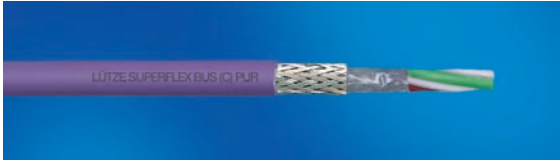


## 4. BUS and network cables



# PUR BUS conductors · c-track compatible

## LÜTZE SUPERFLEX® BUS (C) PUR Profibus



### Application

- For the cabling of industrial field bus systems like PROFIBUS DP, SINEC L2, F.I.P.
- For continuous flexible use e.g. in c-tracks or free movement in automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance
- Free from paint wetting disruptive substances (LABS-free), RoHS-compliant

### Technical data

Impedance	150 Ω ± 15 %
Loop resistance	<155 Ω/km
Operating capacitance	< 30 pF/m
Voltage	
Signal	250 V
Supply	300 V
Test voltage	
Signal	1500 V
Supply	3000 V
Temperature range	
moving	-20 °C to +80 °C
fixed	-40 °C to +80 °C
Minimum bending radius	
moving	Cable diameter × 15
fixed	Cable diameter × 7.5
Burning behaviour	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1; UL 1581 section VW-1 Flame-Test; CSA FT 1
Halogen-free	according to DIN EN 50264-1; EN 50267-2-1 and EN 60684-2
Approvals	UL approval 60 °C 30 V (see UL article designation)
Note	<b>Instructions for laying of c-track lines in Chapter 2 of catalogue TK1.</b>

### Design

- Bare copper wire
- Braid according to AWG  
Braid AWG 24/19 = 0.64 mm Ø
- Conductor insulation special polyolefin
- Stranding with filler
- ST static shield
- Meshwork from tinned copper wire braid, optical covering ≥ 85 %
- Special PUR, matt, adhesion-free surface
- Jacket colour violet, RAL 4001

Part-No.	Number of strands/cross-section/ strand colours	Outer-Ø approx. mm	Weight kg/100 m	Cu-Index kg/100 m
104215	(1×2×0.64/AWG24/19)StC red, green	8.0	6.7	2.0
104265	(1×2×0.64/AWG24/19)StC <b>UL</b> red, green	8.0	5.5	2.3
104275	(1×2×0.64/AWG24/19+3×0.75)StC <b>UL</b> red, green blue, black greenyellow	9.8	14.4	6.6
<b>With inside jacket, easy stripping</b>				
104287	(1×2×0.64/AWG24/19)StC FC <b>UL</b> red, green	8.0	8.5	2.0

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

# Bus cables for Profibus

## LÜTZE ELECTRONIC BUS (C) Profibus



### Application

- For the cabling of industrial field bus systems like PROFIBUS DP, SINEC L2, F.I.P.
- With solid conductor AWG22/1 for hard wiring or with stranded conductor for moving use without compulsory guide in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance
- Free from paint wetting disruptive substances (LABS-free), RoHS-compliant

### Technical data

Impedance	150 Ω ± 15 %
Loop resistance	
Braid AWG 22/7= 0.34 <sup>2</sup>	<110 Ω/km
Wire AWG 22/1= 0.34 <sup>2</sup>	<110 Ω/km
Braid AWG 24/19= 0.24 <sup>2</sup>	<155 Ω/km
Operating capacitance	< 30 pF/m
Voltage	
Signal	250 V
Supply	300 V
Test voltage	
Signal	1500 V
Supply	3000 V
Temperature range	
moving	-5 °C to +70 °C
fixed	-30 °C to +80 °C
Minimum bending radius	
moving	Cable diameter × 12
fixed	Cable diameter × 6
Burning behaviour	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1; UL 1581 section VW-1 Flame-Test; CSA FT 1
Approvals	UL approval 60 °C 30 V (see UL article designation)

### Design

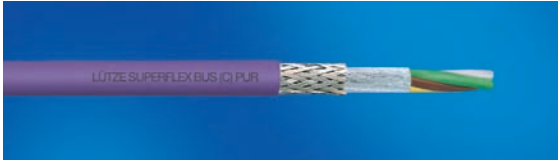
- Bare copper wire
- Braid according to AWG or DIN, solid wire according to DIN
- Braid AWG22/7 0.34 mm<sup>2</sup> = 0.75 mm ∅  
Wire AWG22/1 0.34 mm<sup>2</sup> = 0.64 mm ∅  
Braid AWG24/19 0.24 mm<sup>2</sup> = 0.64 mm ∅
- Conductor insulation special polyolefin
- Stranding with filler
- ST static shield
- Galvanised copper wire braid, optical coverage ≥ 85 %
- Jacket special thermoplastic, matt, adhesion-free surface  
PUR for industrial environment, halogen-free  
HM = halogen-free, flame-retardant, low smoke  
PE for food areas, halogen-free  
Mod-PE can be laid in earth
- Jacket colour violet RAL 4001 or black RAL 9005

Part-No.	Number of strands/cross-section/ strand colours	Jacket colour	Outer-∅ approx. mm	Weight kg/100 m	Cu-Index kg/100 m
104214	(1×2×0.64/AWG22/7)StC red, green	PVC violet	7.9	5.3	2.5
104292	(1×2×0.64/AWG22/1)StC red, green	PVC violet	8.1	7.4	2.3
104264	(1×2×0.64/AWG24/19)StC <b>UL</b> red, green	PVC violet	7.9	5.3	2.5
104224	(1×2×0.64/AWG22/7+3×0.75)StC red, green blue, black greenyellow	PVC violet	10.7	14.4	5.7
104290	(1×2×0.64/AWG22/1)StC red, green	PE black	8.0	5.3	2.5
<b>With inside jacket, machinable peel off</b>					
104267	(1×2×0.64/AWG22/1)StC FC red, green	HM violet	8.0	8.8	3.5
104251	(1×2×0.64/AWG22/1)StC FC red, green	PUR violet	8.0	8.8	3.5
104284	(1×2×0.64/AWG22/1)StC FC red, green	Mod-PE black	10.0	12.6	3.5
104291	(1×2×0.64/AWG22/1)StC FC red, green	PE black	8.0	8.8	3.5
104293	(1×2×0.64/AWG22/1)StC FC <b>UL</b> red, green	PVC violet	8.1	9.1	1.9

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

# PUR BUS conductors · c-track compatible

## LÜTZE SUPERFLEX® BUS (C)PUR CAN-BUS, INTERBUS



### Application

- For wiring of industrial field bus systems such as CAN-BUS and INTERBUS-S
- For continuous flexible use e.g. in c-tracks or free movement in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance
- Free from paint wetting disruptive substances (LABS-free), RoHS-compliant

### Technical data

Impedance	100 or 120 Ω
Loop resistance	
Braid AWG 24/19= 0.24 <sup>2</sup>	<155 Ω/km
Braid DIN 0.25 <sup>2</sup>	<145 Ω/km
Braid DIN 1.0 <sup>2</sup>	<41 Ω/km
Operating capacitance	< 60 pF/m
Voltage	
Signal	300 V
Supply	300 V
Test voltage	
Signal	3000 V
Supply	3000 V
Temperature range	
moving	-20 °C to +80 °C
fixed	-40 °C to +80 °C
Minimum bending radius	
moving	Cable diameter × 12
fixed	Cable diameter × 6
Burning behaviour	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1; UL 1581 section VW-1 Flame-Test; CSA FT 1
Halogen-free	according to DIN EN 50264-1; EN 50267-2-1 and EN 60684-2
Approvals	UL approval 80°C 300 V (see UL article designation)
Note	<b>Instructions for laying of c-track lines in Chapter 2 of catalogue TK1.</b>

### Design

- Bare copper wire
- Wire according to AWG or DIN
- Conductor insulation special polyolefin
- Conductors stranded pairs, foil banding
- Galvanised copper wire braid, optical coverage ≥ 85 %
- Jacket special-PUR, matt, adhesion-free surface
- Jacket colour violet RAL 4001

Part-No.	Number of strands/cross-section/ strand colours	Outer-∅ approx. mm	Weight kg/100 m	Cu-Index kg/100 m
<b>CAN-BUS</b>				
<b>Impedance 120 Ω</b>				
104202	(1×2×0.25) white/brown	6.1	3.2	2.1
104220	(2×2×0.25/AWG24/19) Star quad Transmission pair: white-brown; green-yellow	6.0	6.7	2.7
104210	(1×2×0.25+3G1.0) BUS: white, brown Supply: red, blue, greenyellow	7.5	11.0	5.1
104252	(1×2×0.25/AWG24/19) <b>UL</b> white/brown	6.1	3.2	2.1
104270	(2×2×0.25/AWG24/19) <b>UL</b> Star quad Transmission pair: white-brown; green-yellow	6.0	5.8	2.4
<b>INTERBUS</b>				
<b>impedance 100 Ω</b>				
104208	(3×2×0.25) white/brown; green/yellow; grey/pink	7.7	6.0	3.3
104211	(1×2×1.0) Jacket colour black with white numbers Connector black with white numbers	6.8	8.8	3.0
104258	(3×2×0.25/AWG24/19) <b>UL</b> white/brown; green/yellow; grey/pink	7.8	6.0	3.3
104259	(3×2×0.25/AWG24/19+3G1.0) <b>UL</b> white/brown; green/yellow; grey/pink; blue, red, greenyellow	8.3	13.9	8.8

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

# PVC BUS conductors

## LÜTZE ELECTRONIC BUS (C) Y CAN-BUS, INTERBUS



CANopen



### Application

- For wiring of industrial field bus systems such as CAN-BUS and INTERBUS-S
- For hard wiring or moving use without compulsory guide in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- High active and passive interference resistance
- Free from paint wetting disruptive substances (LABS-free), RoHS-compliant

### Technical data

Impedance	100 or 120 Ω
Loop resistance	
Braid AWG 24/7= 0.22 <sup>2</sup>	<165 Ω/km
Braid 0.34 <sup>2</sup>	<110 Ω/km
Operating capacitance	< 60 pF/m
Rated voltage	300 V
Test voltage	1500 V
Temperature range	
moving	-5 °C to +70 °C
fixed	-30 °C to +80 °C
Minimum bending radius	
moving	Cable diameter × 12
fixed	Cable diameter × 6
Burning behaviour	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1

### Design

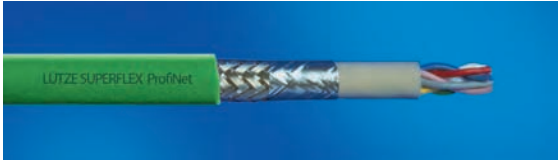
- Bare copper wire
- Wire according to AWG or DIN
- Conductor insulation special polyolefin
- Conductors stranded pairs, foil banding
- Galvanised copper wire braid, optical coverage ≥ 85 %
- Jacket special PVC TM2 according to HD21.1, matt, adhesion-free surface
- Jacket colour violet RAL 4001

Part-No.	Number of strands/cross-section/ strand colours	Outer-Ø approx. mm	Weight kg/100 m	Cu-Index kg/100 m
<b>CAN-BUS</b>				
<b>Impedance 120 Ω</b>				
104205	(1×2×0.22/AWG24/7) white/brown	4.7	5.3	2.5
104206	(2×2×0.22/AWG24/7) white/brown, green/yellow	7.0	4.3	2.4
104238	(2×2×0.34) white/brown; green/yellow	10.5	11.8	4.7
<b>INTERBUS</b>				
<b>impedance 100 Ω</b>				
104207	(3×2×0.22/AWG24/7) white/brown, green/yellow, grey/pink	7.5	5.5	3.2

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

# BUS conductors · c-track compatible

## LÜTZE SUPERFLEX<sup>®</sup> ETHERNET BUS (C) PUR



### Application

- For the cabling of industrial field bus systems with the globally accepted TCP/IP protocol
- Applicable in automation technology, transport and conveyor technology, machine tool manufacture
- For continuous flexible application e.g. in c-tracks or free movement

### Properties

- High active and passive interference resistance
- Free from paint wetting disruptive substances (LABS-free), RoHS-compliant

### Technical data

Impedance	100 Ω ± 10 % (1–100 MHz)
Loop resistance	
Braid AWG 23/19= 0.30 <sup>2</sup>	<130 Ω/km
Braid AWG 24/19= 0.24 <sup>2</sup>	<155 Ω/km
Braid AWG 26/19= 0.14 <sup>2</sup>	<280 Ω/km
Braid AWG 22/7= 0.34 <sup>2</sup>	<110 Ω/km
Operating capacitance	< 50 pF/m
Rated voltage	250 V
Test voltage	1500 V
Temperature range	
moving	-25 °C to +70 °C
fixed	-40 °C to +80 °C
Minimum bending radius	
moving	Cable diameter × 12
fixed	Cable diameter × 6
Burning behaviour	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1; UL 1581 section VW-1 Flame-Test; CSA FT 1
Halogen-free	according to DIN EN 50264-1; EN 50267-2-1 and EN 60684-2
Approvals	UL approval 30 V 80°C (see article designation UL)
Note	<b>Instructions for laying of c-track lines in Chapter 2 of catalogue TK1.</b>

### Design

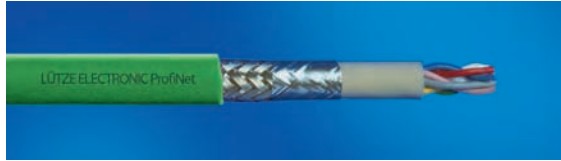
- Bare copper wire
- Braid according to AWG
- Conductor insulation special polyolefin
- ST static shield
- Halogen-free inside jacket
- Galvanised copper wire braid, optical coverage ≥ 85 %
- Jacket special-PUR, matt, adhesion-free surface
- Jacket colour violet RAL 4001; green RAL 6018; black RAL 9005

Part-No.	Number of strands/cross-section/ strand colours	Jacket colour	Outer-∅ approx. mm	Weight kg/100 m	Cu-Index kg/100 m
<b>SUPERFLEX Fast Ethernet / ProfiNet</b>					
104304	(2×2×AWG23/19)StC Cat5 UL Star quad; ProfiNet Transmission pair white/blue; yellow/ orange	PUR green	6.6	7.5	3.7
104246	(4×2×AWG24/19) Cat5 UL white/brown, green/yellow, grey/pink, blue/red	PUR violet	9.6	12.5	5.7
104245	(2×2×AWG24/19) Cat5 UL Star quad Transmission pair white/brown; green/ yellow	PUR violet	6.1	6.5	3.7
104242	(4×2×AWG24/19) Cat5 white/brown; green/yellow; grey/pink; blue/red	PUR violet	9.6	12.5	5.7
104241	(2×2×AWG24/19) Cat5 Star quad Transmission pair white/brown; green/ yellow	PUR violet	6.1	6.5	3.7
104303	(2×2×AWG22/7)StC Cat5 UL Star quad; ProfiNet Transmission pair white/blue; yellow/ orange	PUR green	6.5	6.1	3.1
104326	(4×2×AWG26/19) Cat5e whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	PUR green	6.3	5.2	3.0
104337	(4×2×AWG24/19) Cat5e whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	PUR green	7.8	6.8	5.5
<b>For Siemens Drive-Cliq<sup>®</sup> system</b>					
104310	(2×2×AWG26+2×AWG22)	PUR green	6.8	7.3	3.4
104328	(2×2×AWG24+2×AWG22)	PUR black	6.8	7.3	3.8

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# BUS cables

## LÜTZE ELECTRONIC ETHERNET BUS (C) PUR LÜTZE ELECTRONIC ETHERNET BUS (C) PVC



### Application

- For the cabling of industrial field bus systems with the globally accepted TCP/IP protocol
- Applicable in automation technology, transport and conveyor technology, machine tool manufacture
- For continuous flexible application e.g. in c-tracks or free movement

### Properties

- High active and passive interference resistance
- Free from paint wetting disruptive substances (LABS-free), RoHS-compliant

### Technical data

Impedance	100 Ω ± 10 % (1–100 MHz)
Loop resistance	
Wire AWG 22/1= 0.34 <sup>2</sup>	<110 Ω/km
Braid AWG 24/7= 0.22 <sup>2</sup>	<165 Ω/km
Braid AWG 26/7=0.14 <sup>2</sup>	<273 Ω/km
Operating capacitance	< 50 pF/m
Rated voltage	250 V
Test voltage	1500 V
Temperature range	
moving	-5 °C to +70 °C
run	-30 °C to +80 °C
Minimum bending radius	
moving	Cable diameter × 12
fixed	Cable diameter × 6
Burning behaviour	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1; UL 1581 section VW-1 Flame-Test; CSA FT 1
Halogen-free	according to DIN EN 50264-1; EN 50267-2-1 and EN 60684-2
Approvals	UL approval 30 V 80 °C (see article designation <b>UL</b> )

### Design

- Bare copper wire
- Braid according to AWG
- Conductor insulation special polyolefin
- ST static shield
- Galvanised copper wire braid, optical coverage ≥ 85 %
- Jacket special-PUR, matt, adhesion-free surface or PVC
- Jacket colour violet RAL 4001; green RAL 6018

Part-No.	Number of strands/cross-section/ strand colours	Jacket colour	Outer-∅ approx. mm	Weight kg/100 m	Cu-Index kg/100 m
<b>ELECTRONIC Fast Ethernet / ProfiNet</b>					
104247	(2×2×0.22/AWG24/7) Cat5 <b>UL</b> Star quad Transmission pair white/brown; green/ yellow	PUR violet	6.1	6.5	2.5
104243	(2×2×0.22/AWG24/7) Cat5 Star quad Transmission pair white/brown; green/ yellow	PUR violet	6.1	6.5	2.5
104301	(2×2×0.64/AWG22/1)StC Cat5 <b>UL</b> Star quad, FC, ProfiNet type A Transmission pair white/blue, yellow/ orange	PVC green	6.5	6.5	3.7
104307	(2×2×0.34/AWG22/7)StC Cat5 <b>UL</b> Star quad, FC, ProfiNet type B Transmission pair white/blue, yellow/ orange	PVC green	6.5	6.5	3.1
104327	(4×2×AWG26/7 StC) Cat5e whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	PUR green	6.3	5.0	3.0
104335	(4×2×AWG26/7 StC) Cat5e whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	PVC green	6.3	5.4	3.0
104336	(4×2×AWG24/7 StC) Cat5e whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	PVC green	7.6	6.7	5.5
104338	(4×(2×AWG26/7)StC) Cat6 whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	PVC green	6.4	5.3	3.3
104339	(4×(2×AWG26/7)StC) Cat7 whiteblue/blue, whiteorange/orange, whitegreen/green, whitebrown/brown	PUR green	7.0	6.1	3.3
<b>For Siemens Drive-Cliq® system</b>					
104313	(2×2×AWG26+2×AWG22)	PVC green	6.8	7.3	3.4
104311	(2×2×AWG26+2×AWG22)	PUR green	6.8	7.3	3.4

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

# PUR BUS conductors · c-track compatible

## LÜTZE SUPERFLEX® DeviceNet™ (C) PUR



### Application

- For the wiring of industrial devices, sensors, control devices (SPS), valves
- DeviceNet™ is the leading BUS system for industry automation in the USA
- For continuous flexible application e.g. in c-tracks or free movement in the automation technology, transport and conveyor technology, machine tool manufacture

### Properties

- 2-pair cable: The pair with the smaller cross section serves for the data transmission, the pair with the larger cross section is for the power supply
- High active and passive interference resistance through double shielding (StC)
- Free from silicon paint wetting disruptive substances (LABS-free)
- RoHS-compliant

### Technical data

Impedance	120 Ω ± 10 %
Operating capacitance	< 40 pF/m
Rated voltage	300 V
Test voltage	3000 V
Temperature range	
moving	-20 °C to +80 °C
fixed	-40 °C to +80 °C
Minimum bending radius	
moving	Cable diameter × 12
fixed	Cable diameter × 6
Burning behaviour	Flame-retardant according to VDE 0482 part 265-2; IEC 60332-1; UL 1581 section VW-1 Flame-Test; CSA FT 1
Halogen-free	according to DIN EN 50264-1; EN 50267-2-1 and EN 60684-2
Approvals	UL approvals 300 V 80°C
Note	<b>Instructions for laying of c-track lines in Chapter 2 of catalogue TK1.</b>

### Design

- Bare copper wire
- Conductor insulation special polyolefin
- BUS element statically shielded
- Overall shield: static shield (foil) braid from galvanised Cu wire, optical coverage ≥ 85 %
- Jacket special-PUR, matt, adhesion-free surface
- Jacket colour violet RAL 4001

Part-No.	Number of strands/cross-section/ strand colours	Outer-Ø approx. mm	Weight kg/100 m	Cu-Index kg/100 m
104279	((2×2)+(2×2))StC-Thick 0.75: blue, white 1.5: red, black	11.9	21.5	7.1
104289	((2×2)+(2×2))StC-Thin 0.22: blue, white 0.34: red, black	6.8	8.5	2.8

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# BUS cables

## LÜTZE ELECTRONIC ASI BUS



### Application

- System cables for connection of actuator interface components
- Application in the automation technology, in tool and machine construction, plants and device construction, transport and conveyor technology

### Properties

- Inverse-polarity-proof flat cable
- Fast contacting through penetration technology
- In the TPE design especially suitable in areas in which oils, greases and cooling lubricants occur
- Free from paint wetting disruptive substances (LABS-free), RoHS-compliant

### Technical data

Rated voltage	300 V
Test voltage	2000 V
Temperature range	
EPDM moving	-30 °C to +85 °C
EPDM fixed	-40 °C to +85 °C
PUR moving	-30 °C to +80 °C
PUR fixed	-40 °C to +80 °C
TPE moving	-5 °C to +70 °C
TPE fixed	-30 °C to +70 °C
Loop resistance	27,4 mΩ/m
Cu-Index	2.9 kg/100 m
Weight	6.8 kg/100 m

### Design

- Bare copper wire 1.5 mm<sup>2</sup>
- Wire according to VDE 0295 class 5
- Conductor insulation coloured, brown and blue
- Moulded outer jacket
- Jacket colour black: for auxiliary power 30 V<sub>DC</sub>  
yellow: data and energy transmission

Part-No.	Number of strands/cross-section	Insulation	Jacket material	Jacket colour
<b>1.5 mm<sup>2</sup></b>				
104203	2×1.5	EPDM	PUR	yellow
104204	2×1.5	EPDM	PUR	black
104216	2×1.5	PVC	TPE	yellow
104217	2×1.5	PVC	TPE	black
104219	2×1.5	EPDM	EPDM	yellow
104218	2×1.5	EPDM	EPDM	black

# Bus cables and Industrial Ethernet

## Bus cables

Since the mid-1980s, bus systems have been an important fixture of industrial automation systems. A basic distinction can be made among the following automation fields:

- **Factory automation:** the use of field buses such as PROFIBUS, INTERBUS, DeviceNet, CAN, Ethernet, etc.
- **Process automation:** control of processes in the chemical and petrochemical industries, including: Profibus PA, AS-i Bus, Ethernet
- **Building automation:** building management, including: EIB, Ethernet

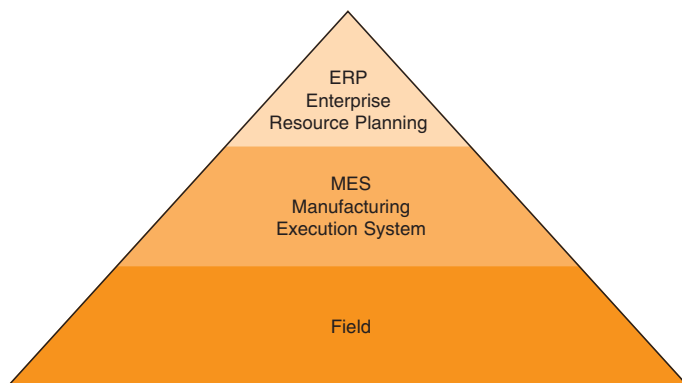
## Passive components also play an important role

Besides the hardware and software components, passive components such as the bus cables and connectors play a great role in functional reliability. Bus cables must satisfy the requirements of the respective systems with respect to all electro-technical parameters. For this reason there is no universally usable bus cable - the industrial requirements are too varied. Lütze offers the systems most commonly used worldwide for fixed laying (indoors and outdoors), as well as for flexible applications. The material selected must be able to cope with the mechanical and chemical stresses in the industrial environment, and the cables must be of sufficiently rugged construction. Electromagnetic compatibility (EMC) requirements are also becoming more and more important. Environmental protection aspects must likewise be taken into account.

## Seamless flow of information

A fully-integrated communication structure between the production systems/attachments and the administrative office sphere creates a seamless flow of integration all the way from the actuator/sensor level to the company's executive management.

Because the conditions in the industrial environment differ significantly from those in office spaces, terminal equipment such as switches, firewalls and hubs have to be adapted for the often harsh environmental conditions. This includes, among other things, being able to snap the equipment onto a 35mm top hat rail, a 24 V power supply, higher IP protection ratings, the operating temperatures and increased resistance to various oils.



Seamless flow of information through vertical integration

## Industrial Ethernet

### Most commonly used communication technology

The most commonly used communication technology is Ethernet. It uses a wide variety of transmission media such as copper, glass or polymer fibres, or wireless. Unlike Ethernet, the various field bus systems operate using different physical transmission types, and thus no special infrastructure components are needed for the individual system. In many cases this means they are tied to a particular technology. Connection to the higher-level Ethernet is provided via gateways (translators).

With the Ethernet standard it is possible to increase the bandwidth significantly, from 12 Mbit/s with bus systems to up to 10 Gbit/s with Ethernet. Furthermore, the Ethernet protocol is open and allows vertical integration. A wide range of systems can be integrated into the Ethernet technology. For this reason, interest in integrating the Ethernet standard into production processes is increasing more and more.

### Rugged infrastructure in industry

Ethernet has already established itself as a standard technology in the office sphere, but conditions in the industrial environment are significantly different from those in the office spaces. Firstly, a more rugged infrastructure is required, and secondly criteria such as real-time capability require special IT solutions. As a result, various suppliers have developed different systems (for example ProfiNet, EtherCAT, Modbus/TCP and PowerLink), which are not always compatible with each other. In contrast, Ethernet-compatible cabling according to EN 50173-3 supports any proprietary Ethernet system.