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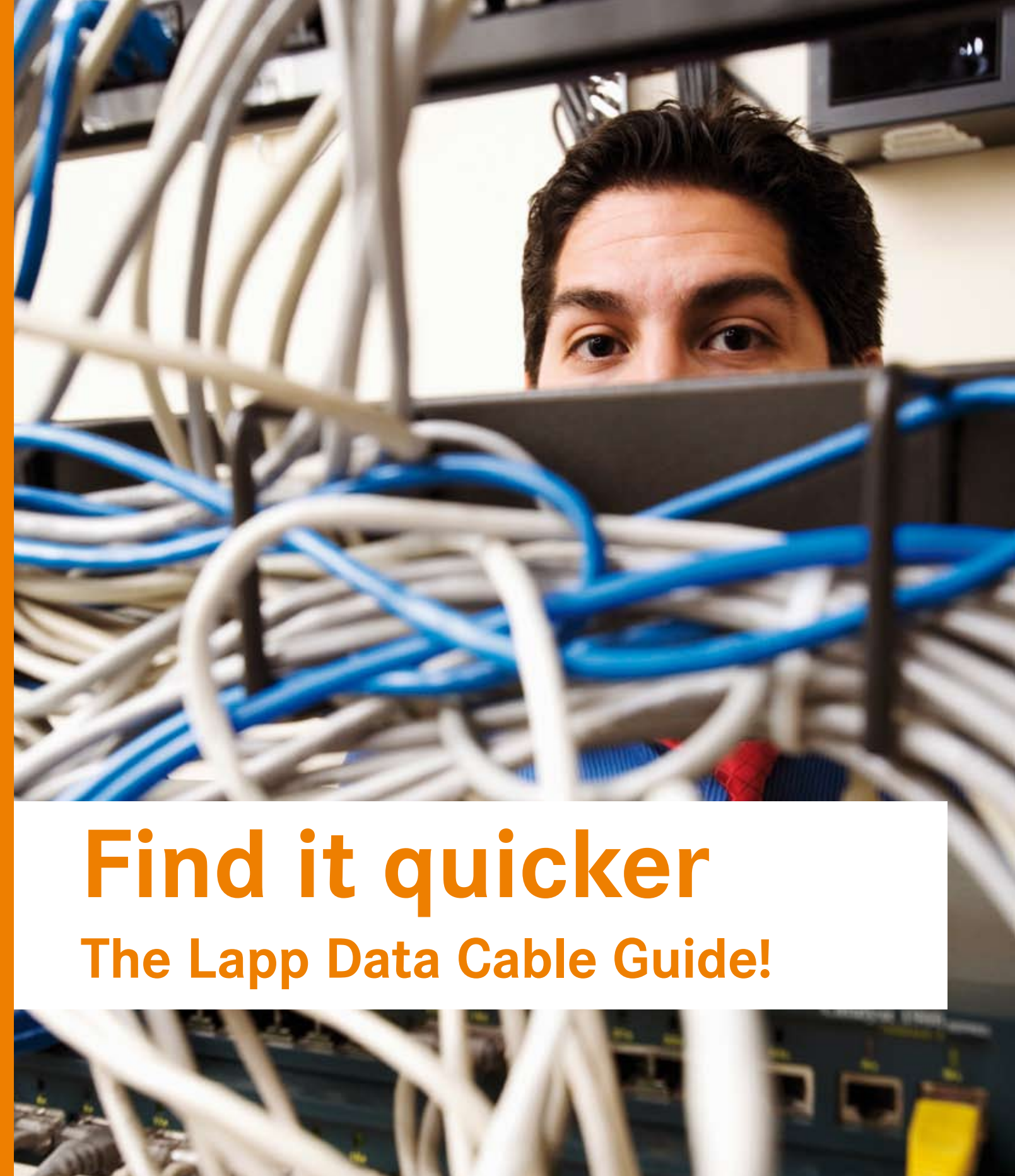
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**HITRONIC® Fibre Optical Cables - BUS & LAN**  
**ETHERLINE® LAN Cables ETHERNET**  
**UNITRONIC® BUS Cables**

## Legend

AS-i	AS-INTERFACE Fieldbus
AWG	American Wire Gauge (coding for wire diameter)
BK	black outer sheath
BU	blue outer sheath
CAN	Controller Area Network
COMBI IBS	Installation remote bus cable for INTERBUS
DUPLEX	two fibres
FC	Fast Connect (screwless)
FD	suitable for power chains
FIP	Factory Instrumentation Protocol Fieldbus
FRNC	Flame Retardant Non Corrosive
F/UTP (FTP)	Foiled Twisted Pair
G	rubber outer sheath (EPDM – Ethylene Propylene Dien Caoutchouc)
GOF	Glass Optical Fibre
H	halogen free material
IBS	Remote bus cable for INTERBUS
L2	Abbreviation for SINEC® L2-DP PROFIBUS-DP Fieldbus
LD	low attenuation
MM	Multimode
ODTR	Optical Time Domain Reflectometry
P/PUR	Polyurethane
PA	Polyamide
PCF	Plastic Cladded Fibre
PE	Polyethylen
POF	Polymer Optical Fibre
PROFIBUS-DP	PROFIBUS for Decentralized Periphery
PROFIBUS-FMS	PROFIBUS for Fieldbus Message Specification
PROFIBUS-PA	PROFIBUS for Process Automation
SIMPLEX	one fibre
SM	Singlemode
SF/UTP (S-FTP)	Shielded-Foiled Twisted Pair
S/FTP (STP/S PiMF)	Shielded Twisted Pair / Shielded Pairs in Metal Foil
TPE	Thermo Plastic Elastomer
U/UTP (UTP)	Unshielded Twisted Pair
Y/PVC	Polyvinylchlorid
YE	yellow outer sheath
Yv	wire for outdoor use / direct burial with reinforced PVC outer sheath
YY	double outer sheath PVC
XPE	cross linked Polyethylen

# BUS Cables

Bussystem	Installation area	Application/cablings	Approval	Type	Art. No.	Outer sheath material	Special feature	Connectors	
PROFIBUS-DP, PROFIBUS-FMS, FIP	indoor	static	UL/CSA (CMX)	UNITRONIC® BUS L2/FIP UL/CSA (CMX)	2170219	PVC		26-33,41,42,45-51	
				UNITRONIC® BUS L2/FIP PUR FC UL/CSA (CMX)	2170330	PUR	Fast Connect	34-40,43,44	
			UL/CSA (CM)	UNITRONIC® BUS L2/FIP-H FC UL/CSA (CM)	2170326	H	halogen free, Fast Connect	34-40,43,44	
				UL/CSA (CMG)	UNITRONIC® BUS L2/FIP 7-wire UL/CSA (CMG)	2170824	PVC		26-33,41,42,45-51
			UNITRONIC® BUS L2/FIP FC UL/CSA (CMG)		2170820	PVC	Fast Connect	34-40,43,44	
			UNITRONIC® BUS L2/FIP 7-wire FC UL/CSA (CMG)		2170826	PVC	Fast Connect	26-33,41,42,45-51	
			UNITRONIC® BUS HFFR L2/FIP FC UL/CSA (CMG)		2170853	H	halogen free, Fast Connect	34-40,43,44	
			UL/CSA (CM)	UNITRONIC® BUS L2/FIP	2170220	PVC		26-33,41,42,45-51	
				UNITRONIC® BUS L2/FIP PE	2170233	PE		26-33,41,42,45-51	
				UNITRONIC® BUS L2/FIP 7-wire halogen free	2170226	H	halogen free	26-33,41,42,45-51	
				UNITRONIC® BUS COMBI L2/FIP 7-wire	2170225	PVC	COMBI	26-33,41,42,45-51	
				UNITRONIC® BUS L2/FIP 105	2170630	PVC		26-33,41,42,45-51	
		UNITRONIC® BUS L2/FIP ROBUST FR		2170620	TPE		26-33,41,42,45-51		
		UL/CSA (CMG)	high flexible	UL/CSA (CMX)	UNITRONIC® BUS FD P L2/FIP UL/CSA (CMX)	2170822	PUR	power chain	26-33,41,42,45-51
					UNITRONIC® FD P L2/FIP FC UL/CSA (CMX)	2170322	PUR	power chain, Fast Connect	34-40,43,44
				UL/CSA (CMG)	UNITRONIC® FD Y PROFIBUS HYBRID UL/CSA (CMG)	2170875	PVC	hybrid	26-33,41,42,45-51
					UNITRONIC® BUS FD P L2/FIP	2170222	PUR	power chain	26-33,41,42,45-51
					UNITRONIC® BUS FD P COMBI L2/FIP	2170227	PUR	COMBI/power chain	26-33,41,42,45-51
	UNITRONIC® FD P PROFIBUS HYBRID				2170495	PUR	hybrid /power chain	26-33,41,42,45-51	
	torsion	UL/CSA (CMX)	UNITRONIC® BUS L2/FIP TORSION UL/CSA (CMX)	2170332	PUR	torsion	26-33,41,42,45-51		
	festoon		UNITRONIC® BUS L2/FIP FESTOON UL/CSA (CMG)	2170331	PVC	festoon	26-33,41,42,45-51		
	outdoor	static	UL/CSA (CMG)	UNITRONIC® BUS Yv L2/FIP	2170223	PVC		26-33,41,42,45-51	
				UNITRONIC® BUS YY L2/FIP	2170236	PVC		26-33,41,42,45-51	
				UNITRONIC® BUS L2/FIP ARM	2170247	PVC	arm	26-33,41,42,45-51	
				UNITRONIC® L2/FIP BURIAL FC	2170323	PVC	Fast Connect	34-40,43,44	
	PROFIBUS-PA	outdoor	static		UNITRONIC® BUS PA ARM (BU)	2170248	PVC		
		indoor	static	UL/CSA (CMG)	UNITRONIC® BUS PA (BU) UL/CSA (CMG)	2170834	PVC		
UNITRONIC® BUS PA (BK) UL/CSA (CMG)					2170835	PVC			
UNITRONIC® BUS PA (BU) FC UL/CSA (CMG)					2170334	PVC	Fast Connect		
UNITRONIC® BUS PA (BK) FC UL/CSA (CMG)					2170335	PVC	Fast Connect		
UNITRONIC® BUS PA (BU)					2170234	PVC			
UNITRONIC® BUS PA (BK)					2170235	PVC			
FOUNDATION FIELDBUS (FF)	indoor	static	UL/CSA (CMG)	UNITRONIC® BUS FF 3 UL/CSA (CMG)	2170350	PVC			
				UNITRONIC® BUS FF 3 ARM (YE) UL/CSA (CMG)	2170351	PVC	arm		
				UNITRONIC® BUS FF 3 ARM (BU) UL/CSA (CMG)	2170353	PVC	arm		
				UNITRONIC® BUS FF 2 UL/CSA (CMG)	2170352	PVC			
CC-Link (CCL)	indoor	static	UL/CSA (CM)	UNITRONIC® BUS CCL UL/CSA (CM)	2170360	PVC	CLPA-Test		



## BUS Cables used in:

- Factory Automation (field buses like PROFIBUS, DeviceNet, CAN, INTERBUS etc.)
- Process Automation (chemical, petro-chemical industry etc.)
- Building Automation (building management)

## Overview of the most common bus systems:

### PROFIBUS

We distinguish between PROFIBUS-DP, PROFIBUS-FMS and PROFIBUS-PA. The DP variant dominates worldwide with a bit rate of mainly 1.5 Mbit/s, and a maximum of 12 Mbit/s, PROFIBUS-PA is the leader in Process Automation in Europe.

### AS-INTERFACE

Developed to have an inexpensive alternative on the lowest level (sensor/ actuator level) of factory automation. Can often be found in connection with PROFIBUS, INTERBUS, CAN and DeviceNet.

### CAN

Originally developed for cars. Today used in industry in an extremely broad range of applications.

### DeviceNet

No. 1 in North America. Developed by Allen Bradley (Rockwell Automation). Based on CAN.

### Foundation™ Fieldbus

Analogous to PROFIBUS-PA, dominates in North America.

### SAFETY BUS

Bus systems developed especially for safety-relevant areas. Operate either completely independently (e.g. SafetyBUS p®) or are part of an overall system (e.g. PROFIsafe, INTERBUS Safety, DeviceNet Safety etc.).

### INTERBUS

One of the first field bus systems. Influence in the automotive industry.

### EIB and LON

Two bus systems for building automation. Operate primarily with low bit rate.

### Bus systems according to own development

Companies that develop their own bus system named after them based on standardized systems find a contact for developing their own ideas in Lapp.

## BUS Connectors

Connectors		
Nr.	Art. No.	Type
26	21124064	ERbic® PROFIBUS S Switch 90
27	21124063	ERbic® PROFIBUS S Switch 90 PG
28	21124060	ERbic® PROFIBUS S Switch 30
29	21124061	ERbic® PROFIBUS S Switch 30 PG
30	21124067	ERbic® PROFIBUS S Node 90 reversed
31	21124071	ERbic® PROFIBUS S Termination 90 reversed
32	21124068	ERbic® PROFIBUS S Node 180
33	21124070	ERbic® PROFIBUS S Termination 180
34	21124050	ERbic® PROFIBUS IDC Switch 90
35	21124051	ERbic® PROFIBUS IDC Switch 90 PG
36	21124055	ERbic® PROFIBUS IDC Switch 30
37	21124056	ERbic® PROFIBUS IDC Switch 30 PG
38	21124052	ERbic® PROFIBUS IDC Switch 90 reversed
39	21124053	ERbic® PROFIBUS IDC Switch 180
40	21124054	ERbic® PROFIBUS IDC Switch 180 AX
41	21124090	ERbic® PROFIBUS FZ Switch 90
42	21124091	ERbic® PROFIBUS FZ Switch 90 PG
43	21700501	EPIC® PROFIBUS 90° PG FC
44	21700502	EPIC® PROFIBUS 90° FC
45	21700503	EPIC® PROFIBUS 90° PG S
46	21700504	EPIC® PROFIBUS 90° S
47	21700505	EPIC® PROFIBUS Axial S
48	21700506	EPIC® PROFIBUS 35° PG S
49	21700507	EPIC® PROFIBUS 35° S
50	21700508	EPIC® PROFIBUS 90° PG FZ
51	21700509	EPIC® PROFIBUS 90° FZ



# BUS Cables

Bussystem	Installation area	Application/ cabling	Approval	Type	Art. No.	Outer sheath material	Special feature	Connectors
CAN (Controller Area Network)	indoor	static	UL/CSA (CMX)	UNITRONIC® BUS CAN UL/CSA (CMX) 1x2x0,22	2170260	PVC		52-60
				UNITRONIC® BUS CAN UL/CSA (CMX) 2x2x0,22	2170261	PVC		52-60
				UNITRONIC® BUS CAN UL/CSA (CMX) 1x2x0,34	2170263	PVC		52-60
				UNITRONIC® BUS CAN UL/CSA (CMX) 2x2x0,34	2170264	PVC		52-60
				UNITRONIC® BUS CAN UL/CSA (CMX) 1x2x0,5	2170266	PVC		52-60
				UNITRONIC® BUS CAN UL/CSA (CMX) 2x2x0,5	2170267	PVC		52-60
				UNITRONIC® BUS CAN UL/CSA (CMX) 1x2x0,75	2170269	PVC		52-60
				UNITRONIC® BUS CAN UL/CSA (CMX) 2x2x0,75	2170270	PVC		52-60
		high flexible	UL/CSA (CMX)	UNITRONIC® BUS FD P CAN UL/CSA (CMX) 1x2x0,25	2170272	PUR	power chain	52-60
				UNITRONIC® BUS FD P CAN UL/CSA (CMX) 2x2x0,25	2170273	PUR	power chain	52-60
				UNITRONIC® BUS FD P CAN UL/CSA (CMX) 1x2x0,34	2170275	PUR	power chain	52-60
				UNITRONIC® BUS FD P CAN UL/CSA (CMX) 2x2x0,34	2170276	PUR	power chain	52-60
				UNITRONIC® BUS FD P CAN UL/CSA (CMX) 1x2x0,5	2170278	PUR	power chain	52-60
				UNITRONIC® BUS FD Y CAN UL/CSA (CMX) 2x2x0,5	2170279	PUR	power chain	52-60
AS-i (AS-INTERFACE)	indoor	static	UL/CSA (CMG)	UNITRONIC® BUS ASI (PVC) YE UL/CSA (CMG)	2170842	PVC		
				UNITRONIC® BUS ASI (PVC) BK UL/CSA (CMG)	2170843	PVC		
			UL/CSA (AWM)	UNITRONIC® BUS ASI (TPE) YE UL/CSA (AWM)	2170830	TPE		
				UNITRONIC® BUS ASI (TPE) BK UL/CSA (AWM)	2170831	TPE		
				UNITRONIC® BUS ASI (G) YE	2170228	G		
				UNITRONIC® BUS ASI (G) BK	2170229	G		
				UNITRONIC® BUS ASI (TPE) YE	2170230	TPE		
				UNITRONIC® BUS ASI (TPE) BK	2170231	TPE		
				UNITRONIC® BUS ASI (PUR) YE	2170201	PUR		
				UNITRONIC® BUS ASI (PUR) BK	2170202	PUR		
				UNITRONIC® BUS ASI (PUR) MARINE YE	2170401	PUR	marine	
				UNITRONIC® BUS ASI (PUR) MARINE BK	2170402	PUR	marine	
SAFETY BUS	indoor	static	UL (AWM)	UNITRONIC® BUS SAFETY PVC FC UL (AWM)	2170895	PVC	Fast Connect	61
				UNITRONIC® BUS SAFETY	2170295	PVC		61
		high flexible		UNITRONIC® BUS FD P SAFETY	2170885	PUR	power chain	61
DeviceNet	indoor	static	UL/CSA (CMG)	UNITRONIC® DeviceNet THICK FRNC UL/CSA (CMG)	2170340	H	halogen free	
				UNITRONIC® DeviceNet THIN FRNC UL/CSA (CMG)	2170341	H	halogen free	
				UNITRONIC® DeviceNet THICK PVC UL/CSA (CMG)	2170342	PVC		
				UNITRONIC® DeviceNet THIN PVC UL/CSA (CMG)	2170343	PVC		
				UNITRONIC® DeviceNet ECO THICK PVC UL/CSA (CMG)	2170362	PVC		
				UNITRONIC® DeviceNet ECO THIN PVC UL/CSA (CMG)	2170363	PVC		
		high flexible	UL/CSA (CMG)	UNITRONIC® FD Y DeviceNet THICK UL/CSA (CMG)	2170346	PVC	power chain	
				UNITRONIC® FD Y DeviceNet THIN UL/CSA (CMG)	2170347	PVC	power chain	
			UL/CSA (CMX)	UNITRONIC® FD P DeviceNet THICK UL/CSA (CMX)	2170344	PVC	power chain	
				UNITRONIC® FD P DeviceNet THIN UL/CSA (CMX)	2170345	PVC	power chain	
EIB (European Installation Bus)	indoor	static		UNITRONIC® BUS EIB	2170240	PVC		
				UNITRONIC® BUS COMBI EIB	2170242	PVC	COMBI	
				UNITRONIC® BUS EIB-H	2170241	H	halogen free	
				UNITRONIC® BUS COMBI EIB-H	2170243	H	COMBI, halogen free	

## BUS Connectors

Connectors		
Nr.	Art. No.	Type
52	21124082	ERbic® CAN Bus S Switch 180
53	21124083	ERbic® CAN Bus S Switch 180 AX
54	21124075	ERbic® CAN Bus S Knoten 90
55	21124078	ERbic® CAN Bus S Termination 90
56	21124081	ERbic® CAN Bus S Node 90 PG
57	21124076	ERbic® CAN Bus S Node 180
58	21124079	ERbic® CAN Bus S Termination 180
59	21124077	ERbic® CAN Bus S Node 90 reversed
60	21124080	ERbic® CAN Bus S Termination 90 reversed
61	21124085	ERbic® Safety Bus p S Node/Termination



# BUS Cables

Bussystem	Installation area	Application/cabling	Approval	Type	Art. No.	Outer sheath material	Special feature	Connectors
InterBus-S	indoor	static	UL/CSA (CMX)	UNITRONIC® BUS IBS UL/CSA (CMX)	2170209	PVC		
				UNITRONIC® BUS P COMBI IBS UL/CSA (CMX)	2170808	PUR	COMBI	
				UNITRONIC® BUS IBS	2170206	PVC		
				UNITRONIC® BUS P COMBI IBS	2170208	PUR	COMBI	
		high flexible	UL/CSA (CMX)	UNITRONIC® BUS FD P IBS UL/CSA (CMX)	2170816	PUR	power chain	
				UNITRONIC® BUS FD P COMBI IBS UL/CSA (CMX)	2170818	PUR	COMBI/power chain	
				UNITRONIC® BUS FD P IBS	2170216	PUR	power chain	
			UNITRONIC® BUS FD P COMBI IBS	2170218	PUR	COMBI/power chain		
	outdoor	static	UL/CSA (CMX)	UNITRONIC® BUS Yv IBS UL/CSA (CMX)	2170807	PVC		
				UNITRONIC® BUS Yv COMBI IBS UL/CSA (CMX)	2170817	PVC	COMBI	
				UNITRONIC® BUS Yv IBS	2170207	PVC		
				UNITRONIC® BUS Yv COMBI IBS	2170217	PVC	COMBI	
Industrial Bussystems 100 - 120 Ω	indoor	static	UL/CSA (CMX)	UNITRONIC® BUS LD UL/CSA (CMX) 1x2x0,22	2170803	PVC		
				UNITRONIC® BUS LD UL/CSA (CMX) 2x2x0,22	2170804	PVC		
				UNITRONIC® BUS LD UL/CSA (CMX) 3x2x0,22	2170805	PVC		
				UNITRONIC® BUS LD 1x2x0,22	2170203	PVC		
				UNITRONIC® BUS LD 2x2x0,22	2170204	PVC		
				UNITRONIC® BUS LD 3x2x0,22	2170205	PVC		
		high flexible	UL/CSA (CMX)	UNITRONIC® BUS FD P LD UL/CSA (CMX) 1x2x0,25	2170813	PUR	power chain	
				UNITRONIC® BUS FD P LD UL/CSA (CMX) 2x2x0,25	2170814	PUR	power chain	
				UNITRONIC® BUS FD P LD UL/CSA (CMX) 3x2x0,25	2170815	PUR	power chain	
				UNITRONIC® BUS FD P LD 1x2x0,25	2170213	PUR	power chain	
				UNITRONIC® BUS FD P LD 2x2x0,25	2170214	PUR	power chain	
				UNITRONIC® BUS FD P LD 3x2x0,25	2170215	PUR	power chain	

## Ethernet in Automation

The Ethernet standard is a permanent fixture in corporate IT departments due to its simplicity. The reason for the acceptance and popularity not only lies in the integrated networking of a company, but rather in the fact that it forms the basic technology for the world's largest network – the Internet. The Ethernet is the world's most-used standard. The advantages of the Ethernet and the related networking are obvious:

- Simple, unlimited expansion possibilities
- Fast commissioning due to simple connection technology with RJ45 or M12
- Dynamic bandwidth adjustment with 10/100 Mbit/s, 1 Gbit/s up to a current 10 Gbit/s
- Networking of various applications areas (Industrial, Factory, Building, Automation, ...)

	Medium	Cable	Installation length
<b>ETHERNET</b>	AUI	-	50 m
	10 Base2	Thin ETHERNET	185 m
	10 Base5	Thick ETHERNET	500 m
	10 Base-T	Twisted Pair	100 m
	10 Base-FL	62.5 µm, 50 µm, Multimode F.O.	2.000 m
<b>Fast ETHERNET</b>	100 Base-TX	Twisted Pair	100 m
	100 Base-FX	62.5 µm, 50 µm, Multimode F.O. FDX	412 m
		62.5 µm, 50 µm, Multimode F.O. HDX	2.000 m
<b>Gigabit ETHERNET</b>	1000 Base-CX	Twinax STP (150 Ω)	25 m
	1000 Base-T	Twisted Pair	100 m
	1000 Base-SX 850 nm	62.5 µm Multimode F.O.	275 m
		50 µm Multimode F.O.	550 m
	1000 Base-LX 1300 nm	62.5 µm Multimode F.O.	550 m
		50 µm Multimode F.O. Singlemode F.O.	550 m 5.000 m
<b>10 Gigabit ETHERNET</b>	10G Base-LX4	Twisted Pair	100 m
	10G Base-LX4 WWDM	Singlemode F.O.	10.000 m
	10G Base-LX4 WWDM	Multimode F.O.	300 m
	10G Base-SR/SW 850 nm	62.5 µm Multimode F.O.	26 m
		50 µm Multimode F.O.	82 m
	10G Base-LR/LW 850 nm	Singlemode F.O.	10.000 m
	10G Base-ER/EW 1550 nm	Singlemode F.O.	40.000 m



# LAN Cables ETHERNET

Automation area	Installation area	Category	Application/cabling	halogen free	Type	Art. No.	Shielding/Outer sheath material	AWG	Special feature	Approval	Connectors	Female (SnapIn)	
Building	indoor	CAT.5e	static	halogen free	UNITRONIC® LAN FTP-H 200 MHz CAT.5e	2170136	FTP	24			25	1	
					UNITRONIC® LAN S-FTP-H 200 MHz CAT.5e	2170138	S-FTP	24			25	1	
					UNITRONIC® LAN S-FTP-H 200 MHz CAT.5e DUPLEX	2170140	S-FTP	24	DUPLEX		25	1	
				non halogen free	UNITRONIC® LAN UTP 200 MHz CAT.5e	2170125	UTP	24			25	1	
					UNITRONIC® LAN FTP 200 MHz CAT.5e	2170126	FTP	24			25	1	
				UNITRONIC® LAN S-FTP 200 MHz CAT.5e	2170128	S-FTP	24			25	1		
				UNITRONIC® LAN S-FTP 200 MHz CAT.5e DUPLEX	2170130	S-FTP	24	DUPLEX		25	1		
			flexible	non halogen free	UNITRONIC® LAN FTP FLEX 200 MHz CAT.5e	2170127	FTP	26			25	2	
					UNITRONIC® LAN S-FTP FLEX 200 MHz CAT.5e	2170129	S-FTP	26			25	2	
				halogen free	UNITRONIC® LAN FTP-H FLEX 200 MHz CAT.5e	2170137	FTP	26			25	2	
				UNITRONIC® LAN S-FTP-H FLEX 200 MHz CAT.5e	2170139	S-FTP	26			25	2		
		CAT.6a		static	non halogen free	UNITRONIC® LAN STP/S PiMF 500 MHz CAT.6a	2170143	STP/S PiMF	23			5	
					UNITRONIC® LAN STP/S PiMF 500 MHz CAT.6a DUPLEX	2170145	STP/S PiMF	23	DUPLEX		5		
			halogen free		UNITRONIC® LAN STP/S-H PiMF 500 MHz CAT.6a	2170147	STP/S PiMF	23			5		
					UNITRONIC® LAN STP/S-H PiMF 500 MHz CAT.6a DUPLEX	2170149	STP/S PiMF	23	DUPLEX		5		
			flexible	non halogen free	UNITRONIC® LAN STP/S PiMF FLEX 500 MHz CAT.6a	2170144	STP/S PiMF	26					
				halogen free	UNITRONIC® LAN STP/S-H PiMF FLEX 500 MHz CAT.6a	2170148	STP/S PiMF	26					
				CAT.7	static	halogen free	UNITRONIC® LAN STP/S-H PiMF 600 MHz CAT.7	2170614	STP/S PiMF	23			6
							UNITRONIC® LAN STP/S-H PiMF 600 MHz CAT.7 DUPLEX	2170634	STP/S PiMF	23	DUPLEX		6
		static	halogen free	UNITRONIC® LAN STP/S-H PiMF 1,2 GHz	2170615	STP/S PiMF	22						
Industrial – 2 pairs	indoor	CAT.5	static	non halogen free	ETHERLINE® Y FC UL/CSA (CMG) CAT.5	2170893	PVC	22	Fast Connect	UL/CSA (CMG)	25	1	
			flexible	halogen free	ETHERLINE® H FLEX CAT.5	2170283	H	26			25	2	
				non halogen free	ETHERLINE® P FLEX CAT.5	2170284	PUR	26			25	2	
			high flexible	non halogen free	ETHERLINE® FD P CAT.5	2170289	PUR	26	power chain		25	2	
					ETHERLINE® FD P FC UL/CSA (CMX) CAT.5	2170894	PUR	22	power chain, Fast Connect		25	1	
		torsion	non halogen free	ETHERLINE® TORSION CAT.5	2170888	PUR	22	torsion	UL/CSA (AWM)	25	1		
		CAT.5e	static	halogen free	ETHERLINE® H CAT.5e	2170280	H	24			25	1	
				non halogen free	ETHERLINE® P CAT.5e	2170281	PUR	24			25	1	
					ETHERLINE® Y UL/CSA CAT.5e	2170891	PVC	22		UL/CSA	25	1	
			flexible	non halogen free	ETHERLINE® Y FLEX FC UL/CSA (CMG) .5e	2170886	PVC	22	Fast Connect	UL/CSA (CMG)	25	1	
	halogen free			ETHERLINE® FRNC HYBRID FLEX UL (AWM) CAT.5e	2170887	H	22	hybrid	UL (AWM)	25	1		
		halogen free	ETHERLINE® MARINE FRNC UL/CSA (CMG) CAT.5e	2170889	H	22	for marine	UL/CSA (CMG), MARINE	25	1			
	outdoor	CAT.5	static	non halogen free	ETHERLINE® Y2Y ARM Type A CAT.5	2170496	PVC	22	arm		25	1	
CAT.5e		static	non halogen free	ETHERLINE® YY CAT.5e	2170494	PVC	22	double sheath		25	1		
Industrial – 4 pairs	indoor	CAT.5	flexible	halogen free	ETHERLINE® H FLEX CAT.5	2170299	H	26			25	2	
				non halogen free	ETHERLINE® P FLEX CAT.5	2170300	PUR	26			25	2	
			high flexible	non halogen free	ETHERLINE® FD P CAT.5	2170489	PUR	26	power chain		25	2	
		CAT.5e	static	halogen free	ETHERLINE® H CAT.5e	2170296	H	24			25	1	
					ETHERLINE® H-H CAT.5e	2170298	H	24	double sheath		25	1	
				non halogen free	ETHERLINE® P CAT.5e	2170297	PUR	24			25	1	
		CAT.6a	static	non halogen free	ETHERLINE® Y PiMF CAT.6a	2170464	PVC	22	PROFINET conform		5		
					ETHERLINE® P PiMF CAT.6a	2170465	PUR	22	PROFINET conform		5		
				halogen free	ETHERLINE® H PiMF CAT.6a	2170466	H	22	PROFINET conform		5		
		CAT.7	static	non halogen free	ETHERLINE® Y PiMF CAT.7	2170474	PVC	22	PROFINET conform		6		
					ETHERLINE® P PiMF CAT.7	2170475	PUR	22	PROFINET conform		6		
				halogen free	ETHERLINE® H PiMF CAT.7	2170476	H	22	PROFINET conform		6		

	Building Automation	Industrial Automation
Installation	<ul style="list-style-type: none"> <li>- Fixed installation in the building</li> <li>- Variable connection of equipment at standard workstations</li> <li>- Mainly radial cabling</li> </ul>	<ul style="list-style-type: none"> <li>- Cabling and cable runs dependent on plant</li> <li>- Connections may be assembled on site, up to IP67</li> <li>- Redundant cabling, often in ring structures</li> </ul>
Data	<ul style="list-style-type: none"> <li>- Large data packages</li> <li>- Moderate network availability</li> <li>- Mainly acyclic transmission</li> <li>- No real-time necessary</li> </ul>	<ul style="list-style-type: none"> <li>- Small data packages</li> <li>- Very high network availability, no down time</li> <li>- Mainly cyclic transmission</li> <li>- Real-time necessary</li> </ul>
Environment	<ul style="list-style-type: none"> <li>- Normal temperature range</li> <li>- Little dust, moisture and vibration</li> <li>- Little mechanical or chemical exposure</li> <li>- Low EMC reliability</li> </ul>	<ul style="list-style-type: none"> <li>- Extended temperature range</li> <li>- Dust, dirt, moisture and vibration possible</li> <li>- Danger of mechanical damage or exposure to chemicals</li> <li>- High EMC reliability</li> </ul>

**New Designations**      **Product Designations**






U/UTP	UTP	Unshielded Twisted Pair
F/UTP	FTP	Foiled Twisted Pair
SF/UTP	S-FTP	Shielded-Foiled Twisted Pair
S/FTP	STP/S PiMF	Shielded Twisted Pair / Shielded Pairs in Metal Foil

According to the type of cable, cables intended for fixed installation have solid conductors (AWG24/1 or AWG23/1 or WG22/1). Flexible cables have 7-wire stranded conductors (Patch cable AWG26/7). DUPLEX cables consist of two individual 4-pair single cables which can be separated as necessary at the installation site. The outer sheaths of the LAN cables are made of PVC, PUR, halogen-free materials, as well as flame retardant according to IEC 60332-1-2.

## Application classes for copper cabling (100 Ω)

Application class	Category	Frequency	Service
Class A	-	100 kHz	Telephone, ISDN
Class B	-	16 MHz	Telephone, ISDN
Class C	CAT.3	26 MHz	Tel,ISDN,TokenRing,Ethernet
Class D	CAT.5	100 MHz	10/100 Base-T
Class D	CAT.5e	125 MHz	10/100/1000 Base-T
Class E	CAT.6	250 MHz	10/100/1000 Base-T
Class F	CAT.6e (Draft CAT.6a)	500 MHz	10/100/1000/10G Base-T
Class F	CAT.7	600 MHz	10/100/1000/10G Base-T
Class G	CAT.7a	1 GHz	10/100/1000/10G Base-T
-	-	1.2 GHz	10/100/1000/10G Base-T

## Connector & Female LAN ETHERNET

Nr.	Art. No.	Type	
<b>SnapIn (Female)</b>			
1	61103	LANmark-5 EVO SnapIn CAT.5e	
2	61102	LANmark-5 EVO SnapIn CAT.5e AWG26	
5	62106	LANmark-6 EVO SnapIn CAT.6 10G	
6	63103	LANmark-7 GG45 SnapIn CAT.7	
7	60795	SnapIn rail mount adapter incl. SnapIn CAT.6	
<b>Connectors (Male)</b>			
25	21700540	Field-Terminable Connector RJ45 CAT.5e FM45	

# Fibre Optical Cables

Fibre type	Automation area	Installation area	Application/cablings	Fibre	Type	Art. No.	halogen free	Outer sheath material	Special feature	Connectors
GOF - Glass Optical Fibre	Industrial & Building	outdoor	static	Multimode	HITRONIC® HQN1500 4 G 50/125	276004	halogen free	PE		1,2
					HITRONIC® HQN1500 8 G 50/125	276008	halogen free	PE		1,2
					HITRONIC® HQN1500 12 G 50/125	276012	halogen free	PE		1,2
					HITRONIC® HQN1500 24 G 50/125	276024	halogen free	PE		1,2
					HITRONIC® HQN1500 4 G 62,5/125	276104	halogen free	PE		1,2
					HITRONIC® HQN1500 8 G 62,5/125	276108	halogen free	PE		1,2
					HITRONIC® HQN1500 12 G 62,5/125	276112	halogen free	PE		1,2
					HITRONIC® HQN1500 24 G 62,5/125	276124	halogen free	PE		1,2
				Singlemode	HITRONIC® HQN1500 8 E 9/125	276208	halogen free	PE		
					HITRONIC® HQN1500 12 E 9/125	276212	halogen free	PE		
	HITRONIC® HQN1500 24 E 9/125	276224	halogen free		PE					
	Building	indoor	static	Multimode	HITRONIC® HIH1000 4 G 50/125	270004	halogen free	FRNC		1,2
					HITRONIC® HIH1000 8 G 50/125	270008	halogen free	FRNC		1,2
					HITRONIC® HIH1000 12 G 50/125	270012	halogen free	FRNC		1,2
					HITRONIC® HIH1000 24 G 50/125	270024	halogen free	FRNC		1,2
					HITRONIC® HIH1000 4 G 62,5/125	270104	halogen free	FRNC		1,2
					HITRONIC® HIH1000 8 G 62,5/125	270108	halogen free	FRNC		1,2
					HITRONIC® HIH1000 12 G 62,5/125	270112	halogen free	FRNC		1,2
					HITRONIC® HIH1000 24 G 62,5/125	270124	halogen free	FRNC		1,2
				Singlemode	HITRONIC® HIH1000 4 E 9/125	270204	halogen free	FRNC		
					HITRONIC® HIH1000 8 E 9/125	270208	halogen free	FRNC		
	HITRONIC® HIH1000 12 E 9/125	270212	halogen free		FRNC					
	HITRONIC® HIH1000 24 E 9/125	270224	halogen free		FRNC					
	Industrial & Building	universal (indoor and outdoor)	static	Multimode	HITRONIC® HUN1500 4 G 50/125	274004	halogen free	FRNC		1,2
					HITRONIC® HUN1500 8 G 50/125	274008	halogen free	FRNC		1,2
					HITRONIC® HUN1500 12 G 50/125	274012	halogen free	FRNC		1,2
					HITRONIC® HUN1500 24 G 50/125	274024	halogen free	FRNC		1,2
					HITRONIC® HUN1500 4 G 62,5/125	274104	halogen free	FRNC		1,2
					HITRONIC® HUN1500 8 G 62,5/125	274108	halogen free	FRNC		1,2
					HITRONIC® HUN1500 12 G 62,5/125	274112	halogen free	FRNC		1,2
					HITRONIC® HUN1500 24 G 62,5/125	274124	halogen free	FRNC		1,2
				Singlemode	HITRONIC® HUN1500 4 E 9/125	274204	halogen free	FRNC		
					HITRONIC® HUN1500 8 E 9/125	274208	halogen free	FRNC		
	HITRONIC® HUN1500 12 E 9/125	274212	halogen free		FRNC					
	HITRONIC® HUN1500 24 E 9/125	274224	halogen free		FRNC					
	Building	Breakout cable (indoor)	static	Multimode	HITRONIC® HRH 2 G 50/125	21806879	halogen free	FRNC		1,2
					HITRONIC® HRH 4 G 50/125	21807090	halogen free	FRNC		1,2
					HITRONIC® HRH 8 G 50/125	21807093	halogen free	FRNC		1,2
					HITRONIC® HRH 12 G 50/125	21807094	halogen free	FRNC		1,2
					HITRONIC® HRH 24 G 50/125	21807041	halogen free	FRNC		1,2
					HITRONIC® HRH 2 G 62,5/125	21806878	halogen free	FRNC		1,2
					HITRONIC® HRH 4 G 62,5/125	21807096	halogen free	FRNC		1,2
					HITRONIC® HRH 8 G 62,5/125	21807098	halogen free	FRNC		1,2
					HITRONIC® HRH 12 G 62,5/125	21807099	halogen free	FRNC		1,2
HITRONIC® HRH 24 G 62,5/125					21807043	halogen free	FRNC		1,2	
Building	Mini-Break-out cable (indoor)	flexible	Multimode	HITRONIC® HDH 4 G 50/125	267004	halogen free	FRNC		1,2	
				HITRONIC® HDH 8 G 50/125	267008	halogen free	FRNC		1,2	
				HITRONIC® HDH 12 G 50/125	267012	halogen free	FRNC		1,2	
				HITRONIC® HDH 4 G 62,5/125	267104	halogen free	FRNC		1,2	
				HITRONIC® HDH 8 G 62,5/125	267108	halogen free	FRNC		1,2	
				HITRONIC® HDH 12 G 62,5/125	267112	halogen free	FRNC		1,2	
Industrial & Building	Mobile cable (indoor and outdoor)	high flexible	Multimode	HITRONIC® FD 4 G 50/125	21807048	halogen free	PUR	power chain	1,2	
				HITRONIC® FD 6 G 50/125	21807047	halogen free	PUR	power chain	1,2	
				HITRONIC® FD 4 G 62,5/125	21807045	halogen free	PUR	power chain	1,2	
				HITRONIC® FD 6 G 62,5/125	21807050	halogen free	PUR	power chain	1,2	

## GOF – Glass Optical Fibre

The Glass Optical Fibre (GOF) consists of a core of the basic material glass. Due to the very low attenuation, GOF is suitable for long distances of up to 80 km depending on the type of fibre used. LEDs are used as transmitters for multimode fibres, while lasers are used for singlemode fibres. GOF cables are mainly used for wiring buildings. They are mainly required in primary and secondary wiring. Termination is complex. With the glass fibres a distinction is made between multimode fibres and singlemode fibres. In addition, a distinction is also made for the multimode fibres between the 50 µm and the 62.5 µm fibres.

## POF – Polymer Optical Fibre

A Polymer Optical Fibre (POF) consists of the core and the cladding of plastic. A POF cable is only suitable for very short distances up to approx. 100 m, as the cable has a high attenuation. The cables are frequently used in the automotive sector (MOST 2), in automation (SERCOS, PROFIBUS etc.) and in lighting technology (information signs).

## PCF – Plastic Cladded Fibre

Plastic Cladded Fibre (PCF) is a mixture of quartz glass and plastic. The core consists of glass and the cladding of plastic. With a total distance of up to 500 m, it is clearly superior to the POF cable. As with POF, a diode acts as a transmitter. POF and PCF are also very similar with regard to termination, which is extremely simple in both cases.



Overview of the advantages of Fibre Optical cables:

- high resistance to tapping
- no EMC interference
- high data transfer rate
- long range
- no potential transfer
- no EMC testing required
- little space required
- low cable weight
- can be installed in a potentially explosive environment

Fibre type	max. attenuation [dB/km]				max. transfer size [m]				Numerical aperture
	660 nm	850 nm	1300 nm	1550 nm	660 nm	850 nm	1300 nm	1550 nm	
POF	160				100 Mbit/s: 60				0.47
PCF	10	8			100 Mbit/s: 550				0.37
GOF MM 50 µm OM2		2.7	0.9			100 Mbit/s: 2.000 1 Gbit/s: 550	100 Mbit/s: 2.000 1 Gbit/s: 550		0.2
GOF MM 50 µm OM3		2.7	0.9			10 Gbit/s: 300	10 Gbit/s: 300		0.2
GOF MM 62.5 µm		3.2	0.9			100 Mbit/s: 2000 1 Gbit/s: 275	100 Mbit/s: 2000 1 Gbit/s: 550		0.27
GOF SM			0.36	0.2			1 Gbit/s: 5.000	1 Gbit/s: 80.000 10 Gbit/s: 40.000	0.1

MM = Multimode, SM = Singlemode

## F.O. Connectors

Nr.	Art. No.	Type	
<b>Connectors</b>			
1	9307	GOF ST Connector 50/62.5 µm	
2	9407	GOF SC Connector 50/62.5 µm	

# Fibre Optical Cables

Fibre type	Automation area	Installation area	Application/cabling	Fibre	Type	Art. No.	halogen free	Outer sheath material	Special feature	Connectors
POF – Polymer Optical Fibre	Industrial & Building	indoor	flexible	Simplex	HITRONIC® POF SIMPLEX PE	2185001	halogen free	PE		3,6,9,12-17,20-22
					HITRONIC® POF SIMPLEX PVC UL	2185201	non halogen free	PVC	UL	3,6,9,12-17,20-22
					HITRONIC® POF SIMPLEX 105 °C XPE	2185202	halogen free	XPE	Temp. range up to 105°C	3,6,9,12-17,20-22
					HITRONIC® POF SIMPLEX PE-PUR	2182030	halogen free	PUR		3,6,9,12-17,20-22
					HITRONIC® POF SIMPLEX S PE-PUR	2185205	halogen free	PUR	for Sercos Systems	4,7,10
					HITRONIC® POF SIMPLEX S PA-PUR	2185204	halogen free	PUR	for Sercos Systems	5,8,11
				Duplex	HITRONIC® POF DUPLEX PE	2185010	halogen free	PE		3,6,9,12,13,18,19,22
					HITRONIC® POF DUPLEX PE-PUR	2185040	halogen free	PUR		3,6,9,12,13,18,19,22
					HITRONIC® POF DUPLEX PE-PVC	2185209	non halogen free	PVC		3,6,9,12,13,18,19,22
					HITRONIC® POF DUPLEX PVC-PVC	2185210	non halogen free	PVC		3,6,9,12,13,18,19,22
					HITRONIC® POF DUPLEX HEAVY PE-PUR	2185211	halogen free	PUR	highly robust	3,6,9,12,13,18,19,22
				Multi Fibre	HITRONIC® POF MULTI FIBRE PE-PVC	3036010	non halogen free	PVC	6 fibres with color coding	3,6,9,12-22
				Hybrid	HITRONIC® HYBRID FD P DESINA®	2186001	halogen free	PUR	hybrid	3,6,9,12,13,18,19,22
				high flexible	Simplex	HITRONIC® POF SIMPLEX FD PE-PUR	2185207	halogen free	PUR	power chain
Duplex	HITRONIC® POF DUPLEX FD PE-PUR	2185213	halogen free		PUR	power chain	3,6,9,12,13,18,19,22			
PCF – Plastic Cladded Fibre	Industrial & Building	indoor	flexible	Duplex	HITRONIC® BUS PCF PUR DUPLEX indoor	2185311	halogen free	PUR		23,24
		outdoor	static	Duplex	HITRONIC® BUS PCF PE DUPLEX outdoor	2185302	halogen free	PE		23,24

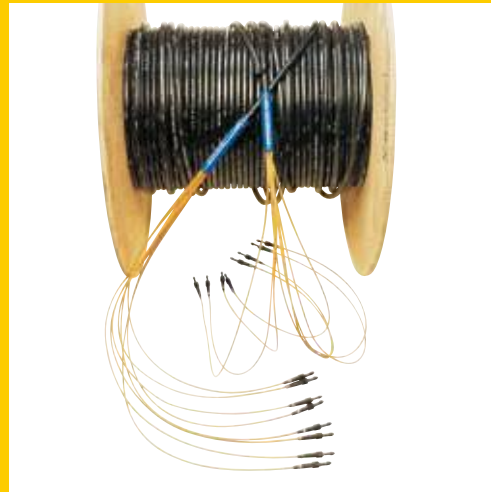


# Trunk systems – tested harnessed fibre optical with connectors.

## Benefits

Using a trunk system offers you the following advantages:

- No costs of special equipment
- No need for highly trained personnel
- Uniform quality thanks to manufacture under laboratory conditions
- Installation is quick, thereby saving costs
- No need to carry out measurements on the cable run, each system comes with OTDR test certificate
- Fan-out elements also available in IP67



## Requirements

The following data are needed to produce your tailor-made trunk system:

- Length of cable run (effective run +3 ... 5 m reserve on each side)
- Fibre type (9  $\mu$ , 50  $\mu$  or 62.5  $\mu$ )
- Number of fibres (2, 4, 6, 8 ... to 48 fibres)
- Plug type (ST, SC, DIN, E-2000 .... including mixed)
- Cable type (indoor, outdoor, rodent protection etc.)

## F.O. Connectors

Nr.	Art. No.	Type	
<b>Connectors</b>			
3	21900178	POF 2.2 F-SMA Crimp-SMA-R metal with spout (knurled nut)	
4	21900040	POF 3.6 F-SMA Crimp-SMA-R metal with spout and crimping ring (knurled nut)	
5	21900070	POF 6.0 F-SMA Crimp-SMA-R metal with spout and crimping ring (knurled nut)	
6	21900174	POF 2.2 F-SMA Crimp-SMA-S metal with spout (hexagonal nut)	
7	21900050	POF 3.6 F-SMA Crimp-SMA-S metal with spout and crimping ring (hexagonal nut)	
8	21900080	POF 6.0 F-SMA Crimp-SMA-S metal with spout and crimping ring (hexagonal nut)	
9	21900179	POF 2.2 F-SMA Clamp-SMA with spout (knurled nut)	
10	21900180	POF 3.6 F-SMA Clamp-SMA with spout (knurled nut)	
11	21900181	POF 6.0 F-SMA Clamp-SMA with spout (knurled nut)	
12	21900172	POF 2.2 B-FOC (ST) Crimp-ST with spout (knurled nut)	
13	21900170	POF 2.2 B-FOC (ST) Clamp-ST with spout (knurled nut)	
14	21900100	POF HFBR-4501-GR Simplex	
15	21900110	POF HFBR-4511-BL Simplex	
16	21900115	POF HFBR-4503-GR Simplex/latch	
17	21900125	POF HFBR-4513-BL Simplex/latch	
18	21900130	POF HFBR-4506-GR Duplex	
19	21900140	POF HFBR-4516-GR Duplex/latch	
20	21900150	POF HFBR-4531-SW Simplex	
21	21900155	POF HFBR-4523-SW Simplex/latch	
22	21900305	POF F-05	
23	21900250	PCF 3.0 Clamp-SMA with spout (knurled nut)	
24	21900260	PCF 3.0 ClampB-FOC (ST) with spout (knurled nut)	