVC $\varnothing 6.5 \pm 0.2$ mm
Permitted ambient conditions	
Operating temperature	-40 °C ... +80 °C
Transportation/storage temperature	-40 °C ... +80 °C
Installation temperature	-20 °C ... +60 °C

Cable type ¹⁾	IE FC TP torsion cable GP 2x2 (PROFINET type C)
Resistance to fire	Flame retardant to UL 1685 (CSA FT 4)
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article number

IE TP torsion cable GP 2x2 (PROFINET type C) ³⁾	4-wire, shielded TP installation cable for connection to IE FC outlet RJ-45/ IE FC RJ-45 plug for use with robots; PROFINET-compliant; with UL approval;	6XV1870-2F
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2.5.13 IE TP ground cable 2x2

Description

The IE TP ground cable 2x2 (Type C) is a standard cable with rigid cores for laying in the earth.

Note

Plugs assembled only after removing the outer jacket

This cable as an additional PE outer jacket with a diameter of 9 mm. An RJ-45 or M12 plus can only be assembled when this outer jacket is removed.

Features and functions

Cable type ¹⁾	IE TP ground cable 2x2 (type C)
Areas of application	Can be laid underground
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	100 m
• with IE FC outlet RJ-45	90 m
Cable type (standard designation)	2YY (ST) CY2Y 2x2x0.64/1.50-100 SF/UTP
Jacket	PVC Ø 9 ± 0.2 mm, black

Cable type 1)	IE TP ground cable 2x2 (type C)
Permitted ambient conditions	
Operating temperature	-40 °C to +70 °C
Transportation/storage temperature	-40 °C to +70 °C
Installation temperature	-5 °C to +50 °C
Resistance to fire	Flammable
Resistance to oil	Restricted resistance
Resistance to water	Well resistant
UV resistance	Resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

1) Electrical properties at 20 °C, tested to EN 50288-2-1

Article number

IE TP ground cable 2x2 (type C)	Can be laid underground	6XV1871-2G
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2.5.14 IE FC TP Standard Cable GP 4x2

Description

The IE FC TP standard cable GP 4x2 is available in two variants.

- IE FC TP standard cable 4x2 (22 AWG)
The cable is used to set up Industrial Ethernet networks up to 100 m.
- IE FC TP cable 4x2 (24 AWG)
The cable is used for direct connection up to 90 m without patch cables.

Features and functions

Cable type 1)	IE FC standard cable GP 4x2 (22 AWG)	IE FC standard cable GP 4x2 (24 AWG)
Areas of application	Universal application	Universal application
Cable specification	Cat 6	Cat 6
maximum cable length		
• with IE FC RJ-45 plug	-	55 m
• with IE FC outlet RJ-45	90 m + 10 m patch cable	-

Cable type ¹⁾	IE FC standard cable GP 4x2 (22 AWG)	IE FC standard cable GP 4x2 (24 AWG)
Cable type (standard designation)	2YH (ST) C 4x2x0.64/1.25-100 GN 4x2xAWG22	2YH (ST) CY 4x2x0.5/1.0-100 GN
Jacket	PVC Ø 9.6 ± 0.3 mm; green	PVC Ø 8 ± 0.2 mm; green
Permitted ambient conditions		
Operating temperature	-40 °C ... +80 °C	-40 °C ... +80 °C
Transportation/storage temperature	-40 °C to +80 °C	-40 °C to +80 °C
Installation temperature	-40 °C to +80 °C	-40 °C to +80 °C
Resistance to fire	Flame retardant to IEC 60332-1	Flame retardant to IEC 60332-3-24 (Category C)
Resistance to oil	Conditionally resistant	Conditionally resistant
UV resistance	resistant	resistant
Product characteristics		
Halogen-free	No	No
Silicone-free	Yes	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article numbers

IE FC TP standard cable GP 4x2	8-wire shielded TP installation cable for universal application; with UL approval.	
	• 22 AWG	6XV1870-2E
	• 24 AWG	6XV1878-2A

2.5.15 IE FC TP flexible cable GP 4x2

Description

The IE FC flexible cable GP 4x2 with its flexible wires is suitable for applications in which occasional movement is required. The cable has the FC design and can be stripped with the IE FC stripping tool. This allows the IE FC RJ-45 4x2 plug-in connector to be connected to the IE FC flexible cable GP 4x2.

Features and functions

Cable type ¹⁾	IE FC TP flexible cable GP 4x2
Areas of application	Occasional movement
Cable specification	Cat 6
Maximum cable length	

Cable type ¹⁾	IE FC TP flexible cable GP 4x2
<ul style="list-style-type: none"> with IE FC RJ-45 plug 	55 m
Cable type (standard designation)	LI02YSH (ST) CY 4x2x0.22/1.1-100 GN
Jacket	PVC Ø 8 ± 0.2 mm; green
Permitted ambient conditions	
Operating temperature	-40 °C ... +80 °C
Transportation/storage temperature	-40 °C ... +80 °C
Installation temperature	-40 °C ... +80 °C
Resistance to fire	Flame retardant to IEC 60332-3-24 (Category C)
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article number

IE FC TP flexible cable GP 4x2	8-wire shielded TP installation cable for universal application; with UL approval.	6XV1878-2B
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2.5.16 IE TP train cable 4x2

Description

The IE TP train cable 4x2 (24/7 AWG) is a shielded flexible bus cable with tin-plated copper stranded wires for laying in rail vehicles and buses. This cable is suitable for assembly with the FC M12 plug PRO 4x2.

Features and functions

Cable type ¹⁾	IE TP train cable 4x2
Areas of application	Rail vehicles and buses
Cable specification	Cat 7
Maximum cable length	
<ul style="list-style-type: none"> in Industrial Ethernet 100BaseTX, 1000BaseT 	100 m
Cable type (standard designation)	02Y(ST)C99Y 4x2x0.61/1.45-100 PIMF
Jacket	Elastomer electron-beam cross-linked Ø 8.1 ± 0.2 mm, black

Cable type ¹⁾	IE TP train cable 4x2
Permitted ambient conditions	
Operating temperature	-40 °C to +80 °C
Transportation/storage temperature	-40 °C to +80 °C
Installation temperature	-20 °C ... +60 °C
Resistance to fire	Meets the following standards: <ul style="list-style-type: none"> • BS 6853 • DIN5510-2 fire protection level 1-4 • prEN 45545-2 hazard level HL 1-HL 3 • EN 50306-4 • NF F 16-101 • NFPA130
Resistance to oil	EN 50306-4 (72h/100 °C, IRM 902, 168h/70 °C, IRM 903)
UV resistance	Resistant
Product characteristics	
Halogen-free	Yes
Silicone-free	Yes

Article number

IE TP train cable 4x2	8-wire shielded TP installation cable for use in rail vehicles and buses, with railway approval.	6XV1878-2T
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2.6 IE connecting cable M12

Description

The IE connecting cable M12 is an assembled connecting cable for connecting Industrial Ethernet nodes. As the connecting cable, the IE FC TP trailing cable GP is used. Due to the 4-wire IE FC TP trailing cable GP that is used, the connecting cable is suitable for drag chains. The IE connecting cable M12 is suitable for drag chains for 3,000,000 bending cycles at a bending radius of 100 mm, a speed of 4 m/s and an acceleration of 4 m/s².



The IE connecting cable M12 is available in the following variants:

- IE connecting cable M12-180/M12-180
Plug-in cable with two 4-pin M12 plugs (D-coded) for connecting Industrial Ethernet nodes with degree of protection IP65/IP67, e.g. SIMATIC ET 200, SCALANCE X208 PRO and SIMATIC RF systems.
- IE connecting cable M12-180/IE FC RJ-45-145
Connecting cable with one 4-pin M12 plug (D-coded) and one IE FC RJ-45 connector. The plug-in cable is used to connect Industrial Ethernet nodes, e.g. SIMATIC ET 200, SCALANCE X208 PRO and SIMOTION.

Features and functions

Cable type ¹⁾	IE connecting cable M12
Areas of application	For connecting Industrial Ethernet nodes
Cable specification	Cat 5e
Maximum cable length	
<ul style="list-style-type: none"> • with two M12 plugs 	1 m
<ul style="list-style-type: none"> • with M12 plugs and RJ-45 plugs 	10 m
Cable type (standard designation)	2YY (ST) CY 2x2x0.75/1.5-100 LI GN
Jacket	PVC Ø (6.5 ± 0.2) mm, green
Permitted ambient conditions	

Cable type ¹⁾	IE connecting cable M12
Operating temperature	-25 °C to +75 °C
Transportation/storage temperature	25 °C to +75 °C
Installation temperature	25 °C to +75 °C
Resistance to fire	Flame retardant to UL 1685 (CSA FT 4)
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	no
Silicone-free	yes

¹⁾ Electrical properties at 20 °C, tested to DIN 0472

Article numbers

IE connecting cable M12-180/M12-180	preassembled IE FC TP trailing cable GP, with 2 x M12 plugs (D coded)	
	• 0.3 m	6XV1870-8AE30
	• 0.5 m	6XV1870-8AE50
	• 1.0 m	6XV1870-8AH10
	• 1.5 m	6XV1870-8AH15
	• 2.0 m	6XV1870-8AH20
	• 3.0 m	6XV1870-8AH30
	• 5.0 m	6XV1870-8AH50
	• 10.0 m	6XV1870-8AN10
• 15.0 m	6XV1870-8AN15	
IE connecting cable M12-180/IE FC RJ45 PLUG-145	preassembled IE FC TP trailing cable GP, with 1 x M12 plugs (D coded) and 1 x IE FC RJ-45 plug	
	• 2.0 m	6XV1871-5TH20
	• 3.0 m	6XV1871-5TH30
	• 5.0 m	6XV1871-5TH50
	• 10.0 m	6XV1871-5TN10
• 15.0 m	6XV1871-5TN15	

2.7 IE Robust Connecting Cable M12

Description

The IE robust connecting cable M12 is an oil and UV resistant cable in a flame retardant version that is particularly suitable for use in the food industry. The preassembled cables have a 4-pin M12 plug at one end and a 4-pin socket at the other (both D-coded). This product is also available by the meter without connectors.

Features and functions

Cable type	FC TP robust food cable 2x2 (PROFINET type B) CAT5 Plus
Areas of application	Particularly resistant cable also suitable for use in the food industry.
Cable specification	Cat 5e
Maximum cable length	
• with IE FC RJ-45 plug	100 m
• with IE FC outlet RJ-45	90 m
Cable type (standard designation)	2YY(ST)CY6Y 2x2x0.75/1.55 LI VZN
Jacket	FEP Ø 6.5 ± 0.2 mm, transparent (inner jacket green)
Permitted ambient conditions	
Operating temperature	-40 °C to +80 °C
Transportation/storage temperature	-40 °C to +80 °C
Installation temperature	-40 °C to +80 °C
Resistance to fire	Flame retardant to IEC 60332-1-2 and UL 1685 (CSA FT 4)
Resistance to oil	Oil-resistant to IEC 60811-404 (24 h / 100 °C)
UV resistance	Resistant acc.to UL 2556 Sec. 4.2.8.5
Product characteristics	
Halogen-free	No
Silicone-free	Yes

Article numbers

FC TP robust food cable 2x2 (PROFINET type B) CAT5 Plus	4-wire, shielded TP installation cable Sold by the meter, minimum order 20 m, maximum order 1000 m.	6XV1881-2A
IE robust connecting cable M12	4-wire shielded TP installation cable, preassembled with an M12 plug and an M12 socket (both D-coded) with degree of protection IP69.	
	• 1.0 m	6XV1881-5AH10
	• 2.0 m	6XV1881-5AH20
	• 3.0 m	6XV1881-5AH30
	• 5.0 m	6XV1881-5AH50

2.8 IE Hybrid Cable

Description

The IE hybrid cable 2x2 + 4x0.34 in conjunction with the IE FC RJ-45 modular outlet is the ideal solution when a device such as SCALANCE W needs to be supplied with its operating voltage and data at the same time.

The cable contains the following:

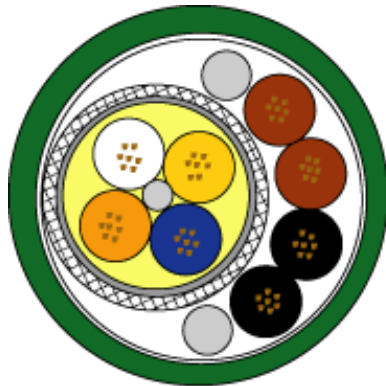
- 2x2 wires according to Cat 5e for data transfer
- 2x2 wires each with a wire diameter of 0.76 mm for transferring power

The power is transferred via the cable according to the Power over Ethernet standard (PoE).

The hybrid cable is halogen-free for universal application in an industrial and office environment. The cable is UV resistant acc. to UL 1581 Sec. 1200.

The maximum cable length between the IE FC RJ-45 modular outlet and the SCALANCE W access point is 80 m with an additional 6 m of patch cable for the IE FC RJ-45 modular outlet. For connection to the SCALANCE W, an IP67 hybrid plug-in connector is recommended.

Cable cross-section



Features and functions

Cable type ¹⁾	IE hybrid cable 2x2 + 4x0.34
Areas of application	Industrial and office area, for IE FC RJ-45 modular outlet and access point SCALANCE W with IP67 hybrid plug-in connector
Cable specification	Cat 5e (data wire) 22 AWG (power wire)
Maximum cable length	

Cable type 1)	IE hybrid cable 2x2 + 4x0.34
<ul style="list-style-type: none"> with IE FC RJ-45 modular outlet IP67 hybrid connector 	80 m
Cable type (standard designation)	L-9YH(ST)CH 2X2X0.34/1.5-100 GN VZN FRNC
Jacket	PVC Ø (6.5 ± 0.2) mm; green
Permitted ambient conditions	
Operating temperature	-25 °C to +70 °C
Transportation/storage temperature	-25 °C to +70 °C
Installation temperature	-25 °C to +70 °C
Free of halogens	yes
Resistance to fire	Flame retardant to IEC 60332-3-24 (Category C)
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	yes
Silicone-free	yes

Article number

IE hybrid cable 2x2 + 4x0.34	Flexible cable; 4 x Cu Cat 5e, shielded (22 AWG) and 4 x CU (0.34 mm ² per wire) for IE FC RJ-45 modular outlet with power insert and hybrid plug-in connector IP67.	6XV1870-2J
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2.9 Plugs

2.9.1 IE FC RJ-45 plugs 2x2

Description

The IE FC RJ-45 plugs 2x2 are compact and rugged plug-in connectors. The connectors have a robust metal casing suitable for industry that provides protection from interference for the data communication. The connectors comply with the standards EN 50173 (RJ-45) and ISO/IEC 11801

The IE FC RJ-45 plugs 2x2 are used to install 4-wire IE FC TP cables in the field.

The connector allows point-to-point connections (10/100 Mbps) to be implemented for Industrial Ethernet between two end devices/network components up to 100 m without patch cables.

The IE FC RJ-45 plugs 2x2 are available in three versions:

- With 180° (straight) cable outlet
Due to their design, the IE FC RJ-45 plug 180 can be used both for devices with individual jacks and for devices with multiple jacks (blocks). The connector is particularly suitable for connecting IE FC TP cables to SIMATIC NET modules and SCALANCE devices.



- With 90° (angled) cable outlet
The connector is particularly suitable for connecting IE FC TP cables to ET200 or PN/PN links.



Figure 2-5 IE FC RJ-45 PLUG 902X2

- With 145° (angled) cable outlet

The connector is intended for connecting IE FC TP cables to SIMOTION and SINAMICS modules.



Features and functions

Connection type	IE FC RJ-45 plug 180 (2x2)	IE FC RJ-45 plug 90 (2x2)	IE FC RJ-45 plug 145 (2x2)
Cabling specification	Cat5	Cat5	Cat5
Standards, approvals			
• RoHS conformity	yes	yes	yes
• UL approval	yes	yes	yes
Transmission speed			
Industrial Ethernet	10 / 100 Mbps	10 / 100 Mbps	10 / 100 Mbps
Interfaces			
Number of electrical connectors for IE FC TP cables	4	4	4
version IE FC TP	Integrated insulation-piercing contacts for 4-wire IE FC TP cables	Integrated insulation-piercing contacts for 4-wire IE FC TP cables	Integrated insulation-piercing contacts for 4-wire IE FC TP cables
Version for network components or end devices	RJ-45 plug	RJ-45 plug	RJ-45 plug
Design			
Cable outlet	180°	90°	145°
Housing material	Metal	Metal	Metal
Permitted ambient conditions			
Operating temperature	-20 °C to +70 °C	-20 °C to +70 °C	-20 °C to +70 °C
Transportation/storage temperature	-40 °C to +80 °C	-40 °C to +80 °C	-40 °C to +80 °C
IP degree of protection	IP20	IP20	IP20
Product property			
Silicone-free	yes	yes	yes

Article numbers

IE FC RJ45 Plug 180	RJ-45 cable connector Industrial Ethernet with rugged metal casing and integrated insulation displacement contacts for connection of the 4-wire IE FC TP cables. With 180° cable outlet.	
	1 pack of 1	6GK1901-1BB10-2AA0
	1 pack of 10	6GK1901-1BB10-2AB0
	1 pack of 50	6GK1901-1BB10-2AE0
IE FC RJ45 Plug 90	RJ-45 cable connector for Industrial Ethernet with rugged metal casing and integrated insulation piercing contacts for connection of the 4-wire IE FC TP cables. With 90° cable outlet.	
	1 pack of 1	6GK1901-1BB20-2AA0
	1 pack of 10	6GK1901-1BB20-2AB0
	1 pack of 50	6GK1901-1BB20-2AE0
IE FC RJ45 Plug 145	RJ-45 cable connector for Industrial Ethernet with rugged metal casing and integrated insulation piercing contacts for connection of the 4-wire IE FC TP cables. With 145° cable outlet.	
	1 pack of 1	6GK1901-1BB30-0AA0
	1 pack of 10	6GK1901-1BB30-0AB0
	1 pack of 50	6GK1901-1BB30-0AE0

2.9.2 IE FC RJ45 Plug 180 (4x2)

Description

The IE FC RJ-45 PLUG 180 (4x2) is an RJ-45 data plug-in connector with a metal housing suitable for industry and straight cable outlet (180°). The plug is suitable for fitting to 8-wire IE FastConnect cables (24 AWG) and meets the requirements of the standard Cat6A acc. to EIA/TIA 568. The maximum transmission rate is 10 Gbps. Due to the FastConnect technology assembly in the field is possible without problems. The design of the housing matches all SIMATIC NET modules and SCALANCE devices.

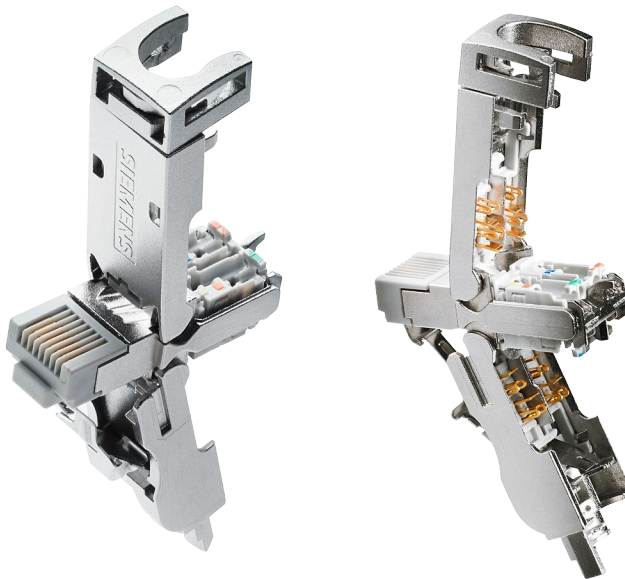


Figure 2-6 IE FC RJ-45 PLUG 180 (4x2) opened

Features and functions

Connection type	IE FC RJ-45 PLUG 180 (4x2)
Cabling specification	Cat6A
Standards, approvals	
• RoHS conformity	Yes
• UL approval	Yes
• cULus approval	Yes
Transmission speed	
Industrial Ethernet	10 Mbps, 100 Mbps, 1000 Mbps or 10000 Mbps
Interfaces	
Number of electrical connectors for IE FC TP cables	8
IE FC TP version	Integrated insulation displacement contacts for 8-wire IE FC TP cables, FastConnect technology

Connection type	IE FC RJ-45 PLUG 180 (4x2)
Version for network components or end devices	RJ-45 plug.
Design	
Cable outlet	180°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	-40 °C ... +85 °C
Transportation/storage temperature	-40 °C ... +85 °C
IP degree of protection	IP 20
Product property	
Silicone-free	Yes
Number of re-uses	10

Article numbers

IE FC RJ45 Plug 180 (4x2)	RJ-45 plug for Industrial Ethernet with rugged metal casing and integrated insulation displacement contacts for connection of the 8-wire IE FC TP cables.	
	1 pack of 1	6GK1901-1BB12-2AA0
	1 pack of 10	6GK1901-1BB12-2AB0
	1 pack of 50	6GK1901-1BB12-2AE0

2.9.3 IE M12 panel feedthrough 4x2

Description

The IE M12 panel feedthrough 4x2 allows the transition from M12 connector technology to RJ-45 connector technology. The metal housing with 90° cable outlet is designed for ambient temperatures up to 85 °C. The M12 connector (X-coded) has a degree of protection IP67, the RJ-45 connector has a degree of protection IP20. The product is intended for use with 8-wire Cat6A cables; the maximum transmission rate is 10 Gbps.



Figure 2-7 IE M12 panel feedthrough 4x2

Features and functions

Connection type	IE M12 panel feedthrough 4x2
Cabling specification	Cat6A
Standards, approvals	
• RoHS conformity	Yes
• UL approval	Yes
• cULus approval	Yes
Transmission speed	
Industrial Ethernet	10 Mbps, 100 Mbps, 1000 Mbps or 10000 Mbps
Interfaces	
Version for network components or end devices	M12 socket (X-coded) and RJ-45 plug
Design	
Cable outlet	90°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	-40 °C ... +85 °C
Transportation/storage temperature	-40 °C ... +85 °C
IP degree of protection	M12 socket: IP67 RJ-45 plug: IP20
Product property	
Silicone-free	Yes
Dimensions (W x H x D)	22 x 29 x 46 mm

Article number

IE M12 panel feedthrough 4x2	Cabinet feedthrough for the transition from M12 connector technology to RJ-45 connector technology. 1 pack of 5	6GK1901-0DM40-2AA5
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2.9.4 IE M12 Panel Feedthrough PRO

Description

The IE M12 panel feedthrough PRO has an M12 socket (D-coded) on both sides with degree of protection IP65/67. The maximum ambient temperature is 60 °C. The product is intended for use with 4-wire Cat5 cables, the maximum transmission rate is 100 Mbps.



Figure 2-8 IE M12 panel feedthrough PRO

Features and functions

Connection type	IE M12 panel feedthrough PRO
Cabling specification	Cat5A
Standards, approvals	
• RoHS conformity	Yes
• UL approval	No
• cULus approval	No
Transmission speed	
Industrial Ethernet	10 Mbps, 100 Mbps
Interfaces	
Version for network components or end devices	2 x M12 socket (D-coded)
Design	
Cable outlet	180°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	-5 °C ... +60 °C
Transportation/storage temperature	-5 °C ... +60 °C
IP degree of protection	IP65/IP67

Connection type	IE M12 panel feedthrough PRO
Product property	
Silicone-free	Yes
Dimensions (W x H x D)	35.6 x 22.6 x 44.5 mm

Article number

IE M12 panel feedthrough PRO	Panel feedthrough with M12 connector technology. 1 pack of 5	6GK1901-0DM30-2AA5
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2.9.5 IE FC M12 plug PRO 2x2

Description

The plug-in connector IE FC M12 plug PRO 2x2 can be used in conjunction with end devices and network components with degree of protection IP65/67 in systems without cabinets.

The connector is a 4-pin M12 plug with which you can connect industrial Ethernet devices with M12 Fast Ethernet sockets via a 4-wire IE FC TP cable to a Fast Ethernet network, for example SCALANCE X208 PRO, IM 154-4 PN and SIMATIC RF systems.

With IE FC cable 2x2 and IE M12 plug PRO 2x2, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.



Figure 2-9 IE FC M12 plug PRO

Features and functions

Connection type	IE FC M12 plug PRO 2x2
Cabling specification	Cat5
Standards, approvals	
• RoHS conformity	yes
• UL approval	yes
Transmission speed	
Industrial Ethernet	10 / 100 Mbps
Interfaces	
Number of electrical connectors for IE FC TP cables	Integrated insulation-piercing contacts for 4-wire IE FC TP cables
Version for network components or end devices	M12 plug (D-coded)

Connection type	IE FC M12 plug PRO 2x2
Design	
Cable outlet	180°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	- 40 °C to + 85 °C
Transportation/storage temperature	- 40 °C to + 85 °C
IP degree of protection	IP 65/67
Product property	
Silicone-free	yes

Article numbers

IE FC M12 Plug PRO 2x2	M12 plug-in connector 4-pin, D-coded, for fitting to 4-wire IE FC TP cables with rugged metal casing and FastConnect technology; 180° cable outlet.	
	1 pack of 1	6GK1901-0DB20-6AA0
	1 pack of 8	6GK1901-0DB20-6AA8

2.9.6 IE FC M12 Plug PRO 4x2

Description

The IE M12 plug PRO is a 4-pin, X-coded M12 plug with degree of protection IP67. The plug is particularly suitable for use with devices with the relevant degree of protection such as the SCALANCE X208PRO. The plug can be fitted to cables with an outer diameter of 6 mm to 8 mm. The plug is suitable for assembling IE FC cables with transmission rates of up to 100 Mbps. This allows the IE FastConnect stripping tool to be used. By using the insulation piercing technique, assembly is simple and fast and requires no additional special tools.

With IE FC cable 2 x 2 and IE M12 plug PRO, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.



Figure 2-10 IE FC M12 plug PRO 4 x 2

Features and functions

Connection type	IE FC M12 Plug PRO 4x2
Cabling specification	Cat6
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Transmission speed	
Industrial Ethernet	10 / 100 / 1000 / 10000 Mbps
Interfaces	
Number of electrical connectors for IE FC TP cables	Integrated insulation-piercing contacts for 8-wire IE FC TP cables
Version for network components or end devices	M12 plug (X-coded)
Design	
Cable outlet	180°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	-40 °C to +85 °C
Transportation/storage temperature	-40 °C to +85 °C
IP degree of protection	IP 65/67
Product property	
Silicone-free	yes

Article numbers

IE FC M12 Plug PRO 4x2	M12 plug-in connector 8-pin, X-coded, for fitting to 8-wire cables with rugged metal casing and FastConnect technology; 180° cable outlet	
	1 pack of 1	6GK1901-0DB30-6AA0
	1 pack of 8	6GK1901-0DB30-6AA8

2.9.7 IE FC M12 Cable Connector PRO (PROFINET)

Description

The IE FC M12 cable connector PRO (PROFINET) is an 8-pin M12 data plug-in connector (X-coded) with a metal housing suitable for industry. Due to the design and the degree of protection IP67 the main application is to connect electrical cables to the M12 interfaces of SCALANCE W devices. When using Cat6A cables, the maximum transmission rate is 10 Gbps. Due to the FastConnect technology assembly in the field is possible without problems.



Figure 2-11 IE FC M12 cable connector PRO (PROFINET)

Features and functions

Connection type	IE FC M12 cable connector PRO (PROFINET)
Cabling specification	Cat6A
Standards, approvals	
• RoHS conformity	Yes
• UL approval	Yes
• cULus approval	Yes
Transmission speed	
Industrial Ethernet	10 Mbps, 100 Mbps, 1000 Mbps or 10000 Mbps
Interfaces	
Number of electrical connectors for IE FC TP cables	8
IE FC TP version	Integrated insulation displacement contacts for 8-wire IE FC TP cables, FastConnect technology
Version for network components or end devices	
Design	
Cable outlet	180°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	-40 °C ... +85 °C
Transportation/storage temperature	-40 °C ... +85 °C

Connection type	IE FC M12 cable connector PRO (PROFINET)
IP degree of protection	IP67
Product property	
Silicone-free	Yes

Article numbers

IE FC RJ45 Plug 180 (4x2)	M12 plug (X-coded) for Industrial Ethernet with rugged metal casing and integrated insulation displacement contacts for connection of the 8-wire IE FC TP cables.	
	1 pack of 1	6GK1901-0DB40-6AA0
	1 pack of 8	6GK1901-0DB40-6AA8

2.9.8 IE FC RJ-45 plug PRO (push-pull)

Description

The plug with push pull device connector can be used with end devices and network components with degree of protection IP65/67 in systems without cabinets.

The IE FC RJ-45 plug PRO is used to assemble 4-wire IE FC TP cables in the field.



Figure 2-12 IE FC RJ-45 plug PRO

The push pull mechanism allows the IE FC RJ45 plug PRO plug-in connector to be plugged in and pulled easily with SCALANCE X-200IRT PRO, ET 200pro and SIMATIC RF systems. The mechanism also increases the bending and strain the plug-in connector can withstand and protects the RJ-45 socket from mechanical strain in an industrial area.

In contrast to the plug-in connector IE FC RJ-45 Plug PRO (push pull) with the IE RJ-45 Plug PRO the electrical connector is not FastConnect.



Figure 2-13 IE RJ-45 plug PRO

Features and functions

Connection type	IE RJ-45 plug PRO (push pull)	IE FC RJ-45 plug PRO (push pull)
Cabling specification	Cat 5e	Cat 5e
Standards, approvals		
• RoHS conformity	yes	yes
• UL approval	no	no
Transmission speed		
Industrial Ethernet	10 / 100 Mbps	10 / 100 Mbps
Interfaces		
Number of electrical connectors for IE FC TP cables	4	4
IE FC TP version	Integrated insulation displacement contacts for 4-wire IE FC TP cables	Integrated insulation-piercing contacts for 4-wire IE FC TP cables
Version for network components or end devices	RJ-45 plug (push pull device connector)	RJ-45 plug (push pull device connector)
Design		
Cable outlet	180°	180°
Housing material	Plastic	Plastic
Permitted ambient conditions		
Operating temperature	-40 °C to +70 °C	-40 °C to +70 °C
Transportation/storage temperature	-40 °C to +70 °C	-40 °C to +70 °C
Chemical resistance to water	Resistant	Resistant
IP degree of protection	IP65/67	IP65/67
Product property		
Silicone-free	yes	yes

Article numbers

IE RJ-45 plug PRO (push pull)	RJ-45 plug-in connector with push pull device connector with rugged plastic housing and integrated insulation displacement contacts for connection of the Industrial Ethernet FC installation cables. With 180° cable outlet, for switches SCALANCE X-200IRT PRO, ET 200pro and SIMATIC RF systems with Industrial Ethernet interface	
	1 pack of 1	6GK1901-1BB10-6AA0
IE FC RJ-45 plug PRO (push pull)	RJ-45 plug-in connector with push pull device connector with rugged plastic housing and integrated insulation displacement contacts for connection of the IE FC TP cables. With 180° cable outlet	
	1 pack of 1	6GK1901-1BB20-6AA0

2.9.9 IE FC RJ-45 PLUG PRO

Description

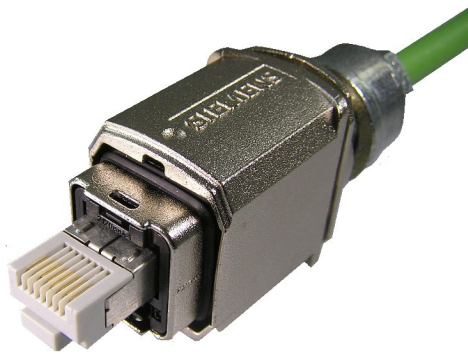


Figure 2-14 IE FC RJ-45 PLUG PRO

The IE FC RJ-45 PLUG PRO has a metal housing with degree of protection IP65/67 and is intended to assemble 8-wire IE FC TP cables in the field. The push pull mechanism allows the IE FC RJ45 plug PRO plug-in connector to be plugged in and pulled easily with SCALANCE X-200IRT PRO, ET 200pro and SIMATIC RF systems. The mechanism also increases the bending and strain the plug-in connector can withstand and protects the RJ-45 socket from mechanical strain in an industrial area.

Features and functions

Connection type	IE RJ-45 plug PRO (metal version)
Cabling specification	Cat 6A
Standards, approvals	
• RoHS conformity	Yes
• UL approval	Yes
Transmission speed	
Industrial Ethernet	10 Mbps, 100 Mbps, 1 Gbps, 10 Gbps
Interfaces	
Number of electrical connectors for IE FC TP cables	8
IE FC TP version	Integrated insulation displacement contacts for 8-wire IE FC TP cables
Version for network components or end devices	RJ-45 plug (push pull device connector)
Design	
Cable outlet	180°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	-40 °C ... +70 °C

Connection type	IE RJ-45 plug PRO (metal version)
Transportation/storage temperature	-40 °C ... +70 °C
Chemical resistance to water	Resistant
IP degree of protection	IP65/67
Product property	
Silicone-free	yes

Article number

IE RJ-45 plug PRO (metal version)	RJ-45 plug-in connector with push pull device connector with rugged metal housing and integrated insulation displacement contacts for connection of the Industrial Ethernet FC installation cables. With 180° cable outlet, for switches SCALANCE X-200IRT PRO, ET 200pro and SIMATIC RF systems with Industrial Ethernet interface. 1 pack of 1	6GK1901-1BB21-6AA0
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2.9.10 IE RJ-45 COUPLER PRO

Description



Figure 2-15 IE RJ-45 COUPLER PRO

The RJ-45 COUPLER PRO has a rugged metal housing and is designed for wall mounting. This component is used when setting up flexible cabling as an optional connector for data cables. On both sides there is a socket for push-pull plugs, one side is also equipped with a protective cap. If both sockets have a plug or protective cap, the requirements of degree of protection IP65/67 are met.

Features and functions

Connection type	RJ-45 COUPLER PRO
Cabling specification	Cat5A
Standards, approvals	
• RoHS conformity	Yes
• UL approval	No
• cULus approval	No
Transmission speed	
Industrial Ethernet	10 Mbps, 100 Mbps
Interfaces	
Version for network components or end devices	2 x push-pull mounting with RJ-45 socket
Design	
Cable outlet	180°
Housing material	Aluminum extruded section, zinc die casting
Permitted ambient conditions	
Operating temperature	-5 °C ... +60 °C
Transportation/storage temperature	-5 °C ... +60 °C
IP degree of protection	IP65/IP67
Product property	
Silicone-free	Yes
Dimensions with protective cap (W x H x L)	46 x 58 x 99 mm

Article number

RJ-45 COUPLER PRO	Flexible connection option with push-pull fasteners. 1 pack of 1	6GK1901-0BP10-6AA0
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2.9.11 IP 67 hybrid cable connector

General

The IP67 hybrid plug-in connector is used to connect SCALANCE W700 to Industrial Ethernet. In conjunction with the hybrid cable 2x2 + 4x0.34 and the IE FC RJ-45 modular outlet with power insert in addition to the data transmission the supply voltage for the target device can also be transferred. The connection of a voltage is possible with Power over Ethernet (PoE). The IP67 hybrid plug-in connector is supplied with the SCALANCE W700.

Features and functions

Connection type	IP67 hybrid plug-in connector
Cabling specification	Cat 5
Transmission speed	
Industrial Ethernet	10 / 100 Mbps
Interfaces	
Number of electrical connectors for hybrid cables	1
IE FC TP version	integrated insulation displacement contacts for 4-wire TP FC installation cables
Cable outlet	180°
Housing material	Plastic
Permitted ambient conditions	
Ambient temperature	-40 °C to + 70°C
IP degree of protection	IP67

Article number

IP67 hybrid plug-in connector	Plug-in connector to connect SCALANCE W700 to Industrial Ethernet and Power over Ethernet (PoE) with assembly instructions. can be ordered directly from: HARTING Germany GmbH & Co KG Postfach 24-51 D-32381 Minden Tel. +49 571-8896-0 Fax. +49 571-8896-354 E-mail: de.sales@HARTING.com Internet: http://www.HARTING.com	
	1 pack of 1	09 45 125 1300.00

2.10 Outlets

2.10.1 IE FC RJ-45 modular outlet

Description

The rugged metal housing allows the mounting of the IE FC modular outlet on a DIN rail. Direct wall mounting is also possible.



Figure 2-16 IE FC RJ-45 modular outlet - basic module

The Industrial Ethernet FC RJ-45 modular outlet basic module exists with three inserts:

- Insert 2 FE: Basic module with insert for two Fast Ethernet connections for connection of two 10/100 Mbps end devices/network components



Figure 2-17 Modular outlet, 2x LAN

- Insert 1 GE: Basic module with insert for one Gigabit Ethernet connection for connecting a 10/100/1000 Mbps end device/network component



Figure 2-18 Modular outlet insert 1GE

- Outlet power insert: Basic module with insert for connecting a power supply and a 10/100 Mbps end device/network component.



Figure 2-19 Modular outlet, power insert

By replacing the insert, it is possible to upgrade a 100 Mbps double connection to a gigabit connection. The requirement for this is that the wiring was done with an IE FC standard cable GP 4x2. In this case, only the insert 2FE needs to be replaced with an insert of the type 1GE.

To supply detached nodes with power and data, the IE FC RJ-45 modular outlet with the power insert is connected to the hybrid cable 2x2 + 4x0.34. A maximum of 80 m can be bridged between the outlet and the IP67 hybrid plug-in connector. The connection between the outlet and end device can be established with a maximum 6 m long patch cable.

Features and functions

Connection type	IE FC RJ45 modular outlet insert 2FE	IE FC RJ45 modular outlet insert 1GE	IE FC RJ45 modular outlet power insert
Cabling specification	Cat 5e	Cat 6	Cat 5e
Standards, approvals			
• RoHS conformity	yes	yes	yes
• UL approval	yes	yes	yes
Transmission speed			
Industrial Ethernet	10 / 100 Mbps	10 / 100 / 1000 Mbps	10 / 100 Mbps
Interfaces			
Number of electrical connectors for IE FC TP cables	8	8	8
IE FC TP version	integrated insulation displacement contacts for 8-wire TP FC installation cables	integrated insulation displacement contacts for 8-wire TP FC installation cables	integrated insulation displacement contacts for 8-wire TP FC installation cables
Version for network components or end devices	RJ-45 plug	RJ-45 plug	RJ-45 plug 24 VDC terminal (2-pin)
Design			
Cable outlet	180°	180°	180°
Housing material	Metal	Metal	Metal
Permitted ambient conditions			
Operating temperature	-25 °C to +70 °C	-25 °C to +70 °C	-25 °C to +70 °C

2.10 Outlets

Connection type	IE FC RJ45 modular outlet insert 2FE	IE FC RJ45 modular outlet insert 1GE	IE FC RJ45 modular outlet power insert
Transportation/storage temperature	-40 °C to +80 °C	-40 °C to +80 °C	-40 °C to +80 °C
IP degree of protection	IP40	IP40	IP40

Article numbers

IE FC RJ-45 modular outlet (basic module)	IE FC RJ-45 modular outlet basic module for Industrial Ethernet for insertion of an insert.	
	1 pack of 1	6GK1901-1BE00-0AA0
IE FC RJ-45 modular outlet insert 2FE	IE FC RJ-45 modular outlet basic module with insert; 2 x RJ-45 for 2 x 100 Mbps interface	
	1 pack of 1	6GK1901-1BE00-0AA1
IE FC RJ-45 modular outlet insert 1GE	IE FC RJ-45 modular outlet basic module with insert; 1 x RJ-45 for 1 x 1000 Mbps interface	
	1 pack of 1	6GK1901-1BE00-0AA2
IE FC RJ45 modular outlet power insert	IE FC RJ-45 modular outlet basic module with insert; 1 x RJ-45 for 1 x 1000 Mbps interface and 1 x 24 VDC	
	1 pack of 1	6GK1901-1BE00-0AA3
Insert 2 FE	Insert for IE FC RJ-45 modular outlet basic module; 2 x RJ-45 for 2 x 100 Mbps interface	
	1 pack of 4	6GK1901-1BK00-0AA1
Insert 1 GE	Insert for IE FC RJ-45 modular outlet basic module; 2 x RJ-45 for 2 x 100 Mbps interface	
	1 pack of 4	6GK1901-1BK00-0AA2

2.10.2 IE FC outlet RJ-45

Description

The IE FC outlet R-45 serves as a transition from the rugged IE FC cables used in the industrial environment to preassembled TP cord cables with an RJ-45 socket.

The IE FC outlet RJ-45 has a rugged metal housing and meets the requirements of category 5 of the international cabling standards ISO/IEC 11801 and EN 50173. The IE FC outlet RJ-45 is suitable for installation on a DIN rail or for wall mounting.

The IE FC outlet RJ-45 can be mounted behind a metal plate with a cutout, e.g. a cabinet.

By lining up several IE FC outlets RJ-45 it is possible to set up a patch field with any connection density.

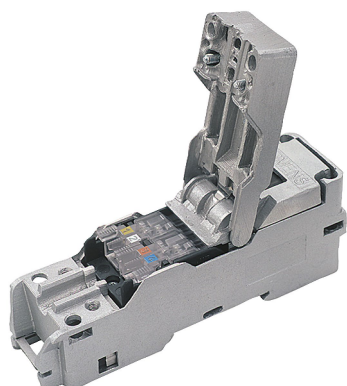


Figure 2-20 Industrial Ethernet FC outlet RJ-45 (opened)

Features and functions

Connection type	IE FC outlet RJ-45
Cabling specification	Cat 5
Standards, approvals	
• RoHS conformity	yes
• UL approval	yes
Transmission speed	
Industrial Ethernet	10 / 100 Mbps
Interfaces	
Number of electrical connectors for IE FC TP cables	4
IE FC TP version	Integrated insulation-piercing contacts for 4-wire FC TP installation cables
Version for network components or end devices	RJ-45 plug
Design	
Cable outlet	180°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	-25 °C to +70 °C
Transportation/storage temperature	-40 °C to +70 °C
IP degree of protection	IP20

Article number

IE FC outlet RJ-45	IE FC outlet RJ-45 for connecting Industrial Ethernet FC TP cables and TP cords	
	1 pack of 1	6GK1901-1FC00-0AA0

Optical networks

3.1 Optical transmission technology

Fiber-optic cables (FO cables)

On fiber-optic cables (FO) data is transmitted by modulating electromagnetic waves in the range of visible and invisible light.

The materials used are highquality plastic and glass fibers

Only the fiber-optic cables intended for SIMATIC NET for Industrial Ethernet are described below. The various FO cable types allow solutions for connecting the components with each other adapted to the operating and environmental conditions.

The following fiber-optic cables are available for industrial Ethernet:

- Glass FO cables
- PCF FO cables (Polymer Cladded Fiber)
- POF FO cables (Polymer Optical Fiber)

Compared with electrical cables, fiber-optic cables have the following advantages:

Advantages

- Electrical isolation of nodes and segments
- No grounding problems,
- No shield currents,
- Transmission path immune to external electromagnetic noise,
- No lightning protection required,
- No noise emission along the transmission path,
- Light weight,
- Depending on the fiber type, cables several kilometers long can be used even at higher transmission rates.
- The transmission rate does not affect the maximum permitted cable length
- The meter markers printed on the cable make it easier to identify the length. (Serve as orientation; accuracy $\pm 5\%$.)

Point-to-point link

Fiber-optic technology only allows the implementation of point-to-point links; in other words, one transmitter is connected to only one receiver. The transmission path between two nodes requires two fibers (one for each transmission direction). With the optical components for Industrial Ethernet, bus, star and ring structures can be implemented.

3.2 Overview of optical cables

For the various topologies, requirements or areas of application the following fiber-optic cables are available.

Cabling	Cable type	Area of application
Glass FO cable Glass fiber, sold by the meter or pre-assembled with 4 ST/BFOC or SC plugs	FO standard cable GP (50/125)	Standard cable for universal application.
	MM FO robust cable GP (50/125)	Rugged multimode cable also for outdoors and laying in the earth.
	SM FO robust cable GP (50/125)	Rugged single mode cable also for outdoors and laying in the earth.
	FO FRNC cable GP (50/125/OM2)	Multimode cable with halogen-free and flame retardant design for laying in buildings.
	FO FRNC cable GP (50/125/OM4)	Multimode cable with halogen-free and flame retardant design for laying in buildings.
	INDOOR FO cable (62.5/125/OM1)	Multimode cable with halogen-free and flame retardant design for laying in buildings. Orange FRNC cable jacket with flat cross section.
	FO trailing cable GP (50/125) FO trailing cable (50/125)	Cable for use in drag chains.
	FO ground cable (50/125)	Longitudinally and laterally watertight cable for use outdoors, with non-metal rodent protection, laying in the earth possible.
	Flexible FO trailing cable (62.5/125)	Multimode cable for use in drag chains indoors and outdoors.
	SIENOPYR duplex fiber-optic marine cable (62.5/125)	Multimode cable for use on ships and offshore platforms with numerous shipbuilding approvals.
Glass FO cable with FastConnect technology	FC FO standard cable GP 62.5/200/230 µm	Multimode cable for fixed installation in cable channels and pipes with round PVC cable jacket.
	FC FO trailing cable 62.5/200/230 µm	Flexible multimode cable for use in drag chains indoors and outdoors.
Plastic FO cable Plastic fiber-optic cable, sold by the meter or preassembled (PCF FO cable) with 4 SC RJ plugs	POF Standard Cable GP 980/1000	POF FO standard cable for fixed installation indoors up to 50 m with PVC jacket.
	POF trailing cable 980/1000	POF FO trailing cable for moving applications (e.g. drag chains) up to 50 m with rugged PUR jacket.
	PCF standard cable GP 200/230	PCF FO standard cable for fixed installation indoors and outdoors with cable lengths up to 100 m with rugged PVC jacket.
	PCF trailing cable 200/230	PCF FO trailing cable for high mechanical load indoors and outdoors with cable lengths up to 100 m with rugged PUR jacket.
	PCF trailing cable GP 200/230	PCF FO trailing cable for lower mechanical load indoors and outdoors with cable lengths up to 100 m with PVC jacket.

3.3 Glass FO cables

3.3.1 FOC links

Standard Fast Ethernet

The switches equipped with interfaces for 100BASE-FX correspond to the standard IEEE 802.3u. They operate at a wavelength of 1300 nm.

For the connection, multimode glass fibers of the type 50/125 μm are suitable.

Switches or media modules equipped with an optical interface for single mode glass fibers of the type 10/125 μm have the supplement "LD (Long Distance)" in their names.

The maximum length of the insertable FO section is decided by:

- the fiber type multimode / single mode
- the link attenuation of the FO cable at the wavelength being used
- the bandwidth length product of the FO cable

Requirements for multimode glass FO cables

Table 3- 1 Maximum distance with multimode glass FO cables between two switches:

Fiber-optic cable type	FO cable attenuation at 1300 nm	Bandwidth length product	max. length
50/125 μm	$\leq 0,7$ dB/km	≥ 1200 MHz * km	5,000 m

Requirements for single mode glass FO cables

The single mode glass fiber-optic cables to be inserted between the interfaces must meet the following requirements regarding attenuation and bandwidth length product:

Table 3- 2 Maximum distance with single mode glass FO cables between two switches equipped for this:

Fiber-optic cable type	FO cable attenuation at 1300 nm	Bandwidth length product	max. length
10/125 μm	$\leq 0,5$ dB/km	k. A.	26,000 m

SIMATIC NET multimode glass FO cables

The SIMATIC NET product range for Industrial Ethernet contains various variants of multimode glass fiber-optic cables with 50/125 µm fibers. When linking SIMATIC NET Industrial Ethernet switches connected by SIMATIC NET multimode glass fiber-optic cables, distances of up to 5000 m are possible between 3 neighboring components.

Note

Single mode glass fiber-optic cables with the fiber type 10/125 µm are available as special cables. You will find a contact in the section "Contacts for special cables and special lengths" in this manual.

Standard 1 Gbps Ethernet

Similar to Fast Ethernet, with Gbps Ethernet a distinction is made between two versions that are both described in the standard IEEE 802.3z.

1000BASE-SX is the designation for the version with multimode glass fibers. It operates with a wavelength of 850 nm. Due to its properties, the same 50/125 µm fiber from the SIMATIC NET product spectrum can be used that is also used for 100BASE-FX. The distance between two points is 750 m. Taking into account the distance cabling with this fiber can be upgraded later from 100 Mbps Ethernet to 1 Gbps without laying new cables.

The version for single mode glass fibers is called 1000BASE-LX. Here it operates with a wavelength of 1300 nm. A single mode glass fiber-optic cable 10/125 m may be up to 10,000 m long.

In terms of the laying of the insertable FO section, the same dependencies apply as with 1000 Mbps Ethernet.

Table 3- 3 Maximum distance with multimode glass fiber-optic cables with 1 Gbps Ethernet:

Fiber-optic cable type	FO cable attenuation	Bandwidth length product	max. length
50/125 µm multimode	≤ 2,7 dB/km at 850 nm	≥ 600 MHz * km	750 m
9/125 µm single mode	≤ 0.5 dB/km at 1310 nm		10,000 m
	≤ 0.28 dB/km at 1550 nm		

3.3.2 FO Standard Cable GP 50/125 µm

Description

The FO standard cable contains 2 multimode graded index fibers of type 50/125 µm. The FO standard cable GP is the universal cable for use indoors and outdoors. The standard cable is suitable for connecting optical interfaces operating in the wavelength range around 850 nm and 1300 nm.

The FO standard cable GP is available in fixed lengths, preassembled with four ST/BFOC plugs or 4 SC plugs.

Features and functions

Cable type	FO standard cable GP 50/125	
Areas of application	Universal cable for use indoors and outdoors	
Cable type (standard designation)	AT-W(ZN)YY 2x1G50/125	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • ST/BFOC plug • SC plug 	
Standards, approvals		
• RoHS conformity	yes	
• UL approval	yes	
Mechanical data		
Number of fibers	2	
Fiber material	Multimode graded-index fiber 50/125 µm, OM2	
Maximum tensile load	500 N	
Optical data		
Attenuation	805 nm	≤ 2.7 dB/km
	1300 nm	≤ 0.7 dB/km
Bandwidth length product	805 nm	600 GHz *m
	1300 nm	1200 GHz *m
Permitted ambient conditions		
Operating temperature	-25 °C to +80 °C	
Transportation/storage temperature	-25 °C to +80 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	Flame-retardant to IEC 60332 -1-2 and IEC 60332 -3-22 (Cat A)	
Resistance to oil	Conditionally resistant	
UV resistance	resistant	
Product characteristics		
Silicone-free	yes	
Halogen-free	no	

Cable type		FO standard cable GP 50/125
Rodent protection		no
Cable length	100BaseFX	5000 m
	1000BaseSX	750 m
	1000BaseLX	2000 m

Article numbers

FO standard cable GP 50/125 ¹⁾	Standard cable; UL approval; splittable, without connectors, sold by the meter	6XV1873-2G
FO standard cable GP 50/125	Preassembled FO cable with 2x2 ST/BFOC plugs.	
	• 0.5 m	6XV1873-3AH05
	• 1 m	6XV1873-3AH10
	• 2 m	6XV1873-3AH20
	• 3 m	6XV1873-3AH30
	• 5 m	6XV1873-3AH50
	• 10 m	6XV1873-3AN10
	• 15 m	6XV1873-3AN15
	• 20 m	6XV1873-3AN20
	• 30 m	6XV1873-3AN30
	• 40 m	6XV1873-3AN40
	• 50 m	6XV1873-3AN50
	• 80 m	6XV1873-3AN80
	• 100 m	6XV1873-3AT10
	• 150 m	6XV1873-3AT15
• 200 m	6XV1873-3AT20	
• 300 m	6XV1873-3AT30	

FO standard cable GP 50/125	Preassembled FO cable with 2x2 SC plugs	
	• 0.5 m	6XV1873-6AH05
	• 1 m	6XV1873-6AH10
	• 2 m	6XV1873-6AH20
	• 3 m	6XV1873-6AH30
	• 5 m	6XV1873-6AH50
	• 10 m	6XV1873-6AN10
	• 15 m	6XV1873-6AN15
	• 20 m	6XV1873-6AN20
	• 30 m	6XV1873-6AN30
	• 40 m	6XV1873-6AN40
	• 50 m	6XV1873-6AN50
	• 80 m	6XV1873-6AN80
	• 100 m	6XV1873-6AT10
	• 150 m	6XV1873-6AT15
	• 200 m	6XV1873-6AT20
• 300 m	6XV1873-6AT30	

¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables

3.3.3 MM FO robust cable GP (50/125)

Description

The MM FO robust cable GP is for use indoors and outdoors - also suitable for laying in the earth. It also has rodent protection. The multimode graded index fiber 50/125/245 used allows transmission distances up to 5000 m. The product is available by the meter or preassembled with two LC Duplex plugs.

Features and functions

Cable type	MM FO robust cable GP (2G50/125)											
Areas of application	Universal cable for use indoors and outdoors and for direct installation underground.											
Version of the preassembled FO cable	<p>The non-preassembled cable can be fitted with the following plugs:</p> <ul style="list-style-type: none"> • BFOC plug • SC plug • LC Duplex plug <p>The preassembled cables are supplied with two LC Duplex plugs.</p>											
Cable type (standard designation)	AT-V(ZN)H(ZN)BH 2G50/125											
Standards, approvals	<ul style="list-style-type: none"> • RoHS conformity Yes • UL approval Yes 											
Mechanical data	<p>Number of cores 2</p> <p>Fiber material Multimode graded-index fiber 50/125/245 μm, OM 2</p> <p>Maximum tensile load 1000 N</p>											
Optical data	<table border="1"> <tr> <td rowspan="2">Attenuation</td> <td>850 nm</td> <td>≤ 2.7 dB/km</td> </tr> <tr> <td>1300 nm</td> <td>≤ 1 dB/km</td> </tr> <tr> <td rowspan="2">Bandwidth length product</td> <td>850 nm</td> <td>600 GHz *m</td> </tr> <tr> <td>1300 nm</td> <td>1200 GHz *m</td> </tr> </table>		Attenuation	850 nm	≤ 2.7 dB/km	1300 nm	≤ 1 dB/km	Bandwidth length product	850 nm	600 GHz *m	1300 nm	1200 GHz *m
Attenuation	850 nm	≤ 2.7 dB/km										
	1300 nm	≤ 1 dB/km										
Bandwidth length product	850 nm	600 GHz *m										
	1300 nm	1200 GHz *m										
Permitted ambient conditions	<p>Operating temperature -40 °C ... +70 °C</p> <p>Transportation/storage temperature -40 °C ... +70 °C</p> <p>Installation temperature -5 °C to +50 °C</p> <p>Resistance to fire Flame retardant to IEC 60332-1-24</p> <p>Resistance to oil Restricted resistance</p> <p>UV resistance Resistant</p>											
Product characteristics	<p>Halogen-free yes</p> <p>Silicone-free yes</p> <p>Rodent protection yes</p> <table border="1"> <tr> <td rowspan="3">Cable length</td> <td>100BaseFX</td> <td>5000 m</td> </tr> <tr> <td>1000BaseSX</td> <td>750 m</td> </tr> <tr> <td>1000BaseLX</td> <td>2000 m</td> </tr> </table>		Cable length	100BaseFX	5000 m	1000BaseSX	750 m	1000BaseLX	2000 m			
Cable length	100BaseFX	5000 m										
	1000BaseSX	750 m										
	1000BaseLX	2000 m										

Article number

MM FO robust cable GP (2G50/125)¹⁾	Cables for indoors and outdoors, also for laying in the earth, rodent protection. Sold by the meter without plugs, minimum order 20 m, maximum order 2000 m.	6XV1873-2R
MM FO Robust Cable GP (2G50/125)	Cables for indoors and outdoors, also for laying in the earth, rodent protection. Preassembled with two LC Duplex plugs:	
	1 m	6XV1873-5RH10
	2 m	6XV1873-5RH20
	3 m	6XV1873-5RH30
	10 m	6XV1873-5RN10
	30 m	6XV1873-5RN30
	50 m	6XV1873-5RN50
	100 m	6XV1873-5RT10
	150 m	6XV1873-5RT15

¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables.

3.3.4 SM FO robust cable GP (4E9/125)

Description

The 4-fiber single mode (SM) FO robust cable can be used to bridge distances of more than 3 km.

The SM FO robust cable GP can be used to set up optical networks with devices that have an LC (Lucent Connector) interface, for example SCALANCE X devices.

To connect to the LC interface, the SM FO robust cable GP is cemented to the SM FO LC duplex plug.

Features and functions

Cable type	SM FO robust cable GP (4E9/125)
Areas of application	Cable for use indoors and outdoors and for direct installation underground
Version of the preassembled FO cable	<ul style="list-style-type: none"> • ST/BFOC plug • SC plug • LC Duplex plug
Cable type (standard designation)	AT-V(ZN)H(ZN)BH 2G50/125
Standards, approvals	
<ul style="list-style-type: none"> • RoHS conformity 	yes

Cable type		SM FO robust cable GP (4E9/125)
• UL approval		yes
Mechanical data		
Number of fibers		4
Fiber material		Single mode fiber 9/125 μm, OS2
Maximum tensile load		1000 N
Optical data		
Attenuation	805 nm	-
	1300 nm	≤ 0.5 dB/km
	1550 nm	≤ 0.5 dB/km
Permitted ambient conditions		
Operating temperature		-40 °C to +70 °C
Transportation/storage temperature		-40 °C to +70 °C
Installation temperature		-20 °C to +60 °C
Resistance to fire		flame retardant to IEC 60332-1-24
Resistance to oil		Conditionally resistant
UV resistance		resistant
Product characteristics		
Halogen-free		yes
Silicone-free		yes
Rodent protection		yes
Cable length	100BaseFX	26 000 m
	1000BaseLX	2000 m

Article number

SM FO robust cable GP (4E9/125)¹⁾	Cable for outdoors; rodent protection, splittable, without connectors, sold by the meter	6XV1843-2R
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¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables.

3.3.5 FO FRNC Cable GP 50/125/OM2

Description

The FO FRNC Cable with two 50/125 μm cores is halogen-free and flame retardant and is suitable for fixed installation in buildings. With this cable design, little smoke that is free of halogens is produced in the case of fire therefore reducing secondary damage significantly. The cable is splittable and therefore suitable for direct fitting of connectors.

Features and functions

Cable type	FO FRNC Cable 50/125	
Areas of application	Halogen-free cable for fixed installation indoors and outdoors	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • ST/BFOC plug • SC plug 	
Cable type (standard designation)	AT-W(ZN)HH 2G50/125 UV	
Standards, approvals		
• RoHS conformity	yes	
• UL approval	yes	
Mechanical data		
Number of cores	2	
Fiber material	Multimode graded-index fiber 50/125 µm, OM2	
Maximum tensile load	500 N	
Optical data		
Attenuation	850 nm	≤ 2.7 dB/km
	1300 nm	≤ 0.7 dB/km
Bandwidth length product	850 nm	600 GHz*m
	1300 nm	1200 GHz*m
Permitted ambient conditions		
Operating temperature	-40 °C to +85 °C	
Transportation/storage temperature	-40 °C to +85 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	Flame-retardant to IEC 60332 -1-2 and IEC 60332 -3-22 (Cat A)	
Resistance to oil	Resistant according to IEC 60811-404 with test oil IRM 902 (acc. to ISO 1817), +70 °C, 4 h and +25 °C, 168 h	
UV resistance	Resistant	
Product characteristics		
Halogen-free	no	
Silicone-free	Yes	
Rodent protection	Yes	
Cable length	100BaseFX	5000 m
	1000BaseSX	750 m
	1000BaseLX	2000 m

Article number

FO FRNC Cable 50/125	Halogen-free cable, splittable, for fixed installation, without connectors, sold by the meter	6XV1873-2B
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3.3.6 FO FRNC Cable GP 50/125/OM4

Description

The FO FRNC Cable with two 50/125 µm cores is halogen-free and flame retardant and is suitable for fixed installation in buildings. With this cable design, little smoke that is free of halogens is produced in the case of fire therefore reducing secondary damage significantly. The cable is splittable and therefore suitable for direct fitting of connectors.

Features and functions

Cable type	FO FRNC cable 50/125/OM4	
Areas of application	Halogen-free cable for fixed installation indoors and outdoors	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • ST/BFOC plug • SC plug 	
Cable type (standard designation)	AT-W(ZN)HH 2G 50/125 OM4BI UV	
Standards, approvals		
• RoHS conformity	yes	
• UL approval	yes	
Mechanical data		
Number of cores	2	
Fiber material	Multimode graded-index fiber 50/125 µm, OM4	
Maximum tensile load	500 N	
Optical data		
Attenuation	850 nm	≤ 2.5 dB/km
	1300 nm	≤ 0.7 dB/km
Bandwidth length product	850 nm	3500 GHz*m
	1300 nm	500 GHz*m
Permitted ambient conditions		
Operating temperature	-40 °C to +85 °C	
Transportation/storage temperature	-40 °C to +85 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	Flame-retardant to IEC 60332 -1-2 and IEC 60332 -3-22 (Cat A)	
Resistance to oil	Resistant according to IEC 60811-404 with test oil IRM 902 (acc. to ISO 1817), +70 °C, 4 h and +25 °C, 168 h	
UV resistance	Resistant	
Product characteristics		
Halogen-free	Yes	

Cable type		FO FRNC cable 50/125/OM4
Silicone-free		Yes
Maximum cable length	100BaseFX	5000 m
	1000BaseSX	1040 m
	1000BaseLX	600 m
	10GBaseSR	550 m
	10GBaseLX4	300 m

Article number

FO FRNC Cable 50/125/OM4	Halogen-free cable, splittable, for fixed installation, without connectors, sold by the meter	6XV1873-2E
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3.3.7 INDOOR FO cable 62.5/125 µm

Description

The INDOOR fiber-optic cable is intended for use indoors in areas protected from the weather, for example in factories and in building automation.

The indoor cable is suitable for connecting optical interfaces operating in the wavelength range around 850 nm and 1300 nm.

Can be supplied in fixed lengths, preassembled with four ST/BFOC connectors.

Features and functions

Cable type		Indoor FO cable GP (62.5/125)
Areas of application		Non-crush, halogen-free and extremely flame-retardant cable for use indoors
Version of the preassembled FO cable		<ul style="list-style-type: none"> ST/BFOC plug
Cable type (standard designation)		I-V(ZN)HH 2x1 G 62.5/125
Standards, approvals		
<ul style="list-style-type: none"> RoHS conformity 		yes
<ul style="list-style-type: none"> UL approval 		no
Mechanical data		
Number of fibers		2
Fiber material		Multimode graded-index fiber 62.5/125 µm, OM 2
Maximum tensile load		1000 N
Optical data		
Attenuation	805 nm	≤ 3.1 dB/km

Cable type		Indoor FO cable GP (62.5/125)
	1300 nm	≤ 0.8 dB/km
Bandwidth length product	805 nm	200 GHz *m
	1300 nm	600 GHz *m
Permitted ambient conditions		
Operating temperature	-40 °C to +70 °C	
Transportation/storage temperature	-40 °C to +70 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	flame resistant to IEC 60332-1-2, IEC 60332-3-22 (Cat. A) and acc. to DIN VDE 472 Part 804, test type B	
Resistance to oil	Conditionally resistant	
UV resistance	resistant	
Product characteristics		
Halogen-free	yes	
Silicone-free	yes	
Rodent protection	no	
Cable length	100BaseFX	4000 m
	1000BaseSX	350 m
	1000BaseLX	550 m

Article numbers

INDOOR fiber-optic indoor cable ¹⁾	Cable for indoors; flame retardant, splittable, without connectors, sold by the meter	6XV1820-7AH10
INDOOR fiber-optic indoor cable	preassembled with 2x2 BFOC connectors	
	• 0.5 m	6XV1820-7BH05
	• 1 m	6XV1820-7BH10
	• 2 m	6XV1820-7BH20
	• 3 m	6XV1820-7BH30
	• 5 m	6XV1820-7BH50
	• 10 m	6XV1820-7BN10
	• 15 m	6XV1820-7BN15
	• 20 m	6XV1820-7BN20
	• 25 m	6XV1820-7BN25
	• 50 m	6XV1820-7BN50
	• 75 m	6XV1820-7BN75
• 100 m	6XV1820-7BT10	

¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables.

3.3.8 FO trailing cable 50/125 µm

Description

The FO trailing cable contains 2 multimode graded index fibers of type 50/125 µm.

The FO trailing cable is available in the following variants:

- FO trailing cable (standard)
Cable for high mechanical strain, PUR outer jacket, without UL approval.
- FO trailing cable GP (general purpose)
Cable for low mechanical strain, PVC outer jacket, with UL approval

The FO trailing cable is available in fixed lengths, preassembled with four ST/BFOC plugs or 4 SC plugs.

Features and functions

Cable type	FO trailing cable 50/125		FO trailing cable GP 50/125	
Areas of application	Use in drag chains		Use in drag chains	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • ST/BFOC plug • SC plug 		<ul style="list-style-type: none"> • ST/BFOC plug • SC plug 	
Cable type (standard designation)	AT-W(ZN)Y(ZN)11Y 2G50/125		50/125 2G AT-W(ZN)Y(ZN)Y	
Standards, approvals				
• RoHS conformity	yes		yes	
• UL approval	no		yes	
Mechanical data				
Number of fibers	2		2	
Fiber material	Multimode graded-index fiber 50/125 µm, OM2		Multimode graded-index fiber 50/125 µm, OM2	
Number of bending cycles	5 000 000		3 500 000	
Maximum tensile load	800 N		800 N	
Optical data				
Attenuation	805 nm	≤ 2.7 dB/km	≤ 2.7 dB/km	
	1300 nm	≤ 0.7 dB/km	≤ 0.7 dB/km	
Bandwidth length product	805 nm	600 GHz *m	600 GHz *m	
	1300 nm	1200 GHz *m	1200 GHz *m	
Permitted ambient conditions				
Operating temperature	-40 °C to +80 °C		-25 °C to +80 °C	
Transportation/storage temperature	-40 °C to +80 °C		-25 °C to +80 °C	
Installation temperature	-5 °C to +50 °C		-5 °C to +50 °C	
Resistance to fire	Flammable		Flame-retardant to IEC 60332 -1-2 and IEC 60332 -3-22 (Cat A)	
Resistance to oil	Conditionally resistant		Conditionally resistant	

3.3 Glass FO cables

Cable type		FO trailing cable 50/125	FO trailing cable GP 50/125
UV resistance		resistant	resistant
Product characteristics			
Halogen-free		no	no
Silicone-free		yes	yes
Rodent protection		no	no
Cable length	100BaseFX	5000 m	5000 m
	1000BaseSX	750 m	750 m
	1000BaseLX	2000 m	2000 m

Article numbers

FO trailing cable 50/125¹⁾	Trailing cable, splittable, without connectors, sold by the meter	6XV1873-2C
FO trailing cable 50/125	Preassembled FO cable with 2x2 ST/BFOC plugs	
	• 3 m	6XV1873-3CH30
	• 5 m	6XV1873-3CH50
	• 10 m	6XV1873-3CN10
	• 20 m	6XV1873-3CN20
	• 50 m	6XV1873-3CN50
	• 100 m	6XV1873-3CT10
FO trailing cable 50/125	Preassembled FO cable with 2x2 SC plugs	
	• 3 m	6XV1873-6CH30
	• 5 m	6XV1873-6CH50
	• 10 m	6XV1873-6CN10
	• 20 m	6XV1873-6CN20
	• 50 m	6XV1873-6CN50
	• 100 m	6XV1873-6CT10
FO trailing cable GP 50/125¹⁾	Trailing cable, UL approval, splittable, without connectors, sold by the meter, minimum length available 20 m, maximum 1000 m	6XV1873-2D
FO trailing cable GP 50/125	Preassembled FO cable with 2x2 ST/BFOC plugs	
	• 3 m	6XV1873-3DH30
	• 5 m	6XV1873-3DH50
	• 10 m	6XV1873-3DN10
	• 20 m	6XV1873-3DN20
	• 50 m	6XV1873-3DN50
	• 100 m	6XV1873-3DT10

FO trailing cable GP 50/125	Preassembled FO cable with 2x2 SC plugs	
	• 3 m	6XV1873-6DH30
	• 5 m	6XV1873-6DH50
	• 10 m	6XV1873-6DN10
	• 20 m	6XV1873-6DN20
	• 50 m	6XV1873-6DN50
	• 100 m	6XV1873-6DT10

¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables

3.3.9 FO Ground Cable 50/125 µm

Description

The FO ground cable contains 2 multimode graded index fibers of type 50/125 µm. The FO ground cable is a standard cable for laying directly in the ground, in pipes, cable channels or on cable racks, also suitable for cable ladders.

The FO ground cable is available in fixed lengths, preassembled with four ST/BFOC plugs or 4 SC plugs.

Features and functions

Cable type	FO ground cable 50/125	
Areas of application	Outdoors and for direct installation underground	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • ST/BFOC plug • SC plug 	
Cable type (standard designation)	AT-WQ(ZN)Y(ZN)B2Y 2G 50/125	
Standards, approvals		
• RoHS conformity	yes	
• UL approval	no	
Mechanical data		
Number of fibers	2	
Fiber material	Multimode graded-index fiber 50/125 µm, OM2	
Maximum tensile load	800 N	
Optical data		
Attenuation	805 nm	≤ 2.7 dB/km
	1300 nm	≤ 0.7 dB/km

Cable type			FO ground cable 50/125		
Bandwidth length product	805 nm	600 GHz *m			
	1300 nm	1200 GHz *m			
Permitted ambient conditions					
Operating temperature		-40 °C to +75 °C			
Transportation/storage temperature		-40 °C to +75 °C			
Installation temperature		-5 °C to +50 °C			
Resistance to fire		Flammable			
Resistance to oil		resistant			
UV resistance		resistant			
Product characteristics					
Silicone-free		yes			
Halogen-free		no			
Rodent protection		yes			
Cable length	100BaseFX	5000 m			
	1000BaseSX	750 m			
	1000BaseLX	2000 m			

Article numbers

FO ground cable 50/125 ¹⁾	Outdoor cable with rodent protection, splittable, without connectors, sold by the meter	6XV1873-2G
FO ground cable 50/125	Preassembled FO cable with 2x2 ST/BFOC plugs.	
	• 100 m	6XV1873-3GT10
	• 200 m	6XV1873-3GT20
FO ground cable 50/125	• 100 m	6XV1873-3GT30
	Preassembled FO cable with 2x2 SC plugs.	
	• 100 m	6XV1873-6GT10
	• 200 m	6XV1873-6GT20
	• 100 m	6XV1873-6GT30

¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables

3.3.10 Flexible FO trailing cable (62.5/125 µm)

Description

The flexible fiber-optic trailing cable was developed for applications in which the cable must be flexible enough to move, for example when attached to moving machine parts (drag chains).

The cable is mechanically designed for 100,000 bending cycles through $\pm 90^\circ$ (at the specified minimum bending radius). The trailing cable can be used both indoors and outdoors.

The trailing cable is available in fixed lengths, preassembled with four ST/BFOC connectors.

Features and functions

Cable type	Flexible fiber-optic trailing cable	
Areas of application	Flexible cable for installation in drag chains indoors and outdoors	
Version of the preassembled FO cable	<ul style="list-style-type: none"> ST/BFOC plug 	
Cable type (standard designation)	AT-W11Y(ZN)11Y 2 G 62,5/125	
Standards, approvals		
<ul style="list-style-type: none"> RoHS conformity 	yes	
<ul style="list-style-type: none"> UL approval 	no	
Mechanical data		
Number of fibers	2	
Fiber material	Multimode graded-index fiber 62.5/125 μm , OM 2	
Maximum tensile load	1000 N	
Bending cycles	100,000	
Optical data		
Attenuation	805 nm	≤ 3.1 dB/km
	1300 nm	≤ 0.8 dB/km
Bandwidth length product	805 nm	200 GHz *m
	1300 nm	600 GHz *m
Permitted ambient conditions		
Operating temperature	-25 °C to +60 °C	
Transportation/storage temperature	-25 °C to +70 °C	
Installation temperature	-30 °C to +60 °C	
Resistance to fire	acc. to IEC 60332-1, flammable	
Resistance to oil		
UV resistance	resistant	
Product characteristics		
Halogen-free	yes	
Silicone-free	yes	
Rodent protection	no	
Cable length	100BaseFX	4000 m
	1000BaseSX	350 m
	1000BaseLX	550 m

Article numbers

Flexible fiber-optic trailing cable ¹⁾	Cable for indoors; flame retardant, splittable, without connectors, sold by the meter	6XV1 820-6AH10
Flexible fiber-optic trailing cable	preassembled with 2x2 ST/BFOC connectors	
	• 1 m	6XV1820-6BH10
	• 2 m	6XV1820-6BH20
	• 3 m	6XV1820-6BH30
	• 5 m	6XV1820-6BH50
	• 10 m	6XV1820-6BN10
	• 15 m	6XV1820-6BN15
	• 20 m	6XV1820-6BN20
	• 25 m	6XV1820-6BN25
• 50 m	6XV1820-6BN50	

¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables.

3.3.11 SIENOPYR Duplex FiberOptic Marine Cable 62.5/125 µm

Description

The SIENOPYR Duplex fiber-optic marine cable has 2 multimode graded-index fibers 62.5/125 µm. The cable also has 2 multiwire, rubber-insulated copper wires with 1 mm² cross section. The SIENOPYR duplex fiber-optic marine cable is intended for fixed installation on ships and offshore facilities in all enclosed spaces and on open decks. The cable is not, however, suitable for permanent installation in water.

The halogen-free cable is certified for shipbuilding by the following organizations:

- Lloyds Register of Shipping
- Germanischer Lloyd
- Registro Staliano Navale
- Bureau Veritas

Features and functions

Cable type	SIENOPYR duplex fiber-optic marine cable
Areas of application	Fixed installation on ships and offshore facilities in all enclosed spaces and on free decks
Version of the preassembled FO cable	• ST/BFOC plug
Cable type (standard designation)	MI-VHH 2G 62.5/125 3.1B200 + 0.8F600 + 2x1Cu 300V

Cable type	SIENOPYR duplex fiber-optic marine cable	
Standards, approvals		
• RoHS conformity	Yes	
• UL approval	No	
• Shipbuilding	Bureau Veritas (BV) Det Norske Veritas (DNV) Germanischer Lloyd (GL) Lloyds Register of Shipping (LRS)	
Mechanical data		
Number of fibers	2	
Fiber material	Multimode graded-index fiber 62.5/125 µm, OM 2	
Maximum tensile load	250 N	
Bending cycles	100,000	
Optical data		
Attenuation	805 nm	≤ 3.1 dB/km
	1300 nm	≤ 0.8 dB/km
Bandwidth length product	805 nm	200 GHz *km
	1300 nm	600 GHz *km
Permitted ambient conditions		
Operating temperature	-40 °C to +80 °C	
Transportation/storage temperature	-40 °C to +80 °C	
Installation temperature	-10 °C to +50 °C	
Environmental conditions for operation	At ambient temperatures of -10 °C, the cables must not be subjected to any motions beyond the normal vibration and oscillation on ships.	
Resistance to fire	Flame retardant acc. to IEC 60332-3 (Cat. A)	
Resistance to oil	not resistant	
UV resistance	resistant	
Product characteristics		
Halogen-free	yes	
Silicone-free	yes	
Rodent protection	no	

Article number

SIENOPYR duplex fiber-optic marine cable ¹⁾	Glass SIENOPYR fiber-optic marine cable, sold in meters, without connectors	6XV1830-0NH10
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¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables.

3.3.12 FC FO glass fiber-optic cable 62.5/200/230 µm

Description

Thanks to the fiber construction (62.5/200/230), it is possible to work with the FastConnect FO fibers like traditional PCF fibers (Polymer Cladded Fiber). This means that users have the advantages of glass FO cables (longer distances, resistant to temperature) and the advantages of PCF fibers when fitting connectors.

With the FastConnect cables, glass FO runs of up to 3 km (100 Mbps Industrial Ethernet, PROFIBUS) can be set up and the cable assembled on site. A complete link, can be made up of up to 3 subsegments (2 splices) (average coupling loss of a splice approx. 2.5 dB). The combination of already installed, traditional 62.5/125 µm multimode glass FO sections with the new FastConnect FO cables is also possible.

The user can now assemble glass FO cable sections of the correct length for each specific application easily and on site. Repairing installed FastConnect FO links is therefore simple and can be performed without special service personnel (this does not apply to already installed cables - it applies only when FastConnect FO was used).

Features and functions

Cable type	Fiber-optic standard cable	
Areas of application	Cable for use indoors and outdoors	
Version of the preassembled FO cable	<ul style="list-style-type: none"> ST/BFOC plug 	
Cable type (standard designation)	AT-V(ZN)YY 2X1 G 62.5/125	
Standards, approvals		
<ul style="list-style-type: none"> RoHS conformity 	yes	
<ul style="list-style-type: none"> UL approval 	no	
Mechanical data		
Number of fibers	2	
Fiber material	Multimode graded-index fiber 62.5/125 µm, OM 2	
Maximum tensile load	1500 N	
Bending cycles	--	
Optical data		
Attenuation	805 nm	≤ 3.1 dB/km
	1300 nm	≤ 0.8 dB/km
Bandwidth length product	805 nm	200 GHz *m
	1300 nm	600 GHz *m
Permitted ambient conditions		
Operating temperature	-40 °C to +85 °C	
Transportation/storage temperature	-40 °C to +85 °C	
Installation temperature	-5 °C to +50 °C	

Cable type		Fiber-optic standard cable
Resistance to fire		Flame-retardant acc. to IEC 60332 -1-2 and IEC 60332 -3-22 (Cat. A)
Resistance to oil		not resistant
UV resistance		resistant
Product characteristics		
Halogen-free		no
Silicone-free		yes
Rodent protection		yes
maximum cable length	100BaseFX	4000 m
	1000BaseSX	350 m
	1000BaseLX	550 m

Article numbers

Fiber-optic standard cable ¹⁾	Standard cable; can be walked on; splittable; without connectors, sold by the meter,	6XV1820-5AH10
Fiber-optic standard cable	Preassembled FO cable with 2x2 ST/BFOC plugs	
	• 1 m	6XV1820-5BH10
	• 2 m	6XV1820-5BH20
	• 3 m	6XV1820-5BH30
	• 4 m	6XV1820-5BH40
	• 5 m	6XV1820-5BH50
	• 10 m	6XV1820-5BN10
	• 15 m	6XV1820-5BN15
	• 20 m	6XV1820-5BN20
	• 30 m	6XV1820-5BN30
	• 40 m	6XV1820-5BN40
	• 50 m	6XV1820-5BN50
	• 55 m	6XV1820-5BN55
	• 60 m	6XV1820-5BN60
	• 65 m	6XV1820-5BN65
	• 70 m	6XV1820-5BN70
• 75 m	6XV1820-5BN75	
• 80 m	6XV1820-5BN80	
• 100 m	6XV1820-5BT10	
• 120 m	6XV1820-5BT12	

Fiber-optic standard cable	• 130 m	6XV1820-5BT13
	• 150 m	6XV1820-5BT15
	• 200 m	6XV1820-5BT20
	• 250 m	6XV1820-5BT25
	• 300 m	6XV1820-5BT30

1) Special tools and trained personnel are required to assemble glass fiber-optic cables.

3.3.13 FC FO standard cable GP 62.5/200/230 µm

Description

The FC fiber-optic standard cable GP contains two multimode graded fibers of type 62.5/200/230 µm. Thanks to the fiber construction (62.5/200/230), the cable can be worked on like normal PCF fibers (Polymer Cladded Fiber). This means that users have the advantages of glass FO cables (longer distances, resistant to temperature) and the advantages of PCF fibers when fitting connectors.

With the FC cables, glass FO sections of up to 3 km (100 Mbps Industrial Ethernet, PROFIBUS) can be set up and the cable assembled on site. The combination of already installed, traditional 62.5/125 µm multimode glass FO sections with the new FastConnect FO cables is also possible.

Features and functions

Cable type	FC FO standard cable GP
Areas of application	Cable for fixed installation in cable channels and pipes
Version of the preassembled FO cable	<ul style="list-style-type: none"> • FC FO ST/BFOC connectors • FC FO SC connectors
Cable type (standard designation)	AT-V(ZN)YY 2GK 62.5/200/230
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Mechanical data	
Number of fibers	2
Fiber material	Multimode graded-index fiber 62.5/200/230 µm
Maximum tensile load	100 N

Cable type		FC FO standard cable GP
Optical data		
Attenuation	805 nm	≤ 3.2 dB/km
	1300 nm	≤ 0.9 dB/km
Bandwidth length product	805 nm	200 GHz *m
	1300 nm	500 GHz *m
Permitted ambient conditions		
Operating temperature		-40 °C to +85 °C
Transportation/storage temperature		-40 °C to +85 °C
Installation temperature		-5 °C to +50 °C
Resistance to fire		Flame-retardant acc. to IEC 60332 -1-2 and IEC 60332 -3-22 (Cat. A)
Resistance to oil		Conditionally resistant to mineral oils and fats
UV resistance		Resistant
Product characteristics		
Halogen-free		no
Silicone-free		yes
Rodent protection		no
Cable length	100BaseFX	3000 m
	1000BaseSX	350 m
	1000BaseLX	550 m

Article number

FC FO standard cable GP¹⁾	FC FO standard cable for fixed installation indoors with PVC jacket	6XV1847-2A
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¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables.

3.3.14 FC FO trailing cable 62.5/200/230 µm

Description

The FC fiber-optic trailing cable is the universal cable for use in drag chains indoors and outdoors. The FC fiber-optic trailing cable contains two multimode graded fibers of type 62.5/200/230 µm. The outer jacket with the outer diameter 8.8 ± 0.5 mm is made of TPE-U (polyurethane).

Features and functions

Cable type	FC fiber-optic trailing cable	
Areas of application	Cable for high mechanical load for use in drag chains indoors and outdoors	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • FC FO BFOC connectors • FC FO SC connectors 	
Cable type (standard designation)	AT-V(ZN)Y(ZN)11Y 2GK 62.5/200/230	
Standards, approvals		
• RoHS conformity	yes	
• UL approval	no	
Mechanical data		
Number of fibers	2	
Fiber material	Multimode graded-index fiber 62.5/200/230 µm	
Maximum tensile load	800 N	
Bending cycles	5 000 000	
Optical data		
Attenuation	805 nm	≤ 3.2 dB/km
	1300 nm	≤ 0.9 dB/km
Bandwidth length product	805 nm	200 GHz *m
	1300 nm	500 GHz *m
Permitted ambient conditions		
Operating temperature	-25 °C to +70 °C	
Transportation/storage temperature	-30 °C to +75 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	flame retardant to IEC 60332-1-2	
Resistance to oil	resistant	
UV resistance	resistant	
Product characteristics		
Halogen-free	no	
Silicone-free	yes	
Rodent protection	no	
Cable length	100BaseFX	4000 m
	1000BaseSX	350 m
	1000BaseLX	550 m

Article number

FC fiber-optic trailing cable ¹⁾	Trailing cable, splittable, without connectors, sold by the meter	6XV1847-2C
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¹⁾ Special tools and trained personnel are required to assemble glass fiber-optic cables.

3.3.15 SM FO CORD 9/125

Description

The preassembled 1 fiber single mode cable SM FO CORD is available with different plugs. This product is intended for use in the control cabinet. The cable length is 1 m.

Features and functions

Cable type	SM FO CORD LC/LC, 9/125 SM FO CORD SC/LC, 9/125 SM FO CORD SC/BFOC, 9/125 SM FO CORD SC/SC, 9/125	
Areas of application	Cable for use in the cabinet (degree of protection IP20)	
Cable type (standard designation)	I-V(ZN)H 2E9/125 G.652D	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • LC/LC connector • SC/LC connector • SC/BFOC connector • SC/SC connector 	
Standards, approvals		
• RoHS conformity	Yes	
Mechanical data		
Number of fibers	1	
Fiber material	Single mode glass fiber 9/125 µm	
Maximum tensile load	500 N	
Optical data		
Attenuation	1300 nm	≤ 0.4 dB/km
	1550 nm	≤ 0.3 dB/km
Permitted ambient conditions		
Operating temperature	-20 °C to +70 °C	
Transportation/storage temperature	-25 °C to +70 °C	
Installation temperature	-10 °C to +70 °C	
Resistance to fire	flame retardant to IEC 60332-1-2 (Cat.A)	
Product characteristics		
Silicone-free	Yes	
Halogen-free	Yes	
Rodent protection	no	

Article numbers

SM FO CORD LC/LC	Single mode glass FO cable, preassembled with 2 x 2 LC Duplex connectors, length 1 m.	6XV1843-5FH10-0AA0
SM FO CORD SC/LC	Single mode glass FO cable, preassembled with 1 x SC Duplex connector and 1 x LC Duplex connector, length 1 m.	6XV1843-5FH10-0CA0
SM FO CORD SC/BFOC	Single mode glass FO cable, preassembled with 1 x SC Duplex connector and 1 x BFOC connector, length 1 m.	6XV1843-5FH10-0CB0
SM FO CORD SC/SC	Single mode glass FO cable, preassembled with 2 x 2 SC Duplex connectors, length 1 m.	6XV1843-5FH10-0CC0

3.3.16 MM FO CORD 50/125

Description

The preassembled 1 fiber multimode cable graded index cable MM FO CORD is available with different plugs. This product is intended for use in the control cabinet. The cable length is 1 m.

Features and functions

Cable type	MM FO CORD LC/LC, 9/125 MM FO CORD SC/LC, 9/125 MM FO CORD SC/BFOC, 9/125 MM FO CORD SC/SC, 9/125				
Areas of application	Cable for use in the cabinet (degree of protection IP20)				
Cable type (standard designation)	I-V(ZN)H 2x50/125 OM2				
Version of the preassembled FO cable	<ul style="list-style-type: none"> • LC/LC connector • SC/LC connector • SC/BFOC connector • SC/SC connector 				
Standards, approvals					
• RoHS conformity	Yes				
Mechanical data					
Number of fibers	1				
Fiber material	Multimode graded-index fiber 50/125 µm, OM 2				
Maximum tensile load	500 N				
Optical data					
Attenuation	<table border="1"> <tr> <td>850 nm</td> <td>≤ 3.5 dB/km</td> </tr> <tr> <td>1300</td> <td>≤ 1.5 dB/km</td> </tr> </table>	850 nm	≤ 3.5 dB/km	1300	≤ 1.5 dB/km
850 nm	≤ 3.5 dB/km				
1300	≤ 1.5 dB/km				

Cable type	MM FO CORD LC/LC, 9/125 MM FO CORD SC/LC, 9/125 MM FO CORD SC/BFOC, 9/125 MM FO CORD SC/SC, 9/125
Permitted ambient conditions	
Operating temperature	-20 °C to +70 °C
Transportation/storage temperature	-25 °C to +70 °C
Installation temperature	-10 °C to +70 °C
Resistance to fire	flame retardant to IEC 60332-1-2 (Cat.A)
Product characteristics	
Silicone-free	Yes
Halogen-free	Yes
Rodent protection	no

Article numbers

MM FO CORD LC/LC	Multimode glass FO cable, preassembled with 2 x 2 LC Duplex connectors, length 1 m.	6XV1843-5EH10-0AA0
MM FO CORD SC/LC	Multimode glass FO cable, preassembled with 1 x SC Duplex connector and 1 x LC Duplex connector, length 1 m.	6XV1843-5EH10-0CA0
MM FO CORD SC/BFOC	Multimode glass FO cable, preassembled with 1 x SC Duplex connector and 1 x BFOC connector, length 1 m.	6XV1843-5EH10-0CB0
MM FO CORD SC/SC	Multimode glass FO cable, preassembled with 2 x 2 SC Duplex connectors, length 1 m.	6XV1843-5EH10-0CC0

3.4 Plastic fiber-optic cables

3.4.1 Overview

The plastic fiber-optic cable is available with PCF fibers (Polymer Cladded Fiber) and POF fibers (Plastic Optical Fiber).

Properties

Plastic fibers have several properties that differ from those of glass fibers. For example, the maximum possible cable length is shorter with glass fibers due to the higher attenuation and the bandwidth is smaller. Plastic fibers require far less effort to assemble on site compared with glass fibers.

The use of plastic fibers is particularly attractive when networking islands for example with the ET 200. In this case, small distances up to a maximum of 50 m can be covered with the plastic fibers.

3.4.2 POF Standard Cable GP 980/1000

Description

The Plastic Optical Fiber (POF) standard cable GP consists of two plastic fibers with a rugged polyamide inner jacket. The inner jacket is surrounded by Kevlar strengthening elements and a green PVC outer jacket. The POF standard cable GP can be assembled on site. The cable is fitted with SC RJ connectors for devices with an integrated optical interface.

Devices with an integrated optical interface include, for example SCALANCE X200-4P IRT, SCALANCE X201-3P IRT, SCALANCE X202-2P IRT, SCALANCE X101-1POF, ET 200S.

Features and functions

Cable type	POF standard cable GP 980/1000
Areas of application	Fixed installation indoors
Version of the preassembled FO cable	<ul style="list-style-type: none"> • SC RJ plug • SC RJ POF plug Pro
Cable type (standard designation)	I-V4Y(ZN)Y 2P 980/1000
Standards, approvals	
<ul style="list-style-type: none"> • RoHS conformity 	yes
<ul style="list-style-type: none"> • UL approval 	yes
Mechanical data	
Number of fibers	2

Cable type		POF standard cable GP 980/1000
Fiber material	POF FO cable fiber 980/1000 μm	
Maximum tensile load	100 N	
Optical data		
Attenuation	650 nm	≤ 160 dB/km
Bandwidth length product	650 nm	1 GHz*m
Permitted ambient conditions		
Operating temperature	-25 °C to +60 °C	
Transportation/storage temperature	-25 °C to +70 °C	
Installation temperature	-30 °C to +60 °C	
Resistance to fire	flame retardant to IEC 60332-1-2	
Resistance to oil	Conditionally resistant	
UV resistance	resistant	
Product characteristics		
Halogen-free	no	
Silicone-free	yes	
Rodent protection	no	
Cable length for Industrial Ethernet	≤ 50 m	

Article numbers

POF Standard Cable GP 980/1000	Standard cable; without connectors, UL approval, sold by the meter	6XV1874-2A
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3.4.3 POF Trailing Cable 980/1000

Description

The Plastic Optical Fiber (POF) trailing cable consists of two plastic fibers with a rugged polyamide inner jacket. The inner jacket is surrounded by Kevlar strengthening elements and a green PUR outer jacket. The POF trailing cable can be assembled on site.

Devices with an integrated optical interface include, for example SCALANCE X200-4P IRT, SCALANCE X201-3P IRT, SCALANCE X202-2P IRT, SCALANCE X101-1POF, ET 200S

Features and functions

Cable type	POF trailing cable	
Areas of application	Cable for moving applications (e.g. drag chains)	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • SC RJ plug • SC RJ POF plug Pro 	
Cable type (standard designation)	I-V4Y(ZN)11Y 2P 980/1000 FLEX UL	
Standards, approvals		
• RoHS conformity	yes	
• UL approval	yes	
Mechanical data		
Number of fibers	2	
Fiber material	POF FO cable fiber 980/1000 µm	
Maximum tensile load	100 N	
Bending cycles	5 000 000	
Optical data		
Attenuation	650 nm	≤180 dB/km
Bandwidth length product	650 nm	1 GHz *m
Permitted ambient conditions		
Operating temperature	-30 °C to +70 °C	
Transportation/storage temperature	-40 °C to +80 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	flame retardant to IEC 60332-1-2	
Resistance to oil	resistant	
UV resistance	resistant	
Product characteristics		
Free of halogens	no	
Rodent protection	no	
Silicone-free	yes	
Cable length for Industrial Ethernet	≤ 50 m	

Article number

POF trailing cable	Trailing cable; with poly-optic fiber; without connectors, sold by the meter	6XV1874-2B
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3.4.4 PCF standard cable GP 200/230

Description

The PCF standard cable GP consists of two PCF fibers. The fibers are surrounded by aramid strengthening elements and a green PVC outer jacket. The cable is intended for fixed installation indoors and outdoors with cable lengths up to 100 m.

The PCF standard cable GP 200/230 is available in meters and is suitable for fitting connectors directly.

Features and functions

Cable type	PCF standard cable GP 200/230	
Areas of application	Fixed installation indoors and outdoors	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • SC RJ plug • SC RJ PCF plug Pro 	
Cable type (standard designation)	AT-V(ZN)YY 2K 200/230	
Standards, approvals		
• RoHS conformity	yes	
• UL approval	yes	
Mechanical data		
Number of fibers	2	
Fiber material	Graded index fiber 200/230 μm	
Maximum tensile load	100 N	
Optical data		
Attenuation	650 nm	≤10 dB/km
	660 nm	≤10 dB/km
Bandwidth length product	650 nm	17 GHz*m
Permitted ambient conditions		
Operating temperature	-40 °C to +90 °C	
Transportation/storage temperature	-40 °C to +90 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	Flame-retardant acc. to IEC 60332 -1-2 and IEC 60332 -3-22 (Cat. A)	
Resistance to oil	Conditionally resistant	
UV resistance	resistant	
Product characteristics		
Halogen-free	no	
Silicone-free	yes	

Cable type	PCF standard cable GP 200/230
Rodent protection	no
Cable length for Industrial Ethernet	≤ 100 m

Article number

PCF standard cable GP 200/230	Standard cable; UL approval; without connectors, sold by the meter	6XV1861-2A
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3.4.5 PCF trailing cable 200/230

Description

The PCF trailing cable 200/230 consists of two PCF fibers. The fibers are surrounded by aramid strengthening elements and a green PUR outer jacket. The cable is intended for moving applications such as drag chains indoors and outdoors with cable lengths up to 100 m. The recommended wavelength is 660 nm.

The PCF trailing cable is available in meters and is suitable for fitting connectors directly.

Features and functions

Cable type	PCF trailing cable 200/230
Areas of application	Cable for high mechanical load and moving applications, for example drag chains
Version of the preassembled FO cable	<ul style="list-style-type: none"> • SC RJ plug • SC RJ PCF plug Pro
Cable type (standard designation)	AT-V(ZN)Y(ZN)11Y 2K200/230
Standards, approvals	
<ul style="list-style-type: none"> • RoHS conformity 	yes
<ul style="list-style-type: none"> • UL approval 	no
Mechanical data	
Number of fibers	2
Fiber material	Graded index fiber 200/230 μm
Maximum tensile load	800 N
Bending cycles	5 000 000

Cable type		PCF trailing cable 200/230
Optical data		
Attenuation	650 nm	≤10 dB/km
	660 nm	≤10 dB/km
Bandwidth length product	650 nm	17 GHz*m
Permitted ambient conditions		
Operating temperature	-25 °C to +75 °C	
Transportation/storage temperature	-30 °C to +75 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	Flame retardant	
Resistance to oil	resistant	
UV resistance	resistant	
Product characteristics		
Free of halogens	no	
Rodent protection	no	
Silicone-free	yes	
Cable length for Industrial Ethernet	≤ 100 m	

Article number

PCF trailing cable 200/230	PCF fiber-optic cable with plastic cladding, without connectors, sold by the meter	6XV1861-2C
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3.4.6 PCF trailing cable GP 200/230

Description

The PCF trailing cable GP 200/230 is a rugged round cable with a green PVC outer jacket and Kevlar strengthening elements and two glass fibers with a rugged PVC inner jacket. The cable is intended for moving applications such as drag chains indoors and outdoors with cable lengths up to 100 m. The recommended wavelength is 660 nm.

Features and functions

Cable type		PCF trailing cable GP 200/230
Areas of application	Cable for high mechanical load and moving applications, for example drag chains.	
Version of the preassembled FO cable	<ul style="list-style-type: none"> • SC RJ plug • SC RJ PCF plug Pro 	

Cable type	PCF trailing cable GP 200/230	
Cable type (standard designation)	AT-V(ZN)Y(ZN)Y 2K200/230	
Standards, approvals		
• RoHS conformity	yes	
• UL approval	yes	
Mechanical data		
Number of fibers	2	
Fiber material	Graded index fiber 200/230 μm	
Maximum tensile load	800 N	
Bending cycles	5 000 000	
Optical data		
Attenuation	650 nm	≤10 dB/km
	660 nm	≤10 dB/km
Bandwidth length product	650 nm	17 GHz *km
Permitted ambient conditions		
Operating temperature	-25 °C to +75 °C	
Transportation/storage temperature	-30 °C to +75 °C	
Installation temperature	-5 °C to +50 °C	
Resistance to fire	Flame retardant	
Resistance to oil	Conditionally resistant	
UV resistance	resistant	
Product characteristics		
Free of halogens	no	
Rodent protection	no	
Silicone-free	yes	
Cable length for Industrial Ethernet	≤ 100 m	

Article number

PCF trailing cable 200/230	PCF fiber-optic cable with plastic cladding, without connectors	6XV1861-2D
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3.5 Plugs

3.5.1 ST/BFOC plug

Description

The ST/BFOC plug is used to assemble glass fiber-optic cables with the following fiber type.

- Glass fiber-optic cables 50/125 μm
- Glass fiber-optic cables 62.5/125 μm

Special tools and trained personnel are required to assemble glass fiber-optic cables.



Features and functions

Connection type	ST/BFOC plug
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Transmission speed	
Industrial Ethernet	100 / 1000 Mbps
Interfaces	
Number of optical connectors for POF fiber-optic cable	1
Version for opt. interface	ST/BFOC plug
Version for network components or end devices	no
Design	
Cable outlet	180°
Housing material	Metal and plastic
IP degree of protection	IP20
Product property	
Silicone-free	yes

Article number

Multimode FO ST/BFOC connector set	Connector set for on-site assembly of FO standard cable (50/125/1400), FO ground cable, flexible FO trailing cable, INDOOR FO cable (62.5/125/900)	
	1 pack of 20	6GK1901-0DA20-0AA0

3.5.2 Single mode FO LC plug

Description

The SM FO LC plug is used to assemble SM FO robust cable GP. The plug is used to connect to Ethernet/PROFINET devices with an integrated single mode interface, e.g. SCALANCE XR-300EEC, SCALANCE XR-300, SCALANCE X308-2M.



Features and functions

Connection type	SM FO LC plug
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Transmission speed	
Industrial Ethernet	100 / 1000 Mbps
Interfaces	
Number of optical connectors for glass fiber-optic cable	2
Version for opt. interface	Duplex plug (push pull device connection)
Version for network components or end devices	no
Design	
Cable outlet	180°
Housing material	Plastic
IP degree of protection	IP20

Connection type	SM FO LC plug
Product property	
Silicone-free	yes

Article number

SM FO LC plug	LC Duplex plug for SM FO robust cable GP (4E9/125)	
	1 pack of 10	6GK1901-0SB10-2AB0

3.5.3 Multimode FO LC plug

Description

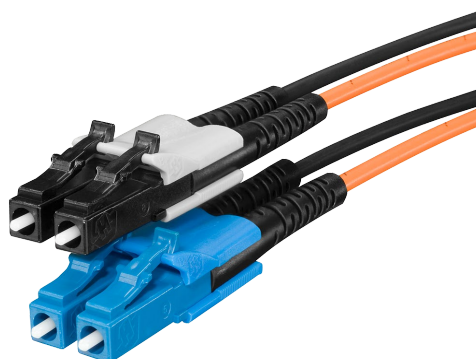


Figure 3-1 Multimode FO LC plug

The MM FO LC plug is used to assemble MM FO robust cable. Numerous SCALANCE products support the Lucent Connector (LC) interface, e.g. X308-2M, XR-300 and X-300EEC.

Features and functions

Connection type	MM FO LC plug
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Transmission speed	
Industrial Ethernet	100 / 1000 Mbps
Interfaces	
Number of optical connectors for glass fiber-optic cable	2
Version for opt. interface	Duplex plug (push pull device connection)

Connection type	MM FO LC plug
Version for network components or end devices	no
Design	
Cable outlet	180°
Housing material	Plastic
IP degree of protection	IP20
Product property	
Silicone-free	yes

Article number

MM FO LC plug	LC Duplex plug for MM FO robust cable GP (2G50/125)	
	1 pack of 10	6GK1901-0RB10-2AB0

3.5.4 FC FO LC Plug

Description

The FC FO LC plug is used to assemble the following cables:

- SIMATIC NET FC FO standard cable (multimode FO cable, Art. no. 6XV1847-2A)
- SIMATIC NET FC FO trailing cable (multimode FO cable, Art. no. 6XV1847-2C)

To assemble these cables the following set of tools is required:

- SIMATIC NET FC FO Termination Kit (Art. no. 6GK1900-0RL00-0AA0)

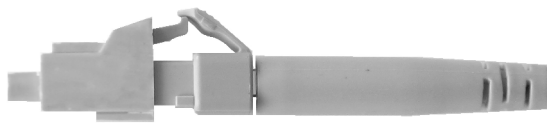


Figure 3-2 FC FO LC plug

Features and functions

Connection type	FC FO LC plug
Standards, approvals	
• RoHS conformity	yes
• UL approval	no

Connection type	FC FO LC plug
Transmission speed	
Industrial Ethernet	100 / 1000 Mbps
Interfaces	
Number of optical connectors for glass fiber-optic cable	2
Version for opt. interface	Duplex plug (push pull device connection)
Version for network components or end devices	no
Design	
Cable outlet	180°
Housing material	Plastic
IP degree of protection	IP20
Product property	
Silicone-free	yes

Article number

FC FO LC plug	LC Duplex plug for multimode FC FO standard cable and FC FO trailing cable.	
	1 pack of 10	6GK1900-1RB00-2AB0

3.5.5 FC FO Termination Kit for the FC FO LC Plug

Description



Figure 3-3 FC FO termination kit FC for the FO LC plug

The FC FO Termination Kit is a set of tools for assembling the FC FO LC plug with the following fiber-optic cables:

- SIMATIC NET FC FO standard cable (multimode FO cable, Art. no. 6XV1847-2A)
- SIMATIC NET FC FO trailing cable (multimode FO cable, Art. no. 6XV1847-2C)

The set of tools contains the following parts:

- Stripping pliers
- Stripping tool with pin holder and brush
- Crimping pliers
- Cleaving pliers
- Scissors
- Alcohol pads
- Container for cable remnants

Article number

FC FO termination kit	Tool set for assembling the FC FO LC plug and multimode fiber-optic cables.	6GK1900-0RL00-0AA0
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3.5.6 FO FC SC plug

Description

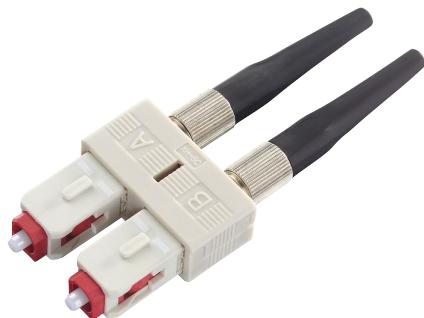


Figure 3-4 FO FC SC plug

The FO FC SC plug is used to assemble FO FC glass fiber-optic cable. To assemble the cable on site a case is available. The case contains the tools required for assembly.

Features and functions

Connection type	FO FC SC plug
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Transmission speed	
Industrial Ethernet	100 / 1000 Mbps
Interfaces	
Number of optical connectors for POF fiber-optic cable	1
Version for opt. interface	SC plug
Version for network components or end devices	yes, FC
Design	
Cable outlet	180°
Housing material	Metal and plastic
IP degree of protection	IP20
Product property	
Silicone-free	yes

Article numbers

FC FO SC plug	Screw-in plug for on-site assembly with FC FO cable	
	1 pack of 10 Duplex plugs + cleaning cloths	6GK1900-1LB00-0AC0
FC FO termination kit	Assembly case for on-site assembly of FC SC plugs on FC glass fiber-optic cable	On request

3.5.7 FO FC ST/BFOC plug

Description

The FO FC ST/BFOC plug is used to assemble FO FC glass fiber-optic cables. To assemble the cable on site a case is available. The case contains the tools required for assembly.



Features and functions

Connection type	FC FO ST/BFOC plugs
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Transmission speed	
Industrial Ethernet	100 / 1000 Mbps
Interfaces	
Number of optical connectors for POF fiber-optic cable	1
Version for opt. interface	ST/BFOC plug
Version for network components or end devices	yes, FC
Design	
Cable outlet	180°
Housing material	Metal and plastic
IP degree of protection	IP20
Product property	
Silicone-free	yes

Article numbers

FC FO ST/BFOC plug	Screw-in plug for on-site assembly with FC FO cables	
	1 pack of 10 Duplex plugs + cleaning cloths	6GK1900-1GB00-0AC0
FC FO termination kit	Assembly case for on-site assembly of FC ST/BFOC plugs on FC glass fiber-optic cable	6GK1900-1GL00-0AA0

3.5.8 SC RJ plug

Description

The SC RJ plug is used to assemble POF and PCF fiber-optic cables.



The Sc RJ plug is available in two versions:

- SC RJ POF plug
For assembling fiber-optic cables. The maximum cable length between two Industrial Ethernet devices is 50 m.
- SC RJ PCF plug
For assembling PCF fiber-optic cables. The maximum cable length between two Industrial Ethernet devices is 100 m.

To assemble the cable on site a case is available. The case contains the tools required for assembly.

Features and functions

Connection type	SC RJ POF plug SC RJ PCF plug
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Transmission speed	
Industrial Ethernet	100 Mbps
Interfaces	
Number of optical connectors for POF fiber-optic cable	1
Version for opt. interface	SC RJ plug (push pull device connection)
Version for network components or end devices	no
Design	
Cable outlet	180°
Housing material	Plastic
IP degree of protection	IP65/67
Product property	
Silicone-free	yes

Article numbers

IE SC RJ POF plug	Screw-in plug for on-site assembly with POF FO cables	
	1 pack of 20	6GK1900-0MB00-0AC0
Termination kit SC RJ POF plug	Assembly case for on-site assembly of SC RJ POF plugs consisting of stripping tool, Kevlar scissors, SC RJ polishing set grinding disc, abrasive paper and microscope	6GK1900-0ML00-0AA0
IE SC RJ PCF plug	Screw-in plug for on-site assembly with PCF FO cables	
	1 pack of 10	6GK1900-0NB00-0AC0
Termination kit SC RJ PCF plug	Assembly case for on-site assembly of SC RJ plugs consisting of stripping tool, buffer stripping tool, Kevlar scissors, fiber breaking tool, microscope	6GK1 900-0NL00-0AA0

3.5.9 IE SC RJ Plug Pro

Description

The SC RJ plug Pro is a plug that can be fitted in the filed for the push-pull device connection with a high degree of protection.



The SC RJ plug Pro is available in two versions:

- SC RJ POF plug Pro
For assembling POF fiber-optic cables The maximum cable length between two Industrial Ethernet devices is 50 m.
- SC RJ PCF plug Pro
For assembling PCF fiber-optic cables The maximum cable length between two Industrial Ethernet devices is 100 m.

Features and functions

Connection type	SC RJ POF plug Pro SC RJ PCF plug Pro
Standards, approvals	
• RoHS conformity	yes
• UL approval	no
Transmission speed	
Industrial Ethernet	100 Mbps
Interfaces	
Number of optical connectors for POF fiber-optic cable	1
Version for opt. interface	SC RJ plug (push pull device connection)
Version for network components or end devices	no
Design	
Cable outlet	180°
Housing material	Plastic
IP degree of protection	IP65/67
Product property	
Silicone-free	yes

Article numbers

IE SC RJ POF plug PRO	Plug for on-site assembly with POF FO cables	
	1 pack of 1	6GK1900-0MB00-6AA0
IE SC RJ PCF plug PRO	Plug for on-site assembly with PCF FO cables	
	1 pack of 1	6GK1900-0NB00-6AA0

Power supply

4.1 Power cable

Different types of cables are required for the power supply in Industrial Ethernet/PROFINET.

The power cables are used for devices with degree of protection IP65/67 to connect the signaling contact or 24 V supply of the SCALANCE X and SCALANCE W components (energy cable 2 x 0.75) and to supply power (energy cable 5 x 1.5) for the ET 200.

Preassembled power cables are also available to supply power for the ET 200 in different lengths (M12 power connecting cable).

For the different areas of application, the following cables are available for supplying power:

Cabling	Cable type	Features	Area of application
Power	Energy cable 2 x 0.75	Power cable, sold by the meter	To connect the signaling contact or 24 VDC power supply
	Energy cable 5 x 1.5		
	Power connecting cable M12-180/M12-180	Preassembled cable with two 4-pin M12 plugs	Plug-in cable with one 4-pin M12 plug (A-coded) and one 4-pin M12 socket (A-coded) for the 24 V power supply.
	Robust Power Connecting Cable	Power cable, preassembled or sold by the meter	Preassembled cable with one 4-pin M12 plug and one 4-pin M12 socket (both A-coded) for the power supply. Also available by the meter without connectors.

4.1.1 Energy cable 2 x 0.75

Description

Rugged cable that can be dragged with 2 copper cores for connecting the signaling contact and 24 VDC power supply to SCALANCE X and SCALANCE W components.

The energy cable 2x1,5 is assembled with the following plug-in connectors:

- Signaling contact M12 cable connector
For connection to SCALANCE X208Pro for the signaling contact
- Power M12 cable connector
For connecting to SCALANCE X208Pro and SCALANCE W700 for the 24 VDC power supply.

Features and functions

Cable type ¹⁾	Energy cable 2x1.5
Areas of application	Connection for signaling contact and power supply
Cable type (standard designation)	2YY (ST) CY 2x2x0.64/1.5-100 GN
Jacket	PVC Ø (7.4 ± 0.3) mm, gray
Electrical data	
Operating voltage (rms value)	600 V
Continuous current of the power cores	6 A
Permitted ambient conditions	
Operating temperature	-20 °C to +80 °C
Transportation/storage temperature	-20 °C to +80 °C
Installation temperature	-20 °C to +80 °C
Resistance to fire	flame retardant to IEC 60332-1-2
Resistance to oil	Conditionally resistant
UV resistance	resistant
Product characteristics	
Halogen-free	no
Silicone-free	yes

¹⁾ Electrical properties at 20 °C, tests according to DIN 47 250, Part 4, or DIN VDE 0472

Article number

Energy cable 2x1.5	2-core power cable (2 x 0.75 mm ²) for connection to M12 plug-in connectors.	6XV1812-8A
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4.1.2 Energy cable 5 x 1.5

Description

The Energy cable 5 x 1.5; is used for connecting the 24 V power supply for ET 200 modules via 7/8" plug-in connectors.

The power supply concept of the ET 200 involves the voltage being supplied by a central power supply unit and being looped through from device to device. The load and device supply are via separate circuits. The devices have a 7/8" male connector on the input side and a socket on the output side.

The Energy cable 5x1.5 is available both in meters to allow connectors to be fitted on-site and preassembled in various lengths as 7/8" plug-in cable with degree of protection IP65.

At one end the 7/8" cable has a 5-pin plug-in connector with a pin insert and at the other end a 5-pin 7/8" plug-in connector with a socket insert.

Features and functions

Cable type ¹⁾	Energy cable 5x1.5
Areas of application	Power supply of ET 200 modules with 7/8" power interface
Cable type (standard designation)	L-Y11Y-Z 5x1x1.5 GR
Jacket	PUR Ø (10.5 ± 0.3) mm, gray
Electrical data	
Operating voltage (rms value)	600 V
Continuous current of the power cores	16 A
Permitted ambient conditions	
Operating temperature	-40 °C to +80 °C
Transportation/storage temperature	-40 °C to +80 °C
Installation temperature	-40 °C to +80 °C
Resistance to fire	flame retardant to IEC 60332-1-2
Resistance to oil	resistant
UV resistance	resistant
Product characteristics	
Halogen-free	no
Silicone-free	yes

¹⁾ Electrical properties at 20 °C, tests according to DIN 47 250, Part 4, or DIN VDE 0472

Article numbers

Energy cable 5x1.5	5-core power cable (5 x 1.5 mm ²) for connection to 7/8" plug-in connectors.	6XV1830-8AH10
7/8" PLUG-IN CABLE	Preassembled Energy cable 5x1.5 with two 5-pin 7/8" plugs/sockets. Maximum cable length 50 m	
	• 0.3 m	6XV1822-5BE30
	• 0.5 m	6XV1822-5BE50
	• 1.0 m	6XV1822-5BH10
	• 1.5 m	6XV1822-5BH15
	• 2.0 m	6XV1822-5BH20
	• 3.0 m	6Xv1822-5BH30
	• 5.0 m	6XV1822-5BH50
	• 10 m	6XV1822-5BN10
• 15 m	6XV1822-5BN15	

4.1.3 Power connecting cable M12-180/M12-180

Description

The power connecting cable M12 is an assembled plug-in cable for 24 V power supply to the ET 200.

The power connecting cable M12 has a 4-pin M12 plug at one end and a 4-pin M12 socket at the other. The M12 plug and the M12 socket are A-coded and have a straight cable outlet.

Features and functions

Cable type ¹⁾	Power connecting cable M12-180/M12-180
Areas of application	Connection of the 24 V power supply to ET 200eco with degree of protection IP65/67
Cable type (standard designation)	LI9YH-Y 4x0.75
Jacket	PVC Ø (5.7 ± 0.2) mm, gray
Electrical data	
Operating voltage (rms value)	300 V
Continuous current of the power cores	-
Permitted ambient conditions	
Operating temperature	-25 °C to +80 °C With a moving application a maximum operating temperature of -5 °C to +80 °C must be adhered to.
Transportation/storage temperature	-25 °C to +80 °C -5 °C to +80 °C
Installation temperature	
Resistance to fire	Flame retardant to UL 758 (CSA FT 1)
Resistance to oil	Conditionally resistant
UV resistance	not resistant
Product characteristics	
Halogen-free	no
Silicone-free	yes

¹⁾ Electrical properties at 20 °C, tests according to DIN 47 250, Part 4, or DIN VDE 0472

Article numbers

Power connecting cable M12-180/M12-180	Flexible 4-core power cable, assembled with A-coded 4-pin M12 plug and A-coded 4-pin M12 socket to supply the ET 200 with 24 VDC.	
	• 0.3 m	6XV1801-5DE30
	• 0.5 m	6XV1801-5DE50
	• 1.0 m	6XV1801-5DH10

Power connecting cable M12-180/M12-180	• 1.5 m	6XV1801-5DH15
	• 2.0 m	6XV1801-5DH20
	• 3.0 m	6XV1801-5DH30
	• 5.0 m	6XV1801-5DH50
	• 10 m	6XV1801-5DN10
	• 15 m	6XV1801-5DN15

4.1.4 Robust Power Connecting Cable

Description

The Robust Power Connecting Cable is a 4-wire cable for power supply in the degree of protection IP69. The preassembled cables have a 4-pin M12 plug at one end and a 4-pin socket at the other (both A-coded). This product is also available by the meter without connectors.

Features and functions

Cable type ¹⁾	Robust Power Connecting Cable
Areas of application	Cable for power supply in the degree of protection IP69.
Cable type (standard designation)	LI9YY6Y 4x1x0.75 GR
Jacket	FEP Ø 5,7 ± 0,2 mm, transparent (inner jacket gray)
Electrical data	
Operating voltage (rms value)	300 V
Continuous current of the power cores	-
Permitted ambient conditions	
Operating temperature	-40 °C to +80 °C
Transportation/storage temperature	-40 °C to +80 °C
Installation temperature	-40 °C to +80 °C
Resistance to fire	Not flame resistant
Product characteristics	
Halogen-free	No
Silicone-free	Yes

¹⁾ Electrical properties at 20 °C, tests according to DIN 47 250, Part 4, or DIN VDE 0472

Article numbers

Robust Energy Cable	4-wire cable for the power supply. Sold by the meter, minimum order 20 m, maximum order 4000 m.	6XV1801-2A
Robust Power Connecting Cable	4-wire cable for the power supply, preassembled with an M12 plug and an M12 socket (both A-coded) in the degree of protection IP69.	
	• 1.0 m	6XV1801-5AH10
	• 2.0 m	6XV1801-5AH20
	• 3.0 m	6XV1801-5AH30
	• 5.0 m	6XV1801-5AH50

4.2 Cable connectors

4.2.1 Power Plug Pro

Description

The IE power plug PRO is 5-pin power plug-in connector that can be fitted in the field for on-site assembly. The plug-in connector is used for the 2 x 24 V power supply for SCALANCE X-200IRT PRO switches and the SIMATIC ET200pro. The energy cable 5x1.5 is assembled with the plug-in connector.



The silicone-free design allows it to be used in the automobile industry, for example in paint spraying lines.

Features and functions

Connection type	IE power plug PRO
Standards, approvals	
• UL approval	yes
• RoHS conformity	yes
Interfaces	
Number of electrical connectors for network components / end devices	1
Version for network components or end devices	Power contacts (push-pull housing)
Feed-out to cable	integrated spring contacts for 5-wire power cables
Cable outlet	180°
Housing material	Plastic
Permitted ambient conditions	
Operating temperature	- 40 °C to + 70 °C
Transportation/storage temperature	- 40 °C to + 70 °C
IP degree of protection	IP 65/67
Silicone-free	yes

Article numbers

IE power plug PRO	5-pin power plug-in connector for on-site assembly with push-pull device connection	
	1 pack of 1	6GK1907-0AB10-6AA0

4.2.2 7/8" plug-in connector

Description

The 7/8" plug-in connector is 5-pin plug-in connector that can be fitted in the field for on-site assembly. The plug-in connector is used for the power supply of PROFIBUS nodes (e.g. SIMATIC ET 200) with degree of protection IP65. The energy cable 5x1.5 is assembled with the plug-in connector.



The 7/8" plug-in connector is available in the following versions.

- Pin insert
For feeding in the supply voltage
- Socket insert
For looping through the supply voltage

Features and functions

Connection type	7/8" plug-in connector
Standards, approvals	
• UL approval	no
• RoHS conformity	yes
Interfaces	
Number of electrical connectors for network components / end devices	1
Version for network components or end devices	7/8" plug (socket insert or pin insert)
Feed-out to cables	Screw terminal
Cable outlet	180°

Connection type	7/8" plug-in connector
Housing material	Plastic
Permitted ambient conditions	
Operating temperature	- 40 °C to + 70 °C
Transportation/storage temperature	- 40 °C to + 80 °C
IP degree of protection	IP 65/67
Silicone-free	yes

Article numbers

7/8" plug-in connector	Plug-in connector with axial cable outlet for field assembly for ET 200, 5-pin, metal casing.	
	Pin insert 1 pack of 5	6GK1905-0FA00
	Socket insert 1 pack of 5	6GK1905-0FA00

4.2.3 Power M12 plug Pro

Description

The Power M12 plug PRO is a 4-pin A-coded M12 power plug-in connector for connection to energy cable 2x0.75.

The Power M12 plug PRO is suitable for connection to power supply PS791-1PRO for 24 VDC power supply.



Features and functions

Connection type	Power M12 plug PRO
Standards, approvals	
• UL approval	no
• RoHS conformity	yes
Interfaces	
Number of electrical connectors for network components / end devices	1
Version for network components or end devices	M12 connector plug (pin insert, A-coded, 4-pin)
Feed-out to cable	integrated screw contacts for 2-wire power cables
Cable outlet	180°
Housing material	Plastic
Permitted ambient conditions	
Operating temperature	- 40 °C to + 70 °C
Transportation/storage temperature	- 40 °C to + 80 °C
IP degree of protection	IP 65/67
Silicone-free	yes

Article number

Power M12 plug PRO	Plug-in connector for connection to power supply PS791-1 PRO; 4-pin, A-coded, with assembly instructions.	
	1 pack of 3	6GK1907-0DB10-6AA3

4.3 Power supply

4.3.1 Power supply PS791-1PRO

Description

The power supply PS791-PRO is an AC/DC power supply unit for input voltages of 90 to 265 VAC for all SCALANCE products. The metal housing provides protection from water and dust in degree of protection IP65.



Figure 4-1 Power supply PS791-1PRO

The following options are available for mounting the power supply PS791-1PRO:

- Directly on the SCALANCE W700 devices and SCALANCE X200 devices
- Wall
- S7-300 mounting rail
- DIN rail

To connect the M12 socket X2 with the SCALANCE products W788 and W744 and the SCALANCE X208PRO, the M12 power cord supplied with the products can be used. As an alternative, a user-assembled cable can also be used.

Overview

Power supply PS791-1PRO	
Interfaces	AC Power 3+PE Cable Connector for AC 100-240V power supply
	Power M12 Plug PRO or Power Cord M12 for 24 VDC output voltage
	On/off switch
Electrical data	
Input voltage	90 to 265 VAC at 47 Hz to 63 Hz
Output voltage	24 VDC, +-7%, 0.42 A

4.3 Power supply

Power supply PS791-1PRO	
Output power	10 W
Network disruption	Bypass min. 20 ms 230 VAC
Permitted ambient conditions	
<ul style="list-style-type: none"> • Operating temperature • Transportation/storage temperature 	<ul style="list-style-type: none"> • -20 °C to +60 °C • -40 °C to +85 °C
Relative humidity	100%
Standards, approvals, degree of protection	
Approvals	EMC: EN 55022 Class B, EN 61000-4; UL 1950, EN 60950;
Degree of protection	IP65

Article numbers

Power supply PS791-1PRO	AC/DC power supply unit for input voltages from 90 to 265 VAC for numerous SCALANCE products in degree of protection IP65	6GK5791-1PS00-0AA6
AC Power 3+PE Cable Connector	Connecting socket for connecting the power supply PS791-1PRO to an AC power supply	
	1 pack of 5	6GK1 907-0FC10-0AA5

4.3.2 Power M12 cable connector PRO

Description



Figure 4-2 Power M12 cable connector PRO

Power M12 cable connector PRO is a 4-pin M12 power connection socket that can be assembled on site. The connection socket is used for the 24 VDC power supply of the devices SCALANCE X208PRO or SCALANCE W788-xPRO.

Features and functions

Connection type	Power M12 cable connector PRO
Standards, approvals	
• UL approval	no
• RoHS conformity	yes
Interfaces	
Number of electrical connectors for network components / end devices	1
Version for network components or end devices	M12 plug (socket insert, A-coded, 4-pin)
Cable outlet	180°
Housing material	Plastic
Permitted ambient conditions	
Operating temperature	- 40 °C to + 70 °C
Transportation/storage temperature	- 40 °C to + 80 °C
IP degree of protection	IP 65/67
Silicone-free	yes

Article number

Power M12 cable connector PRO	Connection socket for connection of SCALANCE W700 for 24 VDC power supply; 4-pin, A-coded with assembly instructions.	
	1 pack of 3	6GK1907-0DC10-6AA3

4.3.3 7/8" Power T-Trap PRO

Description



Figure 4-3 7/8" Power T-Trap PRO

The plug-in connector consists of two 7/8" socket inserts and a 7/8" pin insert, both 5-pin. The 7/8" Power T-Trap PRO is used for power supply and power distribution to ET200pro modules.

Features and functions

Connection type	7/8" Power T-Trap PRO
Standards, approvals	
• UL approval	no
• RoHS conformity	yes
Interfaces	
Number of electrical connectors for network components / end devices	3
Version for network components or end devices	7/8" plug-in connector (2 x socket insert 1 x pin insert)
Cable outlet	180°
Housing material	Metal
Permitted ambient conditions	
Operating temperature	- 40 °C to + 70 °C
Transportation/storage temperature	- 40 °C to + 80 °C
IP degree of protection	IP 65/67
Silicone-free	yes

Article number

7/8" Power T-Trap PRO	Power T piece for ET 200 with two 7/8" socket inserts and one 7/8" pin insert.	
	Pin insert 1 pack of 5	6GK1905-0FC00

4.3.4 Signaling contact M12 cable connector PRO

Description

The signaling contact M12 cable connector PRO is a 5-pin M12 cable connector that is B-coded for the signaling contact. The component has degree of protection IP65 and is used with the SCALANCE X208PRO.



Features and functions

Connection type	Signaling contact M12 cable connector PRO
Standards, approvals	
• UL approval	no
• RoHS conformity	yes
Interfaces	
Number of electrical connectors for network components / end devices	1
Version for network components or end devices	M12 connector plug (socket insert, B-coded, 4-pin)
Cable outlet	180°
Housing material	Plastic
Permitted ambient conditions	
Operating temperature	- 40 °C to + 70 °C
Transportation/storage temperature	- 40 °C to + 80 °C

Connection type	Signaling contact M12 cable connector PRO
IP degree of protection	IP 65/67
Silicone-free	yes

Article number

Signaling contact M12 cable connector PRO	Connection socket for connection of SCALANCE X208PRO for signaling contact, 5-pin, B-coded with assembly instructions	
	1 pack of 3	6GK1908-0DC10-6AA3

Instructions for fitting connectors, attachments and devices

5

5.1 Note on the installation instructions

This section contains installation instructions for several of the most common components. You will find more detailed information in the documentation accompanying the particular product.

5.2 Industrial Ethernet FastConnect Stripping Tool

Introduction

The section describes how to use the IE FC stripping tool.

Note the instructions in the instructions for use that accompany the IE FC stripping tool.

 CAUTION
--

Improper use

The IE FC stripping tool is only approved for the stripping of SIMATIC NET Industrial Ethernet FastConnect cables. If used for other purposes, this can cause accidents or destroy the tool and cable.
--

Under no circumstance use the tool on cables carrying power.
--

Requirement for the qualification of the personnel.

In the sense of these operating instructions or warning notices, qualified personnel are people familiar with the setting up, installation, commissioning and operation of the product and who have suitable qualification for their activities and have been trained in first aid.

IE FC stripping tool

With the IE FC stripping tool the outer jacket and shield of IE FC cables can be stripped to the correct length. The IE FC cable prepared in this way is connected via insulation displacement contacts to the plug or the outlet. For the IE FC stripping tool, there are two blade cassettes with different knife distances. The IE FC stripping tool is supplied with a yellow blade cassette.

Note

Notes on using the IE FC stripping tool

- The insulation piercing contacts of the plug or outlet can be released and recontacted up to 10 times.
 - Once the ends of cables have made contact, do not make contact with them again but cut them off.
 - Replace the knife cassette if the cut is not clean or after stripping approximately
 - 1500 cables with a PVC outer jacket
 - 150 cable on line with PUR outer jackets.
-

Order numbers

IE FC Stripping Tool	Preset insulation stripping tool for stripping of IE FC cables	6GK1901-1GA00
IE FC blade cassettes (5 mm) (green)	Blade cassette with a knife distance of 5 mm for: <ul style="list-style-type: none"> • IE FC RJ-45 plugs (6GK1901-1BB....) • IE FC modular outlet (6GK1901-1B....) 	
	1 pack of 5	6GK1901-1GB01
IE FC blade cassettes (12 mm) (yellow)	Blade cassette with a knife distance of 12 mm for: <ul style="list-style-type: none"> • IE FC outlet RJ-45 (6GK1901-1FC00-0AA0) • ELS TP40 and ELS TP40M (6GK1102-6A...) • RJ-45 pug-in connector from the HARTING company 	
	1 pack of 5	6GK1901-1GB00

Procedure



- | | | |
|--|---|---|
| <ol style="list-style-type: none"> 1. Fit the required blade cassette in the stripping tool. 2. After changing the blade cassette adjust the cutting depth using the middle socket-head screw. | <ol style="list-style-type: none"> 1. Take the stripping tool in your right hand. 2. Measure the cable length by placing the cable on the template. Use the index finger of your left hand as the limit stop. | <ol style="list-style-type: none"> 1. Place the measured end of the cable in the stripping tool. The index finger of your left hand is used as a limit stop. |
|--|---|---|



5.2 Industrial Ethernet FastConnect Stripping Tool

1. Clamp the stripping tool as far as it will go.

1. To strip the insulation, turn the tool in the direction of the arrow with

- PVC insulation approx. 4 times
- PUR insulation approx. 8 times

1. Keeping it closed, pull the stripping tool with jacket and remnants of the shield off the end of the cable.

If the cutting results are poor, change the blade cassette.



1. After releasing the tool, remove the remnants remaining in the tool.

1. If the white filler was not removed off when you stripped the cable, remove the rest by pulling it with your hand.

1. If you score the protective foil between the wires with a screwdriver, this is easier to remove.



1. Pull the protective foil off the wires.

1. For assembling the cable, follow the assembly instructions accompanying your plug or outlet.

1. Replace the knife cassette after approx:

- 1500 cables with a PVC outer jacket
- 150 cables with PUR outer jackets

5.3 Electrical networks

5.3.1 Fitting IE FC cable 2 x 2 with an IE FC RJ-45 plug 180 2x2

Introduction

The individual steps required to assemble a 4-wire IE FC cable and an IE FC RJ-45 plug 180 are explained below.

Note

Fitting the IE FC RJ-45 plug 90 and the IE FC RJ-45 plug 145

The figures show how to fit an IE FC RJ-45 plug 180. To fit the IE FC RJ-45 plug 145 and the IE FC RJ-45 plug 90, the procedure is analogous

Refer to the information in this section "Industrial Ethernet FastConnect stripping tool (Page 130)" and the installation instructions for the plug.

Note

Instructions for assembly







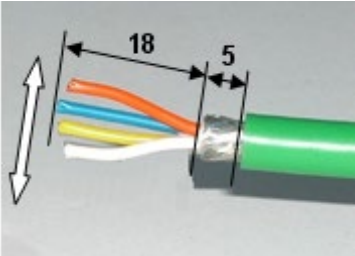
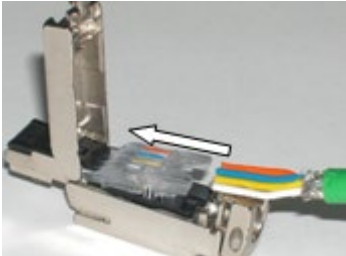
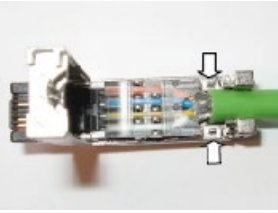
- The insulation-piercing contacts of the IE FC RJ-45 plug can be released and recontacted up to 10 times.
 - Once the ends of cables have made contact, do not make contact with them again but cut them off.
 - Do not pull on the plug when releasing it.
 - To assemble a cable with crossed over wires, connect the color-coded wires at one end of the cable in the connector as shown below:
 - connect white with yellow
 - connect blue with orange
-

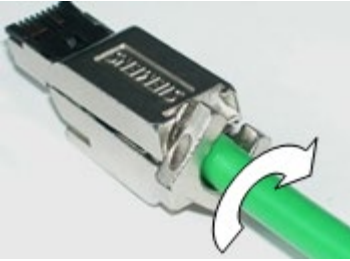


Connector pinout

With the four integrated insulation piercing contacts, establishing contact with the FC cable variants is simple and error-proof. With the casing open, colored markers on the contact cover make it simple to connect the cores to the insulation piercing contacts. The transparent synthetic material of the contact cover allows the user to check the contacts at any time.

Pins of RJ-45	Wire color	Signal on switch	Signal on end device
1	Yellow	RX+	TX+
2	Orange	RX-	TX-
3	White	TX+	RX+
6	Blue	TX-	RX-

Procedure

		
<ol style="list-style-type: none"> 1. In the stripping tool, use the green knife cassette (5.1 mm). 2. If necessary, adjust the cutting depth of the knife cassette using the middle socket-head screw. 	<ol style="list-style-type: none"> 1. Take the stripping tool in your right hand. 2. Place the cable on the measuring template. Use your left index finger as the limit stop. 	<ol style="list-style-type: none"> 1. Place the cable in the stripping tool. The index finger of your left hand is the limit stop. 2. Tighten the stripping tool.
		
<ol style="list-style-type: none"> 1. To strip the insulation, turn the tool in the direction of the arrow <ul style="list-style-type: none"> - approx. 4 times for PVC insulation - approx. 8 times for PUR insulation. 	<ol style="list-style-type: none"> 1. Keeping the it closed, pull the stripping tool with jacket and remnants of the shield off the end of the cable. 	<ol style="list-style-type: none"> 1. Remove the remaining white filler and the transparent protective foil with your fingers. 2. Cut off the dummy cores.
		
<ol style="list-style-type: none"> 1. Spread out the cores according to their colors on the contact elements of the FC RJ-45 plug. 	<ol style="list-style-type: none"> 1. Insert the cores as far as they will go into the contact elements of the FC RJ-45 plug. 	<ol style="list-style-type: none"> 1. Push the cable into position (see arrows). 2. Press the contact elements down as far as the limit stop.

		
<ol style="list-style-type: none">1. Close the cover.2. Turn the locking mechanism with your hand as far as possible in the direction of the arrow.	<ol style="list-style-type: none">1. Insert a 2.5 mm screwdriver into the hole in the locking mechanism and continue turning it as far as the limit stop.	<ol style="list-style-type: none">1. The connector is correctly locked when the opening of the locking mechanism is at the side and the side edges are flush with the connector.

5.3.2 Fitting IE FC cable 2 x 2 with an IE FC RJ-45 plug PRO

Introduction

The individual steps required to assemble a 4-wire IE FC cable and an IE FC RJ-45 plug Pro are explained below.

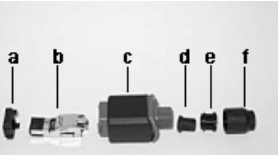


Refer to the information in this section "Industrial Ethernet FastConnect stripping tool (Page 130)" and the installation instructions for the plug.




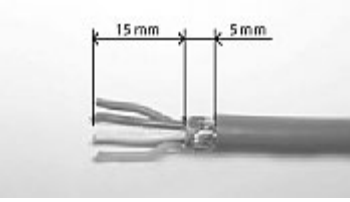


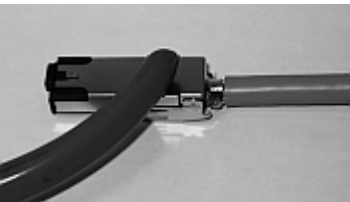

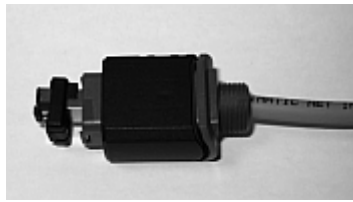
Note

Instructions for assembly

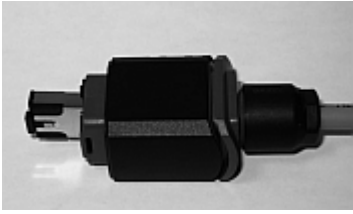
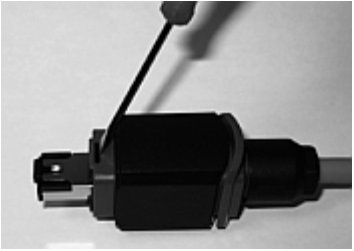
- The insulation-piercing contacts of the IE FC RJ-45 plug Pro can be released and recontacted up to 10 times.
- Once the ends of cables have made contact, do not make contact with them again but cut them off.
- Do not pull on the plug when releasing it.
- To assemble a cable with crossed over wires, connect the color-coded wires at one end of the cable in the connector as shown below:
 - connect white with yellow
 - connect blue with orange

Procedure

		
<p>The IE FC RJ-45 plug PRO consists of the following:</p> <ul style="list-style-type: none"> • a - Catch • b - Contact holder • c - casing • d - Seal • e - Sealing ring • f - Forcing nut 	<ol style="list-style-type: none"> 1. In the stripping tool, use the yellow knife cassette (12 mm). 2. If necessary, adjust the cutting depth of the knife cassette using the middle socket-head screw 	<ol style="list-style-type: none"> 1. Take the stripping tool in your right hand. 2. Place the cable on the measuring template. Use your left index finger as the limit stop

		
<ol style="list-style-type: none"> 1. Place the cable in the stripping tool. The index finger of your left hand is the limit stop. 2. Tighten the stripping tool 	<ol style="list-style-type: none"> 1. To strip the insulation, turn the tool in the direction of the arrow <ul style="list-style-type: none"> - approx. 4 times for PVC insulation - approx. 8 times for PUR insulation 	<ol style="list-style-type: none"> 1. Remove the cable jacket, shield and the white filler with your hand.
		
<ol style="list-style-type: none"> 1. Cut back the wires to a length of 15 mm and + 5 mm shield. 	<ol style="list-style-type: none"> 1. Push parts a to d onto the cable in the order shown. 	<ol style="list-style-type: none"> 1. Open the cover of the contact holder (b). 2. Place the wires in the guide slots according to the colored markers on the contact holder. 3. Align the cable so that the shield lies between the shield clips of the contact holder.
		
<ol style="list-style-type: none"> 1. Contact the wires by pressing down the cover with a tool or hard object. 	<ol style="list-style-type: none"> 1. Push the contact holder into the casing. Make sure that the contract holder is in the correct position. 	<ol style="list-style-type: none"> 1. Push the catch onto the casing.

5.3 Electrical networks

		<ol style="list-style-type: none">1. Pull back the seal and sealing ring.2. Turn and open the forcing nut.3. Push back the sealing ring, the seal and the forcing nut. You can now remove the contact holder.
<ol style="list-style-type: none">1. Push the seal, the sealing ring and the forcing nut in the direction of the casing. Tighten the forcing nut in a clockwise direction.	<p>Opening the plug:</p> <ol style="list-style-type: none">1. To open the connector, press back the catch, for example with a slotted screwdriver so that the contact holder can be taken out.2. Loosen the forcing nut.	

5.3.3 Fitting an IE FC cable 2 x 2 with an IE RJ-45 plug PRO

Introduction

The individual steps required to assemble a 4-wire IE FC cable and an IE RJ-45 plug Pro are explained below.

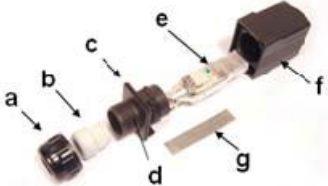
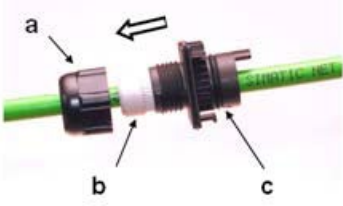

Refer to the information in this section "Industrial Ethernet FastConnect stripping tool (Page 130)" and the installation instructions for the plug.

Note





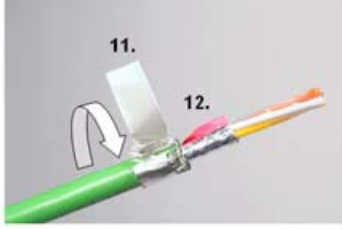
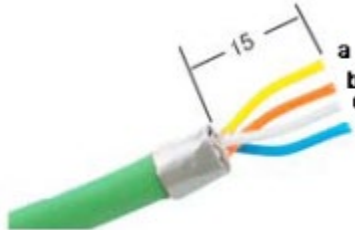
Instructions for assembly






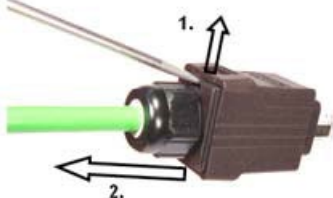
- The insulation-piercing contacts of the IE RJ-45 plug Pro can be released and recontacted up to 10 times.
- Once the ends of cables have made contact, do not make contact with them again but cut them off.
- Do not pull on the plug when releasing it.
- To assemble a cable with crossed over wires, connect the color-coded wires at one end of the cable in the connector as shown below:
 - connect white with yellow
 - connect blue with orange

Procedure

		
<p>The IE RJ-45 plug Pro consists of the following:</p> <ul style="list-style-type: none"> • a: Forcing nut • b: Sealing ring • c: Rear wall • d: Latch • e: Contact holder • f: Casing • g: Metal foil 	<ol style="list-style-type: none"> 1. Release the forcing nut (a) and the sealing ring (b) from the back wall (c) of the connector. 2. Push the forcing nut (a), the sealing ring (b) and the back wall (c) loosely over the cable. 	<ol style="list-style-type: none"> 1. In the stripping tool, use the yellow knife cassette (12 mm). 2. If necessary, adjust the cutting depth of the knife cassette using the middle socket-head screw.

5.3 Electrical networks

		
<ol style="list-style-type: none"> 1. Take the stripping tool in your right hand. 2. Place the cable on the measuring template. Use your left index finger as the limit stop. 	<ol style="list-style-type: none"> 1. Place the cable in the stripping tool. The index finger of your left hand is the limit stop. 2. Tighten the stripping tool. 	<ol style="list-style-type: none"> 1. To strip the insulation, turn the tool in the direction of the arrow <ul style="list-style-type: none"> - approx. 4 times for PVC insulation - approx. 8 times for PUR insulation
		
<ol style="list-style-type: none"> 1. Remove the cable jacket, shield and the white filler with your hand. 	<ol style="list-style-type: none"> 1. Turn back the braid over the cable jacket and secure it with the supplied adhesive metallic cable foil. 2. Remove the exposed foil shield and white filler below it. 	<ol style="list-style-type: none"> 1. Arrange the wires according their colors: <ul style="list-style-type: none"> - a: yellow - b: orange - c: white - d: blue 2. Cut back the wires to a length of 15 mm.

		
<ol style="list-style-type: none"> 1. Open the cover of the contact holder. 2. Place the wires in the guide slots according to the colored markers on the contact holder. 	<ol style="list-style-type: none"> 1. Contact the wires by pressing down the cover with a tool or hard object. 2. Align the cable so that the shield foil lies between the shield clips of the contact holder. 	<ol style="list-style-type: none"> 1. Push the sealing ring into the rear wall and screw the forcing nut over it loosely. 2. Turn the rear wall so that the latch is on the same side as the RJ-45 release catch. 3. Push the contact holder into the rear wall as far as the limit stop. The limit stop must not jut out over the cover of the contact holder.
		
<ol style="list-style-type: none"> 1. Secure the position of the contact holder by tightening the forcing nut. 2. Push the housing over the contact holder. The latch of the rear wall must be on the same side as the labeling of the casing. 	<ol style="list-style-type: none"> 1. Press the rear wall into the housing until it clicks into place audibly. Avoid pressing on the seal around the rear wall. 2. Tighten the forcing nut completely. 	<p>Opening the plug:</p> <ol style="list-style-type: none"> 1. To open the plug, lever the catch in the housing towards the side wall with a slotted screwdriver. 2. Pull the rear wall out of the housing by the cable while holding down the screwdriver.

5.3.4 Fitting IE FC cable 2 x 2 with an IE FC RJ-45 plug 180 4x2

Introduction

The individual steps required to assemble a 4-wire IE FC cable and an IE FC RJ-45 plug 180 4x2 are explained below.




Refer to the information in this section "Industrial Ethernet FastConnect stripping tool (Page 130)" and the installation instructions for the plug.




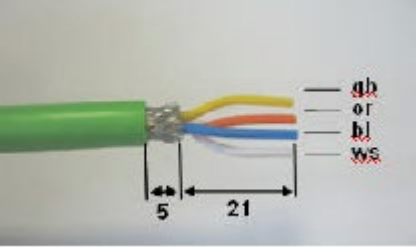
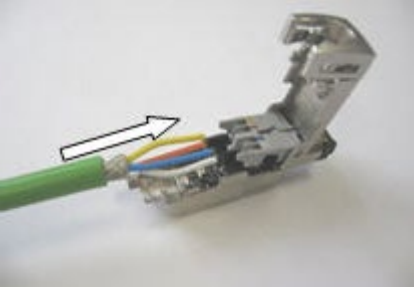
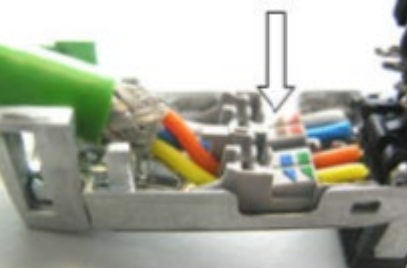
Note

Instructions for assembly

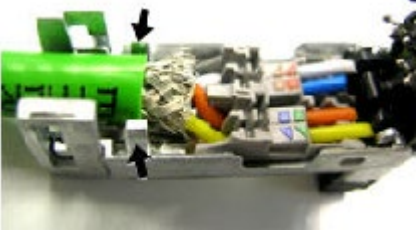
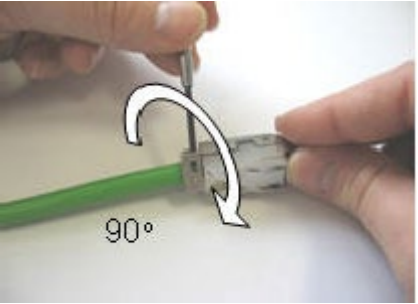

- The insulation-piercing contacts of the IE FC RJ-45 plug 4x2 can be released and recontacted with the same cable cross section up to 10 times.
- Once the ends of cables have made contact, do not make contact with them again but cut them off.
- Do not pull on the plug when releasing it.
- To assemble a cable with crossed over wires, connect the color-coded wires at one end of the cable in the connector as shown below:
 - connect white with yellow
 - connect blue with orange

Procedure

		
<ol style="list-style-type: none"> 1. In the stripping tool, use the green knife cassette (5.1 mm). 2. If necessary, adjust the cutting depth of the knife cassette using the middle socket-head screw. 	<ol style="list-style-type: none"> 1. Take the stripping tool in your right hand. 2. Measure the cable length against the measuring template. Use your left index finger as the limit stop. <p>Note: If the stripping tool has an older measuring template, add the new measure (38 mm from the edge of the stripping tool).</p>	<ol style="list-style-type: none"> 1. Place the cable in the stripping tool. The index finger of your left hand is the limit stop. 2. Tighten the stripping tool.

		
<p>1. To strip the insulation, turn the tool in the direction of the arrow</p> <ul style="list-style-type: none"> - approx. 4 times for PVC insulation - approx. 8 times for PUR insulation 	<p>1. Keeping the it closed, pull the stripping tool with jacket and remnants of the shield off the end of the cable.</p> <p>Note: If a core is damaged, the section of cable must be cut off and stripped again.</p>	<p>1. Remove the cable jacket, shield and the white filler with your hand.</p>
		
<p>1. Spread out the cores according to their colors on the contact holder of the FC RJ-45 plug 180 4x2.</p> <p>2. Cut off the filler thread as close to the shield braid as possible.</p>	<p>1. Insert the wires into the contact element of the FC RJ-45 plug 180 4 x 2 as far as the limit stop according to the color markings.</p>	<p>1. Press down the contact element as far as the limit stop.</p> <p>Notes: If the wires do not completely fill the wire guide slits, the cable must be stripped again.</p> <p>If the wires extend beyond the wire guide slits, the wires must be shortened.</p>

5.3 Electrical networks

		
<p>1. Push the cable into position as shown in the picture. Make sure that the wires remain in the guide slits and close the cover.</p> <p>Notes: Make sure that the shield sits correctly as shown in the picture above. The visible color marking is not valid for this type of installation.</p>	<p>1. Turn the locking mechanism with your hand as far as possible in the direction of the arrow.</p> <p>2. Insert a screwdriver (3mm) into the slit in the locking mechanism and turn it as far as the limit stop.</p> <p>3. The connector is correctly locked when the opening of the locking mechanism is at the side and the side edges are flush with the connector.</p>	<p>Removal from an RJ-45 jack</p> <p>1. If space is limited, release the plug using a screwdriver (blade 3mm wide).</p> <p>Notice: When releasing, do not pull on the plug!</p>

5.3.5 Fitting an IE FC cable 4 x 2 with an IE FC RJ-45 plug 180 4x2

Introduction

The individual steps required to assemble a 8-wire IE FC cable and an IE RJ-45 plug 180 4x2 are explained below.




Refer to the information in this section "Industrial Ethernet FastConnect stripping tool (Page 130)" and the installation instructions for the plug.

Note



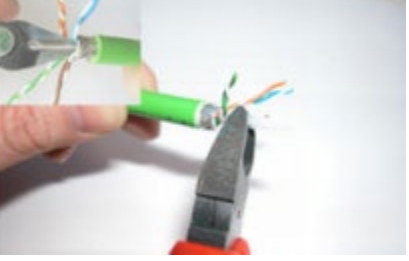
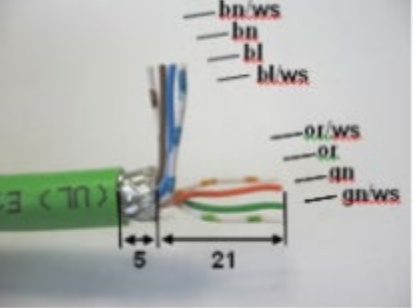
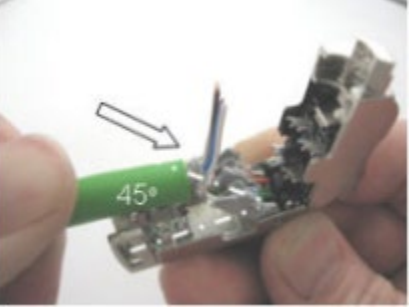
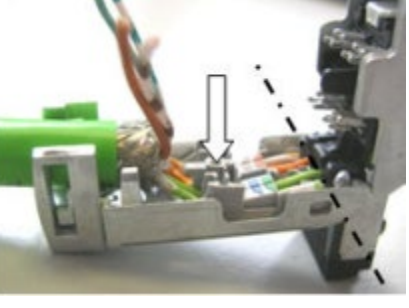
Instructions for assembly

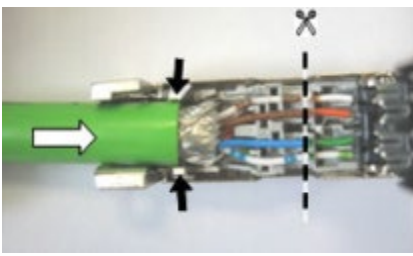


- The insulation-piercing contacts of the IE FC RJ-45 plug 4x2 can be released and recontacted with the same cable cross section up to 10 times.
- Once the ends of cables have made contact, do not make contact with them again but cut them off.
- Do not pull on the plug when releasing it.
- To assemble a cable with crossed over wires, connect the color-coded wires at one end of the cable in the connector as shown below:
 - Connect orange-white with green-white
 - Connect orange with green
 - Connect brown-white with blue
 - Connect brown with blue-white

Procedure

		
<ol style="list-style-type: none"> 1. In the stripping tool, use the green knife cassette (5.1 mm). 2. If necessary, adjust the cutting depth of the knife cassette using the middle socket-head screw. 	<ol style="list-style-type: none"> 1. Take the stripping tool in your right hand. 2. Measure the cable length against the measuring template. Use your left index finger as the limit stop. <p>Note: If the stripping tool has an older measuring template, add the new measure (38 mm from the edge of the stripping tool).</p>	<ol style="list-style-type: none"> 1. Place the cable in the stripping tool. The index finger of your left hand is the limit stop. 2. Tighten the stripping tool.

5.3 Electrical networks

		
<p>1. To strip the insulation, turn the tool in the direction of the arrow</p> <ul style="list-style-type: none"> - approx. 4 times for PVC insulation - approx. 8 times for PUR insulation 	<p>1. Keeping the it closed, pull the stripping tool with jacket and remnants of the shield off the end of the cable.</p> <p>Note: If a core is damaged, the section of cable must be cut off and stripped again.</p>	<p>1. Remove any remaining white filler with your fingers.</p> <p>2. Cut off the inner cable spacer as close to the shield braid as possible. Also shorten the cable spacer between the two pairs orange/orange-white, green/green-white, and blue/blue-white, brown/brown-white.</p>
		
<p>1. Spread out the cores according to their colors on the contact elements of the FC RJ-45 plug 180 4x2.</p>	<p>1. Bend the contact element to approx. 45°.</p> <p>2. Push the pairs with colors green/green-white and orange/orange-white into the lower part of the contact element according to the color markers. Make sure that the wires sit correctly in the wire guide slits.</p> <p>Note: Tweezers can be used to thread the wires into the wire guide slits.</p>	<p>1. Press down the contact element as far as the limit stop.</p> <p>Notes: If the wires do not completely fill the wire guide slits, the cable must be stripped again. If the wires extend beyond the wire guide slits, the wires must be shortened.</p> <p>Once the IE FC RJ-45 Plug 180 4x2 has been fitted to a cable it may no longer be fitted to cables with a different cable cross-section.</p>

		
<ol style="list-style-type: none"> 1. Press the blue/blue-white and brown/brown-white pairs into the color coded wire guide slits. 2. Cut the wires so that they extend by 1-2 mm (see scissors symbol). 3. Push the cable into position as shown in the picture (see arrows). Make sure that the wires remain in the guide slits and close the cover. <p>Note: The edge of the cable jacket must be between the two spikes as shown in the picture.</p>	<ol style="list-style-type: none"> 1. Turn the locking mechanism with your hand as far as possible in the direction of the arrow. 2. Insert a screwdriver (3 mm) into the slit in the locking mechanism and turn it as far as the limit stop. 3. The connector is correctly locked when the opening of the locking mechanism is at the side and the side edges are flush with the connector. <p>Note: If necessary, the connector can be closed with pliers.</p>	<p>Removal from an RJ-45 jack</p> <ol style="list-style-type: none"> 1. If space is limited, release the plug using a screwdriver (blade 3 mm wide). <p>Notice: When releasing, do not pull on the plug!</p>

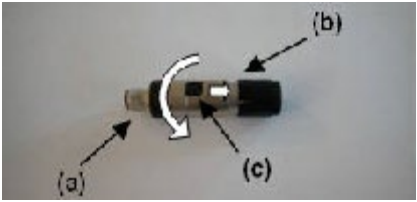
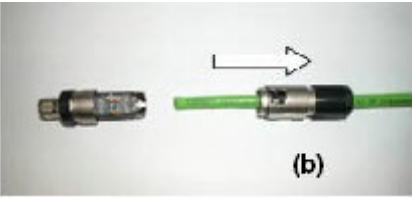
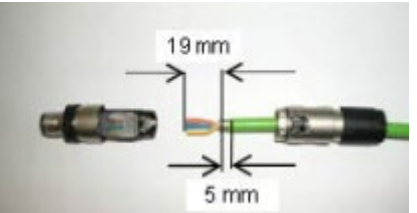
5.3.6 Fitting the IE FC TP cable with an IE FC M12 plug PRO




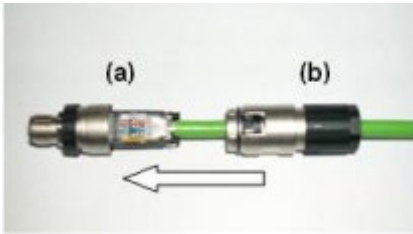
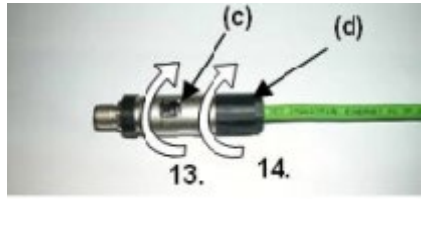
Introduction

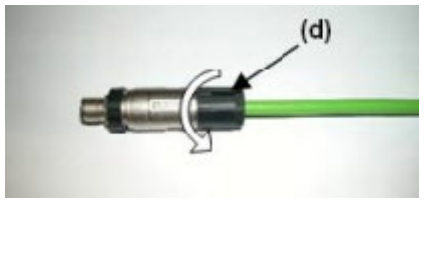
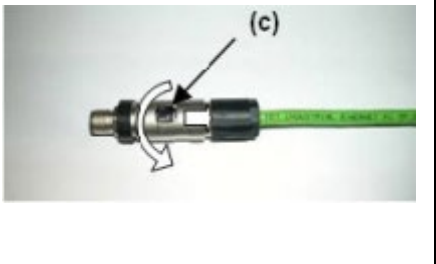
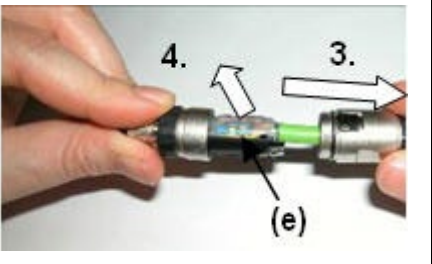
The individual steps required to assemble an IE FC TP cable and an IE FC M12 plug PRO are explained below.

Note the information in the assembly instructions of the plug.

Procedure

		
<p>a front part of connector b connector housing c catch</p> <ol style="list-style-type: none"> 1. Press the catch (c) in the direction of the arrow. 2. While holding the catch open, unscrew the connector housing (b) from the front part of the connector (a). 	<ol style="list-style-type: none"> 1. Fit the connector housing (b) over the cable. 	<ol style="list-style-type: none"> 4. Strip the cable as shown in the drawing using a suitable stripping tool with the required cutting depth or using the IE stripping tool*. <p>* The stripping tool is not suitable for cables other than FC cables.</p>

		
<ol style="list-style-type: none"> 1. Use the stripping tool 6GK1 901-1GA00 with the green knife cassette 6GK1 901-1GB01. 2. Measure the cable length against the measuring template. The correct length is indicated by the marker with the number 6GK1901-0DB.... <p>Note: If the required marks are not available on the stripping tool, make a mark manually 32 mm from the left-hand edge.</p>	<ol style="list-style-type: none"> 1. Insert the cable. Your index finger acts as the limit stop. 2. Clamp the stripping tool as far as it will go. 3. Turn the stripping tool as follows: <ul style="list-style-type: none"> - 4 times for PVC cables, - 8 times for PUR cables in the direction of the arrow and remove remnants of the jacket and if necessary nip off the dummy elements. 	<ol style="list-style-type: none"> 1. Open the flap (e) and push the wires according to the colored marking* as far into the holder as they will go. 2. Press down the holder flap (e) until it is fully closed. Make sure that the jacket shield fully covers the shield contact surface. <p>*To create a crossover cable, connect white with yellow and blue with orange at one end of the cable.</p>
		<p>Note</p> <ul style="list-style-type: none"> • Replace the knife cassette if the cut is not clean or after stripping approximately <ul style="list-style-type: none"> - 1500 operations on cables with PVC outer jackets - 150 operations on cables with PUR outer jackets • The piercing contacts of the IE FC M12 Plug PRO can be released and re-used up to 10 times. Cable ends that have already been pierced must not be used again but must be cut off. • Screw the IE FC M12 plug PRO to devices with a torque of 0.6 Nm +/- 0.1.
<ol style="list-style-type: none"> 1. Push the connector housing (b) up to the front part of the connector (a). 	<ol style="list-style-type: none"> 1. Screw the connector housing and the front of the connector together until the catch (c) locks in position. 2. Screw the pressure nut (d) and the connector housing together with a torque of 1.3 Nm +0.2. 	

Dismantling the plug		
		
<p>1. Release the pressure nut (d).</p>	<p>1. Press the catch (c) in the direction of the arrow and at the same time unscrew the connector housing from the front part of the connector in an anticlockwise direction.</p>	<p>1. Push the connector housing to the back. 2. Open the holder flap (e) of the front part of the connector by pushing up the inserted cable. 3. Remove the cable from the holder (e) and remove the connector housing from the cable.</p>



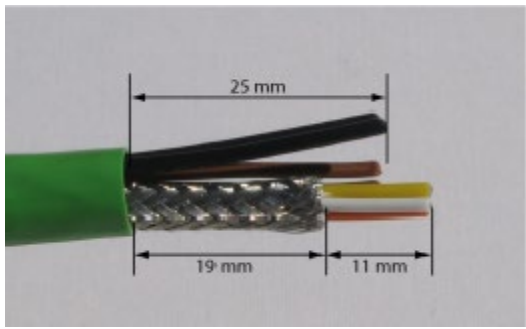
5.3.7 Assembling an IE hybrid cable 2 x 2 + 4 x 0.34 with an IE IP 67 hybrid connector

Introduction

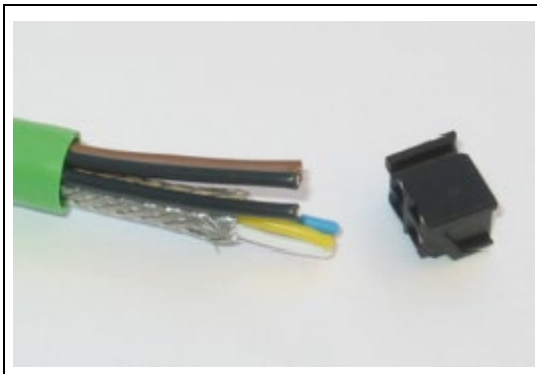
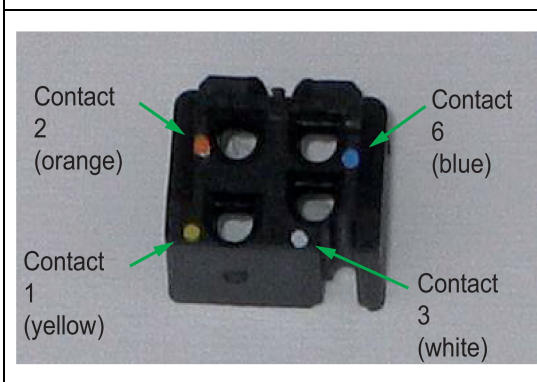
The individual steps required to assemble an IE FC TP hybrid cable 2x2 + 4x0.34 and an IE IP67 hybrid plug are explained below.

Note the information in the compact operating instructions of the SCALANCE W700 devices.

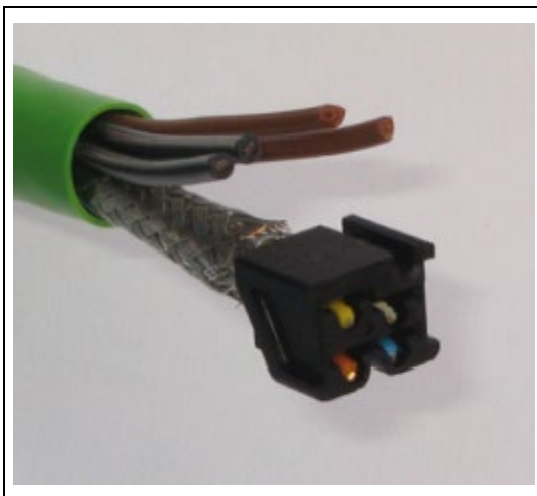
Procedure

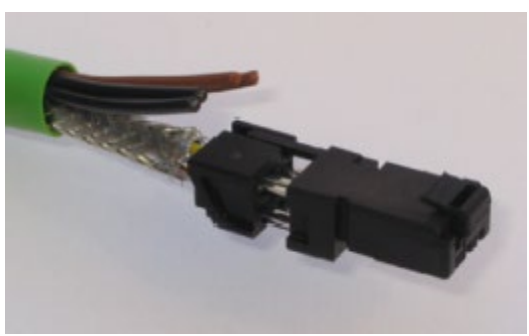
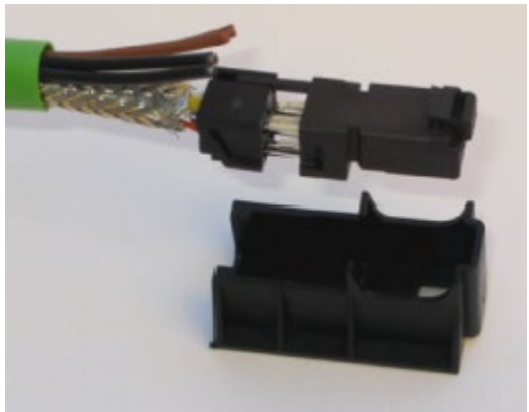
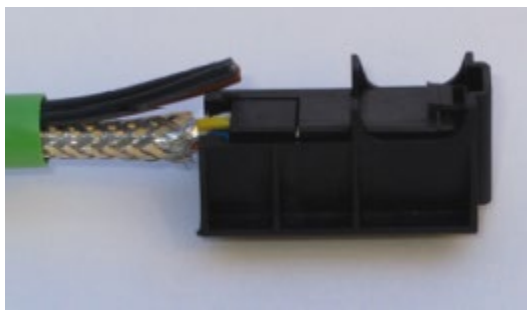
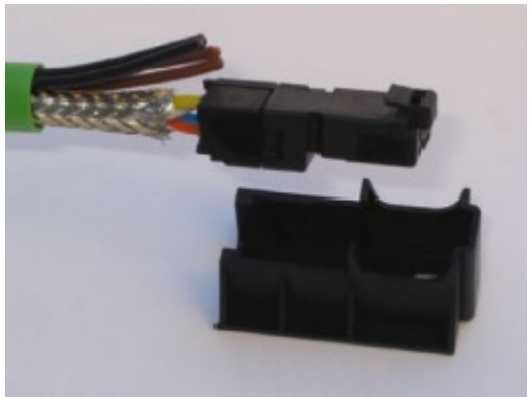
	<p>Remove the two inner shells of the universal sealing ring to adapt it to the diameter of the hybrid cable.</p>
	<p>Push the bushing, the washer, the adapted universal sealing ring and the housing over the cable jacket.</p>
	<p>Remove the following lengths of cable jacket and shield braid:</p> <ul style="list-style-type: none"> • 25 mm for the power leads. • 30 mm for the data leads (to achieve good shielding, the shield braid must be at least 30 mm long).

5.3 Electrical networks

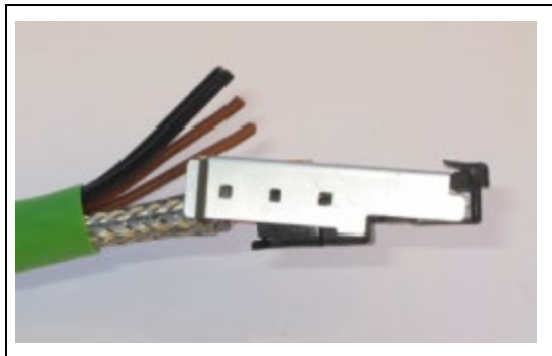
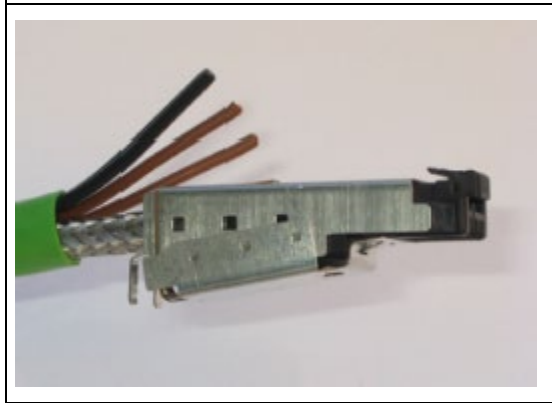
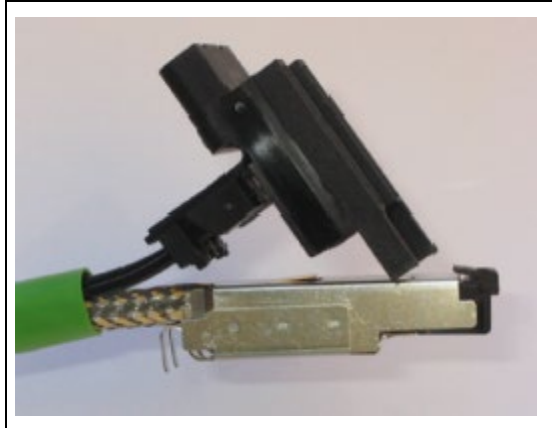
	<p>Arrange the data leads according to the color codes on the splice element. The following table shows the assignment of the data leads.</p>
	<p>Contact and color assignment of the splice element.</p>

Wire color code (standard)	White	Blue	Yellow	Orange
Connector color code (Siemens IE)	White	Blue	Yellow	Orange
Siemens IE FC RJ-45 socket (reference)	3	6	1	2

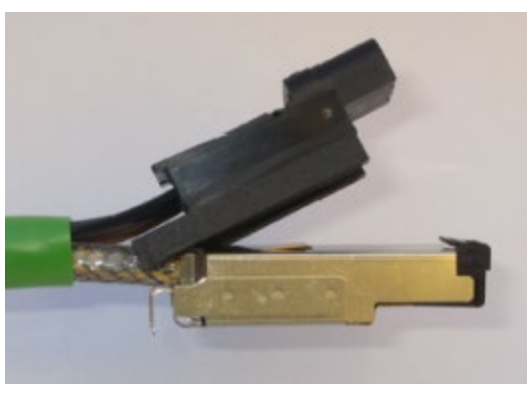



	<p>Insert the all the data leads at the same time into the splice element is far as they will go.</p>
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	<p>Close the splice element and RJ-45 data module until they lock together.</p>
	<p>Insert the data module and the splice element into the supplied IDC assembly tool.</p>
	<p>Press the data module and the IDC assembly tool together to establish the installation piercing connection.</p>
	<p>Remove the assembled data module from the IDC assembly tool.</p>

5.3 Electrical networks

	<p>Position the top shield plate and press it over the cable shield.</p>
	<p>Position the lower shield plate and press it and the upper shield plate together until they lock together with an audible "click".</p>
	<p>Arrange the power leads and insert them as far as they will go into the hinge elements of the isolation body. The following table shows the pin assignment of the power leads.</p>

Wire color code (standard)	Brown	Brown	Black	Black
	24 V	24 V	Ground	Ground
Power supply insert module	1	2	3	4

	<p>Press each individual hinge element together with the integrated IDC contact. Recommendation: Use a small slotted screwdriver (max. 3.5 mm) as a lever.</p>
	
	<p>Push the housing over the assembled data module and the insulator body until they lock together (there should be an audible click).</p>
	<p>Tighten the cable gland. We recommend an open ring key with a size of 21 mm.</p>


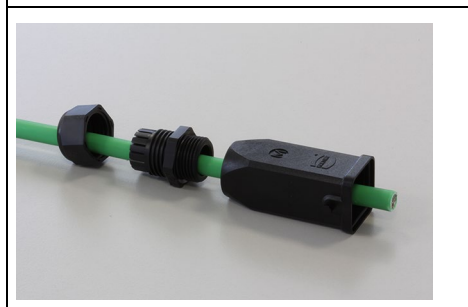
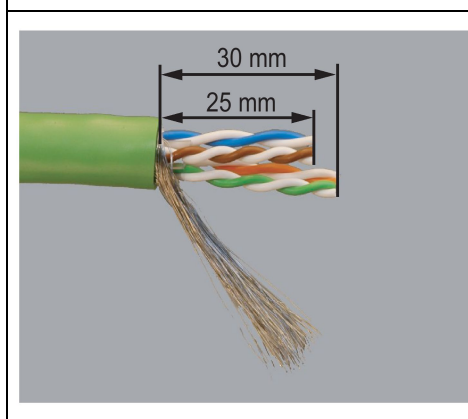
5.3.8 Fitting the IE FC TP standard cable 4 x 2 GP to an IE IP 67 hybrid connector

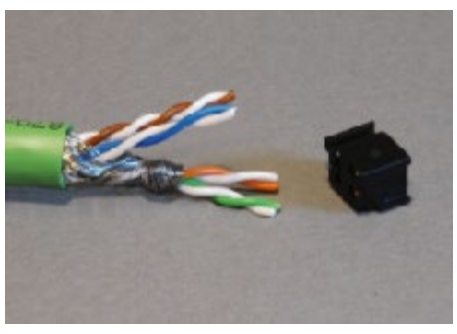
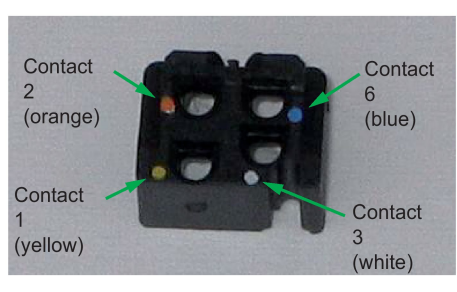
Introduction

The individual steps required to assemble an IE FC TP standard cable 4x2 and an IE IP67 hybrid plug are explained below.

Note the information in the compact installation instructions of the SCALANCE W700 devices.

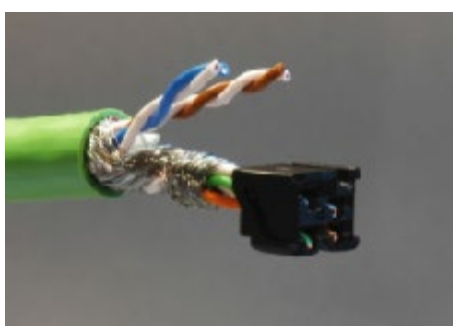
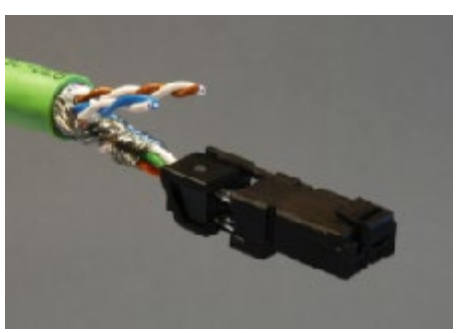
Procedure

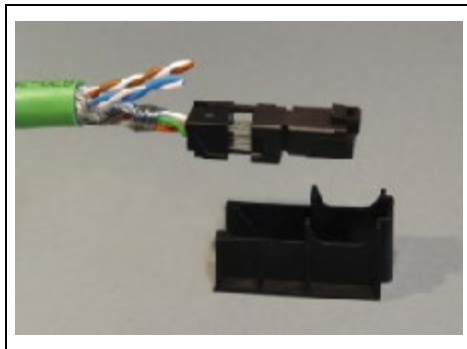
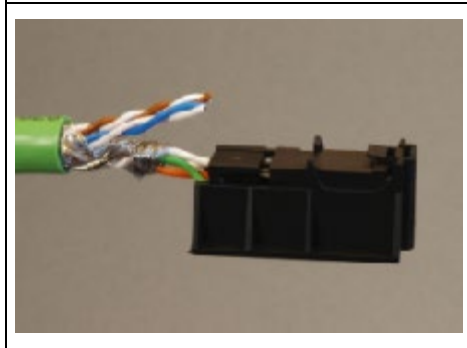
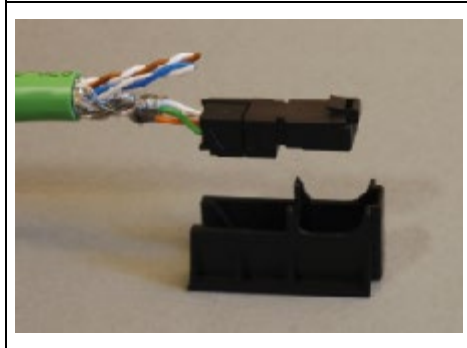
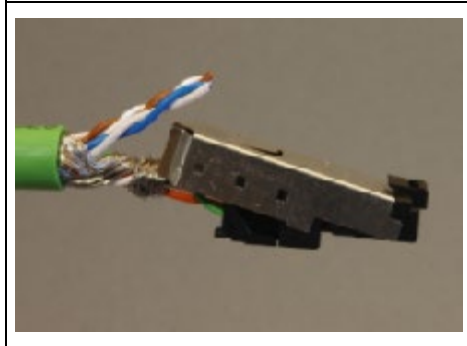
	<p>Remove the two inner shells of the universal sealing ring to adapt it to the diameter of the hybrid cable.</p>
	<p>Push the bushing, washer, adapted universal sealing ring and the housing over the cable jacket.</p>
	<p>Remove the following lengths of cable jacket and shield braid:</p> <ul style="list-style-type: none">• 25 mm for the power leads• 30 mm for the data leads <p>To achieve good shielding, the shield braid must be at least 30 mm long.</p>

	<p>Arrange the data leads according to the color codes on the splice element. The following table shows the assignment of the data leads.</p> <p>Wind the shield braid around the data leads. As a result, the shielding of the cable has contact to the shield plate of the splice element that will be fitted later.</p>
	<p>Contact and color assignment of the splice element.</p>

Color coding of the standard cable	White / orange *	Orange	White / green *	Green
Connector color code (Siemens IE)	White	Blue	Yellow	Orange
Siemens IE FC RJ-45 socket (reference)	3	6	1	2

* White wire of the pair.


	<p>Insert the all the data leads at the same time into the splice element is far as they will go.</p>
	<p>Close the splice element and RJ-45 data module until they lock together.</p>

	<p>Insert the data module and the splice element into the supplied IDC assembly tool.</p>
	<p>Press the data module and the IDC assembly tool together to establish the installation piercing connection.</p>
	<p>Remove the assembled data module from the IDC assembly tool.</p>
	<p>Position the top shield plate and press it over the cable shield.</p>

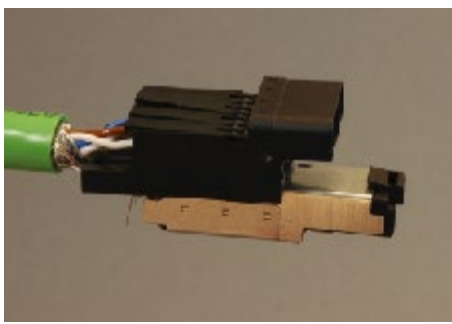


	<p>Position the lower shield plate and press it and the upper shield plate together until they lock together with an audible "click".</p>
	<p>Arrange the power leads and insert them as far as they will go into the hinge elements of the isolation body. The following table shows the assignment of the power leads.</p>

Wire color code (standard)	White / blue *	Blue	White / brown *	Brown
Function	24 V	24 V	Ground	Ground
Power supply insert module	1	2	3	4

* White wire of the pair.

	<p>Press each individual hinge element together with the integrated IDC contact. Recommendation: Use a small slotted screwdriver (max. 3.5 mm) as a lever.</p>
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5.3 Electrical networks

	
	<p>Push the housing over the assembled data module and the insulator body until they lock together (there should be an audible click).</p>
	<p>Tighten the cable gland. We recommend an open key with a size of 21 mm.</p>




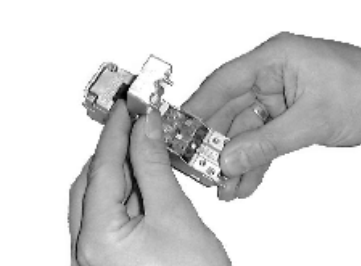
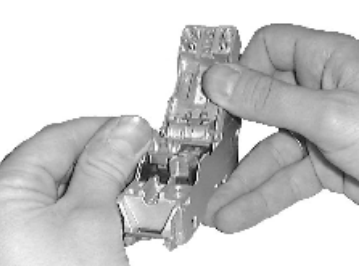


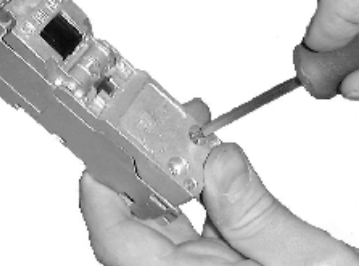
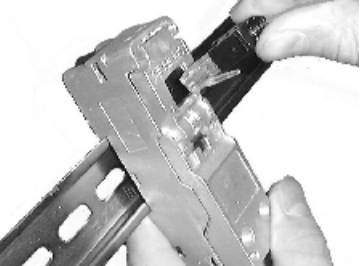
5.3.9 Fitting IE FC outlet RJ-45

Introduction

The individual steps required to assemble an IE FC cable and an IE FC outlet RJ-45 are explained below.

Note the information in the assembly instructions of the outlet.

Procedure

		
<p>1. Strip the IE FC cable with the IE FC stripping tool; refer to the section "Industrial Ethernet FastConnect Stripping Tool (Page 130)".</p>	<p>1. Pull the protective foil off the wires. 2. Remove the support elements between the wires.</p>	<p>1. Spread out the wire pairs according to the colors marked on the contact cover.</p>
		
<p>1. Open the casing cover of the IE FC outlet RJ-45.</p>	<p>1. Open both contact covers.</p>	<p>1. Push the pairs into the contact cover according to the color markings.</p>
		
<p>1. Press down both contact covers to contact the wires.</p>	<p>1. Close the cover of the FC outlet RJ-45 casing and screw down the cover.</p>	<p>1. Connect the end device or the network component using a suitable RJ-45 patch cable.</p>




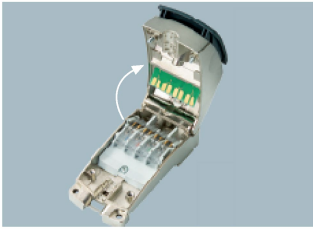
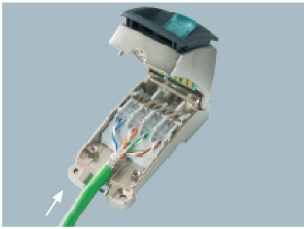
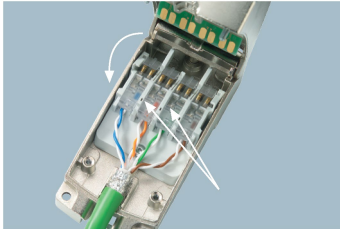
5.3.10 Fitting the IE FC RJ-45 modular outlet

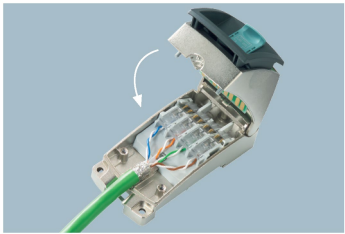

5.3.10.1 Connecting the RJ-45 Modular Outlet

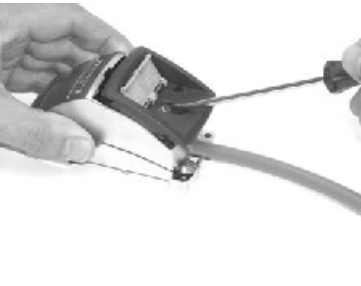

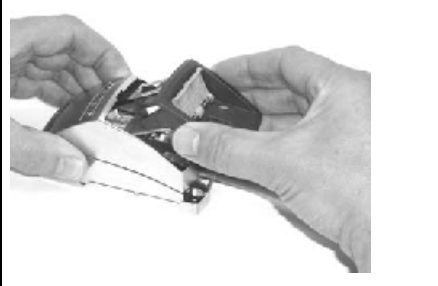
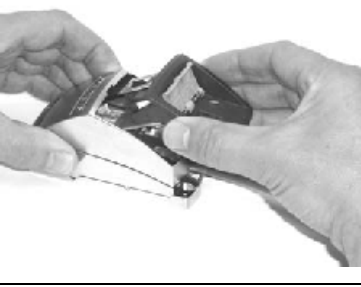
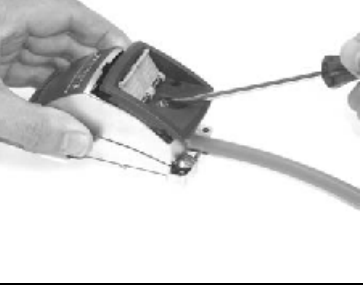
Introduction

Below, you will see the individual steps in connecting the RJ-45 modular outlet.

Procedure

		
<p>The modular outlet consists of the following:</p> <ul style="list-style-type: none"> • a: Insert • b: Base module 	<ol style="list-style-type: none"> 1. Remove the locking screw of the insert. 2. Pull the insert forward as far as the limit stop. 	<ol style="list-style-type: none"> 1. Now release the two cover screws that are now accessible.
		
<ol style="list-style-type: none"> 1. Lift up the cover of the IE FC RJ-45 modular outlet. 	<ol style="list-style-type: none"> 1. Insert the wires into the contact element of the FC RJ-45 modular outlet as far as the limit stop according to the color markings. 	<ol style="list-style-type: none"> 1. Secure the wires in position by pressing down the terminals as far as the limit stop. While doing this, make sure the wires remain in the guide slits.

		
<p>1. Close the cover.</p>	<p>1. Tighten the two cover screws. 2. Push the insert into the base model as far as the limit stop. 3. Tighten the securing screw of the insert until the insert is flush with the base module.</p>	

<p>Replacing the insert</p>		
		
<p>Remove the locking screw of the insert. Pull the insert forward as far as the limit stop.</p>	<p>Unlock the insert by pressing on the locking spring that is now accessible from above.</p>	<p>Remove the insert completely from the base module.</p>
		
<p>Push the insert into the base model as far as the limit stop.</p>	<p>Tighten the securing screw of the insert until the insert is flush with the base module</p>	

5.3.10.2 Assembling IE FC TP standard cable 4x2 GP and IE FC RJ-45 modular outlet

Introduction

The individual steps required to assemble an IE FC TP standard cable 4x2 (22 AWG) and an IE FC RJ-45 modular outlet are explained below. Note the information in the assembly instructions of the plug.

To assemble 8-wire FC cables, the following inserts are available:

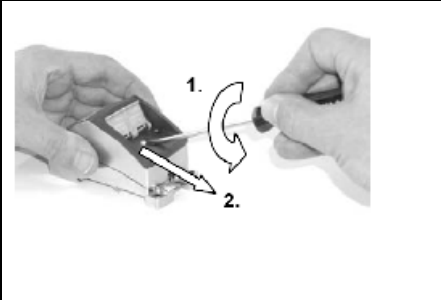
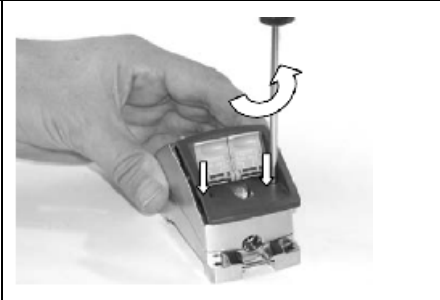
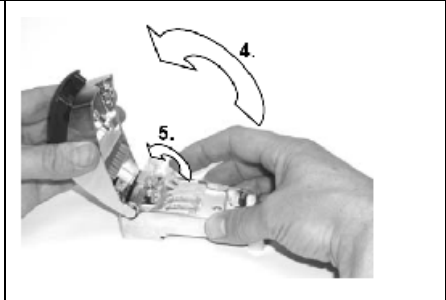
- Insert 2 FE
- Insert 1GE


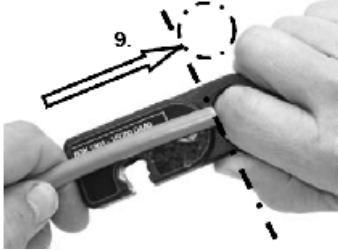




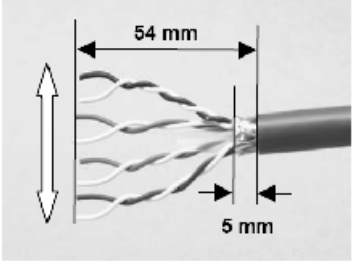
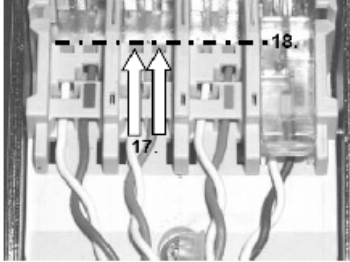
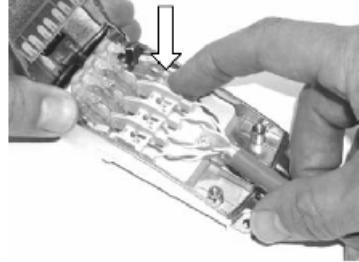
Note

Instructions for assembly

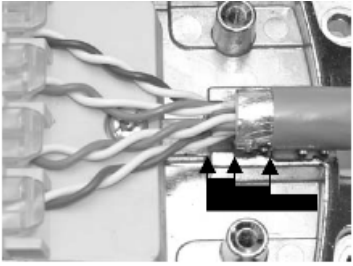
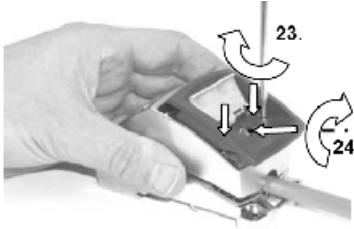
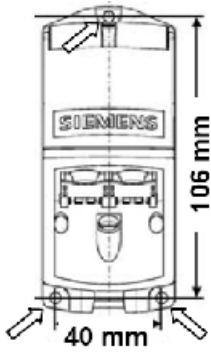
- The IE hybrid cable 2x2 + 4x0.34 6XV1870-2J and 4-wire FC cables (Cat 5) are not suitable for insert 2 FE and insert 1 GE
 - The insulation-piercing contacts of the IE FC RJ-45 plug 4x2 can be released and recontacted with the same cable cross section up to 10 times.
 - Once the ends of cables have made contact, do not make contact with them again but cut them off.
-

Procedure

 A close-up photograph showing a hand using a screwdriver to turn a locking screw on a small electronic component. A curved arrow labeled '1.' indicates the counter-clockwise rotation. A straight arrow labeled '2.' points to the right, indicating the direction to pull the component.	 A photograph showing a hand turning a screwdriver to loosen a screw on the top of the component. A curved arrow indicates the counter-clockwise rotation.	 A photograph showing a hand lifting the top cover of the component. A curved arrow labeled '4.' indicates the upward movement. Another curved arrow labeled '5.' points to the terminals being lifted.
<p>Remove the locking screw of the insert. (1.) Pull the insert forward as far as the limit stop. (2.)</p>	<p>Now release the two cover screws that are now accessible.</p>	<p>Lift up the cover of the IE FC RJ-45 modular outlet. (4.) Lift up the 4 terminals of the terminal block. (5.)</p>

		
<p>Use the green knife cassette (5.1 mm) in the stripping tool.</p> <p>If necessary adjust the cutting depth of the knife cassette with the middle socket-head screw.</p>	<p>Take the stripping tool in your right hand.</p> <p>Measure the cable length against the measuring template. Use your left index finger as the limit stop. (9.)</p>	<p>Place the cable in the stripping tool. Your left index finger is the limit stop. Tighten the stripping tool until it locks into place (audible click).</p>
		
<p>To strip the insulation, turn the tool in the direction of the arrow</p> <ul style="list-style-type: none"> • approx. 4 times for PVC insulation • approx. 8 times for PUR insulation 	<p>Remove the cable jacket, shield and the white filler with your hand.</p>	<p>Cut off the central support element.</p>
		
<p>Spread out the wires according to the color markings on the terminal block of the Modular Outlet.</p> <p>Do not undo the twisting of the wire more than necessary to make the connection.</p> <p>Shorten the two middle pairs so that all wires end in a line.</p>	<p>Guide the wires according to the color markings, pair by pair into the wire channels of the insulation piercing terminals as far as the limit stop on the back panel. (17.)</p> <p>The ends of the wires must be visible in the last viewing window of the terminal block! (18.)</p>	<p>Secure the wires in position by pressing down the terminals as far as the limit stop.</p> <p>Repeat these steps until all four pairs or wires are connected.</p>

5.3 Electrical networks

		
<p>Align the cable so that the braided shield is in the center of the middle section of the shield clamp. Fold down the upper part.</p>	<p>Tighten the two cover screws. (23.) Tighten the insert screw until the insert is flush with the casing of the outlet. (24.)</p>	<p>Fit the outlet on a DIN rail or secure it to a smooth surface using the three holes in the casing.</p>

<p>⚠ WARNING</p>
<p>Keep to the instructions in the SCALANCE W manual for fitting an IP67 hybrid cable connector to a SCALANCE W device!</p>

5.3.10.3 Fitting IE hybrid cable 2x2 + 4x0.34 and IE FC RJ-45 modular outlet

Introduction

The individual steps required to assemble an IE hybrid cable 2x2+ 4x0.34 and an IE FC RJ-45 modular outlet are explained below.

Note the information in the assembly instructions of the plug.

Note

Instructions for assembly

- The IE Hybrid Cable 2x2 + 4x0.34 6XV1870--2J is not suitable for operation of the 2FE insert or 1GE insert!
- The insulation-piercing contacts of the IE FC RJ-45 plug 4x2 can be released and recontacted with the same cable cross section up to 10 times.
- Once the ends of cables have made contact, do not make contact with them again but cut them off.

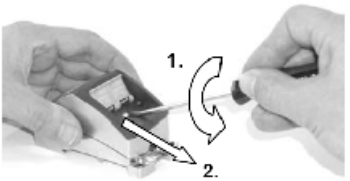
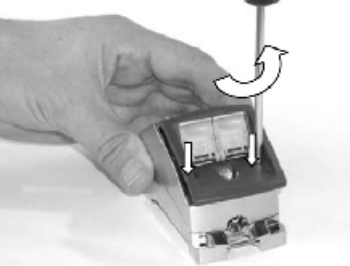
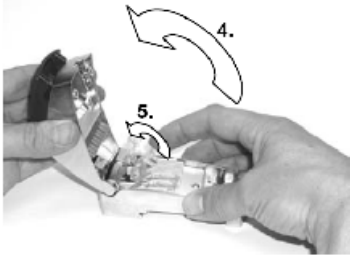
Note

Conditions for use of the power insert

Use the power insert only under the following conditions:

- Extra-low voltages SELV, PELV to IEC 60364-4-41
- In USA/CAN with power supplies according to NEC class 2
- In USA/CAN, the cabling must meet the requirements of the NEC/CEC
- Current load maximum 0.5 A.

Procedure

		
<p>Remove the locking screw of the insert. (1.) Pull the insert forward as far as the limit stop. (2.)</p>	<p>Now release the two cover screws that are now accessible</p>	<p>Lift up the upper part of the IE FC RJ-45 Modular Outlet. (4.) Lift up the 4 terminals of the terminal block. (5.)</p>

5.3 Electrical networks

<p>Strip the approx. 55 mm of the jacket of the IE Hybrid Cable 2x2 + 4x0.34. Shorten the shield of the data wires by approx. 5 to maximum 20 mm. Cut off the dummy cores. Spread the wires according to the color markings in the figure above. Cut all the wires in a straight line to leave 48 mm to the cable jacket.</p>	<p>Insert the wires pair by pair into the wire channels of the insulation piercing terminals according to the color codes in the picture on the left. The color codes on the terminal block of the modular outlet have no meaning for the hybrid cable! The ends of the wires must be visible in the last viewing window of the terminal block and must meet the back panel of the terminal block!</p>	<p>Secure the wires in position by pressing down the terminals as far as the limit stop. Repeat these steps until all four pairs or wires are connected.</p>
<p>Center the cable in the shield clamp so that the power wires are at the bottom in the shield clamp and the braided shield makes contact with the pressure surface in the upper part of the outlet. (15.) Fold down the upper part. (16.) Make sure that the power wires do not slip and are not jammed by the lateral metal bars.</p>	<p>Tighten the two cover screws. Tighten the insert screw until the insert is flush with the casing of the outlet.</p>	<p>Fit the outlet on a DIN rail or secure it to a smooth surface using the three holes in the casing.</p>

⚠ WARNING

Keep to the rules in the SCALANCE W manual for fitting an IP67 hybrid cable connector to a SCALANCE W device!

5.3.11 Assembly of Industrial Twisted Pair connectors

5.3.11.1 Assembling Industrial Twisted Pair Connectors

General

To maintain the excellent EMC and transmission characteristics of the twistedpair cabling system, connectors must be fitted with extreme care.

Note the assembly instructions.

How to fit 9pin and 15pin connectors is explained in detail on the following pages.

Note

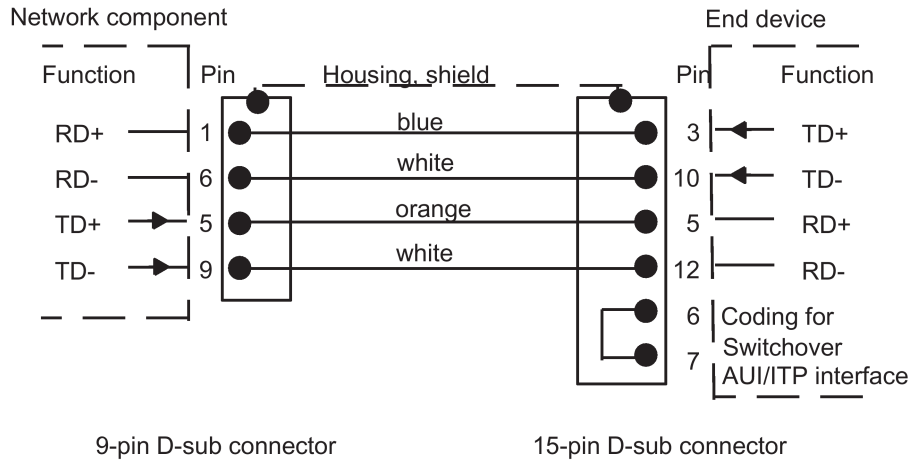
Instructions for assembly

Fit the D-sub plugs for self-assembly only to the ITP standard cable or the ITP FRNC cable. The cable clamp used for contacting the shield is designed for the diameter of this cable.

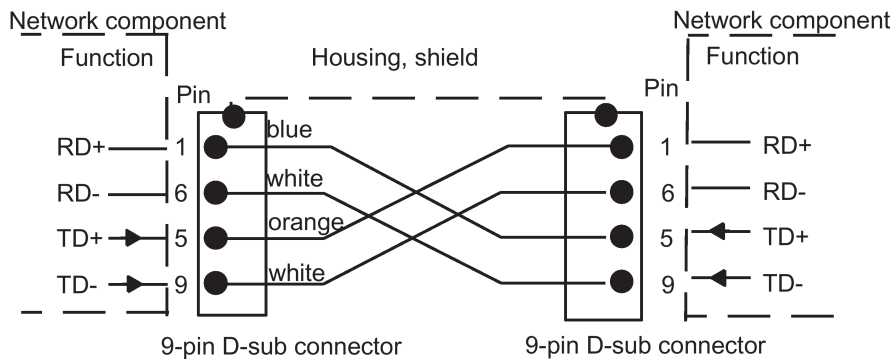
The two ITP cables are not suitable for connection to the IE FC outlet RJ-45, IE FC RJ-45 plug and IE FC RJ-45 modular outlet due to their diameters. Use the FastConnect (FC) twisted pair cables for this.

Connector pinout

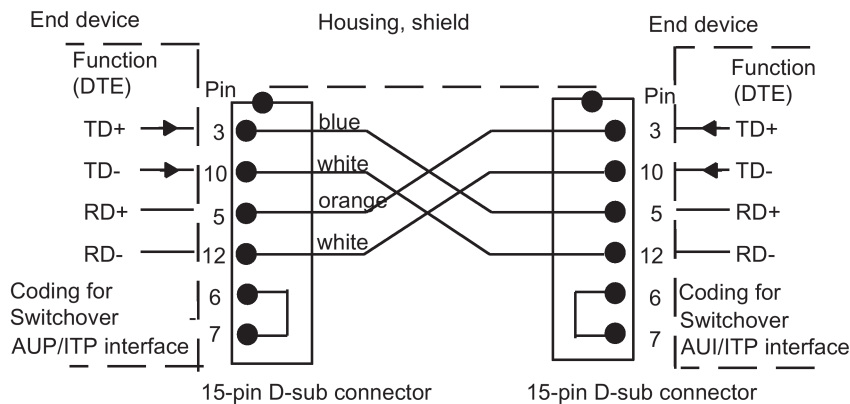
During assembly, the pairs of wires are assigned to the screw terminals. The following figures show the connector pinout:



a) Connector pinout of the ITP Standard Cable 9/15



b) Connector pinout of the ITP XP Standard Cable 9/ 9



c) Connector pinout of the ITP XP Standard Cable 15/15

5.3.11.2 Fitting a 9-pin D-sub plug

9-pin D-sub plug

The figure shows all the components of a 9-pin D-sub plug.

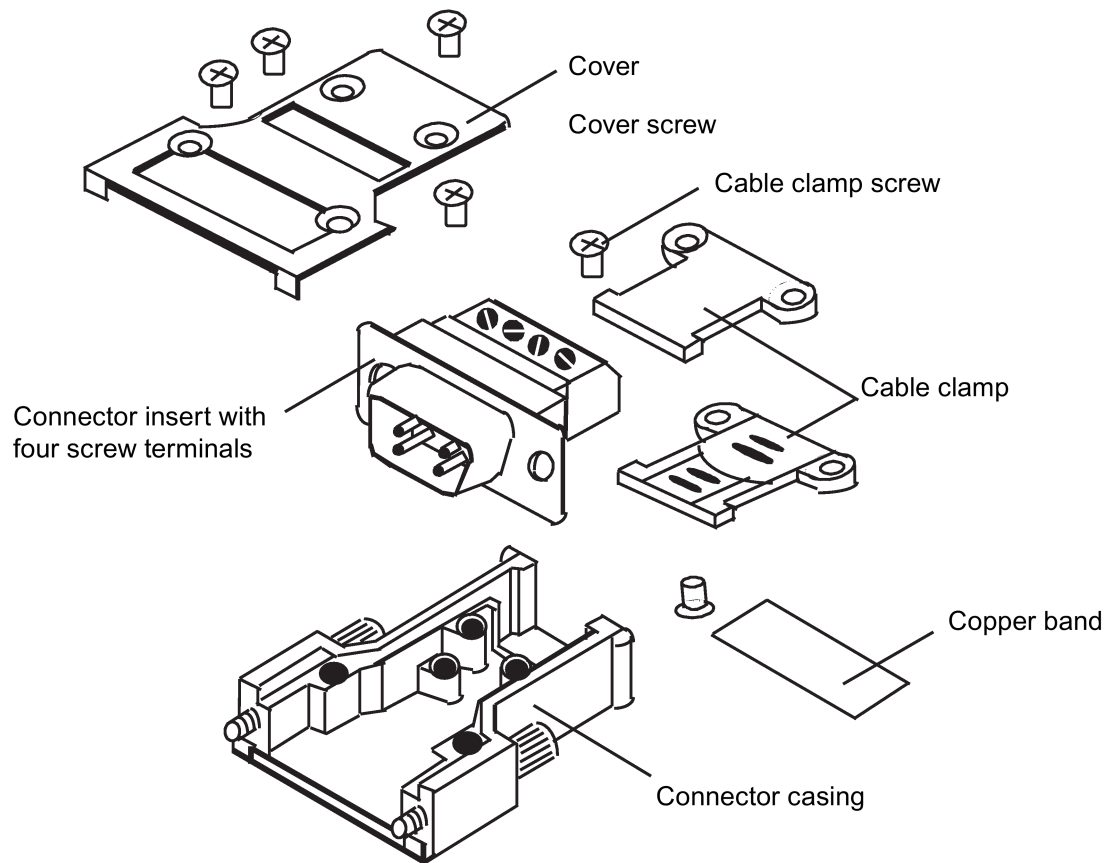
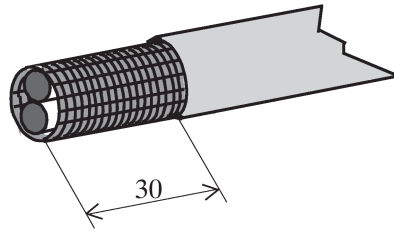


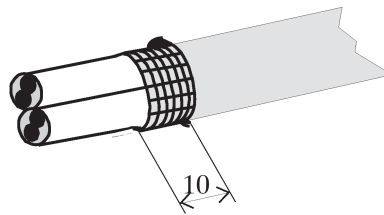
Figure 5-1 Industrial Twisted Pair D-sub plug (9-pin) for user assembly

Steps

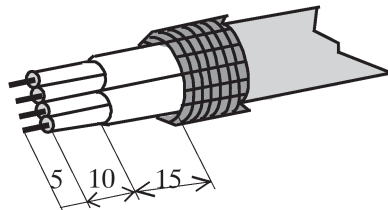
1. Remove approximately 30 mm of the outer sheath from the braided shield.



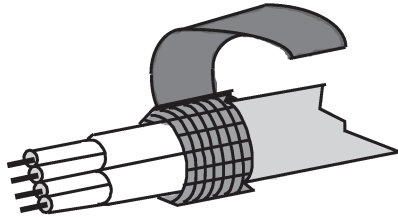
2. Cut the braided shield approximately 10 mm from the edge of the outer sheath and pull off the loose shield.



3. Turn back the braided shield over the outer sheath.
 - Unwind the aluminum foil shield up to a point approximately 15 mm from the folded back braided shield and cut off the unwound material.
 - Remove the plastic foil and blind elements.
 - Remove approximately 5 mm of the insulation from the conductors.



4. Wrap copper band around the braided shield.



5. Fit the connector

- Fit the connector insert into the connector casing
- Fit the lower cable clamp into the grooves of the connector casing
- Match the wire pairs to the screw terminals
You will find the assignment required for a particular cable type in the section Connector pinout (Page 169).
- Fit the cable into the connector casing so that the braided shield with the copper band lies in the cable clamp
- Fit the upper cable clamp into the grooves of the connector casing and screw it tight
- Secure the conductors in the screw terminals
- Screw the cover on to the connector casing

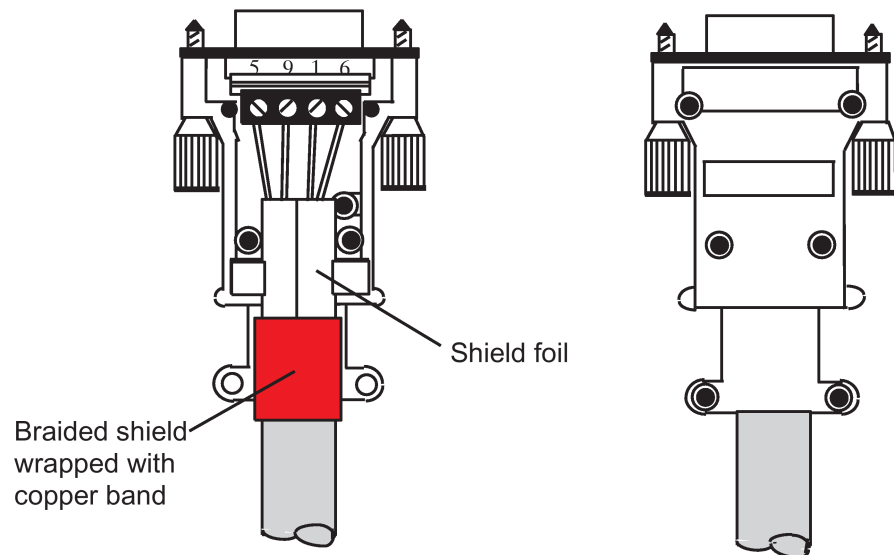


Figure 5-2 9-pin D-sub plug fitted to the standard cable

5.3.11.3 Fitting a 15-pin D-sub plug

15-pin D-sub plug

The figure shows all the components of a 15-pin D-sub plug.

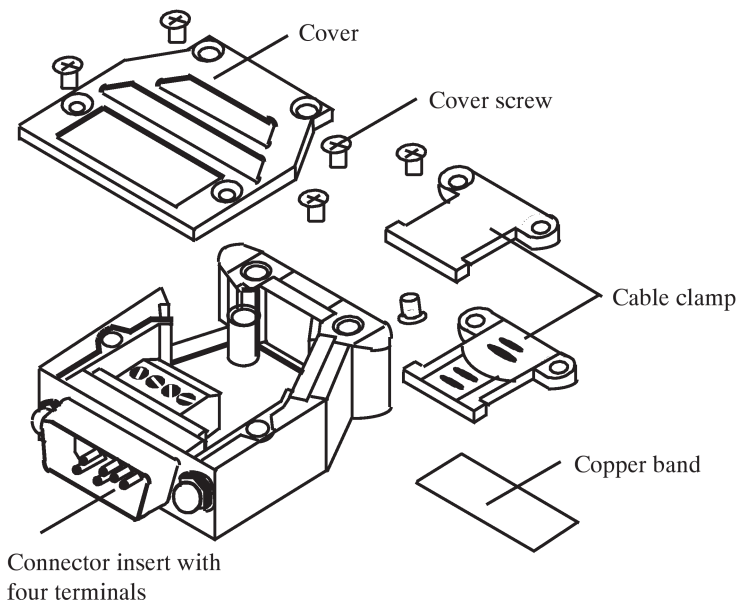
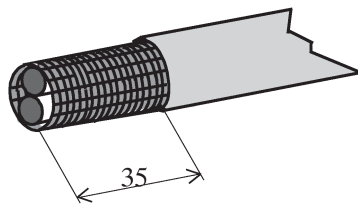


Figure 5-3 15-pin D-sub plug for user assembly

Steps

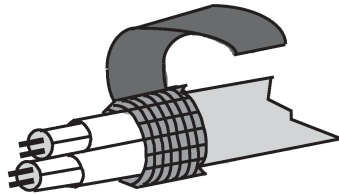
1. Remove approximately 35 mm of the outer sheath from the braided shield.



2. Cut the braided shield approximately 10 mm from the edge of the outer sheath and pull off the loose shield.

3. Shorten the white-blue pair by approximately 3 mm to 32 mm (to introduce the cable as shown in Figure 1–10).
 - Turn back the braided shield over the outer sheath.
 - Unwind the aluminum foil shield leaving approximately 15 mm (shorter pair) or approximately 18 mm (longer pair) to the folded back braided shield and cut off the unwound shield.
 - Remove the plastic foil and blind element.
 - Remove approximately 5 mm of the insulation from the conductors.

4. Wrap copper band around the braided shield.



5. Fit the connector
 - Fit the lower cable clamp into the grooves of the connector casing.
 - Fit the cable into the connector casing so that the braided shield with the copper band lies in the cable clamp
 - Fit the upper cable clamp into the grooves of the connector casing and screw it tight
 - Match the wire pairs to the screw terminals
You will find the assignment required for a particular cable type in the section "Connector pinout (Page 169)".
 - Secure the conductors in the screw terminals
 - Screw the cover on to the connector casing

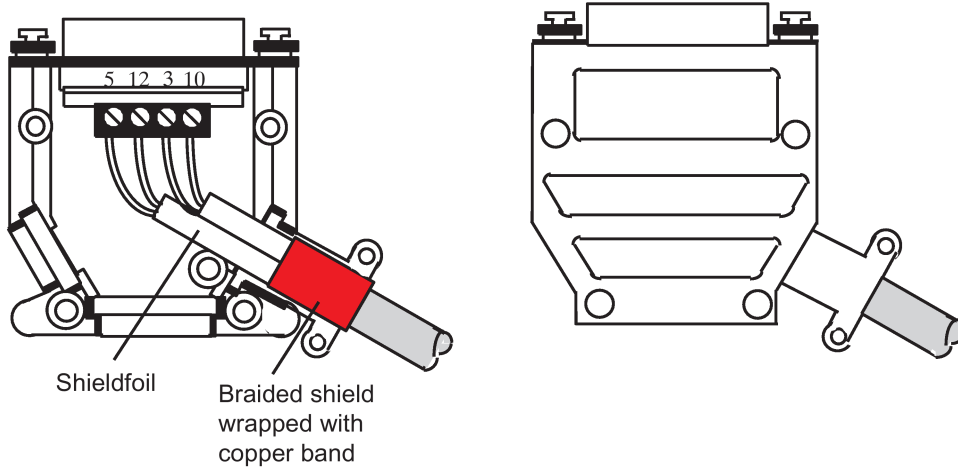


Figure 5-4 15-pin D-sub plug fitted to the standard cable

5.4 Optical networks

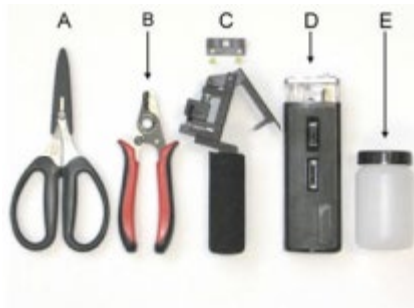
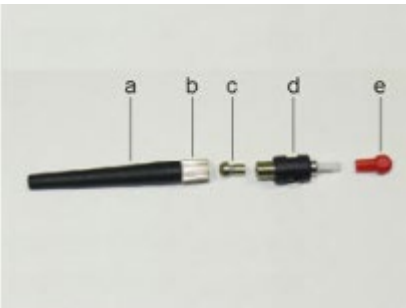
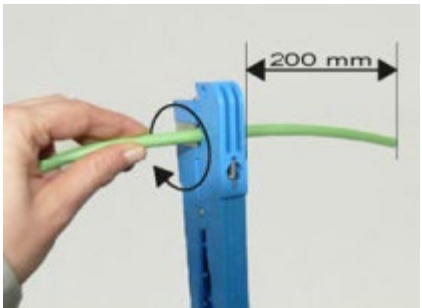
5.4.1 Fitting an IE FC FO cable with an ST/ BFOC plug

Introduction

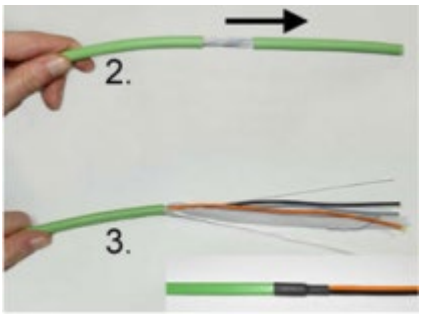
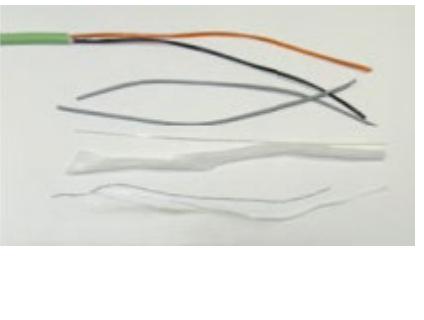
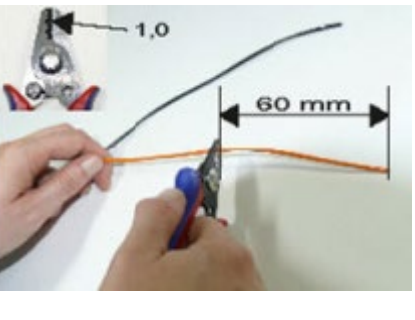
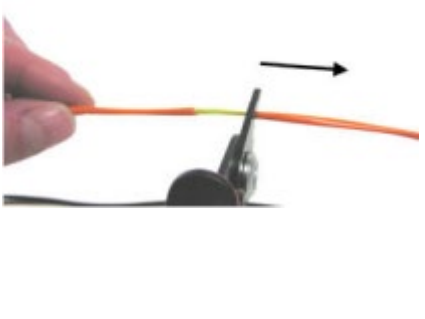


Below, we will show the individual steps involved in assembling an IE FC FO cable and an ST/BFOC plug with the FC FO termination kit for ST/BFOC plugs.



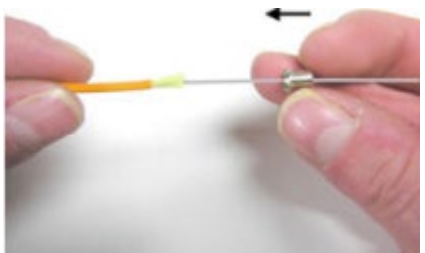
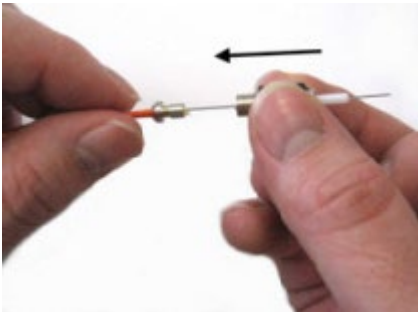
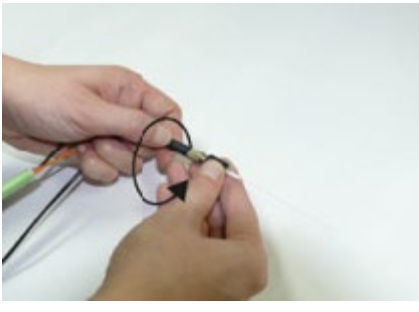

Note the instructions in the assembly instructions that accompany the FC FO termination kit for ST/BFOC plugs.

Procedure

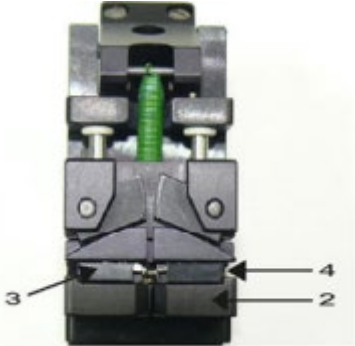
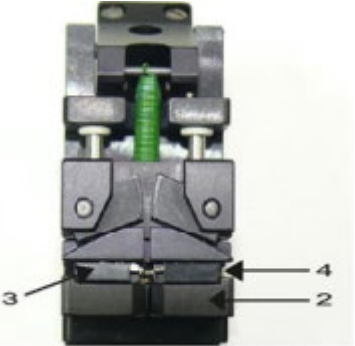
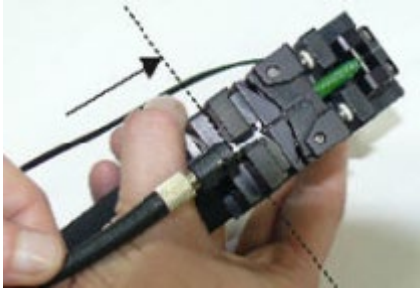

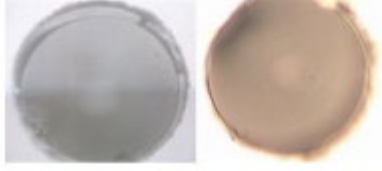
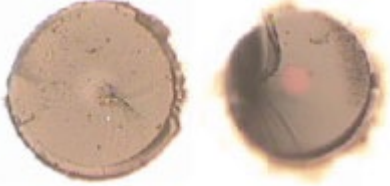
		
<p>FC FO termination kit</p> <ul style="list-style-type: none"> • A Kevlar scissors • B stripping pliers • C cleave tool • D microscope • E fiber container 	<p>ST/BFOC plug</p> <ul style="list-style-type: none"> • a anti-kink sleeve • b forcing nut • c buffer and Kevlar clamp • d body of connector • e dust protection cap 	<p>1. Remove the outer jacket using a suitable stripping tool.</p> <p>Recommendation: The length of the stripped piece of cable should not be less than 200 mm.</p>

5.4 Optical networks

 <p>2.</p> <p>3.</p>		 <p>1,0</p> <p>60 mm</p>
<p>1. Pull off the outer jacket. 2. Expose the individual elements.</p> <p>Recommendation: To provide additional mechanical protection, a shrink tube can be pulled over the cable on completion of step 2 for later handling.</p>	<p>1. Cut the fleece (white) and the remaining threads with the Kevlar scissors (A) as close as possible to the cable jacket. 2. Cut off the blind elements (gray) and the support element (white) with the side cutter as close as possible to the cable jacket.</p>	<p>1. Position the \varnothing 1.0 mm opening of the stripping pliers (B) approximately 60 mm from the end of the wire.</p>
		 <p>0,3</p>
<p>1. Cut into the wire jacket and pull the jacket off without skewing.</p>	<p>1. Cut back the Kevlar with the Kevlar scissors (A) leaving 3 mm.</p>	<p>1. Place the \varnothing 0.3 mm opening of the stripping pliers (B) on the buffer (blue). 2. Cut into the buffer and pull off the buffer parallel to the axis of the fiber without skewing.</p> <p>Note: It is advisable to pull off the buffer in 2 to 3 steps. 3 mm of the buffer must be left (same length as the Kevlar).</p>

		
<ol style="list-style-type: none"> 1. Clean the fiber of remnants of the buffer with a lint-free cloth. 2. Remove the screw-down nut (b) and the buffer and Kevlar clamp (c) from the body of the connector (d). 	<ol style="list-style-type: none"> 1. First push the anti-kink sleeve (a) and then the screw-down nut (b) over the fiber and the wire sleeve. 	<ol style="list-style-type: none"> 1. Push the buffer and Kevlar clamp (c) over the fiber as far as the wire sleeve. 2. Feed the Kevlar yarn through the opening. 3. Remove the dust protection cap (e) from the body of the connector (d). <p>Note: It is easier to maneuver the Kevlar threads through with twisting movements.</p>
		
<ol style="list-style-type: none"> 1. Thread the connector body (d) with the ferrule on to the fiber as far as it will go. 	<ol style="list-style-type: none"> 1. Screw the screw-down nut (b) and connector body (d) tight (d). 2. When screwing them together, make sure that the buffer and Kevlar clamp (c) do not skew. 3. Push the anti-kink sleeve (a) onto the screw-down nut (b). <p>Note: The fiber should extend at least 30 mm out of the ferrule. Otherwise the connector must be fitted again.</p>	<p>Cleave tool</p> <ul style="list-style-type: none"> 1 trigger 2 adapter plate 3 jaw for fiber limit stop 4 jaw with diamond

5.4 Optical networks

		
<p>1. Make sure that the adapter plate (2) with the correct labeling (ST for BFOC connector) is fitted to the cleave tool (C).</p> <p>Note: How to change adapter plates is described in the appendix.</p>	<p>1. Insert the connector into the cleave tool (C) as far as the limit stop and hold the connector in position. The fiber extends out of the cleave tool (C).</p>	<p>1. Press the trigger (1) slowly until you hear a click.</p> <p>2. Dispose of the fiber remnants in the supplied container (E).</p>
		
<p>1. Check the assembled connector with the microscope (D).</p> <p>2. If the connector is dirty, clean it with the supplied lint-free cloths. If it is badly contaminated, dampen the cloth with isopropanol.</p> <p>3. Place the dust protection cap (e) on the connector ferrule.</p>	<p>Note: The connector surface is okay. Slight irregularities at the edge are of no significance.</p>	<p>1. If the result of cleaving is unsatisfactory (bad case: see photo), repeat the fitting of the connector.</p> <p>2. Follow the same steps with the other cores.</p> <p>Note: The stripe pattern in right-hand picture suggests damaged cladding. The speckled pattern in the middle of the left picture indicates an unevenly broken core.</p>

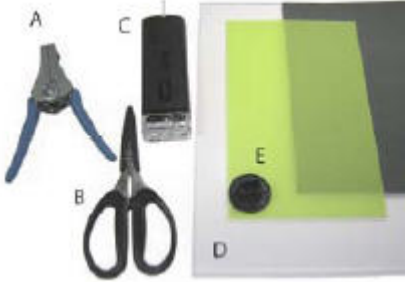

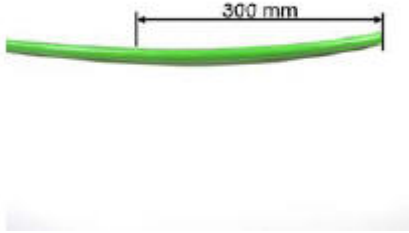
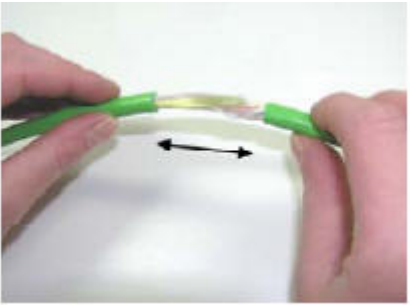

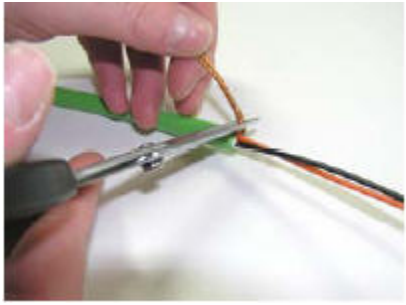
5.4.2 Fitting an SC RJ plug to a plastic FO cable (POF)

Introduction


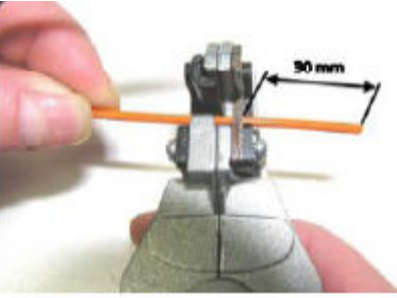
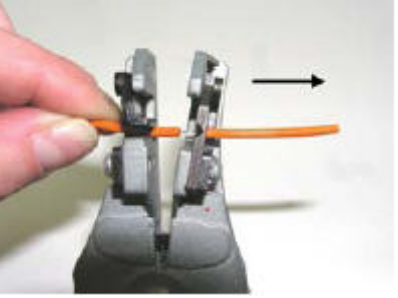
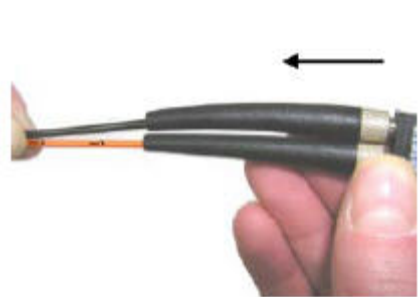

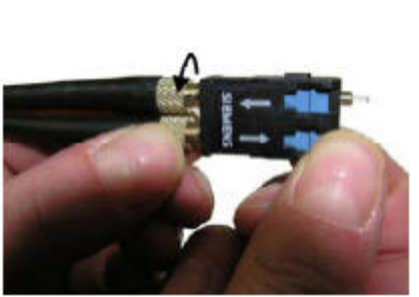


The next section explains the individual steps when assembling a POF FO cable with SC RJ plug using the IE termination kit for SC RJ POF plug.







You should also refer to the assembly instructions supplied with the IE termination kit for SC RJ POF plug.

Procedure

		
<p>A stripping pliers B Kevlar scissors C Microscope D grinding and polishing base E polishing plate, abrasive and polishing paper</p>	<p>a anti-kink sleeve b knurled nut c SC RJ housing d body of connector e dust protection</p>	<ol style="list-style-type: none"> 1. Remove the outer jacket using a stripping tool. 2. Set the cutting depth of the stripping tool so that the inner cores cannot be damaged.
		
<ol style="list-style-type: none"> 1. Pull off the outer jacket. 	<ol style="list-style-type: none"> 1. Cut off the Kevlar yarn and fleece wrapping with the Kevlar scissors. 	<ol style="list-style-type: none"> 1. Cut off the cable strain relief elements (brown) with the side cutter.

5.4 Optical networks

		
<p>1. Place the \varnothing 1.6 mm opening of the stripping pliers marked with a white dot on the orange colored core.</p>	<p>1. Position the cutter 30 mm from the end of the core.</p>	<p>1. When the pliers are closed, the sleeve is removed. The black core is stripped in the same way.</p>
		
<p>1. First remove the dust protection caps. Push the preassembled plug onto both cores at the same time as far as it will go.</p>	<p>1. The arrow on the orange core points in the same direction as the arrow on the SC RJ housing. The fibers of the plastic fiber-optic cable extend 5 to 10 mm out of the plug ferrules.</p>	
		
<p>1. Tighten the two knurled nuts in the direction of the arrow.</p>	<p>1. Shorten the excess fiber to 1 mm with a sharp side cutter.</p>	<p>1. Insert the plug into the SC RJ grinding plate. The coding (stud) on the plug housing is inserted into the groove (1) of the grinding plate.</p>

		
<ol style="list-style-type: none"> 1. Place the abrasive paper and polishing foil on the polishing base. 2. Take hold of the SC RJ plug housing and press down gently. Grind the excess fiber with approximately 10 figure-of-eight movements on the 1500 grade abrasive paper (gray) until it is flush. 	<ol style="list-style-type: none"> 1. Polish the plug in the same way on the matt side of the 1 µm polishing foil (green), approx. 10 figure-of-eight movements. 	<ol style="list-style-type: none"> 1. Remove any resulting dust with a clean, lint-free cloth.
		
<ol style="list-style-type: none"> 1. Check the assembled plug with the microscope. 	<ol style="list-style-type: none"> 1. You can also use the magnifier of the microscope to check the results. 	<ol style="list-style-type: none"> 1. The surface of the fiber-optic cable must be even and free of scratches.


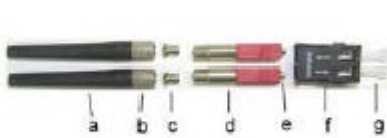
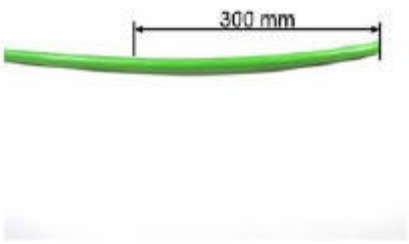
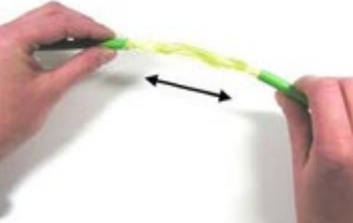

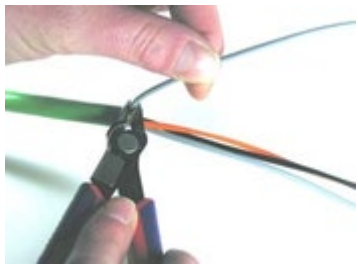
5.4.3 Fitting an SC RJ plug to PCF FO cable

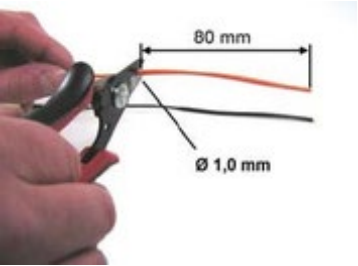

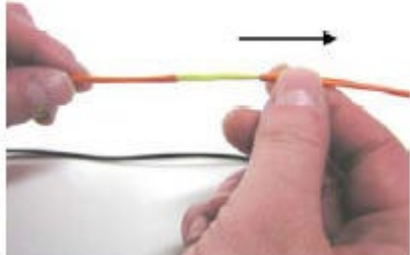

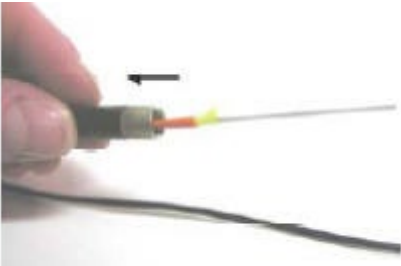
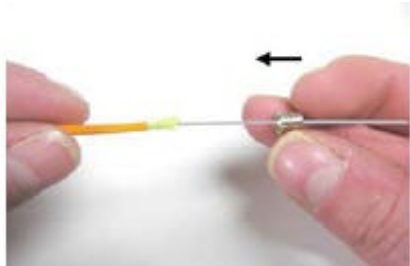

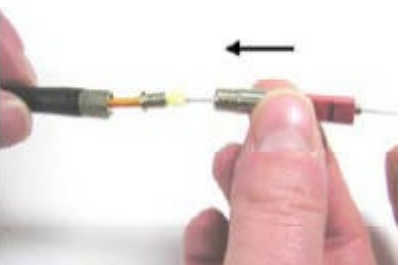

Introduction

The next section explains the individual steps assembling a PCF FO cable with an SC RJ plug using the IE termination kit for SC RJ PCF plug.


You should also refer to the assembly instructions supplied with the IE termination kit for SC RJ PCF plug.



Procedure

		
<p>A stripping pliers B Kevlar scissors C cleave tool D fiber container E card cleaner F microscope</p>	<p>a anti-kink sleeve b union nut c buffer and Kevlar clamp d body of connector e ferrules f SC RJ housing g dust protection</p>	<ol style="list-style-type: none"> 1. Remove the outer jacket using a stripping tool. 2. Set the cutting depth of the stripping tool so that the inner cores cannot be damaged.
		
<ol style="list-style-type: none"> 1. Pull off the outer jacket. 	<ol style="list-style-type: none"> 1. Cut off the Kevlar yarn and fleece wrapping with the Kevlar scissors. 	<ol style="list-style-type: none"> 1. Cut off the blind elements (gray) and the support element (white) with the side cutter.

		
<p>1. Position the \varnothing 1 mm opening of the stripping pliers approximately 80 mm from the end of the core.</p>	<p>1. Cut into the core jacket and pull the jacket partly off without skewing.</p>	<p>1. Remove the loose core sleeve with your hand.</p>
		
<p>1. Cut back the Kevlar with the Kevlar scissors leaving 5 mm.</p>	<p>1. Push the anti-kink sleeve over the fiber and the core jacket.</p>	<p>1. Push the buffer and Kevlar clamp onto the fiber as far as the core sleeve. 2. Feed the Kevlar yarn through the opening.</p>
		
<p>1. Cut into the buffer with pliers opening \varnothing 0.3 mm and pull off the buffer without skewing. Approximately 5 mm of the buffer remain.</p>	<p>1. Push the connector body with the ferrule on to the fiber.</p>	<p>1. Screw the connector body and union nut together.</p>

5.4 Optical networks

		
<p>1. Turn the "Clamp" (1) wheel to "Open" and the "Cleave" (2) wheel to the "0" setting.</p>	<p>1. Feed the fiber into the cleave tool and lock the plug. The fiber projects through the clamp wheel.</p>	<p>1. Turn the "Clamp" wheel gently towards the "Lock" direction to clamp the fiber.</p>
		
<p>1. Turn the "Cleave" wheel slowly from setting "0" to setting "2".</p>	<p>1. Turn the "Clamp" wheel in the direction of "Open" and remove the fiber remnant. 2. Unlock the connector and remove it.</p>	<p>1. Dispose of the fiber remnants in the supplied container.</p>
		
<p>1. Check the assembled plug with the microscope. 2. Then place the dust protection cap on the ferrule.</p>	<p>1. The plug surface is OK. Slight irregularities at the edge are of no significance. 2. Clean a contaminated plug with the card cleaner</p>	<p>1. Greater irregularities in the broken edges and irregular light distribution indicate a damaged connector surface. 2. Repeat the connector assembly.</p>

	
<p>1. Clean the contaminated connector with the card cleaner by rubbing the connector in one direction over a clean area.</p>	<p>1. The main body of the connector clicks into place in the SC RJ housing. The flat side of the main body is against the inner bar. The arrow on the orange core points in the same direction as the arrow on the SC RJ housing.</p>

Note

If you find that the edge breaks are on the increase, send in the cleave tool for inspection. When used correctly, up to 2000 assemblies are possible.

If you need to return the tool, talk to your Siemens contact.

5.4.4 Mounting a SIMATIC NET FC FO LC plug on an FC FO standard cable or FC FO trailing cable

Introduction

The following instructions describe assembling the

- SIMATIC NET FC FO LC plug, article number 6GK1900-1RB00-2AB0

on one of the following fiber-optic cables:

- SIMATIC NET FC FO standard cable, article number 6XV1847-2A
- SIMATIC NET FC FO trailing cable, article number 6XV1847-2C

For this the following set of tools is required:

- SIMATIC NET FC FO termination kit, article number 6GK1900-0RL00-0AA0

General notes on installation

CAUTION

Risk of injury due to material remnants

During assembly fibers of the fiber-optic cable are separated with the cleave tool. These material remnants can cause injuries. While cleaving you should therefore wear protective glasses and dispose of the fiber remnants in the fiber container that ships with the termination kit.

NOTICE

Damage to cables and devices through improper handling

Note the following points to avoid damage to cables and devices:

- Never exceed the maximum permitted forces (tensile strain, transverse compression etc.) specified in the data sheet of the cable you are using. Excessive transverse compression can, for example, arise when using screw-down clamps to secure the cable.
- Install FO cables so that exposed wires and LC connectors are not subjected to tensile stress.
- When cutting cable sections to length, make sure that no loops result and that the cable is not twisted. Loops and torsion can cause kinks or tears under tensile load and cause damage to the cable.
- Never insert dirty LC connectors or LC connectors with protruding fibers into the device sockets. This can destroy the optical transmit and receive elements.

Suitability of the components used

Make sure that the selected cable is suitable for your particular application, in particular regarding the following properties.

- Required temperature range.
- Resistance of the jacket materials to chemicals, water, oils, rodents etc. to which your cable will be exposed when in use.
- Required mechanical properties (bending radii, tensile strain, transverse compression)
- Requirements regarding the behavior of the cable in fire.
- Suitability of the cable and connectors for the devices being connected
- If in doubt, use a special cable to meet your requirements. Your SIMATIC NET contact in your Siemens branch will be happy to advise you.
- Only use FC FO fiber-optic cables in conjunction with devices approved for these cables. Remember the maximum permitted cable lengths.

Fitting connectors

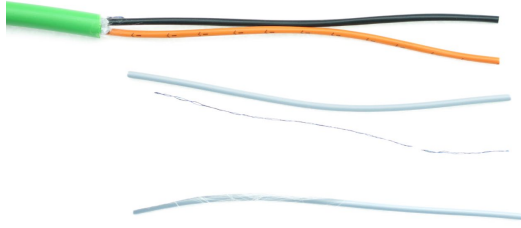
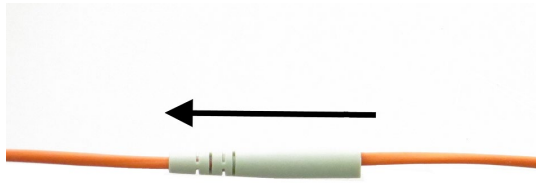
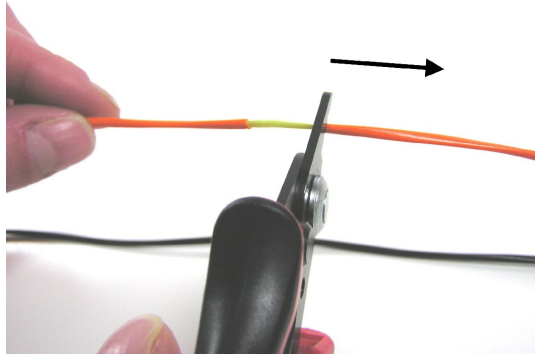
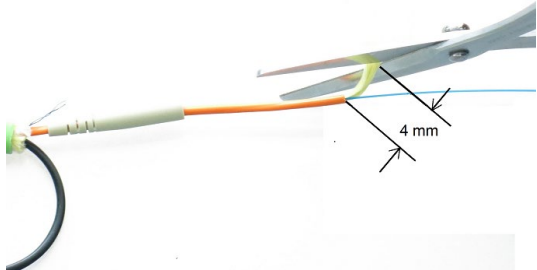
- Follow the steps described in these installation instructions and use only the tools specified here.
- When stripping the wire jacket, use only the opening labeled 1.0 mm on the stripping pliers.
- If you find that the edge breaks are on the increase, the cleave tool should be sent in for inspection. When used correctly, up to 2000 assemblies are possible. If you need to return the tool, talk to your Siemens contact.
- As soon as the screw-down nut of an assembled LC connector has been loosened, the LC connector must be reassembled.

Using the assembled cables

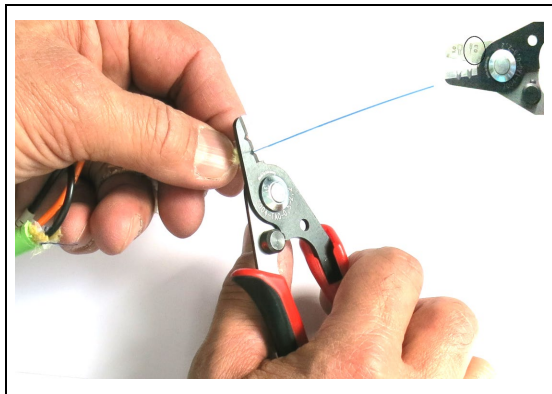
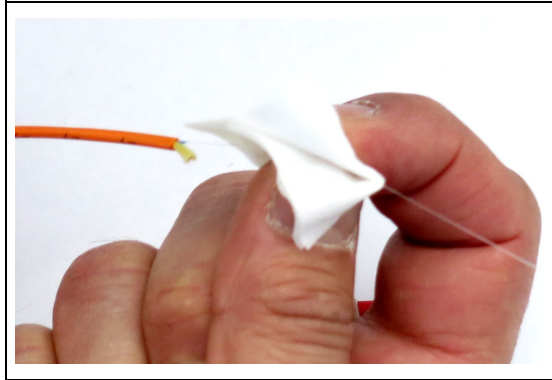
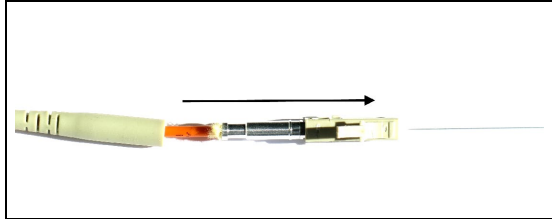

- Make sure that the outer jacket, the jackets of the cores, and the FC FO optical fibers are not damaged.
- Close unused LC connectors with dust protection caps. Remove the dust protection caps only immediately before connecting cables together or plugging cables into devices.
- When assembling adapters for connectors or when connecting the cable to them, make sure that send and receive lines are crossed over.

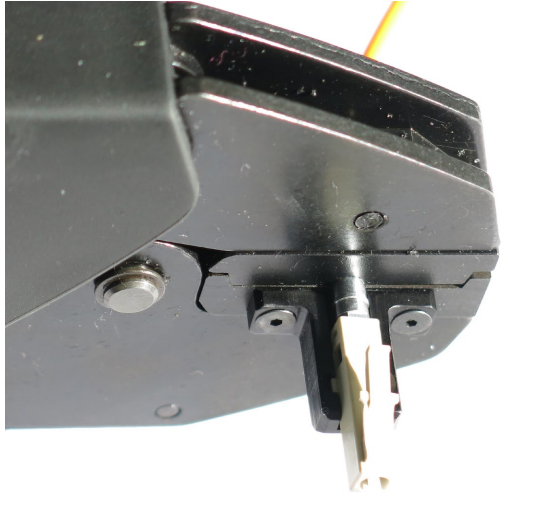
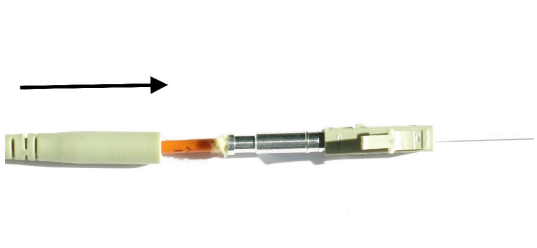
Fitting connectors

	<p>Components supplied with the FC FO termination kit</p> <p>A crimping pliers B Kevlar scissors C stripping pliers D cleave tool E alcohol cloths F fiber container</p>
	<p>Components supplied with the SIMATIC NET FC FO LC plug</p> <p>A anti-kink sleeve B LC connector C dust protection cap</p>
	<ul style="list-style-type: none"> Separate the cable jacket with stripping pliers (not supplied). <p>Note: The length of the stripped section of cable should not be less than 200 mm.</p>
	<ul style="list-style-type: none"> Pull off the outer jacket. Expose the individual elements.

	<ul style="list-style-type: none"> • Cut the fleece (white) and the remaining threads with the Kevlar scissors as close as possible to the cable jacket. • Cut off the blind elements (gray) and the support element (white) with the Kevlar scissors as close as possible to the cable jacket.
	<ul style="list-style-type: none"> • Push on the anti-kink sleeve.
	<ul style="list-style-type: none"> • Position the \varnothing 1.0 mm opening of the stripping pliers approximately 60 mm from the end of the wire. • Cut into the fiber jacket and pull the jacket off without skewing.
	<ul style="list-style-type: none"> • Cut back the Kevlar with the Kevlar scissors leaving 4 mm.

5.4 Optical networks

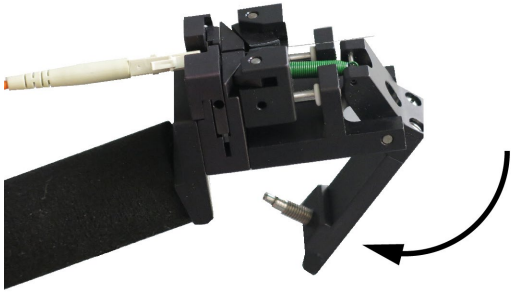
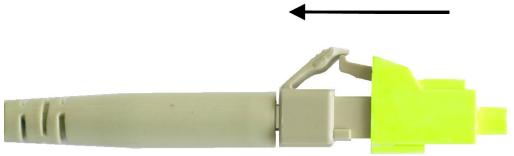
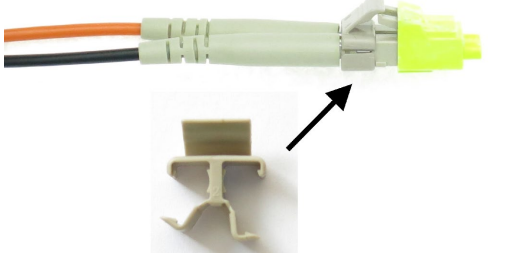
	<ul style="list-style-type: none">• Place the \varnothing 0.3 mm opening of the stripping pliers on the buffer (blue).• Cut into the buffer and pull off the buffer parallel to the axis of the fiber without skewing. <p>Note: It is advisable to pull off the buffer in 2 to 3 steps. 4 mm of the buffer must be left (same length as the Kevlar).</p>
	<ul style="list-style-type: none">• Clean the fiber of remnants of adhesive with an alcohol cloth.
	<ul style="list-style-type: none">• Push the fiber into the LC connector. Make sure that part of the Kevlar is pushed into the crimp opening.
	<ul style="list-style-type: none">• Place the LC connector in the crimping pliers.

	<ul style="list-style-type: none">• Close the crimping pliers as far as the limit stop.
	<ul style="list-style-type: none">• Push the anti-kink sleeve onto the LC connector.

⚠ CAUTION

Risk of injury due to material remnants

While cleaving you should therefore wear protective glasses and dispose of the fiber remnants in the fiber container that ships with the termination kit.

	<ul style="list-style-type: none"> • Insert the LC connector with the fiber into the cleave tool. • Close the cleave tool and dispose of the fiber remnants.
	<ul style="list-style-type: none"> • Push on the protective cap.
	<ul style="list-style-type: none"> • For use of the LC connector as a duplex variant, reverse the double clips.

Article numbers

FC LC Plug (10 duplex plugs)	Pack of 10	6GK1900-1RB00-2AB0
SIMATIC NET FC FO standard cable 62.5/200/230	Sold by the meter	6XV1847-2A
SIMATIC NET FC FO trailing cable 62.5/200/230	Sold by the meter	6XV1847-2C
FC FO termination kit (LC)	1 case	6GK1900-0RL00-0AA0

5.5 Power supply

5.5.1 Fitting the energy cable 5 x 1.5 with a power plug PRO

Introduction

The next section explains the individual steps assembling an energy cable with a power plug PRO.

Note the information in the assembly instructions of the plug.

Connector pinout

An IE M12 plug PRO / IE FC M12 plug PRO with the pinning as shown in the following table must be connected to both ends of the IE FC cable.

Table 5- 1 Pinning at both ends of a straight-through cable

Pin number	Pinning as a network component	Color
Pin 1	RX+	Yellow
Pin 2	TX+	White
Pin 3	RX-	Orange
Pin 4	TX-	Blue

The signal assignment in the table corresponds to the pin assignment of the 4-pin 10/100BaseTX M12 socket of SCALANCE X208 PRO.

The pin assignment of the M12 socket of a network component on the other hand is as follows:

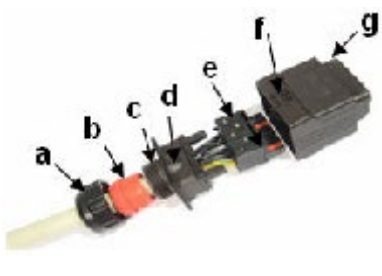
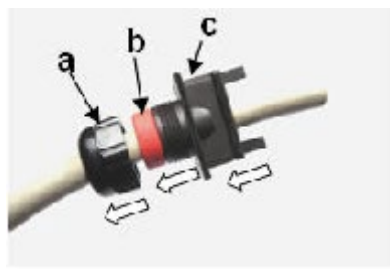
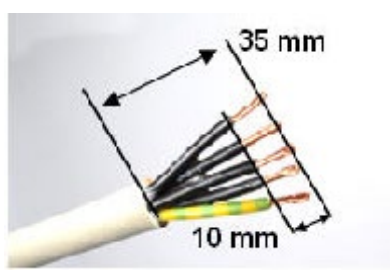
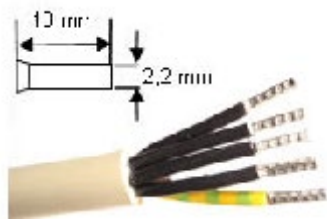
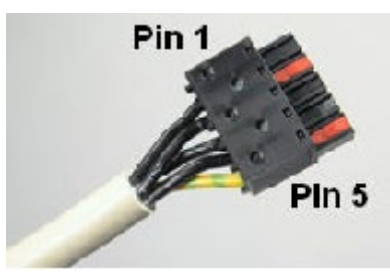
Table 5- 2 Crossover pin assignment at one end of a crossover cable

Pin number	Assignment	
Pin 1	TX+	White
Pin 2	RX+	Yellow
Pin 3	TX-	Blue
Pin 4	RX-	Orange

The difference is that the send pin at one end must connect to the receive pin at the other end. With straight-through cables, this is only the case if the connector pin assignment is not the same at both ends. With devices that have autocrossing, a transmission would work even if the pin assignment was the same.

5.5 Power supply

Procedure

Only use cables with the power plug PRO that meet the following specifications:																	
Cable diameter	9 ... 13 mm																
Cable cross section mm ²	2.5	1.5	<p>a forcing nut b sealing ring c rear wall d latch e plug insert f housing notch g housing</p>		<p>1. Thread the forcing nut (a), the sealing ring (b) and the back wall (c) loosely over the cable.</p>												
Cable cross section AWG	10 x 2.2	10 x 1.7															
Max. current at ambient temperature	16 A 58 °C 13 A 73 °C	16 A 45 °C 13 A 60 °C															
																	
<p>1. Strip 35 mm of the cable jacket. 2. Remove 10 mm of the insulation from the wires.</p>		<p>1. With a wire cross section of 2.5 mm² (AWG14), crimp ferrules DIN 46228-A2.5-10 (dimensions see figure) to the wire ends. For a wire cross section of 1.5 mm² (16 AWG), use the DIN 46228-A1.5-10 ferrules. 2. Push the wires into the spring terminal clamps as shown in the table.</p>		<table border="1"> <thead> <tr> <th>PIN</th> <th>PROFINET</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>L1</td> </tr> <tr> <td>2</td> <td>N1</td> </tr> <tr> <td>3</td> <td>L2</td> </tr> <tr> <td>4</td> <td>N2</td> </tr> <tr> <td>5</td> <td>FE</td> </tr> </tbody> </table>		PIN	PROFINET	1	L1	2	N1	3	L2	4	N2	5	FE
PIN	PROFINET																
1	L1																
2	N1																
3	L2																
4	N2																
5	FE																
				<p>1. Check that good contact is established by pulling lightly on the wires.</p>													

2.

<ol style="list-style-type: none"> 1. Put the sealing ring into the rear wall and screw the forcing nut over it loosely. 2. Turn the latch of the rear wall to the same side as the red coding bars of the plug insert. 3. Push the rear wall as far as the limit stop of the plug insert. 	<ol style="list-style-type: none"> 1. Turn the latch of the rear wall and the notch in the housing to the same side. 2. Push the housing over the plug insert as far as the limit stop. 	<ol style="list-style-type: none"> 1. Press the rear wall into the housing until it clicks in place audibly. 2. Screw the pressure nut tight.
<p>Dismantling the plug</p>		
<ol style="list-style-type: none"> 1. To open the plug, lever the catch in the housing towards the side wall with a slotted screwdriver. 2. Pull the rear wall out of the housing by the cable while holding down the screwdriver. 	<ol style="list-style-type: none"> 1. Press open the cage springs with a slotted screwdriver. 2. Pull the wires out of the contact clamps one by one. 	

5.5.2 Fitting a 7/8" energy connector to an energy cable

Design

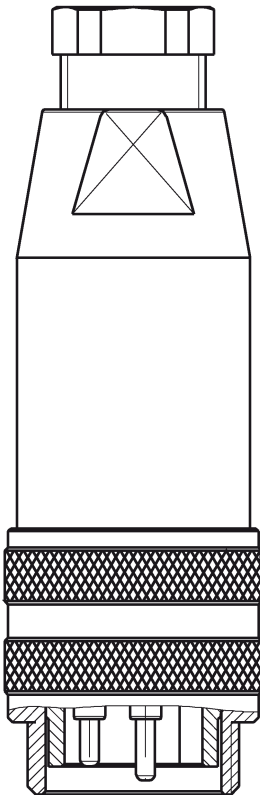


Figure 5-5 7/8" energy connector

Suitable cables

7/8" energy connectors are intended for making connections to the SIMATIC NET energy cable (5 x 1.5 mm²). The stranded wires of the energy cable must be fitted with 0.75 mm² wire-end ferrules.

Note

The mechanical data of the 7/8" energy connector are tailored to the SIMATIC NET energy cables (6XV1 830-8AH10). Fitting 7/8" energy connectors to cables with different electrical or mechanical properties can cause problems during operation!

Connecting up the bus cable

Fit the energy connector to the energy cable (6XV1 830-0AH10) as follows:

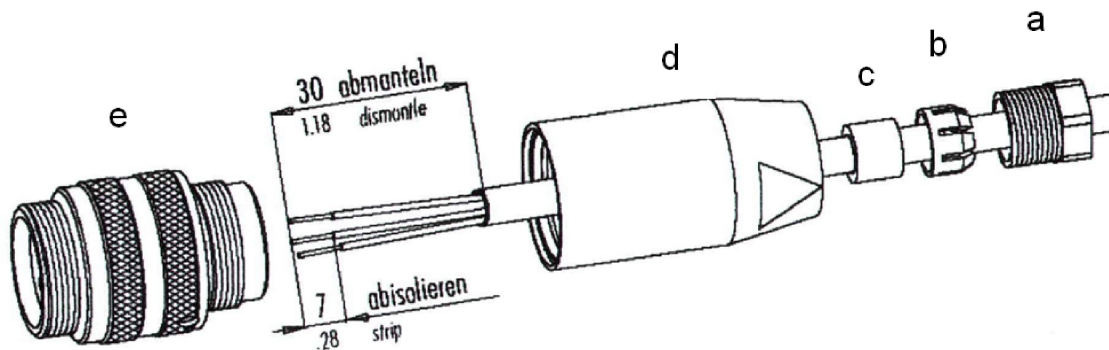



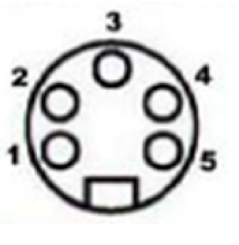
Figure 5-6 Energy connector - fitting

Fitting connectors to cables

1. Push the clamping screw (a), pinch ring (b) and sealing ring (c) over the cable.
2. Strip the jacket and wires as shown in the drawing.
3. Fit the 0.75 mm² wire-end ferrules to the stranded wires.
4. Push the connector sleeve (d) over the wires.
5. Screw the wires into the screw terminals of the female or male connector insert as shown in the chart.
6. Push the connector sleeve (d) onto the female or male insert (e) and screw the two parts together.
7. Push the pinch ring (b) over the sealing ring (c) and press the two parts together with the pressure nut (a) into the connector sleeve.
8. Screw the pressure nut tight.

5.5 Power supply

Pin assignment

View of the connector face	Pin (6GK1905-0EA00)	Cable	Socket (6GK1905-0EB00)	View of the connector face
	Pin 1	Wire 1	Pin 1	
	Pin 2	Wire 2	Pin 2	
	Pin 3	PE	Pin 3	
	Pin 4	Wire 3	Pin 4	
	Pin 5	Wire 4	Pin 5	

5.5.3 Connecting the 7/8" energy connector to a module

Properties

The 7/8" energy connector of a device consists of a 7/8" male incoming connector and a 7/8" female outgoing connector. This means that the 7/8" connector must be equipped with socket contacts for the incoming energy cable and pin contacts for the outgoing energy cable.

Note

Insert or remove the 7/8" energy connector only when the power supply is turned off.

connecting the 7/8" energy connector

To connect the 7/8" energy connector to the device, follow the steps below:

1. Turn off the power supply.
2. Turn the connector so that the slot and key of the mating mechanism fit together.
3. Plug the 7/8" energy connector loosely into the module.
4. By carefully turning the plug, make sure the connector and socket are properly interlocked (slot and key).
5. Tighten the locking nut to secure the 7/8" energy connector to the module.

Closing unused 7/8" connection points

Close all unused 7/8" connection points with sealing caps (6ES7 194-3JA00-0AA0) to achieve degree of protection IP65 or IP67.

Installing network components in cabinets

6.1 SIMATIC NET components

Ventilation openings

The casings of most SIMATIC NET network components have ventilation openings. To allow more effective cooling of the electronics components, ambient air can flow through the casing. The maximum operating temperatures quoted in the technical specifications apply only when there is unrestricted flow of air through the ventilation openings.

Depending on the size of the ventilation openings, such modules comply with degree of protection IP 20, IP 30 to IP 40. You will find the precise degree of protection of a SIMATIC NET component in its operating instructions.

Components with the degrees of protection mentioned above do not provide protection against dust and water! If the installation site requires such protection, the components must be installed in an additional enclosure such as a switching cubicle that provides the higher degree of protection (for example IP65/ IP67).

If you install these components in an additional enclosure, make sure that the conditions required for operation are maintained!

Heat dissipation

Make sure that the temperature inside the additional enclosure does not exceed the permitted ambient temperature for the installed components. Select an enclosure with adequate dimensions or use heat exchangers.

Outdoor installation

If you install the equipment outdoors, make sure that the additional enclosure is not subjected to direct sunlight. This can lead to a considerable rise in temperature within the enclosure.

Clearances

Make sure that there is adequate clearance around the component so that

- the convection cooling of the component is not restricted
- components do not cause neighboring components to heat up more than permitted
- there is enough space for installing cabling
- there is enough space to remove components for maintenance or repair.

Note

Regardless of the degree of protection of the casing, the electrical and optical ports are always sensitive to

- mechanical damage
- damage caused by electrostatic contact discharge when touched
- contamination by dust and fluids

On devices with degree of protection IP65, always close unused ports with the supplied dust protection caps. Remove these caps only immediately before connecting up the cables to the ports.

Standards

EN 60529:2000 degree of protection due to casing (IP code) (IEC 60529:1999)

6.2 IP degrees of protection

General

Electrical equipment is normally surrounded by a protective casing.

The purpose of this casing includes

- Protection of persons from touching live components or moving parts (accidental contact protection)
- Protection of equipment from intrusion of solid foreign bodies (solid body protection)
- Protection of equipment from ingress of water (water protection).

IEC 60529, EN 60529 /15/

The degree of protection specifies the degree to which the casing meets these three protective functions.

The degrees of protection are specified uniformly in the "International Standard IEC 60529" or in the identical European standard EN 60529.

The degree of protection of a casing is indicated by a code. The code consists of the letters IP (International Protection) followed by a code number for contact, solid body and water protection as shown below:

In some situations, the degree of protection is specified in even greater detail by adding letters to the code numbers.

Scope of protection

The various degrees of protection are listed briefly in Tables 1-1 and 1-2. For more detailed information on the individual ratings and the test conditions that must be fulfilled, please refer to the standards listed above.

Table 6- 1 Contact protection (short form)

First number	Protection of equipment from intrusion of solid foreign bodies	Protection of persons from access to dangerous parts
0	not protected	not protected
1	≥ 50.0 mm diameter	back of hand
2	≥ 12.5 mm diameter	finger
3	≥ 2.5 mm diameter	tool
4	≥ 1.0 mm diameter	wire
5	dust protected	wire
6	dustproof	wire

Table 6-2 Water protection (short form)

Second number	Protection of equipment from ingress of water
0	not protected
1	vertically falling drops of water
2	falling water (15° from vertical)
3	sprayed water
4	splashwater
5	jet water
6	strong jet water
7	temporary immersion
8	long period of immersion

6.3 Guidelines for setting up networked automation systems in buildings

6.3.1 General notes on networking bus cables

Bus cables in plants

Bus cables are important connections for communication between individual components of an automation system. Mechanical damage or repeated electrical interference affecting these bus connections reduces the transmission capacity of the system. In extreme cases, such problems can lead to failure of the entire automation system. The following sections explain how to protect cables from mechanical and electrical impairment.

Shielding and grounding concept

Bus cables connect programmable controllers. These in turn are connected to transducers, power supply units, peripheral devices etc. over cables.

All the components together form a complex electrically networked automation system.

When connecting system components via electrical cables (in this case bus cables), remember to take into account the requirements of the overall system structure.

Connecting cables, in particular, influence the shielding and grounding concept. Shielding and grounding an electrical installation serves the following purposes:

- Protects both humans and animals from dangerous network voltages
- Prevents unacceptable noise emission and susceptibility to noise
- Protects the system from overvoltage (for example lightning protection)

Networking SIMATIC with SIMATIC NET

SIMATIC NET network components and SIMATIC automation components are designed to operate together taking into account the aspects listed above. By keeping to the installation instructions described in the system manuals and in the following sections of this book, your automation system will meet the legal and normal industrial requirements for safety and noise immunity.

6.3.2 Protection from electric shock

Twistedpair signal level

The signal levels on twisted pair cables are in the range of only a few volts. Correctly installed and operated twisted-pair cables do not have dangerous electrical voltages.

Nevertheless you should remember the following rules when installing the power supply for all components (end devices, bus components, etc.) that you want to connect to twistedpair cable.

Operation with 24 V DC

Numerous SIMATIC NET components require a voltage of 24 V DC as their operating voltage or as auxiliary contact voltage. This power supply must meet the requirements of an extralow voltage with reliable electrical isolation from the main power system, complying with IEC 60950 or EN 60950 /18/.

Operation with line power

Components operated with line power must meet the requirements for protection against electric shock as stipulated in EN 60950 /18/, EN 611312 /20/, EN 61010 /19/ or other applicable product standards.

All the signals of the twistedpair port must meet the requirements of reliable electrical isolation from the line power supply, complying with IEC 60950 or EN 60950 /18/.

Cabling components

Conductive cable path systems, barriers, and accessories must be included in the protective measures preventing indirect contact (protection against illegal dangerous contact voltage).

Grounding conductors (PE) and equipotential bonding conductors must be installed according to the requirements of systems in buildings complying with HD 384.4.41 (protection against electric shock) and HD 384.5.54 (grounding and grounding conductor). The use of EN 501742 is recommended for the separation of low voltage cabling and IT cabling.

The requirements of HD 384.4.47 S2 (application of measures for protection against electric shock) and HD 384.4.482 S1 (selection of protective measures as a function of external influences) and appropriate national or local regulations must be adhered to.

Safe initial state of the system in case of faults

Problems on communication connections must not be allowed to put system users at risk. Cable or wire breaks must not lead to undefined statuses in the plant or system.

6.3.3 Mechanical protection of bus cables

Protection of electrical and optical bus cables

Mechanical protection is required to protect bus cables from breaks or mechanical damage.

Note

The measures described here for mechanical protection apply both to electrical and optical cables.

Measures for mechanical protection

The following measures are recommended to protect bus cables from physical damage:

- When cable cannot be installed on a cable rack or similar construction, it should be installed in a conduit (for example PG 11-16)
- In areas where the cable is subject to mechanical stress, install the cable in a heavy-gauge aluminum conduit or in a heavy-gauge plastic conduit (see Figure 1–5)
- When 90° bends are necessary and at the junctions between buildings (for example expansion joints), a break in the conduit is acceptable only when there is no likelihood of damage to the cable, for example due to falling objects (see Figure 1–6).
- In areas where the cable is likely to be walked on or driven over in buildings or in machines, install the cable in a closed heavy-gauge aluminum or steel conduit or in a metal cable gutter.

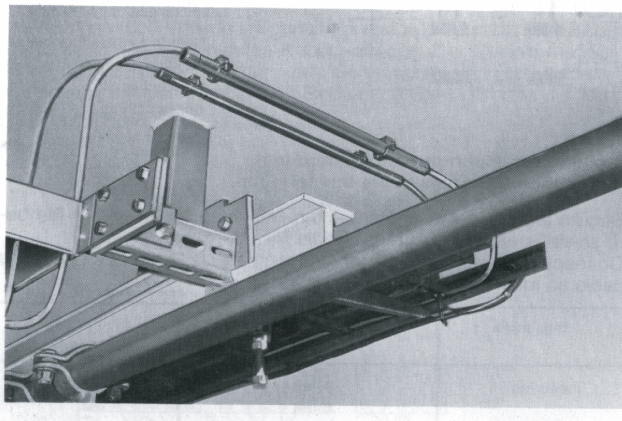


Figure 6-1 Mechanical protection of the bus cable

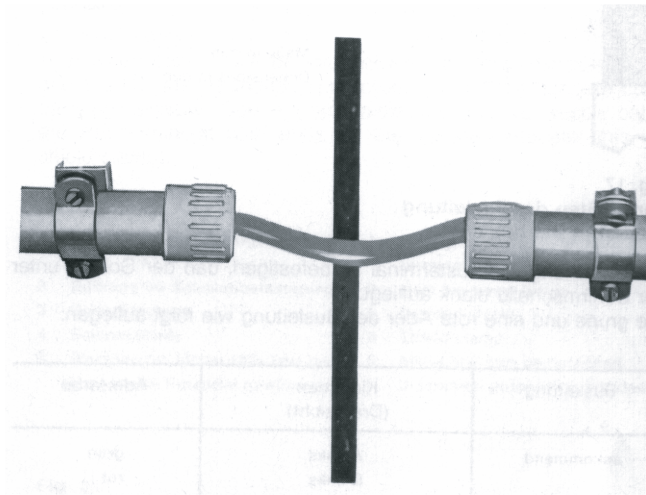


Figure 6-2 Interrupting the conduit at an expansion joint

Redundant bus cables

The installation of redundant bus cables involves special requirements. Redundant cables should always be installed on separate cable racks to avoid simultaneous damage by the same event.

Install bus cables separately

To prevent accidental damage to bus cables, they should be clearly visible and should be separate from all other wiring and cables. To improve EMC, it is often advisable to install the bus cables in a separate cable channel or in conductive metal tubes. Such measures also make it easier to localize a faulty cable.

6.3.4 Electromagnetic compatibility of fiberoptic cables

Fiberoptic cables

For communications between buildings and/or external facilities, the use of fiberoptic cables is generally recommended. Due to the optical transmission principle, fiberoptic cables are not affected by electromagnetic interference. Measures for equipotential bonding and for overvoltage protection are unnecessary with fiberoptic cables.

Note

Fiberoptic cables are ideally suited for connections in areas with high EMI levels. Remember, however, that bus components operating on an electrical basis such as OLMs, OSMs etc. may require additional noise protection measures if they are operated in such areas. These must be protected against unacceptable interference using the measures already mentioned such as shielding, grounding, minimum clearance to sources of interference etc.

6.3.5 Connecting fiber-optic cables

BFOC plug-in connectors

Among other things, Industrial Ethernet fiber optic network components use glass fiber-optic cables with ST/BFOC connector technology.

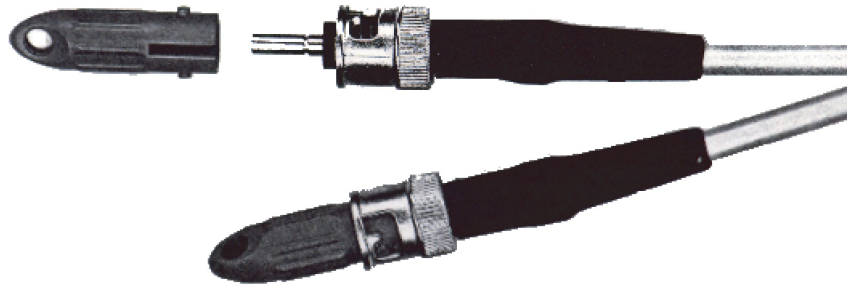


Figure 6-3 BFOC plug with dust cap

Note

Plug-in connectors for glass FO cables should only be fitted by trained personnel. When fitted correctly, they allow extremely low insertion loss and the value is highly reproducible even after multiple plugging cycles.

Assembled cables

To be able to use glass fiber-optic cables with untrained personnel, glass fiber-optic cables are also available with 4 ST/BFOC connectors already fitted. See also assembled FO cables.

Fitting connectors on site

When connectors need to be fitted on site,
– ST/BFOC plugs and matching special tool can be obtained
– SIEMENS provides this service.

If necessary get in touch with your contact for special cables and special lengths.

You will find the address also:

- in our catalog IK PI
on the Internet (<http://www.ad.siemens.de>)

NOTICE
Protecting FO plug-in connectors from contamination
Fiber-plug-in connectors are susceptible to contamination and mechanical damage to the face. Protect open connectors with the supplied dust caps. Remove the dust protection only immediately before establishing the connection.

6.3.6 Electromagnetic compatibility of bus cables

Electromagnetic compatibility (EMC)

Electromagnetic compatibility (EMC) is the capability of a electrical equipment to function satisfactorily in its electromagnetic environment without influencing this environment and interfering with other equipment belonging to it (in compliance with DIN VDE 0870).

This mutual influence can take the form of electrical, magnetic, and electromagnetic effects. These effects can spread both over cable connections (for example a common power supply) or due to radiated interference affecting the cable.

To avoid interference affecting electrical systems, these effects must be reduced to a certain level. The measures involved in achieving this limitation include the design, construction, and correct connection of bus cables. The components and bus cables for SIMATIC NET

Industrial Ethernet meet the requirements of the European standards for devices used in an industrial environment. This is documented by the CE marking.

Note

Adherence to the specified limit values can only be guaranteed when using components from the SIMATIC NET Industrial Ethernet range exclusively and by keeping to the installation instructions in this manual!

6.3.6.1 Equipotential bonding system

Aims of equipotential bonding

The noise immunity of extended electronic automation systems or, in general, information technology systems largely depends on the suitable design of the grounding and equipotential bonding system of the building.

Equipotential bonding and grounding have two essential aims:

- Protection from the dangers of electricity
 - by limiting the contact voltage and creating a fault to ground path
- Improvement of electromagnetic compatibility
 - by creating a reference potential and equalizing potential differences between parts of the system
 - by shielding.

Causes of potential differences

Wherever electric currents flow, magnetic fields are produced that in turn induce stray currents in electrically conductive materials. Induced stray currents can therefore not be avoided in the vicinity of electrical consumers (drives, electronic controls, lighting etc.) and their power supply cables. They spread in all conductor loops. Conductor loops are formed by parts of buildings such as metal banisters on staircases, water pipes or central heating pipes as well as through the shields of electrical data cables and the protective ground connectors of electrical devices (PE). The flow of current produces a voltage drop. This can be measured as a potential difference between two locations within the system.

Extremely high potential differences between two grounding points result from lightning strikes.

Effects of potential differences in information technology systems

If locations with different grounding potential are connected via cables, currents will flow. The currents flow on all connections between these two points, for example also on the signal cables or cable shields connecting them. Attached devices can be disturbed or even destroyed.

The aim of a grounding and equipotential bonding system is to ensure that the currents flow in the grounding system and not in the electronic circuits.

Measures for grounding and equipotential bonding

According to EN 50310 /21/, a "common bonding network CBN" with a fine mesh of conductive elements must be created in buildings with information technology systems. Systems that extend beyond one floor and that are interconnected by electrical bus cables require a threedimensional CBN with a lattice construction resembling a Faraday cage.

With the following measures, you can create a grounding and bonding system that will improve EMC:

- Include all the metal parts of a building in a common bonding network (CBN) with low impedance and high current carrying capacity. To this network, you should then connect the main grounding terminal or bar, grounding conductors, metal conduits, reinforcing rods, equipotential bonding ring conductor, cable racks and any additional bonding conductors.
- Connect all inactive metal parts in the immediate vicinity of your automation components and bus cables to the bonding system ensuring good conductivity. This includes all metal parts of cabinets, machine parts etc. that have no electrical function in the automation system.
- Include metal, conductive cable channels/racks in the equipotential bonding of the building and between the individual parts of the system. The individual segments of the channels/racks must be connected together with low inductance and low resistance and connected to the CBN system as often as possible. Expansion joints and angled connections should be bridged by additional flexible grounding bands. The connections between the individual segments of channels must be protected from corrosion to ensure longterm stability.
- The effectiveness of equipotential bonding is greater when the impedance of the bonding conductor is low.
- The impedance of the additional bonding conductor must not exceed 10% of the shield impedance of parallel Industrial Twisted Pair cables.
- Protect the bonding conductor from corrosion.

- Install the bonding conductor so that the area enclosed by the bonding conductor and signal cables is as small as possible.
- Use copper or galvanized steel for the bonding conductor.

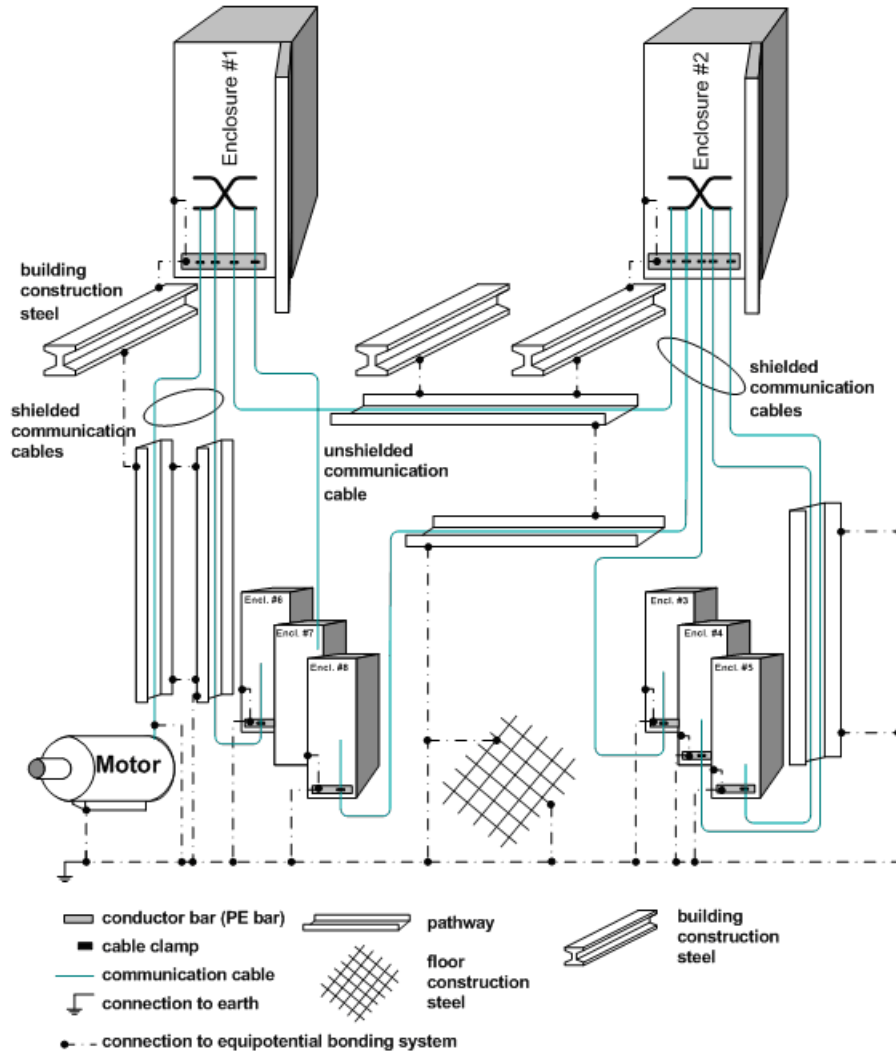


Figure 6-4 Example of meshed bonding system

For information about grounding and bonding techniques, refer to the system manuals of the SIMATIC S7300 /9/, S7400 /10/ programmable controllers.

Note

Equipotential bonding is unnecessary if the sections of a system are connected exclusively using fiberoptic cable (FO).

6.3.6.2 Requirements of the AC power distribution system

General

HD 384.3 S2 (IEC 603643:1993, modified, /22/) describes various power distribution systems (TNS, TNC,S, TNC, TT and IT systems). Additional national or local regulations stipulate the measures required for protection against electric shock and stipulate the requirements for a grounding system (see also section 1.2 Protection against electric shock).

The outer surfaces of switching cubicles, device housings, connectors and bus cables are conductive to provide shielding and must be connected to the grounding system to ensure safety. To ensure that the EMC shield effect is achieved, they make further requirements of the grounding system and grounding of the power distribution system. These result in an alternating power distribution system with noncurrent carrying grounding conductors, for example as in the TNS system.

Cable shields are part of the equipotential bonding network of a system.

Since the shields of twistedpair cables are included in the bonding system, all the currents coupled into the bonding system of a building or plant flow through them.

Depending on the intensity and frequency range, these shield currents can cause disturbances in data communication. Measures must therefore be taken to avoid the alternating power distribution system of a plant including the bonding system in the power return cabling. A TN-S system with separate cables or N and PE, for example, meets these requirements. The EN 50310:2000 /21/ standard provides detailed guidelines for installing a network system for supplying information technology equipment.

Note

End devices and /or network components connected over shielded twistedpair cables must only be supplied by alternating power distribution systems whose grounding conductors cannot contribute to the transmission of energy. There must be no PEN cable within the entire system. This condition is met, for example, by a TNS system.

Signal connections in existing installations

If unexplained, sporadic disturbances occur in data processing systems or on their communication connections, it is advisable to check for unwanted shield currents. These can be measured simply by inserting the cable in question in a clipon ammeter. Currents higher than approximately 0.1 A indicate problems in the electrical installation, for example in the TNC system.

If the alternating current power system supplies a large number of electronic devices or electronically controlled consumers, the highest interference currents can generally be observed at the third harmonic of the frequency.

Other signs of an unsuitable alternating current power supply are as follows:

- Currents on the PE conductor
- Currents through water pipes and heating pipes
- Progressive corrosion at grounding terminals, on lightning conductors, and water pipes.

Remember that sporadic events such as switching, short circuits, or atmospheric discharge (lightning strike) can cause current peaks in the system many times higher than the measured average value.

Troubleshooting

The following measures are suitable for troubleshooting:

- Restructuring the power distribution system (to form a TNS system)
- Replacing the electrical data cabling with fiberoptic cables
- Installing an equipotential bonding conductor parallel to the disturbed data cabling.

Note

If shield currents on bus cables cause problems in communication, the safest often cheapest solution is to replace the disturbed electrical bus connection with a fiberoptic cable.

Example of installing FO cable in a TNCS system

The graphic below illustrates the relationships between the structure of the alternating current network, equipotential bonding system, and information technology cabling in a building.

Three PCs and three S7300 PLCs represent the information technology system. These are networked using two OSMs. The housing of all the end devices and the OSMs are correctly connected to the grounding and bonding system of the building. The PCs are connected to the system via the PE contact of their power supply cable. The housing of the OSMs and the racks of the S7300 PLCs are connected either directly or via a switching cubicle housing locally to the CBN. The shields of the twistedpair cables interconnect all the device housings and are therefore connected to the grounding and bonding systems at both ends.

The horizontal power distribution within a floor corresponds to the requirements of a TNS system. The neutral cable N and grounding conductor PE are separate cables. The PE grounding conductor does not contribute to the power supply of the devices. The parallel cable shields of the twistedpair cables are therefore also free of neutral cable currents. The vertical, interfloor power distribution is designed as a TNC system (common PEN cable for N and PE). The PEN is the return cable of the power supply of all connected consumers. A connection between the two OSMs at the righthand edge of the picture over shielded twistedpair cables would allow the return cable current of the PEN to flow through the entire bonding system, all PE cables, and all cable shields on both floors. It is therefore strongly recommended to implement the interfloor connection between the two OSMs with fiberoptic cables.

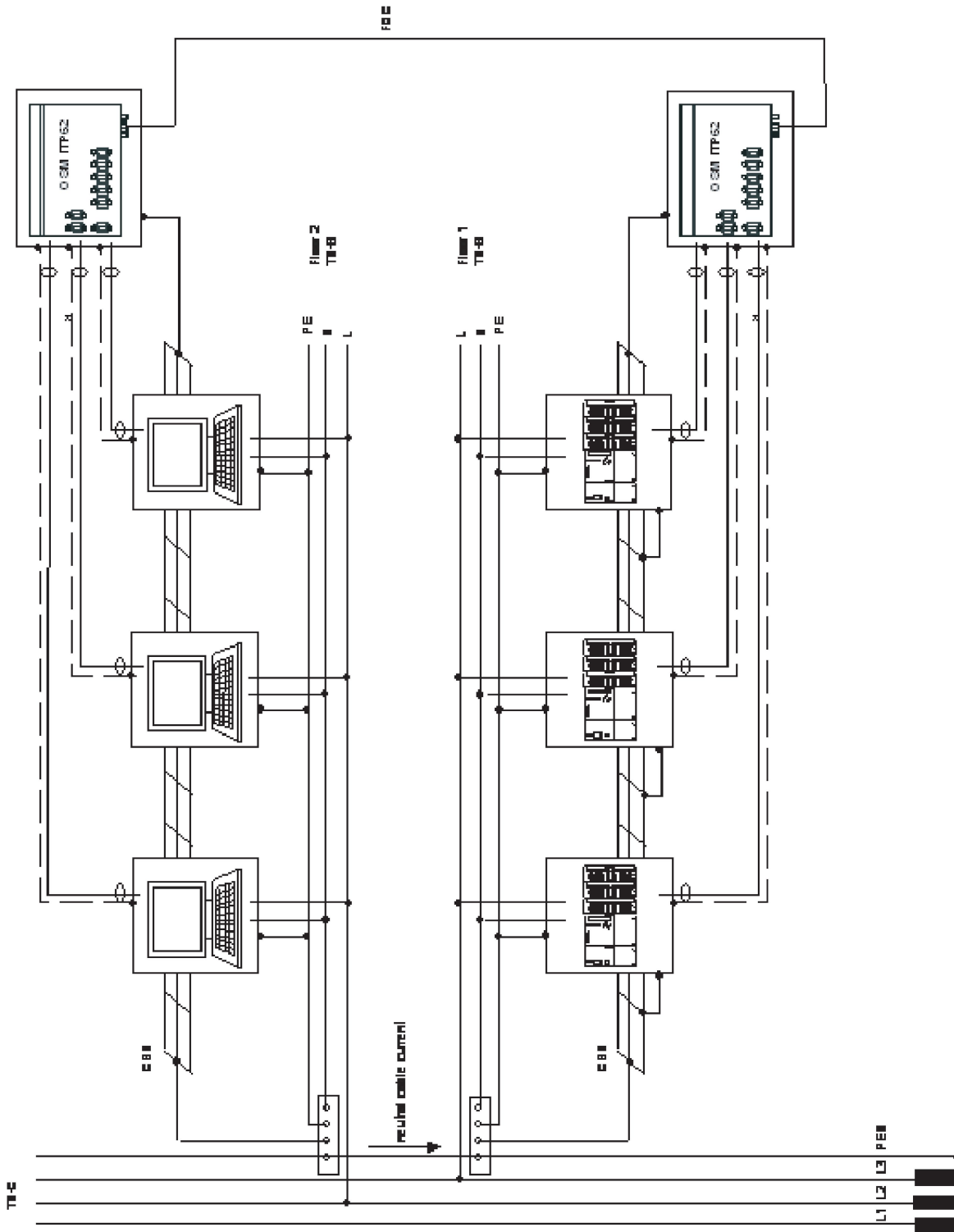


Figure 6-5 Fiber optic links avoid shield currents in the TNCS network

6.3.6.3 Shielding devices and cables

Shielding cables

The high degree of noise immunity of SIMATIC NET twisted-pair copper networks is achieved by the exclusive use of shielded twisted-pair cables. The highly symmetrical twisted signal wires are surrounded by a combination of foil and braided mesh shields. The shield makes large-area, conductive contact with the casing of the attached end device or network component at both ends of the twisted-pair cable via the connector/outlet. The entire communications electronics, consisting of transmitter and receiver chips as well as the signal cables is protected from electromagnetic influence from the outside world by a closed "cocoon" of electrically conductive device casing and cable shield.

Note

The values specified for noise emission and noise immunity in the technical specifications of all SIMATIC NET Industrial Ethernet components assumes the use of shielded twisted-pair cables.

As explained in the installation rules for the devices, the shields of the twisted-pair cables must make good conductive contact with the device housings at **both** ends. This is ensured by the SIMATIC NET connectors designed specially to match the devices.

If, on the other hand, the rules are ignored and unshielded cables are used or the shields do not make contact with the casing at both ends, there is no longer any guarantee that the technical data regarding noise emission and noise immunity will apply. In this case, the operators of the system must take responsibility themselves for compliance with the legal limit values for noise emission and noise immunity (CE mark)!

Handling bus cable shields

Note the following points about cable shields:

- Use SIMATIC NET twisted-pair cables throughout your system. The shields of these cables have an adequate density to meet the legal requirements regarding noise emission and immunity.
- Always contact the shields of bus cables at both ends. The legal requirements for noise emission and noise immunity in your system (CE marking) can only be achieved when the shields make contact at both ends.
- Secure the shield of the bus cable to the connector casing.

- If cables are installed permanently, it is advisable to remove the insulation of the shielded cable and to establish contact on the shield/PE conductor bar.

Note

If there is a potential difference between the grounding points, an illegally high compensating current can flow through the shield grounded at both ends. To rectify the problem, do not, under any circumstances, open the shield of the bus cable.

This problem can be solved in the following ways:

- Install an additional bonding conductor parallel to the bus cable that takes over the shield current.
- Use fiber-optic cable instead of electrical cable (safest solution).

Establishing shield contact

When contacting the cable shields, please note the following points:

- Secure the braided shield with metal cable clamps.
- The clamps must make good and large-area contact with the shield.
- Contact SIMATIC NET twisted-pair cables only using the braided copper shield and not the aluminum foil shield. The foil shield is connected to a plastic foil to increase tearing strength and is therefore non-conductive.
- Contact the shield with the shielding bar directly at the point at which the cable enters the cabinet.

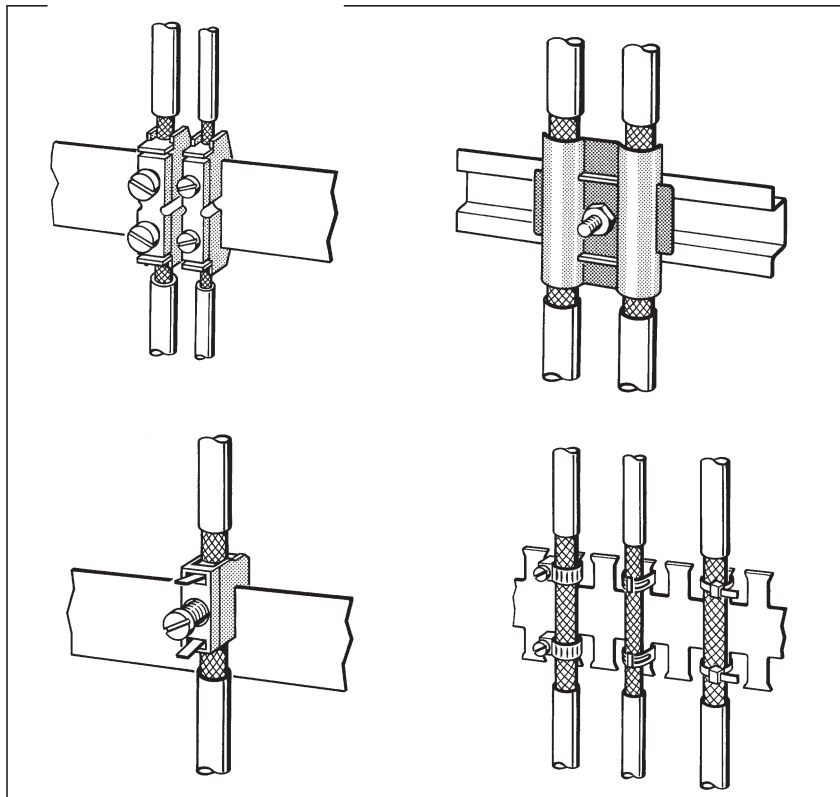


Figure 6-6 Securing shielded cables with cable clamps and ties (schematic representation)

- When removing the sheath of the cable, make sure that the braid shield of the cables is not damaged.
- To allow good contact between grounding elements, tin-plated or galvanically stabilized surfaces are ideal. With galvanized surfaces, the necessary contact should be achieved using suitable screws. Painted surfaces should be avoided at the contact points.
- Unless specifically intended for this purpose, shield clamps and contacts should not be used for strain relief. The contact with the shielding bar could be impaired or be broken altogether.

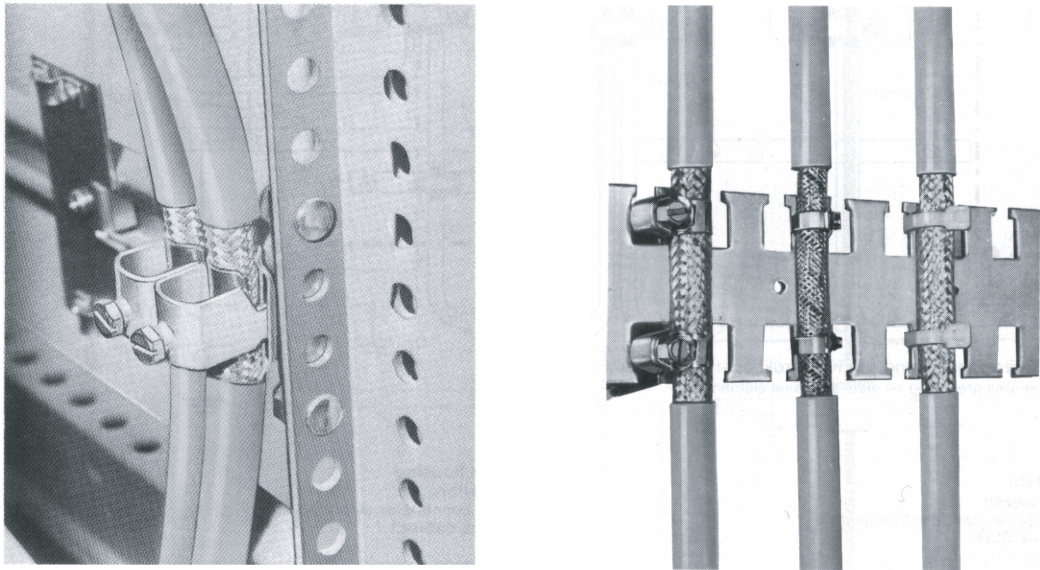


Figure 6-7 Contacting the shield at the point of entry to a cabinet

6.3.6.4 Special noise suppression measures

Connecting switched inductances to suppressors

Some inductive switching devices (for example relays) create interference voltages that are a multiple of the connected operating voltage. The SIMATIC S7-300 /9/ and S7-400 /10/ system manuals contain suggestions on how to limit the interference voltages caused by inductance by connecting them to suppressors.

Power supply for programming devices

It is advisable to include a power socket for programming devices in each cabinet. The socket must be supplied by the same system to which the PE conductor for the cabinet is connected.

Cabinet lighting

Use bulbs for the cabinet lighting, for example LINESTRA lamps. Avoid the use of fluorescent lamps since they cause interference. If you need to use fluorescent lamps, take the measures shown in the figure below.

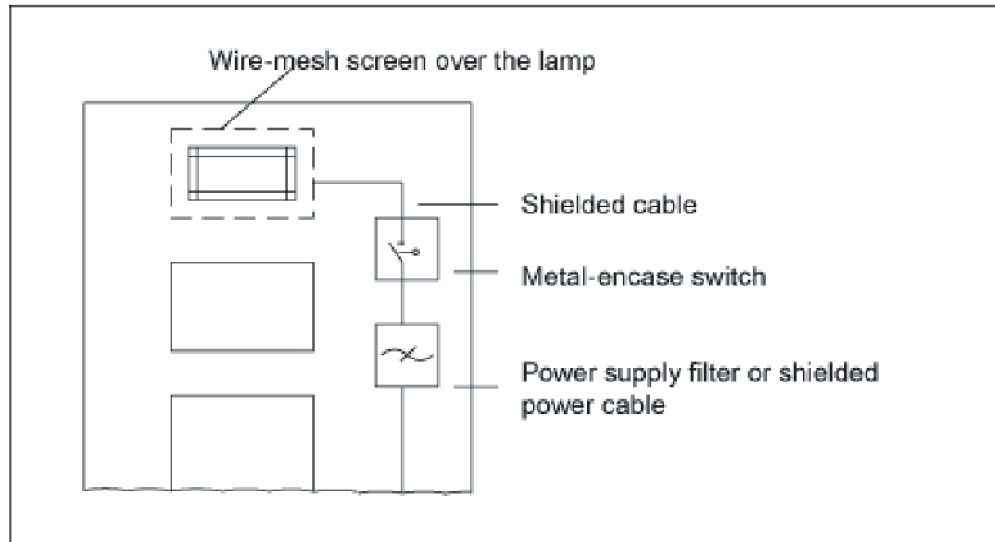


Figure 6-8 Measures for interference suppression of fluorescent lamps in a cabinet

6.3.7 Arrangement of devices and cables

Adequate clearance to reduce the effects of interference

One simple but nevertheless effective method of reducing the effects of interference is to keep the "culprit" and "victim" devices and cables as far apart from each other as possible. Inductive and capacitive interference injection declines in proportion to the square of the distance of the elements involved. This means that doubling the clearance reduces the effects of interference by a factor of four. Taking certain aspects into account during the planning phase of a building generally incurs little extra cost and can save considerable effort later.

Standards recommending the spatial arrangement of devices and cables

EN 501742 /13/ includes recommendations on the spatial arrangement of devices and cables with the aim of achieving the lowest possible mutual interference.

6.3.7.1 The influence of power distribution systems (EN 501742, 6.4.4.2)

Planning the electrical installations

To avoid the power distribution system affecting sensitive devices, the following points must be taken into account when planning the electrical installation:

- Possible sources of interference, for example voltage distributors, voltage transformers, elevators, high currents in power supply bars, must be located at a suitable distance from sensitive devices;
- Metal pipes (for example for water, gas, heating) and cables should enter the building at the same point;
- The metal surfaces, shields, metal pipes, and connections of such conduits must be connected with lowresistance conductors to the main bonding conductor of the building;
- Using a common cable route for lowvoltage cable and signal cables with adequate separation (either by clearance or shielding) between the two to avoid large induction loops that are created by the different lowvoltage cabling;
- The use of either a single multicore cable for all power supplies or (in the case of higher power requirements) of conductor bars with weak magnetic fields.

6.3.7.2 Cable categories and clearances

Fiberoptic cables

When using fiberoptic cables, mechanical protection is necessary, however the EMC rules do not apply.

Grouping in categories

It is useful to group wires and cables into various categories according to the signals they carry, possible interference signals, and their sensitivity to interference. Minimum clearances can be specified for these categories so that interferencefree operation can be expected under normal operating conditions if the clearance is adhered to.

Constraints

Grouping cables according to voltage classes assumes that the interference voltages relate directly to the power supply voltage conducted (the lower the supply voltage, the lower the interference voltage). Remember, however, that DC or 50 Hz power supply voltages do not represent any danger to Industrial Ethernet bus cables. The critical interference voltages in the kHz to MHz frequency range are created by the consumers connected to the cable. A 24 V DC cable with which a relay is switched regularly has a far more critical interference range than a 230 V cable supplying a lightbulb.

In the information shown below, it is assumed that all the components within an automation system and all the plant components controlled by the system (for example machines, robots

etc.) at least meet the requirements of the European standards for electromagnetic compatibility in an industrial environment. If devices are defective or incorrectly installed, higher interference voltages must be expected!

The following is assumed:

- The cables for analog signals, data signals and process signals are always shielded.
- The distance from the cables to the chassis surface of the system (cabinet wall, grounded and conducting cable channel, ...) is not more than 10 cm.

Note

In general, the greater the distance between cables and the shorter the distances over which the cables run parallel to each other, the less the danger of interference.

How to read the table

To check how cables of different types must be laid, follow the steps outlined below:

1. Find the cable type of the first cable in column 1 (Cables for ...).
2. Find the cable type of the second cable in the relevant section in column 2 (and cables for ...).
3. Read the guidelines for laying the cables in column 3 (lay ...).

Table 11 Cabling within buildings

Cables for ...	and cables for ...	Lay ...
Bus signals, shielded (PROFIBUS, Industrial Ethernet) Bus signals, unshielded (ASInterface)	Bus signals, shielded (PROFIBUS, Industrial Ethernet) Bus signals, unshielded (ASInterface) Data signal, shielded (PG, OP, printer, counter inputs etc.) Analog signals, shielded DC voltage (v 60 V), unshielded Process signals (v 25 V), shielded AC voltage (v 25 V), unshielded Monitors (coaxial cable)	In common bundles or cable channels
	DC voltage (u 60 V and v 400 V), unshielded AC voltage (u 25 V and v 400 V), unshielded	In separate bundles or cable channels (no minimum clearance required)

Cables for ...	and cables for ...	Lay ...
	DC and AC voltage (u 400 V), unshielded	<p>Within closets: In separate bundles or cable channels (no minimum clearance required)</p> <p>Outside closets: On separate cable paths with at least 10 cm clearance</p>
	HF cables for transmitter high level stages and transmitter antennas with voltages from 10 to 1000 V	Lay HF cables in steel pipes with multiple ground points; at least 30 cm clearance

6.3.7.3 Cabling within closets

Cabling within closets

When running cables within cubicles and cabinets, remember the following rules:

- Install the cables in metallic, electrically conductive cable channels.
- Screw the cable channels to the struts of the rack or cubicle walls approximately every 50 cm making lowresistance and lowinductance contact.
- Separate the cables according to the categories as shown in table 1-1.
- Maintain the minimum clearance between the cables of different categories as explained in table 1-1. In general, the risk of interference due to crosstalk is less the greater the clearance between the cables.
- Where cables of different categories cross, they should cross approximately at right angles (wherever possible avoid sections where the cables run parallel).
- The shields of all cables entering the wiring closet should make largearea contact with closet ground as close as possible to the point of entry.

6.3.7.4 Cabling within buildings

Cabling within buildings

When laying cables outside cabinets but within buildings, note the following points:

- Install the cables in metallic, electrically conductive cable channels.
- Include the metal cable channels and racks in the bonding system of the building or plant. Note the information on equipotential bonding in Section 1.3 in this manual.

- Separate the cables according to the categories as described in table 11 and run the various categories in their own channels/racks.
- If there is only one common metal channel available for all categories, either the clearances shown in Table 11 must be maintained or the individual categories should be separated from each other by metallic partitions. The partitions must be connected to the channel making lowresistance and lowinductance contact.
- Cable racks should cross each other at right angles.

6.3.7.5 Cabling outside buildings

Using fiberoptic cables

Industrial Twisted Pair is intended for use within buildings (tertiary area). The installation of Industrial Twisted Pair cables between buildings is not permitted. LAN connections between buildings and between buildings and external facilities are only possible with fiberoptic cables (FO). Due to the optical transmission principle, fiberoptic cables are not affected by electromagnetic interference. Measures for equipotential bonding and overvoltage protection are unnecessary with fiberoptic cables.

6.3.8 Laying bus cables

6.3.8.1 Installation instructions for electrical and optical bus cables

General

During installation, remember that bus cables can only be subjected to a certain amount of mechanical strain. Cables can be damaged or even destroyed by too much tensile stress or pressure, by torsion or by bending them too sharply. The following instructions will help you to avoid damage when installing bus cables. If cables are subjected to too much strain or stress for one or more reasons, they should always be replaced.

Storage and transport

During storage, transportation and cabling, the open ends of the bus cable (without connectors) must be kept closed with a shrink-on cover to prevent oxidation of the cores and to keep dampness out of the cable.

Temperatures

During transportation, cabling and operation, the cable must not be exposed to temperatures below the specified minimum temperature or above the specified maximum temperature otherwise the electrical and mechanical characteristics of the cables can deteriorate. The permitted temperature ranges of your bus cable can be found in the technical data sheets of the particular bus cables.

Tensile strength

The tensile force exerted on the cables during or after installation must not exceed the limits of tensile strength of the cables. The permitted tensile loads of your bus cable can be found in the technical data sheets of the particular bus cables.

Pull in assembled cables using cable grips

To pull in assembled cables, make sure that you use cable grips. These surround the fitted plugs and protect them from damage while pulling them in.

Fitting strain relief

Make sure that you provide strain relief approximately 1 m from the connection point on all cables subject to tensile loading. Shield clamps are not adequate for strain relief!

Pressure load

Too much pressure on the cables must also be avoided, for example pinching the cable when securing it in position.

Torsion

Torsion can lead to the elements of a cable being displaced and degrading the electrical characteristics of cables. Bus cables must therefore not be twisted.

Bending radii

To avoid damage within the bus cables, they must at no time be bent more sharply than the minimum bending radius. Note:

- When pulling in cables under tensile load, larger bending radii must be adhered to than when the cable is in its final installed status.
- Bending radii for non-circular cables apply only to bending the flat, broader surface. Bends in the narrower surface require much greater radii.

The permitted bending radii of your bus cable can be found in the technical data sheets of the particular bus cables.

Avoid loops

When laying bus cables, unwind them at a tangent from the cable drum or use appropriate rotary tables. This prevents loops forming and resulting in kinks and torsion.

Installing other cables

When laying bus cables remember that bus cables must not be subjected to excessive strain and stress when installed. This can, for example, happen when cables have been installed along with other cables on a common rack or in a common duct (providing this is electrically permitted) and then new cables are pulled along the same path later (during repairs or when extending a system).

6.3.8.2 Additional instructions on installing fiberoptic cables

Protecting connectors from contamination

Fiber-optic cable connectors are sensitive to contamination. Unconnected plugs and sockets must be protected with the supplied dust caps.

Attenuation variations under load

During installation, fiber-optic cables must not be twisted, stretched or squashed. The specified limit values for tensile strain, bending radii and temperature ranges must be adhered to. During installation, the attenuation values can vary slightly, these variations are, however, reversible providing the strain limits are not exceeded.

Pulling cables using cable grips and protect connectors

To pull in cables without Kevlar pull-in aids use cable grips. Before fitting the cable grip, make sure that the connectors of preassembled cables are protected from the pressure exerted by the cable grip, for example using a piece of protective tube.

Fitting strain relief

Although the ST/BFOC plugs have their own strain relief and kink protection, it is advisable to arrange for additional strain relief as close as possible to the connected device to protect against mechanical strain.

Plan adequate attenuation reserves

When installing the cables over long distances, it is advisable to plan in one or more repair splice connections in the attenuation budget.

EMC robustness

Fiber-optic cables are immune to electromagnetic interference. Installing cables in cable channels along with other cables (for example 230 V/380 V power supply cables) causes no problems. When installing in cable channels, however, make sure that the permitted strain on the fiber-optic cables is not exceeded when pulling in other cables later.

 WARNING
--

Adherence to the technical specifications
--

During installation and operation, all mechanical requirements for the cable such as bending radii, tensile strain etc. must be kept to. If these limits are exceeded, permanent deterioration of the transmission characteristics may result that can cause temporary or permanent failure of data transmission.

Index

1

- 100BASE-TX, 12
- 15-pin D-sub plug
 - Assembly, 174
 - Fitting, 174

7

- 7/8" energy connector
 - Closing unused connectors, 200
 - Fitting to an energy cable, 198
 - Fitting to module, 200
 - Pin assignment, 200
 - Suitable cables, 198

9

- 9-pin D-sub plug
 - Assembly, 171
 - Fitting, 171

A

- Assembly instructions
 - 15-pin D-sub plug, 174
 - 7/8" energy connector to a module, 200
 - 9-pin D-sub plug, 171
 - Energy cable and power plug PRO, 195
 - Fitting a 7/8" energy connector to an energy cable, 198
 - IE FC cable 2 x 2 with an IE FC RJ-45 plug PRO, 136
 - IE FC cable 2x2 and IE FC RJ-45 plug, 133
 - IE FC cable 2x2 and IE FC RJ-45 plug 4x2, 142
 - IE FC cable 2x2 and IE RJ-45 plug PRO, 139
 - IE FC cable 4x2 and IE FC RJ-45 plug 4x2, 145
 - IE FC FO cable on BFOC plug, 177
 - IE FC stripping tool, 130
 - IE FC TP cable and IE FC M12 plug PRO, 148
 - IE FC TP cable and IE FC outlet RJ-45, 161
 - IE FC TP standard cable 4x2 and IE FC RJ-45 modular outlet, 164
 - IE FC TP standard cable 4x2 and IE IP67 hybrid plug, 156

- IE hybrid cable 2x2 and IE FC RJ-45 modular outlet power insert, 167
- IE hybrid cable 2x2 and IE IP 67 hybrid plug, 151
- IE RJ-45 modular outlet, 162
- PCF Fiber-optic cable with SC RJ plug, 184
- POF fiber-optic cable with SC RJ plug, 181

B

- BFOC plug
 - mounting on IE FC FO cable, 177
 - Structure, 177
- BFOC plug-in connectors, 209
- Bus cables, 205
 - Electrical safety, 205
 - Handling bus cables, 205
 - in plants, 205

C

- Cabinet lighting
 - EMC, 221
- Cabling, 224
 - Within buildings, 224
 - Within closets, 224

D

- Degrees of protection, 203

E

- Energy cable
 - Fitting a 7/8" energy connector, 198
 - Fitting the power plug PRO, 196

F

- FastConnect, 11
- FastConnect twisted pair, 11
- FC FO LC plug, 104
- FC FO termination kit, 105
- FC twisted pair, 11
- Fiber-optic cables (FO cables), 65
- FO FRNC cable 50/125/OM4, 76

G

Glossary, 8

I

IE FC cable 2x2

- Connecting an IE FC RJ-45 plug, 134
- Connecting an IE FC RJ-45 plug 180 4x2, 142
- Fitting the IE FC RJ-45 plug PRO, 136
- Fitting the IE RJ-45 Plug PRO, 139

IE FC cable 4x2

- Fitting the IE FC RJ-45 Plug 4x2, 145

IE FC FO cable

- mounting on the BFOC plug, 177

IE FC M12 cable connector PRO (PROFINET), 53

IE FC M12 plug PRO

- Fitting to IE FC TP cable, 148

IE FC outlet RJ-45

- Fitting to IE FC TP cable, 161

IE FC RJ-45 modular outlet

- Fitting to IE FC TP standard cable 4x2, 164

IE FC RJ-45 modular outlet power insert

- Fitting to IE FC cable 2x2, 167

IE FC RJ-45 plug

- Connecting to IE FC cable 2x2, 134
- Connector pinout, 133

IE FC RJ-45 PLUG 180 4x2, 46

IE FC RJ-45 plug 4x2

- Connecting to IE FC cable 2x2, 142
- Connecting to IE FC cable 4x2, 145

IE FC RJ-45 plug PRO

- Fitting the IE FC RJ-45 plug PRO, 136

IE FC RJ-45 PLUG PRO, 56

IE FC TP cable

- Fitting an IE FC outlet RJ-45, 161
- Fitting the IE FC M12 plug PRO, 148

IE FC TP robust flexible cable GP 2x2, 24

IE FC TP robust standard cable GP 2 x 2, 22

IE FC TP standard cable 4x2

- Fitting an IE IP67 hybrid plug, 156
- IE FC RJ-45 modular outlet, 164

IE hybrid cable 2x2

- Fitting an IE FC RJ-45 modular outlet power insert, 167
- Fitting an IE IP67 hybrid plug, 151

IE IP 67 hybrid plug

- Fitting to IE FC cable 2x2, 151

IE IP67 hybrid plug

- Fitting to IE FC TP standard cable 4x2, 156

IE M12 panel feedthrough 4x2, 47

IE M12 panel feedthrough PRO, 49

IE RJ-45 modular outlet

- Fitting, 162
- Replacing the insert, 163

IE RJ-45 plug PRO

- Connecting to IE FC cable 2x2, 139

IE robust connecting cable M12, 40

IE TP ground cable 2x2, 33

IE TP train cable 2x2, 31

IEEE 802.3u, 12, 67

Industrial Twisted Pair

- Connector pinout, 169
- ITP plug, 169

IP degrees of protection, 203

ITP plug

- 15-pin, 174
- 9-pin, 171
- Connector pinout, 169

M

M12, 12

Maximum lengths

- Multimode glass fiber-optic cable, 67
- Multimode glass fiber-optic cables with 1 Gbps Ethernet, 68
- Single mode glass fiber-optic cable, 67
- Twisted pair sections, 13

MM FO robust cable GP, 71

N

Networking bus cables

- Notes, 205

P

PCF fiber-optic cables

- Fitting SC RJ plug, 184

POF fiber-optic cable

- Fitting SC RJ plug, 181

Power plug PRO

- Connector pinout, 195
- Fitting to an energy cable, 196

Primary area

- Cabling buildings, 11

R

RJ-45, 12

RJ-45 COUPLER PRO, 57

Robust Power Connecting Cable, 117

S

SC RJ plug

Assembly, 181, 184

Fitting to PCF fiber-optic cable, 184

Fitting to POF fiber-optic cable, 181

Secondary area

Cabling buildings, 11

Shield contact

Establishing, 218

Shielding cables, 217

SIMATIC NET glossary, 8

Special cables

Contact person, 8

Special lengths

Contact person, 8

Structured cabling, 11

T

Tertiary area

Cabling buildings, 11

Twisted pair cord, 11

