LAPP GROUP

A GUIDE TO CABLING IN FIELDBUS SYSTEMS

Complex automated industrial systems, such as manufacturing assembly lines, require an organized hierarchy of controller systems to function fully. In this hierarchy there is usually a Human Machine Interface (HMI) at the top, where the system is operated and monitored. This is typically linked to a middle layer of programmable logic controllers (PLC) via a non-time-critical communications system (e.g. Ethernet). At the bottom of the control chain is the fieldbus that links the PLCs to the components that actually do the work, such as sensors, actuators, electric motors, console lights, switches, valves and contactors.

Fieldbus works on a network structure that typically allows daisy-chain, star, ring, branch, and tree network topologies. Previously computers were connected using RS-232 (serial connections) by which only two devices could communicate. Whereas fieldbus requires only one communication point at the controller level and then allows multiple (hundreds) of analogue and digital points to be connected at the same time. This reduces both the length of the cable required and the number of cables required.

Overview of the most common bus systems:

AS-Interface (AS-i)

Developed as an inexpensive alternative to the lower fieldbus level (sensor/actuator) of Factory Automation.
Normally used in connection with PROFIBUS, CAN and DeviceNet.

PROFIBUS

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

CAN/CANopen

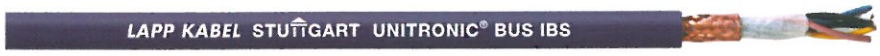
CAN is a message-based protocol, designed specifically for automotive applications but now also used in other areas such as industrial automation and medical equipment.

DeviceNet™

Originally developed by American company Allen-Bradley (Rockwell Automation). Based on the CAN network system used in the automation industry.

INTERBUS®

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



European Installation Bus EIB

Bus system for Building Automation. Operates primarily with low bit rate.

SafetyBUS

The main use of SafetyBUS is the communication of data with safety relevant content. SafetyBUS is found where the data integrity and timely delivery of data is required for the protection against risks.

Advantages of Fieldbus technology over conventional point-to-point wiring:

A significant reduction in installation costs (typically 20% to 40% savings). This saving comes from reduced wiring, connections, junction boxes, marshalling cabinets, cable trays and supports etc.

System expansion and modification is simpler and less expensive since only the additional cable run from the existing network to the new device must be installed.

Two-way communication means that additional information such as calibration and configuration data, diagnostic and test information, device documentation such as device tag numbers; serial numbers service history etc. can be communicated over the network. Equipment maintenance and servicing become more centralised.

Since communication is digital, accuracy is not affected by noise, interference or electrical loading effects. This is a particular advantage in transmitting analogue values.

Application areas for bus cables:

- Factory automation (field busses like Profibus, Interbus, DeviceNet, CAN etc.)
- Plant engineering and construction
- Process automation (chemical, petro-chemical industry etc.)
- Building automation (building management)

Quick Selection Chart

Bus System	Environment	Application	Sheath Material	Approval	Characteristics	Description	Part No.	Suitable Connectors
Bus System	Indoor	Static	PVC			UNITRONIC® BUS PB	2170220	1,2,3,4,5,6,11,12,15,16,17,18
				UL/CSA(CMX)		UNITRONIC® BUS PB A	2170219	1,2,3,4,5,6,11,12,15,16,17,18
				UL/CSA(CMG)	UV Resistant	UNITRONIC® BUS PB 7W A	2170824	1,2,3,4,11,12,15,16,17,18
					Fast Connect, UV Resistant, 7 strands	UNITRONIC® BUS PB 7W FC BK	2170210	8,10,20
				UL/CSA(CMG)	Fast Connect, UV Resistant	UNITRONIC® BUS PB FC	2170820	7,9,13,14,19
				UL/CSA(CMG)	Fast Connect, UV Resistant, 7 strands	UNITRONIC® BUS PB 7W FC	2170826	8,10,20
					COMBI inc 3x1mm² cores	UNITRONIC® BUS PB COMBI	2170225	
					Increased Temperature 105°C	UNITRONIC® BUS PB 105	2170630	1,2,3,4,5,6,11,12,15,16,17,18
			Halogen Free	UL/CSA(CM)	Fast Connect, Halogen Free	UNITRONIC® BUS PB H FC	2170326	7,9,13,14,19
				UL/CSA(CMG)	Fast Connect, Halogen Free	UNITRONIC® BUS PB FRNC FC	2170853	7,9,13,14,19
					Halogen Free	UNITRONIC® BUS PB H 7W	2170226	1,2,3,4,11,12,15,16,17,18
			PUR		Fast Connect, Oil Resistant	UNITRONIC® BUS PB P FC	2170330	7,9,13,14,19
			ROBUST		Higher Chemical Resistant, UV Resistant	UNITRONIC® BUS PB ROBUST	2170620	1,2,3,4,5,6,11,12,15,16,17,18
			PE		Fast Connect, Black, UV Resistant	UNITRONIC® BUS PB PE FC	2170333	7,9,13,14,19
					Food & Beverage use, UV Resistant	UNITRONIC® BUS PB PE	2170233	1,2,3,4,5,6,11,12,15,16,17,18
		High Flexible	PUR		Drag chain suitable, halogen free	UNITRONIC® BUS PB FD P	2170222	1,2,3,4,11,12,15,16,17,18
				UL/CSA(CMX)	Drag chain suitable, halogen free	UNITRONIC® BUS PB FD P A	2170822	1,2,3,4,11,12,15,16,17,18
				UL/CSA(CMX)	Fast Connect, drag chain suitable	UNITRONIC® BUS PB PD P FC	2170322	8,10,20
					Drag chain suitable, COMBI inc 3x1mm²	UNITRONIC® BUS PB FD P COMBI	2170227	
					Drag chain suitable, COMBI inc 4x1.5mm² cores	UNITRONIC® BUS PBFD P HYBRID	2170495	
			PVC	UL/CSA(CMG)	Drag chain suitable, UV Resis,COMBI inc 4x1.5mm²	UNITRONIC® BUS PB FD Y HYBRID	2170875	
			FRNC	UL/CSA(CMG)	Fast Connect, drag chain suitable, halogen free	UNITRONIC® BUS PB FD FRNC FC	2170854	8,10,20
		Torsion	PUR	UL/CSA(CMX)	Torsion resistant, halogen-free	UNITRONIC® BUS PB TORSION	2170332	1,2,3,4,11,12,15,16,17,18
		Festoon	PVC	UL/CSA(CMG)	Cable trolley festoon, UV Resistant	UNITRONIC® BUS PB FESTOON	2170331	1,2,3,4,11,12,15,16,17,18
	Outdoor	Static	PVC		UV Resistant, armoured	UNITRONIC® BUS PB ARM	2170247	
					UV Resistant, black, burial	UNITRONIC® BUS PB Yv	2170223	
					UV Resistant, black, burial	UNITRONIC® BUS PB YY	2170236	1,2,3,4,5,6,11,12,15,16,17,18
			PVC/PE		Fast connect, UV Resistant	UNITRONIC® BUS PB PB BURIAL FC	2170323	7,9,13,14,19

Profibus PA (100Ω)	Indoor	Static	PVC		EX Area,Blue	UNITRONIC® BUS PA BU	2170234
	Indoor/ Outdoor				UV Resistant, Black	UNITRONIC® BUS PA BK	2170235
				UL/CSA(CMG)	Fast Connect, UV Resistant, Blue	UNITRONIC® BUS PA FC (BU) 1x2x1	2170334
					Fast Connect, UV Resistant, Black	UNITRONIC® BUS PA FC (BK) 1x2x1	2170335

Bus System	Environment	Application	Sheath Material	Approval	Characteristics	Description	Part No.
CAN CANopen (120Ω)	Indoor	Static	PVC	UL/CSA(CMG)	Vibration resistant	UNITRONIC® BUS CAN 1x2x0.22mm	2170260
						UNITRONIC® BUS CAN 2x2x0.22mm	2170261
						UNITRONIC® BUS CAN 1x2x0.34mm	2170263
						UNITRONIC® BUS CAN 2x2x0.34mm	2170264
						UNITRONIC® BUS CAN 1x2x0.5mm	2170266
						UNITRONIC® BUS CAN 2x2x0.5mm	2170267
						UNITRONIC® BUS CAN 1x2x0.75mm	2170269
						UNITRONIC® BUS CAN 2x2x0.75mm	2170270
		High Flexible	PUR	UL/CSA(CMG)	Drag chain suitable, oil resistant, halogen free	UNITRONIC® BUS CAN FD P 1x2x0.25mm	2170272
						UNITRONIC® BUS CAN FD P 2x2x0.25mm	2170273
						UNITRONIC® BUS CAN FD P 1x2x0.34mm	2170275
						UNITRONIC® BUS CAN FD P 2x2x0.34mm	2170276
						UNITRONIC® BUS CAN FD P 1x2x0.5mm	2170278
						UNITRONIC® BUS CAN FD P 2x2x0.5mm	2170279

DeviceNet (120Ω)	Indoor	Static	FRNC	UL/CSA(CMG)	Vibration resistant, halogen free, UV Resistant	UNITRONIC® BUS DN Thick FRNC	2170340
						UNITRONIC® BUS DN Thin FRNC	2170341
			PVC	UL/CSA(CMG)	Vibration resistant, oil resistant, UV Resistant	UNITRONIC® BUS DN Thick Y	2170342
						UNITRONIC® BUS DN Thin Y	2170343
				UL/CSA(CMG)	Vibration resistant, UV Resistant	UNITRONIC® BUS DN Thick Y ECO	2170362
						UNITRONIC® BUS DN Thin Y ECO	2170363
		High Flexible	PUR	UL/CSA(CMX)	Drag chain suitable, halogen free, UV Resistant	UNITRONIC® BUS DN Thick FD P	2170344
						UNITRONIC® BUS DN Thin FD P	2170345
			PVC	UL/CSA(CMG)	Drag chain suitable, oil resistant, UV Resistant	UNITRONIC® BUS DN Thick FD Y	2170346
						UNITRONIC® BUS DN Thin FD Y	2170347

AS-Interface (AS-I) (70-140Ω)	Indoor	Static	EPDM (Rubber)		Food & Beverage Industry, Halogen-free	UNITRONIC® ASI (G) Yellow	2170228
						UNITRONIC® ASI (G) Black	2170229
			TPE		Oil resistant, cold flexible	UNITRONIC® ASI (TPE) Yellow	2170230
						UNITRONIC® ASI (TPE) Black	2170231
			PUR		Oil resistant, cold flexible	UNITRONIC® ASI (PUR) Yellow	2170201
						UNITRONIC® ASI (PUR) Black	2170202
			PVC	UL/CSA(CMX)	Oil resistant	UNITRONIC® ASI (PVC) A Yellow	2170842
						UNITRONIC® ASI (PVC) A Black	2170843
		High Flexible	TPE		Drag chain suitable, halogen-free	UNITRONIC® ASI FD P Yellow	2170306
						UNITRONIC® ASI FD P Black	2170307
			PVC	UL(AWM) CSA	Drag chain suitable, halogen-free, 105°C	UNITRONIC® ASI FD (TPE) A Yellow	2170830
						UNITRONIC® ASI FD (TPE) A Black	2170831

RS485, RS422 Bus System (100-120Ω)	Indoor	Static	PVC			UNITRONIC® BUS LD 1x2x0.22	2170203
						UNITRONIC® BUS LD 2x2x0.22	2170204
						UNITRONIC® BUS LD 3x2x0.22	2170205
				UL/CSA(CMX)		UNITRONIC® BUS LD A 1x2x0.22	2170803
						UNITRONIC® BUS LD A 2x2x0.22	2170804
						UNITRONIC® BUS LD A 3x2x0.22	2170805
		High Flexible	PUR		Drag chain suitable, oil resistant	UNITRONIC® BUS LD FD P 1x2x0.25	2170213
						UNITRONIC® BUS LD FD P 2x2x0.25	2170214
						UNITRONIC® BUS LD FD P 3x2x0.25	2170215
				UL/CSA(CMX)	Drag chain suitable, oil resistant	UNITRONIC® BUS LD FD P A 1x2x0.25	2170813
						UNITRONIC® BUS LD FD P A 2x2x0.25	2170814
						UNITRONIC® BUS LD FD P A 3x2x0.25	2170815

Fieldbus Foundation™ (100Ω)	Indoor/ Outdoor	Flexible	PVC	UL/CSA(CMG)	105°C, UV-Resistant, yellow	UNITRONIC® BUS FF 3	2170350
					105°C, UV-Resistant, yellow	UNITRONIC® BUS FF 2	2170352
		Static			105°C, UV-Resistant, Armoured yellow	UNITRONIC® BUS FF 3 ARM Yellow	2170351
					105°C, UV-Resistant, Armoured Blue	UNITRONIC® BUS FF 3 ARM Blue	2170353

CC-Link (110Ω)	Indoor	Flexible	PVC	UL(CM) CLPA	UV-Resistant	UNITRONIC® BUS CC	2170360
	Indoor	High Flexible	PUR	UL (AWM)	Drag chain suitable, halogen-free	UNITRONIC® BUS CC FD P FRNC	2170370

SafetyBUS (120Ω)	Indoor	Static	Halogen Free		Halogen-free, vibration resistant	UNITRONIC® BUS Safety	2170295
			PVC	UL(AWM)	Fast Connect, vibration resistant	UNITRONIC® BUS Safety FC	2170895
		High Flexible	PUR		Drag chain suitable, halogen-free	UNITRONIC® BUS Safety FD P	2170885

INTERBUS (100Ω)	Indoor	Static	PVC		Vibration resistant	UNITRONIC® BUS IBS	2170206
				UL/CSA(CMX)	Vibration resistant	UNITRONIC® BUS IBS A	2170209
			PUR		Vibration resistant, COMBI 3x1mm	UNITRONIC® BUS IBS P COMBI	2170208
		High Flexible	PUR		Drag chain suitable	UNITRONIC® BUS IBS FD P	2170216
					Drag chain suitable, COMBI 3x1mm	UNITRONIC® BUS IBS FD P COMBI	2170218
				UL/CSA(CMX)	Drag chain suitable, COMBI 3x1mm	UNITRONIC® BUS IBS FD P COMBI A	2170818
	Outdoor	Static	PVC		Vibration resistant	UNITRONIC® BUS IBS Yv	2170207
					Vibration resistant	UNITRONIC® BUS IBS Yv COMBI	2170217

European Installation Bus EIB/ KNX	Indoor	Static	PVC			UNITRONIC® BUS EIB	2170240
			Halogen Free		Halogen-free	UNITRONIC® BUS EIB H	2170241
			PVC		Combi 3x1.5mm	UNITRONIC® BUS EIB COMBI	2170242

Connectors for PROFBUS Cables

No.	Cable Type	Core Dimension	Description	Part No.
EPIC Data-PB-90-PG-ST				
1	Solid +Flexible	≤ 1mm²	EPIC Data-PB-35	21700507
2	Solid +Flexible	≤ 1mm²	EPIC Data-PB-35-PG	21700506
3	Solid +Flexible	≤ 1mm²	EPIC Data-PB-90	21700504
4	Solid +Flexible	≤ 1mm²	EPIC Data-PB-90-PG	21700503
5	Solid	≤ 0.5mm²	EPIC Data-PB-90-ST	21700509
6	Solid	≤ 0.5mm²	EPIC Data-PB-90-PG-ST	21700508
7	Solid	0.64mm	EPIC Data-PB-90-FC	21700502
8	Flexible	0.64mm	EPIC Data-PB-90-FC-FLEX	21700528
9	Solid	0.64mm	EPIC Data-PB-90-PG-FC	21700501
10	Flexible	0.64mm	EPIC Data-PB-90-PG-FC-FLEX	21700527
11	Solid +Flexible	≤ 1mm²	EPIC Data-PB-90-LED	21700530
12	Solid +Flexible	≤ 1mm²	EPIC Data-PB-90-PG-LED	21700529
13	Solid	0.64mm	EPIC Data-PB-90-LED-FC	21700547
14	Solid	0.64mm	EPIC Data-PB-90-PG-LED-FC	21700546
15	Solid +Flexible	≤ 1mm²	EPIC Data-PB-90-ATEX	21700543
16	Solid +Flexible	≤ 1mm²	EPIC Data-PB-90-PG-ATEX	21700542
17	Solid +Flexible	≤ 1mm²	EPIC Data-PB-90-RP-PG	21700541
18	Solid +Flexible	≤ 1mm²	EPIC Data-PB-AX	21700505
19	Solid	0.64mm	EPIC Data-PB-AX-FC	21700544
20	Flexible	0.64mm	EPIC Data-PB-AX-FC-FLEX	21700545

Legend –

35	35 degree	PG	Programmable service port
90	90 degree	PB	PROFIBUS
ATEX	Explosive Atmospheres	RP	Repeater
ST	Spring type	FC	Fast Connect

Stripping Tools

DATA STRIP stripping tool is a precise tool with a 9 position settings to ensure an exact strip depth of the outer sheath therefore not damaging the screen or cores internally. Simple press the tool together, to open the tool and then insert the cable, turn the tool and pull the outer sheath off.

FC STRIP is a stripping tool for all Fast Connect BUS cables, which strips the outer sheath and screening braid in one easy step to save time and ensure no cable damage. Suitable for outer diameters from 2.5mm up to 8mm. Replacement blades are also available.

For more information on all our products suitable for the renewable energy markets, please visit our website www.lappgroup.co.uk

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