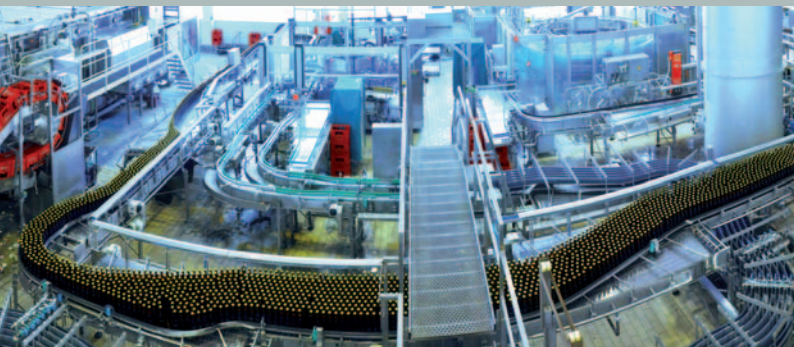




**HELUKABEL®**

HELUCOM®

HELUKAT®



# DATA, NETWORK & BUS TECHNOLOGY

2012/2013

# HELUKABEL® – Meeting all your network technology needs

From beginning to end, the business processes of companies and organisations are accompanied by information. The constant flow of information is just as important for an organisation as the circulation of blood is for the human body. The importance of information technology in our information-oriented world has increased markedly in recent years. Today, companies must react quickly and flexibly to constant changes in the market. For this reason, it is vital to ensure that employees, business areas and work groups are able to communicate efficiently with one another, even if they are working in different locations. To achieve this goal, you need a high-performance, company-wide network infrastructure. In recent years, LAN and WAN networks have greatly increased in importance and are now frequently used as the communication backbone in companies. The introduction of new technologies, especially in the area of multimedia applications, will only serve to further increase their importance. Scalable network solutions offering maximum availability are a necessary requirement for the enhancement of productivity.

Here, HELUKABEL® is able to meet all of your needs: from professional needs analysis and planning all the way to the delivery of cables and accessories, product installation, start-up and, of course, final acceptance.

Our goal is to satisfy our customers by providing them with a complete range of quality services. With our knowledgeable and competent staff, unique storage facility and rapid shipment and delivery, we have the efficiency and flexibility it takes to make your system a success! To further enhance our capacity in this area, we constructed a fully automatic high bay storage system at our company headquarters in Hemmingen, Germany. Due to extensive IT integration, the system – which comprises roughly 16,000 euro-pallet positions – enables us to process customer orders faster than ever before.

With its brands HELUCOM®, HELUCOM Connecting Systems®, HELUKAT® and HELUKAT Connecting Systems®, HELUKABEL® is well positioned to serve the global market. In Germany, HELUKABEL® has five branch offices and a manufacturing facility in Windsbach. The company also has other branches in France, Italy, Switzerland, the Netherlands, Belgium, Sweden, the Czech Republic, Poland, Turkey, South Africa, as well as China, India, Malaysia, Singapore, South Korea, Thailand, Russia and the USA. In addition, HELUKABEL®'s extensive network of representatives provides you with the service you need, regardless of where you are located.

Our success in recent years has shown how well our company philosophy can work.

This catalogue provides you with an overview of the products and services we offer in the area of data, network and bus technology. Our service team is happy to provide you with assistance in finding the best solution for your needs.



HELUKABEL® company headquarters



Logistic Centre

Photos: HELUKABEL®

**We reserve the right to modify our products without prior notice if we believe that this modification is required for the improvement and further development of the products. As a result, the information contained here is subject to modification as well. All images, illustrations, numerical specifications and other information are provided without guarantee of accuracy.**

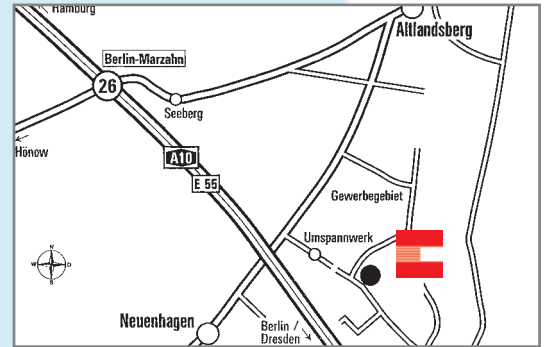
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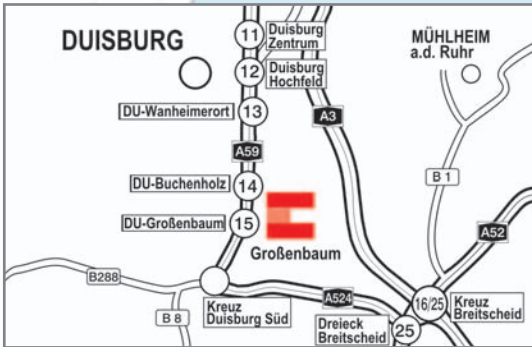
**Sales office**  
**D-25524 Itzehoe**  
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 Telephone +49 4821 40394-0 • Fax +49 4821 40394-29



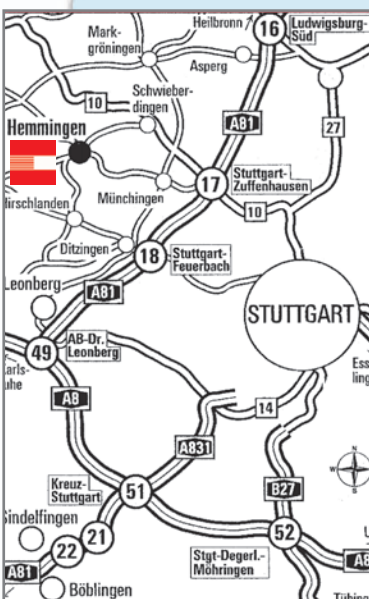
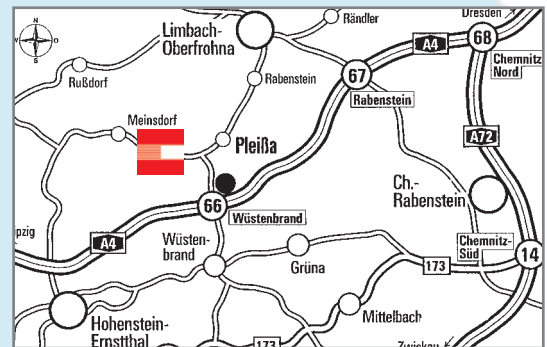
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**Am Handwerkshof 2-4**  
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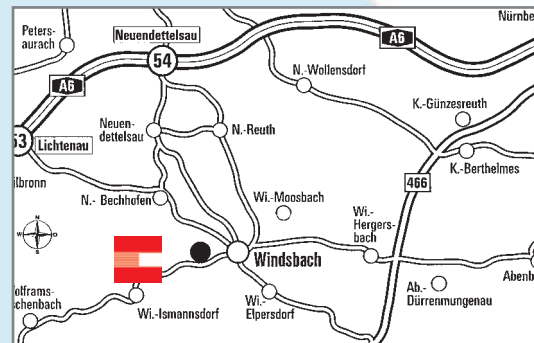


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**Eichelbergstraße 7**  
 Telephone +49 3722 6086-0 • Fax +49 3722 6086-420

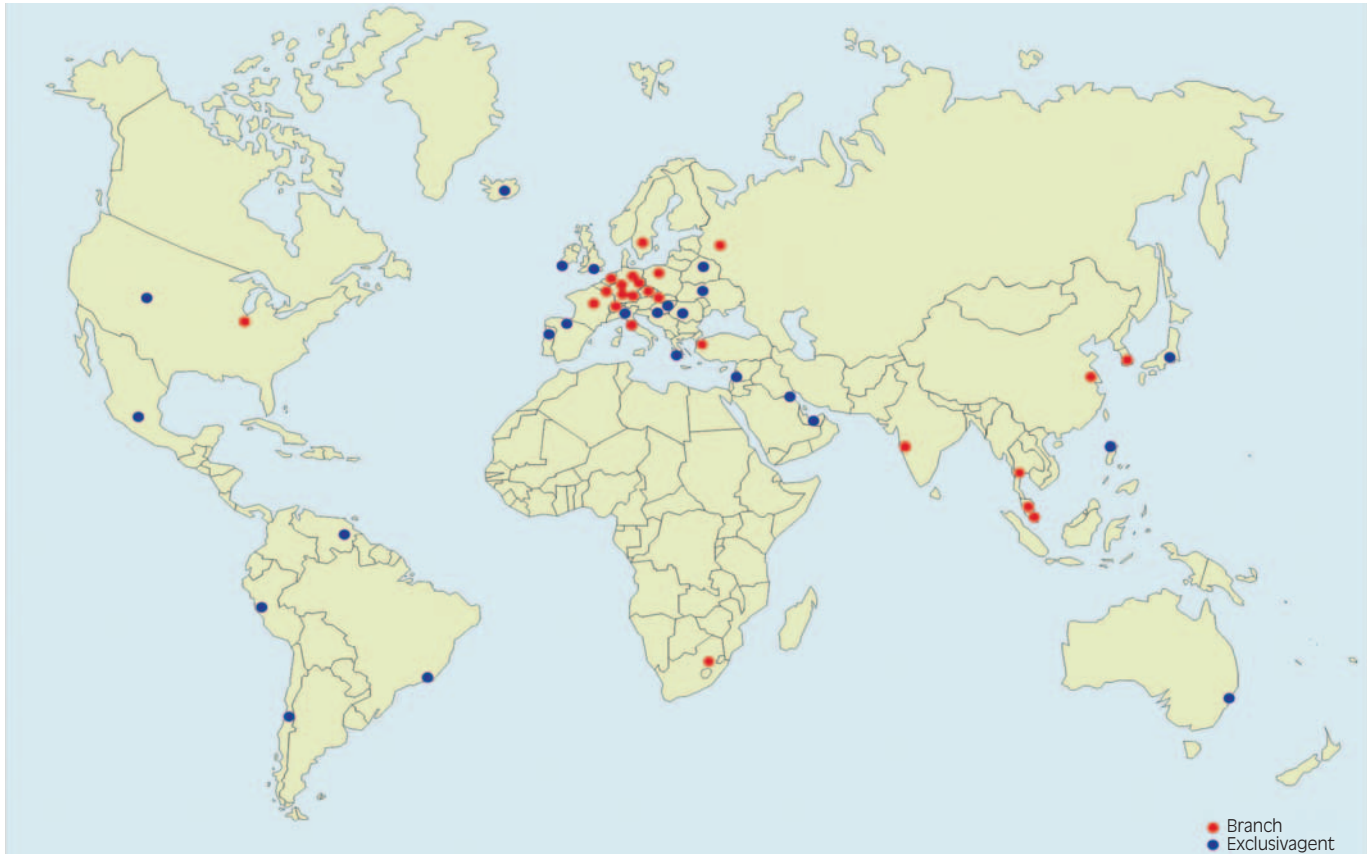


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# Internet presence

**You will find everything concerning Data, Network & Bus Technology at [www.helukabel.de](http://www.helukabel.de)**

The screenshot displays the HELUKABEL website interface. At the top, there are navigation links for Home, HELIS, Contact, and Cart (0), along with a search bar and the HELUKABEL logo. The main content area is titled "Data, Network and Bus Technology" and features a large image of a network switch with numerous cables plugged in. To the left of the main content is a vertical navigation menu with a red arrow icon next to "Data-Network-Engineering" and a list of sub-categories including Active Components, Bus Cables, Copper Termination System, Copper Data Cables, Fibre Optic Cables, Fibre Optic Connecting Equipment, Network System Cabinets, Splicing, Measuring and Processing Equipment, Cables for Industry, Cables for Infrastructure, Cable Accessories, Pre-assembled Cables, Cables for Photovoltaic, Wind Turbines Cables, Media Technology, Shipwiring and Marine Cables, Special Cables, and Spiral Cables. Below the main image, there is a text block describing the company's services and contact information. To the right of the main content, there are several utility boxes: "Product finder" with links for Cables & Wires and Cable Accessories; "Track & Trace"; "Download Center"; "Newsletter - register now" with an input field for an email address; "Your contact person" with a ZIP code input field; "Data, Network and Bus Technology - quick links" with a list of product categories; and a "Download" section with a link for "Enquiry Fibre Optic Special Cable".

Home HELIS Contact Cart (0) HELUKABEL worldwide

HELUKABEL®

**Data, Network and Bus Technology**  
Wide range of products for office and industrial automation

**Product finder**  
Cables & Wires  
Cable Accessories

Track & Trace

Download Center

Newsletter - register now  
Your E-Mail address

Your contact person  
ZIP

Data, Network and Bus Technology - quick links

- Fibre Optic Cables
- Copper Data Cables
- Bus Cables
- Copper Connecting Equipment
- Fibre Optic Connecting Equipment
- Network System Cabinets
- Splicing Systems and Measuring Equipment
- Active Components

Download  
Enquiry Fibre Optic Special Cable

HELUKABEL® offers over the entire range of data, network and bus technology, the expert needs analysis, planning, cables and accessories supply, installation, commissioning and final acceptance of course, all from one source. Our primary concern is to convince you with our complete range of services and satisfaction. Use our efficiency and flexibility, resulting in skilled employees, in an almost unique storage and fastest re-learn training and subcontracting. With brands HELUCOM®, HELUCOM Connecting Systems® and HELUKAT®, HELUKAT Connecting Systems®, HELUKABEL® is well positioned to serve the global market.

Our team will advise you and assist you with your problem solving.  
Phone 07150 9209-181 or e-mail [dnb@helukabel.de](mailto:dnb@helukabel.de)

**Fibre Optic Cables**  
Within the HELUCOM® Series fiber optic cables with the common fiber types 50/125, 62.5 / 125 micron, 9/125 micron, 200/230 micron and 900/1000 microns are available - manufactured to standards and regulations DIN VDE 0888th.

**Copper Data Cables**  
HELUKAT® data cables for use in high speed networks with data rates from 100 Mbit/s designed to meet the requirements of Category 5, Category 6 and Category 7 and 8 after the current draft.

You will find all products and much more on the Internet. Whether company information, product data, metal prices, or catalogue requests. We offer the visitor to our Internet site an extensive collection of important information in all things concerning cable, lines, accessories, data technology, network technology, & bus technology as soon as HELUROBOTICS. Simply log in and try it out. We are looking forward to your visit – [www.helukabel.de](http://www.helukabel.de)

# Success through quality



Quality  
Quality

HELUKABEL

Environment  
Environment



## Certified products are products you can trust.

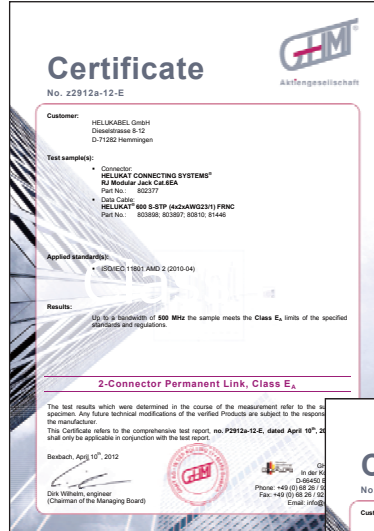
The certification of our products is proof of their superior quality. Product certificates for our products are issued by independent institutions on the basis of applicable performance tests. The certificates are required for use of the product in certain markets or areas of application.

## Product certificates document the tested quality level of our products.

ISO 9000ff is used as the basis for quality management processes carried out at HELUKABEL®. Product certificates issued by accredited institutions also make it easier for you evaluate your suppliers.

## Our commitment to protecting the environment can be seen in our first-rate environmental management systems

# Certified products are products you can trust



Product  
BEL<sup>®</sup> Product



# Product finder HELUCOM® Fibre Optic Systems

Installation area	Application	Kind of processing	Fibre Type	Pulling type*	Tensile strength up to N*	Number of fibres	
Inside	fixed	Splicing	G50/ G62.5/ E9	Manual pulling	1200	4 - 12	
			G50/ G62.5/ E9	Manual pulling	3000	24 - 60	
	flexible	Direct pre-assembling	G50/ G62.5/ E9	Manual pulling	400	2	
			G50/ G62.5/ E9	Manual pulling	400	1 - 2	
			G50/ G62.5/ E9	Manual pulling	500	4 - 8	
			G50/ G62.5/ E9	Manual pulling	800	10 - 12	
			G50/ G62.5/ E9	Manual pulling	1200	4	
			G50/ G62.5/ E9	Manual pulling	1200	4	
			G50/ G62.5/ E9	Manual pulling	1500	2 - 8	
			G50/ G62.5/ E9	Manual pulling	2400	12 - 24	
			G50/ G62.5/ E9/ K200/230	Manual pulling	600	2	
			K200/230	Manual pulling	800	4	
			K200/230	Manual pulling	800	2	
			K200/230	Manual pulling	800	2	
	P980/1000	Manual pulling	100	2			
	P980/1000	Manual pulling	140	1 - 2			
	high flexible			G50/ G62.5/ E9	Manual pulling	650	2 - 8
				G50/ G62.5/ E9	Manual pulling	4800	4 - 12
G50/ G62.5/ E9				Manual pulling	4800	4 - 12	
P980/1000				Manual pulling	400	1 - 4	
Inside/outside	fixed	Splicing	G50/ G62.5/ E9	Manual pulling	700	4 - 12	
			G50/ G62.5/ E9	Manual pulling	1000	4 - 12	
			G50/ G62.5/ E9	Manual pulling	1500	4 - 24	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2500	4 - 24	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2700	24 - 72	
	G50/ G62.5/ E9	Blowing in*/ Manual pulling	3000	84 - 96			
flexible	Direct pre-assembling	G50/ G62.5/ E9	Manual pulling	3000	4 - 12		
Outside	fixed	Direct pre-assembling	G50/ G62.5/ E9	Manual pulling	1200	4	
			K200/230	Manual pulling	1500	2	
		Splicing	E9	Blowing in*/ Manual pulling	180	4 - 12	
			E9	Blowing in*/ Manual pulling	700	4 - 72	
			E9	Blowing in*/ Manual pulling	1500	84 - 288	
			E9	Blowing in*/ Manual pulling	2500	12 - 72	
			E9	Blowing in*/ Manual pulling	2700	12 - 60	
			E9	Manual pulling	9000	12 - 144	
			E9	Manual pulling	16000	12 - 144	
			E9	Manual pulling	35000	12 - 144	
			G50/ G62.5/ E9	Manual pulling	1500	4 - 12	
			G50/ G62.5/ E9	Manual pulling	1500	2 - 24	
			G50/ G62.5/ E9	Manual pulling	1500	2 - 24	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2500	24 - 72	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2500	2 - 24	
			G50/ G62.5/ E9	Manual pulling	2600	2 - 4	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2700	2 - 72	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2700	2 - 72	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2700	2 - 72	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2700	84 - 144	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	2700	24 - 72	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	3000	84 - 144	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	3000	84 - 144	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	3000	84 - 144	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	3000	84 - 144	
			G50/ G62.5/ E9	Blowing in*/ Manual pulling	3500	84 - 144	

\* Note the information of the Blowing jet

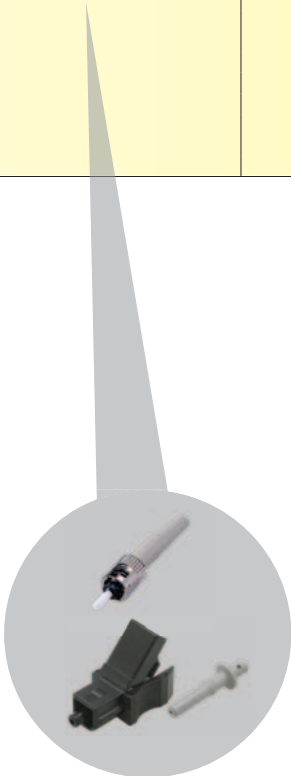
\* = Tensile strength up to N



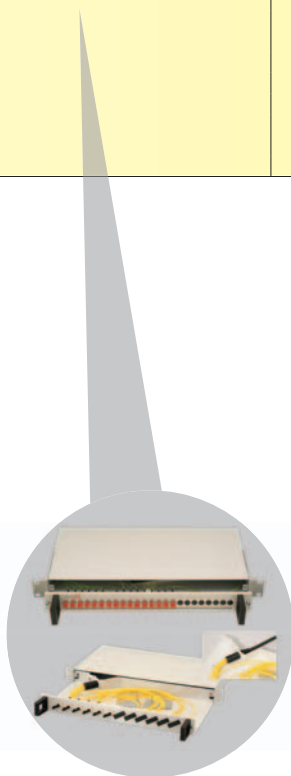
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A-DSFLIZN)2Y	Campus wiring (Signal wiring of roadways,...)	42

Subject to technical alternations.

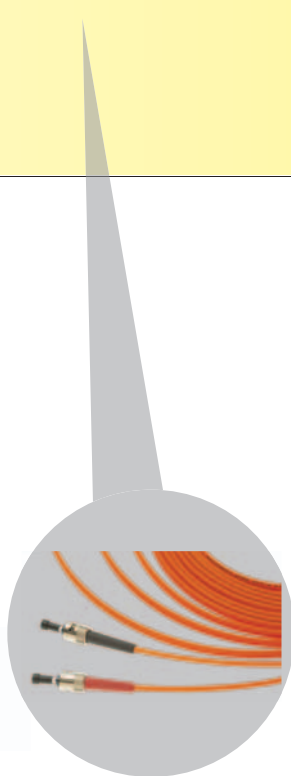
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243	238	245	starting from 276
243	239	245	starting from 276
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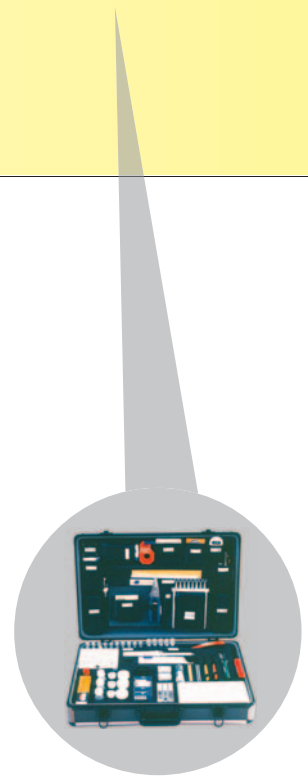
**Plugs**



**Splice Boxes**



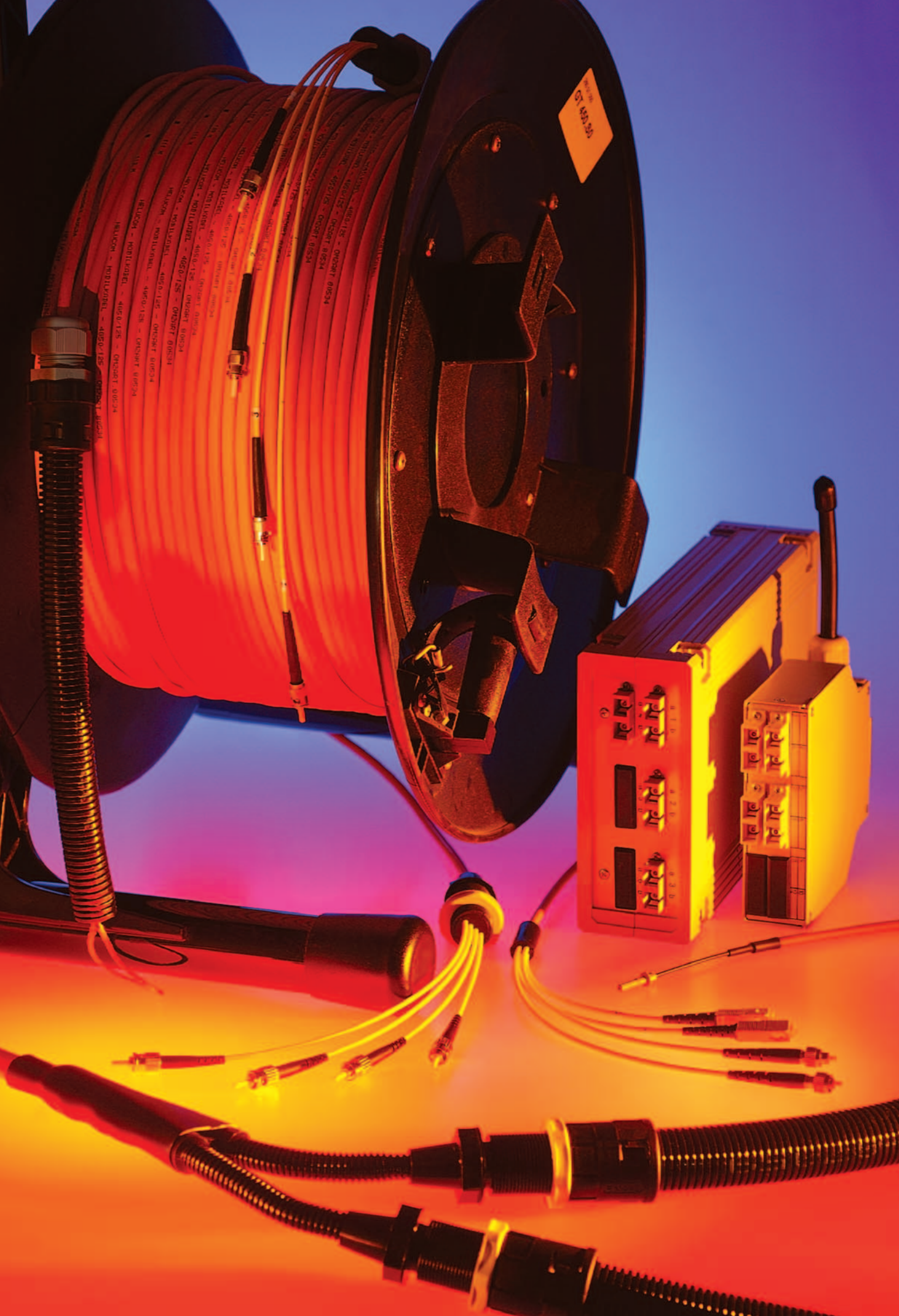
**Jumper Cables**



**Processing Technic**

# Product finder HELUKAT® Copper Data Systems

Installation area	Areal	Application	Category	Frequency range MHz	Application area	UL	CSA	Flame retardance
Inside	Office	fixed	5	100	Floor-/Building Backbone wiring of security areas	-	-	IEC 60332-3
			5 <sub>e</sub>	155	Floor-/Building Backbone wiring	-	-	-
			5 <sub>e</sub>	155	Floor-/Building Backbone wiring	-	-	-
			5 <sub>e</sub>	155	Floor-/Building Backbone wiring	x	x	IEC 60332-1
			5 <sub>e</sub>	200	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			5 <sub>e</sub>	200	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			6	300	Floor-/Building Backbone wiring	x	x	IEC 60332-1
			6	450	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			6	450	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			6 <sub>A</sub>	500	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			6 <sub>A</sub>	500	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			7 <sub>e</sub>	1000	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			7 <sub>e</sub>	1000	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			7 <sub>A</sub>	1200	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			7 <sub>A</sub>	1200	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			8 (draft)	1200	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			8 (draft)	1200	Floor-/Building Backbone wiring	-	-	IEC 60332-3
			8 (draft)	1500	Floor-/Building Backbone wiring of multimedia areas	-	-	IEC 60332-3
			8 (draft)	1500	Floor-/Building Backbone wiring of multimedia areas	-	-	IEC 60332-3
			flexible	5	100	Workarea/Floor-wiring	-	-
	5	100		Workarea/Floor-wiring	-	-	IEC 60332-1	
	5 <sub>e</sub>	200		Workarea/Floor-wiring	-	-	IEC 60332-1	
	5 <sub>e</sub>	200		Workarea/Floor-wiring	x	x	IEC 60332-1	
	6	300		Workarea/Floor-wiring	x	x	IEC 60332-1	
	6 <sub>A</sub>	500		Workarea/Floor-wiring	-	-	IEC 60332-1	
	7	600		Workarea/Floor-wiring	-	-	IEC 60332-1	
	Industry	fixed	5 <sub>e</sub>	100	Industrial cabling (Control- Automation- and Regulation Level)	-	-	IEC 60332-1
			5 <sub>e</sub>	100	Industry cabling, radiated areas (Control- Automation- and Regulation Level)	-	-	-
			5 <sub>e</sub>	100	Industrial cabling (Control- Automation- and Regulation Level)	x	x	IEC 60332-1
			6 <sub>A</sub>	500	Industrial cabling (Control- Automation- and Regulation Level)	x	x	IEC 60332-3
			7	600	Industrial cabling (Control- Automation- and Regulation Level)	-	-	IEC 60332-1
			7	600	Ship cabling (Control- Automation- and Regulation Level)	-	-	IEC 60332-3
			5	100	Industry cabling Motion Controll	x	x	IEC 60332-1
		flexible	5	100	Industrial cabling, flexible (Control- Automation- and Regulation Level)	x	x	IEC 60332-3
			5 <sub>e</sub>	100	Industrial cabling, flexible (Control- Automation- and Regulation Level)	x	x	IEC 60332-1
			5 <sub>e</sub>	100	Ship cabling (Control- Automation- and Regulation Level)	x	x	IEC 60332-1
			5 <sub>e</sub>	100	Industrial cabling, flexible (Control- Automation- and Regulation Level)	x	x	IEC 60332-1
			5 <sub>e</sub>	100	Industrial cabling, flexible (Control- Automation- and Regulation Level)	x	x	IEC 60332-1
			5 <sub>e</sub>	200	Industrial cabling, flexible (Control- Automation- and Regulation Level)	-	-	IEC 60332-1
			7	600	Industrial cabling, flexible (Control- Automation- and Regulation Level)	x	x	IEC 60332-1
		high flexible	5	100	Industry cabling, high flexible (Process- and Field Level)	-	-	IEC 60332-1
			5	100	Industry cabling, high flexible (Process- and Field Level)	-	-	IEC 60332-1
			5	100	Industry cabling, high flexible (Process- and Field Level)	x	x	IEC 60332-1
			5	100	Industry cabling Motion Controll	x	x	IEC 60332-1
5			100	Industry cabling Motion Controll	x	x	IEC 60332-1	
5			100	Industry cabling Motion Controll	x	x	IEC 60332-1	
5 <sub>e</sub>	100		Industry cabling, high flexible (Process- and Field Level)	x	x	IEC 60332-1		
Outside	Area/ Office	fixed	7	600	Campus Backbone	-	-	IEC 60332-1
			7	600	Campus Backbone with rodent attack	-	-	IEC 60332-1 (Inside cables)
	Industry	fixed	7	600	Campus Backbone	x	x	IEC 60332-1
			5 <sub>e</sub>	100	Industry cabling, rodent attacked areas (Campus- and Building wiring)	-	-	-



	Halogen-free	Oil resistant	UV resistant	Construction	Core number	Core dimension	Description*	Part no.	Page
	X	-	-	F/UTP	4 x 2 x	AWG24/1	HELUKAT 100 F/UTP FE60	804045	70
	-	-	-	U/UTP	4 x 2 x	AWG24/1	HELUKAT 155 U/UTP	80053	64
	-	-	-	F/UTP	4 x 2 x	AWG24/1	HELUKAT 155 F/UTP	80043	68
	-	-	-	U/UTP	4 x 2 x	AWG24/1	HELUKAT 155 U/UTP UL	802171	65
	X	-	-	SF/UTP	4 x 2 x	AWG24/1	HELUKAT 200 SF/UTP	81609, 81610	72, 72
	X	-	-	SF/UTP	2 x 4 x 2 x	AWG24/1	HELUKAT 200 SF/UTP duplex	81123	73
	-	-	-	U/UTP	4 x 2 x	AWG24/1	HELUKAT 300 U/UTP UL	802172	66
	X	-	-	F/FTP	4 x 2 x	AWG24/1	HELUKAT 450 F/FTP	82501	76
	X	-	-	F/FTP	2 x 4 x 2 x	AWG24/1	HELUKAT 450 F/FTP duplex	82502	77
	X	-	-	F/FTP	4 x 2 x	AWG23/1	HELUKAT 500 F/FTP	803378	78
	X	-	-	F/FTP	2 x 4 x 2 x	AWG23/1	HELUKAT 500 F/FTP duplex	803379	79
	X	-	-	S/FTP	4 x 2 x	AWG23/1	HELUKAT 600 S/FTP	80810	81
	X	-	-	S/FTP	2 x 4 x 2 x	AWG23/1	HELUKAT 600 S/FTP duplex	81446	82
	X	-	-	S/FTP	4 x 2 x	AWG23/1	HELUKAT 1200 S/FTP	803380	87
	X	-	-	S/FTP	2 x 4 x 2 x	AWG23/1	HELUKAT 1200 S/FTP duplex	803381	88
	X	-	-	S/FTP	4 x 2 x	AWG22/1	HELUKAT 1200 S/FTP	81699	89
	X	-	-	S/FTP	2 x 4 x 2 x	AWG22/1	HELUKAT 1200 S/FTP duplex	800647	90
	X	-	-	S/FTP	4 x 2 x	AWG22/1	HELUKAT 1500 S/FTP	802169	91
	X	-	-	S/FTP	2 x 4 x 2 x	AWG22/1	HELUKAT 1500 S/FTP duplex	802170	92
	-	-	-	U/UTP	4 x 2 x	AWG26/7	HELUKAT 100 U/UTP flex	80055	67
	X	-	-	F/UTP	4 x 2 x	AWG26/7	HELUKAT 100 F/UTP flex	81278	69
	X	-	-	SF/UTP	4 x 2 x	AWG26/7	HELUKAT 200 SF/UTP flex	81254	74
	-	-	-	F/UTP	4 x 2 x	AWG26/7	HELUKAT 200 F/UTP flex UL	802173	71
	-	-	-	U/FTP	4 x 2 x	AWG26/7	HELUKAT 300 U/FTP flex UL	802174	75
	X	-	-	F/FTP	4 x 2 x	AWG26/7	HELUKAT 500 F/FTP flex	804043	80
	X	-	-	S/FTP	4 x 2 x	AWG26/7	HELUKAT 600 S/FTP flex	80294	83
	X	X	X	SF/UTP	2 x 2 x	AWG22/1	HELUKAT 100IND PROFInet A, robust	801194	111
	-	X	X	SF/UTP	2 x 2 x	AWG22/1	HELUKAT 100IND PROFInet A, radiation resistant	801195	112
	-	X	X	SF/UTP	2 x 2 x	AWG22/1	HELUKAT 100IND PROFInet A, fixed	800653	111
	-	X	X	S/FTP	4 x 2 x	AWG22/1	HELUKAT 500IND S/FTP, 10GIG	803693	102
	X	X	-	S/FTP	4 x 2 x	AWG23/1	HELUKAT 600IND S/FTP, Robust	801197	99
	X	X	-	S/FTP	4 x 2 x	AWG24/7	HELUKAT 600IND S/FTP, Shipline	803382	100
	-	X	-	SF/UTP	2 x 2 x	AWG22/7	HELUKStarting from EL HMCB 200, fixed	802471	136
	X	X	X	SF/UTP	2 x 2 x	AWG22/7	HELUKAT 100 SF/UTP, WK Industrial 105°C	802293	105
	X	X	X	SF/UTP	2 x 2 x + 4 x	AWG22/7 + 1,5qmm	HELUKAT 100IND PROFInet B, hybride	801651	113
	X	X	X	SF/UTP	2 x 2 x	AWG22/7	HELUKAT 100IND PROFInet B, Shipline	802185	114
	-	X	X	SF/UTP	2 x 2 x	AWG22/7	HELUKAT 100IND PROFInet B, Festoon	803295	114
	-	X	X	SF/UTP	2 x 2 x	AWG22/7	HELUKAT 100IND PROFInet B, flexible	800654	115
	X	X	-	SF/UTP	4 x 2 x	AWG26/7	HELUKAT 200IND SF/UTP, Robustflex	800068	104
	X	X	X	S/FTP	4 x 2 x	AWG26/7	HELUKAT 600IND S/FTP, Robustflex	802184	101
	X	X	-	SF/UTP	4 x 1 x	AWG24/19	HELUKAT 200S SF/UTP, Drag chain	800088	108
	X	X	-	SF/UTP	4 x 2 x	AWG24/19	HELUKAT 200S SF/UTP, Drag Cchain	81155	109
	X	X	-	SF/UTP	4 x 2 x	AWG26/19	HELUKAT 100T SF/UTP, Tordierflex	800067	110
	X	X	-	SF/UTP	2 x 2 x + 1 x 2 x	AWG26/7 + AWG22/7	HELUKStarting from EL HMCB 500, Drag chain	802472	137
	-	X	-	SF/UTP	2 x 2 x + 1 x 2 x	AWG24/7 + AWG22/19	HELUKStarting from EL HMCB 500S, Drag chain	803672	138
	X	X	-	SF/UTP	2 x 2 x + 1 x 2 x	AWG26/19 + AWG22/19	HELUKStarting from EL HMCB 800, Drag chain	802473	139
	X	X	X	SF/UTP	2 x 2 x	AWG22/7	HELUKAT 100IND PROFInet C, high flexible	800655	115
	X	X	X	SF/UTP	2 x 2 x	AWG22/19	HELUKAT 100IND PROFInet C, Torsion	802186	116
	X	X	X	SF/UTP	4 x 1 x	AWG26/19	HELUKAT 100S SF/UTP, Drag chain ECO	82838	106
	X	X	X	SF/UTP	4 x 2 x	AWG26/19	HELUKAT 100S SF/UTP, Drag chain ECO	82839	107
	-	X	X	SF/UTP	4 x 2 x	AWG26/19	HELUKAT 250S SF/UTP, Drag chain	803387	103
	-	-	X	S/FTP PVC/PVC	4 x 2 x	AWG23/1	HELUKAT 600A S/FTP PVC/PVC	801147	84
	X	-	X	S/FTP FRNC/PE arm.	4 x 2 x	AWG23/1	HELUKAT 600AE S/FTP FRNC/PE	802168	86
	-	-	X	S/FTP PVC	4 x 2 x	AWG23/1	HELUKAT 600E S/FTP PVC	802167	85
	-	X	X	SF/UTP arm.	2 x 2 x	AWG 22/1	HELUKAT 100IND PROFInet A, arm.	801650	112

Subject to technical alternations.

**Accessories**

<b>Plug</b>	<b>Patch panels</b>	<b>Jumper Cable</b>	<b>Processing Technic</b>
<b>Page</b>	<b>Page</b>	<b>Page</b>	<b>Page</b>
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-	193	195	starting from 276
-	188	190	starting from 276
-	193	195	starting from 276
B6	188	190	starting from 276
B6	188	190	starting from 276
-	193	195	starting from 276
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B6*5, B7*5	177, 179, 183	185, 181	starting from 276
B3	177, 179	181	starting from 276
B3	177, 179	181	starting from 276
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B3, B4	177, 179, 183	185, 181	starting from 276
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B3, B4*2	-	-	starting from 276
B3, B4*2	-	-	starting from 276
B3, B4*2	-	-	starting from 276
-	-	-	starting from 276
-	-	-	starting from 276
B1	-	-	starting from 276
B1, B6, B7	-	-	starting from 276
B1, B2, B6, B7, B13	-	-	starting from 276
B1	-	-	starting from 276
B1, B2, B6, B7, B13	-	-	starting from 276
B2	-	-	starting from 276
B2*2	-	-	starting from 276
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B5, B6, B7, B8, B9, B10, B11, B12	203, 204	-	starting from 276
B5, B6, B7, B8, B9, B10, B11, B12	203, 204	208 to 223*3	starting from 276
-	-	217	starting from 276
B6, B7	-	217*2	starting from 276
on request	-	217*2	starting from 276
-	-	-	starting from 276
B5, B6, B7, B8, B9, B10, B11, B12	-	-	starting from 276
-	-	208 to 223*3	starting from 276
B5, B6, B7, B8, B9, B10, B11, B12	-	-	starting from 276
B5, B6, B7, B8, B9, B10, B11, B12	-	208 to 223*3	starting from 276
B5, B6, B7, B8, B9, B10, B11, B12	-	208 to 223*3	starting from 276
B1, B2, B6, B7, B13	-	208 to 223*3	starting from 276
B2, B6, B7, B13*4	-	217*2	starting from 276
B5, B6, B7, B8	-	-	starting from 276
-	-	-	starting from 276
B6, B7, B8	-	-	starting from 276
-	-	-	starting from 276
-	-	-	starting from 276
-	-	-	starting from 276
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B6, B7*5	-	-	starting from 276
B3, B4*	177, 179, 183, 203, 204*	185, 181*2	starting from 276
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B3, B4*	177, 179, 183, 203, 204*	185, 181*2	starting from 276
-	177, 179, 183, 203, 204*	208 to 223*3	starting from 276

\* Preparation of the jacket before connection necessary

\*2 Reduced frequency to Cat. 6

\*3 Plugsystem- and ref. To the applications














\*4 Reduced frequency to Cat. 6 resp. Cat 5e

\*5 Reduced frequency to Cat 5e

Bus Systems	Areal	Installation area	Application	UL	CSA	Flame retardance	Halogen-free	Oil resistant	UV resistant	
Profibus 150 Ohm	Industry	Inside	Fixed	-	-	IEC 60332-1	X	X	-	
				X	X	IEC 60332-1	-	X	X	
				X	X	IEC 60332-1	-	-	-	
				X	X	IEC 60332-3	-	-	X	
				X	X	EN 50265-2-1	X	-	X	
			X	X	IEC 60332-1	X	X	X		
			Flexible/fixed	-	-	IEC 60332-1	X	-	-	
				X	-	EN 50265-2-1	-	-	-	
				-	-	IEC 60332-1	X	X	-	
				-	-	IEC 60332-1	X	X	-	
		X		-	-	X	X	X		
		High flexible	X	-	IEC 60332-1	X	X	-		
			X	X	IEC 60332-1	X	X	-		
			X	X	EN 50265-2-1	-	X	X		
			X	X	IEC 60332-1	X	X	X		
X	X		IEC 60332-1	X	X	X				
Outside	Fixed	-	-	-	-	-	X			
		-	-	-	-	-	X			
		-	-	-	X	-	X			
		-	-	-	X	-	X			
Profibus PA 100 Ohm	Industry	Inside	Fixed	X	-	EN 50265-2-1	-	-	-	
		Inside/outside		X	-	EN 50265-2-1	-	-	X	
		Inside		-	-	EN 50265-2-1	-	-	X	
		Inside/outside		-	-	EN 50265-2-1	-	-	X	
		Inside		X	-	IEC 60332-1	-	-	-	
		Inside/outside		X	-	IEC 60332-1	-	-	X	
CAN Bus 120 Ohm	Industry	Inside	Fixed	X	-	IEC 60332-1	-	-	-	
				X	-	IEC 60332-1	-	-	-	
				X	-	IEC 60332-1	-	-	-	
				X	-	IEC 60332-1	-	-	-	
				X	-	IEC 60332-1	-	-	-	
				X	X	IEC 60332-1	-	-	-	
				X	-	IEC 60332-1	-	-	-	
				X	X	IEC 60332-1	-	-	-	
				X	X	IEC 60332-1	-	-	-	
				X	X	IEC 60332-1	-	-	-	
		Flexible/fixed	X	X	IEC 60332-1	X	X	X		
			-	-	-	X	X	-		
			-	-	-	X	X	-		
			X	-	IEC 60332-1	X	X	-		
			X	-	IEC 60332-1	X	X	-		
Outside	Fixed	-	-	-	-	-	X			
		-	-	-	-	-	X			
		-	-	-	-	-	X			
Foundation™ Fieldbus 100 Ohm	Industry	Inside/outside	Fixed	X	X	X	-	X	X	
			Flexible	X	X	X	-	X	X	
				X	X	X	-	X	X	
				X	X	X	-	X	X	
DeviceNet™ 120 Ohm	Industry	Inside	Fixed	X	X	IEC 60332-1	-	X	X	
				X	X	IEC 60332-1	-	X	X	
				X	X	IEC 60332-1	X	-	X	
				X	X	IEC 60332-1	X	-	X	
				X	X	IEC 60332-1	-	-	X	
			High flexible	X	X	VW 1	X	X	X	
				X	X	VW 1	X	X	X	
Interbus 100 Ohm	Industry	Inside	Fixed	X	-	IEC 60332-1	-	-	-	
				X	-	IEC 60332-1	-	-	-	
			High flexible	-	-	IEC 60332-1	X	-	-	
				-	-	IEC 60332-1	X	X	-	
AS Interface	Industry	Inside	Flexible	-	-	-	X	X	-	
				-	-	-	X	X	X	
				-	-	IEC 60332-1	-	X	-	
				-	-	IEC 60332-1	-	X	X	
			High flexible	X	X	IEC 60332-1	-	X	-	
				X	X	IEC 60332-1	-	X	-	
				X	-	IEC 60332-1	X	X	-	
				X	X	IEC 60332-1	X	X	-	
CC Link	Industry	Inside	Fixed	X	X	IEC 60332-1	-	X	X	
				X	X	IEC 60332-1	-	X	X	
Safety BUS 110 Ohm	Industry	Inside	Fixed	-	-	IEC 60332-1	X	X	-	
			High flexible	X	X	IEC 60332-1	X	X	-	
Multibus	Industry	Inside	High flexible	X	X	VW 1/ FT1	X	X	-	
				X	X	VW 1/ FT1	X	X	-	
USB 2.0 90 Ohm	Industry	Inside	High flexible	X	X	IEC 60332-1	-	X	-	
				X	X	IEC 60332-1	-	X	-	
EIB Bus 100 Ohm	Office	Inside	Fixed	-	-	IEC 60332-1	-	-	-	
				-	-	IEC 60332-1	-	-	-	
				-	-	IEC 60332-1	X	-	-	
				-	-	IEC 60332-1	X	-	-	
				-	-	IEC 60332-1	-	-	-	
LON Bus 100/85 Ohm	Office	Inside	Fixed	-	-	IEC 60332-1	X	-	-	
			Flexible	-	-	IEC 60332-1	-	-	-	
Hospital-System-Bus	Office	Inside	Fixed	-	-	IEC 60332-1	-	-	-	
				-	-	IEC 60332-1	X	-	-	

# Plug Matrix Copper Data Systems



		Part no. Page	Description
B1		801686 Page 199	Plug RJ45 TM11 Cat.5
B2		801772 Page 199	Plu RJ45 TM21 Cat.6
B3		802377 Page 177	RJ45 Jack Cat.6A
B4		802916 Page 177	RJ45 Jack Cat.6/ Classe E
B5		800986 Page 226	Plug RJ45 4-pole/ IP 20, Cat.5
B6		802920 Page 226	Plug RJ45 8-pole/ IP 20, Cat.5
B7		804234 Page 226	Angle Plug RJ45 8-pole/ IP 20, Cat.5
B8		801318 Page 226	Plug RJ45 Snap-in 8-pole/ IP 67, Cat.5
B9		802438 Page 227	Plug RJ45 plastic, Push-Pull 4-pole/ IP 65/67, Cat.5
B10		802439 Page 227	Plug RJ45 metal, Push-Pull 4-pole/ IP 65/67, Cat.5
B11		802440 Page 227	Plug RJ45 plastic, Push-Pull 8-pole/ IP 65/67, Cat.6
B12		802441 Page 227	Plug RJ45 metal, Push-Pull 8-pole/ IP 65/67, Cat.6
B13		802258 Page 227	Plug RJ45 metal, Push-Pull 8-pole/ IP 65/67, Cat.6

## Outlet



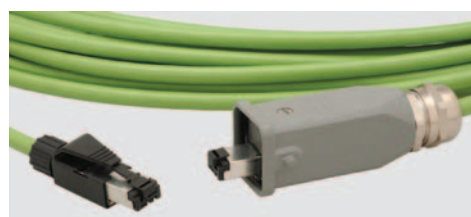
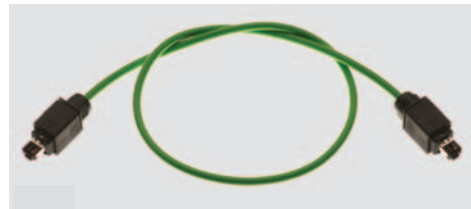
## Splice Box



## Splice Box, DIN rail



## Examples of Patch Cables





Construction	Description	Part no.	Page
Standard	Profibus L2 1x2x0,64mm PUR petrol	81186	118
Standard	Profibus Hochtemperatur FEP violet	802179	123
Standard	Profibus L2 1x2x0,64mm PVC grey	80384	117
Standard	Profibus L2 1x2x0,64mm PVC violet	81448	117
Fast Connect (SK)	Profibus SK 1x2x0,64mm PVC violet	81903	129
Fast Connect (SK)	Profibus SK 1x2x0,64mm FRNC violet	81501	130
Fast Connect (SK)	Profibus SK 1x2x0,64mm PUR violet	81905	130
Fast Connect (SK)	Profibus SHIPLINE FRNC violet	802178	123
Standard	Profibus L2/FIP 7-wire PVC violet	800648	120
Standard	Profibus L2 Drag chain 1x2x0,64mm (stranded) PUR petrol	81003	121
Standard	Profibus L2 Drag chain 1x2x0,64mm (stranded) PUR violet	80267	121
Standard	Profibus ET200X PUR petrol	82913	122
Standard	Profibus ECOFAST TPU petrol	800044	122
Standard	Profibus L2 Torsion PUR violet	800109	124
Standard	Profibus L2 FESTOON PVC petrol	800649	124
Fast Connect (SK)	Profibus SK Drag chain 1x2x0,64mm (stranded) PUR petrol	81906	131
Fast Connect (SK)	Profibus SK Drag chain 1x2x0,64mm (stranded) PUR violet	801659	131
Standard	Profibus L2 1x2x0,64mm PE black	80792	118
Standard	Profibus L2 Direct burial 1x2x0,64mm PVC/PE black	82824	119
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\* Preparation of the jacket before connection necessary

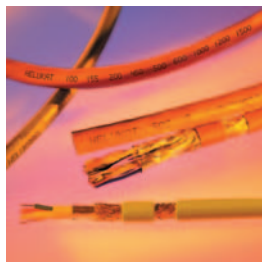
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## Fibre optic cables



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**HELUKAT**<sup>®</sup>

## Copper data cables



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**HELUKABEL**<sup>®</sup>

## Bus cables



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**HELUKAT**<sup>®</sup>  
CONNECTING SYSTEMS

**HELUKAT**<sup>®</sup>  
CONNECTING SYSTEMS INDUSTRY

## Copper connecting equipment



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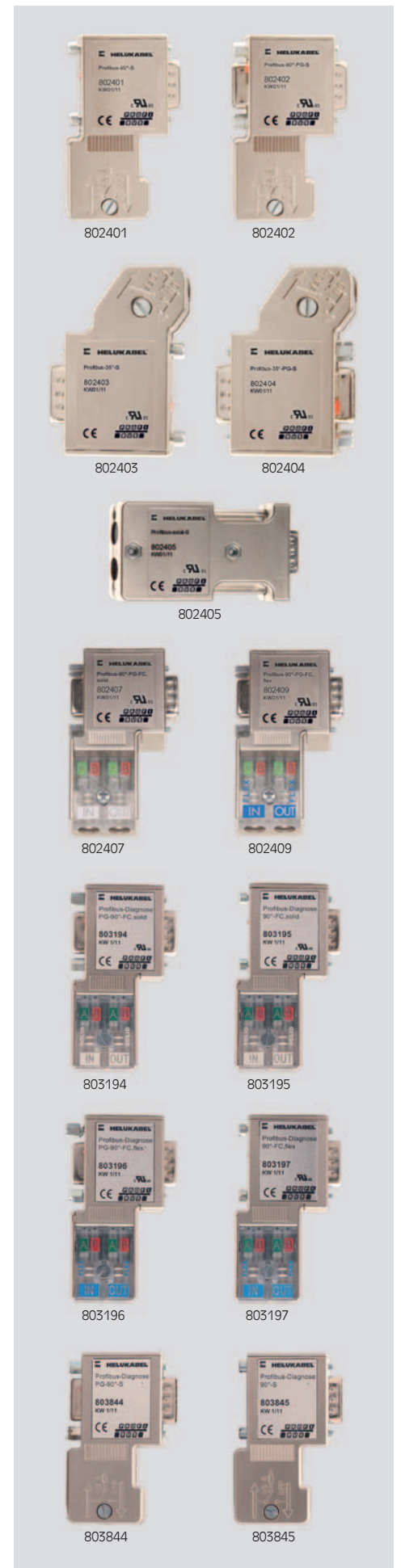
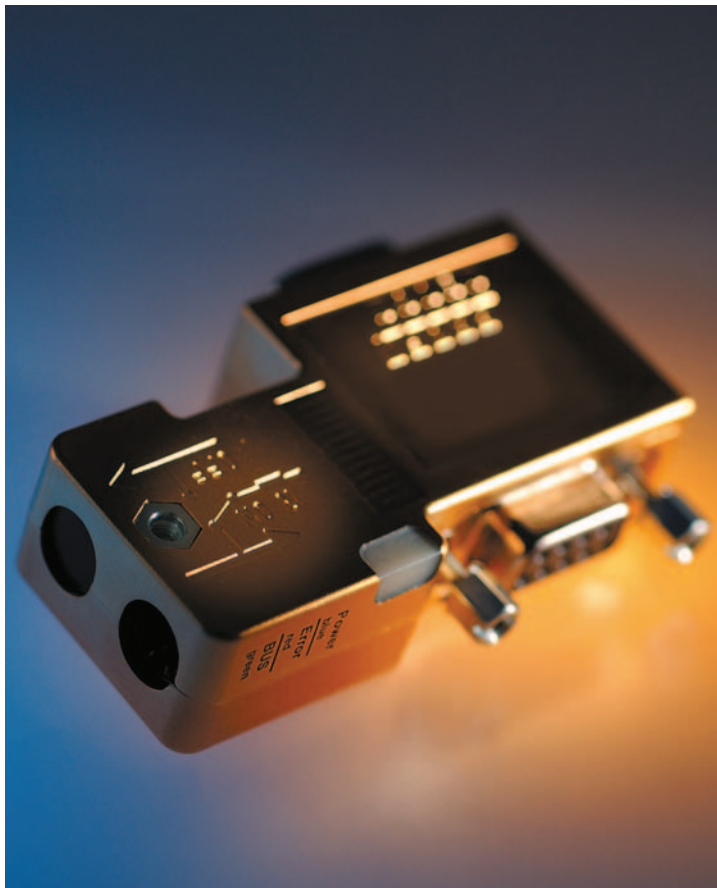
**HELUCOM**<sup>®</sup>  
CONNECTING SYSTEMS

**HELUCOM**<sup>®</sup>  
CONNECTING SYSTEMS INDUSTRY

## Fibre optic connecting equipment

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C5	803356	Profibus-45°-SK, solid
C6	803357	Profibus-45°-PG-SK, solid
C7	803576	Profibus-45°-SK, flex
C8	803577	Profibus-45°-PG-SK, flex
C9	802405	Profibus-axial-S
C10	802406	Profibus-90°-SK, solid
C11	802407	Profibus-90°-PG-SK, solid
C12	802408	Profibus-90°-SK, flexible
C13	802409	Profibus-90°-PG-SK,flexible
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C16	803196	Profibus-90°-PG-SK Diagnose, flex
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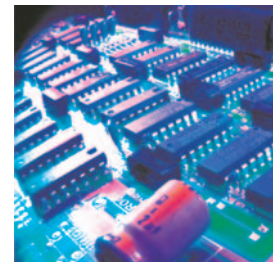
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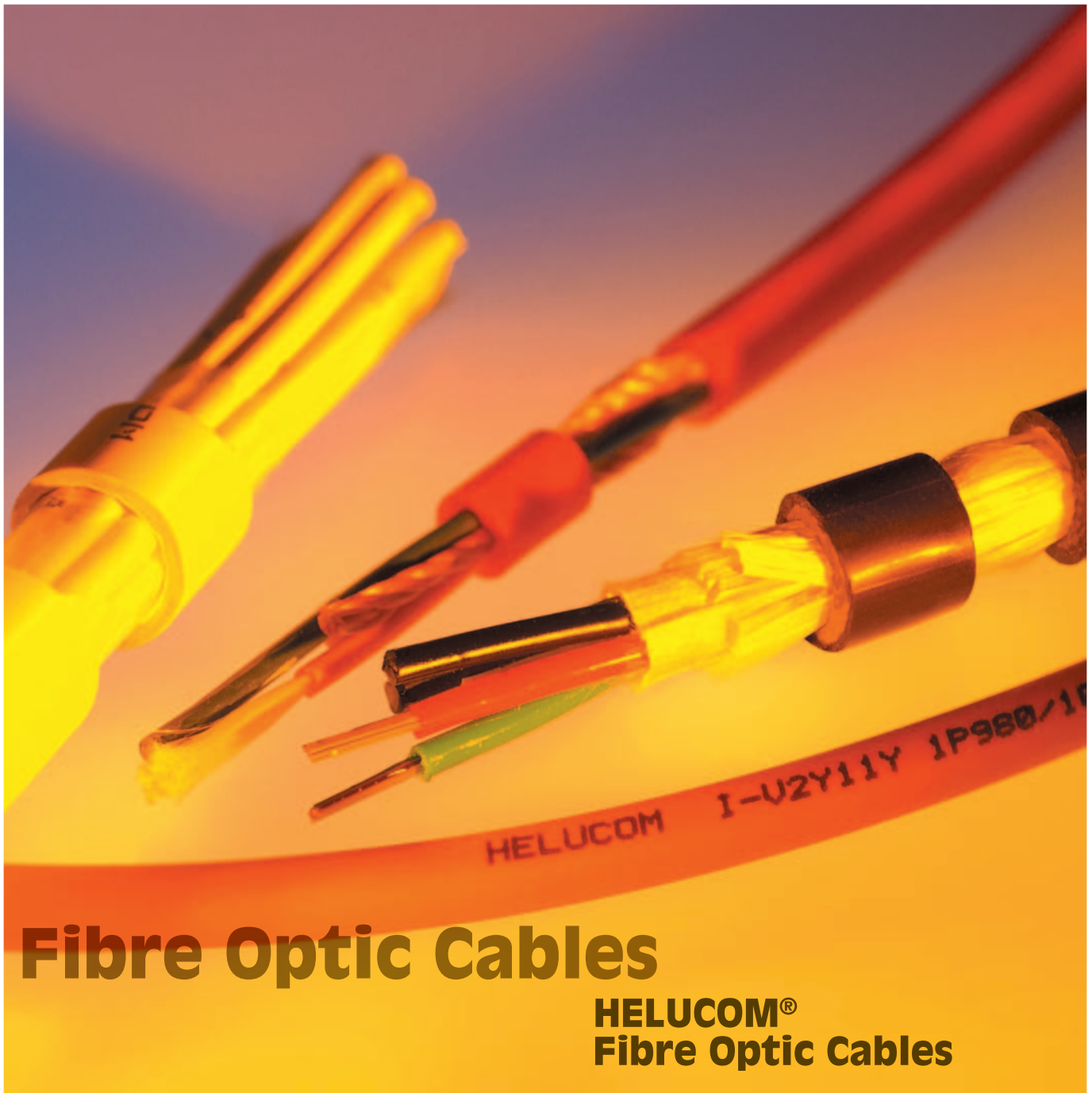
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## Technical appendix





# Fibre Optic Cables

## HELUCOM® Fibre Optic Cables

Photo: HELUKABEL®

The future reliability of any installation depends on the correct choice of cable used in the network technique. It is only by careful selection of the components that compliance with the continually increasing requirements placed upon the quality of the network is possible. Infrastructures based on copper are continually nearing their physical limits because of the rapidly growing demands from multimedia developments, and hence an alternative to copper must be provided for installations in the future.

The benefits of optical fibre technology are obvious: High transmission rates, low attenuation, no electromagnetic

problems, small dimensions and low weight. Modern designs for optical fibre cables of the HELUCOM® series exhibit the same robustness as a copper cable. The cable constructions are selected for optimum protection of the optical fibres in each application.

Within the HELUCOM® series, optical fibre cables are available with the common fibre types of 50/125 µm, 62,5/125 µm, 9/125 µm, 200/230 µm and 980/1000 µm. The HELUCOM® optical fibre cables are manufactured in accordance with the standards and regulations of DIN VDE 0888.

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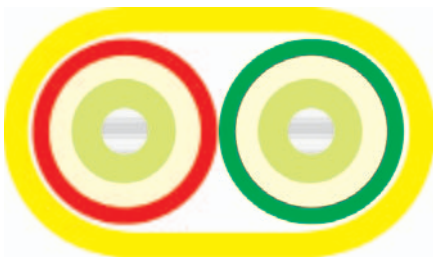
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# Fibre Optic Indoor Cable

acc. DIN VDE 0888

**HELUCOM®**

I-VH, I-V11Y, I-VHH, I-V11Y11Y



## Cable structure

Core type: Composite buffered  
Strain relief elements: Aramide  
Outer sheath material: FRNC  
Outer sheath colour: Yellow

## Temperature range

Laying, min.: 0°C  
Laying, max.: +50°C  
Operating, min.: 0°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034

Designation	Number of fibres	Fibre type	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
I-VH	1	Multimode G50/125	2,6	300	40	0,17	10	8,7	<b>80783</b>
I-VH	1	Multimode G62.5/125	2,6	300	40	0,17	10	8,7	<b>80782</b>
I-VH	1	Single-mode E9/125	2,6	300	40	0,17	10	8,7	<b>80784</b>
I-VH	2	Multimode G50/125	2,6 x 5,6	400	40	0,24	10	17,5	<b>80316</b>
I-VH	2	Multimode G50/125	2,6 x 5,6	400	40	0,24	10	17,5	<b>804256</b>
I-VH	2	Multimode G62.5/125	2,6 x 5,6	400	40	0,24	10	17,5	<b>80699</b>
I-VH	2	Single-mode E9/125	2,6 x 5,6	400	40	0,24	10	17,5	<b>80785</b>
I-V11Y	2	Multimode G50/125	2,6 x 5,6	400	40	2,80	20	14,0	<b>82408</b>
I-V11Y	2	Multimode G62.5/125	2,6 x 5,6	400	40	2,80	20	14,0	<b>82410</b>
I-V11Y	2	Single-mode E9/125	2,6 x 5,6	400	40	2,80	20	14,0	<b>82411</b>
I-VHH	2	Multimode G50/125	3,6 x 6,2	600	50	0,57	20	20,0	<b>804254</b>
I-VHH	2	Multimode G50/125	3,6 x 6,2	600	50	0,57	20	20,0	<b>80789</b>
I-VHH	2	Multimode G62.5/125	3,6 x 6,2	600	50	0,57	20	20,0	<b>80790</b>
I-VHH	2	Single-mode E9/125	3,6 x 6,2	600	50	0,57	20	20,0	<b>80791</b>
I-V11Y11Y	2	Multimode G50/125	3,6 x 6,2	600	60	4,20	20	16,0	<b>82409</b>
I-V11Y11Y	2	Multimode G62.5/125	3,6 x 6,2	600	60	4,20	20	16,0	<b>81900</b>
I-V11Y11Y	2	Single-mode E9/125	3,6 x 6,2	600	60	4,20	20	16,0	<b>82412</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® one-fibre and two-fibre (duplex) cables are used for fixed indoor installation, such as in cable ducts. These cables are also used as ready-made cables (pigtailed) that are spliced to fixed cables or as connection cables (jumper cable) as well as for switch frames. The small diameter and the high flexibility make these cables ideal for the application in switch frames as well as for the connection of terminals.

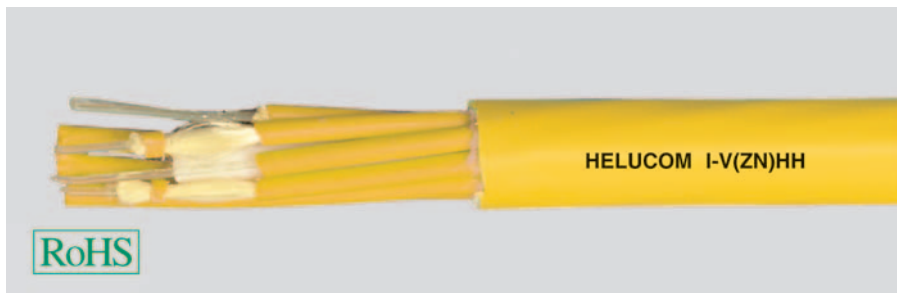


# Fibre Optic Breakout-Cable

acc. DIN VDE 0888

HELUCOM®

I-V(ZN)HH



## Cable structure

Core type: Composite buffered  
Strain relief elements: Aramide  
Outer sheath material: FRNC  
Outer sheath colour: Yellow

## Temperature range

Laying, min.: 0°C  
Laying, max.: +50°C  
Operating, min.: 0°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1 and IEC 60332-3  
Smoke density acc. to IEC 61034

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
I-V(ZN)HH	2	Multimode G50/125	1	7,1	1000	270,0	1,00	300	40,0	<b>80743</b>
I-V(ZN)HH	2	Multimode G62.5/125	1	7,1	1000	270,0	1,00	300	40,0	<b>80799</b>
I-V(ZN)HH	2	Single-mode E9/125	1	7,1	1000	270,0	1,00	300	40,0	<b>80813</b>
I-V(ZN)HH	4	Multimode G50/125	1	7,1	1000	270,0	1,00	300	45,0	<b>80753</b>
I-V(ZN)HH	4	Multimode G62.5/125	1	7,1	1000	270,0	1,00	300	45,0	<b>80800</b>
I-V(ZN)HH	4	Single-mode E9/125	1	7,1	1000	270,0	1,00	300	45,0	<b>80814</b>
I-V(ZN)HH	6	Multimode G50/125	1	8,4	1350	270,0	1,25	300	70,0	<b>80754</b>
I-V(ZN)HH	6	Multimode G62.5/125	1	8,4	1350	270,0	1,25	300	70,0	<b>80769</b>
I-V(ZN)HH	6	Single-mode E9/125	1	8,4	1350	270,0	1,25	300	70,0	<b>80815</b>
I-V(ZN)HH	8	Multimode G50/125	1	9,3	1500	270,0	1,50	300	100,0	<b>80688</b>
I-V(ZN)HH	8	Multimode G62.5/125	1	9,3	1500	270,0	1,50	300	100,0	<b>80801</b>
I-V(ZN)HH	8	Single-mode E9/125	1	9,3	1500	270,0	1,50	300	100,0	<b>80816</b>
I-V(ZN)HH	12	Multimode G50/125	1	9,6	2350	270,0	1,85	300	165,0	<b>80795</b>
I-V(ZN)HH	12	Multimode G62.5/125	1	9,6	2350	270,0	1,85	300	165,0	<b>80803</b>
I-V(ZN)HH	12	Single-mode E9/125	1	9,6	2350	270,0	1,85	300	165,0	<b>80818</b>
I-V(ZN)HH	16	Multimode G50/125	1	15,0	2400	270,0	2,40	300	170,0	<b>80796</b>
I-V(ZN)HH	16	Multimode G62.5/125	1	15,0	2400	270,0	2,40	300	170,0	<b>80804</b>
I-V(ZN)HH	16	Single-mode E9/125	1	15,0	2400	270,0	2,40	300	170,0	<b>80819</b>
I-V(ZN)HH	24	Multimode G50/125	1	17,5	2400	330,0	3,20	300	220,0	<b>80798</b>
I-V(ZN)HH	24	Multimode G62.5/125	1	17,5	2400	330,0	3,20	300	220,0	<b>80806</b>
I-V(ZN)HH	24	Single-mode E9/125	1	17,5	2400	320,0	3,20	300	220,0	<b>80821</b>

Dimensions and specifications may be changed without prior notice.

## Application

HELUCOM® breakout cables are designed to replace splicing on-site. They are mainly used in indoor applications for small and medium transmission lines. The fibre-optic connectors are mounted directly to the individual cables. Therefore no splicing and no splice boxes are necessary. Pre-assembled cables only need to be laid on site and are immediately functional.

# Fibre Optic Minibreakout Cable

acc. DIN VDE 0888

HELUCOM®

I-V(ZN)H



## Cable structure

Core type: Tight buffer  
Strain relief elements: Aramide  
Outer sheath material: FRNC  
Outer sheath colour: Orange

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -10°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
I-V(ZN)H	2	Multimode G50/125	1	4,0	400	60,0	0,24	40	15,0	<b>80435</b>
I-V(ZN)H	2	Multimode G62.5/125	1	4,0	400	60,0	0,24	40	15,0	<b>80434</b>
I-V(ZN)H	2	Single-mode E9/125	1	4,0	400	60,0	0,24	40	15,0	<b>80433</b>
I-V(ZN)H	4	Multimode G50/125	1	4,8	400	70,0	0,31	40	19,0	<b>80432</b>
I-V(ZN)H	4	Multimode G62.5/125	1	4,8	400	70,0	0,31	40	19,0	<b>80431</b>
I-V(ZN)H	4	Single-mode E9/125	1	4,8	400	70,0	0,31	40	19,0	<b>80430</b>
I-V(ZN)H	6	Multimode G50/125	1	5,3	400	80,0	0,35	40	23,0	<b>80429</b>
I-V(ZN)H	6	Multimode G62.5/125	1	5,3	400	80,0	0,35	40	23,0	<b>80428</b>
I-V(ZN)H	6	Single-mode E9/125	1	5,3	400	80,0	0,35	40	23,0	<b>80427</b>
I-V(ZN)H	8	Multimode G50/125	1	5,3	500	80,0	0,40	40	25,0	<b>80426</b>
I-V(ZN)H	8	Multimode G62.5/125	1	5,3	500	80,0	0,40	40	25,0	<b>80425</b>
I-V(ZN)H	8	Single-mode E9/125	1	5,3	500	80,0	0,40	40	25,0	<b>80424</b>
I-V(ZN)H	10	Multimode G50/125	1	6,0	600	90,0	0,53	40	32,0	<b>80423</b>
I-V(ZN)H	10	Multimode G62.5/125	1	6,0	600	90,0	0,53	40	32,0	<b>80422</b>
I-V(ZN)H	10	Single-mode E9/125	1	6,0	600	90,0	0,53	40	32,0	<b>80421</b>
I-V(ZN)H	12	Multimode G50/125	1	7,0	800	110,0	0,61	40	40,0	<b>80420</b>
I-V(ZN)H	12	Multimode G62.5/125	1	7,0	800	110,0	0,61	40	40,0	<b>80419</b>
I-V(ZN)H	12	Single-mode E9/125	1	7,0	800	110,0	0,61	40	40,0	<b>80418</b>

Dimensions and specifications may be changed without prior notice.

## Application

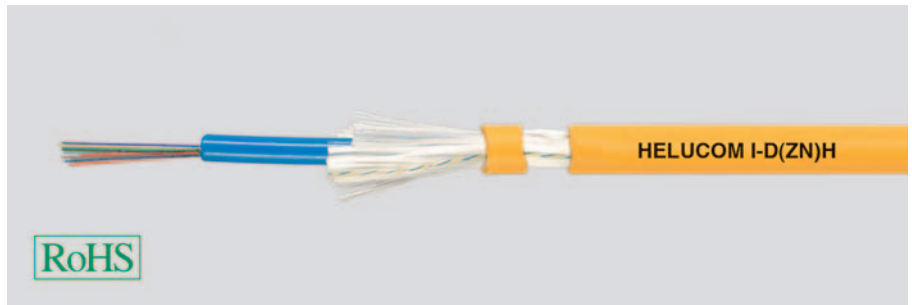
These HELUCOM® fibre-optic cables are used for the data network cabling in indoor applications. A big advantage of this cable type is its space-saving construction. Similar to the breakout cable, the connector is directly mounted at the tight buffer.

# Fibre Optic Indoor Cable

acc. DIN VDE 0888

HELUCOM®

I-D(ZN)H



## Cable structure

Core type: Loose tube  
Strain relief elements: Aramide  
Outer sheath material: FRNC  
Outer sheath colour: Yellow

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
I-D(ZN)H	4	Multimode G50/125	4	8,0	1200	120,0	1,50	150	65,0	<b>80631</b>
I-D(ZN)H	4	Multimode G62.5/125	4	8,0	1200	120,0	1,50	150	65,0	<b>80882</b>
I-D(ZN)H	4	Single-mode E9/125	4	8,0	1200	120,0	1,50	150	65,0	<b>80896</b>
I-D(ZN)H	6	Multimode G50/125	6	8,0	1200	120,0	1,50	150	65,0	<b>80868</b>
I-D(ZN)H	6	Multimode G62.5/125	6	8,0	1200	120,0	1,50	150	65,0	<b>80883</b>
I-D(ZN)H	6	Single-mode E9/125	6	8,0	1200	120,0	1,50	150	65,0	<b>80897</b>
I-D(ZN)H	8	Multimode G50/125	8	8,0	1200	120,0	1,50	150	65,0	<b>80869</b>
I-D(ZN)H	8	Multimode G62.5/125	8	8,0	1200	120,0	1,50	150	65,0	<b>80884</b>
I-D(ZN)H	8	Single-mode E9/125	8	8,0	1200	120,0	1,50	150	65,0	<b>80898</b>
I-D(ZN)H	10	Multimode G50/125	10	8,0	1200	120,0	1,50	150	65,0	<b>80793</b>
I-D(ZN)H	10	Multimode G62.5/125	10	8,0	1200	120,0	1,50	150	65,0	<b>80885</b>
I-D(ZN)H	10	Single-mode E9/125	10	8,0	1200	120,0	1,50	150	65,0	<b>80899</b>
I-D(ZN)H	12	Multimode G50/125	12	8,0	1200	120,0	1,50	150	65,0	<b>80045</b>
I-D(ZN)H	12	Multimode G62.5/125	12	8,0	1200	120,0	1,50	150	65,0	<b>80879</b>
I-D(ZN)H	12	Single-mode E9/125	12	8,0	1200	120,0	1,50	150	65,0	<b>80880</b>
I-D(ZN)H	16	Multimode G50/125	16	8,0	1200	120,0	1,50	150	135,0	<b>80870</b>
I-D(ZN)H	16	Multimode G62.5/125	16	8,0	1200	120,0	1,50	150	135,0	<b>80886</b>
I-D(ZN)H	16	Single-mode E9/125	16	8,0	1200	120,0	1,50	150	135,0	<b>80900</b>
I-D(ZN)H	24	Multimode G50/125	12	12,5	3000	190,0	2,20	200	150,0	<b>80872</b>
I-D(ZN)H	24	Multimode G50/125	24	9,0	1600	140,0	1,50	150	135,0	<b>80871</b>
I-D(ZN)H	24	Multimode G62.5/125	12	12,5	3000	190,0	2,20	200	150,0	<b>80888</b>
I-D(ZN)H	24	Multimode G62.5/125	24	9,0	1600	140,0	1,50	150	135,0	<b>81246</b>
I-D(ZN)H	24	Single-mode E9/125	12	12,5	3000	190,0	2,20	200	150,0	<b>80902</b>
I-D(ZN)H	24	Single-mode E9/125	24	9,0	1600	140,0	1,50	150	135,0	<b>80901</b>
I-D(ZN)H	36	Multimode G50/125	12	13,5	3000	200,0	2,20	200	160,0	<b>80875</b>
I-D(ZN)H	36	Multimode G62.5/125	12	13,5	3000	200,0	2,20	200	160,0	<b>80891</b>
I-D(ZN)H	36	Single-mode E9/125	12	13,5	3000	200,0	2,20	200	160,0	<b>80905</b>
I-D(ZN)H	48	Multimode G50/125	12	13,5	3000	200,0	2,20	200	160,0	<b>80877</b>
I-D(ZN)H	48	Multimode G62.5/125	12	13,5	3000	200,0	2,20	200	160,0	<b>80893</b>
I-D(ZN)H	48	Single-mode E9/125	12	13,5	3000	200,0	2,20	200	160,0	<b>80907</b>
I-D(ZN)H	60	Multimode G50/125	12	13,5	3000	200,0	2,20	200	170,0	<b>80878</b>
I-D(ZN)H	60	Multimode G62.5/125	12	13,5	3000	200,0	2,20	200	170,0	<b>80894</b>
I-D(ZN)H	60	Single-mode E9/125	12	13,5	3000	200,0	2,20	200	170,0	<b>80908</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are available either as central bundle core cable or as stranded versions. They are suitable for indoor cabling of buildings and facilities. The halogen-free version is especially suitable for the application in skyscrapers, hospitals and stores as well as in facilities with high concentration of capital goods, such as power plants, computing centers, and at locations with high security requirements, such as underground and control stations.

# Fibre Optic Indoor/Outdoor Minibreakout Cable

acc. DIN VDE 0888

**HELUCOM®**  
A/I-VQ(ZN)BH



## Cable structure

Core type: Tight buffer  
Strain relief elements: Aramide  
Type of armouring: Glass yarns  
Outer sheath material: FRNC  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +55°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A/I-VQ(ZN)BH	4	Multimode G50/125	1	6,1	2000	90,0	0,35	40	40,0	<b>82804</b>
A/I-VQ(ZN)BH	4	Multimode G62.5/125	1	6,1	2000	90,0	0,35	40	40,0	<b>82809</b>
A/I-VQ(ZN)BH	4	Single-mode E9/125	1	6,1	2000	90,0	0,35	40	40,0	<b>82814</b>
A/I-VQ(ZN)BH	6	Multimode G50/125	1	6,6	2000	100,0	0,41	40	47,0	<b>82805</b>
A/I-VQ(ZN)BH	6	Multimode G62.5/125	1	6,6	2000	100,0	0,41	40	47,0	<b>82810</b>
A/I-VQ(ZN)BH	6	Single-mode E9/125	1	6,6	2000	100,0	0,41	40	47,0	<b>82815</b>
A/I-VQ(ZN)BH	8	Multimode G50/125	1	6,6	2000	100,0	0,43	40	51,0	<b>82806</b>
A/I-VQ(ZN)BH	8	Multimode G62.5/125	1	6,6	2000	100,0	0,43	40	51,0	<b>82811</b>
A/I-VQ(ZN)BH	8	Single-mode E9/125	1	6,6	2000	100,0	0,43	40	51,0	<b>82816</b>
A/I-VQ(ZN)BH	10	Multimode G50/125	1	8,0	2000	120,0	0,61	40	65,0	<b>82807</b>
A/I-VQ(ZN)BH	10	Multimode G62.5/125	1	8,0	2000	120,0	0,61	40	65,0	<b>82812</b>
A/I-VQ(ZN)BH	10	Single-mode E9/125	1	8,0	2000	120,0	0,61	40	65,0	<b>82817</b>
A/I-VQ(ZN)BH	12	Multimode G50/125	1	8,3	3000	125,0	0,71	40	70,0	<b>82808</b>
A/I-VQ(ZN)BH	12	Multimode G62.5/125	1	8,3	3000	125,0	0,71	40	70,0	<b>82813</b>
A/I-VQ(ZN)BH	12	Single-mode E9/125	1	8,3	3000	125,0	0,71	40	70,0	<b>82818</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are used for the data network cabling in indoor and outdoor applications. With their black UV-resistant outer sheath and the non-metallic rodent protection, they are perfectly suited for outdoor use. A big advantage of this cable type is its space-saving construction. Similar to the breakout cable, the connector is directly mounted at the tight buffer.

# Fibre Optic Indoor/Outdoor Cable

acc. DIN VDE 0888

**HELUCOM<sup>®</sup> pact**

A/I-DQ(ZN)BH



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: FRNC  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A/I-DQ(ZN)BH	4	Multimode G50/125	4	7,5	1500	150,0	1,10	200	55,0	<b>82792</b>
A/I-DQ(ZN)BH	4	Multimode G62.5/125	4	7,5	1500	150,0	1,10	200	55,0	<b>82796</b>
A/I-DQ(ZN)BH	4	Single-mode E9/125	4	7,5	1500	150,0	1,10	200	55,0	<b>82800</b>
A/I-DQ(ZN)BH	6	Multimode G50/125	6	7,5	1500	150,0	1,10	200	55,0	<b>82793</b>
A/I-DQ(ZN)BH	6	Multimode G62.5/125	6	7,5	1500	150,0	1,10	200	55,0	<b>82797</b>
A/I-DQ(ZN)BH	6	Single-mode E9/125	6	7,5	1500	150,0	1,10	200	55,0	<b>82801</b>
A/I-DQ(ZN)BH	8	Multimode G50/125	8	7,5	1500	150,0	1,10	200	55,0	<b>82794</b>
A/I-DQ(ZN)BH	8	Multimode G62.5/125	8	7,5	1500	150,0	1,10	200	55,0	<b>82798</b>
A/I-DQ(ZN)BH	8	Single-mode E9/125	8	7,5	1500	150,0	1,10	200	55,0	<b>82802</b>
A/I-DQ(ZN)BH	12	Multimode G50/125	12	7,5	1500	150,0	1,10	200	55,0	<b>82795</b>
A/I-DQ(ZN)BH	12	Multimode G62.5/125	12	7,5	1500	150,0	1,10	200	55,0	<b>82799</b>
A/I-DQ(ZN)BH	12	Single-mode E9/125	12	7,5	1500	150,0	1,10	200	55,0	<b>82803</b>
A/I-DQ(ZN)BH	24	Multimode G50/125	24	8,5	1500	170,0	1,40	200	75,0	<b>802143</b>
A/I-DQ(ZN)BH	24	Multimode G62.5/125	24	8,5	1500	170,0	1,40	200	75,0	<b>802144</b>
A/I-DQ(ZN)BH	24	Single-mode E9/125	24	8,5	1500	170,0	1,40	200	75,0	<b>802145</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM<sup>®</sup> pact fibre-optic cables have a small but robust construction. They are suitable for indoor and outdoor cabling of buildings and facilities when space is an important argument. They are used in particular if the installation is to be done in one piece from the inside to the outside without additional use of couplings. With their black UV-resistant outer sheath and the non-metallic rodent protection, they are perfectly suited for outdoor use. The halogen-free outer sheath makes installation inhouse possible without any problems.

# Fibre Optic Indoor/Outdoor Cable

acc. DIN VDE 0888

**HELUCOM<sup>®</sup> pact**

A/I-DQ(ZN)BH OM3



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: FRNC  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A/I-DQ(ZN)BH	4	Multimode G50/125	4	7,5	1500	150,0	1,10	200	55,0	<b>802247</b>
A/I-DQ(ZN)BH	6	Multimode G50/125	6	7,5	1500	150,0	1,10	200	55,0	<b>802277</b>
A/I-DQ(ZN)BH	8	Multimode G50/125	8	7,5	1500	150,0	1,10	200	55,0	<b>802278</b>
A/I-DQ(ZN)BH	12	Multimode G50/125	12	7,5	1500	150,0	1,10	200	55,0	<b>802248</b>
A/I-DQ(ZN)BH	24	Multimode G50/125	24	8,5	1500	170,0	1,40	200	75,0	<b>802249</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM<sup>®</sup> pact fibre-optic cables have a small but robust construction. They are suitable for indoor and outdoor cabling of buildings and facilities when space is an important argument. They are used in particular if the installation is to be done in one piece from the inside to the outside without additional use of couplings. With their black UV-resistant outer sheath and the non-metallic rodent protection, they are perfectly suited for outdoor use. The halogen-free outer sheath makes installation inhouse possible without any problems.

# Fibre Optic Indoor/Outdoor Cable

acc. DIN VDE 0888

**HELUCOM®**

A/I-DQ(ZN)BH, central



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: FRNC  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A/I-DQ(ZN)BH	4	Multimode G50/125	4	10,0	2500	150,0	1,50	300	125,0	<b>80270</b>
A/I-DQ(ZN)BH	4	Multimode G62.5/125	4	10,0	2500	150,0	1,50	300	125,0	<b>80276</b>
A/I-DQ(ZN)BH	4	Single-mode E9/125	4	10,0	2500	150,0	1,50	300	125,0	<b>80264</b>
A/I-DQ(ZN)BH	6	Multimode G50/125	6	10,0	2500	150,0	1,50	300	125,0	<b>80271</b>
A/I-DQ(ZN)BH	6	Multimode G62.5/125	6	10,0	2500	150,0	1,50	300	125,0	<b>80265</b>
A/I-DQ(ZN)BH	6	Single-mode E9/125	6	10,0	2500	150,0	1,50	300	125,0	<b>80272</b>
A/I-DQ(ZN)BH	8	Multimode G50/125	8	10,0	2500	150,0	1,50	300	125,0	<b>80273</b>
A/I-DQ(ZN)BH	8	Multimode G62.5/125	8	10,0	2500	150,0	1,50	300	125,0	<b>80274</b>
A/I-DQ(ZN)BH	8	Single-mode E9/125	8	10,0	2500	150,0	1,50	300	125,0	<b>80275</b>
A/I-DQ(ZN)BH	12	Multimode G50/125	12	10,0	2500	150,0	1,50	300	125,0	<b>80681</b>
A/I-DQ(ZN)BH	12	Multimode G62.5/125	12	10,0	2500	150,0	1,50	300	125,0	<b>80278</b>
A/I-DQ(ZN)BH	12	Single-mode E9/125	12	10,0	2500	150,0	1,50	300	125,0	<b>80279</b>
A/I-DQ(ZN)BH	16	Multimode G50/125	16	10,0	2500	150,0	1,50	300	145,0	<b>80280</b>
A/I-DQ(ZN)BH	16	Multimode G62.5/125	16	10,0	2500	150,0	1,50	300	145,0	<b>80281</b>
A/I-DQ(ZN)BH	16	Single-mode E9/125	16	10,0	2500	150,0	1,50	300	145,0	<b>80851</b>
A/I-DQ(ZN)BH	24	Multimode G50/125	24	10,0	2500	150,0	1,50	300	145,0	<b>80725</b>
A/I-DQ(ZN)BH	24	Multimode G62.5/125	24	10,0	2500	150,0	1,50	300	145,0	<b>82431</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are available either as central bundle core cable or as stranded versions. They are suitable for indoor and outdoor cabling of buildings and facilities. They are used in particular if the installation is to be done in one piece from the inside to the outside without additional use of couplings. With their black UV-resistant outer sheath and the non-metallic rodent protection, they are perfectly suited for outdoor use. The halogen-free outer sheath makes installation inhouse possible without any problems.

# Fibre Optic Indoor/Outdoor Cable

acc. DIN VDE 0888

**HELUCOM®**  
A/I-DQ(ZN)BH, stranded



## Cable structure

Core type: Loose tube  
GRP support element  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: FRNC  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A/I-DQ(ZN)BH	24	Multimode G50/125	12	11,0	2700	165,0	2,00	600	90,0	<b>81495</b>
A/I-DQ(ZN)BH	24	Multimode G62.5/125	12	11,0	2700	165,0	2,00	600	90,0	<b>802263</b>
A/I-DQ(ZN)BH	24	Single-mode E9/125	12	11,0	2700	165,0	2,00	600	90,0	<b>80846</b>
A/I-DQ(ZN)BH	48	Multimode G50/125	12	11,0	2700	165,0	2,00	600	90,0	<b>802261</b>
A/I-DQ(ZN)BH	48	Multimode G62.5/125	12	11,0	2700	165,0	2,00	600	90,0	<b>802264</b>
A/I-DQ(ZN)BH	48	Single-mode E9/125	12	11,0	2700	165,0	2,00	600	90,0	<b>802266</b>
A/I-DQ(ZN)BH	48	Single-mode E9/125	12	11,0	2700	165,0	2,00	600	90,0	<b>802281</b>
A/I-DQ(ZN)BH	60	Multimode G50/125	12	11,0	2700	165,0	2,00	600	90,0	<b>802262</b>
A/I-DQ(ZN)BH	60	Multimode G62.5/125	12	11,0	2700	165,0	2,00	600	90,0	<b>802265</b>
A/I-DQ(ZN)BH	60	Single-mode E9/125	12	11,0	2700	165,0	2,00	600	90,0	<b>802267</b>
A/I-DQ(ZN)BH	72	Multimode G50/125	12	11,5	2700	175,0	2,10	600	100,0	<b>802268</b>
A/I-DQ(ZN)BH	72	Multimode G62.5/125	12	11,5	2700	175,0	2,10	600	100,0	<b>802271</b>
A/I-DQ(ZN)BH	72	Single-mode E9/125	12	11,5	2700	175,0	2,10	600	100,0	<b>802274</b>
A/I-DQ(ZN)BH	84	Multimode G50/125	12	12,5	3000	190,0	2,40	600	130,0	<b>802269</b>
A/I-DQ(ZN)BH	84	Multimode G62.5/125	12	12,5	3000	190,0	2,40	600	130,0	<b>802272</b>
A/I-DQ(ZN)BH	84	Single-mode E9/125	12	12,5	3000	190,0	2,40	600	130,0	<b>802275</b>
A/I-DQ(ZN)BH	96	Multimode G50/125	12	12,5	3000	190,0	2,80	600	130,0	<b>802270</b>
A/I-DQ(ZN)BH	96	Multimode G62.5/125	12	12,5	3000	190,0	2,80	600	130,0	<b>802273</b>
A/I-DQ(ZN)BH	96	Single-mode E9/125	12	12,5	3000	190,0	2,80	600	130,0	<b>802276</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are available either as central bundle core cable or as stranded versions. They are suitable for indoor and outdoor cabling of buildings and facilities. They are used in particular if the installation is to be done in one piece from the inside to the outside without additional use of couplings. With their black UV-resistant outer sheath and the non-metallic rodent protection, they are perfectly suited for outdoor use. The halogen-free outer sheath makes installation inhouse possible without any problems.

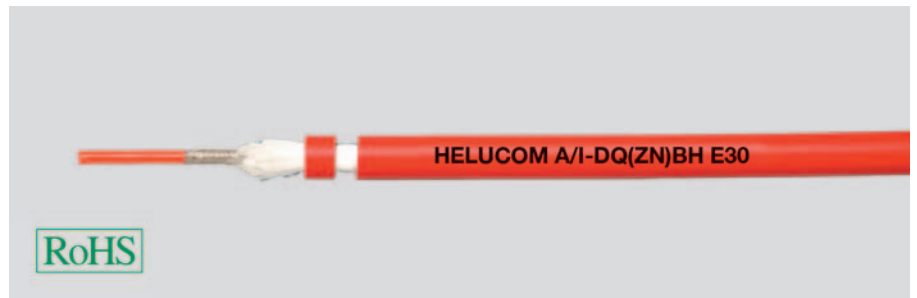


# Fibre Optic Cable with Functionality

with reference to DIN 4102-12

HELUCOM® FS30

A/I-DQ(ZN)BH



## Cable structure

Core type: Loose tube  
Strain relief elements: Aramide  
Type of armouring: Glass yarns  
Outer sheath material: FR/LSOH  
Outer sheath colour: Red

## Temperature range

Laying, min.: -10°C  
Laying, max.: +50°C  
Operating, min.: -25°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant  
Functional integrity: E30

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A/I-DQ(ZN)BH	4	Multimode G50/125	4	7,8	1000	80,0	1,08	200	102,0	<b>801217</b>
A/I-DQ(ZN)BH	4	Multimode G62.5/125	4	7,8	1000	80,0	1,08	200	102,0	<b>801218</b>
A/I-DQ(ZN)BH	4	Single-mode E9/125	4	7,8	1000	80,0	1,08	200	102,0	<b>801219</b>
A/I-DQ(ZN)BH	12	Multimode G50/125	12	7,8	1000	80,0	1,08	200	102,0	<b>801220</b>
A/I-DQ(ZN)BH	12	Multimode G62.5/125	12	7,8	1000	80,0	1,08	200	102,0	<b>801221</b>
A/I-DQ(ZN)BH	12	Single-mode E9/125	12	7,8	1000	80,0	1,08	200	102,0	<b>801190</b>

Dimensions and specifications may be changed without prior notice.

## Application

With the serie HELUCOM® E30 we have realized, based on a special construction and high quality raw materials, a functional integrity according to DIN 4102-12 E30 (30 minutes). Together with the planned accessories the cables realize the full function of the communication in areas like tunnels or buildings for the defined period of time. On request we also can deliver cables with more than 12 fibres as stranded construction.

# Fibre Optic Cable with Functionality

with reference to IEC 60331-25

HELUCOM® FS90

A/I-D(ZN)BH(SR)H



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Inner sheath material: FRNC  
Type of armouring: steel tape  
Outer sheath material: FR/LSOH  
Outer sheath colour: Yellow

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +70°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1 and -3  
Smoke density acc. to IEC 61034  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
Cable, laterally water-tight  
Functional integrity: IEC 60794/ IEC 60331-25

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A/I-D(ZN)BH(SR)H	4	Multimode G50/125	4	12,7	700	180,0	6,20	300	216,0	<b>803917</b>
A/I-D(ZN)BH(SR)H	4	Single-mode E9/125	4	12,7	700	180,0	6,20	300	216,0	<b>803919</b>
A/I-D(ZN)BH(SR)H	12	Multimode G50/125	12	12,7	700	180,0	6,20	300	216,0	<b>803918</b>
A/I-D(ZN)BH(SR)H	12	Single-mode E9/125	12	12,7	700	180,0	6,20	300	216,0	<b>803920</b>

Dimensions and specifications may be changed without prior notice.

## Application

With the serie HELUCOM® FS90 we have realized, based on a special construction and high quality raw materials, a functional integrity according to IEC 60331-25 within 90, minutes (up to 750°C). Together with the planed accessories the cables realize the full function of the communication in areas like tunnels or buildings for the defined period of time. On request we also can deliver cables with more than 12 fibres as stranded construction.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

**HELUCOM®**

A-DQ(ZN)2Y, central



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ(ZN)2Y	2	Multimode G50/125	2	8,8	1500	130,0	1,60	250	40,0	<b>80148</b>
A-DQ(ZN)2Y	2	Multimode G62.5/125	2	8,8	1500	130,0	1,60	250	40,0	<b>80164</b>
A-DQ(ZN)2Y	2	Single-mode E9/125	2	8,8	1500	130,0	1,60	250	40,0	<b>80131</b>
A-DQ(ZN)2Y	4	Multimode G50/125	4	8,8	1500	130,0	1,60	250	40,0	<b>80149</b>
A-DQ(ZN)2Y	4	Multimode G62.5/125	4	8,8	1500	130,0	1,60	250	40,0	<b>80165</b>
A-DQ(ZN)2Y	4	Single-mode E9/125	4	8,8	1500	130,0	1,60	250	40,0	<b>80132</b>
A-DQ(ZN)2Y	6	Multimode G50/125	6	8,8	1500	130,0	1,60	250	40,0	<b>80150</b>
A-DQ(ZN)2Y	6	Multimode G62.5/125	6	8,8	1500	130,0	1,60	250	40,0	<b>80166</b>
A-DQ(ZN)2Y	6	Single-mode E9/125	6	8,8	1500	130,0	1,60	250	40,0	<b>80133</b>
A-DQ(ZN)2Y	8	Multimode G50/125	8	8,8	1500	130,0	1,60	250	40,0	<b>80151</b>
A-DQ(ZN)2Y	8	Multimode G62.5/125	8	8,8	1500	130,0	1,60	250	40,0	<b>80167</b>
A-DQ(ZN)2Y	8	Single-mode E9/125	8	8,8	1500	130,0	1,60	250	40,0	<b>80134</b>
A-DQ(ZN)2Y	12	Multimode G50/125	12	8,8	1500	130,0	1,60	250	40,0	<b>80153</b>
A-DQ(ZN)2Y	12	Multimode G62.5/125	12	8,8	1500	130,0	1,60	250	40,0	<b>80169</b>
A-DQ(ZN)2Y	12	Single-mode E9/125	12	8,8	1500	130,0	1,60	250	40,0	<b>80136</b>
A-DQ(ZN)2Y	16	Multimode G50/125	16	8,8	1500	130,0	1,80	250	70,0	<b>80154</b>
A-DQ(ZN)2Y	16	Multimode G62.5/125	16	8,8	1500	130,0	1,80	250	70,0	<b>80170</b>
A-DQ(ZN)2Y	16	Single-mode E9/125	16	8,8	1500	130,0	1,80	250	70,0	<b>80137</b>
A-DQ(ZN)2Y	24	Multimode G50/125	24	8,8	1500	130,0	1,80	250	70,0	<b>80155</b>
A-DQ(ZN)2Y	24	Multimode G62.5/125	24	8,8	1500	130,0	1,80	250	70,0	<b>80171</b>
A-DQ(ZN)2Y	24	Single-mode E9/125	24	8,8	1500	130,0	1,80	250	70,0	<b>80138</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a design that is particularly easy to mount. Around a central grooved cable, there is a composite of glass yarns and swelling fleece with characteristics that ensure the actual strain relief and waterproofing in longitudinal direction of the cable. In addition, these cables are designed grease-free. Wiping the jelly off is therefore unnecessary. This construction is particularly used in underground, tubes and channel areas, where rodent infestation is not to be expected.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

**HELUCOM®**

A-DQ(ZN)2Y, stranded



## Cable structure

Core type: Loose tube  
GRP support element  
Strain relief elements: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ(ZN)2Y	24	Multimode G50/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80156</b>
A-DQ(ZN)2Y	24	Multimode G62.5/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80172</b>
A-DQ(ZN)2Y	24	Single-mode E9/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80139</b>
A-DQ(ZN)2Y	36	Multimode G50/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80448</b>
A-DQ(ZN)2Y	36	Multimode G62.5/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80449</b>
A-DQ(ZN)2Y	36	Single-mode E9/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80450</b>
A-DQ(ZN)2Y	48	Multimode G50/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80447</b>
A-DQ(ZN)2Y	48	Multimode G62.5/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80446</b>
A-DQ(ZN)2Y	48	Single-mode E9/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80445</b>
A-DQ(ZN)2Y	60	Multimode G50/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80159</b>
A-DQ(ZN)2Y	60	Multimode G62.5/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80175</b>
A-DQ(ZN)2Y	60	Single-mode E9/125	12	10,0	2500	200,0	2,50	400	70,0	<b>80142</b>
A-DQ(ZN)2Y	72	Multimode G50/125	12	10,5	2500	210,0	2,60	400	75,0	<b>80444</b>
A-DQ(ZN)2Y	72	Multimode G62.5/125	12	10,5	2500	210,0	2,60	400	75,0	<b>80443</b>
A-DQ(ZN)2Y	72	Single-mode E9/125	12	10,5	2500	210,0	2,60	400	75,0	<b>80442</b>
A-DQ(ZN)2Y	84	Multimode G50/125	12	11,5	2700	230,0	3,30	400	110,0	<b>80160</b>
A-DQ(ZN)2Y	84	Multimode G62.5/125	12	11,5	2700	230,0	3,30	400	110,0	<b>80176</b>
A-DQ(ZN)2Y	84	Single-mode E9/125	12	11,5	2700	230,0	3,30	400	110,0	<b>80143</b>
A-DQ(ZN)2Y	96	Multimode G50/125	12	11,5	2700	230,0	3,30	400	110,0	<b>80441</b>
A-DQ(ZN)2Y	96	Multimode G62.5/125	12	11,5	2700	230,0	3,30	400	110,0	<b>80440</b>
A-DQ(ZN)2Y	96	Single-mode E9/125	12	11,5	2700	230,0	3,30	400	110,0	<b>80439</b>
A-DQ(ZN)2Y	108	Multimode G50/125	12	13,0	2700	260,0	4,00	400	130,0	<b>80161</b>
A-DQ(ZN)2Y	108	Multimode G62.5/125	12	13,0	2700	260,0	4,00	400	130,0	<b>80177</b>
A-DQ(ZN)2Y	108	Single-mode E9/125	12	13,0	2700	260,0	4,00	400	130,0	<b>80144</b>
A-DQ(ZN)2Y	120	Multimode G50/125	12	13,0	2700	260,0	4,00	400	130,0	<b>80162</b>
A-DQ(ZN)2Y	120	Multimode G62.5/125	12	13,0	2700	260,0	4,00	400	130,0	<b>80178</b>
A-DQ(ZN)2Y	120	Single-mode E9/125	12	13,0	2700	260,0	4,00	400	130,0	<b>80146</b>
A-DQ(ZN)2Y	144	Multimode G50/125	12	14,0	2700	280,0	5,00	400	150,0	<b>80438</b>
A-DQ(ZN)2Y	144	Multimode G62.5/125	12	14,0	2700	280,0	5,00	400	150,0	<b>80437</b>
A-DQ(ZN)2Y	144	Single-mode E9/125	12	14,0	2700	280,0	5,00	400	150,0	<b>80436</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a design that is particularly easy to mount and extremely tension-resistant. Around a stranded grooved cable and filler elements, there is a swelling fleece with characteristics that ensure strain relief and waterproofing in longitudinal direction of the cable. In addition, these cables are designed grease-free. Wiping the jelly off is therefore unnecessary. This construction is particularly used in underground, tubes and channel areas, where above-average tensile stresses and/or transverse compressions occur, but rodent infestation is not to be expected.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

**HELUCOM<sup>®</sup> pact**

A-DQ(ZN)B2Y, central



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ(ZN)B2Y	2	Multimode G50/125	2	7,5	1500	150,0	1,60	300	40,0	<b>800754</b>
A-DQ(ZN)B2Y	2	Multimode G62.5/125	2	7,5	1500	150,0	1,60	300	40,0	<b>802131</b>
A-DQ(ZN)B2Y	2	Single-mode E9/125	2	7,5	1500	150,0	1,60	300	40,0	<b>802137</b>
A-DQ(ZN)B2Y	4	Multimode G50/125	4	7,5	1500	150,0	1,60	300	40,0	<b>800755</b>
A-DQ(ZN)B2Y	4	Multimode G62.5/125	4	7,5	1500	150,0	1,60	300	40,0	<b>802132</b>
A-DQ(ZN)B2Y	4	Single-mode E9/125	4	7,5	1500	150,0	1,60	300	40,0	<b>802138</b>
A-DQ(ZN)B2Y	6	Multimode G50/125	6	7,5	1500	150,0	1,60	300	40,0	<b>800756</b>
A-DQ(ZN)B2Y	6	Multimode G62.5/125	6	7,5	1500	150,0	1,60	300	40,0	<b>802133</b>
A-DQ(ZN)B2Y	6	Single-mode E9/125	6	7,5	1500	150,0	1,60	300	40,0	<b>802139</b>
A-DQ(ZN)B2Y	8	Multimode G50/125	8	7,5	1500	150,0	1,60	300	40,0	<b>800757</b>
A-DQ(ZN)B2Y	8	Multimode G62.5/125	8	7,5	1500	150,0	1,60	300	40,0	<b>802134</b>
A-DQ(ZN)B2Y	8	Single-mode E9/125	8	7,5	1500	150,0	1,60	300	40,0	<b>802140</b>
A-DQ(ZN)B2Y	12	Multimode G50/125	12	7,5	1500	150,0	1,60	300	40,0	<b>800759</b>
A-DQ(ZN)B2Y	12	Multimode G62.5/125	12	7,5	1500	150,0	1,60	300	40,0	<b>802135</b>
A-DQ(ZN)B2Y	12	Single-mode E9/125	12	7,5	1500	150,0	1,60	300	40,0	<b>802141</b>
A-DQ(ZN)B2Y	24	Single-mode E9/125	24	8,5	1500	170,0	1,90	300	60,0	<b>802142</b>
A-DQ(ZN)B2Y	24	Multimode G50/125	24	8,5	1500	170,0	1,90	300	60,0	<b>800762</b>
A-DQ(ZN)B2Y	24	Multimode G62.5/125	24	8,5	1500	170,0	1,90	300	60,0	<b>802136</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM<sup>®</sup> pact fibre-optic cables are characterized by a design that is particularly easy to mount and is rodent-protected. Around a central grooved cable, there is a composite of glass yarns and swelling fleece with characteristics that ensure rodent protection, strain relief, and waterproofing in longitudinal direction of the cable. In addition, these cables are designed grease-free. Wiping the jelly off is therefore unnecessary. This construction is particularly used in underground, tubes and channel areas, where normal tensile stresses and/or transverse compressions occur and rodent infestation is to be expected.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

**HELUCOM®**

A-DQ(ZN)B2Y, central



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ(ZN)B2Y	2	Multimode G50/125	2	10,0	2500	160,0	1,60	300	100,0	<b>80196</b>
A-DQ(ZN)B2Y	2	Multimode G62.5/125	2	10,0	2500	160,0	1,60	300	100,0	<b>80212</b>
A-DQ(ZN)B2Y	2	Single-mode E9/125	2	10,0	2500	160,0	1,60	300	100,0	<b>80180</b>
A-DQ(ZN)B2Y	4	Multimode G50/125	4	10,0	2500	160,0	1,60	300	100,0	<b>80197</b>
A-DQ(ZN)B2Y	4	Multimode G62.5/125	4	10,0	2500	160,0	1,60	300	100,0	<b>80213</b>
A-DQ(ZN)B2Y	4	Single-mode E9/125	4	10,0	2500	160,0	1,60	300	100,0	<b>80181</b>
A-DQ(ZN)B2Y	6	Multimode G50/125	6	10,0	2500	160,0	1,60	300	100,0	<b>80198</b>
A-DQ(ZN)B2Y	6	Multimode G62.5/125	6	10,0	2500	160,0	1,60	300	100,0	<b>80214</b>
A-DQ(ZN)B2Y	6	Single-mode E9/125	6	10,0	2500	160,0	1,60	300	100,0	<b>80182</b>
A-DQ(ZN)B2Y	8	Multimode G50/125	8	10,0	2500	160,0	1,60	300	100,0	<b>80199</b>
A-DQ(ZN)B2Y	8	Multimode G62.5/125	8	10,0	2500	160,0	1,60	300	100,0	<b>80215</b>
A-DQ(ZN)B2Y	8	Single-mode E9/125	8	10,0	2500	160,0	1,60	300	100,0	<b>80183</b>
A-DQ(ZN)B2Y	12	Multimode G50/125	12	10,0	2500	160,0	1,60	300	100,0	<b>80201</b>
A-DQ(ZN)B2Y	12	Multimode G62.5/125	12	10,0	2500	160,0	1,60	300	100,0	<b>80217</b>
A-DQ(ZN)B2Y	12	Single-mode E9/125	12	10,0	2500	160,0	1,60	300	100,0	<b>80185</b>
A-DQ(ZN)B2Y	16	Multimode G50/125	16	10,0	2500	180,0	1,80	300	130,0	<b>80202</b>
A-DQ(ZN)B2Y	16	Multimode G62.5/125	16	10,0	2500	180,0	1,80	300	130,0	<b>80218</b>
A-DQ(ZN)B2Y	16	Single-mode E9/125	16	10,0	2500	180,0	1,80	300	130,0	<b>80186</b>
A-DQ(ZN)B2Y	24	Multimode G50/125	24	10,0	2500	180,0	1,80	300	130,0	<b>80204</b>
A-DQ(ZN)B2Y	24	Multimode G62.5/125	24	10,0	2500	180,0	1,80	300	130,0	<b>80220</b>
A-DQ(ZN)B2Y	24	Single-mode E9/125	24	10,0	2500	180,0	1,80	300	130,0	<b>80187</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a design that is particularly easy to mount and is rodent-protected. Around a central grooved cable, there is a composite of glass yarns and swelling fleece with characteristics that ensure rodent protection, strain relief, and waterproofing in longitudinal direction of the cable. In addition, these cables are designed grease-free. Wiping the jelly off is therefore unnecessary. This construction is particularly used in underground, tubes and channel areas, where normal tensile stresses and/or transverse compressions occur and rodent infestation is to be expected.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

**HELUCOM®**

A-DQ(ZN)B2Y, stranded



## Cable structure

Core type: Loose tube  
GRP support element  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ(ZN)B2Y	24	Multimode G50/125	12	10,5	2700	210,0	2,70	600	95,0	<b>81382</b>
A-DQ(ZN)B2Y	24	Multimode G62.5/125	12	10,5	2700	210,0	2,70	600	95,0	<b>80219</b>
A-DQ(ZN)B2Y	24	Single-mode E9/125	12	10,5	2700	210,0	2,70	600	95,0	<b>80188</b>
A-DQ(ZN)B2Y	36	Multimode G50/125	12	10,5	2700	210,0	2,70	600	95,0	<b>81108</b>
A-DQ(ZN)B2Y	36	Multimode G62.5/125	12	10,5	2700	210,0	2,70	600	95,0	<b>81109</b>
A-DQ(ZN)B2Y	36	Single-mode E9/125	12	10,5	2700	210,0	2,70	600	95,0	<b>81110</b>
A-DQ(ZN)B2Y	48	Multimode G50/125	12	10,5	2700	210,0	2,70	600	95,0	<b>82648</b>
A-DQ(ZN)B2Y	48	Multimode G62.5/125	12	10,5	2700	210,0	2,70	600	95,0	<b>81112</b>
A-DQ(ZN)B2Y	48	Single-mode E9/125	12	10,5	2700	210,0	2,70	600	95,0	<b>81113</b>
A-DQ(ZN)B2Y	60	Multimode G50/125	12	10,5	2700	210,0	2,70	600	95,0	<b>80207</b>
A-DQ(ZN)B2Y	60	Multimode G62.5/125	12	10,5	2700	210,0	2,70	600	95,0	<b>80223</b>
A-DQ(ZN)B2Y	60	Single-mode E9/125	12	10,5	2700	210,0	2,70	600	95,0	<b>80191</b>
A-DQ(ZN)B2Y	72	Multimode G50/125	12	11,0	2700	220,0	2,90	600	100,0	<b>81133</b>
A-DQ(ZN)B2Y	72	Multimode G62.5/125	12	11,0	2700	220,0	2,90	600	100,0	<b>81134</b>
A-DQ(ZN)B2Y	72	Single-mode E9/125	12	11,0	2700	220,0	2,90	600	100,0	<b>81120</b>
A-DQ(ZN)B2Y	84	Multimode G50/125	12	12,0	3000	240,0	3,60	600	140,0	<b>80208</b>
A-DQ(ZN)B2Y	84	Multimode G62.5/125	12	12,0	3000	240,0	3,60	600	140,0	<b>80224</b>
A-DQ(ZN)B2Y	84	Single-mode E9/125	12	12,0	3000	240,0	3,60	600	140,0	<b>80192</b>
A-DQ(ZN)B2Y	96	Multimode G50/125	12	12,0	3000	240,0	3,60	600	140,0	<b>81135</b>
A-DQ(ZN)B2Y	96	Multimode G62.5/125	12	12,0	3000	240,0	3,60	600	140,0	<b>81136</b>
A-DQ(ZN)B2Y	96	Single-mode E9/125	12	12,0	3000	240,0	3,60	600	140,0	<b>81121</b>
A-DQ(ZN)B2Y	108	Multimode G50/125	12	13,5	3000	270,0	4,30	600	155,0	<b>80209</b>
A-DQ(ZN)B2Y	108	Multimode G62.5/125	12	13,5	3000	270,0	4,30	600	155,0	<b>80225</b>
A-DQ(ZN)B2Y	108	Single-mode E9/125	12	13,5	3000	270,0	4,30	600	155,0	<b>80193</b>
A-DQ(ZN)B2Y	120	Multimode G50/125	12	13,5	3000	270,0	4,30	600	155,0	<b>80210</b>
A-DQ(ZN)B2Y	120	Multimode G62.5/125	12	13,5	3000	270,0	4,30	600	155,0	<b>80226</b>
A-DQ(ZN)B2Y	120	Single-mode E9/125	12	13,5	3000	270,0	4,30	600	155,0	<b>80194</b>
A-DQ(ZN)B2Y	144	Multimode G50/125	12	14,5	3000	290,0	5,40	600	200,0	<b>80211</b>
A-DQ(ZN)B2Y	144	Multimode G62.5/125	12	14,5	3000	290,0	5,40	600	200,0	<b>80227</b>
A-DQ(ZN)B2Y	144	Single-mode E9/125	12	14,5	3000	290,0	5,40	600	200,0	<b>80195</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a design that is particularly easy to mount, extremely tension-resistant and rodent-proof. Around a stranded grooved cable and filler elements, there is a composite of glass yarns and swelling fleece with characteristics that ensure rodent protection, strain relief, and waterproofing in longitudinal direction of the cable. In addition, these cables are designed grease-free. Wiping the jelly off is therefore unnecessary. This construction is particularly used in underground, tubes and channel areas, where above-average tensile stresses and/or transverse compressions occur and rodent infestation is to be expected.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

**HELUCOM<sup>®</sup> pact**

A-DQ(ZN)B2Y fibre combi, stranded



## Cable structure

Core type: Loose tube  
 GRP support element  
 Strain relief elements: Glass yarns  
 Type of armouring: Glass yarns  
 Outer sheath material: PE  
 Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
 Laying, max.: +50°C  
 Operating, min.: -20°C  
 Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
 Longitudinally water-tight acc. to IEC 60794-1-2-F5  
 UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ(ZN)B2Y	24	Single- and multimode G50/125	12	9,5	2500	200,0	2,50	400	90,0	<b>803037</b>
A-DQ(ZN)B2Y	24	Single- und Multimode G50/125 OM3	12	9,5	2500	200,0	2,50	400	90,0	<b>803923</b>
A-DQ(ZN)B2Y	48	Single- and multimode G50/125	12	9,5	2500	200,0	2,50	400	90,0	<b>803038</b>
A-DQ(ZN)B2Y	48	Single- und Multimode G50/125 OM3	12	9,5	2500	200,0	2,50	400	90,0	<b>803924</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM<sup>®</sup> pact fibre-optic cables are characterized by a design that is particularly easy to mount, tension-resistant and rodent-proof. Around a stranded grooved cable and filler elements, there is a composite of glass yarns and swelling fleece with characteristics that ensure rodent protection, strain relief and waterproofing in longitudinal direction of the cable. In addition, these cables are designed grease-free. Wiping the jelly off is therefore unnecessary. This construction is particularly used in underground, tubes and channel areas, where packing density also plays a role.



# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

**HELUCOM®**

A-DQ(ZN)B2Y fibre combi, stranded



## Cable structure

Core type: Loose tube  
GRP support element  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ(ZN)B2Y	24	Single- and multimode G50/125	12	10,5	2700	200,0	2,70	600	95,0	<b>81478</b>
A-DQ(ZN)B2Y	48	Single- and multimode G50/125	12	10,5	2700	200,0	2,70	600	95,0	<b>801183</b>

Dimensions and specifications may be changed without prior notice.

## Application

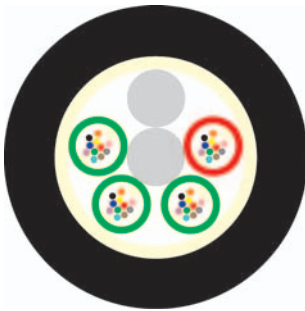
These HELUCOM® fibre-optic cables are characterized by a design that is particularly easy to mount, extremely tension-resistant and rodent-proof. Around a stranded grooved cable and filler elements, there is a composite of glass yarns and swelling fleece with characteristics that ensure rodent protection, strain relief and waterproofing in longitudinal direction of the cable. In addition, these cables are designed grease-free. Wiping the jelly off is therefore unnecessary. This construction is particularly used in underground, tubes and channel areas, where above-average tensile stresses and/or transverse compressions occur and rodent infestation is to be expected.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

HELUCOM®

A-DF(ZN)2Y



## Cable structure

Core type: Loose tube  
GRP support element  
Strain relief elements: Aramide  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DF(ZN)2Y	2	Multimode G50/125	2	9,5	2500	95,0	4,20	400	85,0	80016
A-DF(ZN)2Y	2	Multimode G62.5/125	2	9,5	2500	95,0	4,20	400	85,0	80033
A-DF(ZN)2Y	2	Single-mode E9/125	2	9,5	2500	95,0	4,20	400	85,0	80000
A-DF(ZN)2Y	4	Multimode G50/125	4	9,5	2500	95,0	4,20	400	85,0	80017
A-DF(ZN)2Y	4	Multimode G62.5/125	4	9,5	2500	95,0	4,20	400	85,0	80034
A-DF(ZN)2Y	4	Single-mode E9/125	4	9,5	2500	95,0	4,20	400	85,0	80001
A-DF(ZN)2Y	8	Multimode G50/125	8	9,5	2500	95,0	4,20	400	85,0	80019
A-DF(ZN)2Y	8	Multimode G62.5/125	8	9,5	2500	95,0	4,20	400	85,0	80036
A-DF(ZN)2Y	8	Single-mode E9/125	8	9,5	2500	95,0	4,20	400	85,0	80003
A-DF(ZN)2Y	12	Multimode G50/125	12	9,5	2500	95,0	4,20	400	85,0	80021
A-DF(ZN)2Y	12	Multimode G62.5/125	12	9,5	2500	95,0	4,20	400	85,0	80038
A-DF(ZN)2Y	12	Single-mode E9/125	12	9,5	2500	95,0	4,20	400	85,0	80005
A-DF(ZN)2Y	24	Multimode G50/125	12	9,5	2700	95,0	4,00	400	85,0	80024
A-DF(ZN)2Y	24	Multimode G62.5/125	12	9,5	2700	95,0	4,00	400	85,0	80041
A-DF(ZN)2Y	24	Single-mode E9/125	12	9,5	2700	95,0	4,00	400	85,0	80008
A-DF(ZN)2Y	36	Multimode G50/125	12	9,5	2700	95,0	4,00	400	85,0	80912
A-DF(ZN)2Y	36	Multimode G62.5/125	12	9,5	2700	95,0	4,00	400	85,0	80913
A-DF(ZN)2Y	36	Single-mode E9/125	12	9,5	2700	95,0	4,00	400	85,0	80914
A-DF(ZN)2Y	48	Multimode G50/125	12	9,5	2700	95,0	4,00	400	85,0	80026
A-DF(ZN)2Y	48	Multimode G62.5/125	12	9,5	2700	95,0	4,00	400	85,0	80046
A-DF(ZN)2Y	48	Single-mode E9/125	12	9,5	2700	95,0	4,00	400	85,0	80010
A-DF(ZN)2Y	60	Multimode G50/125	12	9,5	2700	95,0	4,00	400	85,0	80027
A-DF(ZN)2Y	60	Multimode G62.5/125	12	9,5	2700	95,0	4,00	400	85,0	80047
A-DF(ZN)2Y	60	Single-mode E9/125	12	9,5	2700	95,0	4,00	400	85,0	80011
A-DF(ZN)2Y	72	Multimode G50/125	12	10,0	2700	100,0	3,80	400	90,0	80473
A-DF(ZN)2Y	72	Multimode G62.5/125	12	10,0	2700	100,0	3,80	400	90,0	80474
A-DF(ZN)2Y	72	Single-mode E9/125	12	10,0	2700	100,0	3,80	400	90,0	80475
A-DF(ZN)2Y	84	Multimode G50/125	12	10,7	3000	107,0	4,30	400	120,0	80028
A-DF(ZN)2Y	84	Multimode G62.5/125	12	10,7	3000	107,0	4,30	400	120,0	80048
A-DF(ZN)2Y	84	Single-mode E9/125	12	10,7	3000	107,0	4,30	400	120,0	80012
A-DF(ZN)2Y	96	Multimode G50/125	12	11,5	3000	115,0	5,00	400	135,0	80777
A-DF(ZN)2Y	96	Multimode G62.5/125	12	11,5	3000	115,0	5,00	400	135,0	80774
A-DF(ZN)2Y	96	Single-mode E9/125	12	11,5	3000	115,0	5,00	400	135,0	80764
A-DF(ZN)2Y	144	Multimode G50/125	12	14,5	3000	145,0	7,70	400	175,0	80032
A-DF(ZN)2Y	144	Multimode G62.5/125	12	14,5	3000	145,0	7,70	400	175,0	80051
A-DF(ZN)2Y	144	Single-mode E9/125	12	14,5	3000	145,0	7,70	400	175,0	80015

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a stranded construction with jelly filling. They are made waterproof in longitudinal direction by filling a jelly mass into the stranding cavities. Non-metallic tension elements ensure above average strain relief. This construction is particularly used in the area of telecommunication and long distance, but also in regular channels and tubes.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

HELUCOM®

A-DF(ZN)B2Y



## Cable structure

Core type: Loose tube  
GRP support element  
Strain relief elements: Aramide  
Type of armouring: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DF(ZN)B2Y	2	Multimode G50/125	2	10,5	2700	105,0	4,40	400	90,0	80100
A-DF(ZN)B2Y	2	Multimode G62.5/125	2	10,5	2700	105,0	4,40	400	90,0	80115
A-DF(ZN)B2Y	2	Single-mode E9/125	2	10,5	2700	105,0	4,40	400	90,0	80084
A-DF(ZN)B2Y	4	Multimode G50/125	4	10,5	2700	105,0	4,40	400	90,0	80101
A-DF(ZN)B2Y	4	Multimode G62.5/125	4	10,5	2700	105,0	4,40	400	90,0	80116
A-DF(ZN)B2Y	4	Single-mode E9/125	4	10,5	2700	105,0	4,40	400	90,0	80085
A-DF(ZN)B2Y	8	Multimode G50/125	8	10,5	2700	105,0	4,40	400	90,0	80031
A-DF(ZN)B2Y	8	Multimode G62.5/125	8	10,5	2700	105,0	4,40	400	90,0	80771
A-DF(ZN)B2Y	8	Single-mode E9/125	8	10,5	2700	105,0	4,40	400	90,0	80087
A-DF(ZN)B2Y	12	Multimode G50/125	12	10,5	2700	105,0	4,40	400	90,0	80104
A-DF(ZN)B2Y	12	Multimode G62.5/125	12	10,5	2700	105,0	4,40	400	90,0	80120
A-DF(ZN)B2Y	12	Single-mode E9/125	12	10,5	2700	105,0	4,40	400	90,0	80089
A-DF(ZN)B2Y	24	Multimode G50/125	12	10,5	2700	105,0	4,40	400	90,0	80759
A-DF(ZN)B2Y	24	Multimode G62.5/125	12	10,5	2700	105,0	4,40	400	90,0	80123
A-DF(ZN)B2Y	24	Single-mode E9/125	12	10,5	2700	105,0	4,40	400	90,0	80092
A-DF(ZN)B2Y	36	Multimode G50/125	12	10,5	2700	105,0	4,30	400	90,0	81137
A-DF(ZN)B2Y	36	Multimode G62.5/125	12	10,5	2700	105,0	4,30	400	90,0	81138
A-DF(ZN)B2Y	36	Single-mode E9/125	12	10,5	2700	105,0	4,30	400	90,0	81139
A-DF(ZN)B2Y	48	Multimode G50/125	12	10,5	2700	105,0	4,20	400	90,0	80109
A-DF(ZN)B2Y	48	Multimode G62.5/125	12	10,5	2700	105,0	4,20	400	90,0	80125
A-DF(ZN)B2Y	48	Single-mode E9/125	12	10,5	2700	105,0	4,20	400	90,0	80094
A-DF(ZN)B2Y	60	Multimode G50/125	12	10,5	2700	105,0	4,20	400	90,0	80110
A-DF(ZN)B2Y	60	Multimode G62.5/125	12	10,5	2700	105,0	4,20	400	90,0	80126
A-DF(ZN)B2Y	60	Single-mode E9/125	12	10,5	2700	105,0	4,20	400	90,0	80095
A-DF(ZN)B2Y	72	Multimode G50/125	12	11,0	2700	110,0	4,10	400	95,0	81143
A-DF(ZN)B2Y	72	Multimode G62.5/125	12	11,0	2700	110,0	4,10	400	95,0	81144
A-DF(ZN)B2Y	72	Single-mode E9/125	12	11,0	2700	110,0	4,10	400	95,0	81145
A-DF(ZN)B2Y	84	Multimode G50/125	12	11,5	3000	115,0	4,60	400	136,0	80111
A-DF(ZN)B2Y	84	Multimode G62.5/125	12	11,5	3000	115,0	4,60	400	136,0	80127
A-DF(ZN)B2Y	84	Single-mode E9/125	12	11,5	3000	115,0	4,60	400	136,0	80096
A-DF(ZN)B2Y	96	Multimode G50/125	12	12,0	3000	120,0	5,30	400	155,0	81147
A-DF(ZN)B2Y	96	Multimode G62.5/125	12	12,0	3000	120,0	5,30	400	155,0	81148
A-DF(ZN)B2Y	96	Single-mode E9/125	12	12,0	3000	120,0	5,30	400	155,0	81149
A-DF(ZN)B2Y	144	Multimode G50/125	12	14,5	3000	145,0	8,00	400	228,0	80114
A-DF(ZN)B2Y	144	Multimode G62.5/125	12	14,5	3000	145,0	8,00	400	228,0	80130
A-DF(ZN)B2Y	144	Single-mode E9/125	12	14,5	3000	145,0	8,00	400	228,0	80099

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a stranded construction with jelly filling. They are made waterproof in longitudinal direction by filling a jelly mass into the stranding cavities. Non-metallic tension elements and glass yarns ensure above average strain relief and rodent protection. This construction is particularly used in the area of telecommunication and long distance, but also in regular channels and tubes where rodent infestation is possible.

# Fibre Optic Outdoor Cable

acc. DIN VDE 0888

HELUCOM®

A-DF(ZN)2Y4Y



## Cable structure

Core type: Loose tube  
GRP support element  
Strain relief elements: Aramide  
Inner sheath material: PE  
Type of armouring: PA sheath  
Outer sheath material: PA  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
Cable, laterally water-tight  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DF(ZN)2Y4Y	2	Multimode G50/125	2	10,0	2700	100,0	6,10	400	90,0	<b>80915</b>
A-DF(ZN)2Y4Y	2	Multimode G62.5/125	2	10,0	2700	100,0	6,10	400	90,0	<b>80927</b>
A-DF(ZN)2Y4Y	2	Single-mode E9/125	2	10,0	2700	100,0	6,10	400	90,0	<b>80945</b>
A-DF(ZN)2Y4Y	4	Multimode G50/125	4	10,0	2700	100,0	6,10	400	90,0	<b>80735</b>
A-DF(ZN)2Y4Y	4	Multimode G62.5/125	4	10,0	2700	100,0	6,10	400	90,0	<b>80928</b>
A-DF(ZN)2Y4Y	4	Single-mode E9/125	4	10,0	2700	100,0	6,10	400	90,0	<b>80895</b>
A-DF(ZN)2Y4Y	8	Multimode G50/125	8	10,0	2700	100,0	6,10	400	90,0	<b>80691</b>
A-DF(ZN)2Y4Y	8	Multimode G62.5/125	8	10,0	2700	100,0	6,10	400	90,0	<b>80809</b>
A-DF(ZN)2Y4Y	8	Single-mode E9/125	8	10,0	2700	100,0	6,10	400	90,0	<b>80118</b>
A-DF(ZN)2Y4Y	12	Multimode G50/125	12	10,0	2700	100,0	6,10	400	90,0	<b>80627</b>
A-DF(ZN)2Y4Y	12	Multimode G62.5/125	12	10,0	2700	100,0	6,10	400	90,0	<b>80931</b>
A-DF(ZN)2Y4Y	12	Single-mode E9/125	12	10,0	2700	100,0	6,10	400	90,0	<b>80947</b>
A-DF(ZN)2Y4Y	24	Multimode G50/125	12	10,0	2700	100,0	6,10	400	90,0	<b>80578</b>
A-DF(ZN)2Y4Y	24	Multimode G62.5/125	12	10,0	2700	100,0	6,10	400	90,0	<b>80576</b>
A-DF(ZN)2Y4Y	24	Single-mode E9/125	12	10,0	2700	100,0	6,10	400	90,0	<b>80577</b>
A-DF(ZN)2Y4Y	36	Multimode G50/125	12	10,0	2700	100,0	6,00	400	90,0	<b>80672</b>
A-DF(ZN)2Y4Y	36	Multimode G62.5/125	12	10,0	2700	100,0	6,00	400	90,0	<b>80935</b>
A-DF(ZN)2Y4Y	36	Single-mode E9/125	12	10,0	2700	100,0	6,00	400	90,0	<b>80950</b>
A-DF(ZN)2Y4Y	48	Multimode G50/125	12	10,0	2700	100,0	6,00	400	90,0	<b>80732</b>
A-DF(ZN)2Y4Y	48	Multimode G62.5/125	12	10,0	2700	100,0	6,00	400	90,0	<b>80936</b>
A-DF(ZN)2Y4Y	48	Single-mode E9/125	12	10,0	2700	100,0	6,00	400	90,0	<b>80951</b>
A-DF(ZN)2Y4Y	60	Multimode G50/125	12	10,0	2700	100,0	5,80	400	90,0	<b>80920</b>
A-DF(ZN)2Y4Y	60	Multimode G62.5/125	12	10,0	2700	100,0	5,80	400	90,0	<b>80938</b>
A-DF(ZN)2Y4Y	72	Multimode G50/125	12	10,5	2700	105,0	5,80	400	95,0	<b>80921</b>
A-DF(ZN)2Y4Y	72	Multimode G62.5/125	12	10,5	2700	105,0	5,80	400	95,0	<b>80939</b>
A-DF(ZN)2Y4Y	72	Single-mode E9/125	12	10,5	2700	105,0	5,80	400	95,0	<b>80954</b>
A-DF(ZN)2Y4Y	84	Multimode G50/125	12	11,0	3000	110,0	8,40	400	110,0	<b>80922</b>
A-DF(ZN)2Y4Y	84	Multimode G62.5/125	12	11,0	3000	110,0	8,40	400	110,0	<b>80940</b>
A-DF(ZN)2Y4Y	84	Single-mode E9/125	12	11,0	3000	110,0	8,40	400	110,0	<b>80955</b>
A-DF(ZN)2Y4Y	96	Multimode G50/125	12	11,5	3000	115,0	7,20	400	120,0	<b>80923</b>
A-DF(ZN)2Y4Y	96	Multimode G62.5/125	12	11,5	3000	115,0	7,20	400	120,0	<b>80941</b>
A-DF(ZN)2Y4Y	96	Single-mode E9/125	12	11,5	3000	115,0	7,20	400	120,0	<b>80956</b>
A-DF(ZN)2Y4Y	144	Multimode G50/125	12	14,5	3000	145,0	10,40	400	180,0	<b>80926</b>
A-DF(ZN)2Y4Y	144	Multimode G62.5/125	12	14,5	3000	145,0	10,40	400	180,0	<b>80944</b>
A-DF(ZN)2Y4Y	144	Single-mode E9/125	12	14,5	3000	145,0	10,40	400	180,0	<b>80959</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a stranded construction with jelly filling. They are made waterproof in longitudinal direction by filling a jelly mass into the stranding cavities. Non-metallic tension elements and a second outer sheath made of polyamide (PA) ensure above average strain relief and rodent protection. This construction is particularly used in the area of telecommunication and long distance, but also in regular channels and tubes where rodent infestation is possible.

# Fibre Optic Outdoor Cable

Microduct

HELUCOM®

A-DQ2Y, central



## Cable structure

Core type: Loose tube  
Strain relief elements: Aramide  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -20°C  
Laying, max.: +60°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ2Y central	4	Single-mode E9/125	4	2,8	200	30,0	1,40	50	6,7	<b>803664</b>
A-DQ2Y central	12	Single-mode E9/125	12	2,8	200	30,0	1,40	50	6,7	<b>803929</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® micro fibre-optic cables are characterized by a design that is slim but robust. Around a central tube, there is a composite of swelling fleece with characteristics that ensure the strain relief, and waterproofing in longitudinal direction of the cable. This construction is particularly used in tubes and channels. These cables can be blowing into microducts.

# Fibre Optic Outdoor Cable

Microduct

HELUCOM®

A-DQ2Y, stranded



## Cable structure

Core type: Loose tube  
Strain relief elements: Aramide  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -25°C  
Operating, max.: +70°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ2Y stranded	4	Single-mode E9/125	4	5,9	900	70,0	0,87	150	27,0	<b>803931</b>
A-DQ2Y stranded	12	Single-mode E9/125	12	5,9	900	70,0	0,87	150	27,0	<b>803932</b>
A-DQ2Y stranded	24	Single-mode E9/125	12	5,9	900	70,0	0,87	150	27,0	<b>803930</b>
A-DQ2Y stranded	48	Single-mode E9/125	12	5,9	900	70,0	0,867	150	27,0	<b>803658</b>
A-DQ2Y stranded	72	Single-mode E9/125	12	5,9	900	60,0	0,867	150	27,0	<b>803659</b>
A-DQ2Y stranded	96	Single-mode E9/125	12	6,8	1000	70,0	1,245	150	40,0	<b>803660</b>
A-DQ2Y stranded	144	Single-mode E9/125	12	9,5	1800	140,0	2,189	150	79,0	<b>803661</b>
A-DQ2Y stranded	288	Single-mode E9/125	12	11,2	1500	115,0	2,97	100	90,0	<b>803668</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® micro fibre-optic cables are characterized by a design that is slim but robust. Around stranded tubes, there is a composite of swelling fleece with characteristics that ensure the strain relief, and waterproofing in longitudinal direction of the cable. This construction is particularly used in tubes and channels. These cables can be blowing into microducts.

# Fibre Optic Outdoor Cable

steel armoured

**HELUCOM®**

A-DQ(ZN)(SR)2Y



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Type of armouring: Steel rib  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +70°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
Cable, laterally water-tight  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DQ(ZN)(SR)2Y	4	Multimode G50/125	4	9,5	1500	95,0	2,00	500	115,0	<b>802917</b>
A-DQ(ZN)(SR)2Y	4	Multimode G62.5/125	4	9,5	1500	95,0	2,00	500	115,0	<b>803925</b>
A-DQ(ZN)(SR)2Y	4	Single-mode E9/125	4	9,5	1500	95,0	2,00	500	105,0	<b>803927</b>
A-DQ(ZN)(SR)2Y	12	Multimode G50/125	12	9,5	1500	95,0	2,00	500	115,0	<b>802918</b>
A-DQ(ZN)(SR)2Y	12	Multimode G62.5/125	12	9,5	1500	95,0	2,00	500	115,0	<b>803926</b>
A-DQ(ZN)(SR)2Y	12	Single-mode E9/125	12	9,5	1500	95,0	2,00	500	115,0	<b>803928</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a compact construction with a swelling fleece. Above-average rodent protection is achieved with the metallic rodent protection (steel groove) and an outer sheath made of PE. This construction is particularly used in the area of telecommunication and long distance, but also in regular channels and tubes where rodent infestation is possible.

# Fibre Optic Outdoor Cable

acc. **ARCOR Standard**

**HELUCOM®**

A-DF(ZN)2Y(SR)2Y



## Cable structure

Core type: Loose tube  
 GRP support element  
 Strain relief elements: Aramide  
 Inner sheath material: PE  
 Type of armouring: Steel rib  
 Outer sheath material: PE  
 Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
 Laying, max.: +50°C  
 Operating, min.: -25°C  
 Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
 Halogen-free acc. to 60754-2  
 Longitudinally water-tight acc. to IEC 60794-1-2-F5  
 Cable, laterally water-tight  
 UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DF(ZN)2Y(SR)2Y	12	Single-mode E9/125	2	13,0	2700	130,0	800	180	<b>82190</b>
A-DF(ZN)2Y(SR)2Y	24	Single-mode E9/125	4	13,0	2700	130,0	800	180	<b>800708</b>
A-DF(ZN)2Y(SR)2Y	48	Single-mode E9/125	12	13,0	2700	130,0	800	180	<b>800709</b>
A-DF(ZN)2Y(SR)2Y	60	Single-mode E9/125	12	13,0	2700	130,0	800	180	<b>800710</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are characterized by a stranded construction with jelly filling. They are made waterproof in longitudinal direction by filling a jelly mass into the stranding cavities. Above-average rodent protection is achieved with the metallic rodent protection (steel groove) and the second outer sheath made of PE. This construction is particularly used in the area of telecommunication and long distance where ARCOR standards must be followed, but also in regular channels and tubes where rodent infestation is possible.



# Fibre Optic Outdoor Cable Hybrid

acc. DIN VDE 0888

HELUCOM®

A-DSQ(ZN)B2Y



## Cable structure

Core type: Loose tube  
GRP support element  
Number of fibres per core: 4  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -10°C  
Laying, max.: +60°C  
Operating, min.: -25°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	No. of fibres	Fibre type	No. of copper cores	Dimensions of copper cores mm	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DSQ(ZN)B2Y	4	Multimode G50/125	2	1,2	12,0	2100	300	4,80	200	140,0	<b>81209</b>
A-DSQ(ZN)B2Y	4	Multimode G62.5/125	2	1,2	12,0	2100	300	4,80	200	140,0	<b>81255</b>
A-DSQ(ZN)B2Y	4	Single-mode E9/125	2	1,2	12,0	2100	300	4,80	200	140,0	<b>81256</b>
A-DSQ(ZN)B2Y	4	Multimode G50/125	2	1,5	12,5	2300	320	4,80	200	160,0	<b>82561</b>
A-DSQ(ZN)B2Y	4	Multimode G62.5/125	2	1,5	12,5	2300	320	4,80	200	160,0	<b>81257</b>
A-DSQ(ZN)B2Y	4	Single-mode E9/125	2	1,5	12,5	2300	320	4,80	200	160,0	<b>81258</b>
A-DSQ(ZN)B2Y	4	Multimode G50/125	4	1,5	17,0	2600	430	5,80	200	250,0	<b>82786</b>
A-DSQ(ZN)B2Y	4	Multimode G62.5/125	4	1,5	17,0	2600	430	5,80	200	250,0	<b>81259</b>
A-DSQ(ZN)B2Y	4	Single-mode E9/125	4	1,5	17,0	2600	430	5,80	200	250,0	<b>81260</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are designed especially for use in fibre-optical temperature measurements, such as monitoring of dams. The extreme mechanical requirements in these areas are fulfilled by the specially designed cable construction. These lines are hybrid glass fibre lines with copper cores and a special PE outer sheath.

Typical application within a coffer-dam

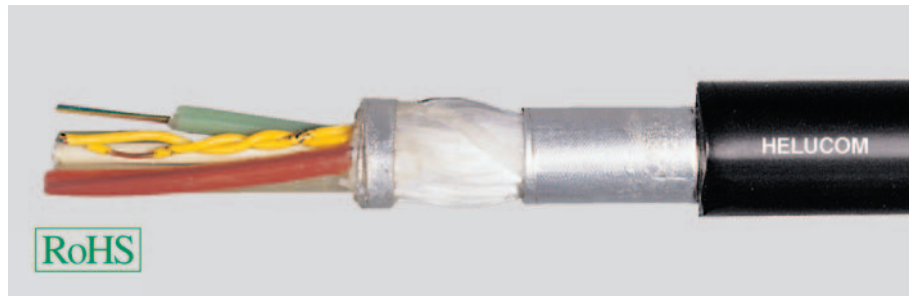


# Fibre Optic Outdoor Cable Hybrid

acc. DIN VDE 0888

HELUCOM®

A-DSF(L)(ZN)2Y



## Cable structure

Core type: Loose tube  
GRP support element  
Number of fibres per core: 12  
Strain relief elements: Aramide  
Aluminium laminated sheath  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -25°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
Cable, laterally water-tight  
UV-resistant

Designation	No. of fibres	Fibre type	No. of copper cores	Dimensions of copper cores mm	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A-DSF(L)(ZN)2Y	12	Single-mode E9/125	2	0,6	12,0	2500	200	4,80	250	135,0	<b>80495</b>
A-DSF(L)(ZN)2Y	12	Single-mode E9/125	4	0,6	12,0	2500	200	4,80	250	140,0	<b>80497</b>
A-DSF(L)(ZN)2Y	24	Single-mode E9/125	2	0,6	13,1	2500	200	4,80	250	139,0	<b>800753</b>
A-DSF(L)(ZN)2Y	24	Single-mode E9/125	4	0,6	13,1	2500	200	4,80	250	144,0	<b>801182</b>
A-DSF(L)(ZN)2Y	48	Single-mode E9/125	2	0,6	13,1	2500	200	4,80	250	141,0	<b>80501</b>
A-DSF(L)(ZN)2Y	48	Single-mode E9/125	4	0,6	13,1	2500	200	4,80	250	146,0	<b>80503</b>
A-DSF(L)(ZN)2Y	60	Single-mode E9/125	2	0,6	14,1	2500	230	4,80	250	166,0	<b>80504</b>
A-DSF(L)(ZN)2Y	60	Single-mode E9/125	4	0,6	14,1	2500	230	4,80	250	171,0	<b>80506</b>
A-DSF(L)(ZN)2Y	72	Single-mode E9/125	2	0,6	14,8	2500	240	5,10	250	179,0	<b>80507</b>
A-DSF(L)(ZN)2Y	72	Single-mode E9/125	4	0,6	14,8	2500	240	5,10	250	184,0	<b>80509</b>
A-DSF(L)(ZN)2Y	96	Single-mode E9/125	2	0,6	16,6	3000	280	6,30	250	276,0	<b>80510</b>
A-DSF(L)(ZN)2Y	96	Single-mode E9/125	4	0,6	16,6	3000	280	6,30	250	281,0	<b>80512</b>
A-DSF(L)(ZN)2Y	120	Single-mode E9/125	2	0,6	18,4	3000	290	8,50	250	280,0	<b>80513</b>
A-DSF(L)(ZN)2Y	120	Single-mode E9/125	4	0,6	18,4	3000	290	8,50	250	285,0	<b>80515</b>
A-DSF(L)(ZN)2Y	144	Single-mode E9/125	2	0,6	20,3	3500	310	10,00	250	331,0	<b>80516</b>
A-DSF(L)(ZN)2Y	144	Single-mode E9/125	4	0,6	20,3	3500	310	10,00	250	336,0	<b>80518</b>

Dimensions and specifications may be changed without prior notice.

## Application

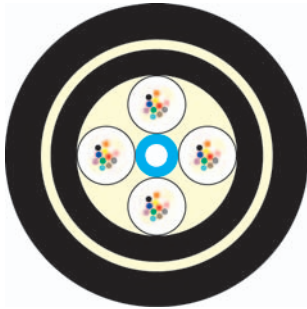
These HELUCOM® outdoor cables are designed for use under extreme environmental conditions. With the double jelly filling and the Al/PE laminated sheath, they are water proof in longitudinal and transverse direction. The welded Al tape acts as an additional vapour barrier. These cables can be layed directly in the ground, in tubes and in ducts. They are mainly used in local and long-distance networks.

# Aerial Fibre Optic Cable

metall free

HELUCOM®

ADSS



## Cable structure

Core type: Loose tube  
GRP support element  
Strain relief elements: Aramide  
Inner sheath material: PE  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -10°C  
Laying, max.: +60°C  
Operating, min.: -25°C  
Operating, max.: +70°C

## Other data

Sag at 25°C ADSS 9: 2,0 m  
Sag at 25°C ADSS 16: 4,5 m  
Sag at 25°C ADSS 35: 9,5 m  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
Cable, laterally water-tight  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Span width m	Max. tensile force kN	Additional load daN / m	Min. stat. bending radius mm	Outer Ø approx. mm	Weight kg / km	Part no.
ADSS 9	12	Single-mode E9/125	4	150	9	0,5	410	13,6	135	<b>82390</b>
ADSS 9	24	Single-mode E9/125	4	150	9	0,5	410	13,6	137	<b>82391</b>
ADSS 9	36	Single-mode E9/125	6	150	9	0,5	470	15,6	177	<b>82392</b>
ADSS 9	48	Single-mode E9/125	8	150	9	0,5	470	15,6	178	<b>82393</b>
ADSS 9	96	Single-mode E9/125	12	150	9	0,5	450	15,5	180	<b>804275</b>
ADSS 9	60	Single-mode E9/125	12	150	9	0,5	450	15,0	161	<b>82394</b>
ADSS 9	144	Single-mode E9/125	12	150	9	0,5	630	20,8	316	<b>82395</b>
ADSS 16	12	Single-mode E9/125	4	350	16	0,3	430	14,4	162	<b>82396</b>
ADSS 16	24	Single-mode E9/125	4	350	16	0,3	430	14,4	165	<b>82397</b>
ADSS 16	36	Single-mode E9/125	6	350	16	0,3	500	16,4	200	<b>82398</b>
ADSS 16	48	Single-mode E9/125	8	350	16	0,3	500	16,4	201	<b>82399</b>
ADSS 16	60	Single-mode E9/125	12	350	16	0,3	480	15,8	184	<b>82400</b>
ADSS 16	96	Single-mode E9/125	12	350	16	0,3	480	16,0	200	<b>804276</b>
ADSS 16	144	Single-mode E9/125	12	350	16	0,3	650	21,6	333	<b>82401</b>
ADSS 35	12	Single-mode E9/125	4	700	35	0,35	520	17,2	198	<b>82402</b>
ADSS 35	24	Single-mode E9/125	4	700	35	0,35	520	17,2	200	<b>82403</b>
ADSS 35	36	Single-mode E9/125	6	700	35	0,35	580	19,2	240	<b>82404</b>
ADSS 35	48	Single-mode E9/125	8	700	35	0,35	580	19,2	241	<b>82405</b>
ADSS 35	60	Single-mode E9/125	12	700	35	0,35	560	18,6	227	<b>82406</b>
ADSS 35	144	Single-mode E9/125	12	700	35	0,35	730	24,4	381	<b>82407</b>

Dimensions and specifications may be changed without prior notice.

## Application

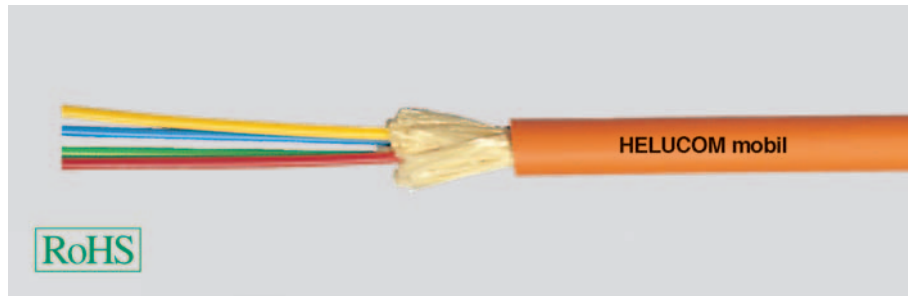
These HELUCOM® outdoor cables designed as aerial cables for freely suspended installations on posts and masts. The construction is waterproof in longitudinal direction thanks to the use of jelly-filled bundle cores and swelling tape. The outer jacket is UV-resistant and at the same time provides protection against environmental influences, such as snow, ice, sun insolation and wind.

# Fibre Optic Cable flexible

WK - mobile

HELUCOM® WK

A-V(ZN)11Y



## Cable structure

Core type: Tight buffer  
Strain relief elements: Kevlar  
Outer sheath colour: Orange

## Temperature range

Laying, min.: +5°C  
Laying, max.: +50°C  
Operating, min.: -30°C  
Operating, max.: +70°C

## Other data

Max. tensile force: 650 N  
Max. transverse pressure: 40 N / cm  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant  
Resistant to hammer impact acc. to IEC 60794-1-2-E6  
Bending cycles acc. to IEC 60794-1-2-E6: 500.000  
Oil-resistant

Designation	Number of fibres	Fibre type	Outer Ø approx. mm	Outer sheath material	Min. stat. bending radius mm	Flame proof	halogen-free	UL	Weight kg / km	Part no.
Fibre-optic cable	2	Multimode G50/125	5,0	PUR	75	yes	yes	no	20	<b>80382</b>
Fibre-optic cable	2	Multimode G62.5/125	5,0	PUR	75	yes	yes	no	20	<b>80363</b>
Fibre-optic cable	4	Multimode G50/125	5,8	PUR	90	yes	yes	no	31	<b>80534</b>
Fibre-optic cable	4	Multimode G62.5/125	5,8	PUR	90	yes	yes	no	31	<b>81036</b>
Fibre-optic cable	4	Single-mode E9/125	5,8	PUR	90	yes	yes	no	31	<b>801727</b>
Fibre-optic cable	8	Multimode G50/125	7,0	PUR	105	yes	yes	no	47	<b>81037</b>
Fibre-optic cable	8	Multimode G62.5/125	7,0	PUR	105	yes	yes	no	47	<b>81038</b>

Dimensions and specifications may be changed without prior notice.

## Application

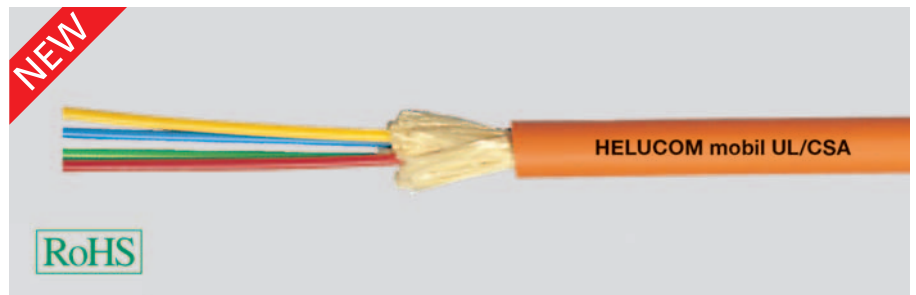
These HELUCOM® cables were designed as mobile field cables. They are easily wound up on a drum and are very tension-proof. As the outer sheath is tightly anchored on the aramid braiding, it is especially suitable for mobile use. The advantage of these cables is evident especially where mobile fibre-optic lines are to be installed, such as for drag chains, TV transmission, supervision of protected areas, etc.

# Fibre Optic Cable flexible

WK - UL/CSA

HELUCOM® WK

A-V(ZN)Y



## Cable structure

Core type: Tight buffer  
Strain relief elements: Aramide  
Outer sheath colour: Orange

## Temperature range

Laying, min.: 0°C  
Laying, max.: +50°C  
Operating, min.: -30°C  
Operating, max.: +80°C

## Other data

Max. tensile force: 1200 N  
Max. transverse pressure: 44 N / cm  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant  
Bending cycles acc. to IEC 60794-1-2-E6: 9.000  
Oil-resistant

Designation	Number of Fibre type fibres		Outer Ø approx. mm	Outer sheath material	Inner sheath material	Min. stat. bending radius mm	Flame proof	halogen-free	UL	Weight kg / km	Part no.
Fibre-optic cable	4	Multimode G50/125	7,0	PVC	PVC	75	yes	no	yes	50	<b>802792</b>
Fibre-optic cable	4	Multimode G62.5/125	7,0	PVC	PVC	75	yes	no	yes	50	<b>803934</b>
Fibre-optic cable	4	Single-mode E9/125	7,0	PVC	PVC	75	yes	no	yes	50	<b>803935</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® cables were designed as mobile field cables. They are easily wound up on a drum and are very tension-proof. As the outer sheath is tightly anchored on the aramid braiding, it is especially suitable for mobile use. The advantage of these cables is evident especially where mobile fibre-optic lines are to be installed, such as windturbine projects, TV transmission, supervision of protected areas, etc.. This series with PVC jacket is certified according the UL/CSA standard OFNG/ FT4.

# Fibre Optic Cable flexible

WK robust PUR + PVC (UL/CSA)

HELUCOM® WK

AT-V(ZN)H(ZN)11Y, AT-V(ZN)Y(ZN)Y



## Cable structure

Core type: Composite buffered  
Strain relief elements: Aramide  
Outer sheath colour: Black

## Temperature range

Laying, min.: -10°C  
Laying, max.: +50°C  
Operating, min.: -40°C  
Operating, max.: +90°C

## Other data

Max. tensile force: 4800 N  
Max. transverse pressure: 200 N / cm  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant  
Resistant to hammer impact acc. to IEC 60794-1-2-E6  
Bending cycles acc. to IEC 60794-1-2-E6: 9.000  
Oil-resistant

Designation	Number of Fibre type fibres		Outer Ø approx. mm	Outer sheath material	Inner sheath material	Min. stat. bending radius mm	Flame proof	halogen-free	UL	Weight kg / km	Part no.
AT-V(ZN)H(ZN)11Y	4	Multimode G50/125	8,5	PUR	ULSZH	100	yes	yes	no	125	<b>803346</b>
AT-V(ZN)Y(ZN)Y	4	Multimode G50/125	8,5	PVC	PVC	130	yes	no	yes	125	<b>803348</b>
AT-V(ZN)H(ZN)11Y	12	Multimode G50/125	12,4	PUR	ULSZH	190	yes	yes	no	320	<b>803347</b>
AT-V(ZN)Y(ZN)Y	12	Multimode G50/125	12,4	PVC	PVC	190	yes	no	yes	320	<b>803349</b>

Dimensions and specifications may be changed without prior notice.

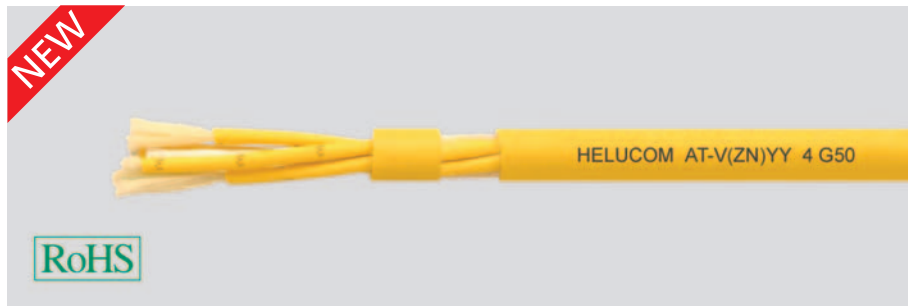
## Application

The HELUCOM® WK range is set apart by its extreme rugged yet highly-flexible design. It is used wherever demanding environmental conditions and extreme movements occur. The tight buffer structure enables the cable to be pre-assembled on site with ease. Applications are for example Windturbines, TV transmissions, mobile field applications, etc..

# Fibre Optic Cable flexible

HELUCOM® WK

AT-V(ZN)YY



## Cable structure

Core type: Composite buffered  
Strain relief elements: Aramide  
Outer sheath colour: Yellow

## Temperature range

Laying, min.: -10°C  
Laying, max.: +50°C  
Operating, min.: -40°C  
Operating, max.: +90°C

## Other data

Max. tensile force: 1200 N  
Max. transverse pressure: 100 N / cm  
UV-resistant  
Resistant to hammer impact acc. to IEC 60794-1-2-E6  
Bending cycles acc. to IEC 60794-1-2-E6: 15  
Oil-resistant

Designation	Number of Fibre type fibres	Outer Ø approx. mm	Outer sheath material	Inner sheath material	Min. stat. bending radius mm	Flame proof	halogen-free	UL	Weight kg / km	Part no.	
Fibre-optic cable	4	Multimode G50/125	7,4	PVC	PVC	90	yes	no	no	65	<b>803364</b>

Dimensions and specifications may be changed without prior notice.

## Application

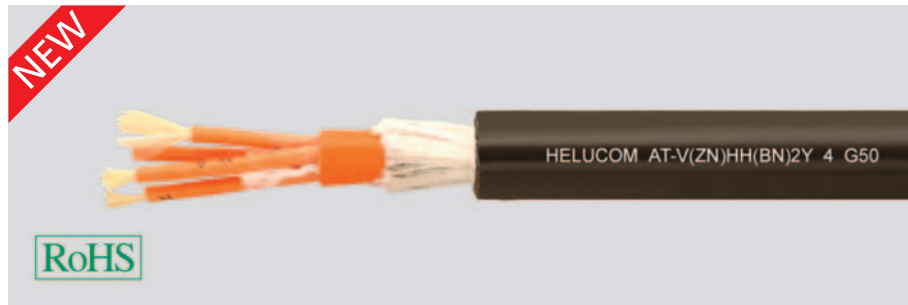
The HELUCOM® range is set apart by its extreme rugged yet flexible design. It is used wherever demanding environmental conditions and movements occur. The tight buffer structure enables the cable to be pre-assembled on site with ease. Applications are for example industry applications, TV transmissions, etc..

# Fibre Optic Breakout Cable

outdoor

HELUCOM®

AT-V(ZN)HH(BN)2Y



## Cable structure

Core type: Composite buffered  
GRP support element  
Strain relief elements: Aramide  
Inner sheath material: ULSZH  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +60°C

## Other data

Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant  
Oil-resistant

Designation	Number of fibres	Fibre type	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Max. transverse pressure N / cm	Caloric load approx. MJ / m	Weight kg / km	Part no.
AT-V(ZN)HH(BN)2Y	4	Multimode G50/125	13,5	1200	340	300	2,95	140	801352

Dimensions and specifications may be changed without prior notice.

## Application

The HELUCOM® range is set apart by its extreme rugged rodent protected design. It is used wherever demanding environmental conditions while fixed installations occur. The tight buffer structure enables the cable to be pre-assembled on site with ease. Applications are for example industry applications, etc..

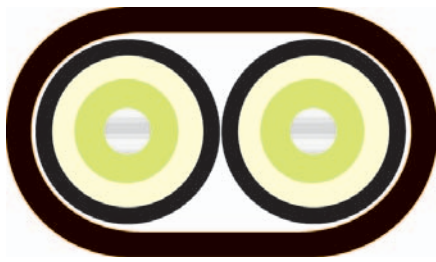


# Fibre Optic Cable robust

multimode

HELUCOM®

AT-VYY



## Cable structure

Core type: Tight buffer  
 Strain relief elements: Aramide  
 Outer sheath material: PVC  
 Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
 Laying, max.: +50°C  
 Operating, min.: -20°C  
 Operating, max.: +60°C

## Other data

Flame-resistance acc. to IEC 60332-1  
 Longitudinally water-tight acc. to IEC 60794-1-2-F5  
 UV-resistant  
 Oil-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
AT-VYY	2	Multimode G62.5/125	1	6,8 x 10,2	400	110,0	1,10	300	76,0	<b>800126</b>

Dimensions and specifications may be changed without prior notice.

## Application

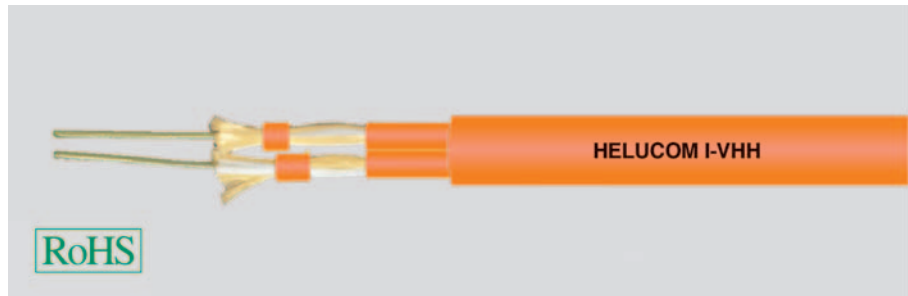
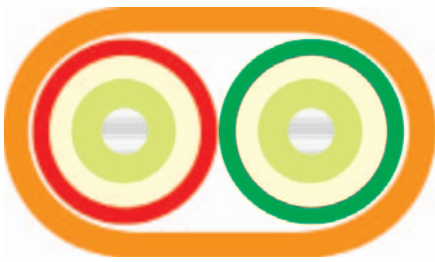
This HELUCOM® fibre-optic cable is suited for fixed installations in pits and channels, but also for flexible applications as jumper cable. Because of the robust construction with Single- and Overall-jacket you also can use it in industrial areas. With the core-construction, direct plug manufacturing, even on site, poses no problems.

# Fibre Optic Cable flexible

HCS

HELUCOM®

I-VH, I-VHH



## Cable structure

Core type: Composite buffered  
Strain relief elements: Aramide  
Outer sheath material: FRNC  
Outer sheath colour: Orange

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -10°C  
Operating, max.: +60°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034

Designation	Number of fibres	Fibre type	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
I-VH	1	HCS 200/230	2,8	300	40	0,26	10	2,8	<b>800579</b>
I-VHH	2	HCS 200/230	3,8 x 6,6	600	50	0,52	10	30,0	<b>81238</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® HCS fibre lines are suitable for stationary installation indoors. For heavy-duty mechanical requirements, such as application in industrial environments, a version with PUR outer sheath is available on request. With a HCS fibre transmission lengths of up to 300m can be achieved. With the tight buffer construction, direct plug manufacturing, even on site, poses no problems.

# Fibre Optic Breakout Cable robust flexible

HCS

HELUCOM®

I-V(ZN)Y11Y



## Cable structure

Core type: Composite buffered  
Strain relief elements: Aramide  
Outer sheath material: PUR  
Outer sheath colour: Red

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +70°C

## Other data

Oil-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
I-V(ZN)Y11Y	2	HCS 200/230	1	7,0	800	50,0	1,014	150	43,0	<b>800980</b>

Dimensions and specifications may be changed without prior notice.

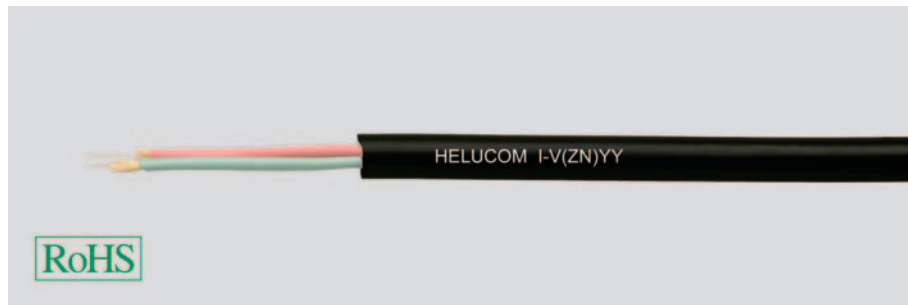
## Application

This HELUCOM® HCS fibre cable is suitable for fixed installation. Possible applications are normal and heavy-duty mechanical requirements for example in industrial environments. With the tight buffer construction, direct plug manufacturing, even on site, poses no problems. With a HCS fibre transmission lengths of up to 300m can be achieved.

# Fibre Optic Breakout Cable robust, flexible

HCS UL/CSA

**HELUCOM®**  
I-V(ZN)YY



## Cable structure

Core type: Composite buffered  
Strain relief elements: Aramide  
Outer sheath material: PVC  
Outer sheath colour: Black

## Temperature range

Laying, min.: -20°C  
Laying, max.: +75°C  
Operating, min.: -30°C  
Operating, max.: +85°C

## Other data

Flame-resistance acc. to IEC 60332-1 and IEC 60332-3  
UV-resistant  
Oil-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
I-V(ZN)YY	2	HCS 200/230	1	7,5	800	100,0	1,40	300	68,0	<b>801733</b>

Dimensions and specifications may be changed without prior notice.

## Application

This HELUCOM® HCS fibre cable is suitable for fixed and normal flexible installations. Possible applications are normal and heavy-duty mechanical requirements for example in industrial environments. Because of a special PVC jacket this construction is certified by UL (FT1 and FT4). With the tight buffer construction, direct plug manufacturing, even on site, poses no problems. With a HCS fibre transmission lengths of up to 300m can be achieved.

# Fibre Optic Breakout Cable flexible

HCS

HELUCOM®

AT-V(ZN)HH



## Cable structure

Core type: Composite buffered  
GRP support element  
Strain relief elements: Aramide  
Outer sheath material: FRNC  
Outer sheath colour: Black

## Temperature range

Laying, min.: -20°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +70°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034  
UV-resistant  
Oil-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
AT-V(ZN)HH	4	HCS 200/230	1	9,0	800	225,0	1,60	100	76,0	<b>802260</b>

Dimensions and specifications may be changed without prior notice.

## Application

This HELUCOM® HCS fibre cable is suitable for fixed and normal flexible installation. Possible applications are normal requirements and also limited industrial environments. With the tight buffer construction, direct plug manufacturing, even on site, poses no problems. With a HCS fibre transmission lengths of up to 300m can be achieved.

# Fibre Optic Breakout Cable robust

HCS

HELUCOM®

AT-VQH(ZN)B2Y



## Cable structure

Core type: Composite buffered  
GRP support element  
Strain relief elements: Aramide  
Type of armouring: Glass yarns  
Outer sheath material: PE  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -25°C  
Operating, max.: +70°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant  
Oil-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
AT-VQH(ZN)B2Y	2	HCS 200/230	1	11,0	1500	200,0	2,10	500	90,0	801196

Dimensions and specifications may be changed without prior notice.

## Application

This HELUCOM® HCS fibre cable is suitable for fixed installation outdoors. Possible applications are normal and heavy-duty mechanical requirements for example in industrial environments. This is the reason we also equipped the cable with a non-metallic rodent-protection. With the tight buffer construction, direct plug manufacturing, even on site, poses no problems. With a HCS fibre transmission lengths of up to 300m can be achieved.

# Fibre-optic Universal Cable

HCS

HELUCOM®

A/I-DQ(ZN)BH



## Cable structure

Core type: Loose tube  
Strain relief elements: Glass yarns  
Type of armouring: Glass yarns  
Outer sheath material: FR/LSOH  
Outer sheath colour: Black

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +70°C

## Other data

Corrosiveness acc. to EN50267-2-3  
Halogen-free acc. to 60754-2  
Flame-resistance acc. to IEC 60332-1  
Smoke density acc. to IEC 61034  
Longitudinally water-tight acc. to IEC 60794-1-2-F5  
UV-resistant

Designation	Number of fibres	Fibre type	Number of fibres per core	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Caloric load approx. MJ / m	Max. transverse pressure N / cm	Weight kg / km	Part no.
A/I-DQ(ZN)BH	4	HCS 200/230	4	8,5	1500	130,0	2,00	150	76,0	<b>801198</b>
A/I-DQ(ZN)BH	8	HCS 200/230	8	8,5	1500	130,0	2,00	150	79,0	<b>802001</b>
A/I-DQ(ZN)BH	12	HCS 200/230	12	8,5	1500	130,0	2,00	150	82,0	<b>802002</b>
A/I-DQ(ZN)BH	24	HCS 200/230	8	17,7	6000	265,0	3,20	300	280,0	<b>802003</b>
A/I-DQ(ZN)BH	48	HCS 200/230	8	18,9	6000	285,0	3,20	300	355,0	<b>802004</b>

Dimensions and specifications may be changed without prior notice.

## Application

These HELUCOM® fibre-optic cables are available either as central bundle core cable or as stranded versions. They are suitable for fixed indoor and outdoor cabling of buildings and industry facilities. They are used in particular if the installation is to be done in one piece from the inside to the outside without additional use of couplings. With their black UV-resistant outer sheath and the non-metallic rodent protection, they are perfectly suited for outdoor use. The halogen-free outer sheath makes installation inhouse possible without any problems.

# Plastic-fibre cable industry

POF/PE

HELUCOM®

I-V2Y, I-V2Y(ZN)11Y



## Cable structure

Fibre type: POF 980/1000  
Fibre cladding: PE

## Optical characteristic

Refractive index core: 1,492  
Refractive index cladding: 1,419  
Numerical aperture: 0,5  
Attenuation see table

## Temperature range

Laying, min.: -20°C  
Laying, max.: +80°C  
Operating, min.: -20°C  
Operating, max.: +80°C

Designation	Outer sheath material	Jacket colour	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Fibre attenuation	Oil-resistant	Acc. to DESINA	Weight kg / km	Part no.
I-V2Y 1P 980/1000	PE	Black	2,2	70	25,0	160A1	no	no	4,0	<b>80532</b>
I-V2Y 2P 980/1000	PE	Black	2,2 x 4,4	140	25,0	160A1	no	no	8,0	<b>80388</b>
I-V2Y(ZN)11Y 1P 980/1000	PUR	Violet	5,8	400	30,0	230A1	yes	yes	30,0	<b>81611</b>
I-V2Y(ZN)11Y 2P 980/1000	PUR	Violet	6,0	400	31,0	230A1	yes	yes	36,0	<b>80629</b>
I-V2Y(ZN)11Y 2P 980/1000	PUR	Violet	6,0	400	31,0	230A1	yes	yes	36,0	<b>81882</b>
I-V2Y(ZN)11Y 4P 980/1000	PUR	Violet	7,1	400	45,0	230A1	yes	yes	65,0	<b>80630</b>
I-V2Y(ZN)11Y 2P 980/1000 + 2x1mm <sup>2</sup> Cu	PUR	Red	7,8	200	70,0	230A1	yes	no	60,0	<b>82032</b>
I-V2Y(ZN)11Y 2P 980/1000 + 3x1,5mm <sup>2</sup> Cu	PUR	Red	11,0	200	70,0	230A1	yes	no	132,0	<b>82033</b>

Dimensions and specifications may be changed without prior notice.

## Application

HELUCOM® plastic-fibre cables are used in mechanical engineering, both in mobile and fixed applications. With different constructions, such as PUR outer sheaths, special strain relief components, hybrid construction with copper cores for power supply or only raw fibre cables, any possible fields of application are covered. Due to their solidity and their simple adjustability on site, the plastic-fibres (PMMA) are particularly suitable for applications where trouble-free data transmission is necessary under heavy-duty conditions.



# Plastic Fibre Cable Industry

POF/PA

HELUCOM®

I-V4Y(ZN)11Y



## Cable structure

Fibre type: POF 980/1000  
Fibre cladding: PA

## Optical characteristic

Refractive index core: 1,492  
Refractive index cladding: 1,419  
Numerical aperture: 0,5  
Attenuation see table

## Temperature range

Laying, min.: -5°C  
Laying, max.: +50°C  
Operating, min.: -20°C  
Operating, max.: +70°C

Designation	Outer sheath material	Jacket colour	Outer Ø approx. mm	Max. tensile force N	Min. stat. bending radius mm	Fibre attenuation	Oil-resistant	Acc. to DESINA	Weight kg / km	Part no.
I-V4Y(ZN)11Y 2P980/1000 RUGGED	PUR	Red	8,0	100	50,0	160A1	yes	no	42,0	<b>801200</b>
I-V4Y(ZN)11Y 2P980/1000 FLEX RUGGED	PUR	Red	8,0	100	50,0	250A1	yes	no	51,0	<b>801201</b>
I-V4Y(ZN)11Y 2P980/1000 HEAVY	PUR	Red	6,0	100	30,0	160A1	yes	no	28,0	<b>801202</b>

Dimensions and specifications may be changed without prior notice.

## Application

Signal lines as plastic optical fibre. The use of these transmission systems significantly reduces the number of different cables in a planned bus installation in machine tools operations. Furthermore, possible EMC problems are prevented by the metal-free construction. The main application of these cables are in machine construction and automobile industry (PA version).

<b>Graded index fibres</b>			
<b>Specification</b>		<b>Fibre type G 50/125</b>	<b>Fibre type G 62,5/125</b>
Fibre categorie		OM2 Standardfibre	OM1 Standardfibre
Core diameter		50 ± 3 µm	62,5 ± 3 µm
Numerical aperture		0,200 ± 0,015	0,275 ± 0,015
Typ. attenuation	850 nm	2,8 dB/km	3,0 dB/km
	1300 nm	0,7 dB/km	1,0 dB/km
Min. bandwidth	850 nm	500 MHz x km	200 MHz x km
	1300 nm	800 MHz x km	500 MHz x km
Cladding diameter		125 ± 1 µm	
Primary coating diameter		245 ± 10 µm	
Core noncircularity		< 5 %	
Cladding concentricity error		< 3,0 µm	
Cladding noncircularity		< 2,0 %	

<b>Specification</b>		<b>Fibre type G 50/125</b>	
Fibre categorie		OM3 Standardfibre	OM4 Standardfibre
Core diameter		50 ± 3 µm	50 ± 3 µm
Numerical aperture		0,200 ± 0,015	0,200 ± 0,015
Typ. attenuation	850 nm	2,5 dB/km	3,0 dB/km
	1300 nm	0,5 dB/km	1,0 dB/km
Min. bandwidth	850 nm	1500 MHz x km	3500 MHz x km
	1300 nm	500 MHz x km	500 MHz x km
Cladding diameter		125 ± 1 µm	125 ± 1 µm
Primary coating diameter		245 ± 10 µm	245 ± 10 µm
Core noncircularity		< 5 %	< 5 %
Cladding concentricity error		< 3,0 µm	< 6,0 µm
Cladding noncircularity		< 2,0 %	< 2,0 %

<b>Single-Mode-Fibre</b>			
<b>Specification</b>		<b>Fibre type E9...10/125 (single mode)</b>	
Fibre categorie		ITU-T G. 652.d	
Attenuation	1300 nm	0,36 dB/km	
	1550 nm	0,22 dB/km	
Dispersion	1285 - 1330 nm	< 3,5 ps/(nm x km)	
	1550 nm	< 19 ps/(nm x km)	
Wave length		1312 nm	
Mode field diameter at 1310		9,3 ± 0,5 µm	
Cladding diameter		125 ± 1 µm	
Primary coating diameter		245 ± 10 µm	
Cut-off wavelength		< 1250 nm	
Cladding concentricity error		≤ 0,8 µm	
Cladding noncircularity		< 1,0 %	

<b>POF and HCS-Fibre</b>			
<b>Specification</b>		<b>Fibre type POF P980/1000</b>	<b>Fibre type HCS K200/230</b>
Core diameter		980 µm	200 µm
Numerical aperture		0,5	0,37
Typ. attenuation	650 nm	160 dB/km	10 db/km
	850 nm	-	8 dB/km
Min. Bandwidth	650 nm	10 MHz x 100 m	17 MHz x km
	850 nm	-	20 MHz x km
Wallthickness		1000 µm	230 µm

Fibres with other parameteres on request

# Inquiry – fibre optic special cable **HELUCOM®**

To:

**HELUKABEL® GmbH**  
Data-, Network- and Bus Technology  
**Dieselstraße 8-12**  
**71282 Hemmingen**  
**Germany**

Phone: +49 7150 9209-181  
Fax: +49 7150 970819

Sender/Stamp

Responsible: \_\_\_\_\_

Phone.: \_\_\_\_\_ Fax: \_\_\_\_\_

**Inquiry:**      **No.:** \_\_\_\_\_      **Date :** \_\_\_\_\_

Quantity: \_\_\_\_\_ km     One Step     Continuous    Yearly Quantity: approx. \_\_\_\_\_ km

**Needed delivery date:** \_\_\_\_\_

**Dimensions:** \_\_\_\_\_

**Cable type:** \_\_\_\_\_

**Using:**    a)  indoor     outdoor     indoor/outdoor    b)  fixed installation     mobil use  
c.) ambient temperature \_\_\_\_\_°C    constant load \_\_\_\_\_°C    shorttime \_\_\_\_\_°C

**Fibre type:**     G 50/125     G 62,5/125     E 9/125     S 200/230     980/1000 POF

**Fibre spec.:** attenuation: \_\_\_\_\_    specification: \_\_\_\_\_  
bandwidth: \_\_\_\_\_

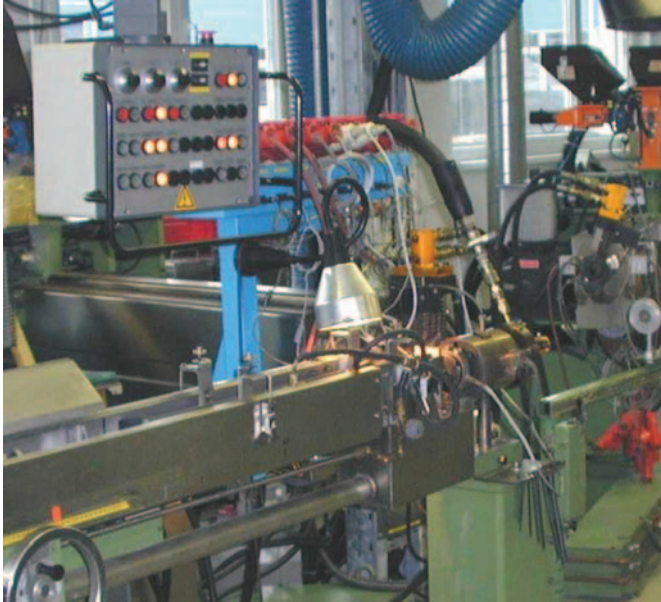
**Cable structure:** a)  Tight buffer     Loose tube filled     Bundle core filled  
 Compact fiber     Loose tube unfilled     Bundle core unfilled  
b) Metal element     yes     no  
c)  Centrale bundle core     Stranded bundle core  
d) Filler: \_\_\_\_\_    e) Armouring: \_\_\_\_\_  
f) Outer jacket:  PVC     PE     PA     PUR     FRNC  
g) Laminated jacket:  yes     no

**Min. bending radius:** \_\_\_\_\_ **Max. tensile load:** \_\_\_\_\_ **Max. transverse pressure:** \_\_\_\_\_ **Caloric load:** \_\_\_\_\_

**Fibre colour:**  acc. DIN     acc. your demands (see notice)    **Tube colour:**  acc. DIN     acc. your demands (see notice)

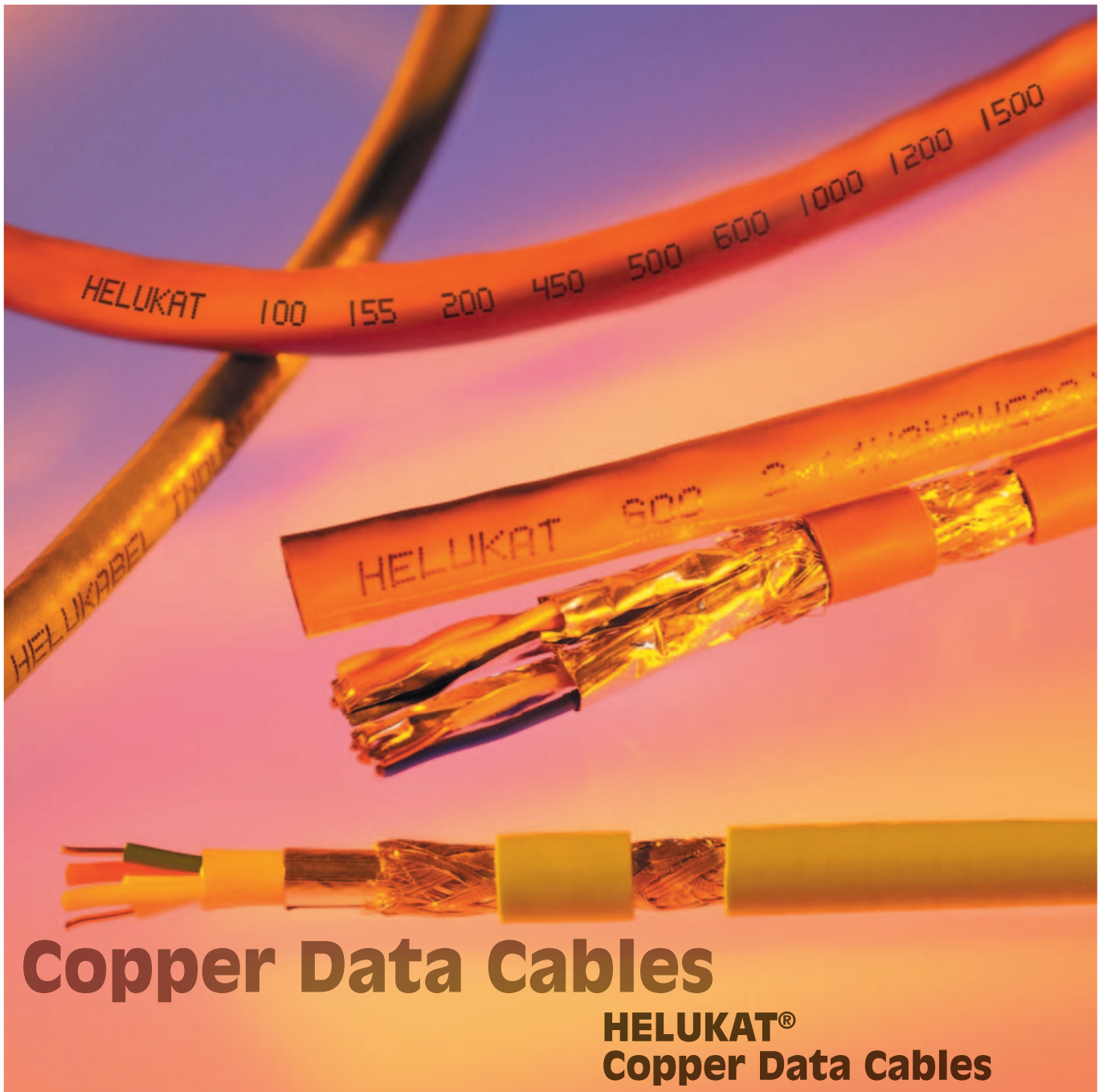
**Jacket printing:** \_\_\_\_\_

**Remarks:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



We manufacture optical fibre cables to meet your specific requests and engineering requirements. A variety of applications requires the use of very special cable constructions. Hence we produce, for example, optical fibre cables for earth buried or duct cables comprising differing fibre types, e. g. a combination of graded index fibres and single mode fibres, or hybrid data cables where different technologies are brought together within one cable, optical fibre cables with copper data cables. Hybrid cables are used in buildings where optical fibre and copper cables shall be installed in parallel so as to minimise the pulling required. These are also used for projects where the optical fibre cable is planned to serve a purpose for future applications. Metal-free optical fibre cables can be used as aerial cable, having a similar structure as cables for outdoor applications, whereby the strain relief must be strengthened accordingly. These aerial cables are used by electricity and railway companies.

Contact us for your special requirements.



# Copper Data Cables

## HELUKAT® Copper Data Cables

Photo: HELUKABEL®

All HELUKAT® data cables and wires comply with the latest standardisation recommendations and are designed for use in high-speed networks with transmission rates of 100 Mbit/s and higher (e.g. CCDI, TPDDI, ATM, SDH/SONET). All HELUKAT® types of cables and wires meet the requirements of category 5 according to EIA/TIA TSB-36 ISO/IEC DIS 11801, CENELEC pr EN 50173, as well as category 6/7 according to DIN 44312-5/ EN 50288. Cables for Ethernet applications, as well as coax/twinaxial cables for IBMs IVS system complete the product range from HELUKABEL®.

The excellent transmission characteristics of HELUKAT® data cables and wires constitute enormous challenges for production equipment and the measurement laboratories. HELUKAT® data cables and wires are manufactured using the latest machinery technologies. These have been designed for producing cables and wires of the categories 5/6/7/8 in accordance with the latest standardisation recommendations. A special laboratory for high-frequency testing such high transmission rates has been installed complete with network analyser and computer-controlled equipment for HF cables.

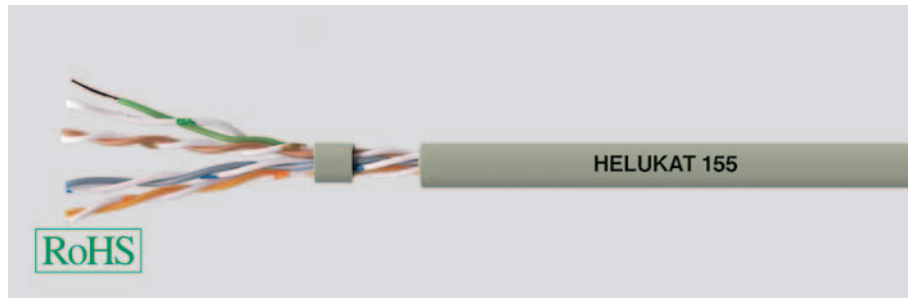
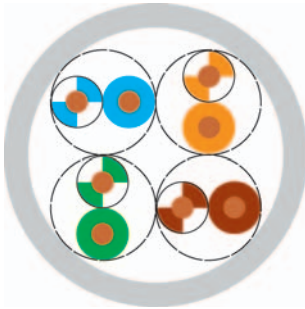
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# LAN Cable

Category 5e

**HELUKAT® 155**  
U/UTP



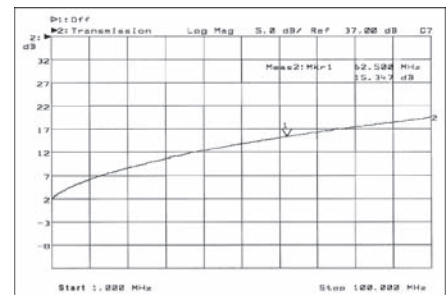
## Cable structure

Inner conductor diameter: 0,51 mm  
 Conductor material: Copper, bare  
 Core insulation: PE  
 Core colours: whbu/bu, whog/og, whgn/gn, whbn/bn  
 Shielding 1: -  
 Screen over stranding element: -  
 Screen 1 over stranding: -  
 Screen 2 over stranding: -  
 Outer sheath material: PVC  
 Outer diameter: approx. 4,9 mm  
 Outer sheath colour: Grey

## U/UTP 4x2xAWG 24/1 PVC

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
 100 Ohm ± 20 ohm at 101 to 155 MHz  
 Loop resistance: 190 Ohm/km max.  
 Mutual capacitance: 50 nF/km nom.  
 Rel. propagation velocity: 66 %



## Typical values

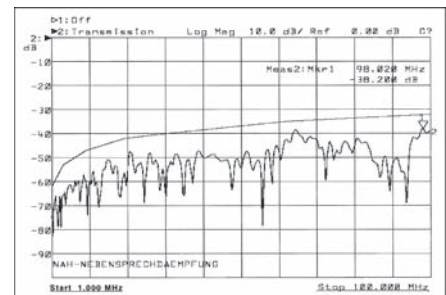
Frequency (MHz)	10	16	62,5	100	155
Attenuation (dB/100m)	6,3	8,0	16,5	21,3	26,8
Next (db)	50,3	47,3	38,4	35,3	33,0
ACR (db)	44,0	39,3	21,9	14,0	6,2

## Technical data

Weight: approx. 26 kg/km  
 bending radius, repeated: 40 mm  
 Operating temperature range min.: -20°C  
 Operating temperature range max.: +60°C  
 Caloric load, approx. value: 0,40 MJ/m  
 Copper weight: 17,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e



## Application

HELUKAT®155 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**80053**, U/UTP 4x2xAWG24/1 PVC (UTP)

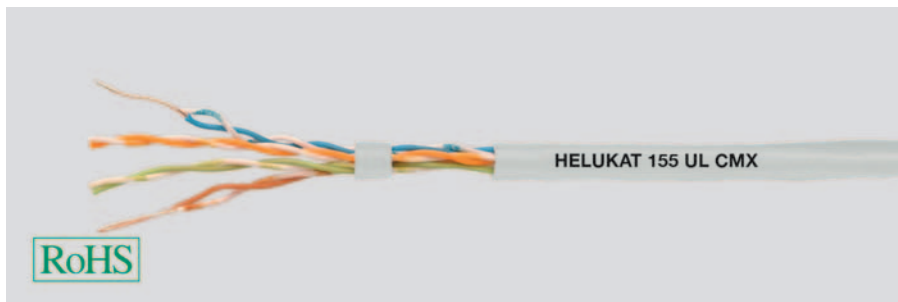
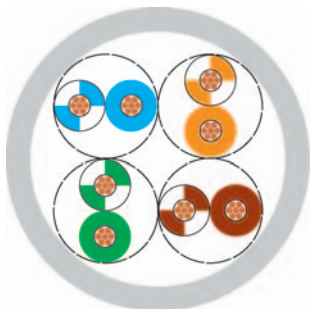
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 5e

**HELUKAT® 155**

U/UTP UL



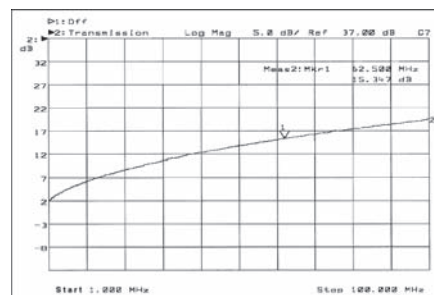
## Cable structure

Inner conductor diameter: 0,53 mm  
 Conductor material: Copper, bare  
 Core insulation: PE  
 Core colours: whbu/bu, whog/og, whgn/gn, whbn/bn  
 Shielding 1: -  
 Screen over stranding element: -  
 Screen 1 over stranding: -  
 Screen 2 over stranding: -  
 Outer sheath material: PVC  
 Outer diameter: approx. 5,2 mm  
 Outer sheath colour: Grey

## U/UTP 4x2xAWG 24/1 PVC, UL

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
 100 Ohm ± 20 ohm at 101 to 155 MHz  
 Loop resistance: 190 Ohm/km max.  
 Mutual capacitance: 50 nF/km nom.  
 Rel. propagation velocity: 66 %



## Typical values

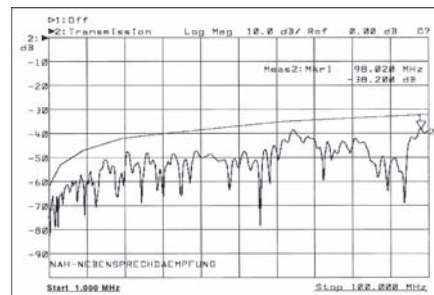
Frequency (MHz)	10	16	62,5	100	155
Attenuation (db/100m)	6,1	7,7	15,2	19,9	22,7
Next (db)	65,0	63,0	53,0	40,0	37,0
ACR (db)	58,9	55,3	37,8	20,1	14,3

## Technical data

Weight: approx. 35 kg/km  
 bending radius, repeated: 42 mm  
 Operating temperature range min.: -20°C  
 Operating temperature range max.: +60°C  
 Caloric load, approx. value: 0,43 MJ/m  
 Copper weight: 17,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e,  
 Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, CMX 444



## Application

HELUKAT®155 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction. This type is certified according to UL because of the special PVC jacket

## Part no.

**802171**, U/UTP 4x2xAWG24/1 PVC UL (UTP)

Dimensions and specifications may be changed without prior notice.

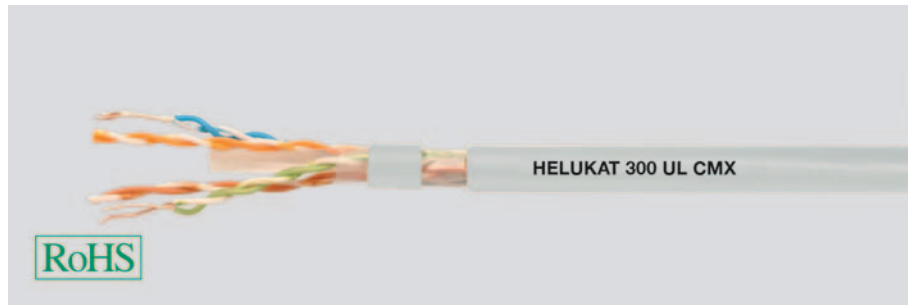


# LAN Cable

Category 6

**HELUKAT® 300**

U/UTP UL

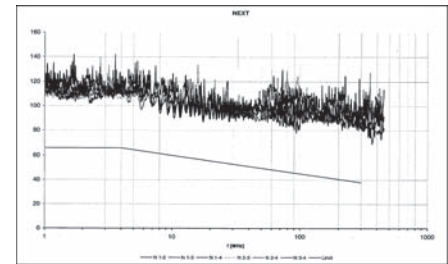


## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Outer diameter:  
Outer sheath colour:

## U/UTP 4x2xAWG 24/1 PVC, UL

0,55 mm  
Copper, bare  
PE  
whbu/bu, whog/og, whgn/gn, whbn/bn  
-  
-  
-  
PVC  
approx. 6,8 mm  
Grey



## Electrical data

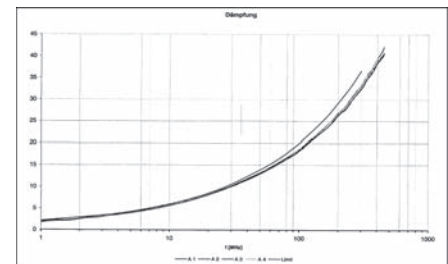
Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 300 MHz  
Loop resistance: 190 Ohm/km max.  
Mutual capacitance: 50 nF/km nom.  
Rel. propagation velocity: 67 %

## Typical values

Frequency (MHz)	10	16	62,5	100	155	200	300
Attenuation (db/100m)	5,6	7,0	14,3	18,2	22,9	26,0	32,5
Next (db)	72,0	70,0	65,0	63,0	60,0	57,0	55,0
ACR (db)	66,4	63,0	50,7	44,8	37,1	31,0	22,5

## Technical data

Weight: approx. 46 kg/km  
bending radius, repeated: 55 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,68 MJ/m  
Copper weight: 20,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6, Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, CMX 444

## Application

HELUKAT®300 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction. This type is certified according to UL because of the special PVC jacket

## Part no.

**802172**, U/UTP 4x2xAWG24/1 PVC UL (UTP)

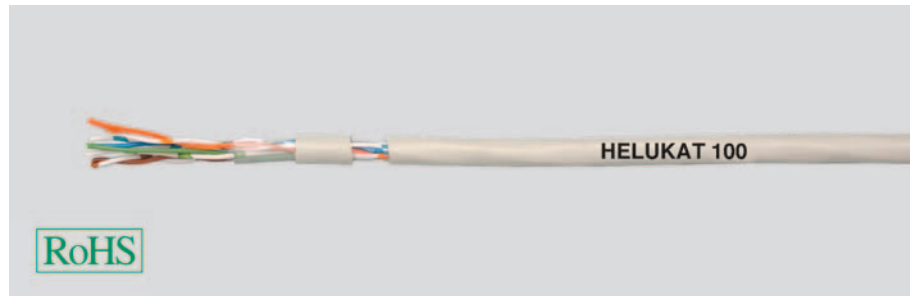
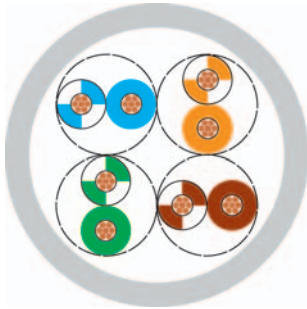
Dimensions and specifications may be changed without prior notice.

# LAN-Cable

Category 5

**HELUKAT® 100**

U/UTP flex



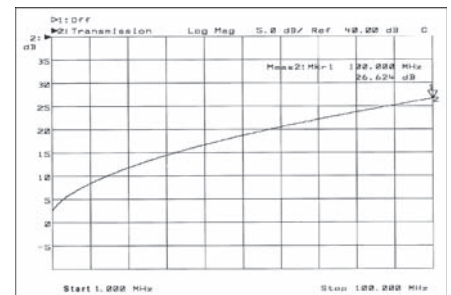
## Cable structure

Inner conductor diameter: 0,48 mm  
 Conductor material: Copper, bare  
 Core insulation: PO  
 Core colours: whbu/bu, whog/og, whgn/gn, whbn/bn  
 Shielding 1: -  
 Screen over stranding element: -  
 Screen 1 over stranding: -  
 Screen 2 over stranding: -  
 Outer sheath material: PVC  
 Outer diameter: approx. 4,5 mm  
 Outer sheath colour: Grey similar to RAL 7035

## U/UTP 4x2xAWG 26/7 PVC

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
 Loop resistance: 290 Ohm/km max.  
 Mutual capacitance: 50 nF/km nom.  
 Rel. propagation velocity: 74 %

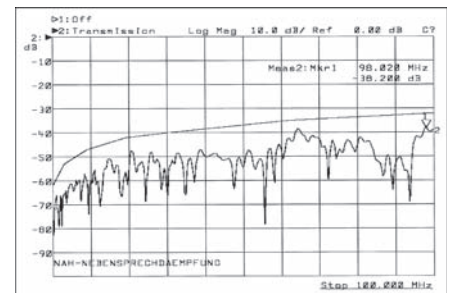


## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/10m)	0,9	1,2	2,4	3,1
Next (db)	53,0	50,0	41,0	38,0
ACR (db)	52,1	48,8	38,6	34,9

## Technical data

Weight: approx. 17 kg/km  
 bending radius, repeated: 35 mm  
 Operating temperature range min.: -20°C  
 Operating temperature range max.: +60°C  
 Caloric load, approx. value: 0,527 MJ/m  
 Copper weight: 11,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5

## Application

HELUKAT®100 data cables are used in the tertiary level of a network as patch cables and connection cables. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. With its optimized construction, the HELUKAT®100 series can be manufactured quickly and easily with all common RJ45 plugs.

## Part no.

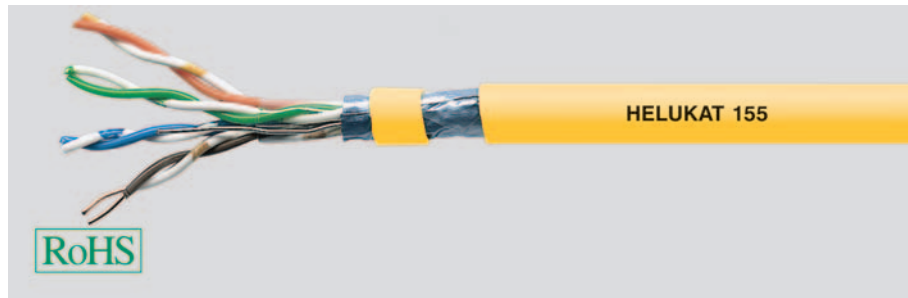
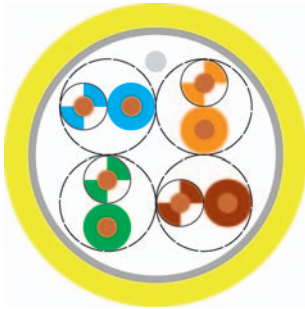
**80055**, U/UTP 4x2xAWG 26/7 PVC (UTP)

Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 5e

**HELUKAT® 155**  
F/UTP

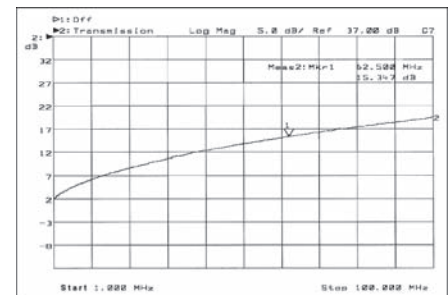


## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Drain wire:  
Outer sheath material:  
Outer diameter:  
Outer sheath colour:

## F/UTP 4x2xAWG 24/1 PVC

0,51 mm  
Copper, bare  
PE  
whbu/bu, whog/og, whgn/gn, whbn/bn  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
-  
yes  
PVC  
approx. 5,9 mm  
Yellow similar to RAL 1021



## Electrical data

Characteristic impedance:  
Loop resistance:  
Mutual capacitance:  
Rel. propagation velocity:

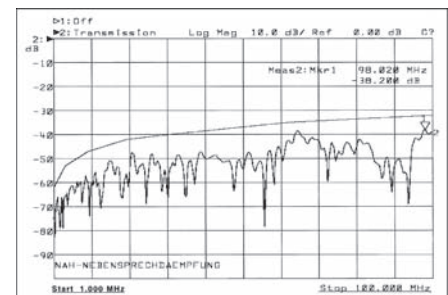
100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 155 MHz  
170 Ohm/km max.  
50 nF/km nom.  
69 %

## Typical values

Frequency (MHz)	10	16	62,5	100	155
Attenuation (dB/100m)	5,9	7,6	15,7	20,3	22,0
Next (db)	59,0	53,0	44,0	40,0	40,0
ACR (db)	53,1	45,4	28,3	19,7	18,0

## Technical data

Weight: approx. 40 kg/km  
bending radius, repeated: 48 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,40 MJ/m  
Copper weight: 18,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e

## Application

HELUKAT®155 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**80043**, F/UTP 4x2xAWG24/1 PVC (FTP)

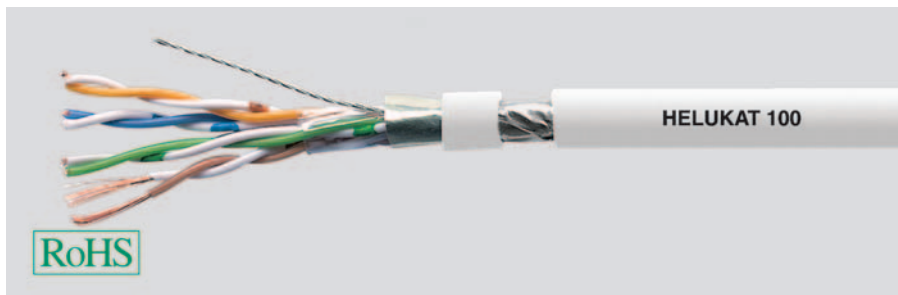
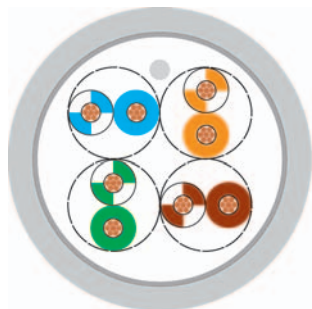
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 5

**HELUKAT® 100**

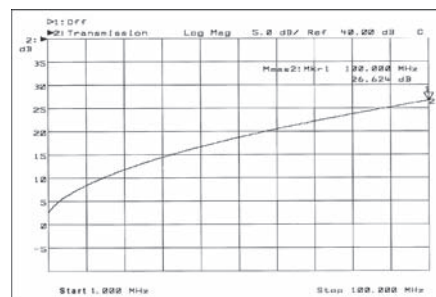
F/UTP flex



## Cable structure

Inner conductor diameter:	0,48 mm
Conductor material:	Copper, bare
Core insulation:	PO
Core colours:	whbu/bu, whog/og, whgn/gn, whbn/bn
Shielding 1:	Polyester foil over stranded bundle
Screen over stranding element:	-
Screen 1 over stranding:	Polyester foil, aluminium-lined
Screen 2 over stranding:	-
Drain wire:	yes
Outer sheath material:	FRNC
Outer diameter:	approx. 5,7 mm
Outer sheath colour:	Grey similar to RAL 7035

## F/UTP 4x2xAWG 26/7 FRNC



## Electrical data

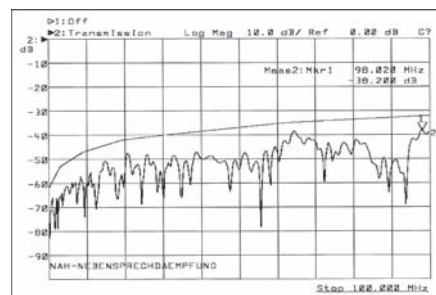
Characteristic impedance:	100 Ohm ± 15 ohm at 1 to 100 MHz
Loop resistance:	290 Ohm/km max.
Mutual capacitance:	50 nF/km nom.
Rel. propagation velocity:	74 %

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/10m)	0,9	1,2	2,4	2,9
Next (db)	58,0	56,0	45,0	43,0
ACR (db)	57,1	54,8	42,6	40,1

## Technical data

Weight:	approx. 31 kg/km
bending radius, repeated:	40 mm
Operating temperature range min.:	-20°C
Operating temperature range max.:	+60°C
Caloric load, approx. value:	0,527 MJ/m
Copper weight:	14,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5, Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3

## Application

HELUKAT®100 data cables are used in the tertiary level of a network as patch cables and connection cables. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. With its optimized construction, the HELUKAT®100 series can be manufactured quickly and easily with all common RJ45 plugs.

## Part no.

**81278**, F/UTP 4x2xAWG 26/7 FRNC (FTP)

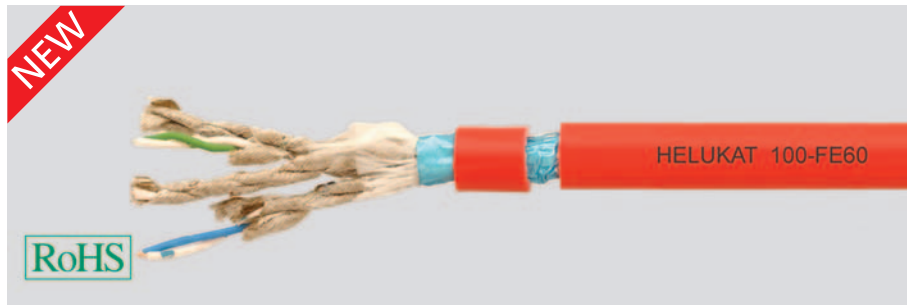
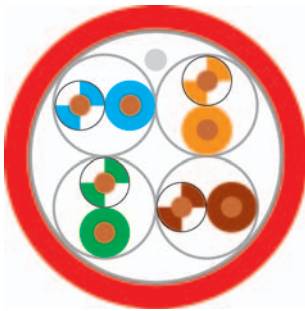
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 5

**HELUKAT® 100**

F/UTP FE60



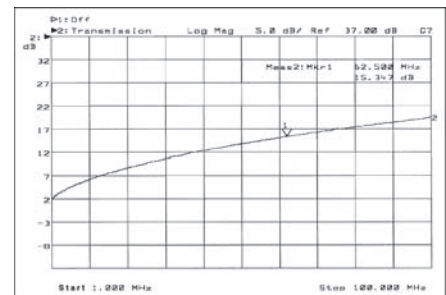
## Cable structure

Inner conductor diameter:	0,56 mm
Conductor material:	Copper, bare
Core insulation:	PO + flame resistant tape
Core colours:	whbu/bu, whog/og, whgn/gn, whbn/bn
Shielding 1:	-
Screen over stranding element:	PO tape
Screen 1 over stranding:	Helical glasfibre tape
Screen 2 over stranding:	Polyester foil, aluminium-lined
Drain wire:	yes
Outer sheath material:	LSZH
Outer diameter:	approx. 8,3 mm
Outer sheath colour:	Red

## F/UTP 4x2xAWG 24/1 FR-OH

## Electrical data

Characteristic impedance:	100 Ohm ± 15 ohm at 1 to 100 MHz
Loop resistance:	188 Ohm/km max.
Mutual capacitance:	65 nF/km nom.
Rel. propagation velocity:	67 %



## Typical values

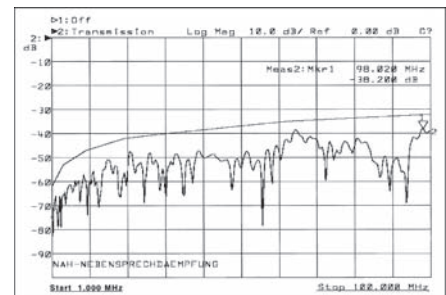
Frequency (MHz)	10	16	62,5	100
Attenuation (dB/100m)	5,7	7,3	14,9	19,3
Next (db)	56,0	53,0	42,0	38,0
ACR (db)	50,3	45,7	27,1	18,7

## Technical data

Weight:	approx. 75 kg/km
bending radius, repeated:	130 mm
Operating temperature range min.:	-20°C
Operating temperature range max.:	+70°C
Caloric load, approx. value:	0,72 MJ/m
Copper weight:	24,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5, Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT®100-FE60 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. Likewise, the thermal characteristics are perfectly suited to realize an isolation integrity according EN50200-FE60 due to their optimized construction.

## Part no.

**804045**, F/UTP 4x2xAWG24/1 FRNC (FTP)

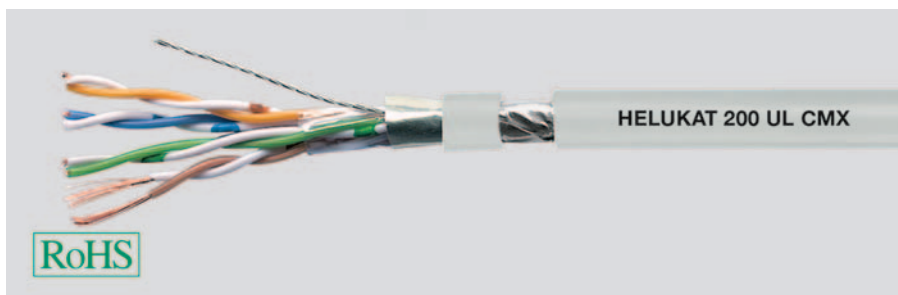
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 5e

**HELUKAT® 200**

F/UTP Flex, UL



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Drain wire:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## F/UTP 4x2xAWG 26/7 PVC, UL

0,48 mm

Copper, bare

PE

whbu/bu, whog/og, whgn/gn, whbn/bn

-

-

Polyester foil, aluminium-lined

-

yes

PVC

approx. 5,4 mm

Grey similar to RAL 7035

## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz

100 Ohm ± 20 ohm at 101 to 200 MHz

Loop resistance:

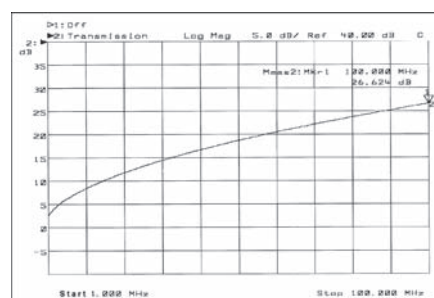
290 Ohm/km max.

Mutual capacitance:

50 nF/km nom.

Rel. propagation velocity:

67 %



## Typical values

Frequency (MHz)	10	16	62,5	100	200
Attenuation (db/10m)	0,9	1,2	2,4	3,1	3,9
Next (db)	62,0	60,0	50,0	48,0	45,0
ACR (db)	61,1	58,8	47,6	44,9	41,1

## Technical data

Weight:

approx. 30 kg/km

bending radius, repeated:

44 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

+60°C

Caloric load, approx. value:

0,40 MJ/m

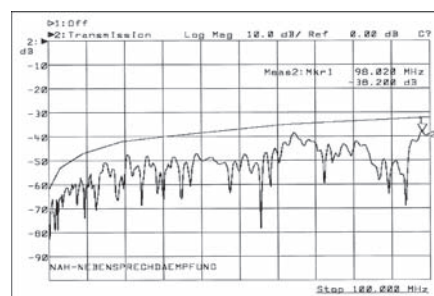
Copper weight:

15,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e,

Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, CMX 444



## Application

HELUKAT®200 data cables are used in the tertiary level of a network as patch cables and connection cables. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. With its optimized construction, the HELUKAT®200 series can be manufactured quickly and easily with all common RJ45 plugs. This type is certified according UL because of the special PVC jacket.

## Part no.

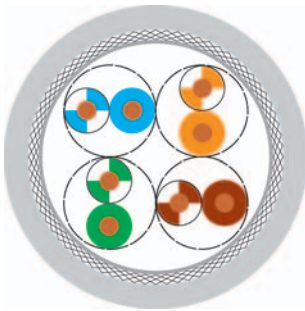
**802173**, F/UTP 4x2xAWG26/7 PVC UL (FTP)

Dimensions and specifications may be changed without prior notice.

# LAN-Cable

Category 5e

**HELUKAT® 200**  
SF/UTP

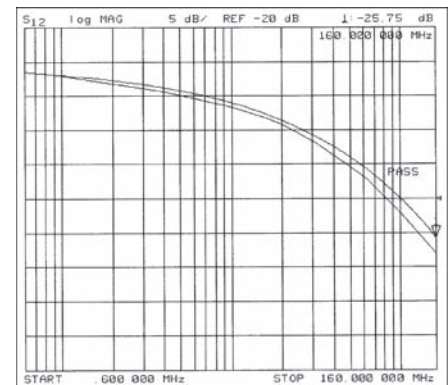


## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Outer diameter:  
Outer sheath colour:

## SF/UTP 4x2xAWG 24/1 PVC or FRNC

0,51 mm  
Copper, bare  
Foam-skin-PE  
whbu/bu, whog/og, whgn/gn, whbn/bn  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
Cu braid  
PVC / FRNC  
approx. 6,0 mm / approx. 6,0 mm  
Grey similar to RAL 7035



## Electrical data

Characteristic impedance:  
Loop resistance:  
Mutual capacitance:  
Rel. propagation velocity:

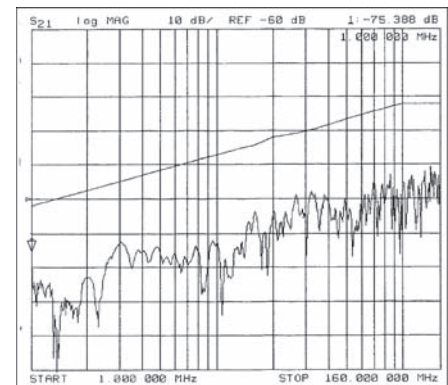
100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 200 MHz  
185 Ohm/km max.  
48 nF/km nom.  
74 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200
Attenuation (dB/100m)	5,6	7,2	14,4	18,2	25,9
Next (db)	62,0	59,0	50,0	46,0	40,0
ACR (db)	56,4	51,8	35,6	27,8	14,6

## Technical data

Weight: approx. 50 kg/km  
bending radius, repeated: 52 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,60 MJ/m / 0,48 MJ/m  
Copper weight: 28,00 kg/km



## Norms

81610:  
Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e  
81609:  
Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e, Flame-retardant:  
acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2,  
Corrosiveness acc. to EN50267-2-3

## Application

HELUKAT®200 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**81610**, SF/UTP 4x2xAWG 24/1 PVC (S-FTP)

**81609**, SF/UTP 4x2xAWG 24/1 FRNC (S-FTP)

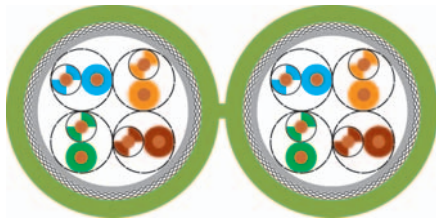
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 5e

**HELUKAT® 200**

SF/UTP duplex



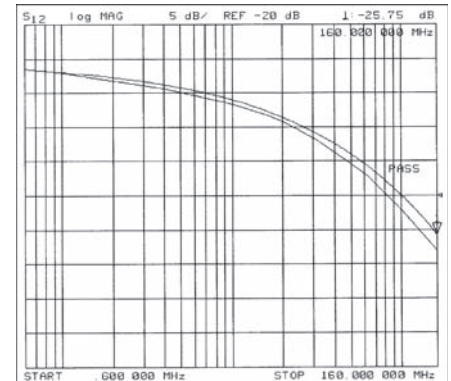
## Cable structure

Inner conductor diameter:	0,51 mm
Conductor material:	Copper, bare
Core insulation:	Foam-skin-PE
Core colours:	whbu/bu, whog/og, whgn/gn, whbn/bn
Shielding 1:	Polyester foil over stranded bundle
Screen over stranding element:	-
Screen 1 over stranding:	Polyester foil, aluminium-lined
Screen 2 over stranding:	Cu braid
Outer sheath material:	FRNC
Cable dimensions:	approx. 6,0 mm x 12,5 mm
Outer sheath colour:	Green similar to RAL 6018

## SF/UTP 2x(4x2xAWG 24/1) FRNC

## Electrical data

Characteristic impedance:	100 Ohm ± 15 ohm at 1 to 100 MHz 100 Ohm ± 20 ohm at 101 to 200 MHz
Loop resistance:	185 Ohm/km max.
Mutual capacitance:	48 nF/km nom.
Rel. propagation velocity:	74 %



## Typical values

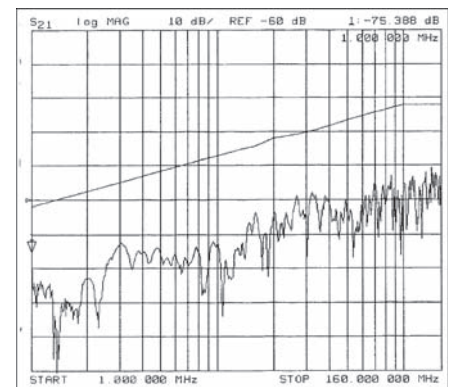
Frequency (MHz)	10	16	62,5	100	200
Attenuation (dB/100m)	5,6	7,2	14,4	18,2	25,9
Next (db)	62,0	59,0	50,0	46,0	40,0
ACR (db)	56,4	51,8	35,6	27,8	14,6

## Technical data

Weight:	approx. 100 kg/km
bending radius, repeated:	52 mm
Operating temperature range min.:	-20°C
Operating temperature range max.:	+60°C
Caloric load, approx. value:	0,96 MJ/m
Copper weight:	56,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e,  
Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT®200 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**81123**, SF/UTP 2x(4x2xAWG 24/1) FRNC (S-FTP)

Dimensions and specifications may be changed without prior notice.

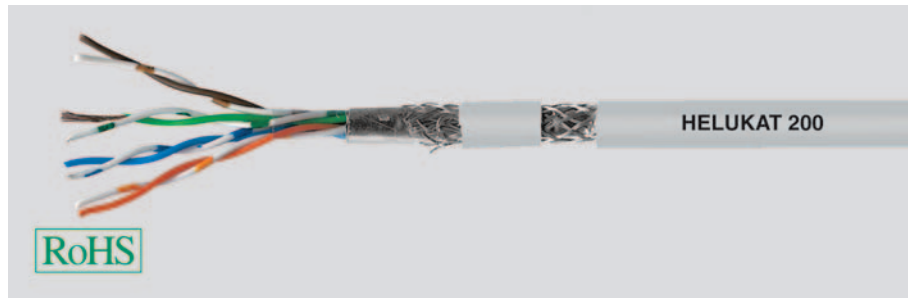
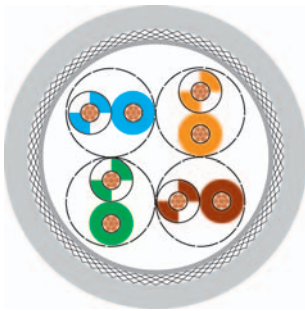


# LAN Cable

Category 5e

**HELUKAT® 200**

SF/UTP flex



## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Outer diameter:  
Outer sheath colour:

## SF/UTP 4x2xAWG 26/7 FRNC

0,48 mm  
Copper, bare  
PO  
whbu/bu, whog/og, whgn/gn, whbn/bn  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
Cu braid  
FRNC  
approx. 5,3 mm  
Grey similar to RAL 7035

## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 200 MHz

Loop resistance:

260 Ohm/km max.

Mutual capacitance:

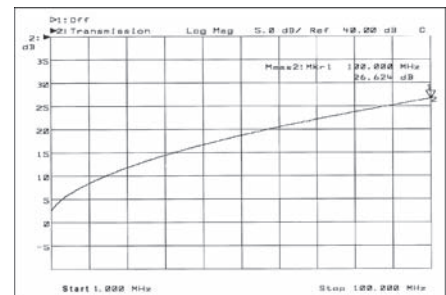
47 nF/km nom.

Rel. propagation velocity:

69 %

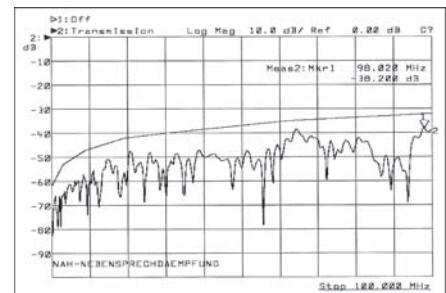
## Typical values

Frequency (MHz)	10	16	62,5	100	200
Attenuation (dB/10m)	0,8	1,1	2,4	2,9	4,3
Next (db)	58,0	56,0	45,0	43,0	37,0
ACR (db)	57,2	54,9	42,6	40,1	32,7



## Technical data

Weight: approx. 35 kg/km  
bending radius, repeated: 46 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,543 MJ/m  
Copper weight: 24,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e,  
Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3

## Application

HELUKAT®200 data cables are used in the tertiary level of a network as patch cables and connection cables. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. With its optimized construction, the HELUKAT®200 series can be manufactured quickly and easily with all common RJ45 plugs.

## Part no.

**81254**, SF/UTP 4x2xAWG 26/7 FRNC (S-FTP)

Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 6

**HELUKAT® 300**

U/FTP, UL



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Drain wire:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## U/FTP 4x2xAWG 26/7 PVC, UL

0,48 mm

Copper, tinned

Foam-skin-PE

whbu/bu, whog/og, whgn/gn, whbn/bn

Polyester foil over stranded bundle

Polyester foil, aluminium-lined

-

-

yes

PVC

approx. 5,9 mm

Grey similar to RAL 7035

## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz

100 Ohm ± 20 ohm at 101 to 300 MHz

Loop resistance:

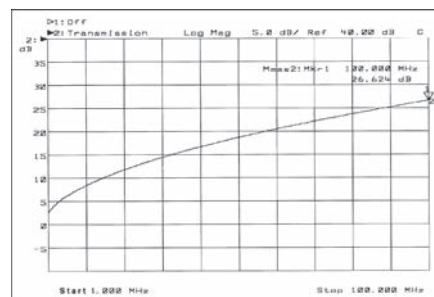
290 Ohm/km max.

Mutual capacitance:

45 nF/km nom.

Rel. propagation velocity:

77 %



## Typical values

Frequency (MHz)	10	16	62,5	100	200	300
Attenuation (db/10m)	0,9	1,1	2,2	2,7	3,9	4,7
Next (db)	90,0	88,0	83,0	80,0	76,0	73,0
ACR (db)	89,1	86,9	80,8	77,3	72,1	68,3

## Technical data

Weight:

approx. 37 kg/km

bending radius, repeated:

48 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

+60°C

Caloric load, approx. value:

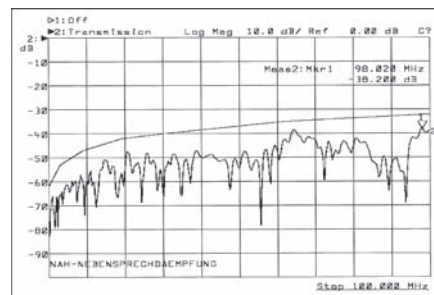
0,41 MJ/m

Copper weight:

20,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6, Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, CMX 444



## Application

HELUKAT®300 data cables are used in the tertiary level of a network as patch cables and connection cables. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s, or ISDN absolutely trouble-free. With its optimized construction, the HELUKAT®300 series can be manufactured quickly and easily with all common RJ45 plugs. This type is certified according to UL because of the special PVC jacket.

## Part no.

**802174**, U/FTP 4x2xAWG 26/7 PVC

Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 6

**HELUKAT® 450**  
F/FTP

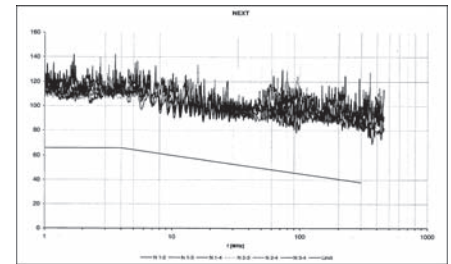


## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Drain wire:  
Outer sheath material:  
Outer diameter:  
Outer sheath colour:

## F/FTP 4x2xAWG 24/1 FRNC

0,52 mm  
Copper, bare  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
-  
Polyester foil, aluminium-lined  
Polyester foil, aluminium-lined  
-  
yes  
FRNC  
approx. 7,4 mm  
Green similar to RAL 6018



## Electrical data

Characteristic impedance:  
Loop resistance:  
Mutual capacitance:  
Rel. propagation velocity:

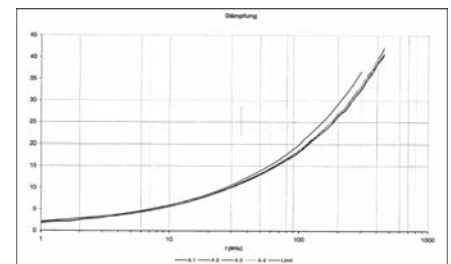
100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 450 MHz  
146 Ohm/km max.  
43 nF/km nom.  
79 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	450
Attenuation (dB/100m)	5,4	7,0	13,8	17,6	26,0	34,0	38,5
Next (db)	100,0	100,0	95,8	94,5	91,0	87,0	84,3
ACR (db)	94,6	93,0	82,0	76,9	65,0	53,0	45,8

## Technical data

Weight: approx. 50 kg/km  
bending radius, repeated: 59 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,57 MJ/m  
Copper weight: 24,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6, Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3

## Application

HELUKAT®450 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**82501**, F/FTP 4x2xAWG 24/1 FRNC (S-STP)

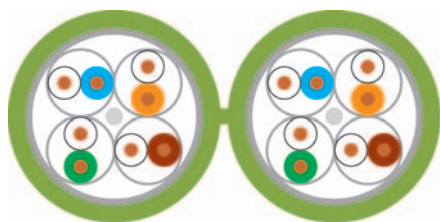
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 6

**HELUKAT® 450**

F/FTP duplex



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Drain wire:

Outer sheath material:

Cable dimensions:

Outer sheath colour:

## F/FTP 2x(4x2xAWG 24/1) FRNC

0,52 mm

Copper, bare

Foam-skin-PE

wh/bu, wh/og, wh/gn, wh/bn

-

Polyester foil, aluminium-lined

Polyester foil, aluminium-lined

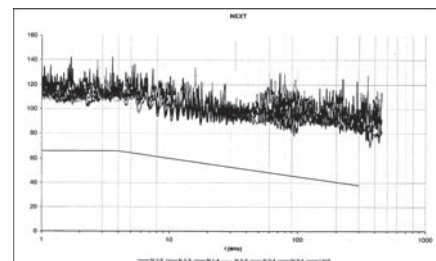
-

yes

FRNC

approx. 7,4 mm x 15,0 mm

Green similar to RAL 6018



## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz

100 Ohm ± 20 ohm at 101 to 450 MHz

Loop resistance:

146 Ohm/km max.

Mutual capacitance:

43 nF/km nom.

Rel. propagation velocity:

79 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	450
Attenuation (dB/100m)	5,4	7,0	13,8	17,6	26,0	34,0	38,5
Next (db)	100,0	100,0	95,8	94,5	91,0	87,0	84,3
ACR (db)	94,6	93,0	82,0	76,9	65,0	53,0	45,8

## Technical data

Weight:

approx. 100 kg/km

bending radius, repeated:

59 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

+60°C

Caloric load, approx. value:

1,14 MJ/m

Copper weight:

48,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6, Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3

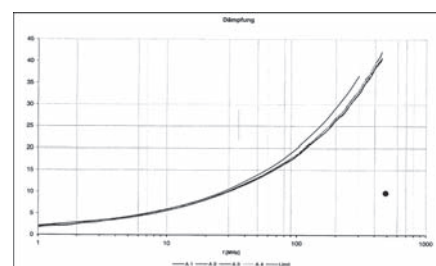
## Application

HELUKAT®450 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**82502**, F/FTP 2x4x2xAWG 24/1 FRNC (S-STP)

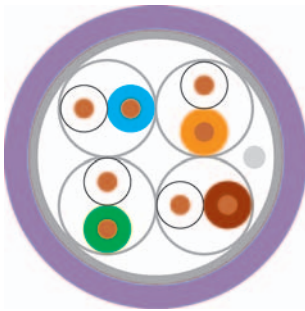
Dimensions and specifications may be changed without prior notice.



# LAN Cable

Category 6A

**HELUKAT® 500**  
F/FTP

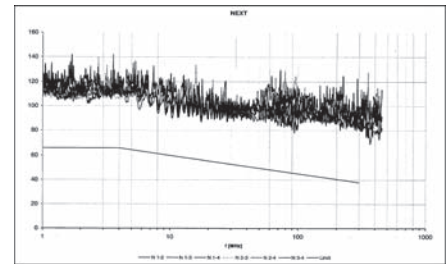


## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Drain wire:  
Outer sheath material:  
Outer diameter:  
Outer sheath colour:

## F/FTP 4x2xAWG 23/1 LSZH

0,57 mm  
Copper, bare  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
-  
Polyester foil, aluminium-lined  
Polyester foil, aluminium-lined  
-  
yes  
LSZH  
approx. 7,5 mm  
Blue Lilac similar to RAL 4005



## Electrical data

Characteristic impedance:  
Loop resistance:  
Mutual capacitance:  
Rel. propagation velocity:

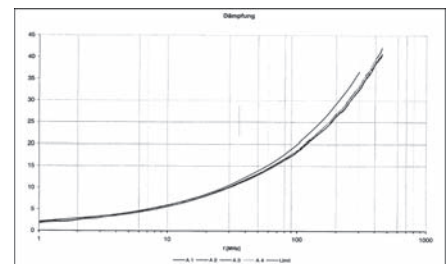
100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 500 MHz  
160 Ohm/km max.  
45 nF/km nom.  
80 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200	250	300	500
Attenuation (db/100m)	5,7	7,2	14,2	18,1	25,8	29,0	31,9	41,8
Next (db)	100,0	100,0	100,0	97,4	92,9	91,4	90,2	86,9
ACR (db)	94,3	92,8	85,8	79,3	67,1	62,4	58,3	45,1

## Technical data

Weight: approx. 50 kg/km  
bending radius, repeated: 100 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,55 MJ/m  
Copper weight: 28,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6A,  
Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3

## Application

HELUKAT® 500 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as 10Gigabit Ethernet, Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**803378**, F/FTP 4x2xAWG 23/1 LSZH (S-STP)

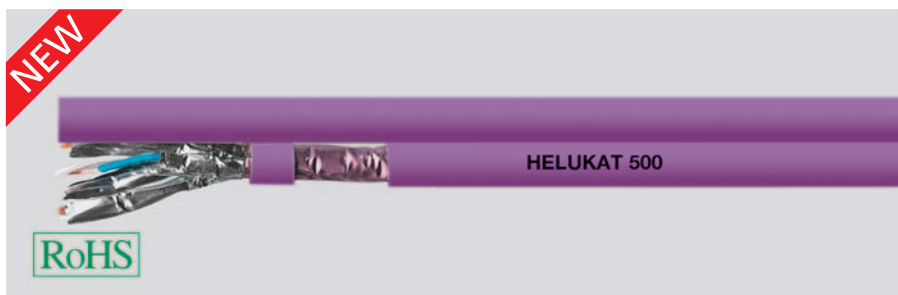
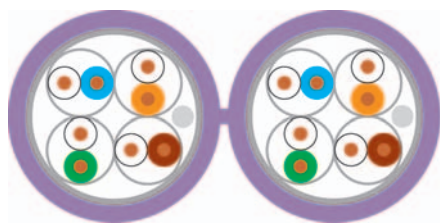
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Kategorie 6<sub>A</sub>

**HELUKAT® 500**

F/FTP duplex



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Drain wire:

Outer sheath material:

Cable dimensions:

Outer sheath colour:

## F/FTP 2x(4x2xAWG 23/1) LSZH

0,57 mm

Copper, bare

Foam-skin-PE

wh/bu, wh/og, wh/gn, wh/bn

-

Polyester foil, aluminium-lined

Polyester foil, aluminium-lined

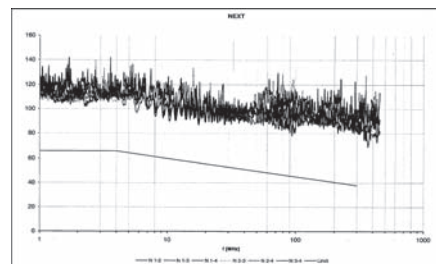
-

yes

LSZH

approx. 7,8 mm x 15,9 mm

Blue Lilac similar to RAL 4005



## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz

100 Ohm ± 20 ohm at 101 to 500 MHz

Loop resistance:

160 Ohm/km max.

Mutual capacitance:

45 nF/km nom.

Rel. propagation velocity:

80 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200	250	300	500
Attenuation (db/100m)	5,7	7,2	14,2	18,1	25,8	29,0	31,9	41,8
Next (db)	100,0	100,0	100,0	97,4	92,9	91,4	90,2	86,9
ACR (db)	94,3	92,8	85,8	79,3	67,1	62,4	58,3	45,1

## Technical data

Weight:

approx. 100 kg/km

bending radius, repeated:

100 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

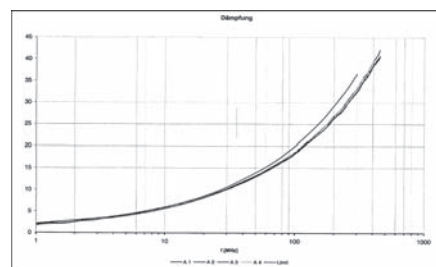
+60°C

Caloric load, approx. value:

1,13 MJ/m

Copper weight:

56,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6<sub>A</sub>,

Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to

60754-2, Corrosiveness acc. to EN50267-2-3

## Application

HELUKAT® 500 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as 10Gigabit Ethernet, Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**803379**, F/FTP 2x4x2xAWG 23/1 LSZH

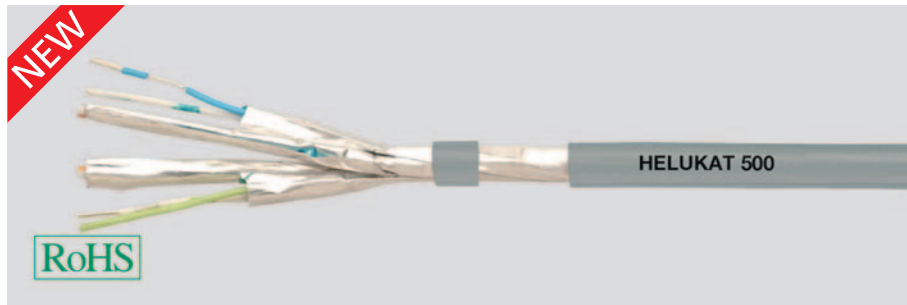
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 6A

**HELUKAT® 500**

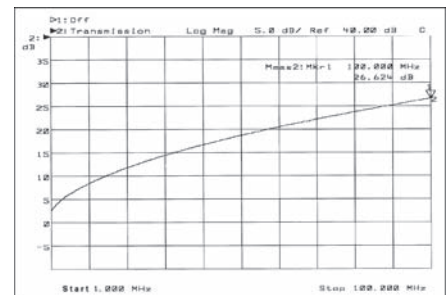
U/FTP, flex



## Cable structure

Inner conductor diameter: 0,48 mm  
 Conductor material: Copper, bare  
 Core insulation: Foam-skin-PE  
 Core colours: wh/bu, wh/og, wh/gn, wh/bn  
 Shielding 1: -  
 Screen over stranding element: Polyester foil, aluminium-lined  
 Screen 1 over stranding: -  
 Screen 2 over stranding: -  
 Drain wire: yes  
 Outer sheath material: LSZH  
 Outer diameter: approx. 5,8 mm  
 Outer sheath colour: Grey similar to RAL 7035

## U/FTP 4x2xAWG 26/7 (stranded) LSZH



## Electrical data

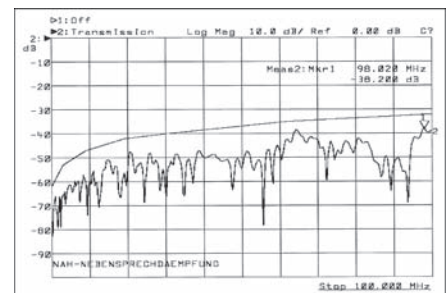
Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
 100 Ohm ± 20 ohm at 101 to 500 MHz  
 Loop resistance: 165 Ohm/km max.  
 Mutual capacitance: 54 nF/km nom.  
 Rel. propagation velocity: 78 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200	250	500
Attenuation (dB/10m)	0,8	1,1	2,1	2,7	3,9	4,4	6,3
Next (db)	100,0	100,0	100,0	97,0	92,0	91,0	86,0
ACR (db)	99,2	98,9	97,9	94,3	88,1	86,6	79,7

## Technical data

Weight: approx. 35 kg/km  
 bending radius, repeated: 49 mm  
 Operating temperature range min.: -20°C  
 Operating temperature range max.: +60°C  
 Caloric load, approx. value: 0,39 MJ/m  
 Copper weight: 15,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6A,  
 Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3

## Application

HELUKAT®500 data cables are used in the tertiary level of a network as patch cables and connection cables. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as 10Gigabit Ethernet, Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. With its optimized construction, the HELUKAT®500 series can be manufactured quickly and easily with many common RJ45 plugs.

## Part no.

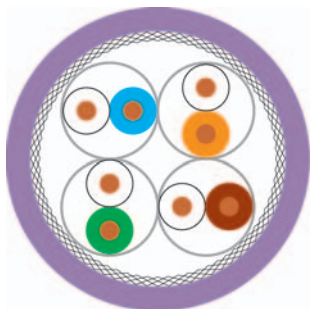
**804043**, U/FTP 4x2xAWG 26/7 LSZH

Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 7e

**HELUKAT® 600**  
S/FTP



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## S/FTP 4x2xAWG 23/1 FRNC

0,57 mm

Copper, bare

Foam-skin-PE

wh/bu, wh/og, wh/gn, wh/bn

-

Polyester foil, aluminium-lined

Cu braid

-

FRNC

approx. 7,5 mm

Blue Lilac similar to RAL 4005

## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz

Loop resistance:

100 Ohm ± 20 ohm at 101 to 1000 MHz

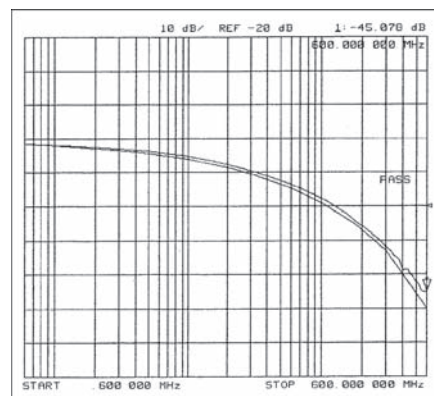
Mutual capacitance:

130 Ohm/km max.

Rel. propagation velocity:

43 nF/km nom.

79 %



## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600	900	1000
Attenuation (dB/100m)	5,6	7,1	13,9	17,5	25,2	32,1	44,9	55,0	58,0
Next (db)	100,0	100,0	96,0	94,0	88,0	84,0	73,0	71,0	69,0
ACR (db)	94,4	92,9	82,1	76,5	62,8	51,9	28,1	16,0	9,0

## Technical data

Weight:

approx. 60 kg/km

bending radius, repeated:

60 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

+60°C

Caloric load, approx. value:

0,60 MJ/m

Copper weight:

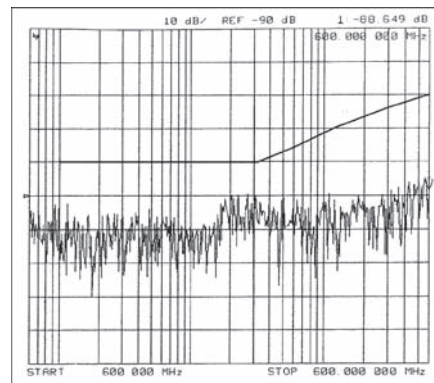
28,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7e,

Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to

60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT®600 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**80810**, S/FTP 4x2xAWG 23/1 FRNC (S-STP)

Dimensions and specifications may be changed without prior notice.

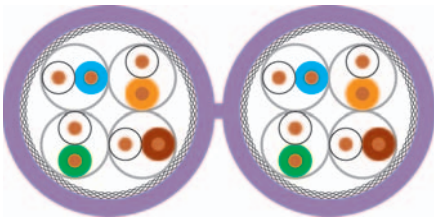


# LAN Cable

Category 7e

**HELUKAT® 600**

S/FTP duplex



## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable dimensions:  
Outer sheath colour:

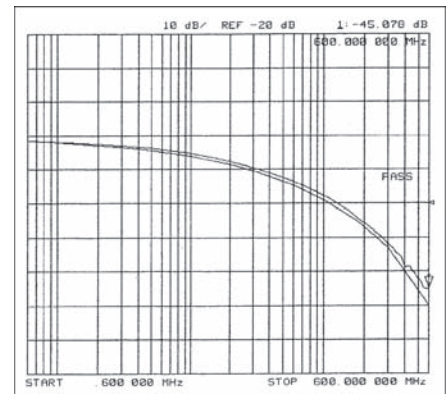
## S/FTP 2x(4x2xAWG 23/1) FRNC

0,57 mm  
Copper, bare  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
-  
Polyester foil, aluminium-lined  
Cu braid  
-  
FRNC  
approx. 7,5 mm x 16,0 mm  
Blue Lilac similar to RAL 4005

## Electrical data

Characteristic impedance:  
Loop resistance:  
Mutual capacitance:  
Rel. propagation velocity:

100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 1000 MHz  
130 Ohm/km max.  
43 nF/km nom.  
79 %

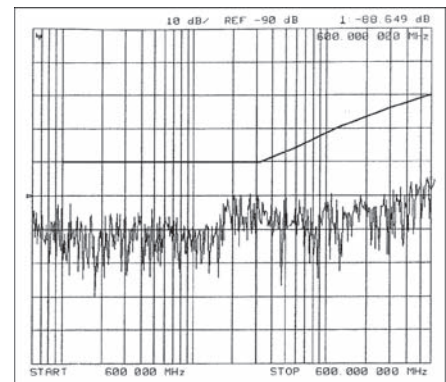


## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600	900	1000
Attenuation (dB/100m)	5,6	7,1	13,9	17,5	25,2	32,1	44,9	55,0	58,0
Next (db)	100,0	100,0	96,0	94,0	88,0	84,0	73,0	71,0	69,0
ACR (db)	94,4	92,9	82,1	76,5	62,8	51,9	28,1	16,0	9,0

## Technical data

Weight: approx. 120 kg/km  
bending radius, repeated: 60 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 1,20 MJ/m  
Copper weight: 56,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7e,  
Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3

## Application

HELUKAT®600 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**81446**, S/FTP 2x(4x2xAWG 23/1) FRNC (S-STP)

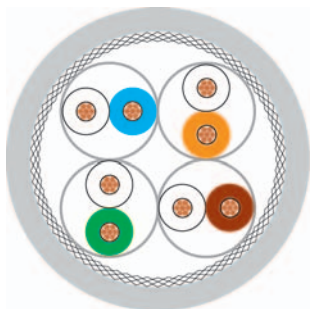
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 7

**HELUKAT® 600**

S/FTP flex



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## S/FTP 4x2xAWG 26/7 FRNC

0,48 mm

Copper, bare

Foam-skin-PE

wh/bu, wh/og, wh/gn, wh/bn

-

Polyester foil, aluminium-lined

Cu braid

-

FRNC

approx. 5,9 mm

Grey similar to RAL 7035

## Electrical data

Characteristic impedance:

100 Ohm  $\pm$  15 ohm at 1 to 100 MHz

Loop resistance:

100 Ohm  $\pm$  20 ohm at 101 to 600 MHz

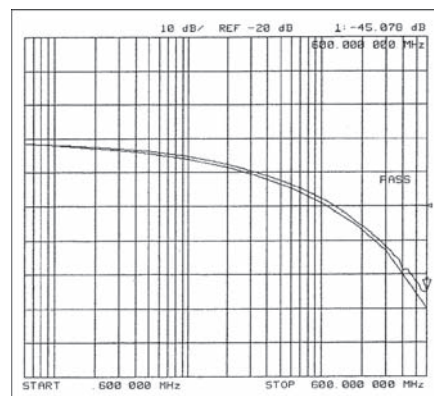
Mutual capacitance:

264 Ohm/km max.

Rel. propagation velocity:

45 nF/km nom.

77 %



## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600
Attenuation (dB/10m)	0,8	1,0	2,0	2,6	4,0	4,9	6,3
Next (db)	96,0	96,0	95,0	94,0	88,0	86,0	80,0
ACR (db)	95,2	95,0	93,0	91,4	84,0	81,1	73,7

## Technical data

Weight:

approx. 42 kg/km

bending radius, repeated:

55 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

+60°C

Caloric load, approx. value:

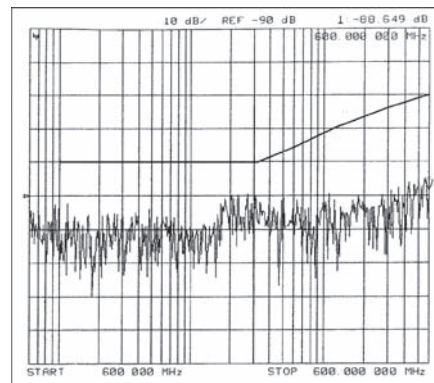
0,47 MJ/m

Copper weight:

22,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7, Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT®600 data cables are used in the tertiary level of a network as patch cables and connection cables. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. With its optimized construction, the HELUKAT®600 series can be manufactured quickly and easily with all common RJ45 plugs.

## Part no.

**80294**, S/FTP 4x2xAWG 26/7 FRNC (S-STP)

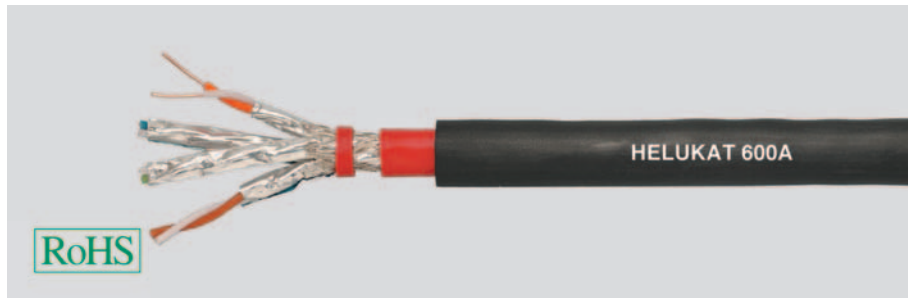
Dimensions and specifications may be changed without prior notice.

# LAN Cable Outdoor

Category 7e

**HELUKAT® 600A**

S/FTP PVC/PVC



## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Inner sheath material:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Outer diameter:  
Outer sheath colour:

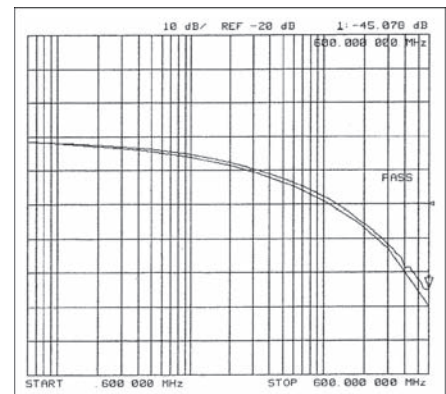
## S/FTP 4x2xAWG 23/1 PVC/PVC

0,58 mm  
Copper, bare  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
-  
PVC  
Polyester foil, aluminium-lined  
Cu braid  
-  
PVC  
approx. 11,6 mm  
Black similar to RAL 9005

## Electrical data

Characteristic impedance:  
  
Loop resistance:  
Mutual capacitance:  
Rel. propagation velocity:

100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 1000 MHz  
160 Ohm/km max.  
43 nF/km nom.  
79 %

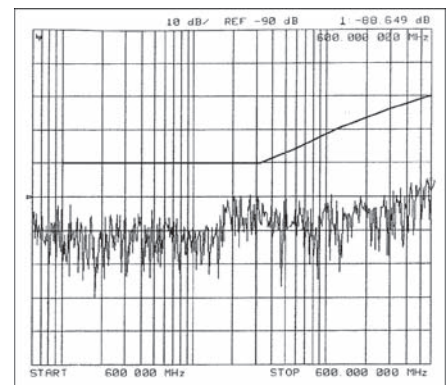


## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600	900	1000
Attenuation (dB/100m)	5,6	7,1	13,9	17,5	25,2	32,1	44,9	55,0	58,0
Next (db)	100,0	100,0	96,0	94,0	88,0	84,0	73,0	71,0	69,0
ACR (db)	94,4	92,9	82,1	76,5	62,8	51,9	28,1	16,0	9,0

## Technical data

Weight: approx. 153 kg/km  
bending radius, repeated: 95 mm  
Operating temperature range min.: -30°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 2,62 MJ/m  
Copper weight: 32,00 kg/km



## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7e,  
Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034

## Application

HELUKAT® 600 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. The serie of HELUKAT® 600A with a double PVC jacket is constructed especially for outdoor applications like laying at house walls or in cable lines.

## Part no.

**801147**, S/FTP 4x2xAWG 23/1 PVC/PVC (S-STP)

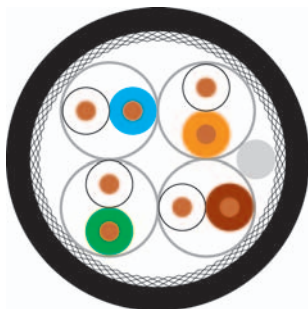
Dimensions and specifications may be changed without prior notice.

# LAN Cable direct Burial

Category 7e

**HELUKAT® 600E**

S/FTP PVC



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Drain wire:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## S/FTP 4x2xAWG 23/1 direct burial

0,58 mm

Copper, bare

PO

wh/bu, wh/og, wh/gn, wh/bn

-

Polyester foil, aluminium-lined

Cu braid

-

yes

PVC

approx. 9,8 mm

Black

## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz

100 Ohm ± 20 ohm at 101 to 1000 MHz

Loop resistance:

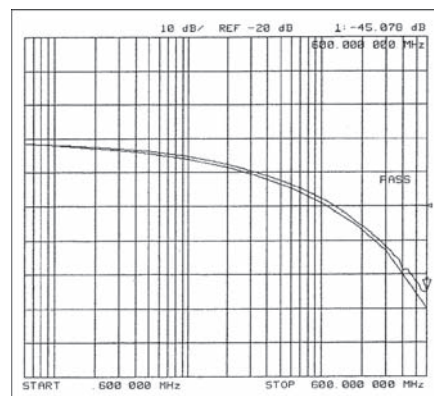
150 Ohm/km max.

Mutual capacitance:

42 nF/km nom.

Rel. propagation velocity:

79 %



## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600	900	1000
Attenuation (dB/100m)	5,6	7,1	13,9	17,5	25,2	32,1	44,9	55,0	58,0
Next (db)	100,0	100,0	96,0	94,0	88,0	84,0	73,0	71,0	69,0
ACR (db)	94,4	92,9	82,1	76,5	62,8	51,9	28,1	16,0	9,0

## Technical data

Weight:

approx. 102 kg/km

bending radius, repeated:

100 mm

Operating temperature range min.:

-45°C

Operating temperature range max.:

+65°C

Caloric load, approx. value:

1,40 MJ/m

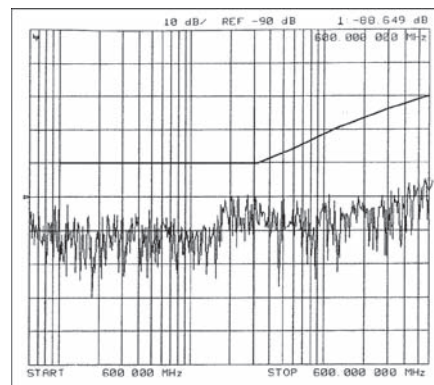
Copper weight:

32,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7e,

Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, UL 1581 VW-1



## Application

HELUKAT® 600 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. The serie of HELUKAT® 600E with a cold resistant PVC jacket is constructed especially for outdoor applications like laying at house walls or direct burial.

## Part no.

**802167**, S/FTP 4x2xAWG23/1 PVC (S-STP)

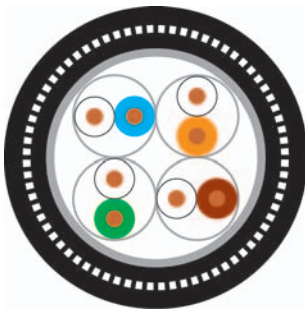
Dimensions and specifications may be changed without prior notice.

# LAN Cable direct burial / armoured

Category 7e

**HELUKAT® 600AE**

S/FTP FRNC/PE



## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Inner sheath material:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
:  
Outer sheath material:  
Outer diameter:  
Outer sheath colour:

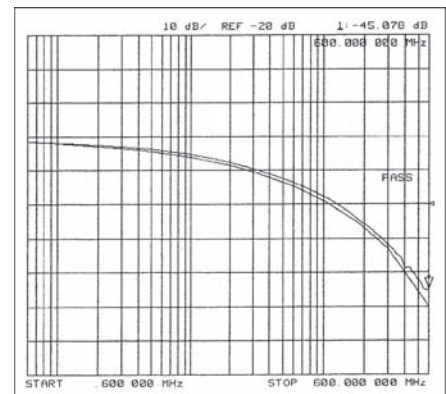
## S/FTP 4x2xAWG 23/1 FRNC/PE

0,58 mm  
Copper, bare  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
-  
FRNC  
Polyester foil, aluminium-lined  
Cu braid  
-  
Steel shaft  
PE  
approx. 12,2 mm  
Black

## Electrical data

Characteristic impedance:  
  
Loop resistance:  
Mutual capacitance:  
Rel. propagation velocity:

100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 1000 MHz  
150 Ohm/km max.  
43 nF/km nom.  
79 %



## Typical values

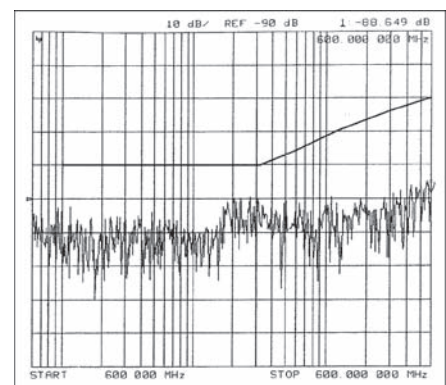
Frequency (MHz)	10	16	62,5	100	200	300	600	900	1000
Attenuation (dB/100m)	5,6	7,1	13,9	17,5	25,2	32,1	44,9	55,0	58,0
Next (db)	100,0	100,0	96,0	94,0	88,0	84,0	73,0	71,0	69,0
ACR (db)	94,4	92,9	82,1	76,5	62,8	51,9	28,1	16,0	9,0

## Technical data

Weight: approx. 155 kg/km  
bending radius, repeated: 330 mm  
Operating temperature range min.: -45°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 2,30 MJ/m  
Copper weight: 32,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7e



## Application

HELUKAT® 600 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. The serie of HELUKAT® 600AE with a FRNC/PE double jacket and the rodent protection is constructed especially for outdoor and direct burial applications.

## Part no.

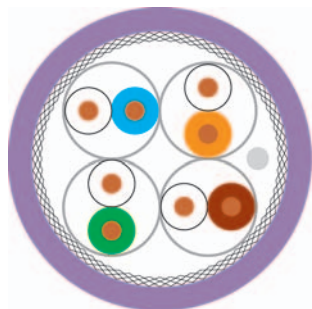
**802168**, S/FTP 4x2xAWG 23/1 FRNC/PE (S-STP)

Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 7<sub>A</sub>

**HELUKAT® 1200**  
S/FTP



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Drain wire:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## S/FTP 4x2xAWG 23/1 LSZH

0,57 mm

Copper, bare

Foam-skin-PE

wh/bu, wh/og, wh/gn, wh/bn

-

Polyester foil, aluminium-lined

Cu braid

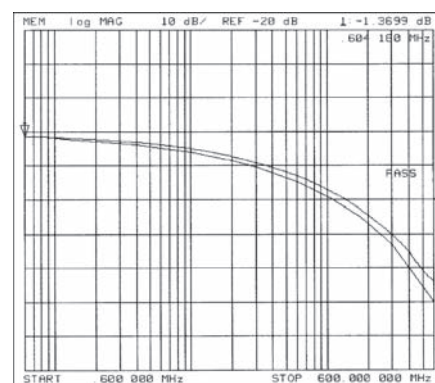
-

yes

LSZH

approx. 7,9 mm

Blue Lilac similar to RAL 4005



## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz

100 Ohm ± 20 ohm at 101 to 1200 MHz

Loop resistance:

160 Ohm/km max.

Mutual capacitance:

45 nF/km nom.

Rel. propagation velocity:

80 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600	900	1000	1200
Attenuation (db/100m)	5,4	6,8	13,3	16,9	24,2	29,8	42,9	53,2	56,3	62,1
Next (db)	105,0	105,0	105,0	100,0	95,0	93,0	88,0	85,0	84,0	82,0
ACR (db)	99,6	98,2	91,7	83,1	70,8	63,2	45,1	31,8	27,7	19,9

## Technical data

Weight:

approx. 60 kg/km

bending radius, repeated:

60 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

+60°C

Caloric load, approx. value:

0,56 MJ/m

Copper weight:

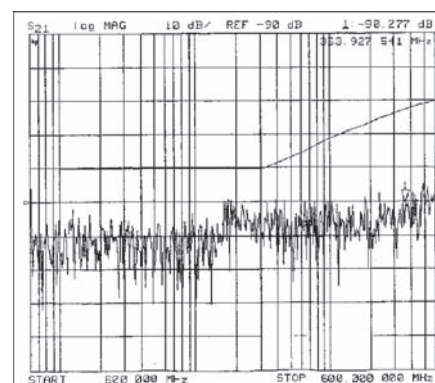
35,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7<sub>A</sub>,

Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to

60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT®1200-7A data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as 10Gigabit Ethernet, Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**803380**, S/FTP 4x2xAWG 23/1 FRNC (S-STP)

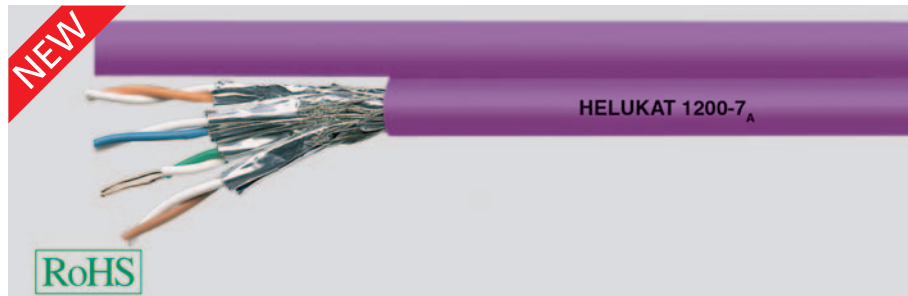
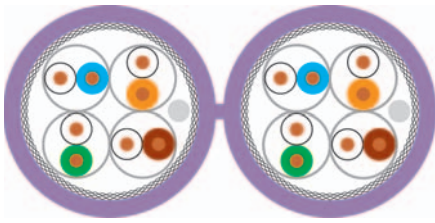
Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 7<sub>A</sub>

**HELUKAT® 1200**

S/FTP duplex



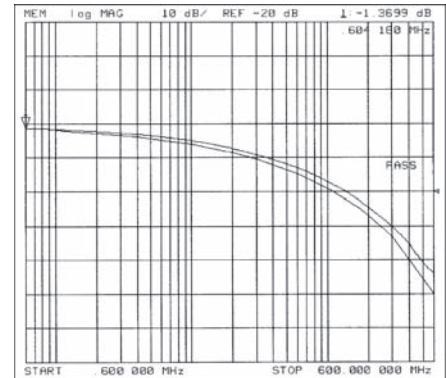
## Cable structure

Inner conductor diameter: 0,57 mm  
 Conductor material: Copper, bare  
 Core insulation: Foam-skin-PE  
 Core colours: wh/bu, wh/og, wh/gn, wh/bn  
 Shielding 1: -  
 Screen over stranding element: Polyester foil, aluminium-lined  
 Screen 1 over stranding: Cu braid  
 Screen 2 over stranding: -  
 Drain wire: yes  
 Outer sheath material: LSZH  
 Cable dimensions: approx. 16,8 mm x 7,9 mm  
 Outer sheath colour: Blue Lilac similar to RAL 4005

## S/FTP 4x2xAWG 23/1 LSZH

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
 100 Ohm ± 20 ohm at 101 to 1200 MHz  
 Loop resistance: 160 Ohm/km max.  
 Mutual capacitance: 56 nF/km nom.  
 Rel. propagation velocity: 80 %



## Typical values

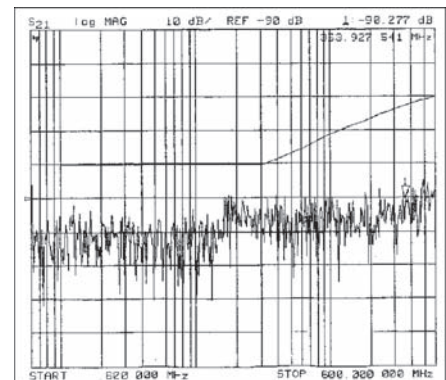
Frequency (MHz)	10	16	62,5	100	200	300	600	900	1000	1200
Attenuation (db/100m)	5,4	6,8	13,3	16,9	24,2	29,8	42,9	53,2	56,3	62,1
Next (db)	105,0	105,0	105,0	100,0	95,0	93,0	88,0	85,0	84,0	82,0
ACR (db)	99,6	98,2	91,7	83,1	70,8	63,2	45,1	31,8	27,7	19,9

## Technical data

Weight: approx. 120 kg/km  
 bending radius, repeated: 60 mm  
 Operating temperature range min.: -20°C  
 Operating temperature range max.: +60°C  
 Caloric load, approx. value: 1,15 MJ/m  
 Copper weight: 70,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7<sub>A</sub>,  
 Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT®1200-7A data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as 10Gigabit Ethernet, Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

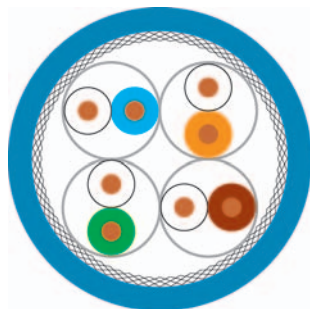
**803381**, S/FTP 2x(4x2xAWG 23/1) FRNC (S-STP)

Dimensions and specifications may be changed without prior notice.

# LAN Cable

Category 8

**HELUKAT® 1200**  
S/FTP



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## S/FTP 4x2xAWG 22/1 FRNC

0,64 mm

Copper, bare

Foam-skin-PE

wh/bu, wh/og, wh/gn, wh/bn

-

Polyester foil, aluminium-lined

Cu braid

-

FRNC

approx. 7,7 mm

Blue similar to RAL 5015

## Electrical data

Characteristic impedance:

100 Ohm  $\pm$  15 ohm at 1 to 100 MHz

100 Ohm  $\pm$  20 ohm at 101 to 1200 MHz

Loop resistance:

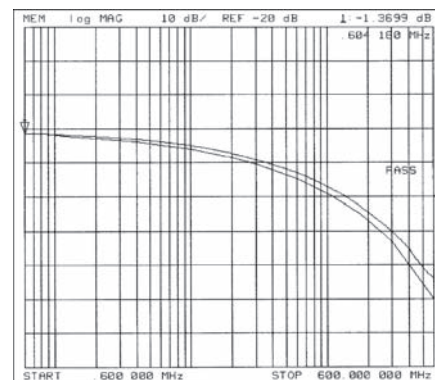
120 Ohm/km max.

Mutual capacitance:

43 nF/km nom.

Rel. propagation velocity:

79 %



## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600	1000	1200
Attenuation (dB/100m)	4,9	6,3	12,7	16,3	23,5	29,4	42,8	53,0	59,0
Next (db)	100,0	100,0	95,0	93,0	90,0	87,0	81,0	78,0	77,0
ACR (db)	95,1	93,7	82,3	76,7	66,5	57,6	38,2	25,0	18,0

## Technical data

Weight:

approx. 66 kg/km

bending radius, repeated:

72 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

+60°C

Caloric load, approx. value:

0,70 MJ/m

Copper weight:

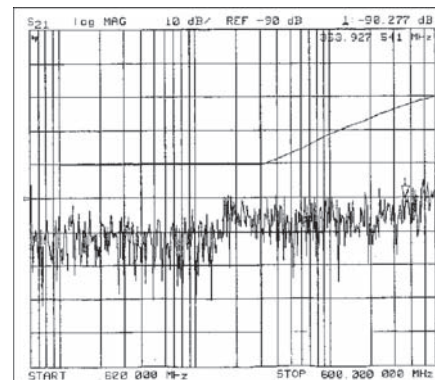
40,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 8 (draft),

Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to

60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT®1200 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**81699**, S/FTP 4x2xAWG 22/1 FRNC (S-FTP)

Dimensions and specifications may be changed without prior notice.

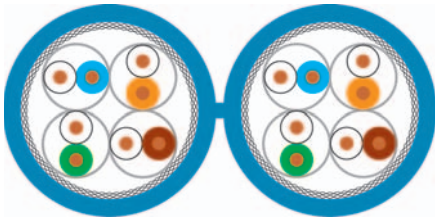


# LAN Cable

Category 8

**HELUKAT® 1200**

S/FTP duplex



## Cable structure

Inner conductor diameter:  
Conductor material:  
Core insulation:  
Core colours:  
Shielding 1:  
Screen over stranding element:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable dimensions:  
Outer sheath colour:

## S/FTP 2x(4x2xAWG 22/1) FRNC

0,64 mm  
Copper, bare  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
-  
Polyester foil, aluminium-lined  
Cu braid  
-  
FRNC  
approx. 7,7 mm x 16,5 mm  
Blue similar to RAL 5015

## Electrical data

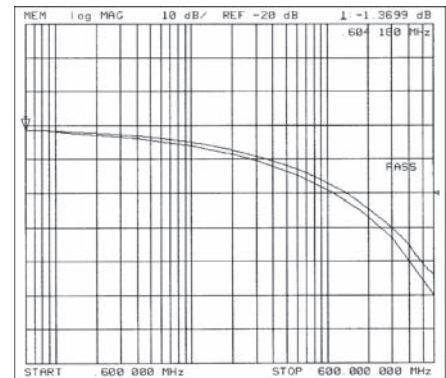
Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 1200 MHz  
120 Ohm/km max.  
43 nF/km nom.  
79 %

Loop resistance:

Mutual capacitance:

Rel. propagation velocity:



## Typical values

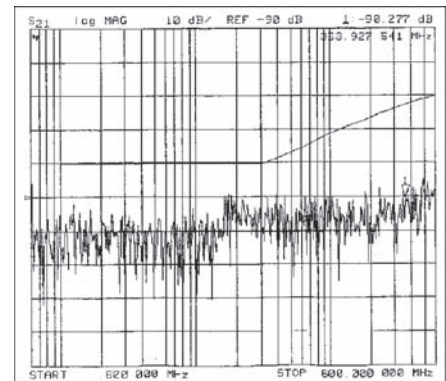
Frequency (MHz)	10	16	62,5	100	200	300	600	1000	1200
Attenuation (dB/100m)	4,9	6,3	12,7	16,3	23,5	29,4	42,8	53,0	59,0
Next (db)	100,0	100,0	95,0	93,0	90,0	87,0	81,0	78,0	77,0
ACR (db)	95,1	93,7	82,3	76,7	66,5	57,6	38,2	25,0	18,0

## Technical data

Weight: approx. 133 kg/km  
bending radius, repeated: 72 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 1,50 MJ/m  
Copper weight: 80,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 8 (draft),  
Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT®1200 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**800647**, S/FTP 2x(4x2xAWG 22/1) FRNC (S-STP)

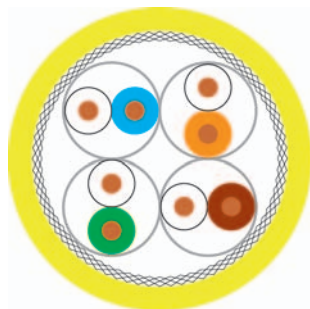
Dimensions and specifications may be changed without prior notice.

# Multimedia Cable

Category 8

**HELUKAT® 1500**

S/FTP



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Shielding 1:

Screen over stranding element:

Screen 1 over stranding:

Screen 2 over stranding:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## S/FTP 4x2xAWG 22/1 FRNC

0,64 mm

Copper, bare

Foam-skin-PE

wh/bu, wh/og, wh/gn, wh/bn

-

Polyester foil, aluminium-lined

Cu braid

-

FRNC

approx. 8,6 mm

Yellow

## Electrical data

Characteristic impedance:

100 Ohm ± 15 ohm at 1 to 100 MHz

100 Ohm ± 20 ohm at 101 to 1200 MHz

Loop resistance:

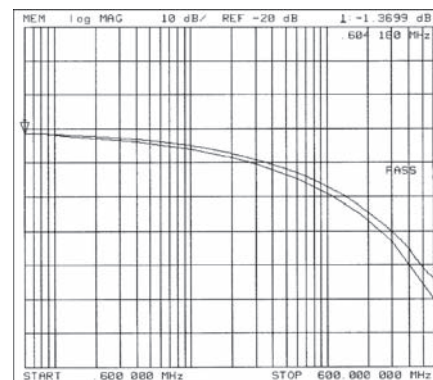
120 Ohm/km max.

Mutual capacitance:

42 nF/km nom.

Rel. propagation velocity:

80 %



## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600	1000	1200	1500
Attenuation (db/100m)	4,2	6,3	12,7	14,4	21,5	27,5	37,7	49,0	54,9	62,0
Next (db)	110,0	110,0	110,0	110,0	110,0	105,0	100,0	92,0	88,0	73,0
ACR (db)	106,0	103,7	97,3	95,6	88,5	77,5	62,3	43,0	33,1	11,0

## Technical data

Weight:

approx. 80 kg/km

bending radius, repeated:

68 mm

Operating temperature range min.:

-20°C

Operating temperature range max.:

+60°C

Caloric load, approx. value:

0,74 MJ/m

Copper weight:

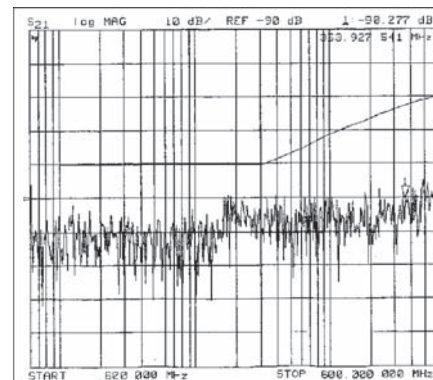
53,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 8 (draft),

Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to

60754-2, Corrosiveness acc. to EN50267-2-3



## Application

HELUKAT® 1500 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as 10Gigabit Ethernet, Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. That means applications such as multimedia (TV, Video, Data, Speech) are no problem for this series. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**802169**, S/FTP 4x2xAWG 22/1 FRNC (S-STP)

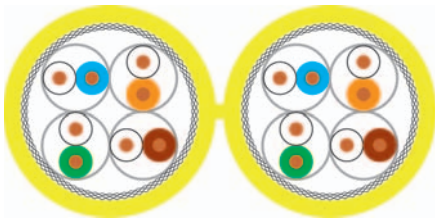
Dimensions and specifications may be changed without prior notice.

# Multimedia Cable

Category 8

**HELUKAT® 1500**

S/FTP duplex



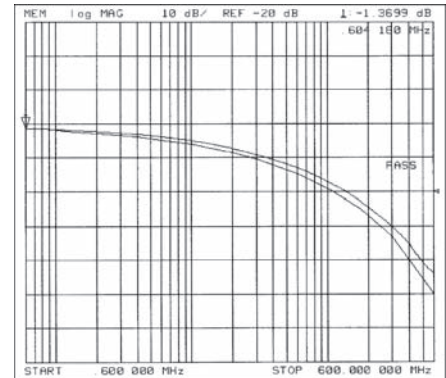
## Cable structure

Inner conductor diameter:	0,64 mm
Conductor material:	Copper, bare
Core insulation:	Foam-skin-PE
Core colours:	wh/bu, wh/og, wh/gn, wh/bn
Shielding 1:	-
Screen over stranding element:	Polyester foil, aluminium-lined
Screen 1 over stranding:	Cu braid
Screen 2 over stranding:	-
Outer sheath material:	FRNC
Cable dimensions:	approx. 8,6 mm x 18,2 mm
Outer sheath colour:	Yellow

## S/FTP 2x(4x2xAWG 22/1) FRNC

## Electrical data

Characteristic impedance:	100 Ohm ± 15 ohm at 1 to 100 MHz 100 Ohm ± 20 ohm at 101 to 1200 MHz
Loop resistance:	120 Ohm/km max.
Mutual capacitance:	42 nF/km nom.
Rel. propagation velocity:	80 %



## Typical values

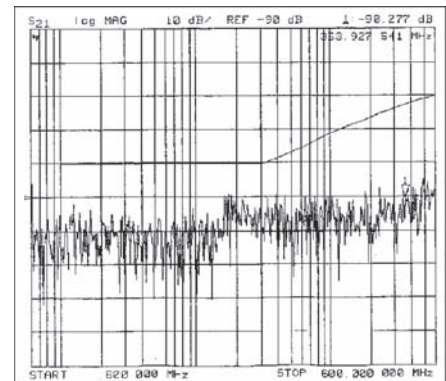
Frequency (MHz)	10	16	62,5	100	200	300	600	1000	1200	1500
Attenuation (db/100m)	4,2	6,3	12,7	14,4	21,5	27,5	37,7	49,0	54,9	62,0
Next (db)	110,0	110,0	110,0	110,0	110,0	105,0	100,0	92,0	88,0	73,0
ACR (db)	106,0	103,7	97,3	95,6	88,5	77,5	62,3	43,0	33,1	11,0

## Technical data

Weight:	approx. 160 kg/km
bending radius, repeated:	68 mm
Operating temperature range min.:	-20°C
Operating temperature range max.:	+60°C
Caloric load, approx. value:	1,50 MJ/m
Copper weight:	106,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 8 (draft), Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3



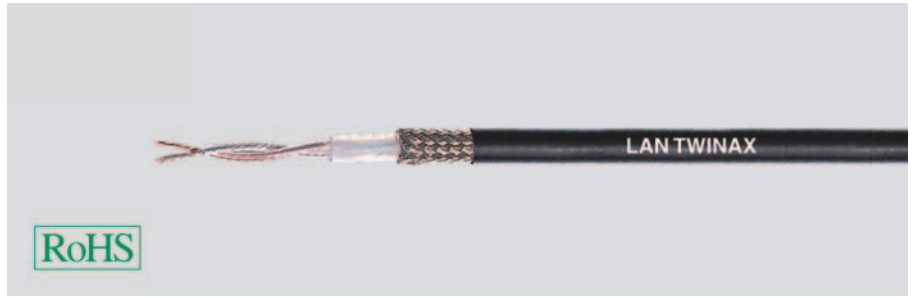
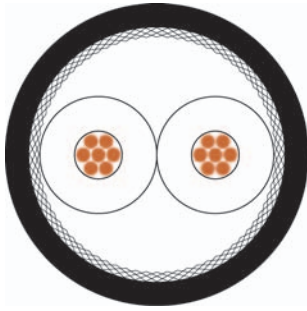
## Application

HELUKAT®1500 data cables are used in the tertiary, but also in the secondary level of a network. They are characterized by large performance reserves and outstanding performance. They can be used to implement services such as 10Gigabit Ethernet, Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. That means applications such as multimedia (TV, Video, Data, Speech) are no problem for this series. Likewise, the mechanical characteristics are perfectly suited for the application in tight cable channels and platforms due to their optimized construction.

## Part no.

**802170**, S/FTP 2x(4x2xAWG 22/1) FRNC (S-STP)

Dimensions and specifications may be changed without prior notice.



## Cable structure

Inner conductor diameter:

Conductor material:

Core insulation:

Core colours:

Screen over stranding element:

Screen over stranding 1:

Screen over stranding 2:

Outer sheath material:

Outer diameter:

Outer sheath colour:

## Twinax indoor or outdoor

1 x AWG 20, Copper, bare + 1 x AWG 20,

Copper, tinned

Copper, bare

PE

Transparent

Solid PE dielectric

-

Cu braid, tinned

PVC / PE

approx. 8,3 mm / approx. 9,3 mm

Black

## Electrical data

Characteristic impedance:

105 Ohm

Mutual capacitance:

53 nF/km nom.

Rel. propagation velocity:

66 %

## Typical values

Frequency	(MHz)	100
Attenuation	(dB/100m)	14,0

## Technical data

Weight: approx. 88 kg/km

bending radius, repeated: 125 mm

Operating temperature range min.: -10°C

Operating temperature range max.: +80°C

Copper weight: 51,00 kg/km

## Application

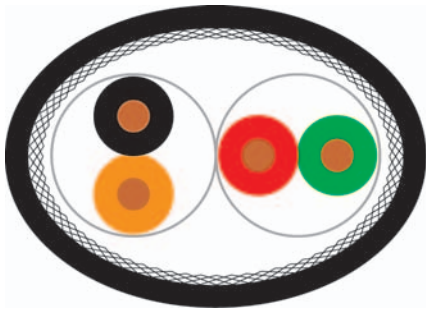
HELUKABEL® TWINAX cables are used in the area of the IBM computer systems S/36, S/38 and AS400. By using a special PE sheath, an outdoor version was developed as well.

## Part no.

**80072**, IBM P/N 7362211 Twinax indoor

**80073**, IBM P/N 7362211 Twinax outdoor

Dimensions and specifications may be changed without prior notice.



## Cable structure

Inner conductor diameter:  
 Conductor material:  
 Core insulation:  
 Number of cores:  
 Core colours:  
 Screen over stranding element:  
  
 Screen over stranding 1:  
 Screen over stranding 2:  
 Outer sheath material:  
 Cable dimensions:  
 Outer sheath colour:

### IBM P/N 33G2772 type 1A

0,64 mm  
 Copper, bare  
 Foam-skin-PE  
 4  
 bk/og, rd/gn  
 Polyester foil,  
 aluminium-lined  
 Cu braid, tinned  
 -  
 PVC  
 approx. 7,6 mm x 11,9 mm  
 Black

### IBM P/N 33G2775 type 6A

0,48 mm  
 Copper, bare  
 Foam-skin-PE  
 4  
 bk/og, rd/gn  
 Polyester foil,  
 aluminium-lined  
 Cu braid, tinned  
 -  
 PVC  
 approx. 7,8 mm  
 Black

### IBM P/N 33G8224 type 1A mini

0,4 mm  
 Copper, bare  
 Foam-skin-PE  
 4  
 bk/og, rd/gn  
 Polyester foil,  
 aluminium-lined  
 Cu braid, tinned  
 -  
 PVC  
 approx. 5,5 mm x 8,9 mm  
 Black

## Electrical data

Characteristic impedance:  
  
 Direct current resistance:  
 Rel. propagation velocity:

150 Ohm  
 ± 15 ohm at 3 to 20 MHz  
 185 Ohm  
 ± 18.5 ohm at 38.4 kHz  
 270 Ohm  
 ± 27 ohm at 9.6 kHz  
 57,1 Ohm/km  
 78 %

150 Ohm  
 ± 15 ohm at 3 to 20 MHz  
 235 Ohm  
 ± 35.25 ohm at 38.4 kHz  
 390 Ohm  
 ± 58.5 ohm at 9.6 kHz  
 151 Ohm/km  
 -

150 Ohm  
 ± 15 ohm at 3 to 20 MHz  
 235 Ohm  
 ± 23.5 ohm at 38.4 kHz  
 390 Ohm  
 ± 39 ohm at 9.6 kHz  
 151 Ohm/km  
 78 %

## Typical values

Frequency (MHz)	20	100	20	100	20	100
Attenuation (dB/100m)	7,4	18,7	4,9	12,3	7,4	18,7
Next (db)	80,0	60,0	50,0	39,0	60,0	49,0

## Technical data

Weight: approx. 85 kg/km  
 bending radius, repeated: 110 mm  
 Operating temperature range min.: -10°C  
 Operating temperature range max.: +70°C  
 Caloric load, approx. value: 1,70 MJ/m  
 Copper weight: 38,00 kg/km

Weight: approx. 70 kg/km  
 bending radius, repeated: 117 mm  
 Operating temperature range min.: -10°C  
 Operating temperature range max.: +70°C  
 Caloric load, approx. value: 0,78 MJ/m  
 Copper weight: 25,00 kg/km

Weight: approx. 60 kg/km  
 bending radius, repeated: 84 mm  
 Operating temperature range min.: -10°C  
 Operating temperature range max.: +70°C  
 Caloric load, approx. value: 0,68 MJ/m  
 Copper weight: 21,00 kg/km

## Application

HELUKABEL® IVS types are used in the area of the IVS system, developed by IBM. They correspond to the wiring guidelines set by IBM.

## Part no.

**80068**, IBM P/N 33G2772 type 1A

**80071**, IBM P/N 33G2775 type 6A

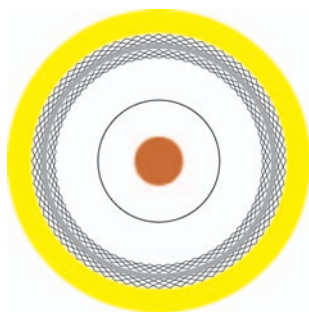
**80070**, IBM P/N 33G8224 type 1A mini

Dimensions and specifications may be changed without prior notice.

# LAN Cable



Cheapernet Cable, Yellow Cable, Transceiver Cable



## Cable structure

Inner conductor diameter:  
 Conductor material:  
 Core insulation:  
 Number of cores:  
 Core colours:  
 Screen over stranding element:

Screen over stranding 1:

Screen over stranding 2:

Outer sheath material:  
 Outer diameter:  
 Outer sheath colour:

## Electrical data

Characteristic impedance:  
 Mutual capacitance:  
 Direct current resistance:  
 Rel. propagation velocity:

## Typical values

Frequency (MHz)	4	10	4	10	4	10
Attenuation (dB/100m)	1,2	1,8	3,3	4,6	4,2	6,0

## Technical data

Weight:	approx. 32 kg/km	approx. 176 kg/km	approx. 142 kg/km
bending radius, repeated:	69 mm	117 mm	159 mm
Operating temperature range min.:	-10°C	-10°C	-10°C
Operating temperature range max.:	+80°C	+70°C	+60°C
Caloric load, approx. value:	0,36 MJ/m	-	-
Copper weight:	21,00 kg/km	128,00 kg/km	95,00 kg/km

## Application

HELUKABEL® ETHERNET types are used as baselines (Yellow + Cheapernet) and cable connections (Transceiver or AUI) within the Ethernet wiring structure.

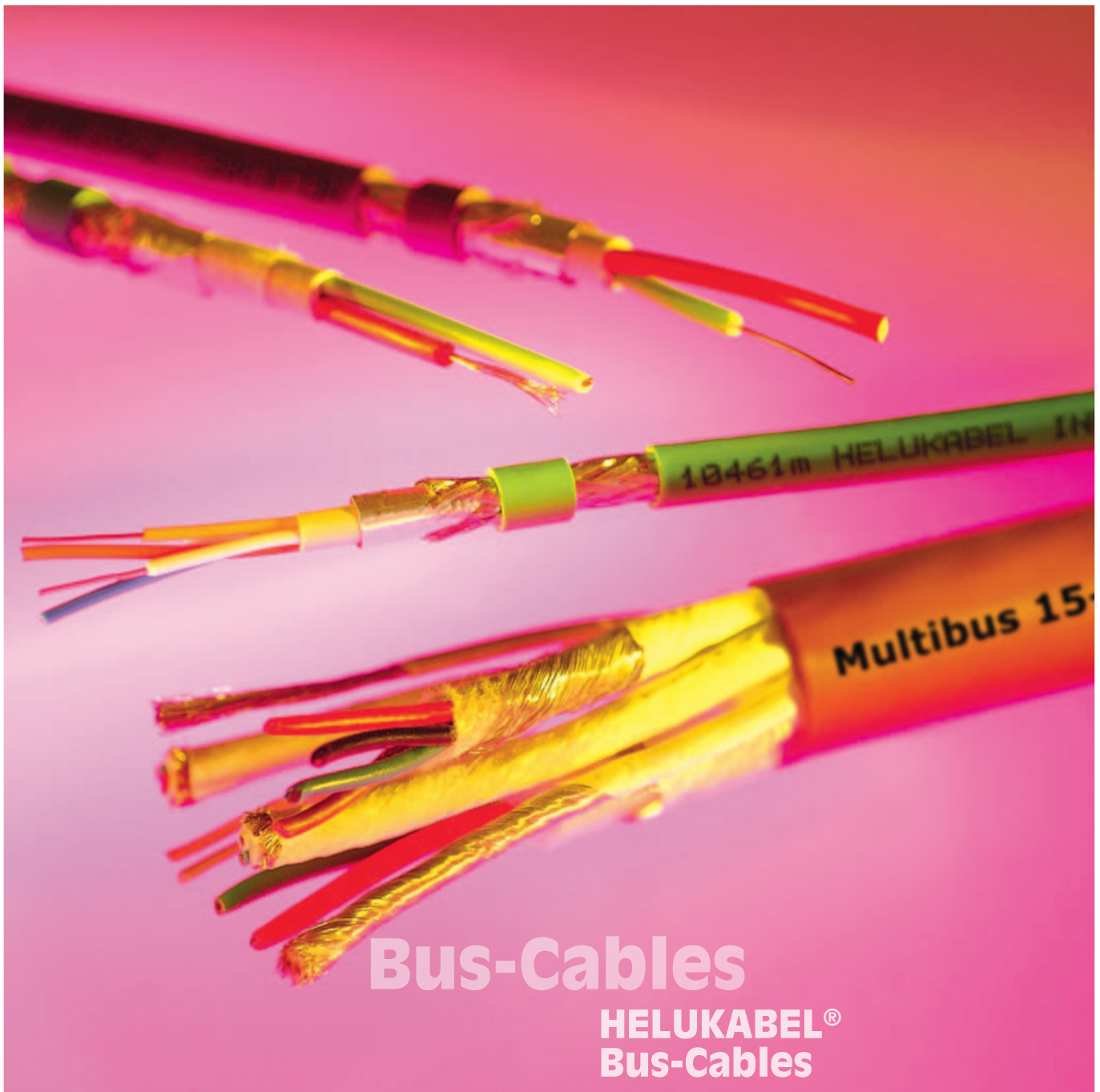
## Part no.

**80044**, Cheapernet cable

**80074**, Yellow cable

**80076**, Transceiver cable

Dimensions and specifications may be changed without prior notice.



# Bus-Cables

**HELUKABEL®  
Bus-Cables**

Photo: HELUKABEL®

Bus technology is being used in an increasing number of industrial applications. This technology can be applied in every branch in industry where process-control techniques are used. The enormous pressures of competitiveness and costs in all areas of process control emphasise the need for even more rationalisation and greater efficiency. The traditional method of parallel wiring for the equipment and machines does not have the flexibility and thus constitutes a major factor in costs and time. The potential for saving

costs from internetworking the machinery by bus systems is very high. So as to keep the amount of cabling low, the information from the master controller is sent over a bus network and is potentially available to all components in the system. Only those components specifically addressed by the information can respond and process these signals. All types of cables and wires used in all common bus systems are available from HELUKABEL®.

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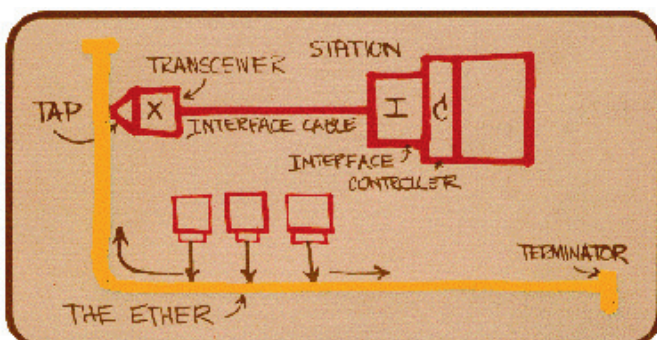
## Ethernet at all business levels

### Standardised communication from the office to production.

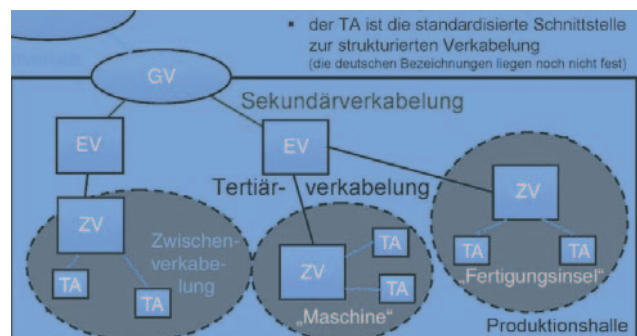
The year 2012 continues standing at the forefront of complete networking of the office and production worlds with Ethernet technology. From an historical perspective, Ethernet as it was developed about 25 years ago by Bob Metcalfe has little in common with INDUSTRIAL ETHERNET of today. The prioritisation of data, combined with the standards for switching, full duplex transfer and the possibility for scaling the bandwidth from 10 Mbit/s up to 10 Gbit/s have been milestones along the way. New technologies such as "Real-time Ethernet RTE", replacement of defective terminal equipment (FDR) without problem or security solutions for production cells. With all these possibilities, a drastic increase in efficiency and simultaneous stabilisation of the automation networks is achieved. A simple migration to faster and more perspective networks will also be possible. Redundancy mechanisms are also increasing the availability in enterprise-wide networks.

As the requirements of all active and passive components in the office and production environments are very different, other product prerequisites must be created here. With new industry-compatible network components based on IP20 or IP67, or suitable for DIN rail mounting and standards such as ISO/IEC 24702 or EN 50173-3, the prerequisites for a completely networked future are being created.

The HELUKAT®, HELUCOM®, HELUKAT CONNECTING SYSTEMS® INDUSTRY and HELUCOM CONNECTING SYSTEMS® INDUSTRY series from HELUKABEL® provide passive and active components which comply with the particular requirements in a harsh industrial environment.



One of the first sketches of an Ethernet system by Bob Metcalfe



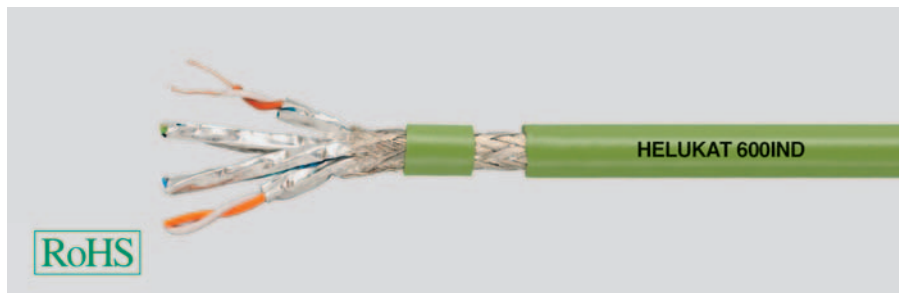
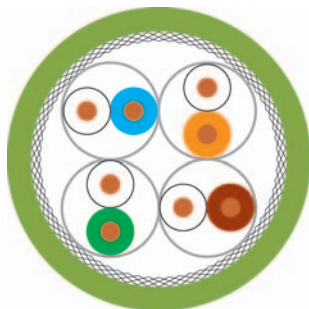
Cabling structure in the production area

# Industrial Ethernet

ROBUST

**HELUKAT® 600IND**

S/FTP, Category 7e



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Industrial Area

### S/FTP 4x2xAWG 23/1 PUR

Copper, bare (AWG 23/1)  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid  
-  
PUR  
approx. 8,2 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance: 100 Ohm  $\pm$  15 ohm at 1 to 100 MHz  
100 Ohm  $\pm$  20 ohm at 101 to 1000 MHz  
Loop resistance: 148 Ohm/km max.  
Mutual capacitance: 43 nF/km nom.  
Relative propagation velocity: 78 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	600	900	1000
Attenuation (dB/100m)	5,6	7,1	13,9	17,5	25,2	32,1	44,9	55,0	58,0
Next (db)	100,0	100,0	96,0	94,0	88,0	84,0	73,0	71,0	69,0
ACR (db)	94,4	92,9	82,1	76,5	62,8	51,9	28,1	16,0	9,0

## Technical data

Weight: approx. 62 kg/km  
bending radius, repeated: 85 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +80°C  
Caloric load, approx. value: 0,74 MJ/m  
Copper weight: 34,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7e, Flame-retardant acc. to IEC 60332-1, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3, Oil-resistant

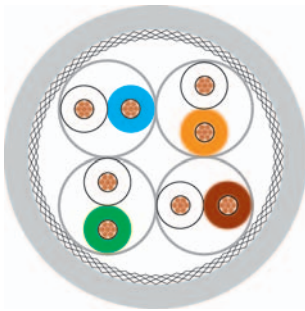
## Application

HELUKAT® 600IND data cables are used for harsh industrial applications. Mechanical characteristics are the steady against mineral oils, fats and cooling lubricants. Also they are microben resistant and hydrolysis resistant. Electrically they are characterized by large performance reserves and outstanding performance. They can be used to implement services such as Gigabit Ethernet, Fast Ethernet, Ethernet, ATM155, FDDI, token ring 4/16 Mbit/s or ISDN absolutely trouble-free. The cables thus exceed the requirements for EN55022 Class B emission and EN55024 immunity. So this serie has a superior electromagnetic compatibility qualification.

## Part no.

**801197**, S/FTP 4x2xAWG 23/1 PUR (S-STP)

Dimensions and specifications may be changed without prior notice.



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Marine and Offshore

#### S/FTP 4x2xAWG 24/7 (stranded) FRNC

Copper, bare (AWG 24/7)  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid  
-  
FRNC  
approx. 9,1 mm ± 0,3 mm  
Grey similar to RAL 7035

### Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 600 MHz  
Loop resistance: 164 Ohm/km max.  
Mutual capacitance: 43 nF/km nom.  
Relative propagation velocity: 72 %

### Typical values

Frequency (MHz)	10	16	62,5	100	200	600
Attenuation (dB/10m)	0,7	0,8	1,6	2,1	3,1	5,2
Next (db)	90,0	90,0	85,0	81,0	76,0	68,0
ACR (db)	89,3	89,2	83,4	78,9	72,9	62,8

### Technical data

Weight: approx. 85 kg/km  
bending radius, repeated: 85 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +75°C  
Caloric load, approx. value: 0,80 MJ/m  
Copper weight: 36,00 kg/km

### Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7, Flame-retardant acc. to IEC 60332-3, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3, Oil-resistant

### Application

This copper data cable, designed specifically for extreme industrial applications, is the ideal solution for Ethernet applications. Superior transmission properties, suitable for use even under the most demanding conditions, certified by **Germanischer Lloyd**, that means suitable for flexible **marine and offshore applications**.

### Part no.

**803382**, S/FTP 4x2xAWG 24/7 stranded FRNC (S-STP)

Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

ROBUSTFLEX

**HELUKAT® 600IND**

S/FTP, Category 7



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Industrial Patch Cables

### S-STP 4x2xAWG 26/7 PUR

Copper, bare (AWG 26/7)  
Foam-skin-PE  
wh/bu, wh/og, wh/gn, wh/bn  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid  
-  
PUR  
approx. 6,4 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance: 100 Ohm  $\pm$  15 ohm at 1 to 100 MHz  
100 Ohm  $\pm$  20 ohm at 101 to 600 MHz  
Loop resistance: 290 Ohm/km max.  
Mutual capacitance: 42 nF/km nom.  
Relative propagation velocity: 64 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200	600
Attenuation (db/10m)	0,8	1,1	2,2	2,8	4,0	7,4
Next (db)	80,0	80,0	75,0	72,0	68,0	61,0
ACR (db)	79,2	78,9	72,8	69,2	64,0	53,6

## Technical data

Weight: approx. 48 kg/km  
bending radius, repeated: 64 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +80°C  
Caloric load, approx. value: 0,45 MJ/m  
Copper weight: 28,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 7, Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3, Oil-resistant, AWM 20963 (80°C/30V)

## Application

HELUKAT®600 industry data cables were designed for high requirements in the industry (industrial ethernet) and other heavy-duty environments. They are characterized by large performance reserves and outstanding performance. Mechanically they are also perfectly suited for rough industrial environments due to their halogen-free PUR outer sheath. These line are manufacturable with common RJ45 plugs (industry and office version), and also with some Sub-D and M12 plugs.

## Part no.

**802184**, S/FTP 4x2xAWG 26/7 PUR (S-STP)

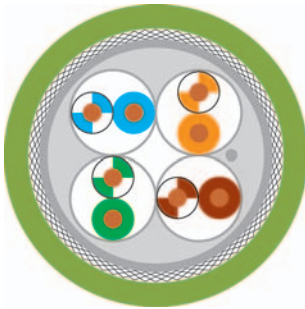
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

10GIG

**HELUKAT®** 500IND

S/FTP, Category 6A



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Industrial Area

### S/FTP 4x2xAWG 22/1

Copper, bare (AWG 22/1)  
Foam-skin-PE  
whbu/bu, whog/og, whgn/gn, whbn/bn  
Double core  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Foil + braid  
yes  
PVC  
approx. 9,6 mm ± 0,3 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm at 101 to 500 MHz  
Conductor resistance, max.: 59 Ohm/km  
Insulation resistance, min.: 0,5 GOhm x km  
Loop resistance: 118 Ohm/km max.  
Mutual capacitance: 72 nF/km nom.  
Test voltage: 0,7 kV  
Relative propagation velocity: 62 %

## Typical values

Frequency	(MHz)	10	16	62,5	100	250	500
Attenuation	(db/100m)	5,9	7,5	15,0	19,1	31,1	45,3
Next	(dB)	60,3	57,2	48,4	45,3	39,3	34,3
PSNext	(dB)	57,3	54,2	45,4	42,3	36,3	31,8

## Technical data

Weight: approx. 115 kg/km  
bending radius, repeated: 80 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 1,69 MJ/m  
Copper weight: 44,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6A, Flame-retardant acc. to IEC 60332-3, CMG FT4

## Application

These specially designed for extreme industrial use copper data cables are ideal for Ethernet applications of **category 6A 10G / 500MHz (IEC 61156-5)**. They guarantee excellent transmission characteristics and smooth operation even under difficult conditions. The line given here is based on the Type A PROFinet. The additional inner casing pipe in the quick contact method is workable. This version with PVC jacket is specially designed for harsh industrial conditions as permanent installations.

## Part no.

**803693**, INDUSTRIAL ETHERNET CAT.6A 10GIG

Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

Drag Chain

**HELUKAT® 250S**

SF/UTP, Category 6



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications

### SF/UTP 4x2x0.15 mm<sup>2</sup> (stranded) PUR

Copper, tinned (AWG 26/19)  
PP  
whbu/bu, whog/og, whgn/gn, whbn/bn  
Double core  
-  
FRNC  
-  
Foil + braid  
PUR  
approx. 7,8 mm ± 0,3 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
100 Ohm ± 20 ohm bei 101 bis 250 MHz  
Conductor resistance, max.: 140 Ohm/km  
Insulation resistance, min.: 0,5 GOhm x km  
Loop resistance: 280 Ohm/km max.  
Mutual capacitance: 52 nF/km nom.  
Test voltage: 0,7 kV  
Relative propagation velocity: 67 %

## Typical values

Frequency (MHz)	10	16	62,5	100	250
Attenuation (db/10m)	0,9	1,2	2,4	2,9	4,9
Next (db)	59,3	56,2	47,4	44,3	38,3
ACR (db)	58,4	55,0	45,0	41,4	33,4

## Technical data

Weight: approx. 63 kg/km  
bending radius, repeated: 60 mm  
Operating temperature range min.: -30°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 1,35 MJ/m  
Copper weight: 34,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 6, Flame-retardant acc. to IEC 60332-1, UL 1581, Sec. 1080 (VW-1) and Sec. 1060 (FT-1)

## Application

This copper data cable, designed specifically for extreme industrial applications, is the ideal solution for Ethernet Category 6 applications. Superior transmission properties, suitable for use even under the most demanding conditions, designed for use in drag chains, fire-proof and oil-resistant according to UL/CSA, the cable can also be used in the USA and Canada.

## Part no.

**803387**, INDUSTRIAL ETHERNET CAT.6

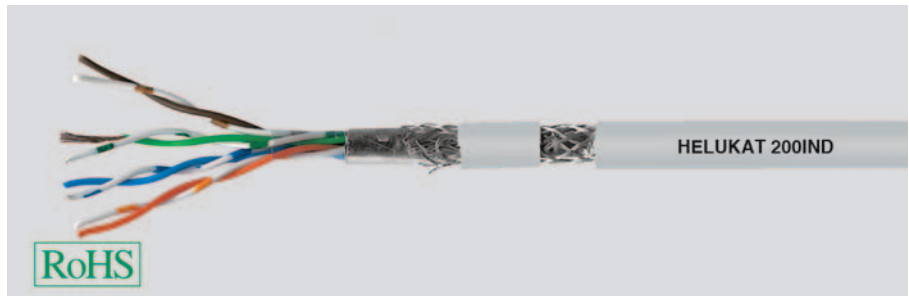
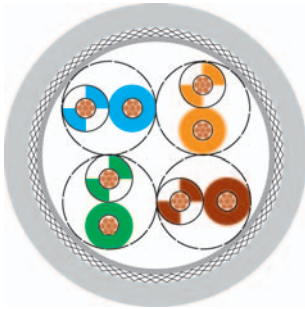
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

ROBUSTFLEX

**HELUKAT® 200IND**

SF/UTP, Category 5e



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Industrial Patch Cables

### SF/UTP 4x2xAWG 26/7 PUR

Copper, bare (AWG 26/7)  
PO  
whbu/bu, whog/og, whgn/gn, whbn/bn  
Double core  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
Cu braid  
PUR  
approx. 5,7 mm  
Grey similar to RAL 7035

## Electrical data

Characteristic impedance:

100 Ohm  $\pm$  15 ohm at 1 to 100 MHz  
100 Ohm  $\pm$  20 ohm at 101 to 200 MHz

Loop resistance:

260 Ohm/km max.

Mutual capacitance:

47 nF/km nom.

Relative propagation velocity:

74 %

## Typical values

Frequency (MHz)	10	16	62,5	100	200
Attenuation (dB/10m)	0,8	1,1	2,4	2,9	4,3
Next (db)	58,0	56,0	45,0	43,0	37,0
ACR (db)	57,2	54,9	42,6	40,1	32,7

## Technical data

Weight: approx. 44 kg/km  
bending radius, repeated: 46 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +80°C  
Caloric load, approx. value: 0,54 MJ/m  
Copper weight: 24,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e, Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Oil-resistant

## Application

HELUKAT®200 industry data cables were designed for high requirements in the industry (industrial ethernet) and other heavy-duty environments. They are characterized by large performance reserves and outstanding performance. Mechanically they are also perfectly suited for rough industrial environments due to their halogen-free PUR outer sheath. These lines are manufacturable with all common RJ45 plugs (industry and office version), and also with some Sub-D and M12 plugs.

## Part no.

**800068**, SF/UTP 4x2xAWG 26/7 PUR (S-FTP)

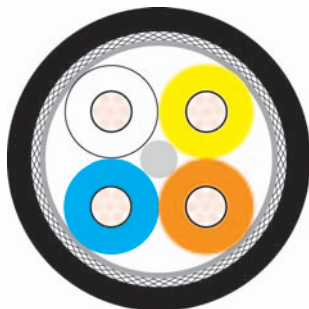
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

WK Industrial 105°C

**HELUKAT®** 100IND

SF/UTP, Category 5e



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Windenergy

### SF/UTP 2x2x0,75 mm (stranded)

Copper, tinned (AWG 22/7)  
XLPE ray cross-linking  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
X-FRNC  
approx. 6,5 mm ± 0,2 mm  
Black similar to RAL 9005

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
Conductor resistance, max.: 60 Ohm/km  
Insulation resistance, min.: 0,5 GOhm x km  
Loop resistance: 120 Ohm/km max.  
Mutual capacitance: 52 nF/km nom.  
Test voltage: 2 kV  
Relative propagation velocity: 69 %

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/100m)	6,3	8,0	16,5	21,3
Next (db)	70,0	65,0	55,0	50,0
ACR (db)	63,7	57,0	38,5	28,7

## Technical data

Weight: approx. 64 kg/km  
bending radius, repeated: 46 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +105°C \*  
Caloric load, approx. value: 0,89 MJ/m  
Copper weight: 34,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Category 5e, Flame-retardant acc. to IEC 60332-3, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3, UL-Syle 21281 80°C/300V

## Application

This copper data cable, designed specifically for extreme industrial applications, is the ideal solution for Ethernet applications. It guarantees superior transmission properties. Cable with oil-resistant FRNC sheath and increased temperature resistance for use in the wind turbine and similar sectors. Certified to UL, the cable can also be used in the USA.

\* = with limited service life

## Part no.

**802293**, INDUSTRIAL ETHERNET CAT.5e

Dimensions and specifications may be changed without prior notice.

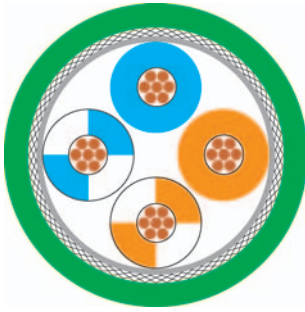


# Industrial Ethernet

DRAG CHAIN ECO

**HELUKAT® 100S**

SF/UTP 4 core, Category 5e



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications

### SF/UTP 4x1x0.15 mm<sup>2</sup> (stranded)

Copper, bare (AWG 26/19)  
PP  
whbl, bl, whor, or  
Star quad  
-  
PETP fleece  
Foil + braid  
PUR  
approx. 4,8 mm ± 0,3 mm  
Green

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
Insulation resistance, min.: 0,15 GOhm x km  
Loop resistance: 250 Ohm/km max.  
Mutual capacitance: 51 nF/km nom.  
Test voltage: 0,7 kV  
Relative propagation velocity: 60 %

## Typical values

Frequency (MHz)	10	16	62,5	100	155
Attenuation (db/100m)	9,9	12,3	25,6	33,0	41,0
Next (db)	47,0	44,0	35,0	32,0	30,0

## Technical data

Weight: approx. 30 kg/km  
bending radius, repeated: 72 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +80°C  
Caloric load, approx. value: 0,37 MJ/m  
Copper weight: 17,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e, Flame-retardant acc. to IEC 60332-1, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3, AWM 20963 (80°C/30V)

## Application

This copper data cable, designed especially for heavy-duty industrial applications (Industrial Ethernet), is very well suited for manufacturing of RJ45 and 15 or 9-Pin Sub-D plugs. With its PUR sheath, it is also suitable for the application in drag chains.

## Part no.

**82838**, INDUSTRIAL ETHERNET CAT.5e

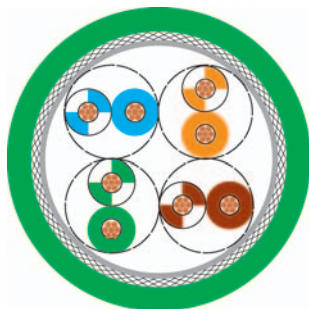
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

Drag chain ECO

**HELUKAT® 100S**

SF/UTP 4-pair, Category 5e



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications

### SF/UTP 4x2x0.15 mm<sup>2</sup> (stranded)

Copper, bare (AWG 26/19)  
PP  
whbu/bu, whog/og, whgn/gn, whbn/bn  
Double core  
-  
PETP fleece  
Foil + braid  
PUR  
approx. 6,6 mm ± 0,2 mm  
Green

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
Insulation resistance, min.: 0,15 GOhm x km  
Loop resistance: 250 Ohm/km max.  
Mutual capacitance: 48 nF/km nom.  
Test voltage: 0,7 kV  
Relative propagation velocity: 74 %

## Typical values

Frequency (MHz)	10	16	62,5	100	155
Attenuation (db/100m)	9,9	12,3	25,6	33,0	41,0
Next (db)	47,0	44,0	35,0	32,0	30,0

## Technical data

Weight: approx. 56 kg/km  
bending radius, repeated: 102 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +80°C  
Caloric load, approx. value: 0,64 MJ/m  
Copper weight: 31,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5e, Flame-retardant acc. to IEC 60332-1, Halogen-free acc. to 60754-2, Corrosiveness acc. to EN50267-2-3, AWM 20963 (80°C/30V)

## Application

This copper data cable, designed especially for heavy-duty industrial applications (Industrial Ethernet), is very well suited for manufacturing of RJ45 and 15 or 9-Pin Sub-D plugs. With its PUR sheath, it is also suitable for the application in drag chains.

## Part no.

**82839**, INDUSTRIAL ETHERNET CAT.5e

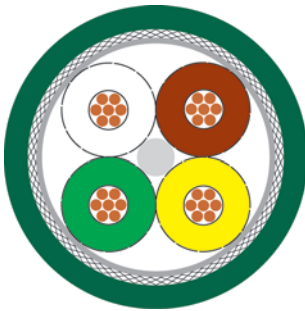
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

DRAG CHAIN

**HELUKAT® 200S**

SF/UTP 4 core, Category 5



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag Chain Patch Cables

### SF/UTP 4x1xAWG 24/19 (stranded) PUR

Copper, bare (AWG 24/19)  
PP  
wh/bn, gn/ye  
Quad  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
Cu braid  
PUR  
approx. 6,2 mm ± 0,2 mm  
Green similar to RAL 6026

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
Loop resistance: 156 Ohm/km max.  
Mutual capacitance: 51 nF/km nom.  
Relative propagation velocity: 67 %

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/10m)	1,0	1,2	2,6	3,3
Next (db)	47,0	44,0	35,0	32,0
ACR (db)	46,0	42,8	32,4	28,7

## Technical data

Weight: approx. 54 kg/km  
bending radius, repeated: 80 mm  
Operating temperature range min.: -25°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 0,944 MJ/m  
Copper weight: 30,00 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5, Flame-retardant acc. to IEC 60332-1, Halogen-free acc. to 60754-2, Oil-resistant

## Application

HELUKAT®200T industry data cables were designed for the most extreme requirements in the industry (industrial ethernet) and other heavy-duty environments. They are characterized by large performance reserves and outstanding performance, even under the most extreme conditions. In addition, the thought-out mechanical construction even ensures applications in drag chains with high packing density. These lines are manufacturable with conventional Sub-D plugs or with various RJ45 plugs.

## Part no.

**800088**, SF/UTP 4x1xAWG 24/19 PUR (S-FTP)

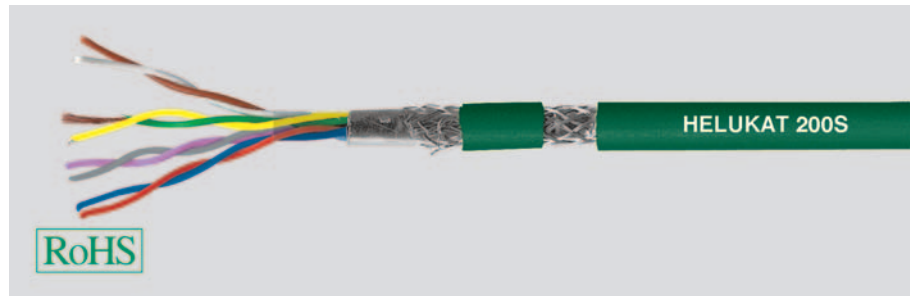
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

DRAG CHAIN

**HELUKAT® 200S**

SF/UTP 4 pair, Category 5



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Drag Chain Patch Cables

#### SF/UTP 4x2xAWG 24/19 PUR (stranded)

Copper, bare (AWG 24/19)  
PE  
wh/bn, gn/ye, gy/pk, bu/rd  
Double core  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
Cu braid  
PUR  
approx. 9,5 mm ± 0,2 mm  
Green similar to RAL 6026

### Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
Loop resistance: 156 Ohm/km max.  
Mutual capacitance: 51 nF/km nom.  
Relative propagation velocity: 67 %

### Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/10m)	1,0	1,2	2,6	3,3
Next (db)	47,0	44,0	35,0	32,0
ACR (db)	46,0	42,8	32,4	28,7

### Technical data

Weight: approx. 110 kg/km  
bending radius, repeated: 115 mm  
Operating temperature range min.: -25°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 2,08 MJ/m  
Copper weight: 54,30 kg/km

### Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5, Flame-retardant acc. to IEC 60332-1, Halogen-free acc. to 60754-2, Oil-resistant

### Application

HELUKAT®200T industry data cables were designed for the most extreme requirements in the industry (industrial ethernet) and other heavy-duty environments. They are characterized by large performance reserves and outstanding performance, even under the most extreme conditions. In addition, the thought-out mechanical construction even ensures applications in drag chains with high packing density. These lines are manufacturable with conventional Sub-D plugs or with various RJ45 plugs.

### Part no.

**81155**, SF/UTP 4x2xAWG 24/19 PUR (S-FTP)

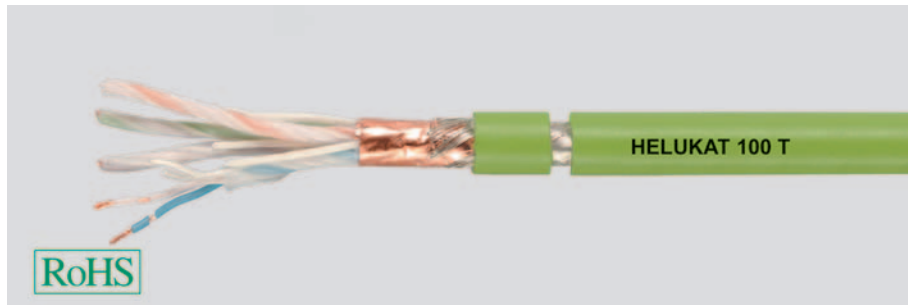
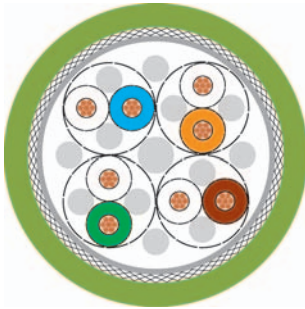
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

TORDIERFLEX

**HELUKAT® 100T**

SF/UTP, Category 5



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Screen 1 over stranding:  
Screen 2 over stranding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Torsion Patch Cables

### SF/UTP 4x2xAWG 26/19 PUR (stranded)

Copper, bare (AWG 26/19)  
PP  
wh/bu, wh/og, wh/gn, wh/bn  
Double core  
Polyester foil over stranded bundle  
-  
Polyester foil copper, bare  
Cu braid  
PUR  
approx. 7,5 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance: 100 Ohm  $\pm$  15 ohm at 1 to 100 MHz  
Loop resistance: 260 Ohm/km max.  
Mutual capacitance: 50 nF/km nom.  
Relative propagation velocity: 68 %

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/10m)	1,3	1,6	3,2	4,0
Next (db)	47,0	44,0	35,0	32,0
ACR (db)	45,7	42,4	31,8	28,0

## Technical data

Weight: approx. 63 kg/km  
bending radius, repeated: 80 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +80°C  
Caloric load, approx. value: 1,234 MJ/m  
Copper weight: 29,50 kg/km

## Norms

Acc. to ISO/IEC 11801, Acc. to EN 50173, Acc. to EIA/TIA 568-A, Category 5, Flame-retardant acc. to IEC 60332-1, Smoke density acc. to IEC 61034, Halogen-free acc. to 60754-2, Oil-resistant, AWM 20963 (80°C/30V)

## Application

HELUKAT®100T TORDIERFLEX data cables were designed for the most extreme requirements in the industry and other heavy-duty environments in torsion applications. They are characterized by large performance reserves and outstanding performance, even under extreme conditions. Long mechanical service life is also ensured due to a thought-out design. These lines are manufacturable with conventional Sub-D plugs or with various RJ45 plugs.

## Part no.

**800067**, SF/UTP 4x2xAWG 26/19 PUR (S-FTP)

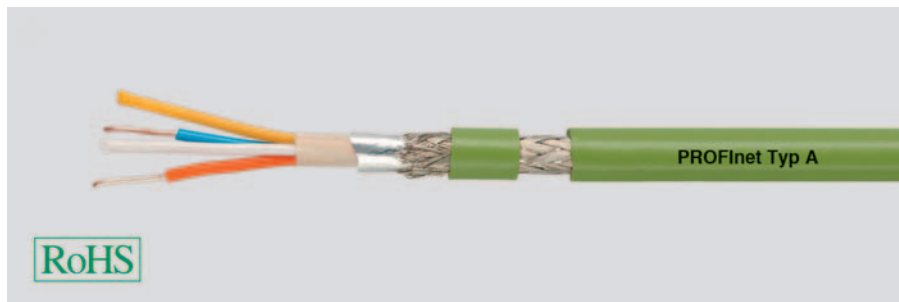
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

## PROFINet Type A

**HELUKAT®**

fixed installed + robust



### Type Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Fixed installation, indoor 2x2x0.64 mm

Copper, bare (AWG 22/1)  
PE  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 6,5 mm ± 0,2 mm  
Green similar to RAL 6018

### Industrial Area 2x2x0.64 mm

Copper, bare (AWG 22/1)  
PE  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 6,5 mm ± 0,2 mm  
Green similar to RAL 6018

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

100 Ohm ± 15 ohm at 1 to 100 MHz  
62 Ohm/km  
0,5 GOhm x km  
124 Ohm/km max.  
50 nF/km nom.  
2 kV

100 Ohm ± 15 ohm at 1 to 100 MHz  
62 Ohm/km  
0,5 GOhm x km  
124 Ohm/km max.  
50 nF/km nom.  
2 kV

### Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/100m)	5,2	6,9	15,0	19,5
Next (db)	70,0	65,0	55,0	50,0
ACR (db)	64,8	58,1	40,0	30,5

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 67 kg/km  
100 mm  
-40°C  
+80°C  
0,34 MJ/m  
32,00 kg/km

approx. 64 kg/km  
100 mm  
-40°C  
+70°C  
0,91 MJ/m  
32,00 kg/km

### Norms

Applicable standards:

PROFINet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e  
Flame-retardant acc. to IEC 60332-1

PROFINet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e  
Halogen-free acc. to 60754-2  
Flame-retardant acc. to IEC 60332-1

UL Style:

CSA standard:

CMG 75°C PLTC FT4  
CSA FT 4

-

-

### Application

These copper data cables, designed especially for heavy-duty industrial applications, are very well suited for Ethernet applications. They ensure superior transmission properties and can be used even under most severe conditions. The line specified here correspond to the PROFINet type A it is designed for normal (PVC) and robust (PUR) fixed installation applications.

### Part no.

**800653**, PROFINet type A (SK)

**801194**, PROFINet type A (SK)

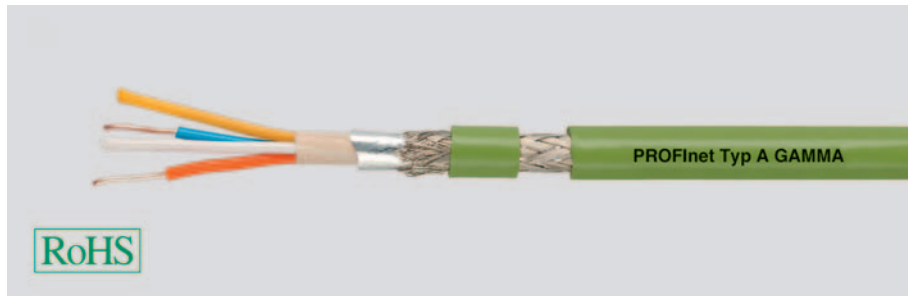
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

PROFINet Type A

**HELUKAT**<sup>®</sup>

radiation resistant + armoured



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Armouring:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### ray loaded areas

#### 2x2x0.64 mm

Copper, bare (AWG 22/1)  
XLPE ray cross-linking  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
TPR ray cross-linking  
Polyester foil, aluminium-lined  
Cu braid, tinned  
-  
PUR  
approx. 6,5 mm ± 0,2 mm  
Green similar to RAL 6018

### Fixed installation, outdoor

#### 2x2x0.64 mm

Copper, bare (AWG 22/1)  
PE  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
Steel rib  
PE  
approx. 9,3 mm ± 0,5 mm  
Black

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

100 Ohm ± 15 ohm at 1 to 100 MHz  
62 Ohm/km  
0,5 GOhm x km  
124 Ohm/km max.  
50 nF/km nom.  
2 kV

100 Ohm ± 15 ohm at 1 to 100 MHz  
62 Ohm/km  
0,5 GOhm x km  
124 Ohm/km max.  
50 nF/km nom.  
2 kV

### Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/100m)	5,2	6,9	15,0	19,5
Next (db)	70,0	65,0	55,0	50,0
ACR (db)	64,8	58,1	40,0	30,5

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 63 kg/km  
100 mm  
-40°C  
+80°C  
0,29 MJ/m  
32,00 kg/km

approx. 124 kg/km  
120 mm  
-40°C  
+70°C  
2,14 MJ/m  
31,00 kg/km

### Norms

Applicable standards:

PROFINet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e

PROFINet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e

### Application

These copper data cables, designed especially for heavy-duty industrial applications are very well suited for Ethernet applications. They ensure superior transmission properties and can be used even under most severe conditions. The line specified here correspond to the PROFINet type A and because of the special construction with cross-linked inner-jacket and PUR outer-jacket it is suitable for fixed installation applications inside radiated areas and with the PVC inner-jacket/PE outer-jacket it is suitable for areas with rodent problems.

### Part no.

**801195**, PROFINet type A (SK)

**801650**, PROFINet type A (SK)

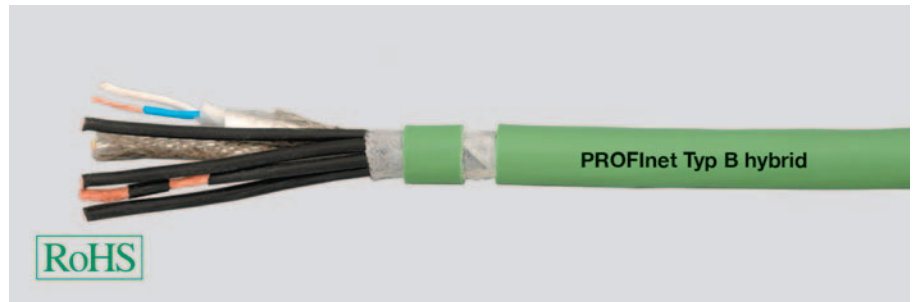
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

## PROFInet Type B

**HELUKAT**<sup>®</sup>

hybrid



### Type

#### Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Mobile use

#### 2x2x0,75 mm (stranded)+ 4x1,5qmm

Copper, bare (AWG 22/7)  
Copper, bare (AWG 16/84)  
Foam-skin-PE  
Foam-skin-PE  
wh, ye, bu, og  
Black  
Double core  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Polyester foil  
FRNC  
approx. 10,3 mm ± 0,3 mm  
Green similar to RAL 6018

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

100 Ohm ± 15 ohm at 1 to 100 MHz  
60 Ohm/km  
0,5 GOhm x km  
120 Ohm/km max.  
52 nF/km nom.  
2 kV

### Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/100m)	6,3	8,0	16,5	21,3
Next (db)	50,0	47,0	38,0	35,0
ACR (db)	43,7	39,0	21,5	13,7

### Technical data

Weight: approx. 153 kg/km  
bending radius, repeated: 103 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 1,50 MJ/m  
Copper weight: 94,00 kg/km

### Norms

Applicable standards: PROFInet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e  
Halogen-free acc. to 60754-2  
Flame-retardant acc. to IEC 60332-1  
Corrosiveness acc. to EN50267-2-3  
Low-smoke acc. to EN50268-2  
UL Style: UL Style 21282

### Application

This copper data cable, designed especially for heavy-duty industrial applications is very well suited for Ethernet applications. It ensures superior transmission properties and can be used even under most severe conditions. The line specified here corresponds to the PROFInet type, i.e. it is designed for flexible applications with integrated energo cores.

### Part no.

**801651**, PROFInet type B (SK)

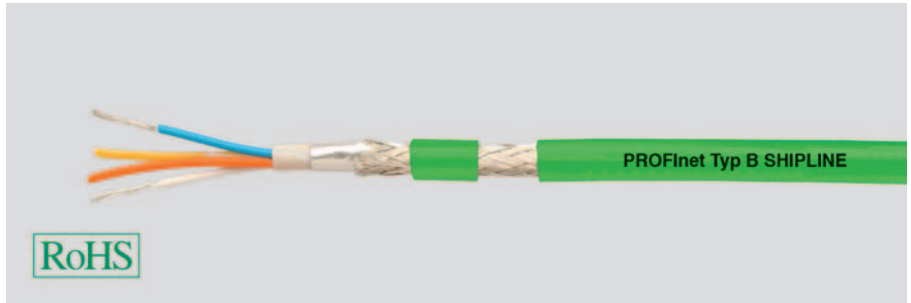
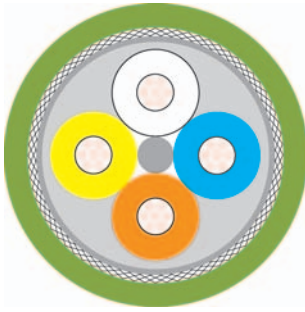
Dimensions and specifications may be changed without prior notice.



# Industrial Ethernet

PROFInet Typ B

**HELUKAT**<sup>®</sup>  
SHIPLINE + FESTOON



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Marine and Offshore 2x2x0,75 mm (stranded)

Copper, tinned (AWG 22/7)  
PP  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
FRNC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
FRNC  
approx. 6,5 mm ± 0,4 mm  
Green similar to RAL 6018

### FESTOON 2x2x0.75 mm (stranded)

Copper, tinned (AWG 22/7)  
PE  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 6,5 mm ± 0,2 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

100 Ohm ± 15 ohm at 1 to 100 MHz  
60 Ohm/km  
0,5 GOhm x km  
120 Ohm/km max.  
52 nF/km nom.  
2 kV

100 Ohm ± 5 %  
60 Ohm/km  
0,5 GOhm x km  
120 Ohm/km max.  
52 nF/km nom.  
0,7 kV

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/100m)	6,0	7,6	16,0	21,0
Next (db)	70,0	65,0	55,0	50,0
ACR (db)	64,0	57,4	39,0	29,0

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 68 kg/km  
50 mm  
-40°C  
+70°C  
0,45 MJ/m  
32,00 kg/km

approx. 68 kg/km  
70 mm  
-10°C  
+80°C  
1,20 MJ/m  
32,00 kg/km

## Norms

Applicable standards:

PROFInet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e  
Halogen-free acc. to 60754-2  
Flame-retardant acc. to IEC 60332-3  
Corrosiveness acc. to EN50267-2-3  
Low-smoke acc. to EN50268-2  
CMG 75°C PLTC FT4  
CSA FT 4

PROFInet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e  
Flame-retardant acc. to IEC 60332-3

UL Style:  
CSA standard:

CMG 75°C or PLTC or AWM 21694 600V  
CSA FT 4

## Application

This copper data cable, designed especially for heavy-duty industrial applications is very well suited for Ethernet applications. It ensures superior transmission properties and can be used even under most severe conditions. The lines specified here corresponds the PROFInet type B and are certified by the **Germanische Lloyd** (SHIPLINE), i.e. designed for **flexible marine and offshore** applications and **Festoon** applications.

## Part no.

**802185**, PROFInet type B (SK)

**803295**, PROFInet type B (SK)

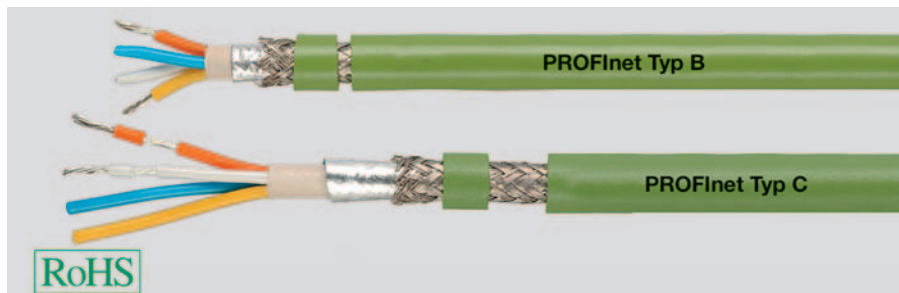
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

PROFINet Type B + C

**HELUKAT**<sup>®</sup>

flexible + high flexible



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Mobile use

#### 2x2x0,75 mm (stranded)

Copper, tinned (AWG 22/7)  
PE  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 6,5 mm ± 0,2 mm  
Green similar to RAL 6018

### Drag chain applications

#### 2x2x0.75 mm (stranded)

Copper, tinned (AWG 22/7)  
PE  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
FRNC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 6,5 mm ± 0,2 mm  
Green similar to RAL 6018

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

100 Ohm ± 15 ohm at 1 to 100 MHz  
62 Ohm/km  
0,5 GOhm x km  
124 Ohm/km max.  
52 nF/km nom.  
2 kV

100 Ohm ± 15 ohm at 1 to 100 MHz  
60 Ohm/km  
0,5 GOhm x km  
120 Ohm/km max.  
52 nF/km nom.  
0,7 kV

### Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (dB/100m)	6,0	7,6	16,0	21,0
Next (db)	70,0	65,0	55,0	50,0
ACR (db)	64,0	57,4	39,0	29,0

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 67 kg/km  
100 mm  
-40°C  
+70°C  
0,32 MJ/m  
32,00 kg/km

approx. 61 kg/km  
60 mm  
-40°C  
+70°C  
0,85 MJ/m  
32,00 kg/km

### Norms

Applicable standards:

PROFINet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e  
Flame-retardant acc. to IEC 60332-1

PROFINet Guideline  
Acc. to ISO/IEC 11801  
Acc. to EN 50173  
Category 5e  
Halogen-free acc. to 60754-2  
Flame-retardant acc. to IEC 60332-1  
CMX 75°C (shielded)  
-

UL Style:

CSA standard:

CMG 60°C or PLTC or AWM 20201  
CSA FT 4

### Application

This copper data cable, designed especially for heavy-duty industrial applications is very well suited for Ethernet applications. It ensures superior transmission properties and can be used even under most severe conditions. The lines specified here corresponds the PROFINet types B and C, i.e. they are designed for flexible and highly flexible applications, such as drag chains.

### Part no.

**800654**, PROFINet type B (SK)

**800655**, PROFINet type C (SK)

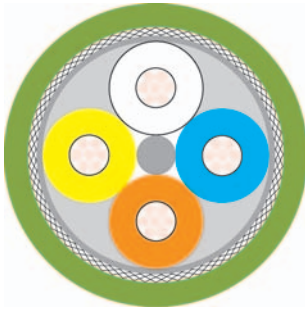
Dimensions and specifications may be changed without prior notice.

# Industrial Ethernet

PROFINet Type C

**HELUKAT**<sup>®</sup>

Torsion



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Torsional applications

### 2x2x0,75 mm (stranded)

Copper, tinned (AWG 22/19)  
Foam-skin-PE  
wh, ye, bu, og  
Star quad  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 6,5 mm ± 0,2 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
Conductor resistance, max.: 60 Ohm/km  
Insulation resistance, min.: 0,5 GOhm x km  
Loop resistance: 120 Ohm/km max.  
Mutual capacitance: 52 nF/km nom.  
Test voltage: 0,7 kV

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (db/100m)	7,6	10,0	26,5	41,0
ELFEXT (db)	43,8	39,7	24,0	20,0

## Technical data

Weight: approx. 54 kg/km  
bending radius, repeated: 70 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +80°C  
Caloric load, approx. value: 0,45 MJ/m  
Copper weight: 32,00 kg/km

## Norms

Applicable standards: PROFINet Guideline  
Category 5e  
Halogen-free acc. to 60754-2  
Flame-retardant acc. to IEC 60332-1  
Corrosiveness acc. to EN50267-2-3  
Low-smoke acc. to EN50268-2  
UL Style: AWM Style 21161 80°C

## Application

This copper data cable, designed especially for heavy-duty industrial applications is very well suited for Ethernet applications. It ensures superior transmission properties and can be used even under most severe conditions. The lines specified here corresponds the PROFINet types C, i.e. they are designed for torsion applications, such as roboter arms.

## Part no.

**802186**, PROFINet type C (SK)

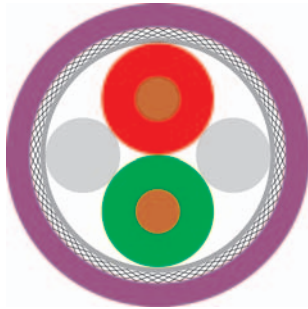
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## Profibus L2



Indoor



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

#### Fixed installation, indoor 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 7,8 mm ± 0,2 mm  
Grey similar to RAL 7001

#### Fixed installation, indoor 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 7,8 mm ± 0,2 mm  
Violet similar to RAL 4001

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
110 Ohm/km max.  
30 nF/km nom.  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
110 Ohm/km max.  
30 nF/km nom.  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 69 kg/km  
120 mm  
-40°C  
+70°C  
0,99 MJ/m  
24,00 kg/km

approx. 69 kg/km  
120 mm  
-40°C  
+70°C  
0,99 MJ/m  
24,00 kg/km

### Norms

Applicable standards:  
UL Style:  
CSA standard:

Profibus acc. to DIN 19245 T3 and EN50170  
CMX 75°C (shielded)  
CSA FT1

Profibus acc. to DIN 19245 T3 and EN50170  
CMX 75°C (shielded)  
CSA FT1

### Application

This system cable is used to interconnect L2-BUS components. This cable is an economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The types mentioned here are suitable for indoor laying and are equipped with a special PVC sheath.

### Part no.

**80384**, Profibus L2

**81448**, Profibus L2

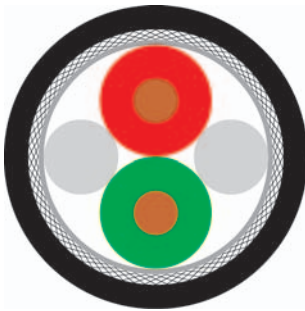
Dimensions and specifications may be changed without prior notice.

# BUS Cables

PROFIBUS L2 Outdoor + Industry



Outdoor + Industry



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Fixed installation, outdoor

#### 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PE  
approx. 8,0 mm ± 0,4 mm  
Black similar to RAL 9005

### Industrial Area

#### 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 8,0 mm ± 0,4 mm  
Petrol similar to RAL 5018

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
110 Ohm/km max.  
30 nF/km nom.  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
110 Ohm/km max.  
30 nF/km nom.  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 64 kg/km  
120 mm  
-40°C  
+70°C  
2,26 MJ/m  
24,00 kg/km

approx. 67 kg/km  
120 mm  
-40°C  
+70°C  
1,52 MJ/m  
24,00 kg/km

### Norms

Applicable standards:

Profibus acc. to DIN 19245 T3 and EN50170

Profibus acc. to DIN 19245 T3 and EN50170

### Application

This system cable is used to interconnect L2-BUS components. This cable is an economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The types mentioned here are suitable for outdoor laying (PE sheath) and industry laying (PUR sheath).

### Part no.

**80792**, Profibus L2

**81186**, Profibus L2

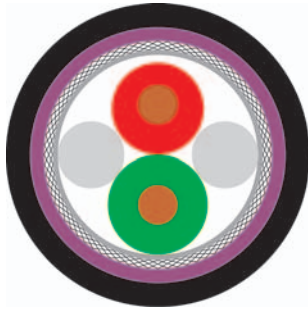
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## Profibus L2 Direct Burial



without + with Armouring



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Armouring:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

#### Direct burial 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
-  
PE  
approx. 10,0 mm ± 0,2 mm  
Black similar to RAL 9005

#### Direct burial 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Cell PE  
rd, gn  
2 cores + 2 fillers stranded together  
-  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
Steel band  
PE  
approx. 10,6 mm ± 0,5 mm  
Black similar to RAL 9005

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:  
Attenuation:

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
114 Ohm/km max.  
30 nF/km nom.  
-  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
3 MHz < 22,0 dB/km  
20 MHz < 42,0 dB/km

150 Ohm ± 10 %  
55 Ohm/km  
5 GOhm x km  
110 Ohm/km max.  
30 nF/km nom.  
250 V  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 92 kg/km  
180 mm  
-40°C  
+70°C  
2,657 MJ/m  
24,00 kg/km

approx. 132 kg/km  
190 mm  
-40°C  
+70°C  
2,40 MJ/m  
24,00 kg/km

### Norms

Applicable standards:

Profibus acc. to DIN 19245 T3 and EN50170

Profibus acc. to DIN 19245 T3 and EN50170

### Application

This system cable is used to interconnect L2-BUS components. This cable is an economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The above mentioned types are suitable for underground installation and are equipped with a special PVC/PE sheath or a steel armouring.

### Part no.

**82824**, Profibus ERD

**802177**, Profibus L2

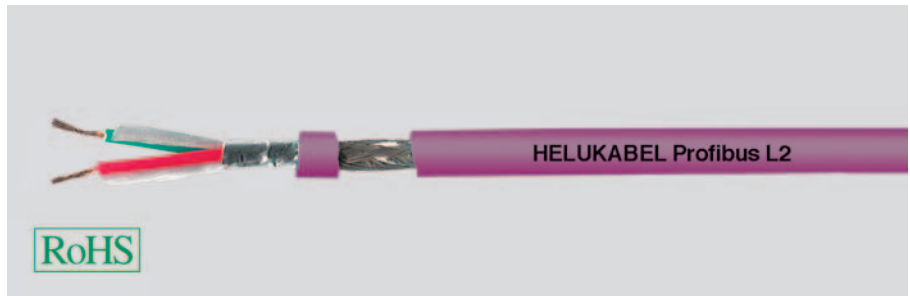
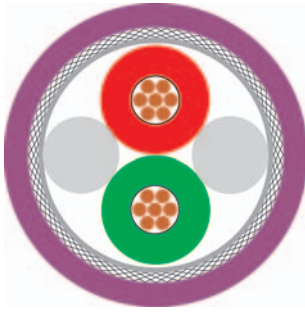
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## Profibus L2



7-wire



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Mobile use

#### 1x2x0.64 mm (stranded)

Copper, bare (AWG 24/7)  
Foam-skin-PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 7,8 mm ± 0,2 mm  
Violet similar to RAL 4001

### Electrical data

Characteristic impedance: 150 Ohm ± 10 %  
Conductor resistance, max.: 86,7 Ohm/km  
Insulation resistance, min.: 1 GOhm x km  
Loop resistance: 110 Ohm/km max.  
Mutual capacitance: 30 nF/km nom.  
Test voltage: 1,5 kV  
Attenuation:  
9,6 kHz < 3,0 dB/km  
38,4 kHz < 5,0 dB/km  
4 MHz < 26,0 dB/km  
16 MHz < 55,0 dB/km

### Technical data

Weight: approx. 75 kg/km  
bending radius, repeated: 120 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 1,20 MJ/m  
Copper weight: 24,00 kg/km

### Norms

Applicable standards: Profibus acc. to DIN 19245 T3 and EN50170  
UL Style: UL Style 2571

### Application

This system cable is used to interconnect L2-BUS components. This cable is an economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. With his cord design, the type mentioned here is suitable for laying in regular mobile applications and is equipped with a special PVC sheath.

### Part no.

**800648**, Profibus L2

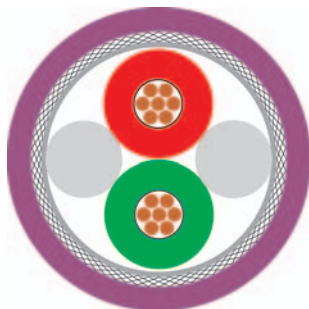
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## Profibus L2



Drag Chain



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

#### Drag chain applications 1x2x0.64 mm (stranded)

Copper, bare (AWG 24/19)  
Foam-skin-PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 8,0 mm ± 0,4 mm  
Petrol similar to RAL 5018

#### Drag chain applications 1x2x0.64 mm (stranded)

Copper, bare (AWG 24/19)  
Foam-skin-PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 8,0 mm ± 0,4 mm  
Violet similar to RAL 4001

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

150 Ohm ± 10 %  
82 Ohm/km  
1 GOhm x km  
164 Ohm/km max.  
30 nF/km nom.  
1,5 kV  
9,6 kHz < 3,0 dB/km  
38,4 kHz < 5,0 dB/km  
4 MHz < 25,0 dB/km  
16 MHz < 52,0 dB/km

150 Ohm ± 10 %  
82 Ohm/km  
1 GOhm x km  
164 Ohm/km max.  
30 nF/km nom.  
1,5 kV  
9,6 kHz < 3,0 dB/km  
38,4 kHz < 5,0 dB/km  
4 MHz < 25,0 dB/km  
16 MHz < 52,0 dB/km

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 65 kg/km  
125 mm  
-20°C  
+60°C  
1,52 MJ/m  
25,00 kg/km

approx. 65 kg/km  
125 mm  
-20°C  
+60°C  
1,52 MJ/m  
25,00 kg/km

### Norms

Applicable standards:

Profibus acc. to DIN 19245 T3 and EN50170

Profibus acc. to DIN 19245 T3 and EN50170

### Application

This system cable is used to interconnect L2-BUS components. This cable is an economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The above mentioned types are suitable for drag chains (stranded).

### Part no.

**81003**, Profibus L2

**80267**, Profibus L2

Dimensions and specifications may be changed without prior notice.

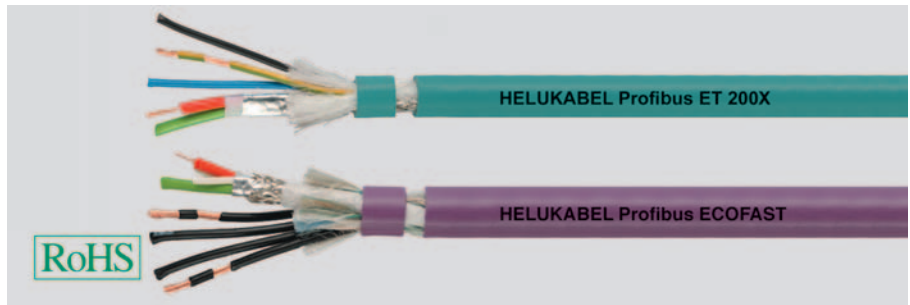
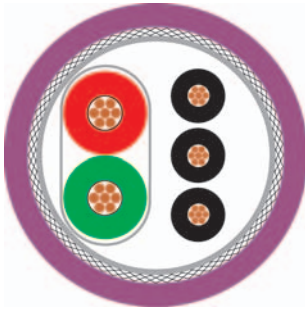


# BUS Cables

Profibus

**HELUKABEL**

ET200X + ECOFAST



## Type Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications 1x2x0.65 mm + 3x1x0.75 mm<sup>2</sup> (stranded)

Copper, bare (AWG 22/19)  
Copper, bare (AWG 18/24)  
Foam-skin-PE  
PVC  
rd, gn  
bk, bu, gnye  
Double core  
Polyester foil over stranded bundle  
Foil + braid  
Polyester foil  
PUR  
approx. 9,5 mm ± 0,5 mm  
Petrol similar to RAL 5018

## Drag chain applications 1x2x0.65 mm + 4x1x1.5 mm<sup>2</sup> (stranded)

Copper, bare (AWG 24/19)  
Copper, bare (AWG 18/84)  
Foam-skin-PE  
TPM  
rd, gn  
bk, bk, bk, bk  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Foil + braid  
-  
TPU  
approx. 11,0 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Relative propagation velocity:  
Attenuation:

150 Ohm ± 10 %  
84 Ohm/km  
1 GOhm x km  
168 Ohm/km max.  
30 nF/km nom.  
1,5 kV  
-  
9,6 kHz < 3,0 dB/Km  
38,4 kHz < 5,0 dB/Km  
4 MHz < 25,0 dB/Km  
16 MHz < 52,0 dB/Km

150 Ohm ± 15 %  
89,9 Ohm/km  
1 GOhm x km  
179 Ohm/km max.  
30 nF/km nom.  
1,5 kV  
81 %  
9,6 kHz ≤ 3,0 dB/km  
38,4 kHz ≤ 5,0 dB/km  
4 MHz ≤ 30,0 dB/km  
16 MHz ≤ 60,0 dB/km

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 105 kg/km  
140 mm  
-5°C  
+60°C  
1,973 MJ/m  
46,00 kg/km

approx. 159 kg/km  
165 mm  
-20°C  
+60°C  
2,835 MJ/m  
90,00 kg/km

## Norms

Applicable standards:  
UL Style:

Profibus acc. to DIN 19245 T3 and EN50170  
AWM Style 20351

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 20233

## Application

The Profibus-ET200X and Profibus ECOFAST lines used in the area of process automation. These BUS systems are a very economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The series ET200X and ECOFAST hybrid are characterized by a special construction with data and power supply in one cable. These types are suited for the application in drag chains and similar mobile applications.

## Part no.

**82913**, Profibus L2

**800044**, Profibus L2

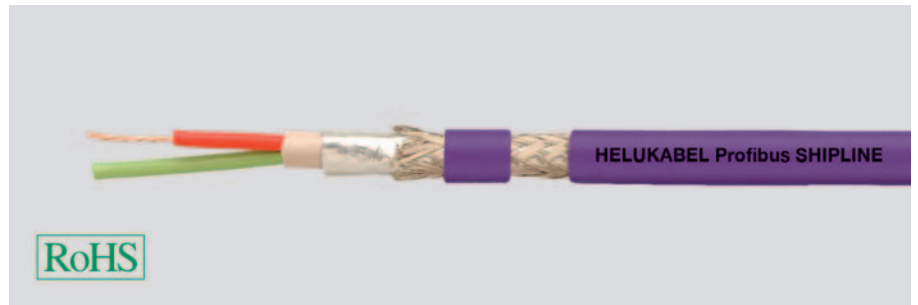
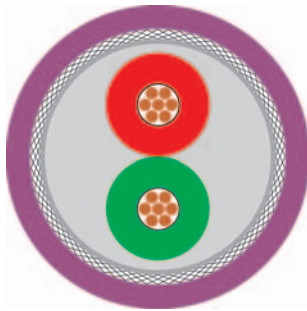
Dimensions and specifications may be changed without prior notice.

# Bus Cables

Profibus



SHIPLINE and High Temperature



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Marine and Offshore 1x2x0.75 mm (stranded)

Copper, bare (AWG 22/7)  
Foam-skin-PE  
rd, gn  
Double core  
Polyester foil over stranded bundle  
FRNC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
X-FRNC  
approx. 8,0 mm ± 0,4 mm  
Violet similar to RAL 4001

### High temperature areas 1x2x0.64 mm

Copper, bare (AWG 22/1)  
XLPE ray cross-linking  
rd, gn  
2 cores + 2 fillers stranded together  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
FEP  
approx. 7,2 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:  
Attenuation:

150 Ohm ± 10 %  
55 Ohm/km  
1,6 GOhm x km  
110 Ohm/km max.  
29 nF/km nom.  
60 V  
1 kV  
9,6 kHz < 2,5 dB/Km  
38,4 kHz < 4,0 dB/Km  
4 MHz < 22,0 dB/Km  
16 MHz < 42,0 dB/Km

150 Ohm ± 10 %  
55 Ohm/km  
1,6 GOhm x km  
110 Ohm/km max.  
28 nF/km nom.  
250 V  
3,6 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 84 kg/km  
80 mm  
-25°C  
+80°C  
1,26 MJ/m  
35,00 kg/km

approx. 64 kg/km  
52 mm  
-50°C  
+180°C  
0,30 MJ/m  
24,00 kg/km

## Norms

Applicable standards:

Profibus acc. to DIN 19245 T3 and EN50170

Profibus acc. to DIN 19245 T3 and EN50170

## Application

The series SHIPLINE and HIGH TEMPERATURE are used to interconnect Profibus components. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The lines described here are designed for **Marine and Offshore applications (certification of Germanischer Lloyd)** or the use in **extreme temperature ranges**.

## Part no.

**802178**, Profibus SHIPLINE

**802179**, Profibus high temperature

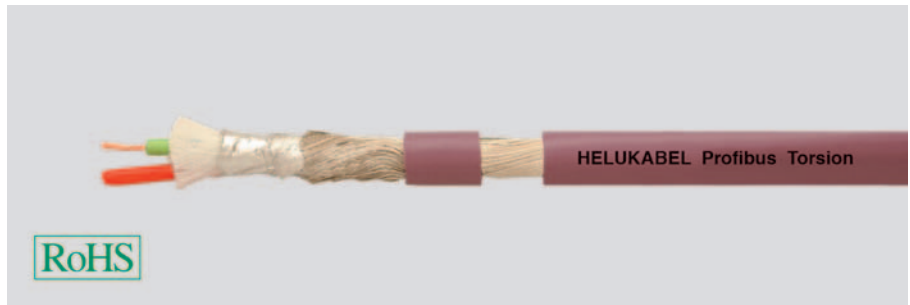
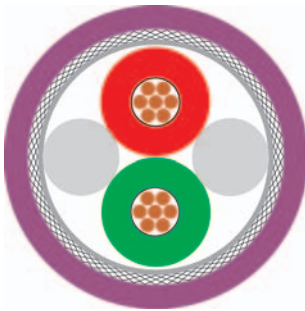
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## Profibus L2



TORSION + FESTOON



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Torsional applications

#### 1x2x0.80 mm (stranded)

Copper, bare (AWG 22/19)  
Foam-skin-PE  
rd, gn  
2 cores + filler  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 8,0 mm ± 0,4 mm  
Violet similar to RAL 4001

### Mobile use

#### 1x2x0.65 mm (stranded)

Copper, bare (AWG 24/19)  
Cell PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 8,0 mm ± 0,3 mm  
Petrol similar to RAL 5018

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Relative propagation velocity:  
Attenuation:

150 Ohm ± 10 %  
49 Ohm/km  
1 GOhm x km  
98 Ohm/km max.  
29 nF/km nom.  
3,6 kV  
-  
9,6 kHz < 3,0 dB/km  
38,4 kHz < 5,0 dB/km  
4 MHz < 25,0 dB/km  
16 MHz < 51,0 dB/km

150 Ohm ± 10 %  
66,5 Ohm/km  
1,6 GOhm x km  
133 Ohm/km max.  
28 nF/km nom.  
2 kV  
81 %  
9,6 kHz ≤ 3,0 dB/km  
38,4 kHz ≤ 4,0 dB/km  
4 MHz ≤ 25,0 dB/km  
16 MHz ≤ 49,0 dB/km

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 66 kg/km  
100 mm  
-25°C  
+75°C  
0,89 MJ/m  
32,00 kg/km

approx. 64 kg/km  
70 mm  
-40°C  
+60°C  
1,09 MJ/m  
23,00 kg/km

### Norms

Applicable standards:  
UL Style:  
CSA standard:

Profibus acc. to DIN 19245 T3 and EN50170  
CMX 75°C (shielded)  
-

Profibus acc. to DIN 19245 T3 and EN50170  
CMG 75°C or CL2 or AWM 20201 600V  
CSA FT 4

### Application

The series TORSION and FESTOON are used to interconnect Profibus BUS components. This BUS system is a very economical solution for the field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The lines described here are designed torsionable or hanging movable construction. Areas such as robot applications and/or garland suspension are easily realized.

### Part no.

**800109**, Profibus L2

**800649**, Profibus L2

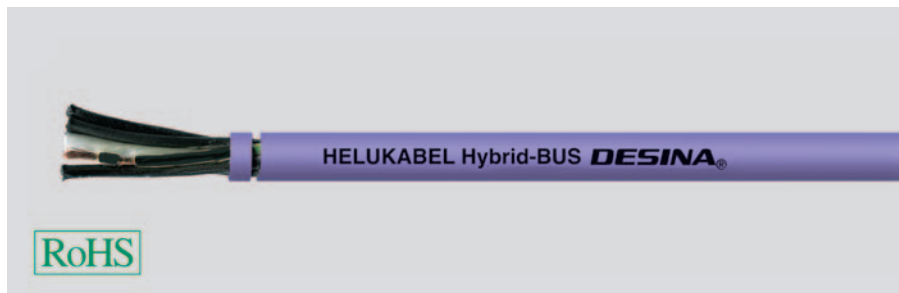
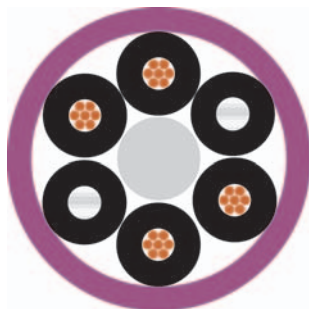
Dimensions and specifications may be changed without prior notice.

# BUS Cables

DESINA-HYBRID-BUS



hybrid



## Type

### Cable structure

Conductor material  
Core insulation:  
Polymer optical fibre:  
Core colours:  
Core identification:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Hybrid Bus Cable

### 4x1.5 mm<sup>2</sup> + 2xPOF

Copper, bare, KL.6 = extra fine wire  
TPM  
4x POF 980/1000  
Black  
Numbers  
PETP fleece  
TPU  
approx. 8,8 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Conductor resistance, max.:  
Insulation resistance, min.:  
Test voltage:

13,7 Ohm/km  
0,5 GOhm x km  
3 kV

## Optical characteristic

Fibre attenuation:

230 dB/km max. at 650 nm

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Copper weight:

approx. 120 kg/km  
130 mm  
-20°C  
+80°C  
60,00 kg/km

## Norms

Applicable standards:

Detail specification for DESINA

## Application

The DESINA® Cu/POF hybrid field bus cables combines signal lines made of plastic fibre-optic conductors and copper cables. The use of these transmission systems significantly reduces the number of different cables in a planned bus installation in machine tools operations. The main applications of these cables are in mobile applications in machine construction.

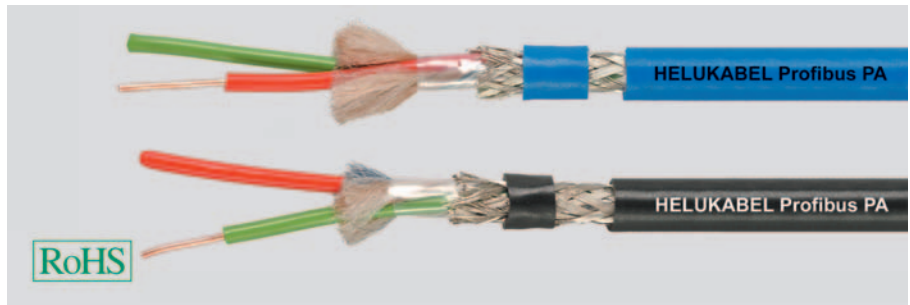
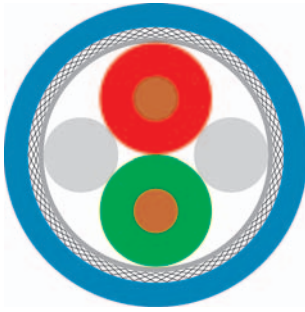
## Part no.

**81713**, DESINA HYBRID BUS

Dimensions and specifications may be changed without prior notice.

# BUS Cables

## Profibus PA



### Type Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Hazardous areas 1x2x1.0/2.55 mm

Copper, bare (AWG 18/1)  
PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 7,6 mm ± 0,2 mm  
Blue

### Non-hazardous areas 1x2x1.0/2.55 mm

Copper, bare (AWG 18/1)  
PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 7,6 mm ± 0,2 mm  
Black

### Electrical data

Characteristic impedance: 100 Ohm ± 20 %  
Conductor resistance, max.: 22 Ohm/km  
Insulation resistance, min.: 1 GOhm x km  
Loop resistance: 44 Ohm/km max.  
Mutual capacitance: 55 nF/km nom.  
Nominal voltage: 300 V  
Test voltage: 2,5 kV  
Attenuation: 39 kHz ≤ 3,0 dB/km

Characteristic impedance: 100 Ohm ± 20 %  
Conductor resistance, max.: 22 Ohm/km  
Insulation resistance, min.: 1 GOhm x km  
Loop resistance: 44 Ohm/km max.  
Mutual capacitance: 55 nF/km nom.  
Nominal voltage: 300 V  
Test voltage: 2,5 kV  
Attenuation: 39 kHz ≤ 3,0 dB/km

### Technical data

Weight: approx. 76 kg/km  
bending radius, repeated: 140 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 0,95 MJ/m  
Copper weight: 44,00 kg/km

Weight: approx. 76 kg/km  
bending radius, repeated: 140 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 0,95 MJ/m  
Copper weight: 44,00 kg/km

### Norms

Applicable standards: Profibus acc. to DIN 19245 T3 and EN50170 Profibus acc. to DIN 19245 T3 and EN50170  
UL Style: UL Style 2571 UL Style 2571

### Application

This Profibus PA line is used in the area of process automation, among other things in the chemical industry. This cable is an economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The above mentioned types are suitable for ex (and ATEX/ Class II, EX-i/ EN 60079-14) and not-ex installation and are equipped with a special PVC-sheath.

### Part no.

**82835**, Profibus PA

**82836**, Profibus PA

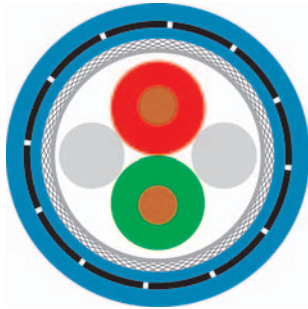
Dimensions and specifications may be changed without prior notice.

# Bus Cables

## Profibus PA



armoured



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Armouring:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

#### Hazardous areas 1x2x1.0/2.55 mm

Copper, bare (AWG 18/1)  
PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
Steel band  
PVC  
approx. 10,2 mm ± 0,2 mm  
Blue

#### Non-hazardous areas 1x2x1.0/2.55 mm

Copper, bare (AWG 18/1)  
PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
Steel band  
PVC  
approx. 10,2 mm ± 0,2 mm  
Black

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:  
Attenuation:

100 Ohm ± 15 %  
22 Ohm/km  
1 GOhm x km  
44 Ohm/km max.  
55 nF/km nom.  
300 V  
2,5 kV  
39 kHz ≤ 3,0 dB/km

100 Ohm ± 15 %  
22 Ohm/km  
1 GOhm x km  
44 Ohm/km max.  
55 nF/km nom.  
300 V  
2,5 kV  
39 kHz ≤ 3,0 dB/km

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 170 kg/km  
200 mm  
-20°C  
+70°C  
1,95 MJ/m  
45,00 kg/km

approx. 170 kg/km  
200 mm  
-20°C  
+70°C  
1,95 MJ/m  
45,00 kg/km

### Norms

Applicable standards:

Profibus acc. to DIN 19245 T3 and EN50170

Profibus acc. to DIN 19245 T3 and EN50170

### Application

This Profibus PA line is used in the area of process automation, among other things in the chemical industry. This cable is an economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The above mentioned types are suitable for ex and not-ex installation where rodent infestation is to be expected and therefore equipped with a metal armouring and a double PVC-sheath.

### Part no.

**802180**, Profibus PA

**802181**, Profibus PA

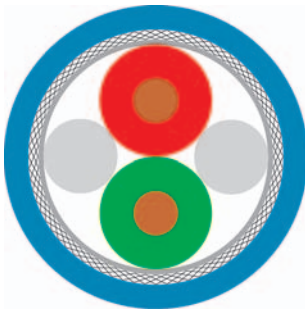
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## Profibus PA



Long Distance



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Hazardous areas

#### 1x2x1.6/3.2 mm

Copper, bare (AWG 16/7)  
PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 9,5 mm ± 0,5 mm  
Blue

### Non-hazardous areas

#### 1x2x1.6/3.2 mm

Copper, bare (AWG 16/7)  
PE  
rd, gn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 9,5 mm ± 0,5 mm  
Black

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:  
Attenuation:

100 Ohm ± 20 %  
24 Ohm/km  
1 GOhm x km  
48 Ohm/km max.  
60 nF/km nom.  
300 V  
1 kV  
39 kHz ≤ 2,7 dB/km

100 Ohm ± 20 %  
24 Ohm/km  
1 GOhm x km  
48 Ohm/km max.  
60 nF/km nom.  
300 V  
1 kV  
39 kHz ≤ 2,7 dB/km

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 110 kg/km  
150 mm  
-40°C  
+70°C  
1,57 MJ/m  
62,00 kg/km

approx. 110 kg/km  
150 mm  
-40°C  
+70°C  
1,57 MJ/m  
62,00 kg/km

### Norms

Applicable standards:  
UL Style:

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571

### Application

This Profibus PA line is used in the area of process automation, among other things in the chemical industry. This cable is an economical solution for the cell and field area. For the information exchange between different automation systems as well as for communication with the connected decentralized field units, serial field bus systems are used. The types mentioned here are suitable for ex and not-ex installation and are equipped with a special PVC-sheath.

### Part no.

**800650**, Profibus PA

**800715**, Profibus PA

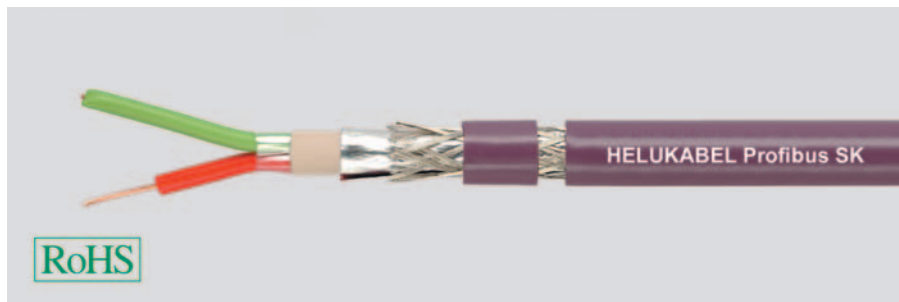
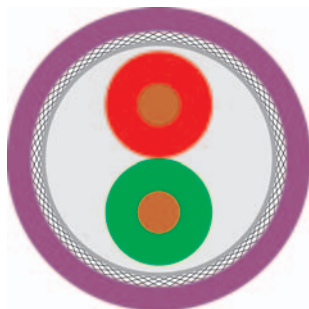
Dimensions and specifications may be changed without prior notice.

# BUS Cables

Profibus SK

**HELUKABEL®**

Indoor + Outdoor



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor

### 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
Double core  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 8,0 mm ± 0,4 mm  
Violet similar to RAL 4001

## Fixed installation, outdoor

### 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
Double core  
Polyester foil over stranded bundle  
PE  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PE  
approx. 8,0 mm ± 0,4 mm  
Black similar to RAL 9005

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
110 Ohm/km max.  
35 nF/km nom.  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4,0 MHz < 22,0 dB/km  
16,0 MHz < 42,0 dB/km

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
110 Ohm/km max.  
35 nF/km nom.  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 79 kg/km  
120 mm  
-40°C  
+80°C  
1,068 MJ/m  
24,00 kg/km

approx. 65 kg/km  
120 mm  
-20°C  
+70°C  
1,451 MJ/m  
24,00 kg/km

### Norms

Applicable standards:  
UL Style:  
CSA standard:

Profibus acc. to DIN 19245 T3 and EN50170  
CMG 75°C or CL3 or AWM 21694 600V  
CSA FT 4

Profibus acc. to DIN 19245 T3 and EN50170  
-  
-

### Application

The application of these Profibus SK cables are in the cell and field area, just as for conventional types. The great advantage of this new system is the quick connection of the cable to the respective plugs. This type of processing also avoids errors. The above mentioned types are suitable for indoor- or outdoor installation and are equipped with a special PVC or PE sheath.

### Part no.

**81903**, Profibus SK

**81904**, Profibus SK

Dimensions and specifications may be changed without prior notice.

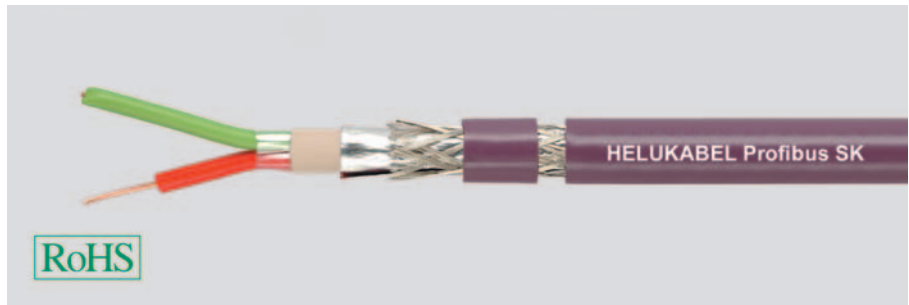
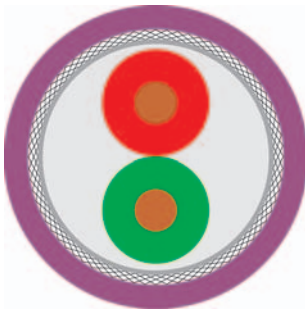


# BUS Cables

Profibus SK



FRNC + Robust



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor

### 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
Double core  
Polyester foil over stranded bundle  
FRNC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
FRNC  
approx. 8,0 mm ± 0,4 mm  
Violet similar to RAL 4001

## Industrial Area

### 1x2x0.64 mm

Copper, bare (AWG 22/1)  
Foam-skin-PE  
rd, gn  
Double core  
Polyester foil over stranded bundle  
PE  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 8,0 mm ± 0,4 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
110 Ohm/km max.  
35 nF/km nom.  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

150 Ohm ± 10 %  
55 Ohm/km  
1 GOhm x km  
110 Ohm/km max.  
35 nF/km nom.  
1,5 kV  
9,6 kHz < 2,5 dB/km  
38,4 kHz < 4,0 dB/km  
4 MHz < 22,0 dB/km  
16 MHz < 42,0 dB/km

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 73 kg/km  
160 mm  
-25°C  
+70°C  
1,203 MJ/m  
24,00 kg/km

approx. 71 kg/km  
120 mm  
-40°C  
+70°C  
1,574 MJ/m  
24,00 kg/km

## Norms

Applicable standards:  
UL Style:  
CSA standard:

Profibus acc. to DIN 19245 T3 and EN50170  
CM 750C (shielded)  
-

Profibus acc. to DIN 19245 T3 and EN50170  
AWM Style 20236 AWM I/II A/B 80°C 30V FT1  
CSA FT1

## Application

The application of these Profibus SK cables are in the cell and field area, just as for conventional types. The great advantage of this new system is the quick connection of the cable to the respective plugs. This type of processing also avoids errors. The types mentioned here are suitable for indoor laying (special FRNC sheath) and heavy industry laying (PUR sheath).

## Part no.

**81501**, Profibus SK

**81905**, Profibus SK

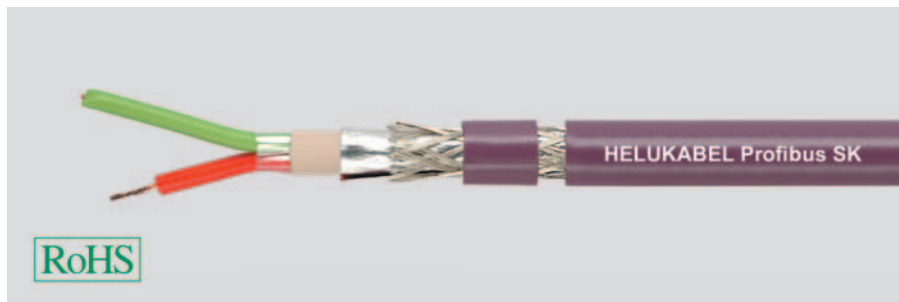
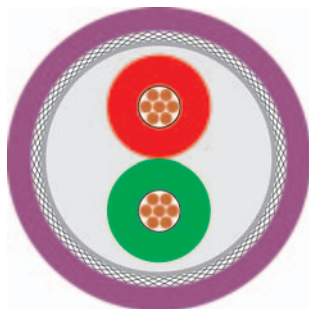
Dimensions and specifications may be changed without prior notice.

# BUS Cables

Profibus SK

**HELUKABEL**

Drag Chain



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Drag chain applications 1x2x0.64 mm (stranded)

Copper, bare (AWG 24/19)  
Foam-skin-PE  
rd, gn  
Double core  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 8,0 mm ± 0,4 mm  
Violet similar to RAL 4001

### Drag chain applications 1x2x0.64 mm (stranded)

Copper, bare (AWG 24/19)  
Foam-skin-PE  
rd, gn  
Double core  
Polyester foil over stranded bundle  
PVC  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PUR  
approx. 8,0 mm ± 0,4 mm  
Petrol similar to RAL 5018

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

150 Ohm ± 10 %  
84 Ohm/km  
1 GOhm x km  
168 Ohm/km max.  
35 nF/km nom.  
1,5 kV  
9,6 kHz < 3,0 dB/km  
38,4 kHz < 5,0 dB/km  
4 MHz < 25,0 dB/km  
16 MHz < 52,0 dB/km

150 Ohm ± 10 %  
84 Ohm/km  
1 GOhm x km  
168 Ohm/km max.  
35 nF/km nom.  
1,5 kV  
9,6 kHz < 3,0 dB/km  
38,4 kHz < 5,0 dB/km  
4 MHz < 25,0 dB/km  
16 MHz < 52,0 dB/km

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 70 kg/km  
120 mm  
-40°C  
+70°C  
1,53 MJ/m  
25,00 kg/km

approx. 70 kg/km  
120 mm  
-40°C  
+70°C  
1,53 MJ/m  
25,00 kg/km

## Norms

Applicable standards:  
UL Style:  
CSA standard:

Profibus acc. to DIN 19245 T3 and EN50170  
CMX 75°C (shielded)  
CSA FT1

Profibus acc. to DIN 19245 T3 and EN50170  
CMX 75°C (shielded)  
CSA FT1

## Application

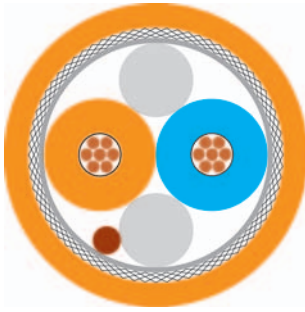
The application of these Profibus SK cables are in the cell and field area, just as for conventional types. The great advantage of this new system is the quick connection of the cable to the respective plugs. This type of processing also avoids errors. The above mentioned types are suitable for drag chains (stranded).

## Part no.

**801659**, Profibus SK

**81906**, Profibus SK

Dimensions and specifications may be changed without prior notice.



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### process automation

#### 1x2x1.1/2,55-100 LI

Copper, bare (AWG 18/7)  
PO  
or, bl  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
PVC  
approx. 8,0 mm ± 0,3 mm  
Orange

### Electrical data

Characteristic impedance: 100 Ohm ± 20 Ohm  
Conductor resistance, max.: 22 Ohm/km  
Insulation resistance, min.: 5 GOhm x km  
Loop resistance: 44 Ohm/km max.  
Mutual capacitance: 60 nF/km nom.  
Nominal voltage: 300 V  
Test voltage: 1,5 kV  
Attenuation: 39 kHz ≤ 3,4 dB/km

### Technical data

Weight: approx. 85 kg/km  
bending radius, repeated: 80 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +80°C  
Caloric load, approx. value: 1,22 MJ/m  
Copper weight: 45,00 kg/km

### Norms

Applicable standards: Foundation Fieldbus Spec. FF-816-1.4  
UL Style: CMG 75°C PLTC FT4  
CSA standard: CSA FT 4

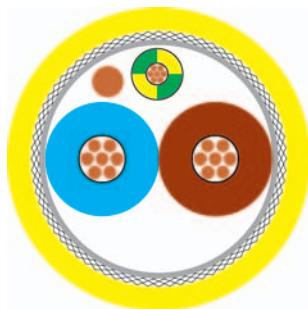
### Application

The FOUNDATION™ Fieldbus is an open and neutral fieldbus standard which is primarily oriented on the requirements of process automation. It is a functionally complete fieldbus solution for areas like temperature transmitters, pressure transmitters or valve actuators. Today we distinguish between the specification H1 (31,25 kbit/s) and HSE (100Mbit/s). Branches like the petrochemical, chemical or the food- and beverage industry see the advantages and use the FOUNDATION™ fieldbus technology.

### Part no.

**803354**, Foundation™ Fieldbus Basic

Dimensions and specifications may be changed without prior notice.



### Type

#### Cable structure

Inner conductor diameter 1:  
 Inner conductor diameter 2:  
 Core insulation 1:  
 Core insulation 2:  
 Core colours 1:  
 Core colours 2:  
 Stranding element 1:  
 Shielding 1:  
 Shielding 2:  
 Total shielding:  
 Drain wire:  
 Outer sheath material:  
 Cable external diameter:  
 Outer sheath colour:

### process automation

#### 1x2x1.1/2,85-100 LI + 1x0,8 gnye

Copper, bare (AWG 18/41)  
 Copper, bare (AWG 18/41)  
 XLPE ray cross-linking  
 PVC  
 bu, bn  
 gn/ye  
 Double core  
 -  
 Polyester foil, aluminium-lined  
 Cu braid, tinned  
 yes  
 PVC  
 approx. 7,9 mm ± 0,3 mm  
 Yellow

### Electrical data

Characteristic impedance: 100 Ohm ± 20 Ohm  
 Conductor resistance, max.: 24 Ohm/km  
 Insulation resistance, min.: 2 GOhm x km  
 Loop resistance: 48 Ohm/km max.  
 Mutual capacitance: 65 nF/km nom.  
 Nominal voltage: 300 V  
 Test voltage: 1,5 kV  
 Attenuation: 39 kHz ≤ 3,4 dB/km

### Technical data

Weight: approx. 84 kg/km  
 bending radius, repeated: 80 mm  
 Operating temperature range min.: -25°C  
 Operating temperature range max.: +105°C  
 Caloric load, approx. value: 1,00 MJ/m  
 Copper weight: 49,00 kg/km

### Norms

Applicable standards: Foundation Fieldbus Spec. FF-816-1.4  
 UL Style: CMG 105° or CL3 FT4  
 CSA standard: CSA FT 4

### Application

The FOUNDATION™ Fieldbus is an open and neutral fieldbus standard which is primarily oriented on the requirements of process automation. It is a functionally complete fieldbus solution for areas like temperature transmitters, pressure transmitters or valve actuators. Today we distinguish between the specification H1 (31,25 kbit/s) and HSE (100Mbit/s). Branches like the petrochemical, chemical or the food- and beverage industry see the advantages and use the FOUNDATION™ fieldbus technology.

### Part no.

**801191**, Foundation Fieldbus FF A

Dimensions and specifications may be changed without prior notice.



### Type

#### Cable structure

Inner conductor diameter 1:  
 Inner conductor diameter 2:  
 Core insulation 1:  
 Core insulation 2:  
 Core colours 1:  
 Core colours 2:  
 Stranding element 1:  
 Shielding 1:  
 Shielding 2:  
 Total shielding:  
 Drain wire:  
 Armouring:  
 Outer sheath material:  
 Cable external diameter:  
 Outer sheath colour:

### process automation

#### 1x2x1.1/2,85-100 LI + 1x0,8 gnye, armoured

Copper, bare (AWG 18/41)  
 Copper, bare (AWG 18/41)  
 XLPE ray cross-linking  
 PVC  
 bu, bn  
 gn/ye  
 Double core  
 -  
 Polyester foil, aluminium-lined  
 Polyester foil, aluminium-lined  
 yes  
 Steel shaft  
 PVC  
 approx. 12,3 mm ± 0,3 mm  
 Yellow

### Electrical data

Characteristic impedance: 100 Ohm ± 20 Ohm  
 Conductor resistance, max.: 24 Ohm/km  
 Insulation resistance, min.: 2 GOhm x km  
 Loop resistance: 48 Ohm/km max.  
 Mutual capacitance: 65 nF/km nom.  
 Nominal voltage: 300 V  
 Test voltage: 1,5 kV  
 Attenuation: 39 kHz ≤ 3,4 dB/km

### Technical data

Weight: approx. 187 kg/km  
 bending radius, repeated: 130 mm  
 Operating temperature range min.: -25°C  
 Operating temperature range max.: +105°C  
 Caloric load, approx. value: 1,65 MJ/m  
 Copper weight: 125,00 kg/km

### Norms

Applicable standards: Foundation Fieldbus Spec. FF-816-1.4  
 UL Style: CMG 105°C or PLTC FT4 Sun Res  
 CSA standard: CSA FT 4

### Application

The FOUNDATION™ Fieldbus is an open and neutral fieldbus standard which is primarily oriented on the requirements of process automation. It is a functionally complete fieldbus solution for areas like temperature transmitters, pressure transmitters or valve actuators. Today we distinguish between the specification H1 (31,25 kbit/s) and HSE (100Mbit/s). Branches like the petrochemical, chemical or the food- and beverage industry see the advantages and use the FOUNDATION™ fieldbus technology.

### Part no.

**801192**, Foundation Fieldbus FF A

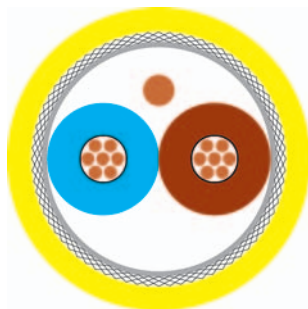
Dimensions and specifications may be changed without prior notice.

# BUS Cables

FOUNDATION™ Fieldbus

**HELUKABEL**

Type A



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## process automation

### 1x2x1.1/2,85-100 LI

Copper, bare (AWG 18/41)  
XLPE ray cross-linking  
bu, bn  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
PVC  
approx. 7,9 mm ± 0,3 mm  
Yellow

## Electrical data

Characteristic impedance: 100 Ohm ± 20 Ohm  
Conductor resistance, max.: 24 Ohm/km  
Insulation resistance, min.: 2 GOhm x km  
Loop resistance: 48 Ohm/km max.  
Mutual capacitance: 65 nF/km nom.  
Nominal voltage: 300 V  
Test voltage: 1,5 kV  
Attenuation: 39 kHz ≤ 3,4 dB/km

## Technical data

Weight: approx. 89 kg/km  
bending radius, repeated: 80 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +105°C  
Caloric load, approx. value: 1,05 MJ/m  
Copper weight: 42,00 kg/km

## Norms

Applicable standards: Foundation Fieldbus Spec. FF-816-1.4  
UL Style: CMG 105° or CL3 FT4  
CSA standard: CSA FT 4

## Application

The FOUNDATION™ Fieldbus is an open and neutral fieldbus standard which is primarily oriented on the requirements of process automation. It is a functionally complete fieldbus solution for areas like temperature transmitters, pressure transmitters or valve actuators. Today we distinguish between the specification H1 (31,25 kbit/s) and HSE (100Mbit/s). Branches like the petrochemical, chemical or the food- and beverage industry see the advantages and use the FOUNDATION™ fieldbus technology.

## Part no.

**801193**, Foundation Fieldbus FF A

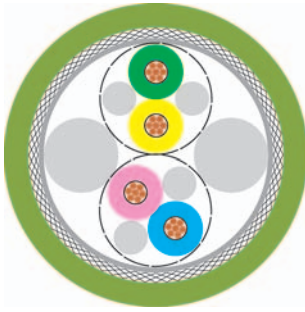
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# BUS Cables

HMCB200

**HELUKABEL**

fixed installed



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor

### 2x2x0,22qmm

Copper, bare (AWG 22/7)  
Foam-skin-PE  
gn, ye, pk, bu  
Double core  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
PVC  
approx. 6,8 mm ± 0,15 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
Conductor resistance, max.: 87,6 Ohm/km  
Insulation resistance, min.: 1 GOhm x km  
Loop resistance: 175 Ohm/km max.  
Mutual capacitance: 50 nF/km nom.  
Test voltage: 0,5 kV

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (db/100m)	8,0	10,0	20,0	27,0
Next (db)	47,0	44,0	35,0	32,0
ACR (db)	39,0	34,0	15,0	5,0

## Technical data

Weight: approx. 71 kg/km  
bending radius, repeated: 100 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 0,92 MJ/m  
Copper weight: 35,00 kg/km

## Norms

UL Style: AWM Style 2502 AWM I/II A/B 80°C 30V FT1

## Application

These signal cables, designed specifically for use in heavy-duty industries, are the ideal solution for MOTION-CONNECT 200, 500 and 800\*\* series applications. They guarantee superior transmission properties and can be used under the most severe conditions. The cable cited here conforms to HMCB200 for fixed installation.

## Part no.

**802471**, HMCB200

Dimensions and specifications may be changed without prior notice.

\* Drive Cliq is registered trademark from Siemens AG.

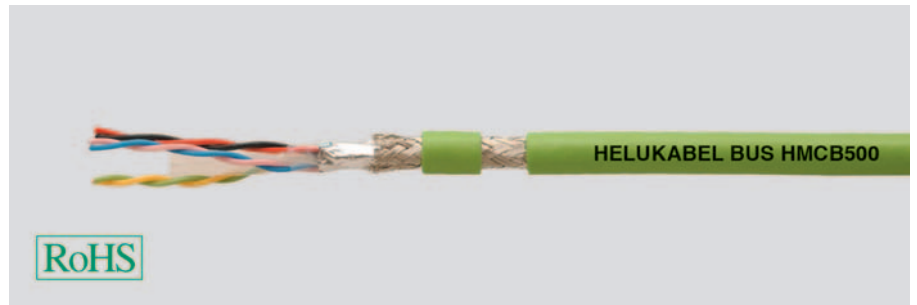
\*\* MOTION-CONNECT 200, 500 and 800 series applications are registered trademarks of the Siemens AG.

# BUS Cables

HMCB500

**HELUKABEL**

Drag Chain



## Type

### Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications

### 2x2xAWG26 + 1x2xAWG22

Copper, bare (AWG 26/7)  
Copper, bare (AWG 22/7)  
PO  
PO  
gn, ye, pk, bu  
rd, bk  
Double core  
Polyester foil over stranded bundle  
-  
Foil + braid  
PUR  
approx. 6,9 mm ± 0,1 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

100 Ohm ± 15 ohm at 1 to 100 MHz  
135 Ohm/km  
1 GOhm x km  
270 Ohm/km max.  
50 nF/km nom.  
0,5 kV

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (db/100m)	13,0	16,0	32,0	40,0
Next (db)	47,0	44,0	35,0	32,0
ACR (db)	34,0	28,0	3,0	-8,0

## Technical data

Weight: approx. 61 kg/km  
bending radius, repeated: 70 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,97 MJ/m  
Copper weight: 35,00 kg/km

## Norms

UL Style: AWM Style 20236 AWM I/II A/B 80°C 30V FT1

## Application

These signal cables, designed specifically for use in heavy-duty industries, are the ideal solution for MOTION-CONNECT 200, 500 and 800\*\* series applications. They guarantee superior transmission properties and can be used under the most severe conditions. The cable cited here conforms to HMCB500 for highly-flexible applications inside motor drives up to cable length of 50m.

## Part no.

**802472**, HMCB500

Dimensions and specifications may be changed without prior notice.

\* Drive Cliq is registered trademark from Siemens AG.

\*\* MOTION-CONNECT 200, 500 and 800 series applications are registered trademarks of the Siemens AG.



# BUS Cables

HMCB500S

**HELUKABEL**

Drag Chain



## Type

### Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications

### 2x2xAWG24 + 1x2xAWG22

Copper, bare (AWG 24/7)  
Copper, tinned (AWG 22/19)  
Foam-skin-PE  
PE  
gn, ye, pk, bu  
rd, bk  
Double core  
-  
-  
Foil + braid  
PVC  
approx. 7,0 mm ± 0,15 mm  
Green similar to RAL 6018

## Electrical data

Characteristic impedance: 100 Ohm ± 15 ohm at 1 to 100 MHz  
Conductor resistance, max.: 90 Ohm/km  
Insulation resistance, min.: 1 GOhm x km  
Loop resistance: 180 Ohm/km max.  
Mutual capacitance: 50 nF/km nom.  
Test voltage: 0,5 kV

## Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (db/100m)	10,0	12,0	23,0	30,0
Next (db)	47,0	44,0	35,0	32,0
ACR (db)	37,0	36,0	12,0	2,0

## Technical data

Weight: approx. 72 kg/km  
bending radius, repeated: 125 mm  
Operating temperature range min.: 0°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,00 MJ/m  
Copper weight: 38,00 kg/km

## Norms

UL Style: AWM Style 2502 AWM I/II A/B 80°C 30V FT1  
CSA standard: CSA FT1

## Application

These signal cables, designed specifically for use in heavy-duty industries, are the ideal solution for MOTION-CONNECT 200, 500 and 800\*\* series applications. They guarantee superior transmission properties and can be used under the most severe conditions. The cable cited here conforms to HMCB500 for flexible applications inside motor drives for distances up to 100m.

## Part no.

**803672**, HMCB500S

Dimensions and specifications may be changed without prior notice.

\* Drive Cliq is registered trademark from Siemens AG.

\*\* MOTION-CONNECT 200, 500 and 800 series applications are registered trademarks of the Siemens AG.

# BUS Cables

HMCB800

**HELUKABEL**

Drag Chain



## Type

### Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Drag chain applications

#### 2x2x0,15qmm + 1x2x0,38qmm

Copper, bare (AWG 26/19)  
Copper, tinned (AWG 22/19)  
PO  
PO  
gn, ye, pk, bu  
rd, bk  
Double core  
Polyester foil over stranded bundle  
-  
Foil + braid  
PUR  
approx. 7,0 mm ± 0,15 mm  
Green similar to RAL 6018

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

100 Ohm ± 15 ohm at 1 to 100 MHz  
135 Ohm/km  
1 GOhm x km  
270 Ohm/km max.  
50 nF/km nom.  
0,5 kV

### Typical values

Frequency (MHz)	10	16	62,5	100
Attenuation (db/100m)	13,0	16,0	32,0	40,0
Next (db)	47,0	44,0	35,0	32,0
ACR (db)	34,0	28,0	3,0	-8,0

### Technical data

Weight: approx. 72 kg/km  
bending radius, repeated: 105 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,91 MJ/m  
Copper weight: 42,00 kg/km

### Norms

UL Style: AWM Style 20236 AWM I/II A/B 80°C 30V FT1

### Application

These signal cables, designed specifically for use in heavy-duty industries, are the ideal solution for MOTION-CONNECT 200, 500 and 800\*\* series applications. They guarantee superior transmission properties and can be used under the most severe conditions. The cable cited here conforms to HMCB800 for highly-flexible applications.

### Part no.

**802473**, HMCB800

Dimensions and specifications may be changed without prior notice.

\* Drive Cliq is registered trademark from Siemens AG.

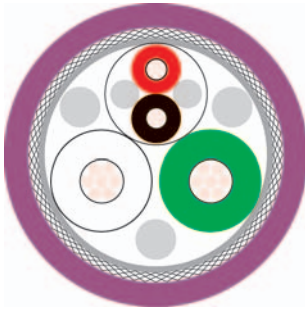
\*\* MOTION-CONNECT 200, 500 and 800 series applications are registered trademarks of the Siemens AG.

# BUS Cables

USB Bus S

**HELUKABEL**

Drag Chain



## Type

### Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications

### 1x2xAWG28 + 1x2xAWG20

Cu VAG + steel core (AWG 28/19)  
Copper, tinned (AWG 20/37)  
FEP  
PO  
wh, gn  
rd, bk  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
-  
Foil + braid  
PUR  
approx. 5,0 mm ± 0,2 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance: 90 Ohm ± 15 %  
Conductor resistance, max.: 232 Ohm/km  
Insulation resistance, min.: 0,1 GOhm x km  
Loop resistance: 464 Ohm/km max.  
Mutual capacitance: 54 nF/km nom.  
Test voltage: 0,5 kV

## Typical values

Frequency (MHz)	10	16	62,5	100	200	300	400
Attenuation (db/100m)	12,1	15,4	31,0	39,7	60,2	76,2	99,7

## Technical data

Weight: approx. 45 kg/km  
bending radius, repeated: 50 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,49 MJ/m  
Copper weight: 30,00 kg/km

## Norms

Applicable standards: USB-Standard 2.0  
UL Style: AWM 20963 (80°C/30V)  
CSA standard: CSA FT1

## Application

These USB cables, designed specifically for use in heavy-duty industries, are the ideal solution for highly-flexible applications such as drag chains and camera technology. They guarantee superior transmission properties. The cable cited here can be used up to a maximum cable length of 5m.

## Part no.

**802469**, USB S

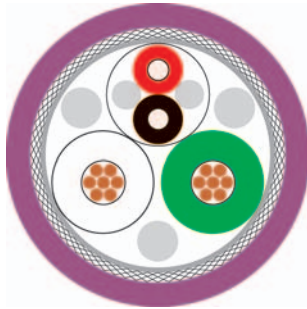
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## USB Bus L



Drag Chain



### Type

#### Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Drag chain applications

#### 1x2xAWG24 + 1x2xAWG20

Copper, bare (AWG 24/19)  
Copper, tinned (AWG 20/37)  
PO  
PO  
wh, gn  
rd, bk  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
-  
Foil + braid  
PUR  
approx. 6,0 mm ± 0,2 mm  
Violet similar to RAL 4001

### Electrical data

Characteristic impedance: 90 Ohm ± 15 %  
Conductor resistance, max.: 140 Ohm/km  
Insulation resistance, min.: 0,1 GOhm x km  
Loop resistance: 280 Ohm/km max.  
Mutual capacitance: 50 nF/km nom.  
Test voltage: 0,5 kV

### Typical values

Frequency (MHz)	10	16	62,5	100	200	300
Attenuation (db/100m)	8,5	10,2	21,3	27,3	41,5	53,3

### Technical data

Weight: approx. 56 kg/km  
bending radius, repeated: 75 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 0,57 MJ/m  
Copper weight: 34,00 kg/km

### Norms

Applicable standards: USB-Standard 2.0  
UL Style: AWM 20963 (80°C/30V)  
CSA standard: CSA FT1

### Application

These USB cables, designed specifically for use in heavy-duty industries, are the ideal solution for highly-flexible applications such as drag chains and camera technology. They guarantee superior transmission properties and can be used even under the most severe conditions. The cable cited here can be used up to a maximum cable length of 10m.

### Part no.

**802470**, USB L

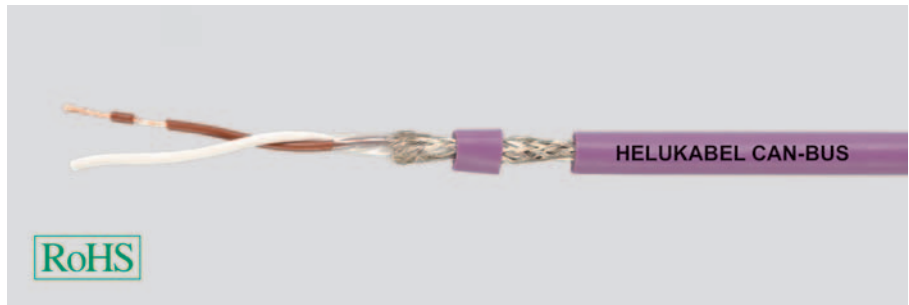
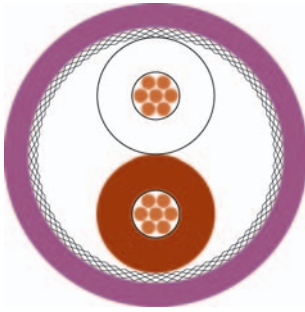
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL**

fixed installed



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Fixed installation, indoor 1x2x0.22 mm<sup>2</sup> (stranded)

Copper, bare (AWG 24/7)  
Cell PE  
wh/bn  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 5,4 mm ± 0,2 mm  
Violet similar to RAL 4001

### Fixed installation, indoor 4x1x0.22 mm<sup>2</sup> (stranded)

Copper, bare (AWG 24/7)  
Cell PE  
wh, bn, gn, ye  
Star quad  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 6,9 mm ± 0,2 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:

120 Ohm ± 10 %  
87 Ohm/km  
1 GOhm x km  
174 Ohm/km max.  
58 nF/km nom.  
30 V  
1,5 kV

120 Ohm ± 10 %  
87 Ohm/km  
1 GOhm x km  
174 Ohm/km max.  
58 nF/km nom.  
30 V  
1,5 kV

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 41 kg/km  
81 mm  
-40°C  
+70°C  
0,574 MJ/m  
17,00 kg/km

approx. 60 kg/km  
107 mm  
-40°C  
+70°C  
1,234 MJ/m  
21,00 kg/km

## Norms

Applicable standards:  
UL Style:

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in indoor applications. This is also a very economical solution of a BUS system.

## Part no.

**81286**, CAN BUS

**81287**, CAN BUS

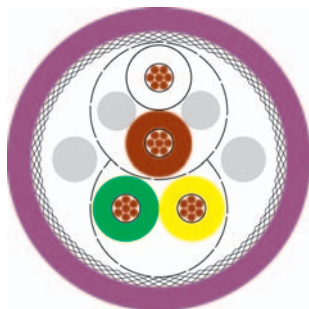
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL®**

fixed installed



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Fixed installation, indoor 2x2x0.22 mm<sup>2</sup> (stranded)

Copper, bare (AWG 24/7)  
Cell PE  
wh/bn, gn/ye  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 7,5 mm ± 0,3 mm  
Violet similar to RAL 4001

### Electrical data

Characteristic impedance: 120 Ohm ± 10 %  
Conductor resistance, max.: 87,6 Ohm/km  
Insulation resistance, min.: 5 GOhm x km  
Loop resistance: 174 Ohm/km max.  
Mutual capacitance: 40 nF/km nom.  
Nominal voltage: 30 V  
Test voltage: 1,5 kV

### Technical data

Weight: approx. 60 kg/km  
bending radius, repeated: 113 mm  
Operating temperature range min.: -25°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 1,13 MJ/m  
Copper weight: 32,00 kg/km

### Norms

Applicable standards: Profibus acc. to DIN 19245 T3 and EN50170  
UL Style: UL Style 2571  
CSA standard: CSA FT1

### Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in indoor applications. This is also a very economical solution of a BUS system.

### Part no.

**82509**, CAN BUS

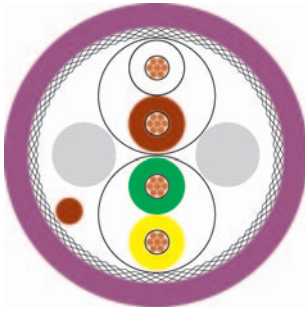
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL®**

fixed installed, 105°C



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Industrial Area

### 2x2xAWG 24/19 mm<sup>2</sup> (stranded)

Copper, bare (AWG 24/19)  
XLPE ray cross-linking  
wh/bn, gn/ye  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PUR  
approx. 8,4 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance: 120 Ohm ± 10 %  
Conductor resistance, max.: 87,2 Ohm/km  
Insulation resistance, min.: 1 GOhm x km  
Loop resistance: 84 Ohm/km max.  
Mutual capacitance: 42 nF/km nom.  
Nominal voltage: 600 V  
Test voltage: 2,5 kV

## Technical data

Weight: approx. 80 kg/km  
bending radius, repeated: 126 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +105°C \*  
Caloric load, approx. value: 1,31 MJ/m  
Copper weight: 40,00 kg/km

## Norms

Applicable standards: Profibus acc. to DIN 19245 T3 and EN50170  
UL Style: UL/CSA 21223 80°C, 600V

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in indoor applications. This is also a very economical solution of a BUS system. Cable with oil-resistant FRNC sheath and increased temperature resistance for use in the wind turbine and similar sectors. Certified to UL, the cable can also be used in the USA and Canada.

\* = with limited service life

## Part no.

**801982**, CAN BUS

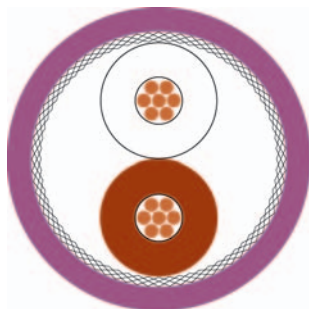
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL**

fixed installed



## Type Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor 1x2x0.34 mm<sup>2</sup> (stranded)

Copper, bare (AWG 22/7)  
Cell PE  
wh/bn  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 6,5 mm ± 0,2 mm  
Violet similar to RAL 4001

## Fixed installation, indoor 4x1x0.34 mm<sup>2</sup> (stranded)

Copper, bare (AWG 22/7)  
Cell PE  
wh/bn, gn/ye  
Star quad  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 8,0 mm ± 0,2 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:

120 Ohm ± 10 %  
57,5 Ohm/km  
5 GOhm x km  
115 Ohm/km max.  
40 nF/km nom.  
30 V  
2 kV

120 Ohm ± 10 %  
57,5 Ohm/km  
5 GOhm x km  
115 Ohm/km max.  
40 nF/km nom.  
30 V  
2 kV

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 54 kg/km  
98 mm  
-25°C  
+70°C  
1,109 MJ/m  
23,00 kg/km

approx. 77 kg/km  
120 mm  
-25°C  
+70°C  
1,179 MJ/m  
30,00 kg/km

## Norms

Applicable standards:  
UL Style:

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in indoor applications. This is also a very economical solution of a BUS system.

## Part no.

**801572**, CAN BUS

**801573**, CAN BUS

Dimensions and specifications may be changed without prior notice.

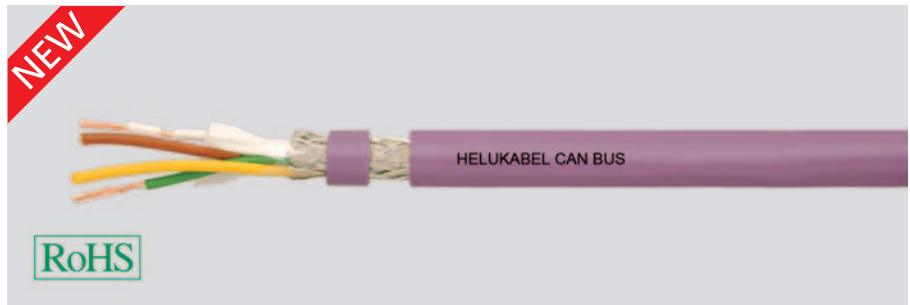
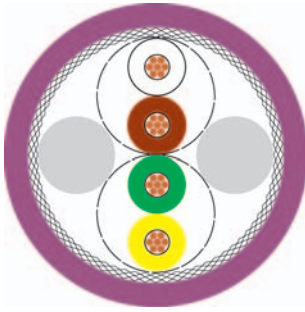


# BUS Cables

## CAN Bus



fixed installed



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Fixed installation, indoor 2x2x0.34 mm<sup>2</sup> (stranded)

Copper, bare (AWG 22/7)  
Foam-skin-PE  
wh/bn, gn/ye  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 8,5 mm ± 0,2 mm  
Violet similar to RAL 4001

### Electrical data

Characteristic impedance: 120 Ohm ± 10 %  
Conductor resistance, max.: 55,4 Ohm/km  
Insulation resistance, min.: 5 GOhm x km  
Loop resistance: 110 Ohm/km max.  
Mutual capacitance: 40 nF/km nom.  
Nominal voltage: 250 V  
Test voltage: 1,5 kV

### Technical data

Weight: approx. 85 kg/km  
bending radius, repeated: 130 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 1,32 MJ/m  
Copper weight: 46,00 kg/km

### Norms

Applicable standards: Profibus acc. to DIN 19245 T3 and EN50170  
UL Style: CMX 75°C (shielded)  
CSA standard: CSA FT1

### Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in indoor applications. This is also a very economical solution of a BUS system.

### Part no.

**803344**, CAN BUS

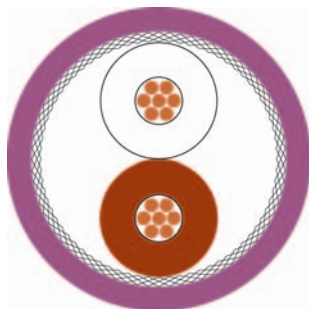
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL®**

fixed installed



## Type Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor 1x2x0.50 mm<sup>2</sup> (stranded)

Copper, bare (AWG 20/7)  
Foam-skin-PE  
wh/bn  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 7,0 mm ± 0,2 mm  
Violet similar to RAL 4001

## Fixed installation, indoor 4x1x0.50 mm<sup>2</sup> (stranded)

Copper, bare (AWG 20/7)  
Foam-skin-PE  
wh, bn, gn, ye  
Star quad  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 8,5 mm ± 0,2 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

120 Ohm ± 10 %  
37 Ohm/km  
1 GOhm x km  
74 Ohm/km max.  
50 nF/km nom.  
1,5 kV

120 Ohm ± 10 %  
37 Ohm/km  
1 GOhm x km  
74 Ohm/km max.  
65 nF/km nom.  
1,5 kV

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 69 kg/km  
105 mm  
-40°C  
+70°C  
1,09 MJ/m  
30,00 kg/km

approx. 100 kg/km  
128 mm  
-40°C  
+70°C  
1,64 MJ/m  
45,00 kg/km

## Norms

Applicable standards:  
UL Style:

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in indoor applications. This is also a very economical solution of a BUS system.

## Part no.

**800571**, CAN BUS

**800685**, CAN BUS

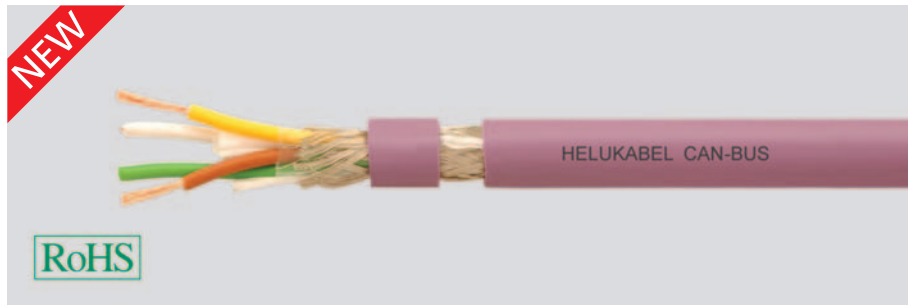
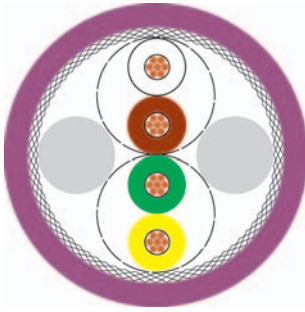
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL**

fixed installed



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor 2x2x0.50 mm<sup>2</sup> (stranded)

Copper, bare (AWG 20/7)  
Foam-skin-PE  
wh/bn, gn/ye  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 9,5 mm ± 0,2 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance: 120 Ohm ± 10 %  
Conductor resistance, max.: 34,4 Ohm/km  
Insulation resistance, min.: 5 GOhm x km  
Loop resistance: 68 Ohm/km max.  
Mutual capacitance: 40 nF/km nom.  
Nominal voltage: 250 V  
Test voltage: 1,5 kV

## Technical data

Weight: approx. 116 kg/km  
bending radius, repeated: 150 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 1,62 MJ/m  
Copper weight: 60,00 kg/km

## Norms

Applicable standards: Profibus acc. to DIN 19245 T3 and EN50170  
UL Style: CMX 75°C (shielded)  
CSA standard: CSA FT1

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in indoor applications. This is also a very economical solution of a BUS system.

## Part no.

**803722**, CAN BUS

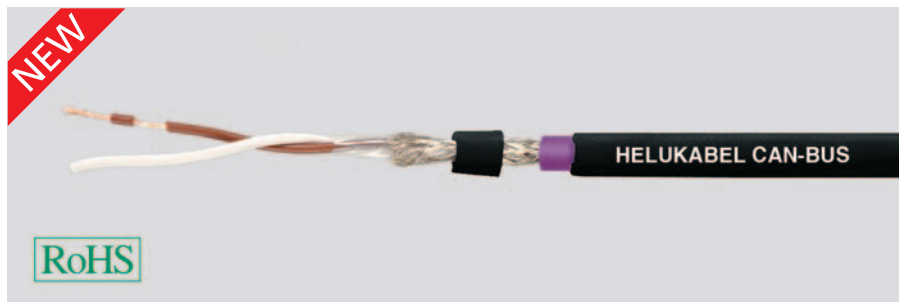
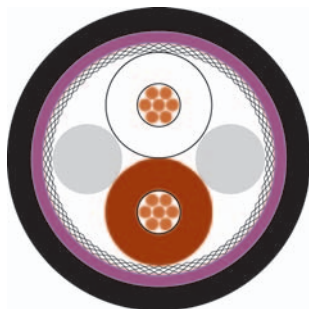
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL**

direct burial



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Inner sheath material:  
Shielding 2:  
Total shielding:  
Armouring:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Direct burial

#### 1x2x0.50 mm<sup>2</sup> (stranded)

Copper, bare (AWG 20/7)  
Foam-skin-PE  
wh/bn  
2 cores + 2 fillers stranded together  
Polyester foil over stranded bundle  
PVC  
-  
Cu braid, tinned  
PET/PA tape  
PE  
approx. 9,0 mm ± 0,4 mm  
Black similar to RAL 9005

### Direct burial

#### 4x1x0.50 mm<sup>2</sup> (stranded)

Copper, bare (AWG 20/7)  
Foam-skin-PE  
wh, bn, gn, ye  
Star quad  
Polyester foil over stranded bundle  
PVC  
-  
Cu braid, tinned  
PET/PA tape  
PE  
approx. 9,9 mm ± 0,4 mm  
Black similar to RAL 9005

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

120 Ohm ± 10 %  
37 Ohm/km  
1 GOhm x km  
74 Ohm/km max.  
50 nF/km nom.  
1,5 kV

120 Ohm ± 10 %  
37 Ohm/km  
1 GOhm x km  
74 Ohm/km max.  
58 nF/km nom.  
1,5 kV

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 105 kg/km  
150 mm  
-40°C  
+70°C  
2,05 MJ/m  
33,00 kg/km

approx. 115 kg/km  
160 mm  
-40°C  
+70°C  
2,18 MJ/m  
45,00 kg/km

## Norms

Applicable standards:

Profibus acc. to DIN 19245 T3 and EN50170

Profibus acc. to DIN 19245 T3 and EN50170

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in outdoor and direct burial applications. This is also a very economical solution of a BUS system.

## Part no.

**804268**, CAN BUS

**804269**, CAN BUS

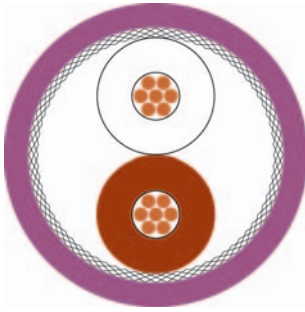
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL**

fixed installed



## Type Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor 1x2x0.75 mm<sup>2</sup> (stranded)

Copper, bare (AWG 18/19)  
Foam-skin-PE  
wh/bn  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 8,7 mm ± 0,3 mm  
Violet similar to RAL 4001

## Fixed installation, indoor 4x1x0.75 mm<sup>2</sup> (stranded)

Copper, bare (AWG 18/19)  
Foam-skin-PE  
wh/bn, gn/ye  
Star quad  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PVC  
approx. 8,8 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:

120 Ohm ± 15 %  
27,5 Ohm/km  
1 GOhm x km  
55 Ohm/km max.  
42 nF/km nom.  
300 V  
1,5 kV

120 Ohm ± 15 %  
27,5 Ohm/km  
1 GOhm x km  
55 Ohm/km max.  
42 nF/km nom.  
300 V  
1,5 kV

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 101 kg/km  
110 mm  
-40°C  
+70°C  
1,67 MJ/m  
40,00 kg/km

approx. 112 kg/km  
120 mm  
-40°C  
+70°C  
1,76 MJ/m  
58,00 kg/km

## Norms

Applicable standards:  
UL Style:  
CSA standard:

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571  
CSA FT1

Profibus acc. to DIN 19245 T3 and EN50170  
UL Style 2571  
CSA FT1

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The above mentioned types are suitable for fixed laying in indoor applications. This is also a very economical solution of a BUS system.

## Part no.

**803383**, CAN BUS

**803384**, CAN BUS

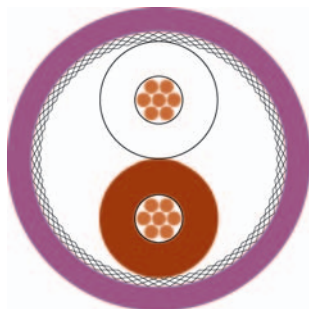
Dimensions and specifications may be changed without prior notice.

# BUS Cables

CAN Bus

**HELUKABEL**

Drag Chain



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Drag chain applications 1x2x0.25 mm<sup>2</sup> (stranded)

Copper, bare (AWG 24/19)  
PE  
wh/bn  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PUR  
approx. 6,2 mm ± 0,3 mm  
Violet similar to RAL 4001

### Drag chain applications 4x1x0.25 mm<sup>2</sup> (stranded)

Copper, bare (AWG 24/19)  
PE  
wh, bn, gn, ye  
Star quad  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PUR  
approx. 6,5 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:

120 Ohm ± 10 %  
85 Ohm/km  
1 GOhm x km  
170 Ohm/km max.  
50 nF/km nom.  
1,5 kV

120 Ohm ± 10 %  
85 Ohm/km  
1 GOhm x km  
170 Ohm/km max.  
50 nF/km nom.  
1,5 kV

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 40 kg/km  
90 mm  
-20°C  
+70°C  
0,798 MJ/m  
18,00 kg/kg

approx. 45 kg/km  
95 mm  
-20°C  
+70°C  
0,943 MJ/m  
25,00 kg/kg

## Norms

Applicable standards:

Profibus acc. to DIN 19245 T3 and EN50170

Profibus acc. to DIN 19245 T3 and EN50170

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The lines specified here are designed for highly flexible applications. This is also a very economical solution of a BUS system.

## Part no.

**81911**, CAN BUS, highly flexible

**81912**, CAN BUS, highly flexible

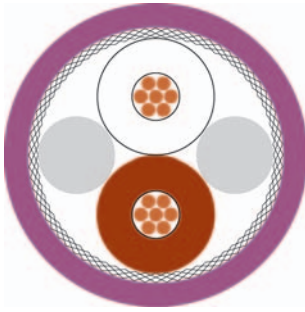
Dimensions and specifications may be changed without prior notice.

# Bus Cables

CAN Bus

**HELUKABEL**

Drag Chain, UL



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Drag chain applications 1x2x0.34 mm<sup>2</sup> (stranded)

Copper, bare (AWG 22/43)  
Foam-skin-PE  
wh/bn  
2 cores + 2 fillers stranded together  
-  
-  
Cu braid, tinned  
PUR  
approx. 6,9 mm ± 0,3 mm  
Violet similar to RAL 4001

### Drag chain applications 4x1x0.34 mm<sup>2</sup> (stranded)

Copper, bare (AWG 22/43)  
Foam-skin-PE  
wh/bn, gn/ye  
Star quad  
-  
-  
Cu braid, tinned  
PUR  
approx. 7,5 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:

120 Ohm ± 15 %  
56 Ohm/km  
5 GOhm x km  
170 Ohm/km max.  
40 nF/km nom.  
250 V  
1,5 kV

120 Ohm ± 15 %  
56 Ohm/km  
5 GOhm x km  
170 Ohm/km max.  
40 nF/km nom.  
250 V  
1,5 kV

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 54 kg/km  
105 mm  
-30°C  
+70°C  
1,20 MJ/m  
30,00 kg/km

approx. 64 kg/km  
130 mm  
-30°C  
+70°C  
1,20 MJ/m  
42,00 kg/km

## Norms

Applicable standards:  
UL Style:

Profibus acc. to DIN 19245 T3 and EN50170  
CMX 444

Profibus acc. to DIN 19245 T3 and EN50170  
CMX 444

## Application

The CAN bus series (control area network) is a variable field bus system. In the area of automation technology, complex controllers and control units are networked. Industries, such as the textile or construction machine industry and the medical technology, use this series. The lines specified here are designed for highly flexible applications where also a UL Certificate is required.

## Part no.

**802182**, CAN BUS, highly flexible

**802339**, CAN BUS, highly flexible

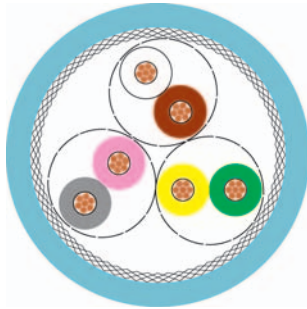
Dimensions and specifications may be changed without prior notice.

# BUS Cables

I-BUS



fixed installed



## Type Cable structure

Inner conductor diameter:  
Inner conductor diameter 2:  
Core insulation:  
Core insulation 2:  
Core colours:  
Core colours 2:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor 3x2x0.22 mm<sup>2</sup>

Copper, bare (AWG 24/7)  
-  
PE  
-  
wh/bn, gn/rd, ye/gn  
-  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, bare  
PVC  
approx. 7,0 mm ± 0,3 mm  
Pastel turquoise similar to RAL 6034

## Fixed installation, indoor 3x2x0.22 mm<sup>2</sup> + 3x1.0 mm<sup>2</sup>

Copper, bare (AWG 24/7)  
Copper, bare (AWG 17/56)  
PE  
PE  
wh/bn, gn/rd, ye/gn  
bu, rd, gnye  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, bare  
PVC  
approx. 8,0 mm ± 0,3 mm  
Pastel turquoise similar to RAL 6034

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

100 Ohm ± 15 Ohm  
96 Ohm/km  
1 GOhm x km  
192 Ohm/km max.  
60 nF/km nom.  
1 kV  
256 kHz < 1,5 dB/100m  
772 kHz < 2,4 dB/100m  
1 MHz < 2,7 dB/100m  
4 MHz < 5,2 dB/100m  
10 MHz < 8,4 dB/100m  
16 MHz < 11,2 dB/100m  
20 MHz < 11,9 dB/100m

100 Ohm ± 15 Ohm  
96 Ohm/km  
1 GOhm x km  
192 Ohm/km max.  
60 nF/km nom.  
1 kV  
256 kHz < 3,0 dB/100m  
772 kHz < 4,8 dB/100m  
1 MHz < 5,2 dB/100m  
4 MHz < 10,4 dB/100m  
10 MHz < 16,8 dB/100m  
16 MHz < 22,4 dB/100m  
20 MHz < 23,8 dB/100m

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 70 kg/km  
110 mm  
-40°C  
+70°C  
1,20 MJ/m  
35,00 kg/km

approx. 96 kg/km  
120 mm  
-40°C  
+70°C  
1,31 MJ/m  
68,00 kg/km

## Norms

Applicable standards:  
UL Style:

interbus specification 2.0, IEC61158  
UL Style 2571

interbus specification 2.0, IEC61158  
UL Style 2571

## Application

Interbus-S is an inexpensive way to network sensors and actuators with all standard automation instruments. The twisted two-core conductor is used as a standard transfer medium. This bus system replaces the expensive parallel cabling for the different signal types in the lower levels of automation technique and combines the cables in a single bus cable. Interbus components are connected with this long-distance BUS cable.

## Part no.

**80778**, I-BUS

**81202**, I-BUS

Dimensions and specifications may be changed without prior notice.

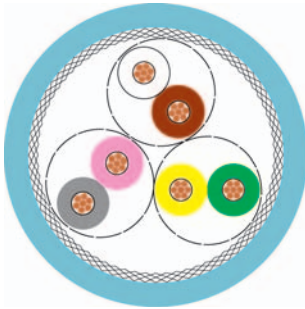


# BUS Cables

I-BUS



fixed installed, halogenfree



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor

### 3x2x0.22 mm<sup>2</sup>

Copper, bare (AWG 24/7)  
PE  
wh/bn, gn/rd, ye/gn  
Double core  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, bare  
PE  
approx. 7,0 mm ± 0,3 mm  
Pastel turquoise similar to RAL 6034

## Electrical data

Characteristic impedance: 100 Ohm ± 15 Ohm  
Conductor resistance, max.: 96 Ohm/km  
Insulation resistance, min.: 1 GOhm x km  
Loop resistance: 192 Ohm/km max.  
Mutual capacitance: 50 nF/km nom.  
Test voltage: 1 kV  
Attenuation:

256	kHz	< 1,5	dB/100m
772	kHz	< 2,4	dB/100m
1	MHz	< 2,7	dB/100m
4	MHz	< 5,2	dB/100m
10	MHz	< 8,4	dB/100m
16	MHz	< 11,2	dB/100m
20	MHz	< 11,9	dB/100m

## Technical data

Weight: approx. 67 kg/km  
bending radius, repeated: 110 mm  
Operating temperature range min.: -25°C  
Operating temperature range max.: +60°C  
Caloric load, approx. value: 1,10 MJ/m  
Copper weight: 35,00 kg/km

## Norms

Applicable standards: interbus specification 2.0, IEC61158

## Application

Interbus-S is an inexpensive way to network sensors and actuators with all standard automation instruments. The twisted two-core conductor is used as a standard transfer medium. This bus system replaces the expensive parallel cabling for the different signal types in the lower levels of automation technique and combines the cables in a single bus cable. Interbus components are connected with this long-distance BUS cable. The cable with halogenfree jacket is used for outdoor applications and in the food-industry.

## Part no.

**81557**, I-BUS

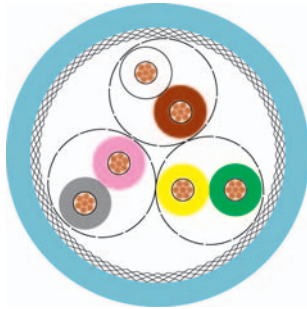
Dimensions and specifications may be changed without prior notice.

# BUS Cables

I-BUS



Drag Chain



## Type Cable structure

Inner conductor diameter:  
Inner conductor diameter 2:  
Core insulation:  
Core insulation 2:  
Core colours:  
Core colours 2:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications 3x2x0.25 mm<sup>2</sup>

Copper, bare (AWG 24/19)  
-  
PE  
-  
wh/bn, gn/rd, ye/gn  
-  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, bare  
PUR  
approx. 7,6 mm ± 0,3 mm  
Pastel turquoise similar to RAL 6034

## Drag chain applications 3x2x0.25 mm<sup>2</sup> + 3x1.0 mm<sup>2</sup>

Copper, bare (AWG 24/19)  
Copper, bare (AWG 17/65)  
PE  
PE  
wh/bn, gn/rd, ye/gn  
bu, rd, gnye  
Double core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PUR  
approx. 8,6 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

100 Ohm ± 15 Ohm  
96 Ohm/km  
1 GOhm x km  
192 Ohm/km max.  
60 nF/km nom.  
1 kV  
256 kHz < 1,5 dB/100m  
772 kHz < 2,4 dB/100m  
1 MHz < 2,7 dB/100m  
4 MHz < 5,2 dB/100m  
10 MHz < 8,4 dB/100m  
16 MHz < 11,2 dB/100m  
20 MHz < 11,9 dB/100m

100 Ohm ± 15 Ohm  
96 Ohm/km  
1 GOhm x km  
192 Ohm/km max.  
60 nF/km nom.  
1 kV  
256 kHz < 3,0 dB/100m  
772 kHz < 4,8 dB/100m  
1 MHz < 5,2 dB/100m  
4 MHz < 10,4 dB/100m  
10 MHz < 16,8 dB/100m  
16 MHz < 22,4 dB/100m  
20 MHz < 23,8 dB/100m

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 63 kg/km  
120 mm  
-20°C  
+70°C  
0,937 MJ/m  
36,00 kg/km

approx. 92 kg/km  
130 mm  
-20°C  
+70°C  
1,227 MJ/m  
70,00 kg/km

## Norms

Applicable standards:

interbus specification 2.0, IEC61158

interbus specification 2.0, IEC61158

## Application

Interbus-S is an inexpensive way to network sensors and actuators with all standard automation instruments. The twisted two-core conductor is used as a standard transfer medium. This bus system replaces the expensive parallel cabling for the different signal types in the lower levels of automation technique and combines the cables in a single bus cable. Interbus components are connected with this long-distance BUS cable. The above mentioned types are suitable for drag chain application.

## Part no.

**81203**, I-BUS

**82696**, I-BUS

Dimensions and specifications may be changed without prior notice.



## Type Cable structure

Profibus:	1 x 2 x AWG 22 mm <sup>2</sup> (Foam-Skin PO/rd/gn)
DeviceNet™:	2 x 2 x AWG 22 mm <sup>2</sup> (Foam-Skin PO/wh/bn, ye/gn)
Interbus:	1 x 2 x 0,25 mm <sup>2</sup> (Foam-Skin PO/ gn/pk, ye/gn)
Power cores:	4 x 1 x 1,0 mm <sup>2</sup> (PO/rd, bl, bu, bn)
Protective earth core:	1,0 mm <sup>2</sup> (PO/gnye)
Stranding:	Single cores totally stranded together and filled with plastic elements
Total shielding:	PP vlies
Outer sheath material:	PUR, halogenfree + flame resistant
Cable external diameter:	app. 14,4 mm
Outer sheath colour:	violet similar to RAL 4001

## Electrical data

Characteristic impedance:	150 + -15 Ohm (Profibus) 120 + -12 Ohm (DeviceNet™) 100 + -15 Ohm (Interbus)
Conductor resistance:	<= 20 Ohm/km (power cores + protection core) <= 70 Ohm/km (Profibus) <= 70 Ohm/km (DeviceNet™) <= 85,9 Ohm/km (Interbus)
Insulation resistance:	>= 500 Mohm x km (at 20° C)
Mutual capacitance:	30 pF/m nominal (Profibus) 40 pF/m nominal (DeviceNet™) 50 pF/m nominal (Interbus)
Testvoltage:	1500 V (core/ core) 1000 V (core/ screen)

## Mechanical data

Bending radius single:	<= 70 mm
Bending radius repeated:	<= 110 mm
Tensile strength static:	50 N/mm <sup>2</sup>
Tensile strength dynamic:	20 N/mm <sup>2</sup>
Oil resistance:	Diesel IRM 901,902,903, Bioethanol TMP68, Ecocut HFN 10LE
Flame resistance:	IEC 60332-1-2 and VW/FT1 acc. to C-UL
FCKW free:	yes
Self extinguishable:	yes
Other attributes:	PVC free, self extinguishable, siliconfree, Resistant against PVC flexibiliser and cable fat RB1

## Thermal attributes

Operating temperature range:	- 40° C to + 80° C
Laying temperature range:	- 30° C to + 75° C

## Norms

Profibus standard, DeviceNet™ standard, Interbus standard

## UL-Style

C-UL

## Application

Drag chains, torsion applications (according HELU spezifikation)

## Part no.

**801652**, Multibus I, 15 cores



## Type Cable structure

Profibus:  
DeviceNet™:  
Power cores 1:  
Power cores 2:  
Protective earth core:  
Stranding:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Multibus II, 15 cores high flexible

1 x 2 x 0,34 mm<sup>2</sup> (Foam-Skin PO/rd/gn)  
4 x 2 x 0,34 mm<sup>2</sup> (Foam-Skin PE/ye, or, wh, bu-ye, or, wh, bu)  
2 x 1,0 mm<sup>2</sup> (PO/rd, bl)  
2 x 1,5 mm<sup>2</sup> (PO/bu, bn)  
1,5 mm<sup>2</sup> (PO/gnye)  
Single cores totally stranded together and filled with plastic elements  
PP vlies  
PUR, halogenfree  
app. 15,0 mm  
violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
  
Conductor resistance:  
  
Insulation resistance:  
Mutual capacitance:  
  
Testvoltage:

150 + -15 Ohm (Profibus)  
100 + -15 Ohm (PROFinet)  
<= 20 Ohm/km (power cores + protection core)  
<= 70 Ohm/km (Profibus)  
<= 62 Ohm/km (PROFinet)  
>= 500 Mohm x km (at 20° C)  
30 pF/m nominal (Profibus)  
40 pF/m nominal (PROFinet)  
2500 V (core/ core)  
1500 V (core/ screen)

## Mechanical data

Bending radius single:  
Bending radius repeated:  
Tensile strength static:  
Tensile strength dynamic:  
Oil resistance:  
Flame resistance:  
FCKW free:  
Self extinguishable:  
Other attributes:

<= 70 mm  
<= 110 mm  
300 N  
140 N  
Diesel, Biodiesel, ASTM-Oil 1, ASTM-Oil 2, Vitam EHF, Biohydran  
HD 405.1, IEC 60332-1, VW1/ FT1 acc. C-UL  
yes  
yes  
PVC free, free of lacquer wetting disturbing substances, siliconfree,  
resistant against PVC flexibiliser and cable fat RB1

## Thermal attributes

Operating temperature range:  
Laying temperature range:

- 40° C to + 80° C  
- 20° C to + 80° C

## Norms UL-Style Application Part no.

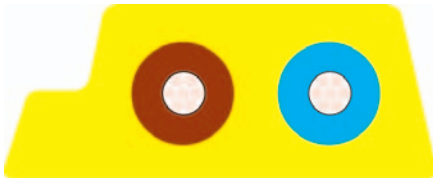
Profibus standard, PROFinet standard  
VW1/ FT1 acc. C-UL  
Drag chains, torsion applications (according HELU specification)  
**804115**, Multibus II, 15 cores

# BUS Cables

A-BUS

**HELUKABEL®**

EPDM



## Type Cable structure

Inner conductor:  
Core insulation:  
Core colours:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Outer sheath colour:

## Actuator Sensor Interface 2x1.5 mm<sup>2</sup>

Copper, tinned  
Rubber compound  
bu, bn  
-  
-  
-  
EPDM  
Yellow similar to RAL 1023

## Actuator Sensor Interface 2x1.5 mm<sup>2</sup>

Copper, tinned  
Rubber compound  
bu, bn  
-  
-  
-  
EPDM  
Black similar to RAL 9005

## Electrical data

Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Nominal voltage:  
Test voltage:

13,7 Ohm/km  
1 GOhm x km  
27 Ohm/km max.  
32 V  
1 kV at 15 min.

13,7 Ohm/km  
1 GOhm x km  
27 Ohm/km max.  
48 V  
1 kV at 15 min.

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 70 kg/km  
30 mm  
-40°C  
+85°C  
0,975 MJ/m  
31,00 kg/km

approx. 70 kg/km  
30 mm  
-40°C  
+85°C  
0,975 MJ/m  
31,00 kg/km

## Norms

Applicable standards: ASI standard

ASI standard

## Application

AS components are interconnected with this special system cable. With the AS interface, the cable assembly from the control system to the sensor/actuator is not needed. The AS interface is the field bus system that transmits both data and power in one single cable. With fast contacting in penetration technique, the possibility of errors in cabling is largely reduced. The special outer jacket provides protection against bio-oil, grease, and refrigerant lubricants, and the cable is therefore even suitable for applications in wet surroundings, in machinery and plant construction, as well as in the machine tool and automotive industry.

## Part no.

**80824**, A-BUS EPDM

**80825**, A-BUS EPDM

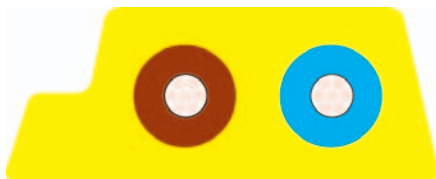
Dimensions and specifications may be changed without prior notice.

# BUS Cables

A-BUS

**HELUKABEL**

PUR, UL/CSA



## Type Cable structure

Inner conductor:  
Core insulation:  
Core colours:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Outer sheath colour:

## Actuator Sensor Interface 2x1.5 mm<sup>2</sup>

Copper, tinned  
PO  
bu, bn  
-  
-  
PUR  
Yellow similar to RAL 1023

## Actuator Sensor Interface 2x1.5 mm<sup>2</sup>

Copper, tinned  
PO  
bu, bn  
-  
-  
PUR  
Black similar to RAL 9005

## Electrical data

Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Nominal voltage:  
Test voltage:

13,7 Ohm/km  
1 GOhm x km  
27 Ohm/km max.  
32 V  
1 kV at 15 min.

13,7 Ohm/km  
1 GOhm x km  
27 Ohm/km max.  
48 V  
1 kV at 15 min.

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 64 kg/km  
30 mm  
-40°C  
+80°C  
0,965 MJ/m  
31,00 kg/km

approx. 64 kg/km  
30 mm  
-40°C  
+80°C  
0,965 MJ/m  
31,00 kg/km

## Norms

Applicable standards:  
UL Style:  
CSA standard:

ASI standard  
AWM Style 20549/10493  
CSA FT2

ASI standard  
AWM Style 20549/10493  
CSA FT2

## Application

AS components are interconnected with this special system cable. With the AS interface, the cable assembly from the control system to the sensor/actuator is not needed. The AS interface is the field bus system that transmits both data and power in one single cable. With fast contacting in penetration technique, the possibility of errors in cabling is largely reduced. The special outer jacket provides protection against oil, grease, and refrigerant lubricants, and the cable is therefore even suitable for applications in wet surroundings, in machinery and plant construction, as well as in the machine tool and automotive industry. The PUR variant is suitable for heavy-duty industrial environments. These types are certified for the American market (UL 1581, FT2) through the use of special materials.

## Part no.

**82434**, A-BUS PUR

**82822**, A-BUS PUR

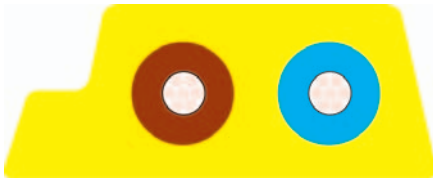
Dimensions and specifications may be changed without prior notice.

# BUS Cables

A-BUS

**HELUKABEL®**

TPE



## Type Cable structure

Inner conductor:  
Core insulation:  
Core colours:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Outer sheath colour:

## Actuator Sensor Interface 2x1.5 mm<sup>2</sup>

Copper, tinned  
TPE  
bu, bn  
-  
-  
-  
TPE  
Yellow

## Actuator Sensor Interface 2x1.5 mm<sup>2</sup>

Copper, tinned  
TPE  
bu, bn  
-  
-  
-  
TPE  
Black

## Electrical data

Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Nominal voltage:  
Test voltage:

13,7 Ohm/km  
1 GOhm x km  
27 Ohm/km max.  
32 V  
1,5 kV at 15 min.

13,7 Ohm/km  
1 GOhm x km  
27 Ohm/km max.  
48 V  
1,5 kV at 15 min.

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 70 kg/km  
24 mm  
-40°C  
+105°C  
1,10 MJ/m  
31,00 kg/km

approx. 70 kg/km  
24 mm  
-40°C  
+105°C  
1,10 MJ/m  
31,00 kg/km

## Norms

Applicable standards: ASI standard

ASI standard

## Application

AS components are interconnected with this special system cable. With the AS interface, the cable assembly from the control system to the sensor/actuator is not needed. The AS interface is the field bus system that transmits both data and power in one single cable. With fast contacting in penetration technique, the possibility of errors in cabling is largely reduced. The special outer jacket provides protection against many oils, grease, and refrigerant lubricants, and the cable is therefore even suitable for applications in wet surroundings, in machinery and plant construction, as well as in the machine tool and automotive industry.

## Part no.

**801846**, A-BUS TPE

**801847**, A-BUS TPE

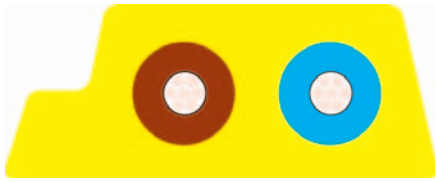
Dimensions and specifications may be changed without prior notice.

# BUS Cables

A-BUS

**HELUKABEL**

TPE, UL/CSA



## Type Cable structure

Inner conductor:  
Core insulation:  
Core colours:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Outer sheath colour:

## Actuator Sensor Interface 2x1.5 mm<sup>2</sup>

Copper, tinned  
TPE  
bu, bn  
-  
-  
TPE  
Yellow

## Actuator Sensor Interface 2x1.5 mm<sup>2</sup>

Copper, tinned  
TPE  
bu, bn  
-  
-  
TPE  
Black

## Electrical data

Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Nominal voltage:  
Test voltage:

13,7 Ohm/km  
1 GOhm x km  
27 Ohm/km max.  
32 V  
1,5 kV at 15 min.

13,7 Ohm/km  
1 GOhm x km  
27 Ohm/km max.  
48 V  
1,5 kV at 15 min.

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 70 kg/km  
24 mm  
-40°C  
+105°C  
1,10 MJ/m  
31,00 kg/km

approx. 70 kg/km  
24 mm  
-40°C  
+105°C  
1,10 MJ/m  
31,00 kg/km

## Norms

Applicable standards:  
UL Style:  
CSA standard:

ASI standard  
21439 nach UL 758  
CSA FT2

ASI standard  
21439 nach UL 758  
CSA FT2

## Application

AS components are interconnected with this special system cable. With the AS interface, the cable assembly from the control system to the sensor/actuator is not needed. The AS interface is the field bus system that transmits both data and power in one single cable. With fast contacting in penetration technique, the possibility of errors in cabling is largely reduced. The special outer jacket provides protection against many oils, grease, and refrigerant lubricants, and the cable is therefore even suitable for applications in wet surroundings, in machinery and plant construction, as well as in the machine tool and automotive industry. These variations are certified for the American market (UL 1581, FT2) through the use of special materials.

## Part no.

**801954**, A-BUS UL

**801955**, A-BUS UL

Dimensions and specifications may be changed without prior notice.

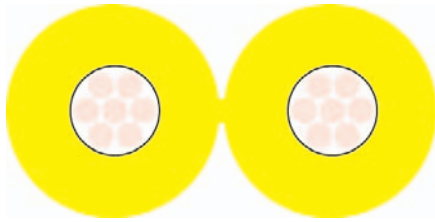


# BUS Cables

## AS-Interface



Electrical Cabinet FLIH



### Type Cable structure

Inner conductor:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Outer sheath colour:

### Fixed installation, indoor 2x0,86/ 2,5

Copper, tinned  
-  
-  
-  
FRNC  
Yellow

### Electrical data

Characteristic impedance: 105 Ohm  $\pm$  35 Ohm  
Conductor resistance, max.: 23 Ohm/km  
Insulation resistance, min.: 0,01 GOhm x km  
Loop resistance: 46 Ohm/km max.  
Nominal voltage: 300 V  
Test voltage: 2 kV at 15 min.

### Technical data

Weight: approx. 24 kg/km  
bending radius, repeated: 30 mm  
Operating temperature range min.: -25°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 0,30 MJ/m  
Copper weight: 20,00 kg/km

### Norms

Applicable standards: ASI standard  
UL Style: UL-Style 2440 (80°C/300V)

### Application

AS components are interconnected with this special system cable. With the AS interface, the cable assembly from the control system to the sensor/actuator is not needed. The AS interface is the field bus system that transmits both data and power in one single cable. With fast contacting in penetration technique, the possibility of errors in cabling is largely reduced. This type is especially constructed for cabling inside electrical cabinets.

### Part no.

**802183**, AS-Interface FLIH

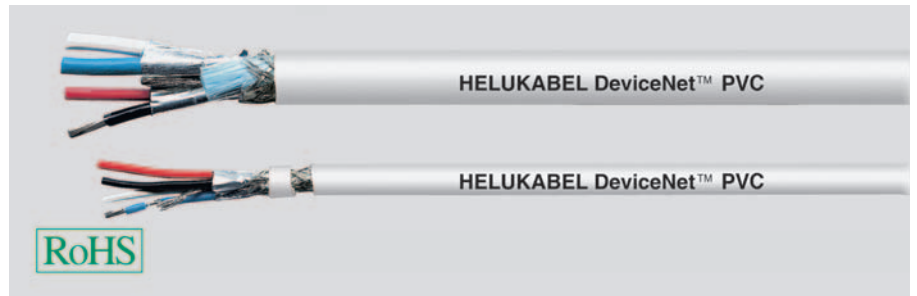
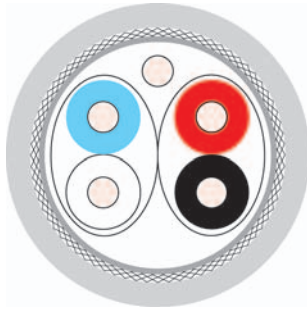
Dimensions and specifications may be changed without prior notice.

# BUS Cables

DeviceNet™

**HELUKABEL®**

PVC



## Type Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor 1x2xAWG18 + 1x2xAWG15

Copper, tinned (AWG 18/19)  
Copper, tinned (AWG 15/19)  
Foam-skin-PE  
PVC  
light bu, wh  
rd, bk  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
PVC  
approx. 12,2 mm ± 0,3 mm  
Grey

## Fixed installation, indoor 1x2xAWG24 + 1x2xAWG22

Copper, tinned (AWG 24/19)  
Copper, tinned (AWG 22/19)  
Foam-skin-PE  
PVC  
light bu, wh  
rd, bk  
Double core  
-  
Polyester foil, aluminium-lined  
Copper shifting, tinned  
yes  
PVC  
approx. 6,9 mm ± 0,3 mm  
Grey

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

120 Ohm ± 10 %  
22,6 Ohm/km  
0,2 GOhm x km  
45 Ohm/km max.  
39,8 nF/km nom.  
2 kV  
125 kHz < 0,42 dB/100m  
500 kHz < 0,81 dB/100m

120 Ohm ± 10 %  
90 Ohm/km  
0,2 GOhm x km  
180 Ohm/km max.  
39,8 nF/km nom.  
2 kV  
125 kHz < 0,95 dB/100m  
500 kHz < 1,64 dB/100m

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 192 kg/km  
190 mm  
-20°C  
+80°C  
2,92 MJ/m  
88,00 kg/km

approx. 67 kg/km  
110 mm  
-20°C  
+80°C  
0,91 MJ/m  
35,00 kg/km

## Norms

Applicable standards:  
UL Style:  
CSA standard:

ODVA DeviceNet  
CMG 75°C PLTC FT4  
CEC: CMG FT4

ODVA DeviceNet  
CMG 75°C PLTC FT4  
CSA FT 4

## Application

DeviceNet™ is a bus system developed by Allen Bradley (Rockwell Automation). These cables are used to interconnect various industrial devices, such as SPS controls or limit switches. The special characteristic of this bus system is that a data pair and a power supply pair are integrated in one cable. These cables with PVC sheath are designed for fixed installation.

## Part no.

**800683**, DeviceNet PVC

**800684**, DeviceNet PVC

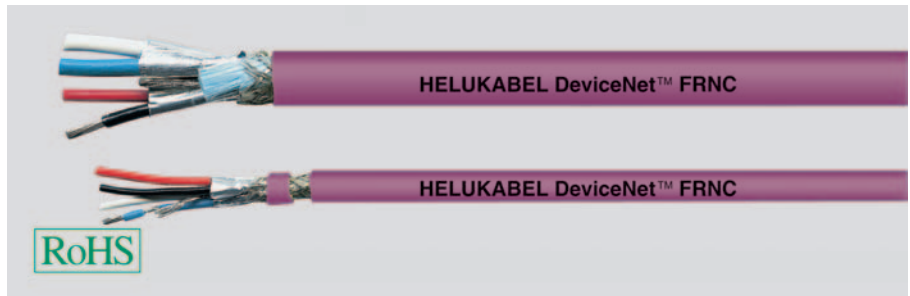
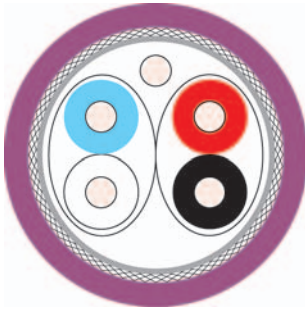
Dimensions and specifications may be changed without prior notice.

# BUS Cables

DeviceNet™

**HELUKABEL®**

FRNC



## Type Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor 1x2xAWG18 + 1x2xAWG15

Copper, tinned (AWG 18/19)  
Copper, tinned (AWG 15/19)  
Cell PE  
Cell PE  
light bu, wh  
rd, bk  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
FRNC  
approx. 12,2 mm ± 0,3 mm  
Violet similar to RAL 4001

## Fixed installation, indoor 1x2xAWG24 + 1x2xAWG22

Copper, tinned (AWG 24/19)  
Copper, tinned (AWG 22/19)  
Cell PE  
Cell PE  
light bu, wh  
rd, bk  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
FRNC  
approx. 6,9 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

120 Ohm ± 10 %  
22,6 Ohm/km  
0,2 GOhm x km  
45 Ohm/km max.  
39 nF/km nom.  
2 kV  
125 kHz < 0.42 dB/100m  
500 kHz < 0.81 dB/100m

120 Ohm ± 10 %  
90 Ohm/km  
0,2 GOhm x km  
180 Ohm/km max.  
39,8 nF/km nom.  
2 kV  
125 kHz < 0.95 dB/100m  
500 kHz < 1.64 dB/100m

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 195 kg/km  
190 mm  
-25°C  
+80°C  
2,73 MJ/m  
88,00 kg/km

approx. 70 kg/km  
110 mm  
-25°C  
+80°C  
0,82 MJ/m  
34,00 kg/km

## Norms

Applicable standards:  
UL Style:  
CSA standard:

ODVA DeviceNet  
CL2 CMG  
CEC: CMG FT4

ODVA DeviceNet  
CL2 CMG  
CEC: CMG FT4

## Application

DeviceNet™ is a bus system developed by Allen Bradley (Rockwell Automation). These cables are used to interconnect various industrial devices, such as SPS controls or limit switches. The special characteristic of this bus system is that a data pair and a power supply pair are integrated in one cable. These cables with FRNC sheath are designed for fixed installation.

## Part no.

**800681**, DeviceNet FRNC

**800682**, DeviceNet FRNC

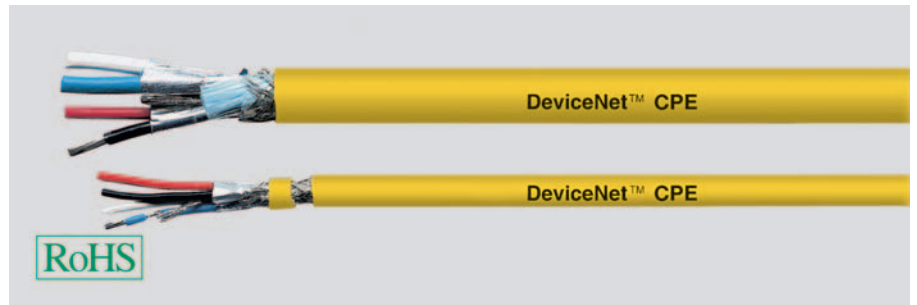
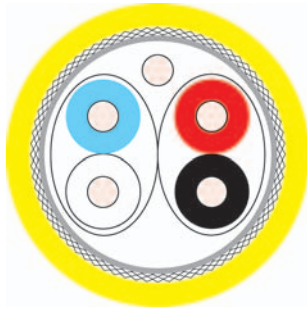
Dimensions and specifications may be changed without prior notice.

# BUS Cables

DeviceNet™



CPE



## Type Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Fixed installation, indoor 1x2xAWG18 + 1x2xAWG15

Copper, tinned (AWG 18/19)  
Copper, tinned (AWG 15/19)  
PE  
PE  
light bu, wh  
rd, bk  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
CPE  
approx. 12,0 mm ± 0,3 mm  
Yellow

## Fixed installation, indoor 1x2xAWG24 + 1x2xAWG22

Copper, tinned (AWG 24/19)  
Copper, tinned (AWG 22/19)  
PE  
PVC  
light bu, wh  
rd, bk  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
CPE  
approx. 7,0 mm ± 0,3 mm  
Yellow

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

120 Ohm ± 10 %  
22,6 Ohm/km  
0,2 GOhm x km  
45 Ohm/km max.  
39 nF/km nom.  
2 kV  
125 kHz < 0,43 dB/100m  
500 kHz < 0,82 dB/100m

120 Ohm ± 10 %  
90 Ohm/km  
0,2 GOhm x km  
180 Ohm/km max.  
39 nF/km nom.  
2 kV  
125 kHz < 0,95 dB/100m  
500 kHz < 1,64 dB/100m

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 195 kg/km  
190 mm  
-20°C  
+60°C  
2,73 MJ/m  
71,20 kg/km

approx. 70 kg/km  
110 mm  
-20°C  
+60°C  
0,82 MJ/m  
28,10 kg/km

## Norms

Applicable standards:  
UL Style:  
CSA standard:

ODVA DeviceNet  
CMG PLTC  
CEC: CMG FT4

ODVA DeviceNet  
CL2 CMG  
CEC: CMG FT4

## Application

DeviceNet™ is a bus system developed by Allen Bradley (Rockwell Automation). These cables are used to interconnect various industrial devices, such as SPS controls or limit switches. The special characteristic of this bus system is that a data pair and a power supply pair are integrated in one cable. These cables are designed for fixed installation.

## Part no.

**81907**, DeviceNet CPE

**81908**, DeviceNet CPE

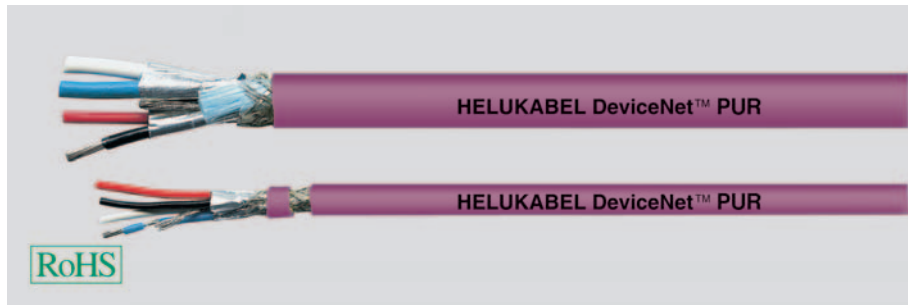
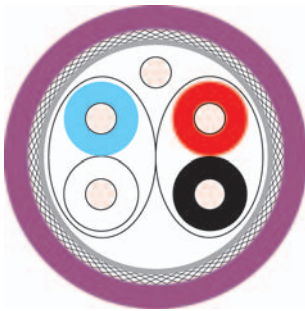
Dimensions and specifications may be changed without prior notice.

# BUS Cables

DeviceNet™



PUR, high flexible



## Type Cable structure

Inner conductor diameter 1:  
Inner conductor diameter 2:  
Core insulation 1:  
Core insulation 2:  
Core colours 1:  
Core colours 2:  
Stranding element 1:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Drag chain applications

### 1x2xAWG18 + 1x2xAWG15

Copper, tinned (AWG 18/40)  
Copper, tinned (AWG 15/84)  
Cell PE  
Cell PE  
light bu, wh  
rd, bk  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
PUR  
approx. 12,0 mm ± 0,3 mm  
Violet similar to RAL 4001

## Drag chain applications

### 1x2xAWG24 + 1x2xAWG22

Copper, tinned (AWG 24/19)  
Copper, tinned (AWG 22/19)  
Cell PE  
Cell PE  
light bu, wh  
rd, bk  
Double core  
-  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
PUR  
approx. 7,0 mm ± 0,3 mm  
Violet similar to RAL 4001

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Test voltage:  
Attenuation:

120 Ohm ± 10 %  
22,6 Ohm/km  
0,2 GOhm x km  
45 Ohm/km max.  
39,8 nF/km nom.  
2 kV  
125 kHz < 0,41 dB/100m  
500 kHz < 0,82 dB/100m

120 Ohm ± 10 %  
90 Ohm/km  
0,2 GOhm x km  
45 Ohm/km max.  
39,8 nF/km nom.  
2 kV  
125 kHz < 0,95 dB/100m  
500 kHz < 1,64 dB/100m

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 185 kg/km  
61 mm  
-40°C  
+80°C  
2,54 MJ/m  
90,00 kg/km

approx. 68 kg/km  
70 mm  
-40°C  
+80°C  
0,76 MJ/m  
35,00 kg/km

## Norms

Applicable standards:  
UL Style:

ODVA DeviceNet  
CMX 75°C CL2X

ODVA DeviceNet  
CMX 75°C CL2X

## Application

DeviceNet™ is a bus system developed by Allen Bradley (Rockwell Automation). These cables are used to interconnect various industrial devices, such as SPS controls or limit switches. The special characteristic of this bus system is that a data pair and a power supply pair are integrated in one cable. These cables with PUR sheath are designed for highly flexible applications.

## Part no.

**81909**, DeviceNet PUR

**81910**, DeviceNet PUR

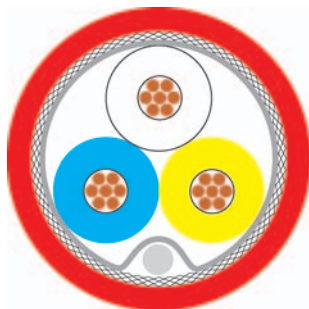
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## CC-Link BUS



PVC



### Type

#### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Fixed installation, indoor

#### 3x0.5 mm<sup>2</sup>

Copper, bare (AWG 20/7)  
Cell PE  
wh, bu, ye  
Triple core  
Polyester foil over stranded bundle  
Polyester foil, aluminium-lined  
Cu braid, tinned  
yes  
PVC  
approx. 7,7 mm ± 0,3 mm  
Red

### Electrical data

Characteristic impedance: 110 Ohm ± 15 Ohm  
Conductor resistance, max.: 37,8 Ohm/km  
Insulation resistance, min.: 10 GOhm x km  
Loop resistance: 75 Ohm/km max.  
Mutual capacitance: 60 nF/km nom.  
Test voltage: 2 kV  
Attenuation: 1 MHz < 16,0 dB/100m  
5 MHz < 35,0 dB/100m

### Technical data

Weight: approx. 77 kg/km  
bending radius, repeated: 120 mm  
Operating temperature range min.: -40°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 1,10 MJ/m  
Copper weight: 40,00 kg/km

### Norms

Applicable standards: CC-Link Specification 1.10  
UL Style: CM 75°C or PLTC  
CSA standard: CSA FT 4

### Application

The CC link (control and communication link) is a field bus system that is used in the area of testing, sensors and actuators. The main target market is Asia, but the USA and Great Britain also rely more and more on CC link. As an option, a version with power supply cores is available. It is used particularly in channels.

### Part no.

**800497**, CC-Link communications cable

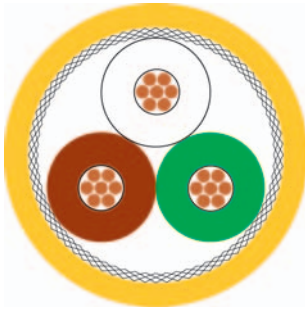
Dimensions and specifications may be changed without prior notice.

# BUS Cables

SafetyBUS

**HELUKABEL**

FRNC + PUR



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Fixed installation, indoor 3x0,75 mm<sup>2</sup> (stranded)

Copper, bare (AWG 18/24)  
PO  
wh, bn, gn  
Triple core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
FRNC  
approx. 7,5 mm ± 0,3 mm  
Yellow similar to RAL 1003

### Drag chain applications 3x0,75 mm<sup>2</sup> (stranded)

Copper, bare (AWG 18/96)  
PO  
wh, bn, gn  
Triple core  
Polyester foil over stranded bundle  
-  
Cu braid, tinned  
PUR  
approx. 7,8 mm ± 0,3 mm  
Yellow similar to RAL 1003

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:  
Attenuation:

110 Ohm ± 10 Ohm  
26 Ohm/km  
5 GOhm x km  
52 Ohm/km max.  
45 nF/km nom.  
250 V  
3 kV  
1 MHz < 1,6 dB/Km  
5 MHz < 3,4 dB/Km  
10 MHz < 5,6 dB/Km  
16 MHz < 7,5 dB/Km

110 Ohm ± 10 Ohm  
26 Ohm/km  
5 GOhm x km  
52 Ohm/km max.  
45 nF/km nom.  
250 V  
3 kV  
1 MHz < 1,6 dB/Km  
5 MHz < 3,4 dB/Km  
10 MHz < 5,6 dB/Km  
16 MHz < 7,5 dB/Km

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 68 kg/km  
75 mm  
-25°C  
+80°C  
0,72 MJ/m  
50,00 kg/km

approx. 65 kg/km  
80 mm  
-30°C  
+80°C  
0,76 MJ/m  
50,00 kg/km

## Norms

Applicable standards:  
UL Style:

abutted at SafetyBUS p technical guidelines  
copper wires 1.0  
-

abutted at SafetyBUS p technical guidelines  
copper wires 1.0  
CMX 75°C (shielded)

## Application

SafetyBUS p is an open bus system for the serial transfer of safety-related data. It is based on the CAN (Controller Area Network) protocol. From this technology benefit the users in several areas like the automotive industry or the process automation. The above mentioned types are suitable for fixed installations and as well as for drag chains (PUR).

## Part no.

**800651**, SafetyBus p

**800652**, SafetyBus p

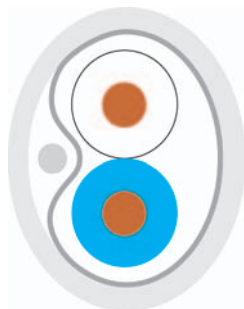
Dimensions and specifications may be changed without prior notice.

# BUS Cables

LON BUS

**HELUKABEL**

H112 + Y116



## Type

### Cable structure

Inner conductor diameter:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Fixed installation, indoor 1x2xAWG 22/1

Copper, bare (AWG 22/1)  
PE  
wh, bu  
Double core  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
yes  
FRNC  
approx. 4,4 mm ± 0,3 mm  
White

### Mobile use 1x2xAWG 16/19

Copper, bare (AWG 16/19)  
PVC  
wh, bk  
Double core  
Polyester foil over stranded bundle  
-  
-  
-  
PVC  
approx. 7,0 mm ± 0,4 mm  
Grey

### Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:  
Nominal voltage:  
Test voltage:

100 Ohm ± 10 %  
57 Ohm/km  
5 GOhm x km  
114 Ohm/km max.  
45 nF/km nom.  
125 V  
0,7 kV

85 Ohm ± 15 %  
15,8 Ohm/km  
0,02 GOhm x km  
31 Ohm/km max.  
10 nF/km nom.  
300 V  
2 kV

### Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 24 kg/km  
70 mm  
-20°C  
+75°C  
0,337 MJ/m  
11,00 kg/km

approx. 71 kg/km  
85 mm  
-20°C  
+80°C  
1,25 MJ/m  
30,00 kg/km

### Application

The LON bus (Local Operating Network) is a system used in building automation systems. It has the great advantage that it allows usage of different transmission media. It is used in the interior as hard wiring (H122) and as patch cable (Y116) and must be made in accordance with DIN EN 50090-2-2 (VDE 0892 Part 2-2:1997-06).

### Part no.

**802187**, LON H122

**802188**, LON Y116

Dimensions and specifications may be changed without prior notice.



# BUS Cables

E-BUS

**HELUKABEL®**

PVC



## Type

### Cable structure

Inner conductor:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### 2-pairs 2x2x0.8 mm

Copper, bare  
PVC  
wh, ye, rd, bk  
Star quad  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
yes  
PVC  
approx. 6,6 mm ± 0,3 mm  
Blue Lilac similar to RAL 4005

### 2-pairs 2x2x0.8 mm

Copper, bare  
PVC  
wh, ye, rd, bk  
Star quad  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
yes  
PVC  
approx. 6,6 mm ± 0,3 mm  
Green similar to RAL 6010

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:

100 Ohm  
73,2 Ohm/km  
0,1 GOhm x km  
146 Ohm/km max.  
100 nF/km nom.

100 Ohm  
73,2 Ohm/km  
0,1 GOhm x km  
146 Ohm/km max.  
100 nF/km nom.

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 54 kg/km  
95 mm  
-30°C  
+70°C  
0,90 MJ/m  
25,00 kg/km

approx. 54 kg/km  
95 mm  
-30°C  
+70°C  
0,90 MJ/m  
25,00 kg/km

## Norms

Applicable standards: EIB standard

EIB standard

## Application

The E-bus cable is used for the transmission of bus signals for intelligent systems in buildings. The cables ensure perfect communication in accordance with EIB regulations (European installation bus). They can be laid over, in, or below the plaster, in pipes and pipe ducts, in dry, moist, and wet areas, as well as outside, provided they are protected against direct exposure to the sun. Wiring together with high-power supply cables is possible without limitation. The EIB bus can be used to control lighting, blinds, heating, ventilation, indicator boards, etc.

## Part no.

**81081**, E-BUS

**81663**, E-BUS

Dimensions and specifications may be changed without prior notice.

# BUS Cables

E-BUS

**HELUKABEL**

FRNC + PVC



## Type Cable structure

Inner conductor:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## 2-pairs 2x2x0.8 mm

Copper, bare  
PE  
wh, ye, rd, bk  
Star quad  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
yes  
FRNC  
approx. 6,6 mm ± 0,3 mm  
Blue Lilac similar to RAL 4005

## 4-pairs 4x2x0.8 mm

Copper, bare  
PVC  
wh, ye, rd, gn, bu, bn, wh, wh  
Double core  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
yes  
PVC  
approx. 8,2 mm ± 0,4 mm  
Blue Lilac similar to RAL 4005

## Electrical data

Characteristic impedance:  
Conductor resistance, max.:  
Insulation resistance, min.:  
Loop resistance:  
Mutual capacitance:

100 Ohm  
73,2 Ohm/km  
0,1 GOhm x km  
146 Ohm/km max.  
100 nF/km nom.

100 Ohm  
73,2 Ohm/km  
0,1 GOhm x km  
146 Ohm/km max.  
100 nF/km nom.

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

approx. 54 kg/km  
95 mm  
-30°C  
+70°C  
0,58 MJ/m  
25,00 kg/km

approx. 92 kg/km  
120 mm  
-30°C  
+70°C  
1,37 MJ/m  
41,00 kg/km

## Norms

Applicable standards:

EIB standard

EIB standard

## Application

The E-bus cable is used for the transmission of bus signals for intelligent systems in buildings. The cables ensure perfect communication in accordance with EIB regulations (European installation bus). They can be layed over, in, or below the plaster, in pipes and pipe ducts, in dry, moist, and wet areas, as well as outside, provided they are protected against direct exposure to the sun. Wiring together with high-power supply cables is possible without limitation. The EIB bus can be used to control lighting, blinds, heating, ventilation, indicator boards, etc.

## Part no.

**80826**, E-BUS

**81077**, E-BUS

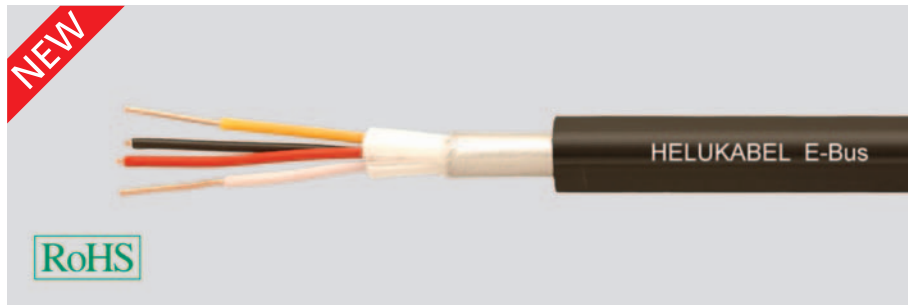
Dimensions and specifications may be changed without prior notice.

# BUS Cables

## E-BUS DIRECT BURIAL



PE, ERD



### Type

#### Cable structure

Inner conductor:  
Core insulation:  
Core colours:  
Stranding element:  
Shielding 1:  
Shielding 2:  
Total shielding:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

### Direct burial

#### 2x2x0.8 mm

Copper, bare  
PE  
wh, ye, rd, bk  
Star quad  
Polyester foil over stranded bundle  
-  
Polyester foil, aluminium-lined  
PE  
approx. 8,8 mm ± 0,3 mm  
Black similar to RAL 9005

### Electrical data

Characteristic impedance: 100 Ohm  
Conductor resistance, max.: 73,2 Ohm/km  
Insulation resistance, min.: 5 GOhm x km  
Loop resistance: 146 Ohm/km max.  
Mutual capacitance: 55 nF/km nom.  
Test voltage: 0,8 kV

### Technical data

Weight: approx. 75 kg/km  
bending radius, repeated: 130 mm  
Operating temperature range min.: -20°C  
Operating temperature range max.: +70°C  
Caloric load, approx. value: 2,00 MJ/m  
Copper weight: 25,00 kg/km

### Norms

Applicable standards: EIB standard

### Application

The E-bus cable is used for the transmission of bus signals for intelligent systems in buildings. The cables ensure perfect communication in accordance with EIB regulations (European installation bus). They can be laid over, in, or below the plaster, in pipes and pipe ducts, in dry, moist, and wet areas, as well as outside, provided they are protected against direct exposure to the sun. Wiring together with high-power supply cables is possible without limitation. The EIB bus can be used to control lighting, blinds, heating, ventilation, indicator boards, etc.

### Part no.

**802800**, E-BUS BURIAL

Dimensions and specifications may be changed without prior notice.

# BUS Cables

KH-BUS

**HELUKABEL**

PVC + FRNC



## Type Cable structure

Inner conductor, power core:  
Inner conductor, data core:  
Core insulation, power core:  
Core insulation, data core:  
Core colours, power core:  
Core colours, data core:  
Stranding element, data core:  
Shielding, data pair:  
Drain wire:  
Outer sheath material:  
Cable external diameter:  
Outer sheath colour:

## Electrical data

Insulation resistance, min.:  
Mutual capacitance:  
Test voltage:

## Technical data

Weight:  
bending radius, repeated:  
Operating temperature range min.:  
Operating temperature range max.:  
Caloric load, approx. value:  
Copper weight:

## Application

For computer-based patient calling systems, easy and quick installation is an important factor. Therefore a 6-core bus cable is used to connect the components of the calling system. This cable is used for the transmission of power, data, and voice.

## Part no.

Dimensions and specifications may be changed without prior notice.

## Hospital-Bus 2x1.5mm<sup>2</sup> (stranded) + 2x2x0.60 mm (solid)

Copper, bare  
Copper, tinned  
PVC  
PE  
rd, bu  
gn/ye, gy/pk  
Double core  
PP foil + aluminium-lined foil + PP foil  
yes  
PVC  
approx. 8,0 mm ± 0,3 mm  
Green similar to RAL 6001

0,02 GOhm x km  
70 nF/km nom.  
2 kV

approx. 90 kg/km  
120 mm  
-30°C  
+80°C  
1,01 MJ/m  
53,00 kg/km

## Hospital-Bus 2x1.5mm<sup>2</sup> (stranded) + 2x2x0.60 mm (solid)

Copper, bare  
Copper, tinned  
PE  
PE  
rd, bu  
gn/ye, gy/pk  
Double core  
PP foil + aluminium-lined foil + PP foil  
yes  
FRNC  
approx. 8,0 mm ± 0,3 mm  
Green similar to RAL 6001

0,02 GOhm x km  
70 nF/km nom.  
2 kV

approx. 93 kg/km  
120 mm  
-30°C  
+80°C  
0,86 MJ/m  
53,00 kg/km



# Copper connection equipment

## Copper connection equipment

Photo: HELUKABEL®

In addition to active components and cables, passive components such as 19" patch panel, patch cable and wiring boxes are necessary for installation and start-up of a data network. A typical example of the application of the patch panel can be seen in the floor distributor, either in connection with the secondary wiring or at the tertiary level. At the tertiary level, the patch panel forms the beginning of the wiring path, which ends at the data socket on the opposite side. In this function, the copper patch panel forms a central component within the structured wiring. The wiring boxes are an important part of both the tertiary wiring and the structured wiring as a whole. These systems, which are also referred to as „IT connection units“, can be installed in floors, walls or a channel system. No additional components are used in the wiring boxes. Also used in conjunction with

the wiring boxes are sockets that fit the plug of the patch / connection cable. RJ 45 cables are classified as either patch or connection cables, depending on their use. For operation of the data networks, HELUKABEL® provides complete CONNECTING SYSTEMS, which make it possible to ensure the full reliability and state-of-the-art functioning of the structured building wiring.



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# Complete system solutions



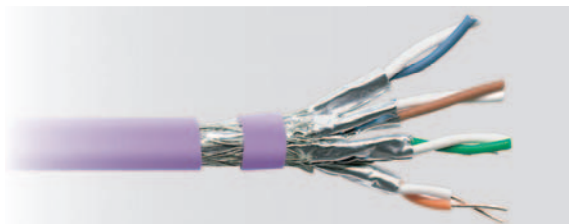
As a result of the drastic growth of the volume of data handled by data and network systems together with subsequently lower tolerance deviations allowed in relation to standard specifications, ensuring the optimum level of component integration and efficiency is sure to be a vital factor in the creation of successful systems in the future.



**Guaranteed Quality**

**Certificated Systems**

**Future orientated**



In recent years, **HELUKAT®** has earned an excellent reputation in the area of structured copper data wiring. Superior quality combined with expert technical assistance and prompt delivery to customers is what makes **HELUKABEL®** the brand of choice.

With **HELUKAT CONNECTING SYSTEMS®**, we have come full circle to provide you with a complete wiring system comprising everything from the installation cable, patch panels and RJ45 sockets all the way to patch cables and data cabinets. To provide customers and users with a sufficient level of transparency, components have been subjected to

a non-based examination carried out according to the channel link. The GHMT company has certified our products for category 6 and classes D, E and Ea.

Simply specify the network structures you need, and let the superior quality and reliability of **HELUKAT CONNECTING SYSTEMS®** do the rest

# Modular system RJ45



Category 6 / class E+ Category 6E<sub>A</sub>

## Type

Plug type:  
Pin Code:  
Screening:  
Colour:  
Category:  
Part no.:  
Packing unit:

## Jack

RJ45 8(8)  
1-2/3-6/4-5/7-8  
yes  
metallic  
6<sub>A</sub>  
**802377**                      **6**  
**802916**  
12



## Type

Version:  
Module type:  
colour:  
Max. number of modules:  
Part no.:  
Packing unit:

## Panel

Modular panel  
RJ45  
Grey similar to RAL 7035  
24  
**802376**  
1



## Type

Version:  
Module type:  
colour:  
Max. number of modules:  
Part no.:  
Packing unit:

## Outlet

Support for module  
RJ45  
Pure White similar to RAL 9010  
3                                      2                                      1  
**802986**                      **802378**                      **802985**  
4



## Accessories

Part no.	Description
<b>802988</b>	Floor tank frame set 3x3-port empty for Keystone System HELUKAT
<b>802987</b>	Floor tank frame set 2x3-port empty for Keystone System HELUKAT
<b>802990</b>	Dust Protection grey for Keystonesystems HELUKAT
<b>804286</b>	Dust Protection black for Keystonesystems HELUKAT



## Norms and standards

Modular system components:  
**802377:** up to 500 MHz (10 GBit Ethernet) according Category 6E<sub>A</sub> EIA/TIA 568-B.2-10, IEC 60603-7-51, ISO/IEC 11801 (Amendment 1 2008-4), ISO/IEC TR-24750 and EN 55022 (EMV)  
**802916:** up to 250 MHz (Gbit Ethernet) according Category 6 EIA/TIA 568-C.2 (2009-08), ISO/IEC 11801 (Amendment AMD2, 2009-04), EN 50173-1 (2007-12) and EN 55022 (EMV)  
The system consists of socket (jack with dust protection and integrated strain relief) panel with a maximum of 24 ports; data socket (max. 3x) either UP or AP.

## Application

As floor distributor in applications of digital and analog image, data and voice transmission.

Dimensions and specifications may be changed without prior notice.



## Certificate

No. z2912a-12-E

**Customer:**  
 HELUKABEL GmbH  
 Dieselstrasse 8-12  
 D-71282 Hemmingen

**Test sample(s):**

- Connector:  
**HELUKAT CONNECTING SYSTEMS®**  
 RJ Modular Jack Cat.6EA  
 Part No.: 802377
- Data Cable:  
**HELUKAT® 600 S-STP (4x2xAWG23/1) FRNC**  
 Part No.: 803898; 803897; 80810; 81446

**Applied standard(s):**

- ISO/IEC 11801 AMD 2 (2010-04)

**Results:**  
 Up to a bandwidth of **500 MHz** the sample meets the **Class E<sub>A</sub>** limits of the specified standards and regulations.

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**2-Connector Permanent Link, Class E<sub>A</sub>**

The test results which were determined in the course of the measurement refer to the submitted specimen. Any future technical modifications of the verified Products are subject to the responsibility of the manufacturer.  
 This Certificate refers to the comprehensive test report, no. **P2912a-12-E**, dated **April 10<sup>th</sup>, 2012** and shall only be applicable in conjunction with the test report.

Bexbach, April 10<sup>th</sup>, 2012

Dirk Wilhelm, engineer  
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## Certificate

No. z2913a-12-E

**Customer:**  
 HELUKABEL GmbH  
 Dieselstrasse 8-12  
 D-71282 Hemmingen

**Test sample(s):**

- Connector:  
**HELUKAT CONNECTING SYSTEMS®**  
 RJ Modular Jack Kat.6  
 Part No.: 802916
- Data Cable:  
**HELUKAT® 600 S-STP (4x2xAWG23/1) FRNC**  
 Part No.: 803898; 803897; 80810; 81446

**Applied standard(s):**

- ISO/IEC 11801 AMD 2 (2010-04)

**Results:**  
 Up to a bandwidth of **250 MHz** the sample meets the **Class E** limits of the specified standards and regulations.

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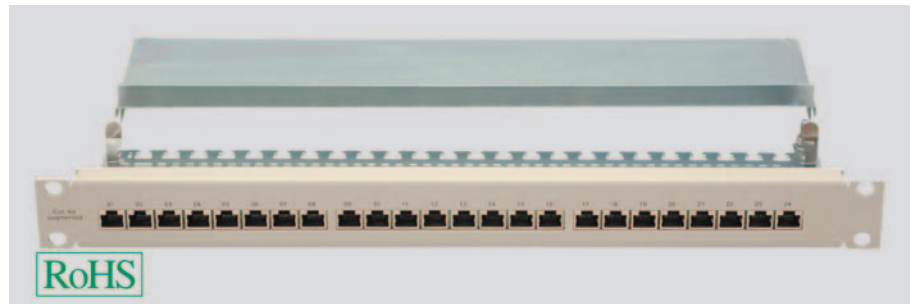
**2-Connector Permanent Link, Class E**

The test results which were determined in the course of the measurement refer to the submitted specimen. Any future technical modifications of the verified Products are subject to the responsibility of the manufacturer.  
 This Certificate refers to the comprehensive test report, no. **P2913a-12-E**, dated **April 10<sup>th</sup>, 2012** and shall only be applicable in conjunction with the test report.

Bexbach, April 10<sup>th</sup>, 2012

Dirk Wilhelm, engineer  
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 Email: info@ghmt.de



## Type

## Patch panel category 24P 6EA 500MHz

### Configuration

Housing material:	Steel plate, solid
Colour:	Grey similar to RAL 7035
Board:	3x8 mother board, number-coded
Push-on connector type:	RJ45(8/8)
Number of bushes:	24
Type of screen:	Overall screen
Screen removal:	metalized cable straps
Strain relief:	by means of cable straps
Cover lock:	Quick-action snap cover

### Connecting system

Connection type:	LSA plus - insulation piercing connections
Suitable for cable diameter:	0.4 - 0.64mm (AWG 26 - 22)
Insulation diameter, min.:	0,7 - 1,6 mm (PE)

### Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

### Dimension

Width:	483 mm
Depth:	125 mm
Number of height modules (HM):	1
Fastening dimensions:	19"

### Norms and standards

HELUKAT CONNECTING SYSTEMS® system component up to 500 MHz (10 GBit Ethernet) in accordance with category 6a EIA/TIA 568-B.2-10, IEEE 802.3an TM-2006, ISO/IEC 11801 (Amendment 1 JTC 1/SC N1255), ISO/IEC TR-24750 and EN 55022 (EMV).

### Application

As floor distributor in applications of digital and analog image, data and voice transmission.

### Part no.

**802024**

Dimensions and specifications may be changed without prior notice.

### Packing unit

**1**



## Type

**RJ-45 UP socket 2P cat. 6a  
500MHz vertical**

**RJ-45 UP socket 2P cat. 6a  
500MHz horizontal**

## Configuration

Housing material:  
Colour:  
Board:  
Push-on connector type:  
Outlet direction:  
Number of bushes:  
Type of screen:  
Strain relief:  
Cable inlet:

Die-cast, shielded  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
Overall screen  
via pre-installed cable clips  
vertical

Die-cast, shielded  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
Overall screen  
via pre-installed cable clips  
horizontal

## Connecting system

Connection type:  
Suitable for cable diameter:  
Insulation diameter, min.:

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,6 mm (PE)

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,6 mm (PE)

## Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

EIA/TIA 568 A + EIA/TIA 568 B

## Dimension

Dimensions of central plate:  
Installation dimensions:

50 x 50mm  
50 x 50 x 32mm

50 x 50mm  
50 x 50 x 32mm

## Norms and standards

HELUKAT CONNECTING SYSTEMS® system component up to 500 MHz (10 GBit Ethernet) in accordance with category 6a EIA/TIA 568-B.2-10, IEEE 802.3an TM-2006, ISO/IEC 11801 (Amendment 1 JTC 1/SC N1255), ISO/IEC TR-24750 and EN 55022 (EMV).

## Application

As workstation interface in applications of digital and analog image, data and voice transmission. Available as in-wall version (channel) and top-mount version (wall).

## Part no.

**802025**

**802034**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**10**

**10**



## Type

### Cable

Designation:  
Sheath material:  
Frequency:

## Patch cable S-STP halogenfree, Cat.6a 500 MHz (10GBit)

S-STP 4x2xAWG 26/7 LSZH  
LSZH  
up to 500 MHz

### Plug

Push-on connector type 1:  
Push-on connector type 2:  
Pin assignment:

RJ45 8(8)  
RJ45 8(8)  
1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

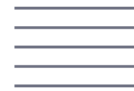
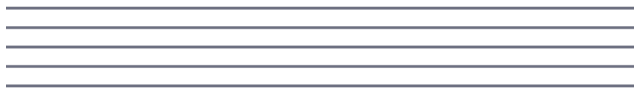
### Norms and standards

HELUKAT CONNECTING SYSTEMS® system components up to 500 MHz (10Gbit) in the of category 6a or Class E in accordance with ISO 11801, 2nd edition, EN 50173, 2nd edition, and EIA/TIA 568 B.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>802380</b>	grey	1,0	10
<b>802381</b>	grey	2,0	10
<b>802382</b>	grey	3,0	10
<b>802383</b>	grey	5,0	10
<b>802384</b>	grey	7,5	10
<b>802385</b>	grey	10,0	10
<b>804287</b>	grey	15,0	10

Dimensions and specifications may be changed without prior notice.



# Certificate

**Customer:** **HELUKABEL® GmbH**  
 Dieselstr. 8-12  
 D-71282 Hemmingen

**Description:**

Modul	<b>HELUKAT CONNECTING SYSTEMS®</b> Modularsystem Keystone Cat. 6EA 500 MHz Part-No.: 802377
Connector	<b>HELUKAT CONNECTING SYSTEMS®</b> Connector Cat. 7 to connect Data Cables
Data Cable 1 x 84m 2 x 3m	<b>HELUKAT® 600MHz</b> Data Cable S-STP 4x2xAWG23/1 FRNC 600MHz Part-No.: 80810
Patchcord 2 x 5m	<b>HELUKAT CONNECTING SYSTEMS®</b> S-STP 4x2xAWG26/7 FRNC 600MHz RJ45 Category 6 (Stewart 39), Length 5,0m

**Applied standards:**

- ISO/IEC 11801 Amendment 1: 2008-04  
Information technology – Generic cabling for customer premises
- ISO/IEC TR-24750 Assessment and mitigation of installed balanced cabling channels in order to support 10GBASE-T
- TIA/EIA-568-B.2-10  
Transmission performance specifications for 4-pair 100 Ω augmented category 6 cabling
- ANSI/TIA-TSB-155  
Additional guidelines for 4-pair 100 Ω category 6 cabling for 10GBase-T
- IEEE 802.3an TM-2006  
Local and Metropolitan Area Networks (10 GBASE-T)

**Results:** Up to a bandwidth of **Augmented Class E (500MHz)** the sample, a **4-Connector-Channel**, meet the limits of the specified standards and regulations.

The test results which were determined in the course of the measurement refer to the submitted specimen. Any future technical modifications of the data cables or connectors are subject to the responsibility of the manufacturer.

This Certificate refers to the comprehensive test report, **no. P1918b-08-E, from July 31<sup>st</sup> 2008** and shall only be applicable in conjunction with the test report.

Bexbach, July 31<sup>st</sup> 2008

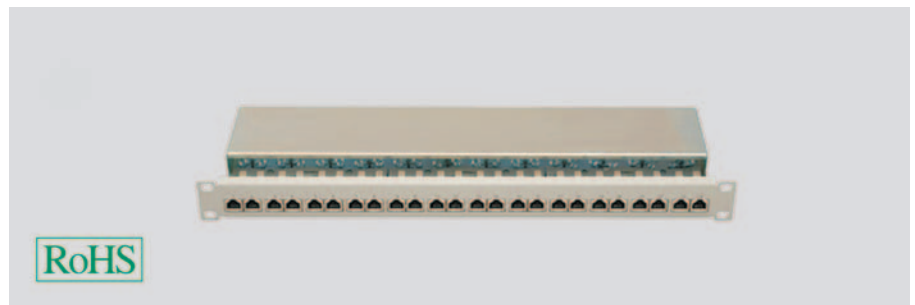


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## Type

### Configuration

Housing material:	Steel plate, solid
Colour:	Grey similar to RAL 7035
Board:	3x8 mother board, colour and number-coded
Push-on connector type:	RJ45(8/8)
Number of bushes:	24
Type of screen:	Overall screen
Screen removal:	via continuous screening tape
Strain relief:	via pre-installed cable clips
Cover lock:	Quick-action snap cover

### Connecting system

Connection type:	LSA plus - insulation piercing connections
Suitable for cable diameter:	0.4 - 0.64mm (AWG 26 - 22)
Insulation diameter, min.:	0,7 - 1,7 mm (PE)

### Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

### Dimension

Width:	483 mm
Depth:	148 mm
Number of height modules (HM):	1
Fastening dimensions:	19"

### Norms and standards

HELUKAT CONNECTING SYSTEMS® system component up to 250 MHz in the permanent link of category 6 or Class E in accordance with ISO 11801, 2nd edition, EN 50173, 2nd edition, EIA/TIA 568 B, and EN 55022 (EMC).

### Application

As floor distributor in applications of digital and analog image, data and voice transmission.

### Part no.

**82848**

Dimensions and specifications may be changed without prior notice.

### Packing unit

**1**



## Type

### RJ-45 UP socket class E 2P horizontal

### RJ-45 UP socket class E 2P vertical

## Configuration

Housing material:  
Colour:  
Board:  
Push-on connector type:  
Outlet direction:  
Number of bushes:  
Type of screen:  
Strain relief:  
Cable inlet:

Die-cast, shielded  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
Overall screen  
via pre-installed cable clips  
horizontal

Plastic, shielded  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
Overall screen  
via pre-installed cable clips  
vertical

## Connecting system

Connection type:  
Suitable for cable diameter:  
Insulation diameter, min.:

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,6 mm (PE)

## Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

EIA/TIA 568 A + EIA/TIA 568 B

## Dimension

Dimensions of central plate:  
Installation dimensions:

50 x 50mm  
51 x 51 x 29mm

50 x 50mm  
51 x 51 x 29mm

## Norms and standards

HELUKAT® system component up to 250 MHz in the permanent link of category 6 or Class E in accordance with ISO 11801, 2nd edition, EN 50173, 2nd edition, EIA/TIA 568 B, and EN 55022 (EMC).

## Application

As workstation interface in applications of digital and analog image, data and voice transmission. Available as in-wall version (channel) and top-mount version (possible with an extra frame).

## Part no.

**82847**

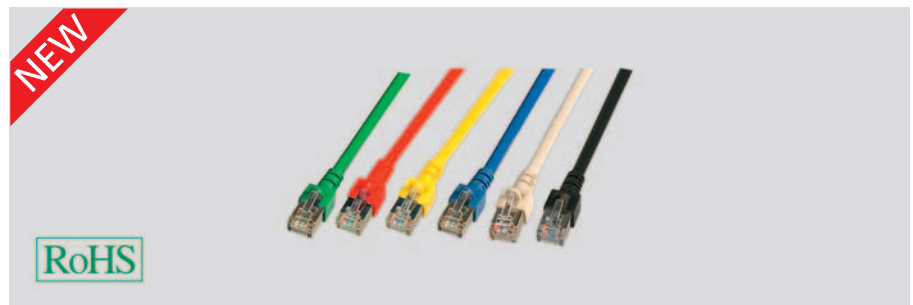
**82851**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**10**

**10**



## Type

### Cable

Designation:  
Sheath material:  
Frequency:

## Patch cable S-STP halogenfree, Cat.6

S-STP 4x2xAWG 27/7 halogenfree  
LSZH  
up to 250 MHz

### Plug

Push-on connector type 1:  
Push-on connector type 2:  
Pin assignment:

RJ45 8(8)  
RJ45 8(8)  
1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Norms and standards

HELUKAT CONNECTING SYSTEMS® system components up to 250 MHz in the of category 6 or Class E in accordance with ISO 11801, 2nd edition, EN 50173, 2nd edition, and EIA/TIA 568 B.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>82857</b>	grey	0,5	10
<b>82858</b>	grey	1,0	10
<b>82859</b>	grey	2,0	10
<b>82860</b>	grey	3,0	10
<b>82861</b>	grey	5,0	10
<b>82862</b>	grey	7,5	5
<b>82863</b>	grey	10,0	5
<b>82864</b>	grey	15,0	5

Part no.	Sheath colour	Length in metres	Unit
<b>802999</b>	blue	0,5	10
<b>803000</b>	blue	1,0	10
<b>803001</b>	blue	2,0	10
<b>803002</b>	blue	3,0	10
<b>803003</b>	blue	5,0	10
<b>803004</b>	blue	7,5	5
<b>803005</b>	blue	10,0	5
<b>803006</b>	blue	15,0	5

Part no.	Sheath colour	Length in metres	Unit
<b>803007</b>	green	0,5	10
<b>803008</b>	green	1,0	10
<b>803009</b>	green	2,0	10
<b>803010</b>	green	3,0	10
<b>803011</b>	green	5,0	10
<b>803012</b>	green	7,5	5
<b>803013</b>	green	10,0	5
<b>803014</b>	green	15,0	5

Continuation ►



# Patch Cables RJ45



Category 6 / Class E

Part no.	Sheath colour	Length in metres	Unit
<b>802991</b>	red	0,5	10
<b>802992</b>	red	1,0	10
<b>802993</b>	red	2,0	10
<b>802994</b>	red	3,0	10
<b>802995</b>	red	5,0	10
<b>802996</b>	red	7,5	5
<b>802997</b>	red	10,0	5
<b>802998</b>	red	15,0	5

Part no.	Sheath colour	Length in metres	Unit
<b>803015</b>	yellow	0,5	10
<b>803016</b>	yellow	1,0	10
<b>803017</b>	yellow	2,0	10
<b>803018</b>	yellow	3,0	10
<b>803019</b>	yellow	5,0	10
<b>803020</b>	yellow	7,5	5
<b>803021</b>	yellow	10,0	5
<b>803022</b>	yellow	15,0	10

Part no.	Sheath colour	Length in metres	Unit
<b>803023</b>	black	0,5	10
<b>803024</b>	black	1,0	10
<b>803025</b>	black	2,0	10
<b>803026</b>	black	3,0	10
<b>803027</b>	black	5,0	10
<b>803028</b>	black	7,5	5
<b>803029</b>	black	10,0	5
<b>803030</b>	black	15,0	5

Dimensions and specifications may be changed without prior notice.



## Zertifikat

**Auftraggeber:** HELUKABEL GmbH  
Dieselstraße 8-12  
D-71282 Hemmingen

**Prüfung:** Installationskabel: **Helukat 600 4x2xAWG23 S-STP**  
90m Art.-Nr.: 80810  
Anschlussdose: **Helukat Connecting Systems**  
**Datendose UP**  
Art.-Nr.: 82851  
Verteilerfeld: **Helukat Connecting Systems**  
**Patch Panel 24 Port**  
Art.-Nr.: 82848

**Bewertungsstandards:** ISO/IEC 11801: 2002  
Information technology – Cabling for customer premises.  
EN 50173-1: 2002  
Information technology – Generic cabling systems –  
Part 1: General requirements and office areas

**Resultat:** Der Prüfling hält bei den im Prüfbericht genannten Prüfparametern die Grenzwerte der besagten Vorgabedokumente **nach Klasse E im Permanent-Link von 90m ein.**

Die bei der Prüfung ermittelten Ergebnisse beziehen sich auf den beschriebenen und vom Auftraggeber vorgelegten Prüfling. Zukünftige technische Änderungen der Datenkabel und Steckverbinder unterliegen dem Verantwortungsbereich der Hersteller.

Dieses Zertifikat verweist auf den ausführlichen Prüfbericht **PB-Nr. P1444b-05-D vom 14. Juli 2005** und ist nur in Verbindung mit diesem gültig.

Bexbach, 14. Juli 2005

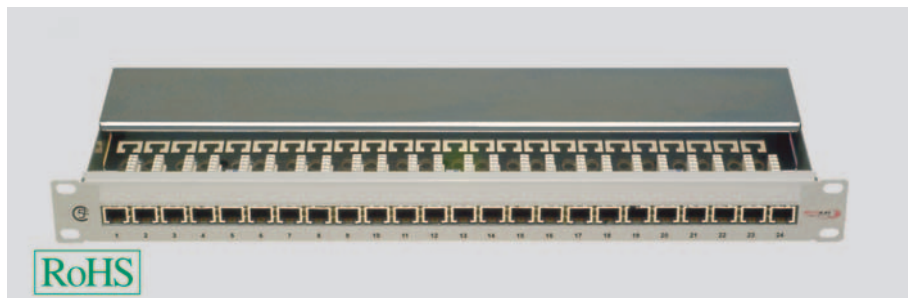


Dipl.-Ing. Dirk Wilhelm  
(Vorstandsvorsitzender)



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<http://www.ghmt.de>

GHMT Aktiengesellschaft



## Type

## Patch panel cat. 5e / class D 24P

### Configuration

Housing material:	Steel plate, solid
Colour:	Grey similar to RAL 7035
Board:	3x8 mother board, colour and number-coded
Push-on connector type:	RJ45(8/8)
Number of bushes:	24
Type of screen:	Overall screen
Screen removal:	via continuous screening tape
Strain relief:	via pre-installed cable clips
Cover lock:	Quick-action twist lock

### Connecting system

Connection type:	LSA plus - insulation piercing connections
Suitable for cable diameter:	0.4 - 0.64mm (AWG 26 - 22)
Insulation diameter, min.:	0,7 - 1,7 mm (PE)

### Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

### Dimension

Width:	483 mm
Depth:	148 mm
Number of height modules (HM):	1
Fastening dimensions:	19"

### Norms and standards

HELUKAT CONNECTING SYSTEMS® system component up to 100 MHz in category 5(e) or Class D in accordance with ISO 11801, 2nd edition, EN 50173, 2nd edition, EIA/TIA 568 B, and EN 55022 (EMC)

### Application

As floor distributor in applications of digital and analog image, data and voice transmission.

### Part no.

**82010**

Dimensions and specifications may be changed without prior notice.

### Packing unit

**1**

# Outlets RJ45



Category 5e / Class D



## Type

### RJ-45 UP socket cat. 5e 2P horizontal

### RJ-45 UP socket cat. 5e 2P vertical

## Configuration

Housing material:  
Colour:  
Board:  
Push-on connector type:  
Outlet direction:  
Number of bushes:  
Type of screen:  
Strain relief:  
Cable inlet:

Die-cast, shielded  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
Overall screen  
via pre-installed cable clips  
horizontal

Die-cast, shielded  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
Overall screen  
via pre-installed cable clips  
vertical

## Connecting system

Connection type:  
Suitable for cable diameter:  
Insulation diameter, min.:

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

## Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

EIA/TIA 568 A + EIA/TIA 568 B

## Dimension

Dimensions of central plate:  
Installation dimensions:

50 x 50mm  
51 x 51 x 29mm

50 x 50mm  
51 x 51 x 29mm

## Norms and standards

HELUKAT CONNECTING SYSTEMS® system component up to 100 MHz in category 5(e) or Class D in accordance with ISO 11801, 2nd edition, EN 50173, 2nd edition, EIA/TIA 568 B, and EN 55022 (EMC)

## Application

As workstation interface in applications of digital and analog image, data and voice transmission. Available as in-wall version (channel) and top-mount version (wall).

## Part no.

**82008**

**82853**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**10**

**10**



## Type

### Cable

Designation:

Sheath material:

Frequency:

## Patch cable S-FTP PVC Cat.5e

S-FTP 4x2xAWG 26/7 PVC

PVC

up to 100 MHz

### Plug

Push-on connector type 1:

Push-on connector type 2:

Pin assignment:

RJ45 8(8)

RJ45 8(8)

1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Norms and standards

HELUKAT CONNECTING SYSTEMS® system components up to 100 MHz in the of category 5(e) or Class D in accordance with ISO 11801, 2nd edition, EN 50173, 2nd edition, and EIA/TIA 568 B.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>803049</b>	grey	0,5	10
<b>803050</b>	grey	1,0	10
<b>803051</b>	grey	2,0	10
<b>803052</b>	grey	3,0	10
<b>803053</b>	grey	5,0	10
<b>803054</b>	grey	7,5	10
<b>803055</b>	grey	10,0	10
<b>803056</b>	grey	15,0	10

Part no.	Sheath colour	Length in metres	Unit
<b>803065</b>	blue	0,5	10
<b>803066</b>	blue	1,0	10
<b>803067</b>	blue	2,0	10
<b>803068</b>	blue	3,0	10
<b>803069</b>	blue	5,0	10
<b>803070</b>	blue	7,5	10
<b>803071</b>	blue	10,0	10
<b>803072</b>	blue	15,0	10

Part no.	Sheath colour	Length in metres	Unit
<b>803073</b>	green	0,5	10
<b>803074</b>	green	1,0	10
<b>803075</b>	green	2,0	10
<b>803076</b>	green	3,0	10
<b>803077</b>	green	5,0	10
<b>803078</b>	green	7,5	10
<b>803079</b>	green	10,0	10
<b>803080</b>	green	15,0	10

Continuation ►

# Patch Cables RJ45



Category 5e / Class D

Part no.	Sheath colour	Length in metres	Unit
<b>803057</b>	red	0,5	10
<b>803058</b>	red	1,0	10
<b>803059</b>	red	2,0	10
<b>803060</b>	red	3,0	10
<b>803061</b>	red	5,0	10
<b>803062</b>	red	7,5	10
<b>803063</b>	red	10,0	10
<b>803064</b>	red	15,0	10

Part no.	Sheath colour	Length in metres	Unit
<b>803081</b>	yellow	0,5	10
<b>803082</b>	yellow	1,0	10
<b>803083</b>	yellow	2,0	10
<b>803084</b>	yellow	3,0	10
<b>803085</b>	yellow	5,0	10
<b>803086</b>	yellow	7,5	10
<b>803087</b>	yellow	10,0	10
<b>803088</b>	yellow	15,0	10

Part no.	Sheath colour	Length in metres	Unit
<b>803089</b>	black	0,5	10
<b>803090</b>	black	1,0	10
<b>803091</b>	black	2,0	10
<b>803092</b>	black	3,0	10
<b>803093</b>	black	5,0	10
<b>803094</b>	black	7,5	10
<b>803095</b>	black	10,0	10
<b>803096</b>	black	15,0	10

Dimensions and specifications may be changed without prior notice.



## Zertifikat

**Auftraggeber:** HELUKABEL GmbH  
Dieselstr. 8-12  
D-71282 Hemmingen

**Prüfling:**



Installationskabel: HELUKAT200 Verlegeleitung  
Verteilerfeld: HELUKAT CONNECTING SYSTEMS 24-port Kat.5E  
Art.: 82010  
Anschlußdose: HELUKAT CONNECTING SYSTEMS RJ45 UPDose Kat.5E  
Art.: 82008 (horizontal), 82853 (vertikal)  
Patchkabel: HELUKAT200 mit RJ45 Stewart-Stecker

**Bewertungsstandards:** prEN 50173:2001 vom Oktober 2001  
Informationstechnik – Anwendungsneutrale Verkabelungssysteme

**Resultat:** Die bei der Prüfung ermittelten Ergebnisse beziehen sich auf den beschriebenen und vom Auftraggeber vorgelegten Prüfling. Zukünftige technische Änderungen der Datenkabel und Steckverbinder unterliegen dem Verantwortungsbereich der Hersteller.

Der Prüfling hält bei den im Prüfbericht genannten Prüfparametern die Grenzwerte der besagten Vorgabedokumente **nach Klasse D im Channel-Link** ein.

Dieses Zertifikat verweist auf den ausführlichen Prüfbericht **PB-Nr. 879/02 vom 24. Januar 2002** und ist nur in Verbindung mit diesem gültig.

Bexbach, 24. Januar 2002



Dipl.-Ing. Frank Streibert  
(Geschäftsleitung)



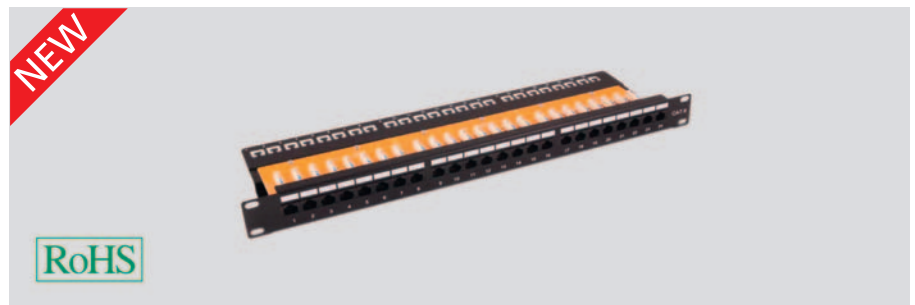
GHMT mbH  
In der Kolling 13  
D-66450 Bexbach  
Tel.: +49 (0) 68 26 / 92 28 – 0  
Fax: +49 (0) 68 26 / 92 28 – 99  
E-Mail: info@ghmt.de  
<http://www.ghmt.de>

Gesellschaft für Hochfrequenz-Meßtechnik mbH

# Patch-Panels RJ45 unscreened



Category 6/ Class E



## Type

## Patch panel unscreened class E 24P

### Configuration

Housing material:	Steel plate, solid
Colour:	Black similar to RAL 9005
Board:	3x8 mother board, colour and number-coded
Push-on connector type:	RJ45(8/8)
Number of bushes:	24
Type of screen:	no
Strain relief:	by means of cable straps

### Connecting system

Connection type:	LSA plus - insulation piercing connections
Suitable for cable diameter:	0.4 - 0.64mm (AWG 26 - 22)
Insulation diameter, min.:	0,7 - 1,7 mm (PE)

### Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

### Dimension

Width:	440 mm
Depth:	110 mm
Number of height modules (HM):	1
Fastening dimensions:	19"

### Norms and standards

HELUKAT CONNECTING SYSTEMS® unscreened system component up to 250 MHz of category 6 or Class E in accordance with ISO 11801, EN 50173.

### Application

As floor distributor in applications of digital and analog image, data and voice transmission.

### Part no.

**802908**

Dimensions and specifications may be changed without prior notice.

### Packing unit

**1**



# Outlets RJ45 unscreened



Category 6/ Class E



## Type

**RJ-45 UP socket  
unscreened class E 2P  
horizontal**

**RJ-45 UP socket  
unscreened class E 2P  
vertical**

## Configuration

Housing material:  
Colour:  
Board:  
Push-on connector type:  
Outlet direction:  
Number of bushes:  
Type of screen:  
Strain relief:  
Cable inlet:

Plastic  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
no  
via pre-installed cable clips  
horizontal

Plastic  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
no  
via pre-installed cable clips  
vertical

## Connecting system

Connection type:  
Suitable for cable diameter:  
Insulation diameter, min.:

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,6 mm (PE)

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,6 mm (PE)

## Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

EIA/TIA 568 A + EIA/TIA 568 B

## Dimension

## Norms and standards

HELUKAT® system component unscreened up to 250 MHz of category 6 or Class E in accordance with ISO 11801, EN 50173, ANSI/TIA/EIA 568 B2-1.

## Application

As workstation interface in applications of digital and analog image, data and voice transmission. Available as in-wall version (channel) and top-mount version (possible with an extra frame).

## Part no.

**803033**

**802909**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**10**

**10**

# Patch Cables RJ45 unscreened



Category 6/ Class E



## Type

### Cable

Designation:  
Sheath material:  
Frequency:

## Patch cable unscreened U-UTP PVC, Cat.6

U-UTP 4x2xAWG 24/7 PVC  
PVC  
up to 250 MHz

### Plug

Push-on connector type 1:  
Push-on connector type 2:  
Pin assignment:

RJ45 8(8)  
RJ45 8(8)  
1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Norms and standards

HELUKAT CONNECTING SYSTEMS® system components up to 250 MHz in the of category 6 or EIA/TIA 568 B.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>803097</b>	grey	0,5	10
<b>803098</b>	grey	1,0	10
<b>803099</b>	grey	2,0	10
<b>803100</b>	grey	3,0	10
<b>803101</b>	grey	5,0	10
<b>803102</b>	grey	7,5	10
<b>803103</b>	grey	10,0	10
<b>803104</b>	grey	15,0	10

Part no.	Sheath colour	Length in metres	Unit
<b>803113</b>	blue	0,5	10
<b>803114</b>	blue	1,0	10
<b>803115</b>	blue	2,0	10
<b>803116</b>	blue	3,0	10
<b>803117</b>	blue	5,0	10
<b>803118</b>	blue	7,5	10
<b>803119</b>	blue	10,0	10
<b>803120</b>	blue	15,0	10

Part no.	Sheath colour	Length in metres	Unit
<b>803121</b>	green	0,5	10
<b>803122</b>	green	1,0	10
<b>803123</b>	green	2,0	10
<b>803124</b>	green	3,0	10
<b>803125</b>	green	5,0	10
<b>803126</b>	green	7,5	10
<b>803127</b>	green	10,0	10
<b>803128</b>	green	15,0	10

Continuation ►

# Patch Cables RJ45 unshielded



Category 6/ Class E

Part no.	Sheath colour	Length in metres	Unit
<b>803105</b>	red	0,5	10
<b>803106</b>	red	1,0	10
<b>803107</b>	red	2,0	10
<b>803108</b>	red	3,0	10
<b>803109</b>	red	5,0	10
<b>803110</b>	red	7,5	10
<b>803111</b>	red	10,0	10
<b>803112</b>	red	15,0	10

Part no.	Sheath colour	Length in metres	Unit
<b>803129</b>	yellow	0,5	10
<b>803130</b>	yellow	1,0	10
<b>803131</b>	yellow	2,0	10
<b>803132</b>	yellow	3,0	10
<b>803133</b>	yellow	5,0	10
<b>803134</b>	yellow	7,5	10
<b>803135</b>	yellow	10,0	10
<b>803136</b>	yellow	15,0	10

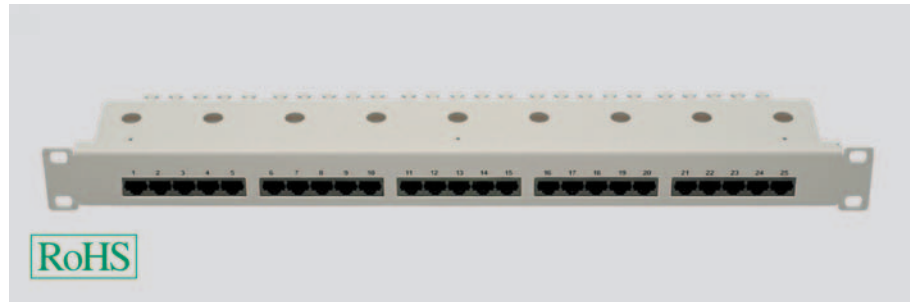
Part no.	Sheath colour	Length in metres	Unit
<b>803137</b>	black	0,5	10
<b>803138</b>	black	1,0	10
<b>803139</b>	black	2,0	10
<b>803140</b>	black	3,0	10
<b>803141</b>	black	5,0	10
<b>803142</b>	black	7,5	10
<b>803143</b>	black	10,0	10
<b>803144</b>	black	15,0	10

Dimensions and specifications may be changed without prior notice.

# Patch-Panels RJ45 unscreened



Category 3



## Type

## Patch panel 25-port cat.3

### Configuration

Housing material:	Steel plate, solid
Colour:	Grey similar to RAL 7035
Board:	5x 5 mother board, number-coded
Push-on connector type:	RJ45(8/4)
Number of bushes:	25
Type of screen:	no
Screen removal:	via clips
Strain relief:	by means of cable straps

### Connecting system

Connection type:	LSA plus - insulation piercing connections
Suitable for cable diameter:	0.4 - 0.64mm (AWG 26 - 22)

### Assignment type

acc. ISO/IEC 11801 and EN 50173

### Dimension

Width:	483 mm
Depth:	118 mm
Number of height modules (HM):	1
Fastening dimensions:	19"

### Norms and standards

HELUKAT CONNECTING SYSTEMS® category 3 system component according ISO/IEC 11801 and EN 50173.

### Application

As floor distributor in applications of voice transmission (ISDN). Deliverable as 25-port or 50-port version.

### Part no.

**81302**

Dimensions and specifications may be changed without prior notice.

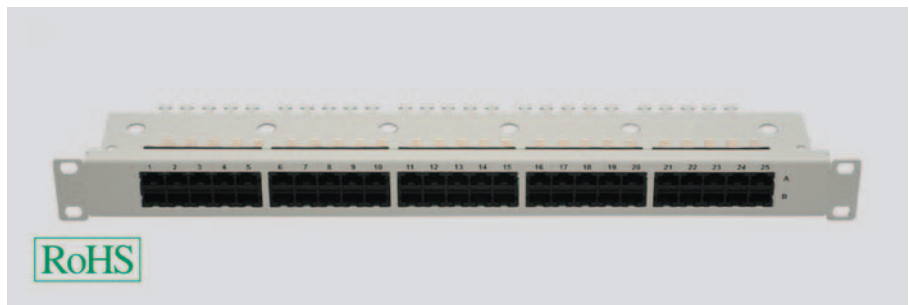
### Packing unit

**1**

# Patch-Panels RJ45 unshielded



Category 3



## Type

### Configuration

Housing material:	Steel plate, solid
Colour:	Grey similar to RAL 7035
Board:	1x 25 mother board (double), number-coded
Push-on connector type:	RJ45(8/4)
Number of bushes:	50
Type of screen:	no
Screen removal:	via clips
Strain relief:	by means of cable straps

### Connecting system

Connection type:	LSA plus - insulation piercing connections
Suitable for cable diameter:	0.4 - 0.64mm (AWG 26 - 22)

### Assignment type

acc. ISO/IEC 11801 and EN 50173

### Dimension

Width:	483 mm
Depth:	118 mm
Number of height modules (HM):	1
Fastening dimensions:	19"

### Norms and standards

HELUKAT CONNECTING SYSTEMS® category 3 system component according ISO/IEC 11801 and EN 50173.

### Application

As floor distributor in applications of voice transmission (ISDN). Deliverable as 25-port or 50-port version.

### Part no.

**801159**

Dimensions and specifications may be changed without prior notice.

### Packing unit

**1**



## Preferred types

Part no.	Description	Colour	Unit
<b>801772</b>	RJ45 plug 8 pole Category 6, TM21 black	black	10
<b>801686</b>	RJ45 plug 8 pole Category 5, TM11 grey	grey	10
<b>82852</b>	RJ-45 AP-frame	Pure White similar to RAL 9010	5
<b>82695</b>	RJ-45 AP-frame cat.5 socket	Pearl White similar to RAL 1013	5
<b>800260</b>	central plate 80x80 UP-socket	Pure White similar to RAL 9010	10

Dimensions and specifications may be changed without prior notice.

# Rubber Cable Reels

HELUKAT® Datacables



## Type

### Drum

Equipment:

### Plug

Push-On connector type 1:

Push-On connector type 2:

System type:

Pin assignment:

## Norms and standards

## Preferred types

## Characteristics

## Rubber cable reel with HELUKAT® copper data cable

### Rubber

with supporting frame

RJ45 8/8 - jack

RJ45 8/8 - jack

office connector

1:1 acc. to TIA/EIA 568 B

Components of HELUKAT CONNECTING SYSTEMS® to 155 MHz acc. Categorie 5E and to 600MHz acc. Categorie 6 (Link), ISO 11801 1st Edition, EN 50173-3 and EIA/TIA 568 B. Be in accordance with the Cat.5E respectively the Cat. 6 structured cabling.

Part no.	Designation	Jacket colour	Fre- quency MHz	Cable length m	Flame proof	Oil- resistant
802076	S-STP 4x2xAWG 23/1 FRNC	Blue Lilac similar to RAL 4005	600	90,0	acc. to IEC 60332-3	-
802208	S-STP 4x2xAWG 23/1 PUR	Green similar to RAL 6018	600	90,0	acc. to IEC 60332-1	EN60811-2-1
802075	S-STP 4x2xAWG 23/1 FRNC	Blue Lilac similar to RAL 4005	600	50,0	acc. to IEC 60332-3	-
802073	FTP 4x2xAWG24/1 PVC	Yellow similar to RAL 1021	155	50,0	-	-
802207	S-STP 4x2xAWG 23/1 PUR	Green similar to RAL 6018	600	50,0	acc. to IEC 60332-1	EN60811-2-1
802074	FTP 4x2xAWG24/1 PVC	Yellow similar to RAL 1021	155	90,0	-	-

Dimensions and specifications may be changed without prior notice.

Rubber cable reel with RJ45 jacks and dust protection. Suitable for mobile use on site, for example for meetings, TV-Transmissions, Fairs, etc.. Everywhere when there is a need for a removable cable connection. Usable for fixed installation cabling.



# INDUSTRIAL copper connection components

Foto: HELUKABEL®

Ethernet was initially used exclusively in the office environment. The Ethernet technology has now also established itself at the automation and production levels as so-called INDUSTRIAL ETHERNET because it makes continuous communication at all levels of a business network possible.

By using standardised interfaces for all communication equipment, the complexity of processes is reduced and the productivity is increased. With new industry-compatible network components based on IP20, IP 65 or IP67, or suitable

for DIN rail mounting and standards such as ISO/IEC 24702, the prerequisites for a completely networked future have been created.

The HELUKAT CONNECTING SYSTEMS® INDUSTRY series from HELUKABEL® provides passive copper connection components such as patch panels, sockets and patch cables for harsh industrial environments.





## Plug RJ45 Industrial



- plastic housing
- IP20, lighth duty
- Category 5 i.e. 6
- IEC 61784-5-3

## Plug RJ45 Snap-in



- plastic housing
- IP20, lighth duty
- Category 5

## Plug RJ45 HAN® 3A



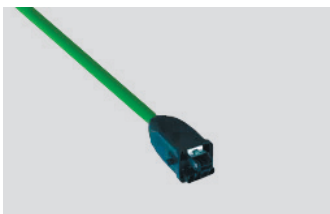
- metal housing
- IP65/67, heavy duty
- Category 5
- IEC 61918

## Plug RJ45 Snap-in



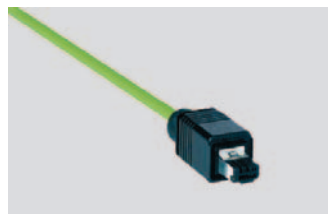
- plastic housing
- IP67, heavy duty
- Category 5

## Plug RJ45 HAN® 3A hybrid



- metal i.e. plastic housing
- IP65/67, heavy duty
- Category 5
- IEC 61076-3-106 variant 5

## Plug RJ45 HAN® PushPull



- metal housing
- IP65/67, heavy duty
- Category 5 i.e. 6
- IEC 61076-3-117 variant 14 (AIDA conform)

## Plug M12 D- i.e. B-coded



- metal i.e. plastic housing
- IP67, heavy duty
- Category 5 (IEC 61076-2-101)
- Profibus

## Plug SUB-D



- metal i.e. plastic housing
- IP20 i.e. IP65
- applicable for Ethernet i.e. Bussystems



### Type

#### Cable structure

Housing material:  
 Colour:  
 Max. number of modules:  
 Screen removal:  
 Strain relief:  
 Cover lock:

#### Basic Panel

Steel plate, solid  
 Grey similar to RAL 7035  
 8  
 via continuous screening tape  
 by means of cable straps  
 Quick-action twist lock

#### Dimension

Width: 195 mm  
 Depth: 150 mm  
 Number of height modules (HM): 1

**Part no.:**  
 Packing unit:

**801311**  
 5

Plug type A:  
 Pin Code A:  
 Plug type B:  
 Pin Code B:  
 Shielding:  
 Type:

#### Module

-  
 -  
 -  
 -

Modul for top-hat rail installation patch panel, 2xST MM

**Part no.:**  
 Packing unit:

**801314**  
 10

Plug type A:  
 Pin Code A:  
 Plug type B:  
 Pin Code B:  
 Shielding:  
 Type:

-  
 -  
 -  
 -

Modul for top-hat rail installation patch panel, 2xSC MM

**Part no.:**  
 Packing unit:

**801315**  
 1

#### Norms and standards

HELUKAT CONNECTING SYSTEMS® INDUSTRY individual system components, category 6 de-embedded (IEC 60603-7-5), ISO 11801 2nd Edition, EN 50173-1 2nd Edition, EIA/TIA 568-B.2-1 and EN 55022 (EMV).

#### Application

As connection distribution unit for DIN rail installation e.g. in the switch cabinet, for applications involving digital and analog image, data and voice transmission. Can be combined (also with fibre optic components) thanks to the modular structure. Tool-free turn latches enable simple closing and opening of the housing.

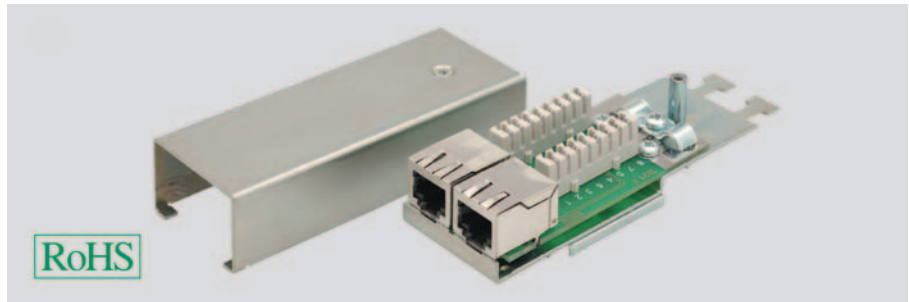
Dimensions and specifications may be changed without prior notice.

# Top hat rail modules

INDUSTRIAL ETHERNET



Duplex modul cat.6 de-embedded



## Type

### Configuration

Housing material:	Steel plate, solid
Board:	Individual - modular
Push-on connector type:	RJ45(8/8)
Number of bushes:	2
Type of screen:	Overall screen
Screen removal:	via clips
Strain relief:	via pre-installed cable clips
Cover lock:	Fastening by means of screws

### Connecting system

Connection type:	LSA plus - insulation piercing connections
Suitable for cable diameter:	0.4 - 0.64mm (AWG 26 - 22)

### Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

### Dimension

Width:	36 mm
Depth:	110 mm

### Norms and standards

HELUKAT CONNECTING SYSTEMS® INDUSTRY individual system components, category 6, ISO 11801 2nd Edition, EN 50173-1 2nd Edition, EIA/TIA 568-B.2-1 and EN 55022 (EMV)

### Application

As connection distribution unit for DIN rail installation e.g. in the switch cabinet, for applications involving digital and analog image, data and voice transmission.

### Part no.

**801310**

Dimensions and specifications may be changed without prior notice.

### Packing unit

**10**

# Machine outlet IP67

INDUSTRIAL ETHERNET



VARIOSUB, HAN® 3A



## Type

**Ind.Outlet Metall, Cat.6  
RJ45-IP67-VARIOSUB  
PHOENIX**

**Ind.Outlet Metal, Cat.5  
RJ45-IP67 HAN 3A HARTING**

## Configuration

Housing material:  
Colour:  
Board:  
Push-on connector type:  
Outlet direction:  
Number of bushes:  
Type of screen:  
Strain relief:  
Cable inlet:

Aluminium die-cast, shielded  
Grey  
1x2  
RJ45(8/8)  
Straight  
2  
Overall screen  
via pre-installed cable clips  
horizontal  
vertical  
67

Aluminium die-cast, shielded  
Grey  
1x2  
RJ45(8/8)  
Straight  
2  
Overall screen  
via pre-installed cable clips  
horizontal  
vertical  
67

Protection classification (IP):

## Connecting system

Connection type:  
Suitable for cable diameter:  
Insulation diameter, min.:

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

## Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

EIA/TIA 568 A + EIA/TIA 568 B

## Dimension

Installation dimensions:

175 x 110 x 45mm

175 x 110 x 45mm

## Norms and standards

HELUKAT CONNECTING SYSTEMS INDUSTRY® components up to 100 MHz category 5 in accordance with ISO/IEC 11801 2nd Edition, EN50173 2nd Edition. Moreover it satisfies the MICE specifications (class 3), EMC requirements in accordance with DIN EN 6100, and the requirements of the IP 67 housing protection class.

## Application

Robust data connection socket (shielded) for the extreme implementation. Robust aluminum die-cast housing, meets all mechanical requirements like vibration, shock, and transverse forces. The socket is used either on the machine distributor (MD) or wall mounted directly on the machine (MC) as connection unit.

## Part no.

**801278**

**801306**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**5**

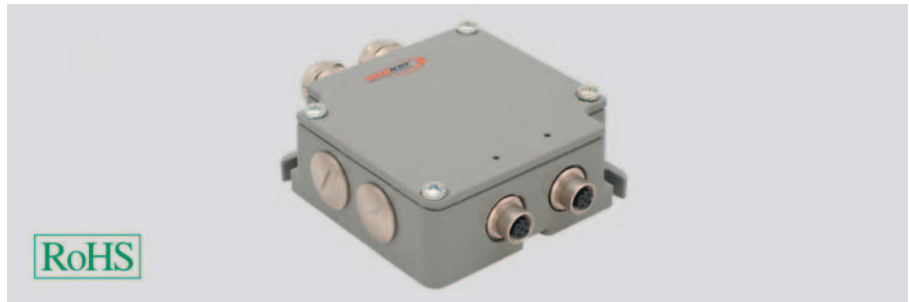
**5**

# Machine outlet IP67

INDUSTRIAL ETHERNET



M12 D-coded, B-coded



## Type

**Ind.Outlet Metal, Cat.5, 2 x M12 D-coded, IP67**

**Ind.Outlet Metal, 2 x M12 B-coded, IP67**

## Configuration

Housing material:  
Colour:  
Board:  
Push-on connector type:  
Outlet direction:  
Number of bushes:  
Type of screen:  
Strain relief:  
Cable inlet:

Aluminium die-cast, shielded  
Grey  
1x2  
plug M12  
Straight  
2  
Overall screen  
via pre-installed cable clips  
horizontal  
vertical  
67

Aluminium die-cast, shielded  
Grey  
1x2  
plug M12  
Straight  
2  
Overall screen  
via pre-installed cable clips  
horizontal  
vertical  
67

Protection classification (IP):

## Connecting system

Connection type:  
Suitable for cable diameter:  
Insulation diameter, min.:

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

## Assignment type

D-coded acc. DKE/IEC 61076-2-101

B-coded acc. DKE/IEC 61076-2-101

## Dimension

Installation dimensions:

175 x 110 x 45mm

175 x 110 x 45mm

## Norms and standards

HELUKAT CONNECTING SYSTEMS® INDUSTRY components up to 100 MHz category 5 in accordance with ISO/IEC 11801 2nd Edition, EN50173 2nd Edition. Couplings in accordance with IEC 61076.2191-A1 Moreover it satisfies the MICE specifications (class 3), EMC requirements in accordance with DIN EN 6100, and the requirements of the IP 67 housing protection class.

## Application

Robust data connection socket (shielded) for the extreme implementation. Robust aluminum die-cast housing; meets all mechanical requirements like vibration, shock, and transverse forces. The socket is used either on the machine distributor (MD) or wall mounted directly on the machine (MC) as connection unit.

## Part no.

**801305**

**801312**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**5**

**5**

# Outlet top hat rail

INDUSTRIAL ETHERNET



RJ45, horizontal/vertical



## Type

**Top-hat rail outlet  
2xRJ-45 cat.6/Class E 2P  
horizontal**

**Top-hat rail outlet  
2xRJ-45 cat.6/Class E 2P  
vertical**

## Configuration

Housing material:  
Colour:  
Board:  
Push-on connector type:  
Outlet direction:  
Number of bushes:  
Type of screen:  
Strain relief:  
Cable inlet:

Plastic, shielded  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
Overall screen  
via pre-installed cable clips  
horizontal

Plastic, shielded  
Pure White similar to RAL 9010  
1x2  
RJ45(8/8)  
45 degrees  
2  
Overall screen  
via pre-installed cable clips  
vertical

## Connecting system

Connection type:  
Suitable for cable diameter:  
Insulation diameter, min.:

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

LSA plus - insulation piercing connections  
0,4 - 0,64mm (AWG 26 - 22)  
0,7 - 1,7 mm (PE)

## Assignment type

EIA/TIA 568 A + EIA/TIA 568 B

EIA/TIA 568 A + EIA/TIA 568 B

## Dimension

Dimensions of central plate:  
Installation dimensions:

50 x 50mm  
80 x 80 x 46mm

50 x 50mm  
80 x 80 x 46mm

## Norms and standards

HELUKAT CONNECTING SYSTEMS® INDUSTRY system component up to 250 MHz in the permanent link of category 6 or Class E in accordance with ISO 11801, 2nd edition, EN 50173, 2nd edition, EIA/TIA 568 B, and EN 55022 (EMC)

## Application

As connection unit for DIN rail installation e.g. in the switch cabinet, for applications involving digital and analog image, data and voice transmission.

## Part no.

**801308**

**801309**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**10**

**10**

# Patch Cables PROFinet A



RJ45-HAN® 3A, IP67



## Type

**Patch Cable RJ45 HARTING HAN® 3A IP67, PROFinet A fixed installation**

## Cable

Designation:

PROFinet type A (SK)

Sheath material:

PVC

Frequency:

up to 100 MHz

## Plug

Push-on connector type 1:

RJ45-connector IP67

Push-on connector type 2:

RJ45-connector IP67

System type:

Harting IP67 HAN® 3A metal

Pin assignment:

1:1 acc. to TIA/EIA 568 B

## Flame proof

acc. to IEC 60332-1

## Oil-resistant

Acc. to EN60811-2-1

## Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3, EIA/TIA 568 B and IEC 61918. Support the PROFinet guideline V 1.8.

## Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>801342</b>	green	0,5	10
<b>801343</b>	green	1,0	10
<b>801344</b>	green	2,0	10
<b>801345</b>	green	3,0	10
<b>801346</b>	green	5,0	10
<b>801347</b>	green	10,0	10
<b>801365</b>	green	15,0	10
<b>801366</b>	green	50,0	5
<b>801367</b>	green	100,0	1

Dimensions and specifications may be changed without prior notice.

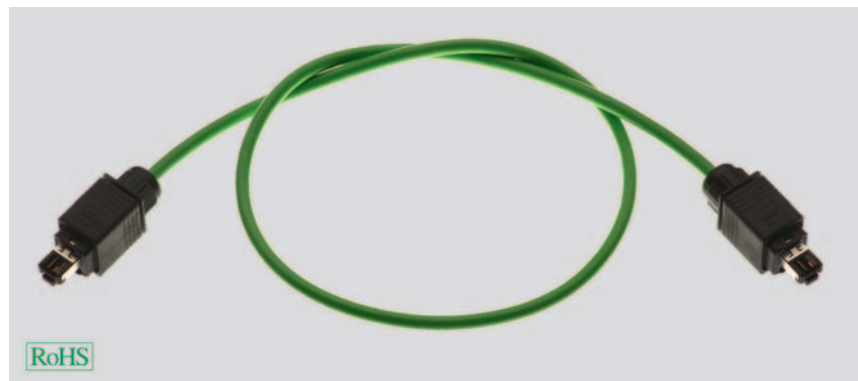
## Characteristics

Jumper cable for the connection between IP67 protected ethernet applications according ISO/IEC 11801 with RJ45 plugs. Usable for fixed installation cabling.

# Patch Cables PROFinet A



RJ45-HAN® PushPull, IP65/67



## Type

**Patch Cable RJ45 HARTING Push-Pull plastic IP65/67, PROFinet A fixed installation**

## Cable

Designation:  
Sheath material:  
Frequency:

PROFinet type A (SK)  
PVC  
up to 100 MHz

## Plug

Push-on connector type 1:  
Push-on connector type 2:  
System type:  
Pin assignment:

RJ45-connector IP67  
RJ45-connector IP67  
Harting IP65/67 HAN® PushPull 4P plastic  
1:1 acc. to TIA/EIA 568 B

## Flame proof

acc. to IEC 60332-1

## Oil-resistant

Acc. to EN60811-2-1

## Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. to Category 5, ISO 11801 1st Edition, EN 50173-3, EIA/TIA 568 B and ISO/IEC 24702 variant 14 (AIDA conform). Support the PROFinet guideline V 1.8.

## Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>802423</b>	green	1,5	10
<b>802424</b>	green	3,0	10
<b>802425</b>	green	5,0	10
<b>802426</b>	green	10,0	10
<b>802427</b>	green	20,0	10
<b>802428</b>	green	50,0	5
<b>802429</b>	green	100,0	1

Dimensions and specifications may be changed without prior notice.

## Characteristics

Jumper cable for the connection between IP67 protected ethernet applications according to ISO/IEC 11801 with RJ45 plugs. Usable for fixed installation cabling.





## Type

### Patch Cable RJ45 HARTING HAN® 3A IP67, PROFinet C drag chain

## Cable

Designation: PROFinet type C (SK)  
 Sheath material: PUR  
 Frequency: up to 100 MHz

## Plug

Push-on connector type 1: RJ45-connector IP67  
 Push-on connector type 2: RJ45-connector IP67  
 System type: Harting IP67 HAN® 3A metal  
 Pin assignment: 1:1 acc. to TIA/EIA 568 B

## Flame proof

acc. to IEC 60332-1

## Oil-resistant

Acc. to EN60811-2-1

## Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3, EIA/TIA 568 B and IEC 61918. Support the PROFinet guideline V 1.8.

## Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>801332</b>	green	0,5	10
<b>801333</b>	green	1,0	10
<b>801334</b>	green	2,0	10
<b>801335</b>	green	3,0	10
<b>801336</b>	green	5,0	10
<b>801337</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

## Characteristics

- Drag chain suitable
- Bending radius 7,5 x cable outerdiameter maximum
- Moving speed 240 m/min maximum
- Movement distance 10 m maximum
- Acceleration 4 m/s<sup>2</sup> maximum
- Cycles maximum 5 Mio.
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 100 m from the Hub to the receiver
- Suitable for the „Heavy-Duty“ range.



## Type

## Patch Cable RJ45 HARTING Push-Pull IP67, PROFinet C drag chain

### Cable

Designation:  
Sheath material:  
Frequency:

PROFinet type C (SK)  
PUR  
up to 100 MHz

### Plug

Push-on connector type 1:  
Push-on connector type 2:  
System type:  
Pin assignment:

RJ45-connector IP67  
RJ45-connector IP67  
Harting IP65/67 HAN® PushPull 4P plastic  
1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-1, EIA/TIA 568 B and ISO/IEC 24702 - variant 14 (AIDA konform). Support the PROFinet guideline V 1.8.

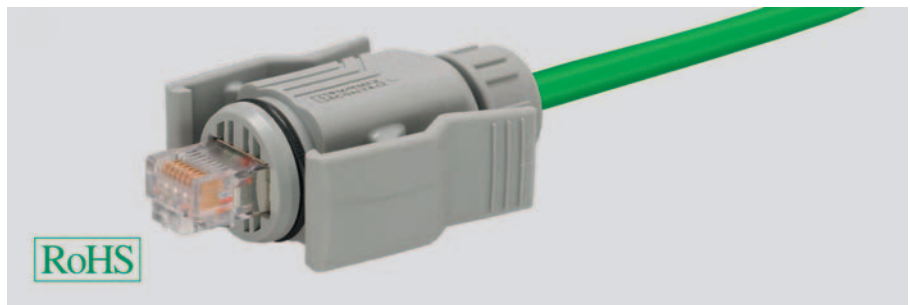
### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>802395</b>	green	0,5	10
<b>802396</b>	green	1,0	10
<b>802397</b>	green	2,0	10
<b>802398</b>	green	3,0	10
<b>802399</b>	green	5,0	10
<b>802400</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Drag chain suitable
- Bending radius 7,5 x cable outerdiameter maximum
- Moving speed 240 m/min maximum
- Movement distance 10 m maximum
- Acceleration 4 m/s<sup>2</sup> maximum
- Cycles maximum 5 Mio.
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 100 m from the Hub to the receiver
- Suitable for the „Heavy-Duty“ range.



## Type

## Patch Cable RJ45 PHOENIX Variosub IP67, LAN-Industry drag chain

### Cable

Designation:

LAN industry 4x2x0,15

Sheath material:

PUR

Frequency:

up to 100 MHz

### Plug

Push-on connector type 1:

RJ45-connector IP67

Push-on connector type 2:

RJ45-connector IP67

System type:

Phoenix Variosub IP67

Pin assignment:

1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3 and EIA/TIA 568 B.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>800827</b>	green	0,5	10
<b>800828</b>	green	1,0	10
<b>800829</b>	green	2,0	10
<b>800830</b>	green	3,0	10
<b>800831</b>	green	5,0	10
<b>800832</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

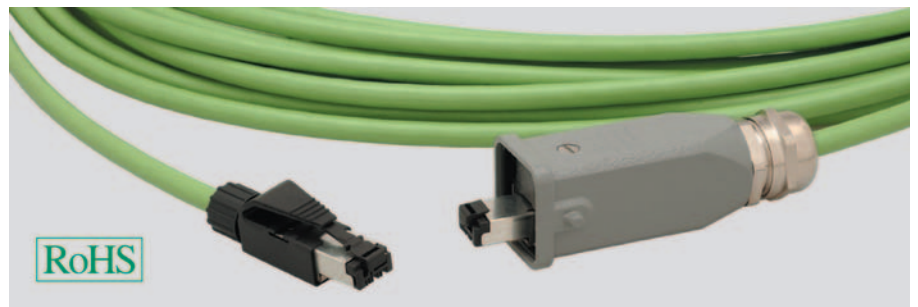
### Characteristics

- Drag chain suitable
- Bending radius 7,5 x cable outerdiameter maximum
- Moving speed 180 m/min maximum
- Movement distance 6 m maximum
- Acceleration 5 m/s<sup>2</sup> maximum
- Cycles maximum 10 Mio.
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 50 m from the Hub to the receiver
- Suitable for the „Heavy-Duty“ range.

# Adapter Cables PROFinet A



RJ45, RJ-INDUSTRIAL IP20 to HAN® 3A IP67



## Type

**Adapter cable RJ45 HARTING IP20 to HAN® 3A IP67, PROFinet A fixed installation**

## Cable

Designation: PROFinet type A (SK)  
Sheath material: PVC  
Frequency: up to 100 MHz

## Plug

Push-on connector type 1: RJ45-connector IP20  
Push-on connector type 2: RJ45-connector IP67  
System type: Harting IP67 to IP20  
Pin assignment: 1:1 acc. to TIA/EIA 568 B

## Flame proof

acc. to IEC 60332-1

## Oil-resistant

Acc. to EN60811-2-1

## Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3, EIA/TIA 568 B and IEC 61918. Support the PROFinet guideline V 1.8.

## Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>801338</b>	green	10,0	10
<b>801339</b>	green	15,0	10
<b>801340</b>	green	50,0	5
<b>801341</b>	green	100,0	1

Dimensions and specifications may be changed without prior notice.

## Characteristics

Adapter cable for the connection between IP20 protected and IP67 protected ethernet applications according ISO/IEC 11801 with RJ45 plugs. Usable for fixed installation cabling.

# Patch Cables PROFinet A



RJ45 4P INDUSTRIAL IP20



## Type

### Patch Cable RJ45 HARTING Industrial IP20, PROFinet A fixed installation

## Cable

Designation:

PROFinet type A (SK)

Sheath material:

PVC

Frequency:

up to 100 MHz

## Plug

Push-on connector type 1:

RJ45-connector IP20

Push-on connector type 2:

RJ45-connector IP20

System type:

Harting IP20 Industrial 4P

Pin assignment:

1:1 acc. to TIA/EIA 568 B

## Flame proof

acc. to IEC 60332-1

## Oil-resistant

Acc. to EN60811-2-1

## Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3, EIA/TIA 568 B and IEC 60603-7. Support the PROFinet guideline V 1.8.

## Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>802416</b>	green	1,5	10
<b>802417</b>	green	3,0	10
<b>802418</b>	green	5,0	10
<b>802419</b>	green	10,0	10
<b>802420</b>	green	20,0	5
<b>802421</b>	green	50,0	5
<b>802422</b>	green	100,0	1

Dimensions and specifications may be changed without prior notice.

## Characteristics

Jumper cable for the connection between IP20 protected ethernet applications according ISO/IEC 11801 with RJ45 plugs. Usable for fixed installation cabling.

# Patch Cables PROFinet A



RJ45 angled left, INDUSTRIAL IP20



## Type

### Patch Cable RJ45 HARTING Industrial IP20 angled left, PROFinet A fixed installation

## Cable

Designation: PROFinet type A (SK)  
Sheath material: PVC  
Frequency: up to 100 MHz

## Plug

Push-on connector type 1: RJ45-connector IP20  
Push-on connector type 2: open  
System type: Harting RJ Robust IP20 angled left  
Pin assignment: 1:1 acc. to TIA/EIA 568 B

## Flame proof

acc. to IEC 60332-1

## Oil-resistant

Acc. to EN60811-2-1

## Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3, EIA/TIA 568 B and IEC 60603-7. Support the PROFinet guideline V 1.8.

## Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>802410</b>	green	0,5	10
<b>802411</b>	green	1,0	10
<b>802412</b>	green	2,0	10
<b>802413</b>	green	3,0	10
<b>802414</b>	green	5,0	10
<b>802415</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

## Characteristics

Jumper cable for the connection between IP20 protected ethernet applications according ISO/IEC 11801 with RJ45 plug, second side without plug. Usable for fixed installation cabling within cabinets or controllers.



### Type

### Patch Cable RJ45 HARTING Industrial IP20, LAN-Industry flexible

### Cable

Designation: S-FTP 4x2xAWG 26/7 PUR  
 Sheath material: PUR  
 Frequency: up to 100 MHz

### Plug

Push-on connector type 1: RJ45-connector IP20  
 Push-on connector type 2: RJ45-connector IP20  
 System type: Harting IP20 Industrial 4P  
 Pin assignment: 1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3, EIA/TIA 568 B and IEC 60603-7.

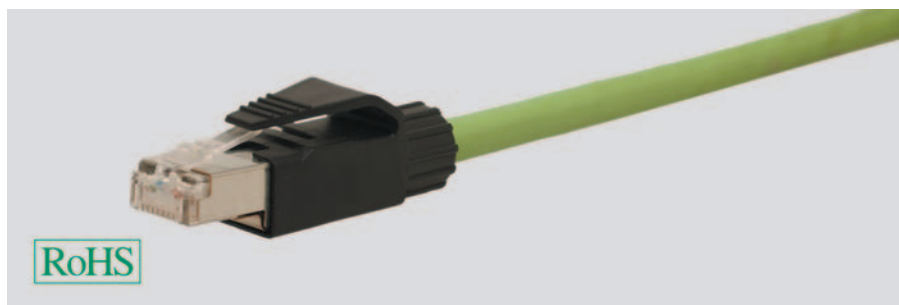
### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>800839</b>	grey	0,5	10
<b>800840</b>	grey	1,0	10
<b>800841</b>	grey	2,0	10
<b>800842</b>	grey	3,0	10
<b>800843</b>	grey	5,0	10
<b>800844</b>	grey	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Suitable for using in rough environs
- Suitable for normal movements
- Temperature range from -20°C to +60°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 30m from the Hub to the receiver
- Suitable for the „Light-Duty“ range



## Type

## Patch Cable RJ45 8P HARTING INDUSTRIAL IP20, LAN-Industry

### Cable

Designation:  
Sheath material:  
Frequency:

S-STP 4x2xAWG 26/7 PUR, UL  
PUR  
up to 600 MHz

### Plug

Push-on connector type 1:  
Push-on connector type 2:  
System type:  
Pin assignment:

RJ45-connector IP20  
RJ45-connector IP20  
Harting IP20 RJ Industrial 8P  
1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 250 MHz acc. Categorie 6/ Class E, ISO 11801 1st Edition, EN 50173-1 and EIA/TIA 568 B. Plug according IEC 60603-7 and Category 6.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>802389</b>	green	0,5	10
<b>802390</b>	green	1,0	10
<b>802391</b>	green	2,0	10
<b>802392</b>	green	3,0	10
<b>802393</b>	green	5,0	10
<b>802394</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Suitable for using in rough environs
- Suitable for normal movements
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 30m from the Hub to the receiver
- Suitable for the „Light-Duty“ range



# Rangierkabel PROFinet C



RJ45 4P INDUSTRIAL IP20



## Type

**Patch Cable RJ45 HARTING Industrial IP20, PROFinet C drag chain**

## Cable

Designation: PROFinet type C (SK)  
Sheath material: PUR  
Frequency: up to 100 MHz

## Plug

Push-on connector type 1: RJ45-connector IP20  
Push-on connector type 2: RJ45-connector IP20  
System type: Harting IP20 Industrial 4P  
Pin assignment: 1:1 acc. to TIA/EIA 568 B

## Flame proof

acc. to IEC 60332-1

## Oil-resistant

Acc. to EN60811-2-1

## Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-1, EIA/TIA 568 B and EN 60603-7. Support the PROFinet guideline V 1.8.

## Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>802432</b>	green	0,5	10
<b>802433</b>	green	1,0	10
<b>802435</b>	green	3,0	10
<b>802434</b>	green	2,0	10
<b>802436</b>	green	5,0	10
<b>802437</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

## Characteristics

- Drag chain suitable
- Bending radius 7,5 x cable outerdiameter maximum
- Moving speed 240 m/min maximum
- Movement distance 10 m maximum
- Acceleration 4 m/s<sup>2</sup> maximum
- Cycles maximum 5 Mio.
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 100 m from the Hub to the receiver
- Suitable for the „Light-Duty“ range.



## Type

## Patch Cable RJ45 HARTING IP20, LAN-Industry drag chain

### Cable

Designation:

S-FTP 4x1xAWG 24/19 PUR

Sheath material:

PUR

Frequency:

up to 100 MHz

### Plug

Push-on connector type 1:

RJ45-connector IP20

Push-on connector type 2:

RJ45-connector IP20

System type:

Harting IP20 Industrial 4P

Pin assignment:

1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3 and EIA/TIA 568 B. Support the ISO/IEC 24702 and IEC 61076-3-106.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>800833</b>	green	0,5	10
<b>800834</b>	green	1,0	10
<b>800835</b>	green	2,0	10
<b>800836</b>	green	3,0	10
<b>800837</b>	green	5,0	10
<b>800838</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Drag chain suitable
- Bending radius 7,5 x cable outerdiameter maximum
- Moving speed 180 m/min maximum
- Movement distance 6 m maximum
- Acceleration 5 m/s<sup>2</sup> maximum
- Cycles maximum 10 Mio.
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 50 m from the Hub to the receiver
- Suitable for the „Light-Duty“ range



## Type

## Patch Cable RJ45 LAN-Industry PHOENIX Variosub IP20, drag chain

### Cable

Designation:  
Sheath material:  
Frequency:

LAN industry 4x1x0,15  
PUR  
up to 100 MHz

### Plug

Push-on connector type 1:  
Push-on connector type 2:  
System type:  
Pin assignment:

RJ45-connector IP20  
RJ45-connector IP20  
Phoenix Variosub IP20  
1:1 acc. to TIA/EIA 568 B

### Flame proof

acc. to IEC 60332-1

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition, EN 50173-3 and EIA/TIA 568 B. Support the "IAONA Industrial Ethernet Guide" Release 4.0.

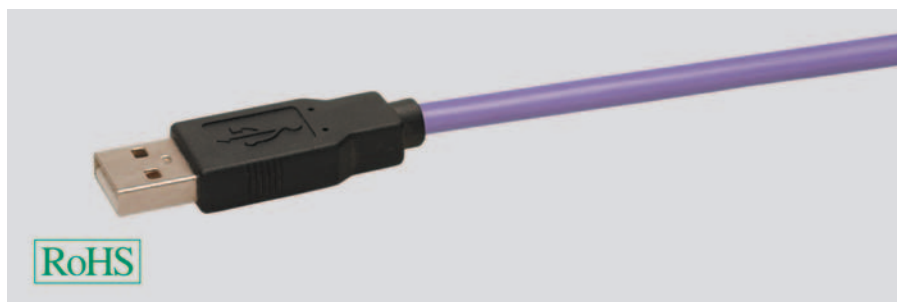
### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>801326</b>	green	0,5	10
<b>801327</b>	green	1,0	10
<b>801328</b>	green	2,0	10
<b>801329</b>	green	3,0	10
<b>801330</b>	green	5,0	10
<b>801331</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Drag chain suitable
- Bending radius 7,5 x cable outerdiameter maximum
- Moving speed 180 m/min maximum
- Movement distance 6 m maximum
- Acceleration 5 m/s<sup>2</sup> maximum
- Cycles maximum 10 Mio.
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 30 m from the Hub to the receiver
- Suitable for the „Light-Duty“ range.



## Type

### USB 2.0 A patch cable, industrial USB – drag chain application

## Cable

Designation:  
Sheath material:  
Frequency:

USB 2.0 shielded cable PUR, up to 5,0m  
PUR  
up to 400 MHz

## Plug

Push-on connection 1:  
Push-on connection 2:

USB A  
USB A

## Flame proof

Acc. to IEC 60332-1

## Norms and standards

HELUKABEL CONNECTING SYSTEMS® system components to 400 MHz in compliance with USB 2.0 Standard. Suitable for applications such as image processing (e.g. surveillance cameras), metrology and control technology.

## Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>802464</b>	violet	0,5	10
<b>802465</b>	violet	1,0	10
<b>802466</b>	violet	2,0	10
<b>802467</b>	violet	3,0	10
<b>802468</b>	violet	5,0	10

Dimensions and specifications may be changed without prior notice.

## Characteristics

- Suitable for use as a patch cable in harsh environments
- Suitable for drag chain and other constantly moving applications
- Application temperature from -20°C to +60°C
- High-speed data transmission rate to max. 480 Mbit/s
- 5.0m maximum transmission distance to terminal device.
- Suitable for light duty applications.



## Type

### Cable

Designation:

Sheath material:

Frequency:

## Patch Cable M12 LAN-Industry IP67, drag chain

LAN industry 4x2x0,15

PUR

up to 100 MHz

### Plug

Push-on connector type 1:

Push-on connector type 2:

Pin assignment:

M12-Connector bush shielded

M12-Buchse bush shielded

D-coded according to DKE/IEC 61076-2-101

### Flame proof

acc. to IEC 60332-1

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition. Plug according IEC 61076-2-101-A1. Support the "IAONA Industrial Ethernet Guide" Release 4.0.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>800800</b>	green	0,3	10
<b>800801</b>	green	1,0	10
<b>800802</b>	green	2,0	10
<b>800803</b>	green	3,0	10
<b>800804</b>	green	5,0	10
<b>800805</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Drag chain suitable
- Bending radius 7,5 x cable outerdiameter maximum
- Moving speed 180 m/min maximum
- Movement distance 6 m maximum
- Acceleration 5 m/s<sup>2</sup> maximum
- Cycles maximum 10 Mio.
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 50 m from the Hub to the receiver
- PIN 1 = whog, PIN 3 = og, PIN 2 = whgn, PIN 4 = gn
- Suitable for the „Heavy-Duty“ range



## Type

### Cable

Designation:  
Sheath material:  
Frequency:

## Patch Cable M12W LAN-Industry IP67, drag chain

LAN industry 4x2x0,15  
PUR  
up to 100 MHz

### Plug

Push-on connector type 1:  
Push-on connector type 2:  
Pin assignment:

M12-Connector bend shielded  
M12-Buchse bend shielded  
D-coded according to DKE/IEC 61076-2-101

### Flame proof

acc. to IEC 60332-1

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKAT CONNECTING SYSTEMS® to 100 MHz acc. Categorie 5, ISO 11801 1st Edition. Plug according IEC 61076-2-101-A1. Support the "IAONA Industrial Ethernet Guide" Release 4.0.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>800806</b>	green	0,3	10
<b>800807</b>	green	1,0	10
<b>800808</b>	green	2,0	10
<b>800809</b>	green	3,0	10
<b>800810</b>	green	5,0	10
<b>800811</b>	green	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Drag chain suitable
- Bending radius 7,5 x cable outerdiameter maximum
- Moving speed 180 m/min maximum
- Movement distance 6 m maximum
- Acceleration 5 m/s<sup>2</sup> maximum
- Cycles maximum 10 Mio.
- Temperature range from -40°C to +80°C
- Transmission rate maximum 100 Mbit/s
- Transmission distance maximum 50 m from the Hub to the receiver
- PIN 1 = whog, PIN 3 = og, PIN 2 = whgn, PIN 4 = gn
- Suitable for the „Heavy-Duty“ range

# Patch Cables Profibus RS 485



M12/4-pole central IP67



## Type

### Cable

Designation:

Sheath material:

Frequency:

## Patch Cable M12 for Profibus RS 485, drag chain

Profibus 1x2x0,64 (strand) drag chain

PUR

up to 16 MHz

### Plug

Push-on connector type 1:

Push-on connector type 2:

Pin assignment:

M12-Connector bush shielded

M12-Buchse bush shielded

B-coded according to DKE/IEC 61076-2-101

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKABEL CONNECTING SYSTEMS® for applications of Profibus RS 485. Plug according IEC 61076-2-101-A1. Support the EN50170.

### Preferred types

Part no.	Sheath colour	Length in metres	Unit
<b>800812</b>	violett similar RAL 4001	0,3	10
<b>800813</b>	violett similar RAL 4001	1,0	10
<b>800814</b>	violett similar RAL 4001	2,0	10
<b>800815</b>	violett similar RAL 4001	3,0	10
<b>800816</b>	violett similar RAL 4001	5,0	10
<b>800817</b>	violett similar RAL 4001	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Drag chain suitable
- Bending radius 10 x cable outerdiameter maximum
- Moving speed 200 m/min maximum
- Movement distance 5 m maximum
- Acceleration 5 m/s<sup>2</sup> maximum
- Cycles maximum 5 Mio.
- Temperature range from -25°C to +70°C
- Transmission rate maximum 3,6 re. 12 Mbit/s
- Segment distance maximum 100 m
- PIN 2 (A) = green, PIN 4 (B) = red, screen terminated on the nut and on PIN 5
- Suitable for the „Heavy-Duty“ range

# Patch Cables Profibus RS 485



M12/4-pole angled IP67



## Type

### Cable

Designation:  
Sheath material:  
Frequency:

## Patch Cable M12W for Profibus RS 485, drag chain

Profibus 1x2x0,64 (strand) drag chain  
PUR  
up to 16 MHz

### Plug

Push-on connector type 1:  
Push-on connector type 2:  
Pin assignment:

M12-Connector bend shielded  
M12-Buchse bend shielded  
B-coded according to DKE/IEC 61076-2-101

### Oil-resistant

Acc. to EN60811-2-1

### Norms and standards

Components of HELUKABEL CONNECTING SYSTEMS® for applications of Profibus RS 485. Plug according IEC 61076-2-101-A1. Support the EN50170.

### Preferred types

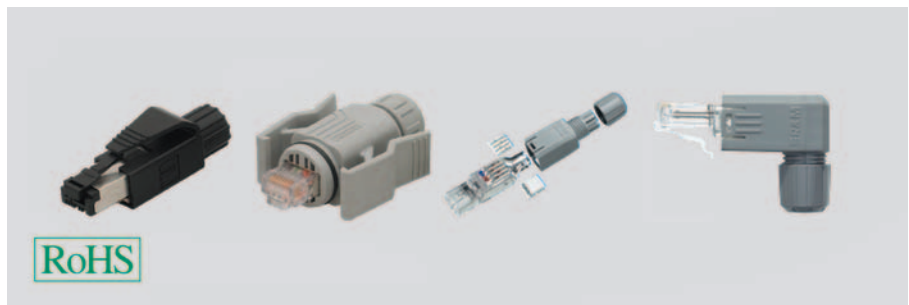
Part no.	Sheath colour	Length in metres	Unit
<b>800818</b>	violett similar RAL 4001	0,3	10
<b>800819</b>	violett similar RAL 4001	1,0	10
<b>800820</b>	violett similar RAL 4001	2,0	10
<b>800821</b>	violett similar RAL 4001	3,0	10
<b>800822</b>	violett similar RAL 4001	5,0	10
<b>800823</b>	violett similar RAL 4001	10,0	10

Dimensions and specifications may be changed without prior notice.

### Characteristics

- Drag chain suitable
- Bending radius 10 x cable outerdiameter maximum
- Moving speed 200 m/min maximum
- Movement distance 5 m maximum
- Acceleration 5 m/s<sup>2</sup> maximum
- Cycles maximum 5 Mio.
- Temperature range from -25°C to +70°C
- Transmission rate maximum 3,6 re. 12 Mbit/s
- Segment distance maximum 100 m
- PIN 2 (A) = green, PIN 4 (B) = red, screen terminated on the nut and on PIN 5
- Suitable for the „Heavy-Duty“ range





### Type

Protection classification (IP):  
System type:

Category:

20  
Harting IP20  
Industrial 4P  
5

20  
standard  
5

20  
standard  
5

67  
Phoenix Variosub  
IP67  
5

### Technical details

Connection type:  
core diameter:

Crimp  
AWG 22-24  
(stranded) and AWG  
22-23 (massive)

Crimp  
AWG 22 - 26  
(stranded + massive)

Crimp  
AWG 22 - 26  
(stranded + massive)

Crimp  
AWG 24-26  
(stranded)

cable diameter min.:

cable diameter max.:

Suitable for circular cable:

Suitable for flat cable:

Suitable for stranded conductor:

Suitable for solid conductor:

Operating temperature range min.:

Operating temperature range max.:

6,4  
6,9  
yes  
no  
yes  
yes  
-40°C  
+70°C

4,5  
8,1  
yes  
no  
yes  
yes  
-20°C  
+70°C

4,5  
8,1  
yes  
no  
yes  
yes  
-20°C  
+70°C

5,0  
8,5  
yes  
no  
yes  
yes  
0°C  
+70°C

Part no.:

Packing unit:

**800986**

**802920**

**804234**

**801318**

**10**

**10**

**10**

**10**

Dimensions and specifications may be changed without prior notice.

### Application

RJ45 plug connectors in accordance with EN50173-1 suitable for industrial Ethernet implementation. Available as IP20 or IP67/50 version. Technical details:

- Plug geometry: in accordance with IEC 60603-7 (RJ45).
- Suitable for light-duty or heavy-duty applications (depending on the plug type).

### Included in delivery

RJ45-plug/ M12-plug, housing and assembly instructions.



### Type

Protection classification (IP):  
System type:

67	67	67	67	20	67
Harting	Harting	Harting IP67	Harting	Harting IP20	Harting
IP65/67	IP65/67	HAN® 3A	IP65/67	RJ Industrial	IP65/67
HAN®		metal	HAN®	8P	HAN®
PushPull 4P			PushPull 8p		PushPull 8p
plastic			plastic		metal
5	5	5	5E	6	6

Category:

### Technical details

Connection type:  
core diameter:

Crimp	Crimp	Crimp	Crimp	Crimp	Crimp
AWG 22-24	AWG 22-24	AWG 22-24	AWG 22-24	AWG 24-27	AWG 22-24
(stranded)	(stranded)	(stranded)	(stranded)	(stranded)	(stranded)
and AWG	and AWG	and AWG	and AWG		and AWG
22-23	22-23	22-23	22-23		22-23
(massive)	(massive)	(massive)	(massive)		(massive)
cable diameter min.:	6,5	6,5	6,5	6,1	6,5
cable diameter max.:	6,9	6,9	6,9	6,9	9,0
Suitable for circular cable:	yes	yes	yes	yes	yes
Suitable for flat cable:	no	no	no	no	no
Suitable for stranded conductor:	yes	yes	yes	yes	yes
Suitable for solid conductor:	yes	yes	yes	no	yes
Operating temperature range min.:	-40°C	-40°C	-40°C	-40°C	-40°C
Operating temperature range max.:	+70°C	+70°C	+70°C	+70°C	+70°C
Part no.:	<b>802438</b>	<b>802439</b>	<b>801320</b>	<b>802440</b>	<b>802258</b>
Packing unit:	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>

Dimensions and specifications may be changed without prior notice.

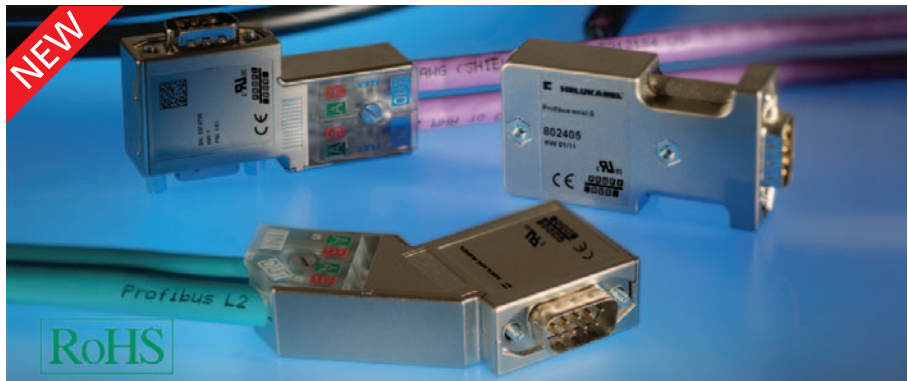
### Application

RJ45 and plug connectors in accordance with EN50173-1 suitable for industrial Ethernet implementation. Available as IP20 or IP67/50 version. Technical details:

- Plug geometry: in accordance with IEC 60603-7 (RJ45), D-coded in accordance with DKE/IEC 61076-2-101
- Suitable for light-duty or heavy-duty applications (depending on the plug type).

### Included in delivery

RJ45-plug, housing, gland and assembly instructions.



### Type

### Cage

Model:  
Number of poles:  
Contact design:  
Housing material:

Jack  
9  
female  
metalized plastic

### Technical details

Protection classification (IP): 20  
Suitable for core diameter: 0,64 mm  
max. transmission rate: 12  
max. current drain: 0,0125 A  
terminating impedance: yes  
Operating temperature range min.: 0°C  
Operating temperature range max.: +60°C

### PROFIBUS connectors

### Plug types

Part no.	Out-going cable	Pro-gramming inter-face	Dia-gnos-tics mode	Connection type	Suitable for cable structure	Suitable for core type	Dimensions in mm	Unit
802401	90°	-	-	Screwing terminal	Standard	solid and flexible	64 x 40 x 17	10
803845	90°	-	yes	Screwing terminal	Standard	solid and flexible	64 x 40 x 17	10
802402	90°	yes	-	Screwing terminal	Standard	solid and flexible	64 x 40 x 17	10
803844	90°	yes	yes	Screwing terminal	Standard	solid and flexible	64 x 40 x 17	10
802406	90°	-	-	Crimp	SK/FC	solid	72 x 40 x 17	10
802408	90°	-	-	Crimp	SK/FC	flexible	72 x 40 x 17	10
803197	90°	-	yes	Crimp	SK/FC	flexible	64 x 40 x 17	10
803195	90°	-	yes	Crimp	SK/FC	solid	64 x 40 x 17	10
802409	90°	yes	-	Crimp	SK/FC	flexible	72 x 40 x 17	10
802407	90°	yes	-	Crimp	SK/FC	solid	72 x 40 x 17	10
803196	90°	yes	yes	Crimp	SK/FC	flexible	64 x 40 x 17	10
803194	90°	yes	yes	Crimp	SK/FC	solid	64 x 40 x 17	10
803576	45°	-	-	Crimp	SK/FC	flexible	72 x 40 x 17	10
803356	45°	-	-	Crimp	SK/FC	solid	95 x 70 x 17	10
803577	45°	yes	-	Crimp	SK/FC	flexible	72 x 40 x 17	10
803357	45°	yes	-	Crimp	SK/FC	solid	72 x 40 x 17	10
802403	35°	-	-	Screwing terminal	Standard	solid and flexible	54 x 40 x 17	10
802404	35°	yes	-	Screwing terminal	Standard	solid and flexible	54 x 40 x 17	10
802405	axial	-	-	Screwing terminal	Standard	solid and flexible	68 x 39,5 x 17	10
803208	axial	-	-	Crimp	SK/FC	solid	70 x 35 x 17	10
803209	axial	-	-	Crimp	SK/FC	flexible	70 x 35 x 17	10

Dimensions and specifications may be changed without prior notice.

### Application

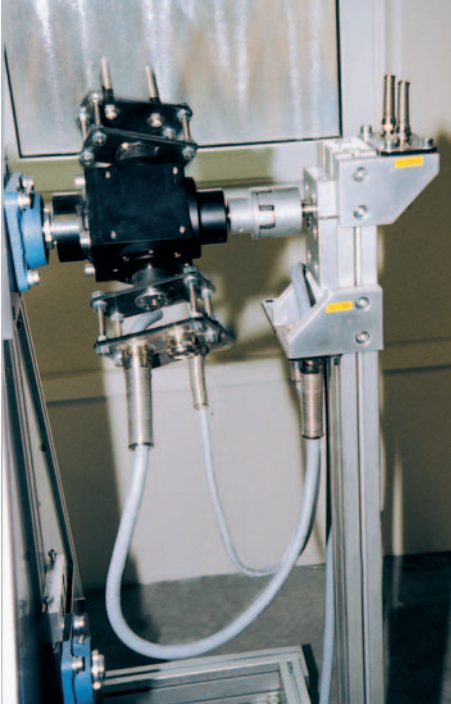
The compact design of the bus connectors from the series HELUKABEL CONNECTING SYSTEMS makes them suitable for use in nearly all Siemens CPU types. A slide switch sets whether the connector will be used as a node or end of segment. The switch can also be operated when the connector is plugged. The switch setting is clearly visible.

### Included in delivery

SUB-D plug 9 poles, housing and assembly instructions.

# Testingcenter

## HELUKABEL® testing centre located in HELUKABEL® factory in Windsbach



We are constantly working together with our customers to develop new cable types with special constructions as well as cable types for extreme conditions such as small bending radii or high alternating bending stress with long service life for extended use in multi-shift operations. New products are tested in our modern testing facility using state-of-the-art equipment to determine their suitability for series production. Additionally, we monitor our products in our testing centre during all stages of production as part of our continuous control process.

### Torsion / bending test machine

Rotation speed: up to max. 118 min<sup>-1</sup> with continuous adjustment  
Rotation angle: ± 15 up to max. ± 360°

### Test machine for drag chain cables

Speed: max. 8 m/s  
Acceleration: max. 10 m/s<sup>2</sup>  
Traverse path: 20 m  
Load capacity: 300 kg



Photos: HELUKABEL®



# Fibre optic connection

## Fibre optic connection

Photo: HELUKABEL®

In addition to the fibre optic cable, the connection equipment plays an essential role in the construction of glass fibre networks. Optical transmission lines are only complete after installing pigtails, jumper cables, plugs, couplings, splice boxes and wiring boxes. Regardless of the application, HELUKABEL® has the cable solution that's right for you. This also includes the use of pre-assembled fibre optic cables. In only a short time, we can supply you with pre-assembled kits containing all the most frequently used plugs and cable types. As a result, it is possible to eliminate the high

costs involved in obtaining the required tools. In addition, this "plug-and-play" solution helps you to reduce the time necessary for installation. These features are what make HELUCOM CONNECTING SYSTEMS® the ideal choice when it comes to providing our customers economical, high-quality solutions. On the pages that follow, you will find a wide range of products that we have developed to help you to complete your network. HELUCOM CONNECTING SYSTEMS® is synonymous with superior quality. This is because we only use components that meet the strictest of standards.



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No special knowledge or tools are needed to install HELUCOM® pre-assembled fibre optic cables. The cable is pre-assembled and can be connected immediately after it has been laid. As a result, the installation process actually comprises nothing more than laying the cable itself. In the distributor bodies, the fibres from the loose-tube cable are conducted through the individual simplex cables without splicing. The simplex cables are terminated using pre-assembled plugs. Included in delivery is a plug shield that protects the plugs, simplex cables and distributor body

while the cable is being laid. The pulling aid is connected to the pull cable. As a result, it is possible to lay the cable together with the pre-assembled distributor just as you would lay a standard cable. The benefits of pre-assembled and pre-assembled cables are easy to see: The fibre optic cables are cut to the desired length, and the fibres are glued to different plug models in a clean and dust-free environment (Sr. SC, FDDI, E-2000 etc.). Pre-assembled fibre-optic cables.

## Features:

### Applications:

1. Outdoor wiring
2. Indoor wiring

### Cable types:

- Zipcords with halogen-free outer jacket
- Breakout cables with halogen-free outer jacket
- Mini breakout cables with halogen-free outer jacket
- Fibre optic cables with central / stranded loose-tube cable
- Plastic fibre cables (POF)

### Fibre types:

- E9/125 IJm
- G50/125 IJm
- G62.5/125 IJm
- 200/230 IJm
- 980/1000 IJm

### Plug systems:

- Sr. SC, SCdx, LC, MTRJ, E-2000, DIN, FDDI, FC-PC and F-SMA

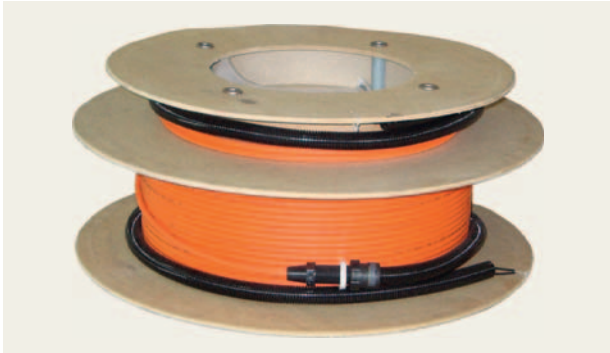
### Additional pre-assembled kits:

- Pulling aid
- Pulling tube
- Core coding



**HELUCOM**®  
CONNECTING SYSTEMS

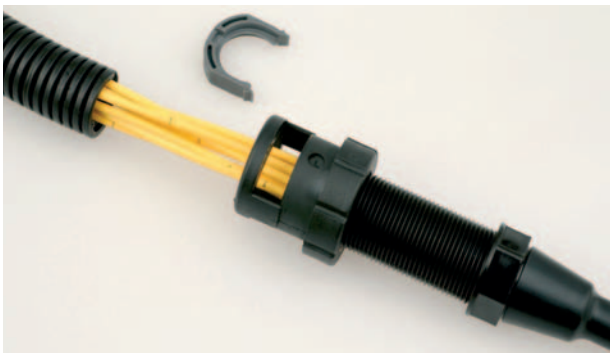
# Connection equipment



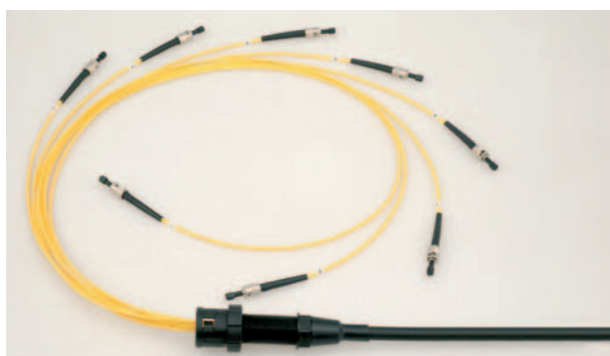
The pre-assembled loose-tube cable together with distributor body and pulling protection as it appears just before shipment. Depending on the length of the cable, the cable can be shipped as a ring or on a disposable shipping reel.



Detailed view from the end of the cable with pulling aid.



Detailed view of the robust, cast distributor body. The distributor body is equipped with a compatible plastic gland for installation in splice boxes. In addition, the system can be reused in a new installation.



Mini loose-tube cables designed to allow easy insertion into prepared splice boxes. In addition, the mini loose-tube cables are number-coded.



Glass fibre splice box used as cable end enclosure for multi-core fibre optic cables in 19" cabinets. The splice box is particularly suitable as a connecting unit for our pre-fabricated fibre-optic grooved cables.



## Matrix Distributor bodies

Designation	Figure	Top view	
		compact fibre	empty fibre
WKOM-01			
WKOM-02			
WKOM-03			
WKOM-04			
WKOM-05			

Designation	Figure	Top view	
		compact fibre	empty fibre
WKOM-100			
WKOM-101			
WKOM-102-4			
WKOM-102-5			

## Cable allocation

Designation	Figure	Top view	
		compact fibre	empty fibre
WKOM-105			
WKOM-106			
WKOM-107			

# Fibre Optic connecting technic

	Compact fibre	Empty fibre	Thread	Fibre-optic cable	Allocation table			
	max. number	max. number	type	max $\varnothing$ [mm]	length [mm]	D [mm]	d <sub>A</sub> [mm]	d <sub>I</sub> [mm]
	24	-	PG21	12	80	39	34	28
	12	-	PG16	12	80	34	28	23
	4	12	PG11	10	66	29	26	18,5
	4	12	-	10	35	17	-	-
	4	4	-	5	29	12	-	-
	Thread	Cable A	Cable B	Cable B	Allocation table			
	type	max $\varnothing$ [mm]	number	$\varnothing$ [mm]	length [mm]	D [mm]	d <sub>A</sub> [mm]	d <sub>I</sub> [mm]
	PG16	12	2	6	80	34	28	23
	PG16	12	3	6	80	34	28	23
	PG21	12	4	8	80	39	34	28
	PG21	12	5	6	80	39	34	28

	Thread	Cable A	Cable B	Cable B	Allocation table			
	type	max $\varnothing$ [mm]	number	$\varnothing$ [mm]	length [mm]	D [mm]	d <sub>A</sub> [mm]	d <sub>I</sub> [mm]
	-	14	2	12	110	-	18	14
	-	10	2	8	100	-	14	10
	-	8	2	6	100	-	12	8

## ST plug



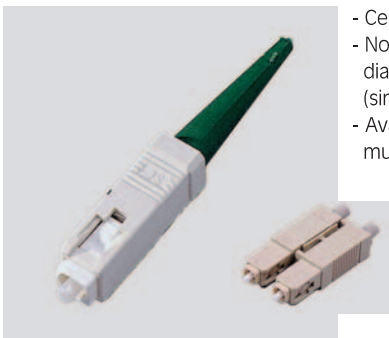
- Ceramic ferrule
- Available for single mode or multi-mode

## ST adapter



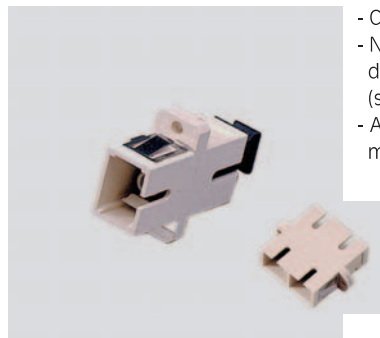
- Ceramic ferrule
- Available for single mode or multi-mode

## SC/SCdx plug



- Ceramic ferrule
- Normal cross section or 8° diagonal cross section (single mode only)
- Available for single mode or multi-mode

## SC/SCdx adapter



- Ceramic ferrule
- Normal cross section or 8° diagonal cross section (single mode only)
- Available for single mode or multi-mode

## MTRJ plug



- Ceramic ferrule
- Available for single mode or multi-mode

## MTRJ adapter



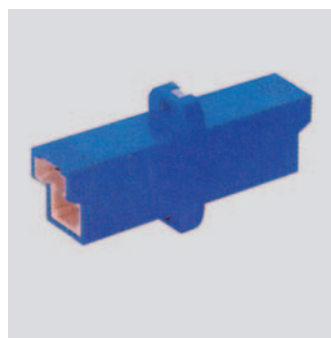
- Ceramic ferrule
- Available for single mode or multi-mode

## E-2000 plug



- Ceramic ferrule
- Normal cross section or 8° diagonal cross section (single mode only)
- Available for single mode or multi-mode

## E-2000 adapter



- Ceramic ferrule
- Normal cross section or 8° diagonal cross section (single mode only)
- Available for single mode or multi-mode

## DIN plug



- Ceramic ferrule
- Available for single mode or multi-mode

## DIN adapter



- Ceramic ferrule
- Available for single mode or multi-mode

## LC plug



- Ceramic ferrule
- Available for single mode or multi-mode

## LC adapter



- Ceramic ferrule
- Available for single mode or multi-mode

## PC plug



- Ceramic ferrule
- Normal cross section or 8° diagonal cross section (single mode only)
- Available for single mode or multi-mode

## FC PC adapter



- Ceramic ferrule
- Normal cross section or 8° diagonal cross section (single mode only)
- Available for single mode or multi-mode

## F-SMA plug



- Ceramic ferrule
- Available for single mode or multi-mode

## F-SMA adapter



- Ceramic ferrule
- Available for single mode or multi-mode

Splice-Boxes complete, Telescope



## Type

**19" splice boxes, telescope**

## Cage

Housing material:  
Cover lock:  
Colour:

Steel sheet  
Fastening by means of screws  
Grey similar to RAL 7035

## Equipment

Full  
Couplers  
Pigtails

## Dimensions

Number of height modules (HM):  
Fastening dimensions:  
Width:

1  
19"  
225 mm

## Preferred types

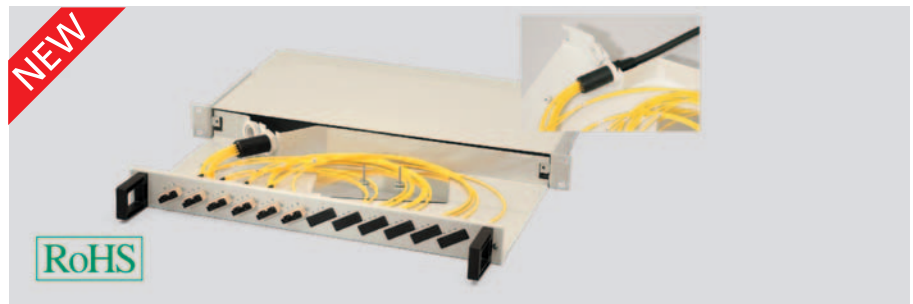
Part no.	Number of couplers	Type of coupler	Fibre type	Unit
801164	4	ST	Multimode G50/125	1
802453	4	ST	Multimode G50/125 OM3	1
801165	8	ST	Multimode G50/125	1
802454	8	ST	Multimode G50/125 OM3	1
81354	12	ST	Multimode G50/125	1
802455	12	ST	Multimode G50/125 OM3	1
81355	12	ST	Multimode G62.5/125	1
82869	12	ST	Single-mode E9/125	1
81356	24	ST	Multimode G50/125	1
802456	24	ST	Multimode G50/125 OM3	1
81357	24	ST	Multimode G62.5/125	1
82870	24	ST	Single-mode E9/125	1
801166	2	SC duplex	Multimode G50/125	1
802457	2	SC duplex	Multimode G50/125 OM3	1
801167	4	SC duplex	Multimode G50/125	1
802458	4	SC duplex	Multimode G50/125 OM3	1
81358	6	SC duplex	Multimode G50/125	1
802459	6	SC duplex	Multimode G50/125 OM3	1
81359	6	SC duplex	Multimode G62.5/125	1
82871	6	SC duplex	Single-mode E9/125	1
81675	12	SC duplex	Multimode G50/125	1
802460	12	SC duplex	Multimode G50/125 OM3	1
81676	12	SC duplex	Multimode G62.5/125	1
82872	12	SC duplex	Single-mode E9/125	1
803145	2	LCdx	Multimode G50/125	1
803146	2	LCdx	Multimode G50/125 OM3	1
803147	4	LCdx	Multimode G50/125	1
803148	4	LCdx	Multimode G50/125 OM3	1
803149	6	LCdx	Multimode G50/125	1
803150	6	LCdx	Multimode G50/125 OM3	1
803151	6	LCdx	Multimode G62.5/125	1
803152	6	LCdx	Single-mode E9/125	1
803153	12	LCdx	Multimode G50/125	1
803154	12	LCdx	Multimode G50/125 OM3	1
803155	12	LCdx	Multimode G62.5/125	1
803156	12	LCdx	Single-mode E9/125	1
82873	12	E2000	Multimode G50/125	1
82874	12	E2000	Multimode G62.5/125	1
82875	12	E2000	Single-mode E9/125	1

Dimensions and specifications may be changed without prior notice.

## Application

Glass fibre splice boxes are used as cable end enclosures for multi-core fibre-optic cables in 19" cabinets.

Splice-Boxes partly equipped, Telescope



## Type

**19" splice boxes, telescope partially configured with couplings MM**

## Cage

Housing material:  
Cover lock:  
Colour:

Steel sheet  
Fastening by means of screws  
Grey similar to RAL 7035

## Equipment

Partially-configured  
Couplers

## Dimensions

Number of height modules (HM):  
Fastening dimensions:  
Width:

1  
19"  
225 mm

## Preferred types

Part no.	Number of couplers	Type of coupler	Unit
<b>801171</b>	4	ST	1
<b>801172</b>	8	ST	1
<b>801173</b>	12	ST	1
<b>801174</b>	24	ST	1
<b>801168</b>	2	SC duplex	1
<b>801169</b>	4	SC duplex	1
<b>801170</b>	6	SC duplex	1
<b>80996</b>	12	SC duplex	1
<b>803157</b>	2	LCdx	1
<b>803158</b>	4	LCdx	1
<b>803159</b>	6	LCdx	1
<b>803160</b>	12	LCdx	1

Dimensions and specifications may be changed without prior notice.

## Application

Glass fibre splice boxes are used as cable end enclosures for multi-core fibre optic cables in 19" cabinets. The splice boxes described here are particularly suitable as a connecting unit for our pre-fabricated fibre-optic grooved cables.



### Type

### Mini-Wallmount Cabinet

### Cage

Housing material:  
Colour:

Steel sheet  
Grey similar to RAL 7035

### Equipment

With front plate  
Maximum number of couplings/adapters:  
Number of couplings/adapters:  
With coupling/adapter:

8  
8  
Empty

### Dimensions

Width:

54 mm

### Included in delivery

Housing with cover, lockable, 2 keys, 2 plastic expanding rivets, 4 openings with sealing strips for incoming and outgoing cables.

### Application

A maximum of 8 splice boxes or 4 splice boxes and one distributor plate can be installed. The distributor plate can be fastened using 2 plastic expanding rivets. Dimensions: W=320xH=280xD=54mm.

### Part no.

**802461**

Dimensions and specifications may be changed without prior notice.



### Type

### Mini-Wallmount Cabinet

### Cage

Housing material:  
Colour:

Steel sheet  
Grey similar to RAL 7035

### Equipment

With front plate  
Maximum number of couplings/adapters:  
Number of couplings/adapters:  
With coupling/adapter:

4  
4  
Empty

### Dimensions

Width:

55 mm

### Included in delivery

1 x distribution plate for 8 x ST or 8 x FC (D-hole) connectors and 1 x distribution plate for 4 x SC Duplex or 4 x LC 4-Way connectors

### Application

Cabinet with hinged cover, lockable, 2 keys, 2 dust-proof openings for incoming and outgoing cables that are fixed in place with cable ties. Space for a maximum of 4 splice trays or 1 splice tray and a distribution plate.  
Dimensions: Width = 265 x Height = 150 x Depth = 55mm.  
Included in delivery: 1 x distribution plate for 8 x ST or 8 x FC (D-hole) connectors and 1 x distribution plate for 4 x SC Duplex or 4 x LC 4-Way connectors.

### Part no.

#### 802462

Dimensions and specifications may be changed without prior notice.





### Type

### Cage

Colour:  
Outlet direction:  
Type of fastening:

### Fibre-optic wiring boxes, in-wall installation

Pure White similar to RAL 9010  
Angled  
Snap-in

### Equipment

Coupler  
Central plate  
Text box

### Dimension

50 x 50mm

### Preferred types

Part no.	Number of couplers	Type of coupler	Suitable for fibre type	Unit
<b>81072</b>	2	ST	Multi-mode	10
<b>81073</b>	4	ST	Multi-mode	10
<b>81074</b>	2	SC	Multi-mode	10
<b>81075</b>	4	SC	Multi-mode	10

Dimensions and specifications may be changed without prior notice.

### Application

The fibre-optic wiring box forms the end element of the fibre-optic network at the workstation. From the wiring box, computers and peripheral devices are connected with cable connections (jumper cables). Depending on the version, the wiring box can be used in-wall mounting or top-mounting.



### Type

### Preferred types

### Fibre optic connector

Part no.	Type	Suitable for fibre type	Unit
<b>80396</b>	ST	Multi-mode	50
<b>81062</b>	SC	Multi-mode	50
<b>81063</b>	SC duplex	Multi-mode	50
<b>800728</b>	SC duplex	Single-mode	50
<b>800725</b>	F-SMA	Multi-mode	50
<b>800727</b>	F-SMA	Single-mode	50
<b>800723</b>	LC	Multi-mode	50
<b>800726</b>	LC	Single-mode	50
<b>82025</b>	MT-RJ	Multi-mode	50
<b>800724</b>	FC	Multi-mode	50
<b>800720</b>	E2000	Single-mode	50
<b>800721</b>	DIN	Multi-mode	50

Dimensions and specifications may be changed without prior notice.

### Included in delivery

### Application

Fibre-optic plug

Fibre-optic plugs and couplings serve as links or removable connections for equipment outputs or distribution centers.

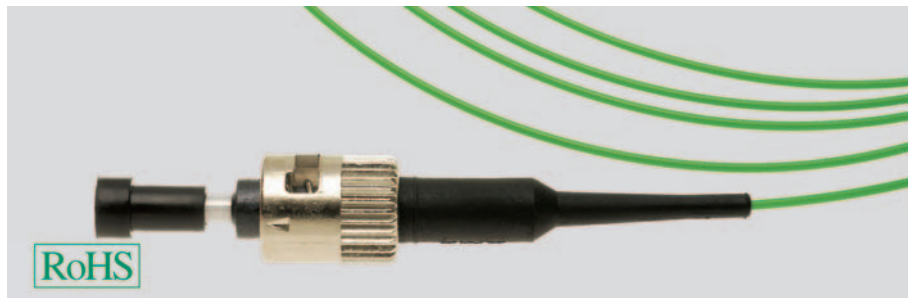
### Type

### Preferred types

### LWL-coupler

Part no.	Type	Suitable for fibre type	Unit
<b>800729</b>	SC / ST	Single-mode	50
<b>802252</b>	ST / ST	Multi-mode	50
<b>80605</b>	ST / ST	Single-mode	50
<b>81069</b>	SC / ST	Multi-mode	50
<b>81065</b>	SC / SC	Multi-mode	50
<b>800731</b>	SC / SC	Single-mode	50
<b>81070</b>	SC duplex / ST	Multi-mode	50
<b>800730</b>	SC duplex / ST	Single-mode	50
<b>81066</b>	SC duplex / SC duplex	Multi-mode	50
<b>800732</b>	SC duplex / SC duplex	Single-mode	50
<b>82026</b>	MT-RJ / MT-RJ	Multi-mode	50
<b>800735</b>	LC / LC	Multi-mode	50
<b>800736</b>	LC / LC	Single-mode	50
<b>800733</b>	E2000 / E2000	Single-mode	50
<b>800737</b>	FC/PC / FC/PC	Multi-mode	50
<b>800738</b>	F-SMA / F-SMA	Multi-mode	50
<b>800734</b>	DIN / DIN	Multi-mode	50

Dimensions and specifications may be changed without prior notice.



### Type

### Standard length

### Preferred types

### Fibre pigtails

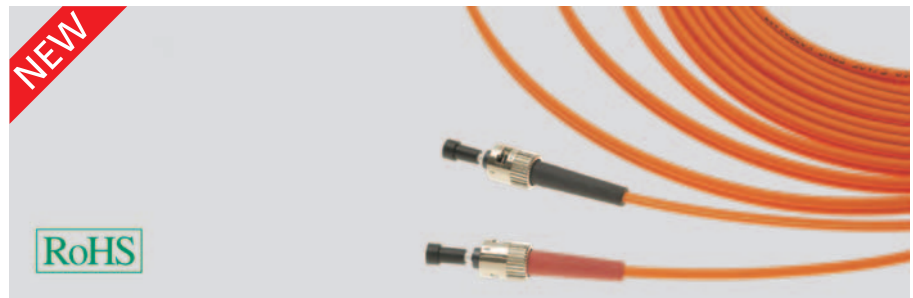
2,0 m

Part no.	Fibre type	Push-on connector type	Colour	Unit
<b>80457</b>	Multimode G50/125	ST	Blue	12
<b>80606</b>	Multimode G62.5/125	ST	Green	12
<b>81041</b>	Single-mode E9/125	ST	Yellow	12
<b>81044</b>	Multimode G50/125	SC	Blue	12
<b>81045</b>	Multimode G62.5/125	SC	Green	12
<b>81046</b>	Single-mode E9/125	SC	Yellow	12

Dimensions and specifications may be changed without prior notice.

### Application

Pigtails are used in glass fibre sets, such as splice boxes.



## Type

## Version

## Preferred types

### Jumper cable I-VH 2x1 (glas fibre)

Duplex

Part no.	End 1	End 2	Fibre type	Length	Unit
80983	ST	ST	Multimode G50/125	2	10
803161	ST	ST	Multimode G50/125	1	10
801175	ST	ST	Multimode G50/125	3	10
801176	ST	ST	Multimode G50/125	5	10
802442	ST	ST	Multimode G50/125 OM3	2	10
80636	ST	ST	Multimode G62.5/125	2	10
81043	ST	ST	Single-mode E9/125	2	10
803163	SC duplex	ST	Multimode G50/125	1	10
81053	SC duplex	ST	Multimode G50/125	2	10
803164	SC duplex	ST	Multimode G50/125	3	10
803165	SC duplex	ST	Multimode G50/125	5	10
802444	SC duplex	ST	Multimode G50/125 OM3	2	10
81054	SC duplex	ST	Multimode G62.5/125	2	10
81055	SC duplex	ST	Single-mode E9/125	2	10
803162	SC duplex	SC duplex	Multimode G50/125	1	10
81050	SC duplex	SC duplex	Multimode G50/125	2	10
801177	SC duplex	SC duplex	Multimode G50/125	3	10
801178	SC duplex	SC duplex	Multimode G50/125	5	10
802443	SC duplex	SC duplex	Multimode G50/125 OM3	2	10
81051	SC duplex	SC duplex	Multimode G62.5/125	2	10
81052	SC duplex	SC duplex	Single-mode E9/125	2	10
803171	LC duplex	ST	Multimode G50/125	1	10
802543	LC duplex	ST	Multimode G50/125	2	10
803172	LC duplex	ST	Multimode G50/125	3	10
803173	LC duplex	ST	Multimode G50/125	5	10
803174	LC duplex	ST	Multimode G50/125 OM3	2	10
803175	LC duplex	ST	Multimode G62.5/125	2	10
803176	LC duplex	ST	Single-mode E9/125	2	10
803169	LC duplex	SC duplex	Multimode G50/125	1	10
802448	LC duplex	SC duplex	Multimode G50/125	2	10
802545	LC duplex	SC duplex	Multimode G50/125	3	10
803170	LC duplex	SC duplex	Multimode G50/125	5	10
802446	LC duplex	SC duplex	Multimode G50/125 OM3	2	10
802450	LC duplex	SC duplex	Multimode G62.5/125	2	10
802452	LC duplex	SC duplex	Single-mode E9/125	2	10
803166	LC duplex	LC duplex	Multimode G50/125	1	10
802447	LC duplex	LC duplex	Multimode G50/125	2	10
803167	LC duplex	LC duplex	Multimode G50/125	3	10
803168	LC duplex	LC duplex	Multimode G50/125	5	10
802445	LC duplex	LC duplex	Multimode G50/125 OM3	2	10
802449	LC duplex	LC duplex	Multimode G62.5/125	2	10
802451	LC duplex	LC duplex	Single-mode E9/125	2	10
82013	MT-RJ	ST	Multimode G50/125	2	10
82014	MT-RJ	ST	Multimode G62.5/125	2	10
82015	MT-RJ	ST	Single-mode E9/125	2	10
82011	MT-RJ	SC duplex	Multimode G50/125	2	10
82012	MT-RJ	SC duplex	Multimode G62.5/125	2	10
82016	MT-RJ	SC duplex	Single-mode E9/125	2	10

Dimensions and specifications may be changed without prior notice.

## Application

Cable connections by HELUCOM® are used for wiring terminals.



## Type

**Rubber cable reel with HELUCOM® fibre optic mobile cable**

## Drum

Equipment:

## Rubber

with supporting frame

## Cable

Description:  
sheath colour:

Fibre-optic cable, mobile, trailing  
Orange

Flame proof

VDE 0482-332-1-2

## Plug

System type:  
Protective grommet:  
APC version:

office connector  
Plugged  
no

## Norms and standards

Components of HELUCOM CONNECTING SYSTEMS® according actual standards. Meet the standard IEC 60794-1-2 F5 and E6. Also they realize the optical data acc. OM1, OM2 and ITU-T G.652.

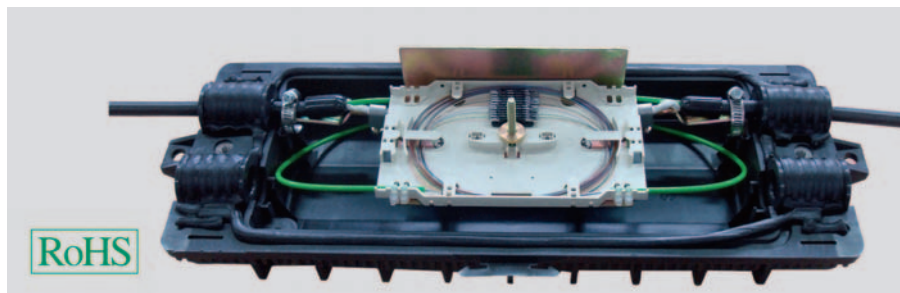
## Preferred types

Part no.	Fibre type	Fibre count	Plug 1	Plug 2	Cable length m
<b>802223</b>	Multimode G50/125	4	ST	ST	500,0
<b>802226</b>	Multimode G62,5/125	4	ST	ST	500,0
<b>802229</b>	Single-Mode E9/125	4	ST	ST	500,0
<b>802224</b>	Multimode G50/125	4	SC duplex	SC duplex	500,0
<b>802227</b>	Multimode G62,5/125	4	SC duplex	SC duplex	500,0
<b>802230</b>	Single-Mode E9/125	4	SC duplex	SC duplex	500,0
<b>802225</b>	Multimode G50/125	4	LC duplex	LC duplex	500,0
<b>802228</b>	Multimode G62,5/125	4	LC duplex	LC duplex	500,0
<b>802231</b>	Single-Mode E9/125	4	LC duplex	LC duplex	500,0

Dimensions and specifications may be changed without prior notice.

## Characteristics

Rubber cable reel with 4 fibre optic jacks and fibre optic plugs. Suitable for mobile use on site, for example for meetings, TV-Transmissions, Fairs, etc.. Everywhere when there is a need for a removable cable connection. Usable for flexible and fixed installation cabling.



## Type

## FO-Sleeve

### General Data

Sleeve typ	max. 48 fibres
Dimensions (LxWxH)	399 x 175 x 107 mm
Dimensions splice tray (LxWxH)	305 x 119 x 84 mm
Weigth	1715 g
Cable diameter	1-2,54 cm (0,4-1 Zoll)
Cable entry	4 (2 per side)
Splice trays	max. 4 DIN
Dielectric strength 12	1 kg, 1 m bei -20° C => No visible damage to the splice connections. No leakage.
Water resistance	Water depth 2,5 m -> 30 Tage. => No penetration of water
Fibres	24 <span style="float: right;">48</span>

### Part no.

**802936**

**804300**

### Application

This fiber optic sleeve is suitable for use with up to 48 fibers and is therefore suitable for most applications in optical distribution networks. The fiber optic sleeve is resistant to chemical and mechanical influences in all fields of optical crosslinking, resistant. In the sleeve set are all included for the complete assembly of the sleeve parts required. The type and number of splice trays are selected according to the particular application. The joint consists of two plastic parts and mastic sealants. The wedge slide closure enables easy and fast closing the outdoor sleeve. Through the closure mechanism short installation times and simple open and closed again be made possible.



## Type

## FO Mast, Tower or Hood sleeves

### General Data

Fibres	48	144
Diameter	190 mm	228 mm
Height total	415 mm	500 mm
Height hood	370 mm	430 mm
Distance wall – hood	220 mm	280 mm
Mast clamp distance	85 mm	107 mm
Cable entry	4 x max. Ø 16 mm	1 x max. Ø 36 mm + 3 x max. Ø 22 mm
Splice trays	4	12
Storage	yes	yes
Permissible temperature range	-40° C bis +65° C	-40° C bis +65° C
Weight	2,7 kg	4,1 kg

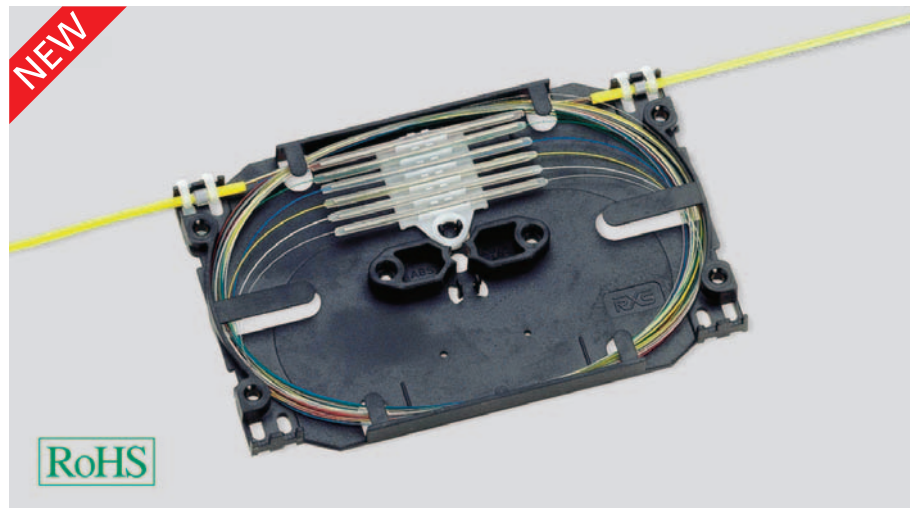
### Part no.

**804301**

**804302**

### Application

FO Mast, tower or hood sleeves are designed for underground laying and mounting in stacks and on masts. These types of sleeves are used in a vertical position – all ingoing and outgoing cables are feeded at the bottom. The special construction ensures a maximal protection against environmental conditions. The family of hood sleeves contains 24 to 144 shrinking splices in which max. 12 fiber optic splices lead to a hinged splice cassette. These sleeves are used in long distance data transmission and in the backbone-area of big companies. Access to single fibers is possible through operation by the hinged splice cassettes, which ensures an undisturbed function of the cables.



## Preferred types

Part no.	Type	Unit
<b>80307</b>	SPLICING CASSETTE	10
<b>81364</b>	SPLICE HOLDER "CRIMP"	100
<b>80309</b>	CRIMP SPLICE PROTECTOR	100
<b>81365</b>	SPLICE HOLDER "SHRINK"	100
<b>81362</b>	SHRINK-ON SPLICE PROTECTOR	100
<b>81363</b>	CASSETTE COVER	10

Dimensions and specifications may be changed without prior notice.





Photo: HELUKABEL®

Ethernet was initially used exclusively in the office environment. The Ethernet technology has now also established itself at the automation and production levels as so-called INDUSTRIAL ETHERNET because it makes continuous communication at all levels of a business network possible.

By using standardised interfaces for all communication equipment, the complexity of processes is reduced and the productivity is increased. With new industry-compatible network components based on IP20, IP 65 or IP67, or suitable

for DIN rail mounting and standards such as ISO/IEC 24702, the prerequisites for a completely networked future have been created.

The HELUCOM CONNECTING SYSTEMS® INDUSTRY series from HELUKABEL® provides passive fibre optic connection components such as splice boxes, data sockets and connection cables for harsh industrial environments.



# POF/HCS connection technology

## Overview Plug connectors

### POF-HFBR 4501/4511 HCS-HFBR 4521



- Simplex connector
- Plastic enclosure
- For POF and HCS
- Processing:

## Overview Plug connectors

### POF-TOCP 155/ F05 HCS-TOCP 155/ F05



- Simplex connector
- Plastic enclosure
- For POF and HCS
- Processing: crimping, grinding, polishing or hotplate

### POF-HFBR 4503/4513



- Simplex connector
- Plastic enclosure
- For POF
- Processing: crimp / latch

### POF-TOCP 255/ F07 HCS-TOCP 255/ F07



- Duplex connector
- Plastic enclosure
- For POF and HCS
- Processing: crimping, grinding, polishing or hotplate

### POF-HFBR 4533/4531



- Simplex connector
- Plastic enclosure
- For POF
- Processing: crimping, grinding, polishing

### POF/HCS F-SMA



- Simplex connector
- Metal enclosure
- For POF and HCS (2.2/3.6/6.0 mm)
- Processing: crimping, grinding, polishing

### POF-HFBR 4506



- Duplex connector
- Plastic enclosure
- For POF
- Processing: crimping, grinding, polishing

### POF/HCS ST



- Simplex connector
- Metal / plastic enclosure
- For POF and HCS (2.2/3.6 mm)
- Processing: crimping, grinding, polishing



### Type

### Configuration

Housing material:  
 Colour:  
 Max. number of modules:  
 Screen removal:  
 Strain relief:  
 Cover lock:

### Basic Panel

Steel plate, solid	Steel plate, solid
Grey similar to RAL 7035	Grey similar to RAL 7035
8	16
via continuous screening tape	via continuous screening tape
by means of cable straps	by means of cable straps
Quick-action twist lock	Quick-action twist lock

### Dimension

Width:  
 Depth:  
 Number of height modules (HM):

195 mm	195 mm
150 mm	150 mm
1	2

### Part no.:

<b>801311</b>	<b>801304</b>
---------------	---------------

### Packing unit:

5	5
---	---

With coupling/adaptor  
 Connection type, exterior  
 Connection type, internal  
 Number of couplers  
 Fibre type  
 APC version  
 Type:

### Module

yes	yes	
ST	SC-Duplex	
ST	SC-Duplex	
1	1	
Multimode	Multimode	
N	N	
Modul for top-hat rail	Modul for top-hat rail	Modul for top-hat rail
installation patch panel, 2xST	installation patch panel, 2xSC	installation patch panel, blind
MM	MM	2ME

### Part no.:

<b>801314</b>	<b>801315</b>	<b>801316</b>
---------------	---------------	---------------

### Packing unit:

10	1	10
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### Norms and standards

HELUKAT CONNECTING SYSTEMS® INDUSTRY individual system components, category 6 de-embedded (IEC 60603-7-5), ISO 11801 2nd Edition, EN 50173-1 2nd Edition, EIA/TIA 568-B.2-1 and EN 55022 (EMV).

### Application

As connection distribution unit for DIN rail installation e.g. in the switch cabinet, for applications involving digital and analog image, data and voice transmission. Can be combined (also with fibre optic components) thanks to the modular structure. Tool-free turn latches enable simple closing and opening of the housing.

Dimensions and specifications may be changed without prior notice.



### Type

### Fibre Optic DIN RAIL splicebox vertical, telescope partially configured with couplings MM

### Cage

Housing material:  
Cover lock:  
Colour:

Steel sheet  
Fastening by means of screws  
Grey

### Equipment

Partially-configured  
Couplers

### Dimensions

Number of height modules (HM):  
Width:

3  
133 mm

### Preferred types

Part no.	Number of couplers	Type of coupler	Unit
<b>804303</b>	2	SC duplex	1
<b>804305</b>	4	ST	1
<b>804307</b>	2	LCdx	1

Dimensions and specifications may be changed without prior notice.

### Application

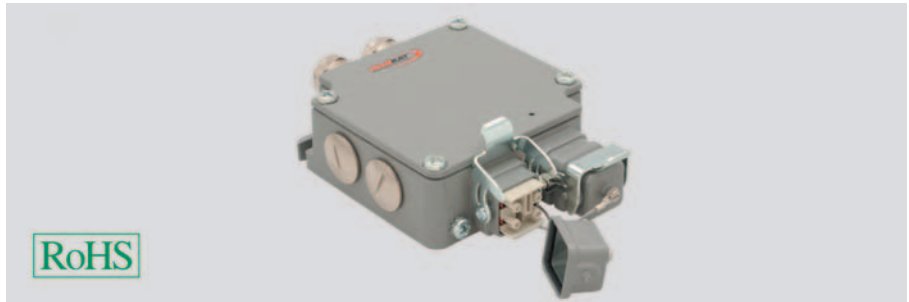
The Fibre Optic DIN rails are used for installing preassembled Breakout cables with cable splitter WKOM-03. The compact and robust construction and handsome design make them suitable for applications in the industry. The panels consist of a metal housing with integrated coupling heads are built in at the front. Breakout cables are inserted up and down. Modern components provide for excellent attenuation and low reflection losses.

# Machine outlet IP67

INDUSTRIAL ETHERNET



SC MM, IP67



## Type

**Industrial Ethernet, SCdx multimode outlets IP67**

## Configuration

Housing material: Aluminium die-cast  
Colour: Grey  
Outlet direction: Straight  
Type of fastening: Screw  
Dust protection: Hinged cover  
Protection classification (IP): 67

## Equipment

Type: Coupler  
Number of couplings: SC  
Suitable for fibre type: 2  
Multi-mode

## Dimension

175 x 110 x 45mm

## Area of application

Industrial environment

## Part no.

**801354**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**5**

## Norms and standards

HELUCOM CONNECTING SYSTEMS® INDUSTRY component suitable for multimode fibre applications (G50/125µm and G62.5/125µm). Moreover it satisfies the MICE specifications (class 3), EMC requirements in accordance with DIN EN 6100, and the requirements of the IP 67 housing protection class.

## Application

Robust data connection socket (shielded) for the extreme implementation. Robust aluminum die-cast housing; meets all mechanical requirements like vibration, shock, and transverse forces. The socket is used either on the machine distributor (MD) or wall mounted directly on the machine (MC) as connection unit.

# Machine outlet IP65

INDUSTRIAL ETHERNET



SC MM, IP65



## Type

**Industrial Ethernet outlet plastic IP 65, SCdx POF/HCS/MM**

## Configuration

Housing material:  
Colour:  
Outlet direction:  
Type of fastening:  
Dust protection:  
Protection classification (IP):

Aluminium die-cast  
Grey similar to RAL 7032  
Straight  
Screw  
Hinged cover  
65

## Equipment

Type:  
Number of couplings:  
Suitable for fibre type:

Coupler  
SC  
2  
POF/HCS/MM

## Dimension

125 x 80 x 57mm

## Area of application

Industrial environment

## Part no.

**801421**

Dimensions and specifications may be changed without prior notice.

## Packing unit

**5**

## Norms and standards

HELUCOM CONNECTING SYSTEMS® INDUSTRY component suitable for POF, HCS and multimode fibre applications (980/1000µm, 200/230µm, 50/125µm and 62.5/125µm). More they satisfy the MICE specifications, EMC requirements in accordance with DIN EN 61000, and the IP65 housing protection class requirements. The socket can be used in a temperature range of 0°C to +70°C.

## Application

Robust data connection socket (shielded) for extreme implementation. Robust plastic housing, and satisfies all mechanical requirements like vibration, shock, and transverse forces. The socket is used either on the machine distributor (MD) or wall mounted directly on the machine (MC) as connection unit.

# Machine outlet top hat rail

INDUSTRIAL ETHERNET



ST, SC, LCdx



## Type

### Configuration

Housing material:  
Colour:

Outlet direction:  
Type of fastening:  
Dust protection:

### Equipment

Type:  
Number of couplings:  
Suitable for fibre type:

### Dimension

### Area of application

### Part no.

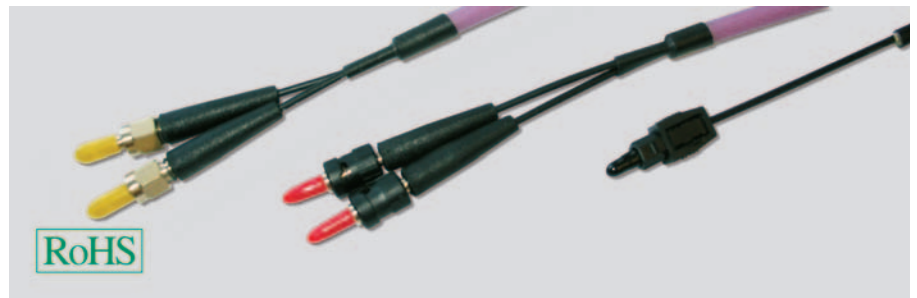
### Packing unit

### Norms and standards

### Application

## Fibre optic top-hat rail installation data outlets

Plastic Pure White similar to RAL 9010 Angled Snap-in Hinged cover	Plastic Pure White similar to RAL 9010 Angled Snap-in Hinged cover	Plastic Pure White similar to RAL 9010 Angled Snap-in Hinged cover
Coupler ST 2 Multi-mode	Coupler SC 2 Multi-mode	Coupler LC 4 Multi-mode
80 x 80 x 46mm	80 x 80 x 46mm	80 x 80 x 46mm
Industrial environment	Industrial environment	Industrial environment
<b>801355</b>	<b>801356</b>	<b>801357</b>
Dimensions and specifications may be changed without prior notice.		
<b>10</b>	<b>10</b>	<b>10</b>
HELUCOM CONNECTING SYSTEM INDUSTRY® system component suitable for multimode fibre applications (G50/125µm and G62.5/125µm).		
As connection unit for DIN rail installation e.g. in the switch cabinet, for applications involving digital and analog image, data and voice transmission.		



## Type

## Version

## Preferred types

### Jumper cable I-V2Y 1P 980/1000µm (POF)

Simplex

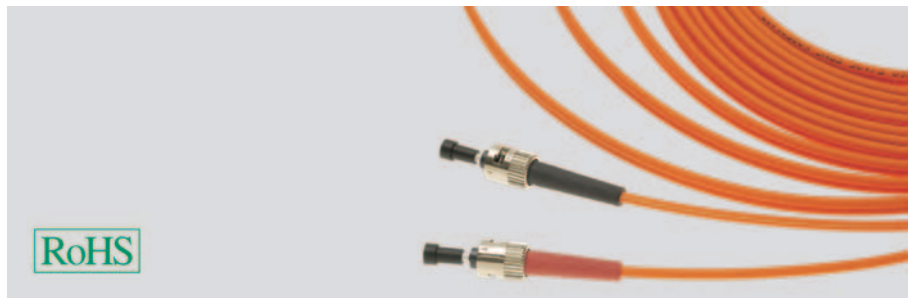
Part no.	End 1	End 2	Fibre type	Length	Unit
<b>801411</b>	ST	ST	POF 980/1000	2	10
<b>801413</b>	HFBR 4533 blau, simplex	HFBR 4533 blau, simplex	POF 980/1000	2	10
<b>801410</b>	F-SMA	F-SMA	POF 980/1000	2	10
<b>801472</b>	HFBR 4511 blue, simplex	HFBR 4511 blue, simplex	POF 980/1000	2	10
<b>801473</b>	HFBR 4503 grey, simplex	HFBR 4503 grey, simplex	POF 980/1000	2	10
<b>801474</b>	HFBR 4513 blue, simplex	HFBR 4513 blue, simplex	POF 980/1000	2	10
<b>801471</b>	HFBR 4531 black, simplex	HFBR 4531 black, simplex	POF 980/1000	2	10
<b>801412</b>	HFBR 4531 black, simplex	HFBR 4531 black, simplex	POF 980/1000	2	10
<b>801475</b>	F05 simplex	F05 simplex	POF 980/1000	2	10

Dimensions and specifications may be changed without prior notice.

## Application

POF (Polymer Optical Fibre) connection cable from HELUCOM® are particularly used in applications involving machine tools and industrial equipment, e.g. for connecting controller and drive. Systems such as SERCOS rely on POF fibre. POF jumper cables are characterized by a significantly more robust structure compared to traditional glass fibre lines. The version with PE coating is designed for normal implementation.





## Type

## Version

## Preferred types

### Jumper cable I-V(ZN)HH 2K 200/230µm (HCS)

Duplex

Part no.	End 1	End 2	Fibre type	Length	Unit
<b>801415</b>	ST	ST	HCS 200/230	2	10
<b>801414</b>	F-SMA	F-SMA	HCS 200/230	2	10
<b>801416</b>	HFBR 4521 simplex	HFBR 4521 simplex	HCS 200/230	2	10
<b>801476</b>	F07 duplex	F07 duplex	HCS 200/230	2	10

Dimensions and specifications may be changed without prior notice.

## Application

HCS (Hard Clad Silica) connection cables from HELUCOM® are particularly used in applications involving machine tools and industrial equipment, e.g. for connecting controller and drive. Systems such as LIGHTBUS rely on HCS fibre. HCS jumper cables are characterized by a significantly more robust structure compared to traditional glass fibre lines. The version with FRNC sheathing is designed for normal mobile implementation.



## Type

### Preferred types

## Fibre optic connector

Part no.	Type	Suitable for fibre type	Unit
<b>801378</b>	HFBR 4501 grey, simplex	POF 980/1000	50
<b>801379</b>	HFBR 4511 blue, simplex	POF 980/1000	50
<b>801380</b>	HFBR 4503 grey, simplex	POF 980/1000	50
<b>801381</b>	HFBR 4513 blue, simplex	POF 980/1000	50
<b>801382</b>	HFBR 4516 latch, duplex	POF 980/1000	50
<b>800713</b>	HFBR 4533 blue, simplex	POF 980/1000	50
<b>800714</b>	HFBR 4531 black, simplex	POF 980/1000	50
<b>801387</b>	HFBR 4506 grey, duplex	POF 980/1000	50
<b>801388</b>	HFBR 4516 latch, duplex	POF 980/1000	50
<b>801383</b>	F05 simplex, grind and polish	POF 980/1000	50
<b>801384</b>	F05 simplex, hotplate	POF 980/1000	50
<b>801386</b>	TOCP 255 duplex	POF 980/1000	50
<b>801385</b>	F07 duplex, hotplate	POF 980/1000	50
<b>801390</b>	ST	POF 980/1000	50
<b>801420</b>	SC duplex	POF 980/1000	50
<b>82821</b>	F-SMA 2,2mm	POF 980/1000	50
<b>801389</b>	F-SMA 6,0mm	POF 980/1000	50
<b>801832</b>	HFBR 4521 blue simplex, for 2,2mm	HCS 200/230	50
<b>801392</b>	HFBR 4521 black simplex, for 2,2mm	HCS 200/230	50
<b>801393</b>	F05 simplex, für 2,2mm	HCS 200/230	50
<b>801394</b>	F07 duplex, für 2,2mm	HCS 200/230	50
<b>801396</b>	ST	HCS 200/230	50
<b>801419</b>	SC duplex	HCS 200/230	50
<b>801395</b>	F-SMA 2,2mm	HCS 200/230	50
<b>801418</b>	SC duplex	Multi-mode	50

Dimensions and specifications may be changed without prior notice.

## Included in delivery

## Application

Fibre-optic plug (partly with housing, crimping)

Fibre optic plugs and couplings serve as links or removable connections for equipment outputs or distribution centers. The types designed have been especially designed for industrial use (light-duty or heavy-duty). They can be assembled in the field and, depending on the type, they are available in a clamp, crimp, adhesive, or hot plate version. According to IAONA the ST or the F-SMA plug is specified as standard.

# Network system cabinets

## Network system cabinets



Photo: Helukabel®

Universal network system cabinets are the central point where all cable ends meet for the installation of local networks, in building and floor wiring as well as for the connection of terminal devices.

The 19" network distributors are available in wall distributor or floor distributor versions.

The cabinets can be expanded to products in the area of data centres, servers and network technology. The design of the network cabinets allows the build-in of servers with special dimensions and standards. Active and passive components, a power supply and distribution system, an ingenious cable

management system and a scalable thermal management system ensure high operational reliability. The thermal management system is an important component in effective heat dissipation for electronic assemblies. The 19" ups-system (uninterruptible power supply) ensure reliable operation of systems.

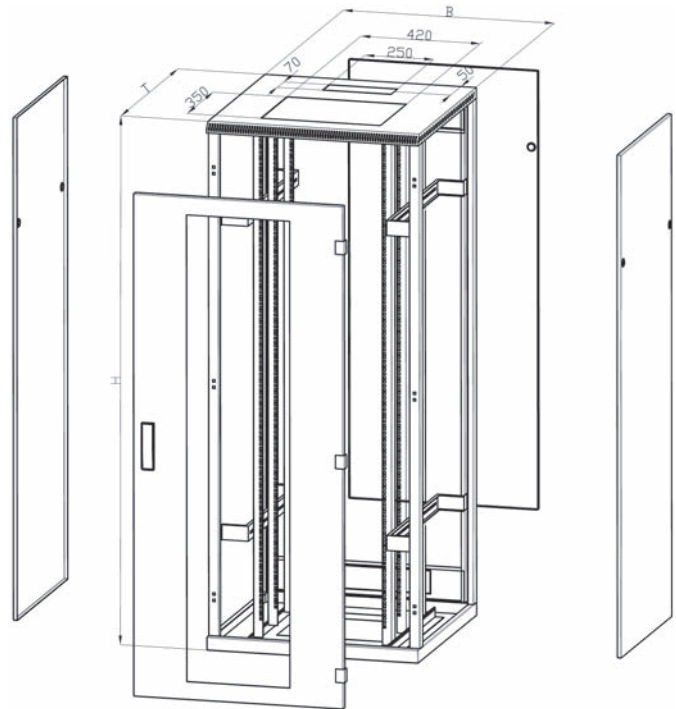
In addition, we are also happy to provide tailor-made solutions to meet your individual needs. In this case, the cabinets are then equipped with the appropriate gear. In this way, you are provided with an individually configured product designed to meet your specific needs.

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# Network Distribution Rack

## Network Cabinet



### Details

- sheet steel case pre -assembled, self ventilated
- Light gray RAL 7035
- Cable feeding possible from the ground or top
- Earthing set pre -installed
- Protection class IP20
- Accessories: 1x strip, 1x cage nut set (20 pieces), 4 levelling feet M10, 2x keys

### Heat dissipation

- Energy dissipation via cabinet surface up to 450 W (at a temperature differential of 15°C)

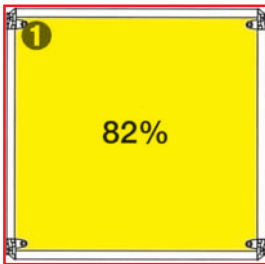
### Preferred types

Width mm	Height mm	Depth mm	Number of height modules (HM)	Design	Unit	Part no.
800	1980	800	42	Steel door, rear, Glass door, front	1	<b>801425</b>
600	1980	600	42	Steel door, rear, Glass door, front	1	<b>804051</b>
600	1980	800	42	Steel door, rear, Glass door, front	1	<b>803480</b>

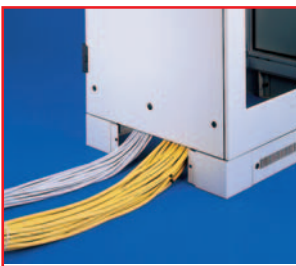
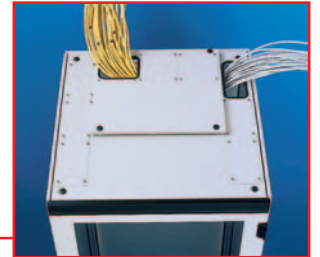
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# Features

## Vario distributor cabinet



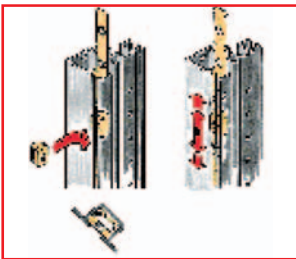
**1** Space-saving construction makes it possible to utilise 82% of the area occupied by the product for installation of component parts and/or cable.



**3** Cable in/out using tailor-made cover plates / panels that can be removed on all sides at the base.



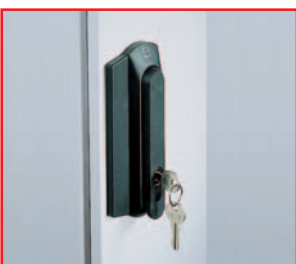
Use of the Miracel multifunction brace makes it much easier to save space and maintain order when installing cables. Even cabinets with a width of 600 mm are designed with lateral compartment space for continuous cable or ventilation installation.



**5** Raster rails utilising the proven T-slot and spring-nut construction make it easy to install component parts with continuous adjustment or with a 19" or 25-mm raster.



Front and rear doors open at an angle of 180 degrees, increasing the accessibility of components for installation and repair, especially on cabinets arranged in rows.



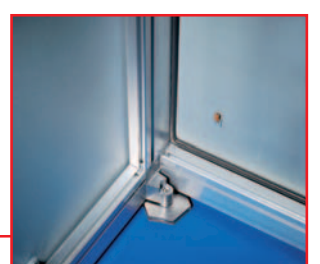
**7** If desired, doors and side compartments can be equipped with locks to prevent unauthorised access.



After disengaging the quick-release connectors, it is possible to remove side and rear parts in only seconds to permit rapid installation of components.



**9** Decorative profiles on the door / cabinet allow you to choose the colours that suit you best.

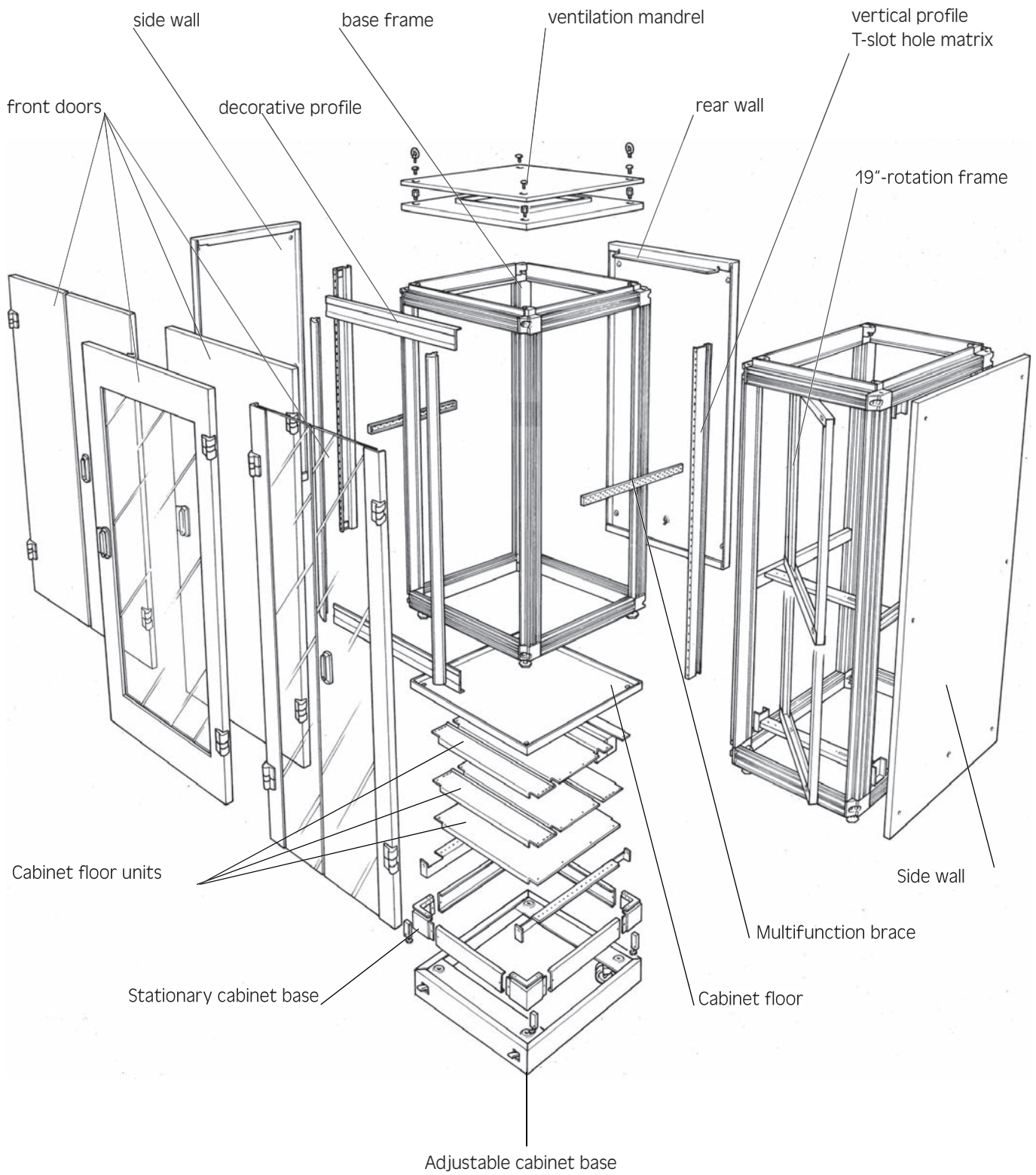


A wide adjustable base foot reduces floor load and makes it possible to compensate for uneven surfaces.



# Construction

## Vario distributor cabinet



# Network Distribution Rack

## Wall mounting Rack



### Details:

- Steel sheet housing
- preassembled, self ventilated
- Door with security glass
- Cabling from top or bottom
- Protection class IP20
- Wall fastening
- Color: light grey RAL7035
- housing totally grounded
- Accessories inclusive: 2xkeys, 1x set cage nut and screws ,1x cable strip

### Preferred types

Width mm	Height mm	Depth mm	Number of height modules (HM)	Design	Unit	Part no.
600	330	500	6	Glass door, front	1	<b>801687</b>
600	330	400	6	Glass door, front	1	<b>804055</b>
600	465	400	9	Glass door, front	1	<b>804056</b>
600	465	500	9	Glass door, front	1	<b>801688</b>
600	600	500	12	Glass door, front	1	<b>801689</b>
600	600	400	12	Glass door, front	1	<b>804057</b>
600	730	500	15	Glass door, front	1	<b>801690</b>
600	730	400	15	Glass door, front	1	<b>804058</b>
600	860	500	18	Glass door, front	1	<b>801691</b>
600	860	400	18	Glass door, front	1	<b>804059</b>

Dimensions and specifications may be changed without prior notice.



# Features

## Wall housing

Best used as a floor distributor for installation of passive and active components with complete accessibility of connection components.



**1** Up to 50% of the transport volume is reduced using „flat-pack“ packaging. Space-saving packaging facilitates transport until installation.

Easy installation thanks to:  
Pre-fabricated keyholes on the back side  
Quick-insert support rails and cover pieces  
Symmetrical housing construction



**2**



**3** Accessibility from all sides makes installation of component parts easier. Open-plan construction facilitates on-site connection of already existent cable strands.

Large switch area on side and cable clamping rails (available as accessories) enable well-ordered cable installation.



**4**



**5** 19" or metric installation possible. Sliding bolt construction makes it easy to replace door stops. Ventilation design can be expanded at a later date using the optional active ventilation unit.

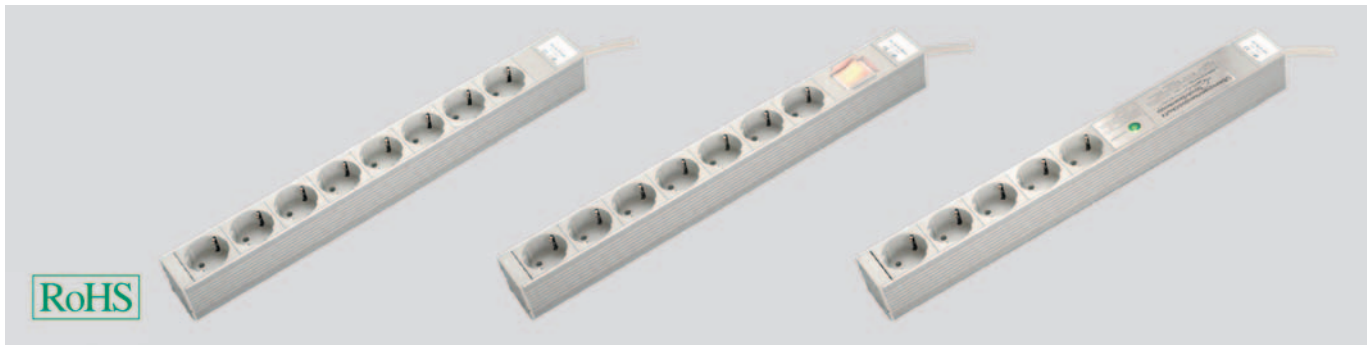
Pre-drilled holes on the vertical profile and back side make it easy to attach accessories such as socket strips.



**6**

# Network Distribution Rack

## Socket Strips



### Characteristics

Housing made of sturdy aluminium U housing, socket inserts made of PA, modular design and rotated 45°. Mounting angle rotatable in 90° steps. Inlet H05VV-F 3G1.5 mm<sup>2</sup> (250 V/16 A), length: 2.0m: Manufactured according to DIN VDE 0620/05.92-DIN 49440 (sockets), E DIN VDE 0675 part 6 (overvoltage protection) and EN 133200:1994 (filter). Color of the plastic components grey similar to RAL 7035.

### Preferred types

#### Series HELU LINE

Socket type	Part no.	Unit
HELU Line 19" 8x without switch	<b>82904</b>	1
HELU Line 19" 7x with switch	<b>82905</b>	1
HELU Line 19" 5x without switch, thermistor-type equipment protection	<b>82906</b>	1
HELU Line 19" 5x residual-current personnel protection system, 2-pin, 30 mA/30 mS	<b>82908</b>	1
HELU Line 19" 5x circuit-breaker, 2-pin, 16A/B	<b>82909</b>	1

Dimensions and specifications may be changed without prior notice.

# Network Distribution Rack

Socket DV



## Characteristics

Socket for network cabinets inclusive mounting screws  
M6x8mm  
Material: Steel plate  
Paint Finish: RAL 7035, light grey  
Enlargement for network rack to install cables from  
socket easier

## Preferred types

Description	Suitable for ventilation/venting	Material	Height mm	For cabinet width mm	For cabinet depth mm	Part no.	Unit
Rack Socket	yes	Steel plate, light grey, Ral 7035	100	600	600	<b>801876</b>	1
Rack Socket	yes	Steel plate, light grey, Ral 7035	100	600	800	<b>801881</b>	1
Rack Socket	yes	Steel plate, light grey, Ral 7035	100	800	800	<b>801674</b>	1

Dimensions and specifications may be changed without prior notice.

# Network Distribution Rack

## Accessories



### Characteristics

#### **19-inch hole matrix**

Elements to reinforce or to enlarge the network rack. Help to mount active components or heavy duty lower shelf in existing cabinets. 19-inch hole matrix included. Rack mount nuts mounting possible.

### Preferred types

#### **19" profiles**

Description	Material	Surface	Number of height modules (HM)	Suitable for	Part no.	Unit
19-inch hole matrix	Stainless steel	Galvanised	12	Wall box	<b>82052</b>	1
19-inch hole matrix	Stainless steel	Galvanised	41	Floor cabinet	<b>82047</b>	1
19-inch hole matrix	Stainless steel	Galvanised	15	Floor box	<b>82097</b>	1
19-inch hole matrix	Stainless steel	Galvanised	21	Floor box	<b>82040</b>	1

Dimensions and specifications may be changed without prior notice.

# Network Distribution Rack

## Accessoires



### Characteristics

Shelf, adjustable  
For installation in all networking and server cabinets and rack frames, mouting with screws and cage nut  
Material: steel sheet  
Finish: RAL7035, light grey

### Preferred types

#### Shelf

Description	Width mm	Depth mm	Extractable	Load rating N	Suitable for	Part no.	Unit
Pullout shelf 1U	440	350	yes	10	Floor cabinet	<b>801849</b>	1
Shelf 2U	432	380	no	20	Floor cabinet	<b>82043</b>	1
Pullout shelf 2U	445	300	no	15	Floor cabinet	<b>801701</b>	1
Shelf 2U	445	400	no	25	Floor cabinet	<b>802716</b>	1
Pullout shelf 1U	440	500	yes	50	Floor cabinet	<b>801805</b>	1
Pullout shelf 1U	440	500	yes	50	Floor cabinet	<b>801878</b>	1
Shelf 1U	432	380	no	100	Floor cabinet	<b>801754</b>	1
Pullout shelf 1U	432	380	yes	150	Floor cabinet	<b>801697</b>	1

Dimensions and specifications may be changed without prior notice.

# Network Distribution Rack

## Fan units



### Characteristics

#### Fan unit

Roof fan, 1U, Weight 3.9 kg  
 Fan, capacity 160 cbm/h  
 For installation in all networking and server cab.  
 Control via connected thermostat  
 Thermostat and mounting material included  
 Rear sided mains connection via non-heating appliance socket (connection cable not included)  
 Rated voltage 230 V, 50 Hz  
 Illuminated switch ON/OFF  
 Material: steel sheet  
 Finish: RAL7035, light grey  
 Fan features:  
 Rated voltage 230 V, Frequency 50 Hz, Rated power 22 W, Speed 2700 r/min, Noise level 44 dB(A), Air capacity 160 m<sup>3</sup>/h, Temperature range -10 to +70 °C, Dimensions 119 x 199 x 38 mm

#### Other Accessories

Mounting equipment and other passiv elements for data racks for orderly and clearly cable routing please find on Network Distribution Rack/Mounting materials.

### Preferred types

#### Fan units

Description	Number of fans	With thermostat	Installation location	Suitable for	Part no.	Unit
Fan Unit data cabinet	2	yes	top area	Floor box	<b>82055</b>	1
Ventilator plate	4	yes	top area	Floor cabinet	<b>82039</b>	1

Dimensions and specifications may be changed without prior notice.

# Network Distribution Rack

## Mounting materials



### Preferred types

### Mounting material

Description	Number of elements which can be installed	For fastening of	Suitable for	Part no.	Unit
Set of captive nuts	20	19-inch components	Floor cabinet	<b>82058</b>	1
Cable Routing Bracket	20	19-inch components	Floor cabinet	<b>801699</b>	1
Fastening set screen-profile	50	Louvered profile	Wall box	<b>82053</b>	1
Cable routing panel 19"	42	Cables	Floor cabinet	<b>802764</b>	1
Cable tidy rail 19"	2	Cables	Floor cabinet	<b>804244</b>	1

Dimensions and specifications may be changed without prior notice.

# Network Distribution Rack

## Lighting



RoHS

## Preferred types

## Lighting

Description	Material	Length mm	Suitable for	Part no.	Unit
Data rack illumination	Plastic	365	Floor cabinet	<b>800455</b>	1
Cabinet light, compact	Plastic	365	Universal	<b>80305</b>	1

Dimensions and specifications may be changed without prior notice.



## Splicing, measuring and processing equipment



## Splicing, measuring and processing equipment

Photo: HELUKABEL®

In addition to the attenuation coefficients of the fibre optic cable, the attenuation values of the connection points must be carefully observed when planning a fibre optic network. In view of the high demands posed by present-day transmission processes, it is particularly important to work toward optimising connection points with regard to their attenuation values. To achieve this goal, a thermal splice process has been used. In this process, direct splicing is carried out using an arc lamp, which creates an adhesive bond between the fibres without any air gaps or inclusion of other materials. Afterwards,

functionality, reliability and performance are tested using fibre optic measuring devices. The test procedures document the quality of the system, while locating sources of errors. The test protocol provides proof as to whether the cable system has been installed correctly. OTDR and performance measuring devices are used for testing. Tool cases for fibre optic cable installation and service cases for adhesives complete the professional assortment of products. For high-speed copper networks, we offer cable analysers for certification and troubleshooting.

# Contents Splicing Systems, Measurement and Processing Technics

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## Characteristics

The OV 1000 is a compact modular Optical Time Domain Reflectometer (OTDR) which is designed for testing, commissioning, documentation and troubleshooting in local area networks (LAN), Carrier-, CATV- and fiber-to-the-x-(FTTx) fiber optic networks. The device can accommodate two test modules. The available module options offer different combinations of wavelengths and dynamic ranges. Available are 850 nm, 1,300 nm, 1,310 nm, 1,490 nm, 1,550 nm and 1,625 nm. In addition to the test modules available in the common wavelength and dynamic range combinations, the option of integrated power meter and visual fault locator in the mainframe is another valuable addition which emphasizes the unit's universal character. The test port of the OTDR module provides the light source function. In combination with the optional fiber inspection probe (FIP), the OV 1000 works as a universal test- and measurement device for all passive optical components of a network. The mainframe is equipped with the Windows® CE Mobile operating system. This allows a fast boot-up time within a few seconds as well as intuitive userfriendly operation.

## Application

- Test and collect data up to four wavelengths by pressing only one button
- Very fast acquisition time
- Fast ready-to-measure boot-up time of 4 seconds

## Details

- Simultaneous use of touch screen, short-cut keys and tracking knob for high user convenience
- Maximum 256,000 data points for highest resolution
- Loss resolution of 0.001 dB
- 6.4" full VGA touch screen
- Three test modes (auto, advanced and template) fit best to user skills and applications for maximum measurement convenience
- Possible configurations cover all typical fiber applications from long-haul and WDM to metro networks, FTTx as well as LAN
- Easy-to-use post-processing software OSTView with professional report generation function including bidirectional analysis and quick print function
- Powerful Li-Ion battery provide mains independent operation time of 8 hours (Bellcore TR-NWT-001138)
- Diverse storage options (in addition to 80 MB builtin flash memory, two USB ports<sup>2</sup>) and a CF card slot
- Internal memory sufficient for up to 1,500 typical traces
- Numerous connection ports for easy connectivity for convenient download and upgrade
- 10/100 Mb/s Ethernet RJ-45 network interface
- Rugged and waterproof housing for long life time

## Designation

OTDR OV 1000 QUAD MDSD-SC

## Part no.

**802495**

Dimensions and specifications may be changed without prior notice.



## Characteristics

The DTX Compact OTDR is a revolutionary enhancement to the DTX CableAnalyzer. The DTX Compact OTDR is a full featured Optical Time Domain Reflectometer (OTDR) module that snaps onto a DTX CableAnalyzer. In addition to copper testing, it makes this powerful certification tool a complete, easy-to-use OTDR that shoots and analyzes traces on singlemode and multimode fiber. With the DTX Compact OTDR, the DTX CableAnalyzer becomes the only cable tester that can completely certify copper and fiber cabling according to all industry standards. The DTX Compact OTDR makes every technician a fiber expert with unparalleled ease of use, automatic OTDR settings, loss limits for events and fiber links, launch fiber compensation, automatic event analysis, and results management, all with the familiar user interface of the DTX CableAnalyzer.

## Application

- Acceptance and test measurements of all common single- and multi-mode fibre optics (1310/1550nm and 850/1300nm)
- With its compact design, the DTX Compact-OTDR is outstanding for field applications

## Details

- Expanding installation revenue • without expanding staff
- Shortening technicians' learning • curve for fiber testing
- Performing Basic (Tier 1) and Extended (Tier 2) fiber certification with a single tool
- Accelerating troubleshooting with a powerful, single-ended OTDR for fiber and extensive DTX diagnostics for copper
- Delivering integrated copper and fiber reports using LinkWare™ Results Management Software

## Designation

DTX Compact OTDR QUAD

## Part no.

**802496**

Dimensions and specifications may be changed without prior notice.



## Characteristics

The output of the signal generator is a modulatable power source, which creates a stabilized optical power output by means of an LED adapter. With the micro process technology used, the measuring instrument permits the measurement of two wavelengths as well as the display of the absolute power in 5W or dBm. For relative power measurements, the measured value is displayed in dB. A change adapter system permits connecting all common fibre-optic cable plug connectors. Systems like TCOP 155, F-SMA, ST, HFBR, F05/ F07 or SC are available.

## Application

The good characteristics and the precise coupling to ready-made fibre-optic cables with the exchangeable adapter system allow using the signal generators and receiver in a variety of applications, such as installation control, quality control, attenuation measurements of fibre-optic cables, laboratory tests, or testing visual transmitters and receivers.

## Details

Measuring instrument OPM1:

- Optical power measuring instrument
- 660nm and 850nm calibrated wavelengths
- M12 change adapter connector
- 25mm x 50mm LC display
- Plastic housing
- sturdy plastic sleeve
- simple operation

Signal generator MS100HU:

- Stabilized power source
- 1, 10, 20 kHz modulating frequency
- BNC female connector
- 9V battery operation or ext. power pack
- 25mm x 50mm LC display
- Plastic housing
- sturdy plastic sleeve
- simple operation

## Designation

Measuring instrument case POF/ TOCP 255/F07

## Part no.

**800597**

Dimensions and specifications may be changed without prior notice.



## Characteristics

The output of the signal generator is a modulatable power source, which creates a stabilized optical power output by means of an LED adapter. With the micro process technology used, the measuring instrument permits the measurement of two wavelengths as well as the display of the absolute power in 5W or dBm. For relative power measurements, the measured value is displayed in dB. A change adapter system permits connecting all common fibre-optic cable plug connectors. Following systems are available:

SC Adapter  
FST Adapter  
HFBR Adapter  
TOPCP Adapter

## Application

The good characteristics and the precise coupling to ready-made fibre-optic cables with the exchangeable adapter system allow using the signal generators and receiver in a variety of applications, such as installation control, quality control, attenuation measurements of fibre-optic cables, laboratory tests, or testing visual transmitters and receivers.

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- 1, 10, 20 kHz modulating frequency
- BNC female connector
- 9V battery operation or ext. power pack
- 25mm x 50mm LC display
- Plastic housing
- sturdy plastic sleeve
- simple operation

## Designation

Measuring instrument toolbox HCS

## Part no.

**801465**

Dimensions and specifications may be changed without prior notice.



## Application

When assembling fibre-optic cables and cores, special tools are required. The high-quality tools are put together in the fibre-optic toolbox.

## Details

Generally, the toolbox is equipped with two removable, double-sided tool plates, a covering tool plate, and a document compartment. The essential components are a hot air blower, cross head screw drivers, Miller stand-off pliers, Claus stand-off, tube socket wrench, bolt cutter as well as consumption materials.

## Designation

Fibre-optic tool case

## Part no.

**800378**

Dimensions and specifications may be changed without prior notice.

## Equipment of fibre optical tool case





## Application

Tool for damage-free stripping of fibre optics, cut or uncut mini grooved cable. Also for suitable for rough grooved cables as well as inside of stranding.

## Details

- Multifibre buffer tube diameters to 1.8mm to 4.2mm can be cut by means of replaceable multifibre buffer tube guides
- Tool made of burnished special tool steel with plastic handle
- Simple time and cost-saving operation

## Included in delivery

Cut start tool, core guide set, spatula, hexagon key, and spare knife, supplied in a plastic case

## Designation

HELUCUT I 0.9-4.2

## Part no.

**800380**

Dimensions and specifications may be changed without prior notice.



## Application

Tool for damage-free stripping of fibre optics, cut or uncut maxi grooved cable. This avoids fibre separation when creating of branches.

## Details

- The application area is grooved cables with a diameter of 4.0 - 10,0 mm (expandable to 14.0mm)
- Interchangeable grooved cable guide (5.0/6.0/7.0/8.0/9.0/10.0)
- Diametric cutting technique (with cable supply)
- High continuous cutting performance
- Simple time and cost-saving operation

## Included in delivery

Cut start tool, cutting set, cable shears, toggle and hexagon key, supplied in a plastic case

## Designation

HELUCUT II 4.2-10.5

## Part no.

**800381**

Dimensions and specifications may be changed without prior notice.





## Application

This box can be used for both, mobile applications on site and stationary applications.

**Type for ST (BFOC) connector**

## Details

The assembly toolbox contains all necessary processing tools for professional POF 980/1000µm plug assembly for ST plugs. Essential components are: Crimping pliers 4-notch, positioning sleeve, crimping pliers 5-edge, sheath stripping tool, fibre stripper, Kevlar scissors, cutter, buffing wheels, polishing paper (grain 1000) and aluminum case.

## Designation

POF Connector Assembly Case ST

## Part no.

**801186**

Dimensions and specifications may be changed without prior notice.



## Application

This box can be used for both, mobile applications on site and stationary applications.

**Type for F-SMA connector**

## Details

The assembly toolbox contains all necessary processing tools for professional POF 980/1000µm plug assembly for F-SMA plugs. Essential components are: Crimping pliers 4-notch, positioning sleeve, crimping pliers 5-edge, sheath stripping tool, fibre stripper, Kevlar scissors, cutter, buffing wheels, polishing paper (grain 1000) and aluminum case.

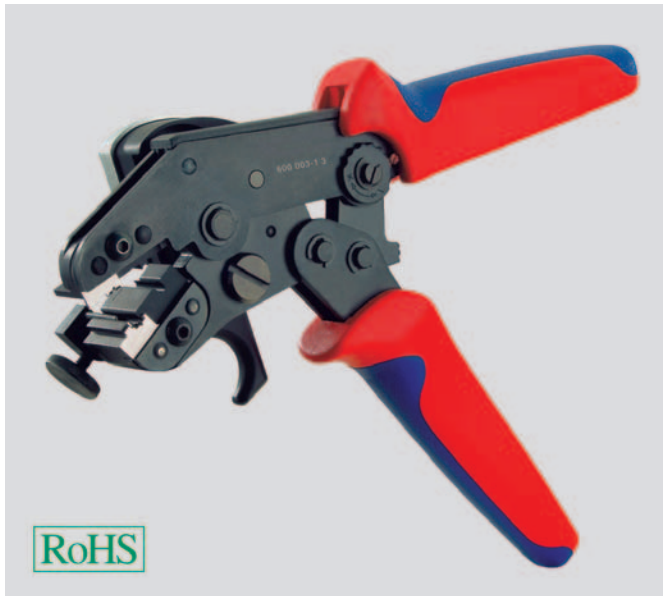
## Designation

POF Connector Assembly Case F-SMA

## Part no.

**801400**

Dimensions and specifications may be changed without prior notice.



## Application

Tool for damage-free cutting and crimping of 2.2 mm synthetic fibres (POF). Repolishing is no longer necessary.

## Details

- The application area is POF fibres with 2.2 mm diameter
- Interchangeable cutting device
- Stripping length of 4.0 - 20.0 mm
- Tool made of burnished special tool steel with plastic handle
- Simple time and cost-saving operation

## Included in delivery

Pliers made from special tool steel with cutting device and stripping knife

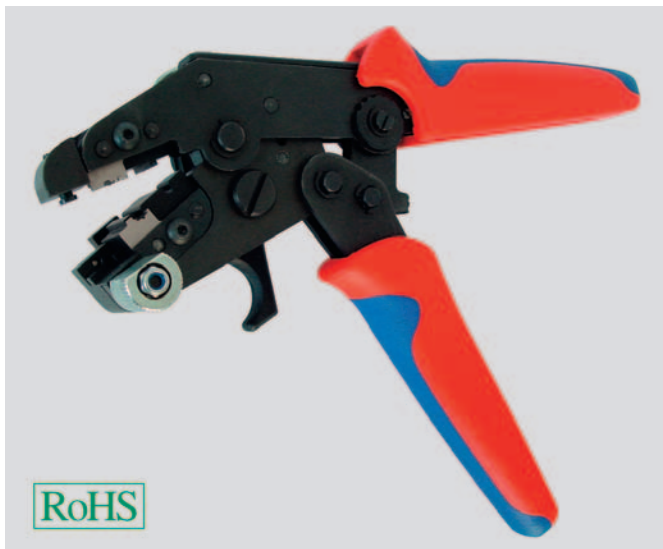
## Designation

HELUCUT'n STRIPP

## Part no.

**800382**

Dimensions and specifications may be changed without prior notice.



## Application

Tool for damage-free cutting, stripping and crimping of 2.2 mm synthetic fibres (POF). Repolishing is no longer necessary.

## Details

- The application area is POF fibres with 2.2 mm diameter
- Adaptable to different contacts
- Optimal crimping quality due to safety interlock
- Tool made of burnished special tool steel with plastic handle
- Simple time and cost-saving operation

## Included in delivery

Pliers made from special tool steel with cutting device

## Designation

HELUCUT'n STRIPP Multi

## Part no.

**800383**

Dimensions and specifications may be changed without prior notice.



## Application

Tool for damage-free cutting and stripping of synthetic fibre lines (POF).

## Details

- Field of application are POF fibres with 2.2 mm in diameter and PUR-encased POF fibres (simplex, duplex, quattro), Make: HELUKABEL art. no. 81611, 81882, 80629, 80630
- Interchangeable cutting device
- Stripping length of 4.0 - 20.0 mm
- Tool made of burnished special tool steel with plastic handle
- Simple time and cost-saving operation

## Included in delivery

Pliers made from special tool steel with cutting device and stripping knife set.

## Designation

POF MULTI STRIPPER TOOL

## Part no.

**81320**

Dimensions and specifications may be changed without prior notice.

# Processing Technic



## Application

Tool for trouble-free crimping of 2.2 mm synthetic fibres (POF).

## Details

- The application area is POF fibres with 2.2 mm diameter
- Suitable for different contacts (4.85 mm diameter + 3.15 mm key width)
- Optimal crimping quality due to safety interlock
- Unblocking possibilities in case of possible faulty operation
- Tool made from durable special tool steel with plastic handle
- Very simple operation

## Included in delivery

Tool made from special tool steel

## Designation

HELUcrimp

## Part no.

**800385**

Dimensions and specifications may be changed without prior notice.



## Application

This box can be used for both, mobile applications on site and stationary applications.

## Details

The assembly toolbox contains all necessary processing tools for professional HCS 200/230 $\mu$ m plug assembly "adhesive technique" for ST plugs. Essential components are: Crimping pliers, 3 x fibre strippers (0,6, 0,3, 0,18mm), scoring pin, hardening oven, manual microscope (100x), change adapter ST, polishing paper (grain 0.3 $\mu$ m, 5 $\mu$ m), polishing plate, cutter, polishing disk, epoxy adhesive, syringe and aluminum case.

## Designation

HCS Connector Assembly Case for ST

## Part no.

**801403**

Dimensions and specifications may be changed without prior notice.



## Application

This box can be used for both, mobile applications on site and stationary applications.

## Details

The assembly toolbox contains all necessary processing tools for professional HCS 200/230 $\mu$ m plug assembly "adhesive technique" for F-SMA plugs. Essential components are: Crimping pliers, 3 x fibre strippers (0,6, 0,3, 0,18mm), scoring pin, hardening oven, manual microscope (100x), change adapter ST, polishing paper (grain 0.3 $\mu$ m, 5 $\mu$ m), polishing plate, cutter, polishing disk, epoxy adhesive, syringe and aluminum case.

## Designation

HCS CONNECTOR ASSEMBLY CASE FOR F-SMA PLUG

## Part no.

**801404**

Dimensions and specifications may be changed without prior notice.



## Application

The test equipment is suitable for the error analysis of PROFIBUS DP segments. With its possibility to test these segments systematically without large effort, time-consuming individual tests are unnecessary.

## Details

- Connector PROFESSIONAL BUS RS485 (DB9 socket strip) and RS232 (DB9 socket strip)
- Power supply with rechargeable battery pack 4.8V/1.500 mAh NIMH
- Error detection in 3 steps: without closure, with one closure and with two closure
- Short-circuit display A-B core with distance reading in meters
- Short-circuit display A-B shield with distance reading in meters
- Line and shield break display with distance reading in meters
- Display for interchanged signal lines A-B
- Display for incorrect or missing bus closures
- Display for incorrect position of the bus connectors
- Error due to inadmissible line length
- Error in characteristic impedance
- Incorrectly used cable type
- Reflections
- Error in sending and reception levels
- Error due to use of inadmissible branch lines

## Included in delivery

Basic equipment in the sturdy service toolbox: 2 rechargeable batteries, international charging station, RS232 cable, PROFIBUS branch line, PROFIBUS T line, bus cutter, gender changer (3), documentation

## Designation

Measuring instrument for PROFIBUS NetTEST II

## Part no.

**800657**

Dimensions and specifications may be changed without prior notice.





## Application

Pliers for crimping of shielded modular RJ45 plug connectors.

## Details

- Crimping pliers for shielded RJ45 TYPE Hirose TM11, TM21, TM31
- Crimps the strain relief in the same work step
- particularly suited for manufacturing "on site"

## Included in delivery

RJ45 pliers

## Designation

HELUCRIMP45

## Part no.

**82493**

Dimensions and specifications may be changed without prior notice.



## Application

Tool for crimping Harting Industrial IP20 RJ45 8 - poles (HELUKABEL type 802258 and 802259).

## Details

- Straight action principle with ratchet release
- Contact positioning with locator
- Ergonomic soft grips

## Included in delivery

Crimping tool made of special steel.

## Designation

Crimping tool for Harting Industrial RJ45 8 - poles

## Part no.

**802375**

Dimensions and specifications may be changed without prior notice.



## Application

Dismantling and stripping the special Profibus SK types.

## Details

- Triple-stage stand-off of sheath, screen, and filler
- Knife block can be inserted on both sides
- Standard port for SK bus lines with outside diameter of 8.0 mm
- Variable tool use thanks to adjustable screw holders or replacement of the knife block for other line types as well, e.g. coaxial cables

## Included in delivery

Stripping tools with brown knife block and adjustment block. As an option, other knife blocks for other diameters are available.

## Designation

Stripper for SK bus cables

## Part no.

**81233**

Dimensions and specifications may be changed without prior notice.



## Application

Dismantling tool for unshielded and shielded data cables.

## Details

- Can cut UTP and STP data cables and other cables of up to 4 mm<sup>2</sup>
- Dismantling of the outer insulation of UTP and STP data cables, as well as other round cables from 0.5 - 12.5 mm
- No damage to shielding or conductor due to stripping knife adjustable to different insulation thicknesses
- Length stop for repeatable cutting and stripping lengths

## Included in delivery

Dismantling tool with length stop

## Designation

HELU-LAN 12

## Part no.

**82902**

Dimensions and specifications may be changed without prior notice.





## Application

Dismantling and stripping the special PROFinet™ types A, B, C.

## Details

- Triple-stage stand-off of sheath, screen, and filler
- Knife block can be inserted on both sides
- Standard port for PROFinet™ lines with outside diameter of 6.5 mm
- Variable tool use thanks to adjustable screw holders or replacement of the knife block for other line types as well, e.g. coaxial cables

## Included in delivery

Stripping tools with green knife block and adjustment block. As an option, other knife blocks for other diameters are available.

## Designation

Stripper for PROFinet cables

## Part no.

**801497**

Dimensions and specifications may be changed without prior notice.



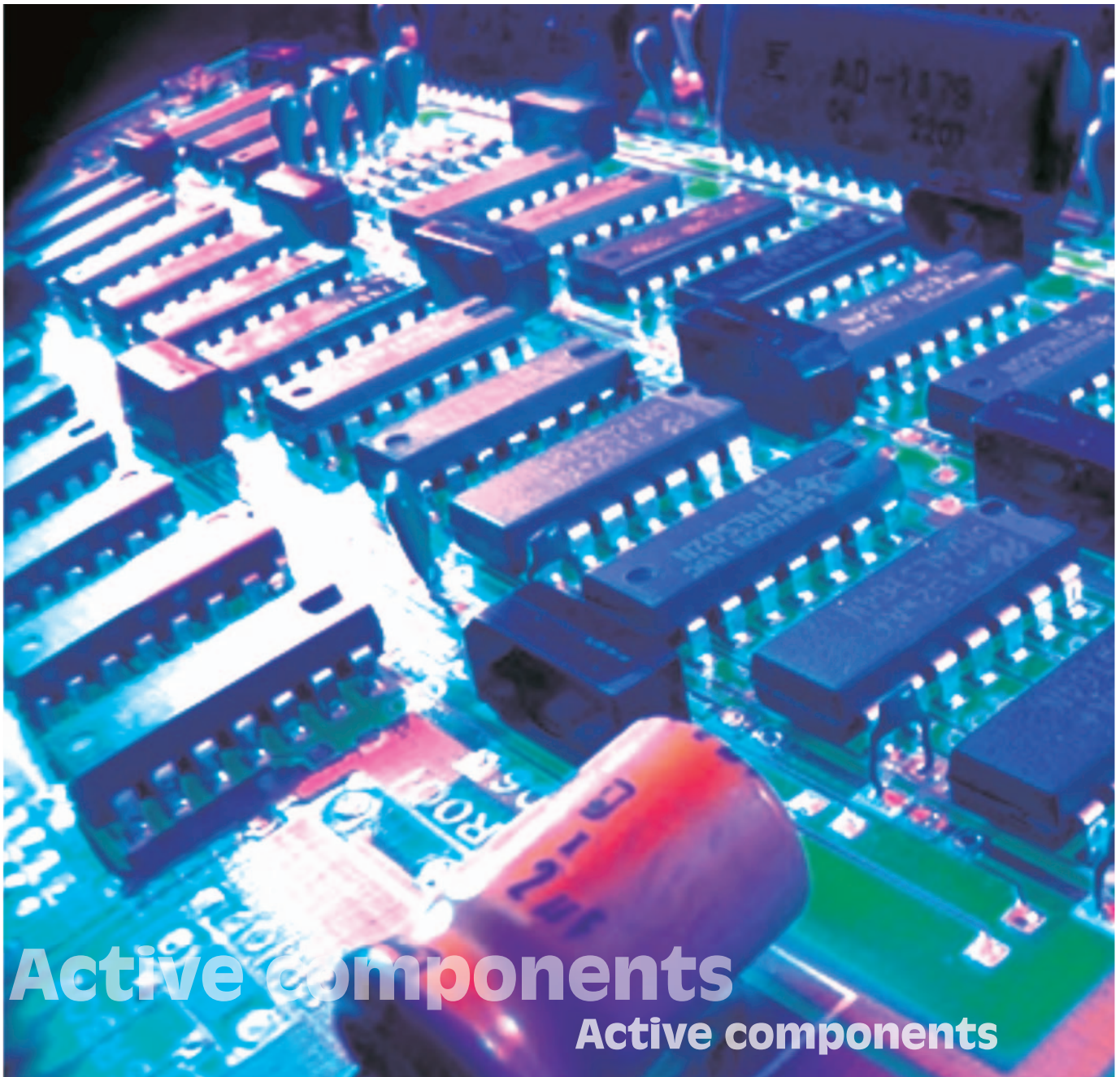


Photo: HELUKABEL®

For data transmission between computers, servers and PCs, both passive and active components are required. Passive elements such as wiring boxes, patch panels, cables and distributors are all permanent components of the building installation. Once they have been installed, they are no longer removed. Active components are electronic systems required for amplification, utilisation, control and transfer of data flow. Active components make it possible for workplace computers to communicate with one another as well as send, receive and understand data. The network itself is comprised of computers

that are interconnected, but independent of one another while accessing common resources. According to the requirements of the costumers HELUKABEL® is supplying switches, router and media converter from well-known manufactures for the configuration of high speed networks in office environment. For the use in industrial environment there are available devices from **Moxa** and **Hirschmann**. As supplement of the wired communication wireless products can be used for new installations and for expansions of existing LAN-networks.

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# Active Components

## Switches for top DIN Rails



### Description

Entry level industrial ETHERNET rail switch with store and forward switching mode and speeds of 10/100 and 1000Mbit/s. All devices are maintenance-free and automatically adapt to your requirements. Switch with copper RJ45 and fibre optic port. Ideal for using as media converters. Plug and play.

All devices have the following features:

- Autocrossing (crossover adaption, straight or crossed)
  - Autonegotiation (speed adaption 10/100/1000)
  - Autopolarity (pin correction on RJ 45 connector)
  - Redundant power supply (2x DC In: 9.6 V to 32 V)
  - Proliferation of options for all applications (e.g. ship building, vehicle construction, automation)
- Compact design and low weight

### Technical Data

- Voltage: 9,6 V DC-32 V DC
- Max. power consumption: 130 mA
- Humidity: 10-95%
- Protection class: IP30
- cUL 508
- Accessories: Exclusive 19" mounting frame 802793 and power unit (e.g. RPS15 Part No. 803178) available to order.

Type	Description	Operating temperature	Speed	Ports	Part No.
Spider 1Tx/1Fx	1x TP RJ45, 1x Fx SC duplex	0°C bis +60°C	10/100 Mbit/s	2	802851
Spider 4Tx/1Fx	4x TP RJ45, 1x Fx SC duplex	0°C bis +60°C	10/100 Mbit/s	5	803177
Spider 5 Tx	5x TP RJ45	0°C bis +60°C	10/100 Mbit/s	5	803323
Spider 8Tx	8x TP RJ45	0°C bis +60°C	10/100 Mbit/s	8	803324
Spider II Giga 5T/2S EEC	5x TP RJ45, 2x GE-SFP slots	-40°C bis +70°C	10/100/1000 Mbit/s	7	803326
Spider II Giga 5T EEC	5x TP RJ45	-40°C bis +70°C	10/100/1000 Mbit/s	5	803325

Other versions on request.

Dimensions and specifications may be changed without prior notice.

# Active Components

## Power supply for DIN Rails



### Description

For quick and safe installation just use our power supplies or the 19" mounting frame for data rack integration. 24 V DC power supply for the redundant power to DIN Rail components with one terminal block 3-pin 230 V (100 V - 240 V AC In) and one terminal block 5-pin, 2x24 V DC Out. Output current up to 5 A. With LED diagnostic: green Power and DC ON. Power units can be switched parallel!

### Technical Data

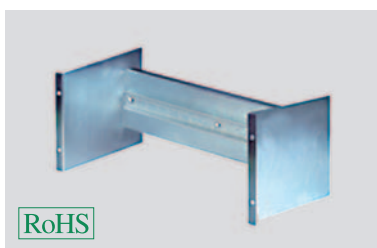
- Diagnostic: LED (Power, DC ON)
- Redundancy function: Power supply can be switched parallel
- Humidity (non-condensing): Max. 95%
- Weight: 130 - 500 g
- Protection class: IP 20
- EMC, interference immunity: EN 50082-1: EN 61000-6-2 (encompasses EN 55024)
- EN 50082-2: EN 61000-6-2 (encompasses EN 55024)
- EMC, emitted interference: EN 50081-1
- EN 50081-2
- Safety of industrial control equipment: cUL 508
- Safety of information technology equipment: cUL 60950 (E 137006)
- Hazardous locations cUL 1604 class 1 Div. 2
- Scope of delivery: Rail power supply, description and operating manual

Type	Description	Operating temperature	Out	In	Part No.
RPS 15	DIN Rail power pack	-10°C bis 70°C	24, 5 V DC/30W max. 1,3 A	100 V - 240 AC max. 0,6 A	803178
RPS 80 EEC	DIN Rail power pack	-25°C bis 70°C	24, 5 V DC/80W max. 3,3 A	100 V - 240 V AC max. 1,6 A	803331

Other versions on request.

Dimensions and specifications may be changed without prior notice.

## 19" mounting frame for top hat rail components



### Description

Frame for mounting DIN Rail components for fixed installation in data and network cabinets with 19" frames. Mounting to 19" rail using cage nuts.

Type	Description	Dimensions	Assembly	Weight	Part No.
DIN rail rdapter	Mounting frame for 19" cabinets	BxHxT 481 mm (435mm usable) x177mmx275mm	19" rack or switch cabinet	1 kg	802793



Photo: Helukabel®

In today's world, the speed at which information moves in a company and the degree of integration of the data contained in this flow are crucial factors determining the company's productivity and ability to compete. An increasingly greater amount of information, language, data and images has to be made available to all users in every area of the company quickly and reliably. At the same time, applications such as multimedia create new possibilities in communication. There's no question about it: only those who are able to communicate quickly, reliably and efficiently with their employees, customers and suppliers have a chance of surviving in the market.

In the age of multimedia communication, knowledge of the right strategies, techniques, methods of implementation and ways to maximise savings has become a decisive factor determining success. While communication technology is

becoming increasingly more productive and efficient, is it also becoming more complex at the same time. In this situation, companies are faced with the enormous challenge of dealing with both forced cost reductions and increasingly shorter technical investment cycles. Investments for data transmission lines must be carefully applied to solutions that are not only reliable and secure, but that have the necessary future potential as well. For this reason, choosing the right partner for the construction or expansion of a network is an important decision that should be considered with great care. Here, HELUKABEL® is someone you can rely on. We offer complete system solutions - from consultation, project planning and delivery all the way to turnkey systems and training. Worldwide presence, direct contact with customers and fast reaction times are all reasons that make HELUKABEL® systems the solution of choice.

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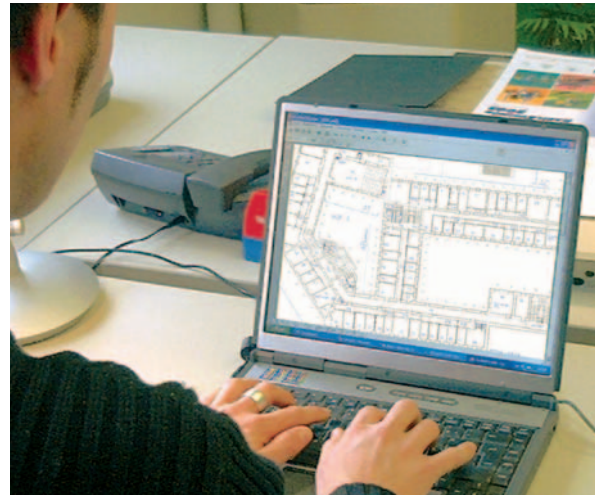
# Expert planning and project development

For each and every network, the right planning is crucial, regardless of whether you're considering installation of a new network, inter-networking between existing islands or expansion and optimisation of an already present network. When investing in a network, it is essential to choose your products carefully to ensure the quality and security of your investment well into the future.

Here, HELUKABEL® provides you with a proven and well-structured concept that maintains an optimum infrastructure during all stages of planning while focussing on finding the best possible technical solutions.

By carefully analysing the infrastructure and environment, for example, the facility grounds, the structure and utilisation of buildings, plans for new buildings etc., it is possible to shape the network efficiently. Taken into account are not only the company's development and its communication targets, but also the need to protect investments made for existing solutions.

Other important factors that must be considered when planning are the investment security and reliability of the network infrastructure for the future. The reliability and efficiency of a network in the future all depends on how well the network was initially planned. At HELUKABEL®, planning is carried out by experts in the field, so you can be sure that your investment is secure.



## Working to meet all your business needs

HELUKABEL® offers a wide array of network solutions to meet your every need. Regardless of your network structure or technology, we can provide you with a turnkey system that meets your individual requirements – from delivery of the cable and on-site installation all the way to final transfer of the system.

Careful and correct installation is essential for reliable and efficient operation of the network. This is especially important in an age of high-speed networks, which place great demands on the quality of the traffic networks that carry the data. To achieve these goals, you need the help of highly qualified experts who are there for you on a daily basis. After installation is complete, the entire network together with all installed components is checked carefully from top to bottom. The results of the measurements and checks are recorded in protocol form. This information is just as important for your documentation as the network-specific plans and component lists.

HELUKABEL® is certified to ISO 9000. For you, this means you can rely on a well-structured work method that guides the project through every stage to completion.



# Providing you with high-quality services

In addition to supplying network components, HELUKABEL® offers a complete line of services, making us your one stop provider for complete, turnkey network solutions and comprehensive service. Our employees have extensive experience working with network components. They are constantly being trained to ensure that they are always informed of the latest developments in this innovative field.

We use high-quality equipment ranging from fibre optic splicing devices to LAN analysers to ensure the best possible performance of your network.

We only use the best components available today. Our collaboration with numerous well-known manufacturers of IT components makes it possible for us to provide you with the right selection of components for proper installation of your network.

After installation is complete, the entire network together with all installed components is checked with care. The results of the measurements and checks are recorded in protocol form. This information is just as important for your documentation as the network-specific plans and address and component lists.



## Practical training

We provide continuing education and training specially designed to meet the growing demands of the market. Our seminars and workshops provide you with the latest information in the field, giving you the edge you need to succeed in your daily work.

As cable specialists, we are interested in sharing with you the extensive knowledge and expertise we have gained in the field. We offer seminars covering all theoretical and practical questions concerning copper and fibre optic cables. In the courses, we familiarise you with the installation and correct application of our products to ensure reliable and lasting operation.

In addition, the courses provide useful background information for customer-specific solutions as well as practical exercises.

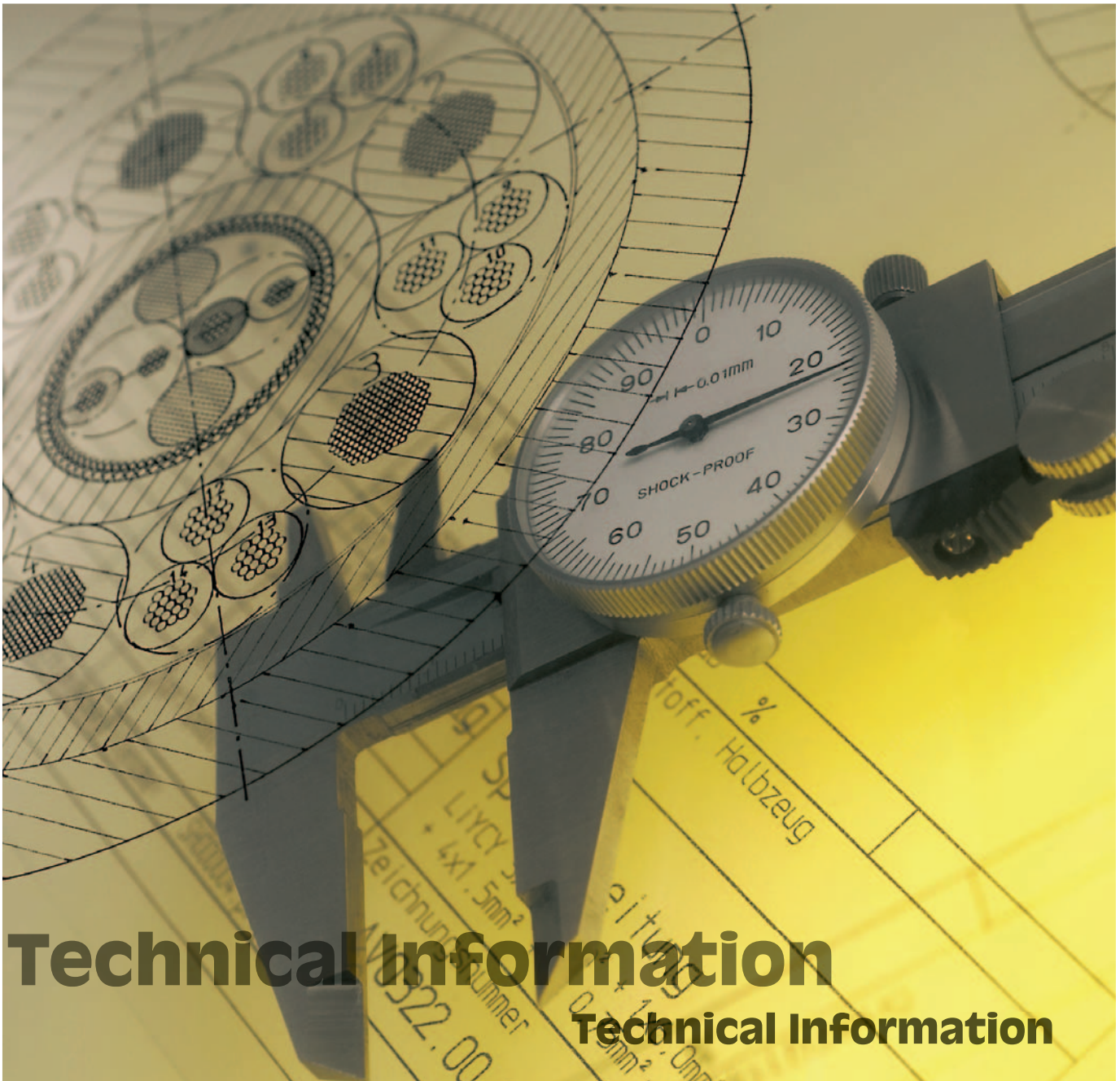
We offer the following standard training courses:

- Category 5 / 6 / 7 measuring techniques
- The basics of fibre optics
- Arc lamp splicing devices
- OTDR measuring techniques

If you do not find the course you need, we are happy to provide you with a tailored solution to meet your requirements.



Photos: HELUKABEL®



# Technical Information

## Technical Information

Photo: HELUKABEL®

On the following pages, we have provided a summary of important information and standards to help you find the information you need quickly and easily. Here you will find essential information on everything from dimensions and power ratings to international standards and abbreviations.

Nevertheless, we can only provide you with a fraction of all the information required today. However this is the elementary information. If you have any further questions about standards or technology, please do not hesitate to contact a member of our project management group responsible for data, network & bus technics.

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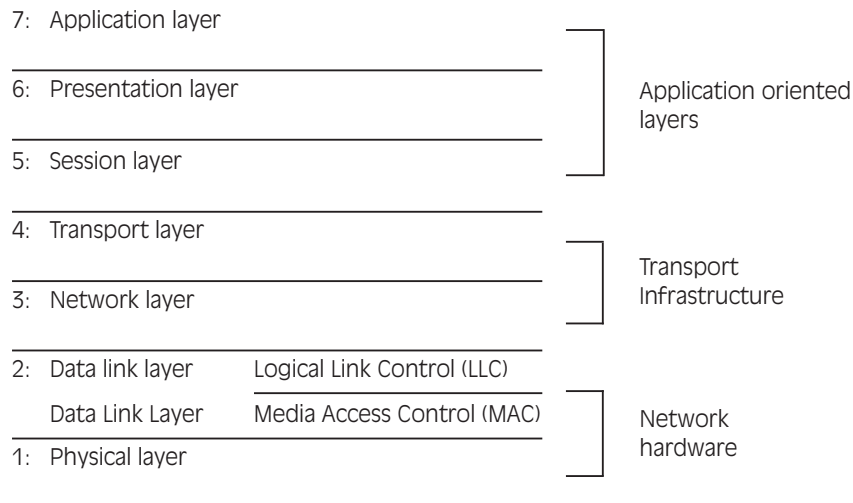
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# OSI reference model

The communication between systems (devices, computers) in an open network architecture is specified schematically and standardised by the OSI reference model. The individual functions for communication between an application process in one system and any other application in another system are classified in seven functional layers. The complex communication process is simplified by this abstraction and divided into logical units. A further benefit of this

modularisation of the individual function tasks is also the possibility of being able to simply replace the technical implementation of one layer independently from the other layers. For example, it is possible to easily change the transmission medium. The functionality of the other layers is maintained without modification.

## OSI reference model



### Layer 7 Application layer

(also called: processing layer, application level). The application layer is at the top of the seven hierarchical layers. It provides the applications with a multitude of functionalities (for example, data transmission, email, Virtual Terminal or Remote Login etc.).

### Layer 6 Presentation layer

(also called: data presentation layer, data provision level). The presentation layer converts the system-dependent presentation of the data (for example, ASCII, EBCDIC) to an independent form and thus enables syntactically correct data exchange between different systems. Tasks such as data compression and encryption also belong to Layer 6.

### Layer 5 Session layer

(control of logical connections, session level). The session layer provides services for an organised and synchronised data exchange in order to resolve session crashes and similar problems. For this purpose, restart points, so-called tokens, are implemented, using which the session can be resynchronised after a transport connection failure without having to restart the transmission from the beginning.

### Layer 4 Transport layer

(also called: end-to-end control, transport control). The tasks of the transport layer include the segmentation of data packets and congestion control. The transport layer is the bottom layer which provides a complete end-to-end communication between sender and recipient. It provides standard access to the application-oriented layers 5 - 7 so that these do not need to take account of the characteristics of the communication network. Five differentiated service classes of different quality are defined in Layer 4 and can be used by

the upper layers, from the simplest to the most convenient service with multiplexing mechanisms, error protection and error correction methods.

### Layer 3 Network layer

(also called: packet level:). The network layer ensures control of connections for connection-oriented services and the forwarding of data packets for packet-oriented services. In both cases, the data transmission passes over the complete communication network and includes the routing between the network nodes. As a direct connection between the sender and destination is not always possible, packets must be forwarded from nodes which are on the path.

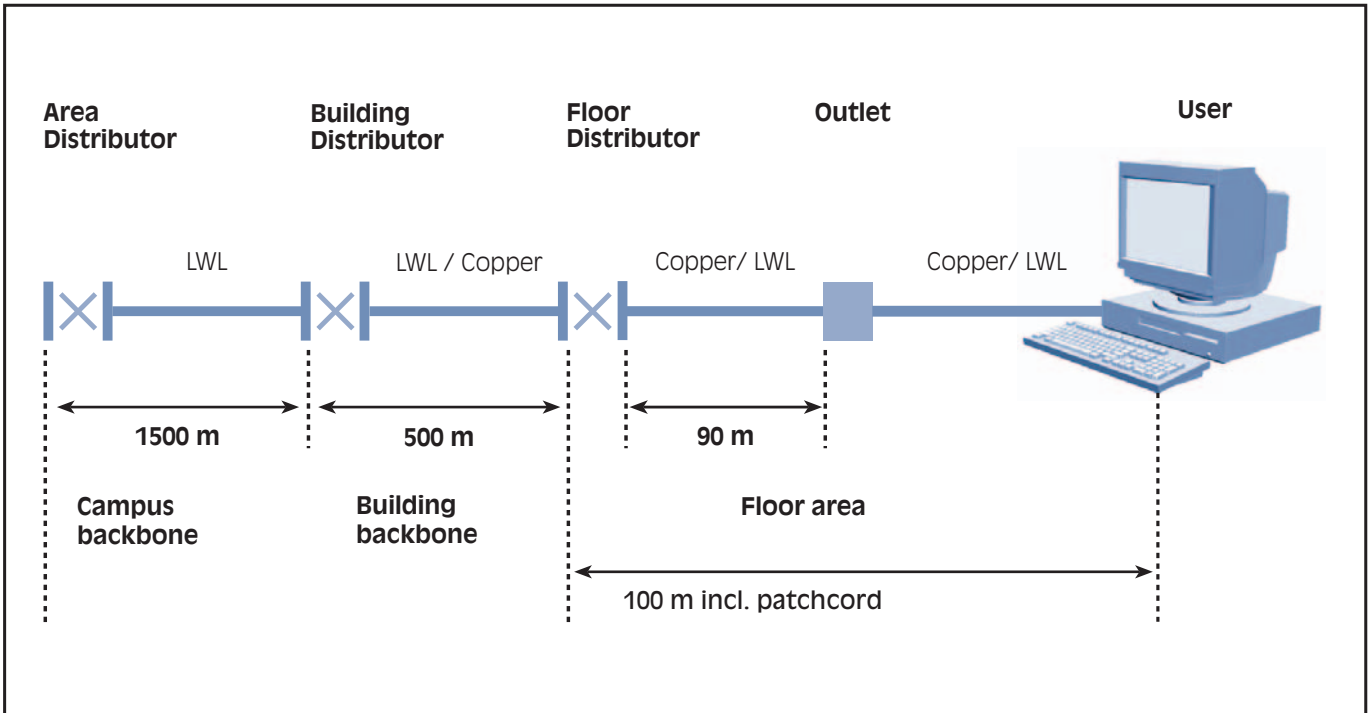
### Layer 2 Data link layer

(also called: connection link layer, connection level, procedure level). The role of the data link layer is to ensure a safe, i.e. transmission as error-free as possible and to control the access to the transmission medium. Splitting the bit data stream into blocks and the insertion of sequence numbers and check numbers are provided for this. Incorrect or lost blocks caused by errors can be requested again by the recipient using acknowledgement and repetition mechanisms. The blocks are also called frames. A so-called flow control makes it possible for a recipient to dynamically control the speed at which the other side is allowed to send blocks.

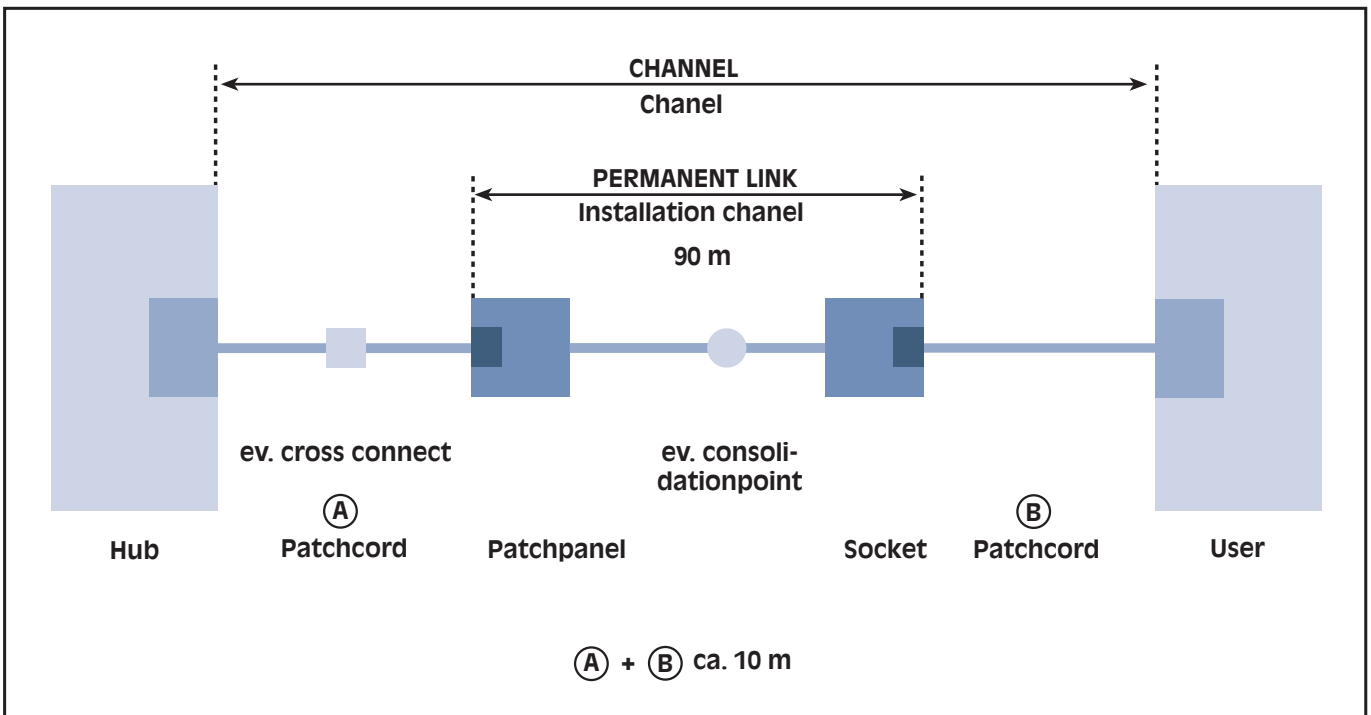
### Layer 1 Physical layer

(also called: bit transmission layer, physical level). The physical layer is the bottom layer. The specifications for Layer 1 mainly include the mechanical (plug connectors, etc.), electrical (level, type of pulse, etc.) and optical (wavelength) characteristics of the transmission medium (cable, fibre optics, wireless technology etc.).

# Basics of structured cabling (EN 50173)



The permanent link and the transmission path (channel) are defined as follows in the ISO/IEC 11801 and EN 50173 standards:



# Planning and installation instructions

Fibre optic cable is recommended for execution of the PRIMARY area, and the site distributor is usually connected to the individual building distributors in a star configuration.

The SECONDARY area can be laid out with fibre optic, as well as with copper cable, (fibre optic is recommended) and the structure can be either a star configuration or ring configuration.

The TERTIARY area is executed in a star configuration with copper cable.

The minimum cable structure recommendation is 4 pair with a conductor cross-section of 0.51 mm that is covered with foil shielding.

However cable with foil shielding for each pair, and overall braid screening is preferred in order to also handle future applications and requirements. (Higher near-end crosstalk attenuation and better EMC behaviour).

Halogen-free cable is recommended for buildings with higher concentration of material assets or personnel.

The system reserves in the type selection should be specified for a service life of 10-15 years.

Ensure that all components contained are either screened or non-screened.

Existing standards facilitate execution and increase security, and they should be strictly complied with.

Due to the high cable density in the tertiary area, sufficiently dimensioned cable routes must be planned.

## Installation instructions

Note that in the tertiary area, the max. cable length between floor distributors and the workstation wiring box is 90 m. (Ethernet according to 802.3, Copper).

Ensure that earthing is carefully equalised. The earth potential difference between any earthing points should not exceed 1 volt.

Ensure that power cables and data cables are separated by a metallic centre web if laid in shared cable routes.

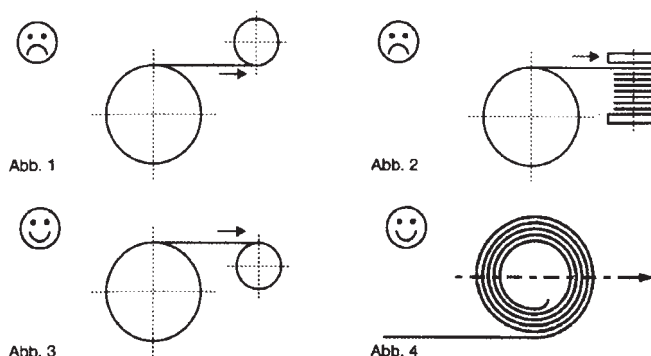
Ensure that the cables are used in enclosed and dry areas and that the cable routes are protected from aggressive chemicals and rodents.

An adjacent fire barrier is required for floor penetrations for the riser line.

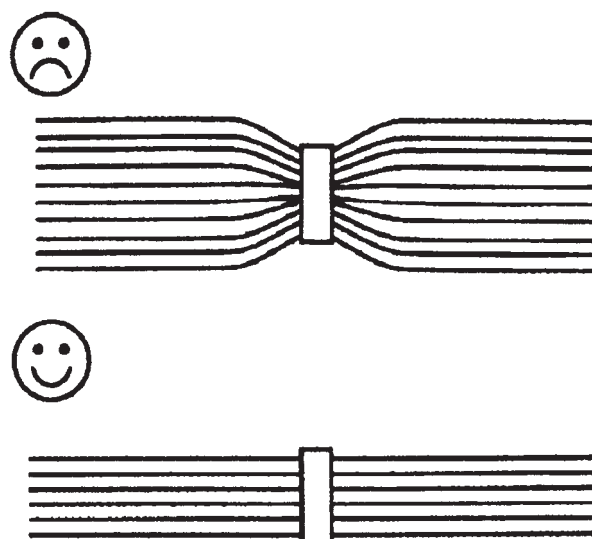
## Cable installation guidelines

Never take cable and lines from a reel against their original run direction (Fig. 1); turn around (Fig. 2) is also not permitted. When installing cable, the reel should always be horizontal (Fig. 3), preferably it should be placed on a roll dispenser. This is the only way to ensure that the cable is laid on the ground without incurring damage due to mechanical stress.

In order to avoid a crossover effect with cable rings, they should always be positioned vertically (Fig. 4) and unrolled onto the ground.



If cable cannot be unrolled in the required length due to a lack of space, then you must maintain a bend of sufficient dimensions when running back.



If, for example, multiple cables are routed parallel in the same channel, then we recommend bundling them using cable ties or insulation tape. The bundle should always be laid out straight to avoid possible jamming when installing.

# Planning and installation instructions

## Tensile stress during and after the installation

Data lines should only be exposed to low level mechanical stress. In the relevant guidelines, 5daN/qmm Cu-conductor is specified as maximum permissible tensile force. This results in the following permissible tensile stress values depending on number of pairs and execution of the overall screen:

Conductor Dimension	Ø NW (mm)	without screened braiding		with screened braiding	
		2 pair	4 pair	2 pair	4 pair
AWG26/7	7 x 0.16	3 daN	6 daN	7 daN	10 daN
AWG24	0.51	5 daN	9 daN	9 daN	15 daN
AWG23	0.55	-	-	13 daN	19 daN
Ø 0.6	0.60	7 daN	12 daN	16 daN	24 daN
AWG22	0.64	8 daN	15 daN	17 daN	25 daN

(1daN corresponds to approximately 1kg)

Ensure that the cable is not pulled too forcefully when bending around sharp corners or edges. Excessive mechanical stress can influence the transmissions properties. The **bend radius** must not exceed **8 times** the cable diameter while subject to tensile stress. In installed condition this value can be reduced to **4 times** the cable diameter.

In the design as well as in the production of HELUKAT® lines, care has been taken to achieve cable structure that is as solid and compact as possible, so that no essential losses occur in the transmission parameters if these installation guidelines cannot be complied with due to local conditions..

## Patch cable

The calculation of the maximum. Patch Cable Length = flexible printed circuit, calculated using the formula below. It follows with optimal conditions, a max. 80 m flexible Section (AWG 22, 7-wiry, FM45 industrial connectors, Profinet-B). This patch cable is a channel for a To see complete route. After installation, it is absolutely necessary to carry out a measurement.



# Structured wiring

## Device wiring/ Work area

### Copper data cables

(Chapter 2 HELUKAT®)

1. UTP (UTP\*)
2. FTP (FTP\*)
3. S-FTP (S-FTP\*)
4. S-STP (S-STP\*)

### Glas fibre cables

(Chapter 1 HELUCOM®)

1. Installation cables/zipcords  
(z.B. I-VH)

## Floor wiring/ Horizontal cables

### Copper data cables

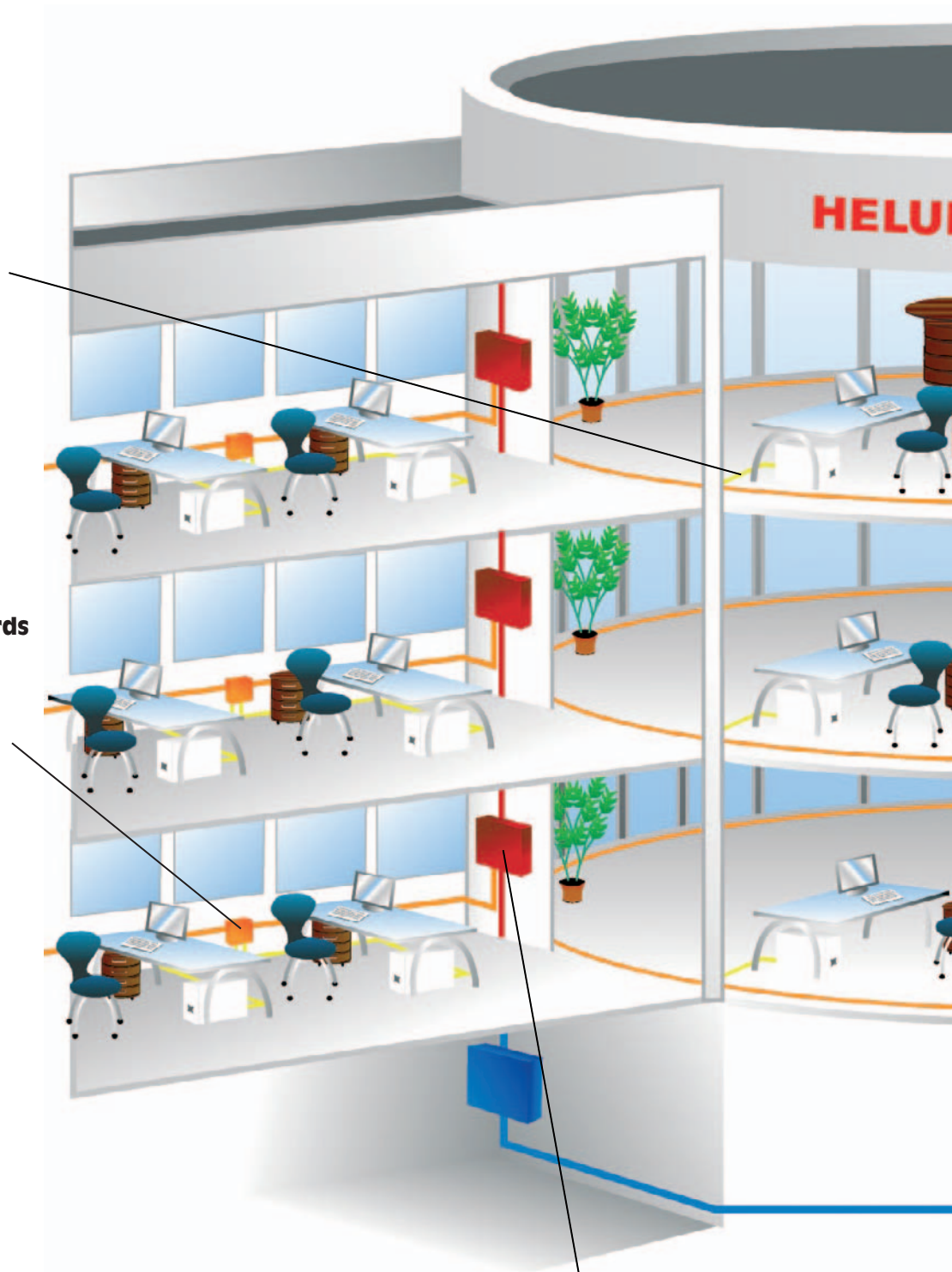
(Chapter 2 HELUKAT®)

1. UTP (UTP\*)
2. FTP (FTP\*)
3. S-FTP (S-FTP\*)
4. S-STP (S-STP\*)

### Glass fibre cables

(Chapter 1 HELUCOM®)

1. Breakout cable  
(z.B. I-V(ZN)HH)
2. Mini breakout cable  
(z.B. A/I-VQ(ZN)BH)



## Building backbone/vertical cables

### Copper data cables

(Chapter 2 HELUKAT®)

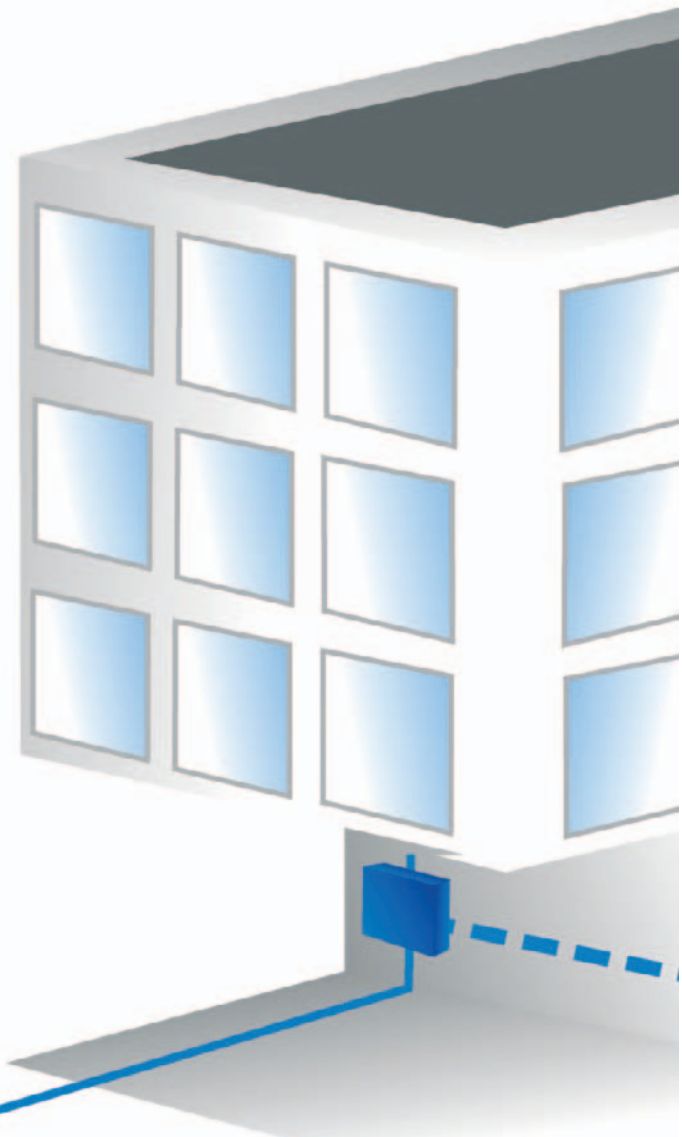
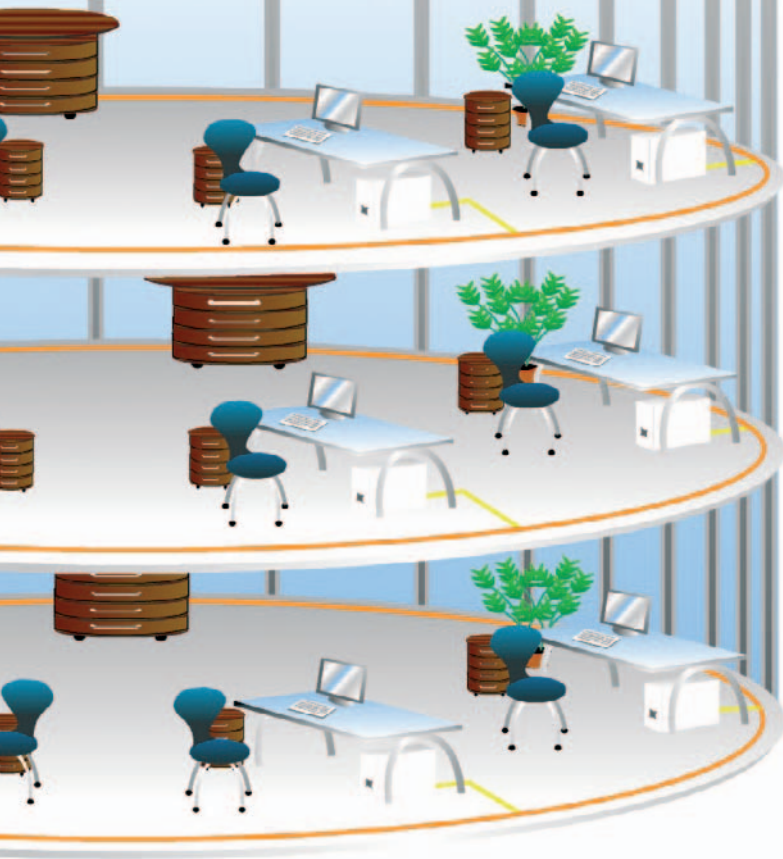
1. UTP (UTP\*)
2. FTP (FTP\*)
3. S-FTP (S-FTP\*)
4. S-STP (S-STP\*)

### Glass fibre cables

(Chapter 1 HELUCOM®)

1. Breakout cable (z.B. I-V(ZN)HH)
2. Mini breakout cable (z.B. A/I-VQ(ZN)BH)
3. Loose-tube cable with or without rodent protection (z.B. A/I-DQ(ZN)BH)

**KABEL**



## Campus backbone

### Glass fibre cables

(Chapter 1 HELUCOM®)

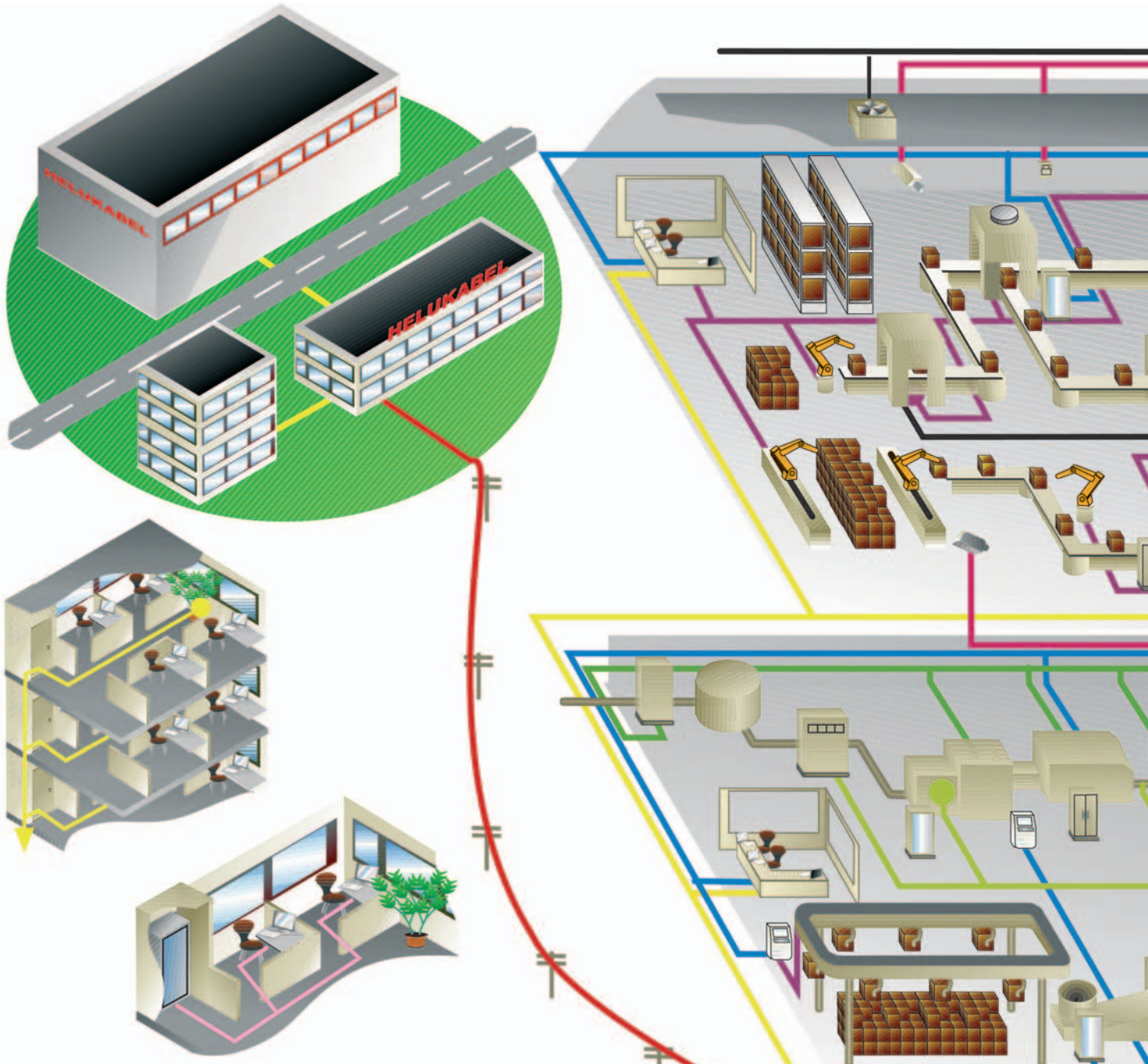
1. Breakout with rodent protection  
(z.B. AT-V(ZN)HH(BN)2Y)
2. Loose-tube cable with rodent protection  
(z.B. A-DQ(ZN)B2Y)

## Application:

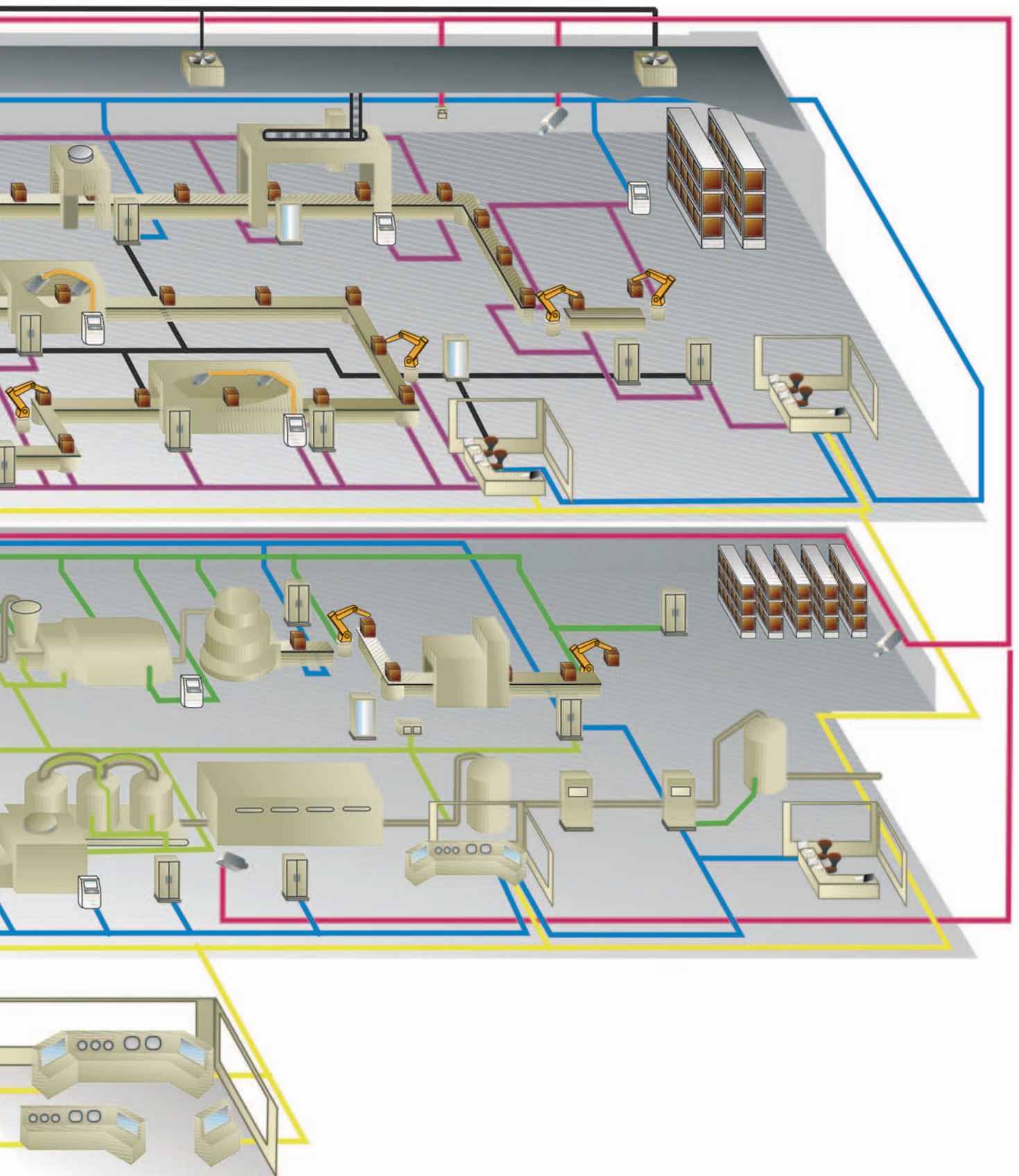
These cables are suitable for use with the following LAN standards:

Ethernet	10 Mb/s
Token Ring	10 Mb/s
Fast Ethernet	100 Mb/s
FDDI-CDDI	100 Mb/s
ATM	155 Mb/s
ATM	622 Mb/s
Gigabit Ethernet	1 Gb/s
10 Gigabit Ethernet	10 Gb/s

# Wiring topology of industrial application



- Building backbone cables such as HELUCOM® or HELUKAT® series
- Horizontal wiring (discrete production) such as HELUKABEL® bus or HELUCOM® series wiring (e.g. Fieldbus, CC link, Twinax, glass fibre cable)
- Horizontal wiring (manufacturing process level) such as HELUKABEL® bus or HELUCOM® series wiring (e.g. Fieldbus, CC link, glass fibre cable)
- Device-level wiring (discrete production) such as Profi bus, Interbus, DeviceNet or ASI bus from the HELUKABEL® bus series
- Device-level wiring (manufacturing process level) such as Profibus, Interbus or DeviceNet (HELUKABEL® bus series)
- HELUKABEL® control and power cables
- HELUKABEL® RE or RD series instrument wiring
- HELUKABEL® JZ series flexible control cables
- Alarm, security and voice wiring such as fire alarm cables from HELUKABEL®
- HELUCOM® or HELUKAT® series floor wiring
- HELUCOM® series area backbone cables



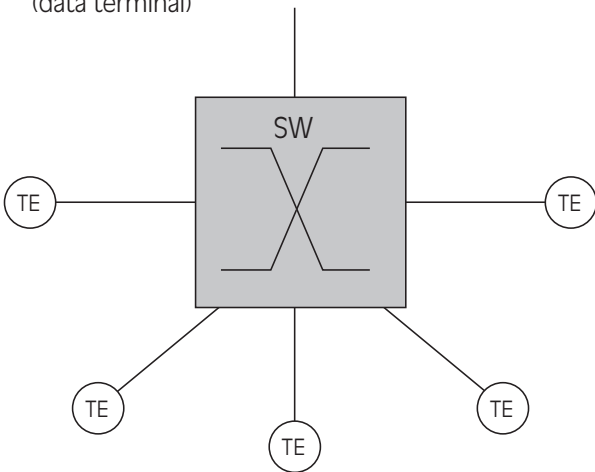
# Network topologies in the industrial environment

The network topologies for Ethernet networks are oriented towards the requirements of the equipment to be networked. The most frequently used are star, point-to-point, tree and ring structures. In practice, a real system often consists of a mixture of the structures considered below.

## Star

The characteristic of the star structure is a central switch with individual connects to all nodes of the network. Applications for star network structures are areas with high node density and low thermal expansion, e.g. small production cells or a single production machine.

SW = Switch  
TE = Terminal Equipment (data terminal)

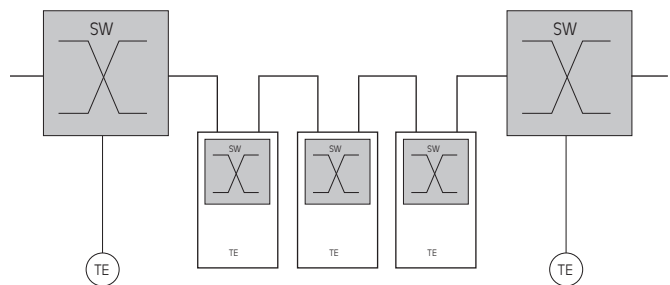


## Tree

The tree topology results from the connection of several stars to a network. It is used for dividing complex systems into subsystems.

## Point-to-point

The point-to-point structure can be realised by a switch in the vicinity of the integrated switch in the node to be connected. The point-to-point structure is preferred for use in systems with remote structure, e.g. conveyor systems and for connecting production cells.



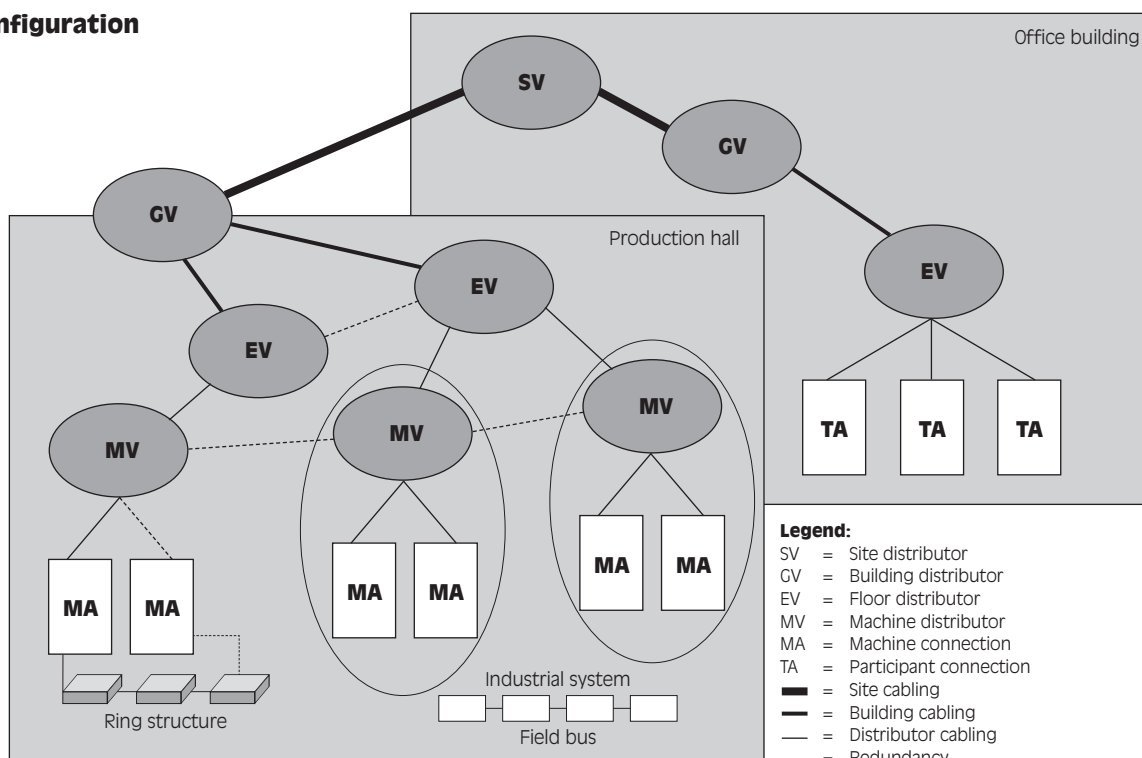
Point-to-point structure

SW = Switch  
TE = Terminal Equipment

## Ring (redundancy)

A ring structure is produced if the ends of a line are closed with an additional connection. Ring topologies are used in systems with increased availability requirements for protection against cable breaks or failure of network components.

## Example configuration



# Requirements for office and industrial networks

The international standard ISO/IEC 11801 and its European equivalent EN 50173 define an application-neutral, standard IT networking for a building complex. Their contents are largely identical. Both standards assume an office environment usage of the building and require application neutrality. The specific requirements for Ethernet networks in industrial environments such as

- system specific cable layout
- individual connectivity for each machine / system
- point-to-point network structures
- robust industry-compatible cables and plug connectors with particular requirements for EMC, temperature, moisture, dust and vibration are not considered in both these standards.

The comparison is below:

	Office area	Production and field area
<b>Installation conditions</b>	<ul style="list-style-type: none"> <li>• fixed basic installation in the building</li> <li>• laying in false floors</li> <li>• variable equipment connection at the work place</li> <li>• prefabricated equipment connection cables</li> <li>• mainly standard work places (desk with PC, ...)</li> <li>• tree-shaped network structures</li> </ul>	<ul style="list-style-type: none"> <li>• strongly system-dependent cabling</li> <li>• system specific cable layout</li> <li>• connection points are seldom changed</li> <li>• equipment connections can be assembled in the field</li> <li>• each machine / system requires individual connectivity</li> <li>• frequent point-to-point network structures and (redundant) ring structures</li> </ul>
<b>Transmission performance</b>	<ul style="list-style-type: none"> <li>• big data packets (for ex. pictures)</li> <li>• medium network availability</li> <li>• transmission time in seconds range</li> <li>• high proportion of not cyclic transmission</li> <li>• no isochrony</li> </ul>	<ul style="list-style-type: none"> <li>• small data packets (measured values)</li> <li>• very high network availability</li> <li>• transmission time in microseconds range</li> <li>• high proportion of cyclic transmission</li> <li>• isochrony</li> </ul>
<b>Environmental requirements</b>	<ul style="list-style-type: none"> <li>• moderate temperatures</li> <li>• low dust contamination</li> <li>• no moisture</li> <li>• hardly any vibration</li> <li>• low EMC load</li> <li>• low mechanical hazard</li> <li>• low UV radiation</li> <li>• hardly any chemical hazard</li> </ul>	<ul style="list-style-type: none"> <li>• extreme temperatures</li> <li>• high dust contamination</li> <li>• possible moisture</li> <li>• vibrating machines</li> <li>• high EMC load</li> <li>• risk of mechanical damage</li> <li>• UV exposure outdoors</li> <li>• chemical contamination by oily or aggressive atmospheres</li> </ul>

# The MICE concept

## The MICE concept – explanation using cabling solutions as an example

**M** echanical                      Mechanical properties  
**I** ngress                            Leak tightness properties  
**C** limatic                            Climatic properties  
**E** lectromagnetic                Electromagnetic properties

communication cables used in the industrial environment is crucially important for a fault-free and above all, reliable operation of communication and data networks.

In contrast to the cables used in the office environment, the selection of the correct insulation material for

First drafts of the future cabling standard show an interesting approach which could help the user with the selection of the correct cable.

**low requirements**                      **medium requirements**                      **high requirements**  
 → office application                      → industrial application                      → rough industrial application

<b>Mechanical properties</b>	<b>M<sub>1</sub></b>	<b>M<sub>2</sub></b>	<b>M<sub>3</sub></b>
Impacts (maximum acceleration)	40 ms <sup>2</sup>	100 ms <sup>2</sup>	250 ms <sup>2</sup>
Vibrations (oscillation amplitude) 2-9 Hz	1.5 mm	7.0 mm	15.0 mm
Vibrations (acceleration amplitude) 9-500 Hz	5 ms <sup>2</sup>	20 ms <sup>2</sup>	50 ms <sup>2</sup>
Tensile force	see note *	see note *	see note *
Pressure	45 N over 25 mm (linear) min.	1.100 N over 150 mm (linear) min.	2.200 N over 150 mm (linear) min.
Impact	1 J	10 J	30 J
Torsion	see note *	see note *	see note *

\* installation-specific according to IEC 61918

<b>Leak tightness properties</b>	<b>I<sub>1</sub></b>	<b>I<sub>2</sub></b>	<b>I<sub>3</sub></b>
Particle entry (max. diameter)	12.5 mm	50 µm	50 µm
Immersion	none	Liquid spray interval ≤12-5 l/min ≥ 6.3 mm spray >2-5 m distance	Liquid spray interval ≤12-5 l/min. ≥ 6.3 mm spray >2-5 m distance and immersion (≤1m for ≤30 minutes)

<b>Climatic properties</b>	<b>C<sub>1</sub></b>	<b>C<sub>2</sub></b>	<b>C<sub>3</sub></b>
Ambient temperature	-10 °C bis + 60 °C	-25 °C bis + 70 °C	-40 °C bis + 70 °C
Rate of temperature change	0,1 °C per minute	1,0 °C per minute	3,0 °C per minute
Humidity	5% bis 85%	5% bis 95%	5% bis 95%
	(non-condensing)	(condensing)	(condensing)
Solar irradiation	700 Wm <sup>2</sup>	1.120 Wm <sup>2</sup>	1.120 Wm <sup>2</sup>
Contamination by liquids Foreign substances	Max.	Max.	Max.
Sodium chloride (Saltwater / seawater) (ppm)	0	0.3	0.3
Oil (ppm)	0	5.0	500
Sodium stearate (soap)	none	5% aqueous not gelatinous	5% aqueous not gelatinous
Cleaning agents	none	ffs	ffs
Dissolved carriers	none	temporary (condensation)	current
Contamination by gases Foreign substances (cm <sup>3</sup> m <sup>3</sup> =ppm)	Average value/ maximum value	Average value/ maximum value	Average value/ maximum value

\* installation-specific according to IEC 61918

# The MICE concept



Climatic properties	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>
Hydrogen sulphide	<0.003/<0.01	<0.05/<0.5	<10/<50
Sulphur dioxide	<0.01/<0.03	<0.1/<0.3	<5/<15
Sulphur trioxide	<0.01/<0.03	<0.1/<0.3	<5/<15
Wet chlorine (<50 % humidity)	<0.0005/<0.001	<0.005/<0.03	<0.05/<0.3
Dry chlorine (<50 % humidity)	<0.002/<0.01	<0.02/<0.1	<0.2/<1.0
Hydrogen chloride	-/<0.06	<0.06/<0.3	<0.6/3.0
Hydrogen fluoride	<0.001/<0.005	<0.01/<0.05	<0.1/<1.0
Ammonia	<1/<5	<10/<50	<50/<250
Nitrogen oxide	<0.05/<0.1	<0.57/<1	<5/<10
Ozone	<0.002/<0.005	<0.025/<0.05	<0.1/<1

Electromagnetic properties	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>
Electromagnetic discharge Contact (0.667 µC)	4 kV	4 kV	4 kV
Electrostatic discharge Air (0.132 µC)	8 kV	8 kV	8 kV
Solar irradiation	700 Wm <sup>2</sup>	1.120 Wm <sup>2</sup>	1.120 Wm <sup>2</sup>
EMC emission HF-AM	3 V/m at 80 - 2,000 MHz 1 V/m at 2,000 - 2,700 MHz	3 V/m at 80 - 2,000 MHz 1 V/m at 2,000 - 2,700 MHz	10 V/m at 80 - 1,000 MHz 3 V/m at 1,400 - 2,000 MHz
Conducted HF	3 V at 150 - 80 MHz	3 V at 150 - 80 MHz	10 V at 150 - 80 MHz
EFT/B			
Alternating current	500 V	1,000 V	2,000 V
Voltage surge (earth potential difference) Signal, earthing line	500 V	1,000 V	2,000 V
Magnetic field (50/60 Hz)	1 Am <sup>-1</sup>	3 Am <sup>-1</sup>	30 Am <sup>-1</sup>
Magnetic field (60 - 20,000 Hz)	ffs	ffs	ffs
Surge: Long term effect of repeated surges on the channel must be taken into account.			

Draft standard CD ISO/IEC 24702

## Application Examples

Area of application	properties								environment class
	Humidity	Vibration	Irradiation	Electrical	UV light	Aggressive Fields	Oil	H2O Liquids	Solution proposals
Chemical industry	✓	✓		✓		✓	✓	✓	M <sub>1</sub> ₃C <sub>2</sub> E <sub>2</sub>
Car manufacturing		✓		✓		✓	✓		M <sub>1</sub> ₃C <sub>2</sub> E <sub>3</sub>
Airport	✓				✓		✓		M <sub>1</sub> ₂C <sub>1</sub> E <sub>1</sub>
Transmission line	✓				✓		✓	✓	M <sub>1</sub> ₂C <sub>1</sub> E <sub>1</sub>
Oil production facility	✓	✓			✓		✓	✓	M <sub>1</sub> ₃C <sub>2</sub> E <sub>1</sub>
Mining	✓	✓							M <sub>1</sub> ₃C <sub>1</sub> E <sub>1</sub>
Power station	✓	✓	✓	✓					M <sub>1</sub> ₃C <sub>2</sub> E <sub>3</sub>
Nuclear power station	✓	✓	✓	✓		✓	✓		M <sub>1</sub> ₃C <sub>1</sub> E <sub>3</sub>
Steelworks	✓	✓		✓					M <sub>1</sub> ₃C <sub>2</sub> E <sub>3</sub>

Possible classification criteria of environmental requirements



# Characteristics\* of insulating and sheath materials

Designation			Electrical					Thermic						
VDE Initial-code	Abbreviations	Materials	Density g/m <sup>3</sup>	Break-down-voltage- KV/mm (20°C)	Spezific volume resistivity Ohm · cm 20°C	Dielectric constant 50 Hz/20°C	Dielectric loss-factor tan δ	Working temperature		Melt-temperature +°C	Flame-resistance	Oxygen index LOI (% O <sub>2</sub> )	Heating value H <sub>0</sub> MU · kg <sup>-1</sup>	
								permanent °C	short time °C					
Thermoplastic	Y	PVC	Polyvinylchloride compounds	1,35–1,5	25	10 <sup>15</sup> –10 <sup>15</sup>	3,6–6	4 x 10 <sup>-2</sup> to 1 x 10 <sup>-1</sup>	- 30 + 70	+100	>140	self-extinguishing	23–42	17–25
	Yw	PVC	Heat-resistant 90°C	1,3–1,5	25	10 <sup>12</sup> –10 <sup>15</sup>	4–6,5		- 20 + 90	+120	>140			16–22
	Yw	PVC	Heat-resistant 105°C	1,3–1,5	25	10 <sup>12</sup> –10 <sup>15</sup>	4,5–6,5		- 20 +105	+120	>140		24–42	16–20
	Yk	PVC	Cold resistant	1,2–1,4	25	10 <sup>12</sup> –10 <sup>15</sup>	4,5–6,5		- 40 + 70	+100	>140			17–24
	2Y	LDPE	Low density Polyethylene	0,92–0,94	70	10 <sup>17</sup>	2,3	2 x 10 <sup>-4</sup>	- 50 + 70	+100	105–110	flammbale	≅22	42–44
	2Y	HDPE	High density Polyethylene	0,94–0,98	85	10 <sup>17</sup>	2,3	3 x 10 <sup>-4</sup>	- 50 +100	+120	130			
	2X	VPE	Cross-linked Polyethylene	0,92	50	10 <sup>12</sup> –10 <sup>16</sup>	4–6	2 x 10 <sup>-3</sup>	- 35 + 90	+100	-			
	O2Y		Foamed Polyethylene	~0,65	30	10 <sup>17</sup>	~1,55	5 x 10 <sup>-4</sup>	- 40 + 70	+100	105		18–30	
	3Y	PS	Polystrole	1,05	30	10 <sup>16</sup>	2,5	1 x 10 <sup>-4</sup>	- 50 + 80	+100	>120		≅22	40–43
	4Y	PA	Polyamide	1,02–1,1	30	10 <sup>15</sup>	4	2 x 10 <sup>-2</sup> bis 1 x 10 <sup>-3</sup>	- 60 +105	+125	210		≅22	27–31
	9Y	PP	Polypropylene	0,91	75	10 <sup>16</sup>	2,3–2,4	4 x 10 <sup>-4</sup>	- 10 +140	+140	160		42–44	
	11Y	PUR	Polyurethane	1,15–1,2	20	10 <sup>10</sup> –10 <sup>12</sup>	4–7	2,3 x 10 <sup>-2</sup>	- 55 + 80	+100	150		20–26	20–26
	TPE-E (12Y)		Polyester Elastomer	1,2–1,4	40	>10 <sup>10</sup>	3,7–5,1	1,8 x 10 <sup>-2</sup>	- 50 +100	+140	190		≅29	20–25
TPE-O		Polyolefine Elastomer	0,89–1,0	30	>10 <sup>14</sup>	2,7–3,6	+130		150	≅25	23–28			
Elastomere	G	NR SBR	Natural rubber Styrol-butadiene-rubber-compounds	1,5–1,7	20	10 <sup>12</sup> –10 <sup>15</sup>	3–5	1,9 x 10 <sup>-2</sup>	- 65 + 60	+120	-		flammbale	≅22
	2G	SiR	Silicone rubber	1,2–1,3	20	10 <sup>15</sup>	3–4	6 x 10 <sup>-3</sup>	- 60 +180	+260	-	high flash point	25–35	17–19
	3G	EPR	Ethylen-propylene rubber-compounds	1,3–1,55	20	10 <sup>14</sup>	3–3,8	3,4 x 10 <sup>-3</sup>	- 30 + 90	+160	-	flammbale	≅22	21–25
	4G	EVA	Ethylen-vinylacetat copolymer-compunds	1,3–1,5	30	10 <sup>12</sup>	5–6,5	2 x 10 <sup>-2</sup>	- 30 +125	+200	-			19–23
	5G	CR	Polychloroprene compounds	1,4–1,65	20	10 <sup>10</sup>	6–8,5	5 x 10 <sup>-2</sup>	- 40 +100	+140	-	self-extinguishing	30–35	14–19
	6G	CSM	Chlorsulfonated Polyethylene compunds	1,3–1,6	25	10 <sup>12</sup>	6–9	2,8 x 10 <sup>-2</sup>	- 30 + 80	+140	+160			19–23
High temp. materials	10Y	PVDF	Polyvinylidene fluoride Kynar/Dyflor	1,7–1,9	25	10 <sup>14</sup>	9–7	1,4 x 10 <sup>-2</sup>	- 40 +135	+160	>170	self-extinguishing	40–45	15
	7Y	ETFE	Ethylene-Tetrafluor ethylene	1,6–1,8	36	10 <sup>16</sup>	2,6	8 x 10 <sup>-4</sup>	-100 +150	+180	>265	self-extinguishing	30–35	14
	6Y	FEP	Fluorine ethylene propylene	2,0–2,3	25	10 <sup>18</sup>	2,1	3 x 10 <sup>-4</sup>	-100 +205	+230	>225	self-extinguishing	>95	5
	5YX	PFA	Perfluoralkoxypolimeric	2,0–2,3	25	10 <sup>18</sup>	2,1	3 x 10 <sup>-4</sup>	-190 +260	+280	>290	self-extinguishing	>95	5
	5Y	PTFE	Polytetrafluorethylene	2,0–2,3	20	10 <sup>18</sup>	2,1	3 x 10 <sup>-4</sup>	-190 +260	+300	>325	self-extinguishing	>95	5
halogen-free compunds	H	not cross-linked	halogen-free polymer-compounds	1,4–1,6	25	10 <sup>12</sup> –10 <sup>14</sup>	3,4–5	~10 <sup>-3</sup>	- 30 + 70	+100	>130	self-extinguishing	≅40	17–22
	HX	cross-linked	halogen-free polymer-compounds	1,4–1,6	25	10 <sup>15</sup> –10 <sup>14</sup>	3,4–5	10 <sup>-2</sup> –10 <sup>-3</sup>	- 30 + 90	+150	-	self-extinguishing	≅40	16–25

\* The characteristics valid for unprocessed material

# Characteristics\* of insulating and sheath materials

Thermic		Mechanical				Halogen	Weather		Designation														
Thermal-conductivity W·K <sup>-1</sup> ·m <sup>-1</sup>	Corrosive gases in case of fire	Radiation-resistance-max Mrad	tensile strength N/mm <sup>2</sup>	Elongation at break %	Shore-hardness	Abrieb-verhalten	Abrasion resistance	halogen-free	Weather resistance	Cold resistance	VDE-Initial-code	Abbre-viat-ions	Material										
0,17	Hydrogen chloride	80	10–25	130–350	70–95 (A)	medium	0,4	no	medium in black	moderate-good	Y	PVC	Polyvinylchloride-compounds										
											Yw	PVC	Heat-resistant 90°C										
											Yw	PVC	Heat-resistant 105°C										
											YK	PVC	Cold resistant										
	0,3	no	100	10–20	400–600	43–50 (D)	medium	0,1	yes	good	good	2Y	LDPE	Low density Polyethylene									
												2Y	HDPE	High density Polyethylene									
	0,4											0,3	12,5–20	300–400	40–45 (D)	medium	0,1	yes	good	good	2X	VPE	Cross-linked Polyethylene
	0,25																				8–12	350–450	–
	0,25	no	80	55–65	300–400	35–50 (D)	good	0,4		medium - good	moderate - good	3Y	PS	Polystrole									
	0,23	no	10	50–60	50–170	–	very good	1,0–1,5	yes	good	good	good	4Y	PA	Polyamide								
0,19	20–35												300	55–60 (D)	medium	0,1	moderate	9Y	PP	Polypropylene			
0,25	100 (500)												30–45	500–700	70–100 (A)	very good	1,5	yes <sup>2)</sup>		11Y	PUR	Polyurethane	
0,5	no	10	30	>300	85 (A) 70 (D)	good	1,5	yes	very good	very good	very good	TPE-E (12Y)		Polyester Elastomer									
1,5												10	20	55 (A) 70 (D)	good	1,5	yes		TPE-O		Polyolefine Elastomer		
–	no	100	5–10	300–600	60–70 (A)	moderate	1,0	yes	moderate	very good	very good	G	NR SBR	Natural rubber Styrol-butadiene-rubber-compounds									
												0,22	50	40–80 (A)	moderate	1,0	yes	good	2G	SIR	Silicone rubber		
												–	200	200–400	65–85 (A)	moderate	1,0	yes	very good	3G	EPR	Ethylen-Propylene rubber-compounds	
												–	100	8–12	250–350	70–80 (A)	moderate	1,0	yes	good	4G	EVA	Ethylen-vinylacetat copolymer-compunds
	–	Hydrogen chloride	50	10–20	400–700	55–70 (A)	medium	1,5	no	very good	moderate - good	5G	CR	Polychloroprene compounds									
	–											350–600	60–70 (A)	medium	1,5	no	very good	moderate	6G	CSM	Chlorsulfonated Polyethylene compunds		
0,17	Hydro-fluoric	10	50–80	150	75–80 (D)	very good	0,01	no	very good	very good	10Y	PVDF	Polyvinylidene fluoride Kynar/Dyflor										
	yes	10	40–50	150	70–75 (D)	very good	0,02				very good	7Y	ETFE	Ethylene-Tetrafluor ethylene									
	yes	1	15–25	250	55–60 (D)	very good	0,01				very good	6Y	FEP	Fluorine ethylene propylene									
	yes	0,1	25–30	250	55–60 (D)	very good	0,01				very good	5YX	PFA	Perfluoralkoxypolimeric									
	yes	0,1	80	50	55–60 (D)	very good	0,01				very good	5Y	PTFE	Polytetrafluorethylene									
0,17	no	100	8–13	150–250	65–95 (A)	medium	0,2–1,5	yes	medium in black: good	average	H	not cross-linked	halogen-free polymer-compounds										
	0,20	no				200					8–13	150–250	medium	0,2–1,5	yes	HX	cross-linked	halogen-free polymer-compounds					

Thermoplastic

Elastomere

High temp. materials

halogen-free compunds

<sup>1)</sup> The propellent may be e.g. Fluor-Chlor-Hydrcarbon

<sup>2)</sup> depend on the type compound

# IAONA-classification

General requirements for cabling components in the industrial environment according to IAONA recommendations

Parameter	Value	Notes
Operating temperature	0°C ... +55°C	Installation >5°C
Storage temperature	-25°C ... +70°C	IEC 61131-2
Storage temperature	5°C ... +55°C, 3°C/min.	IEC 6068-2-14 Test N b
Humidity	10% ... 95% non-condensing	IEC 60068-2-30 Version 2
Shock test	15 G, 11 ms according to EN 60068-2-27 or IEC 60068-2-27 Criterion: no mechanical or functional damage	
Vibration	5 G at 10 Hz ... 150 Hz according to EN 60068-2-6 or IEC 60068-2-6, Criterion A	
Earthing		cf Chapter 3.1.6 [2]
Cabling class (minimum requirements)	EN 50173;2002 or ISO/IEC 11801, Cass D	

**There are also two protection classes defined as in addition to these general requirements which, on closer examination, are aimed at the protection of the connection components:**

## Light Duty (IP20)

This class contains components which are installed in a protected distribution cabinet. These requirements must be limited by those for the office environment as these cabinets are also installed in the vicinity of moving system parts. The protection class IP20 according to EN 60529 is

defined for this class which states that the components are protected against penetration by solid foreign substances no larger than 12.5 mm. Protection against penetration by moisture is not included.

## Heavy Duty (IP67)

The components in this protection class are completely exposed to the aggressive industrial environment. According to the IP67 protection class, the components are constructed absolutely dustproof and protected against damage by temporary immersion in water.

	Light Duty	Heavy Duty
Protection class	IP 20 + IP 30	IP 67 + IP 69
Degree of contamination	according to IEC 60529, EN 60529	according to IEC 60529, EN 60529
Relative humidity	95% non-condensing	Temperature cycles (25°C–50°C–25°C) at 80% bis 95% relative humidity condensing according to IEC 60068-2-30
Operating temperature	0°C at +55°C	-20°C at +65°C
Shock test	15 G, 11 ms according to EN 60068-2-27 and IEC 60068-2-27 no mechanical and functional damage	15 G, 11 ms according to EN 60068-2-27 and IEC 60068-2-27 no mechanical and functional damage
Vibration	5 G at 10 Hz ... 150 Hz according to EN 60068-2-6 and IEC 60068-2-6, Criterion A	5 G at 10 Hz ... 150 Hz according to EN 60068-2-6 and IEC 60068-2-6, Criterion A

# Essential cable parameters

## Wave impedance

Characteristic impedance is the terminating resistance of a cable at which no line reflections occur, i.e. the total power fed into the cable by a signal source is transmitted at the characteristic impedance on the output, except for the losses caused by cable attenuation. A data cable's task is transmitting electrical pulse groups. The higher the desired data bit rate, the greater the frequency bandwidth that must be selected for the transmission channel (e.g. cable). Output impedance and input impedance of the devices connected to the cable must match (or must be adapted) to the characteristic impedance of the data cable. If this is not the case, then pulse distortions occur, which means defective transmission. The characteristic impedances of symmetric cables for telecommunications engineering are standardised in EN 50173 or ISO/IEC 11801: 100, 120 and 150.

## Wave attenuation $\alpha$ [dB]

Cable attenuation reduces the signal amplitude arriving at the output, and thus limits the free cable lengths that can be implemented. Ohmic loss resistance in the longitudinal direction occurs due to the conductor material and the conductor cross section. In addition the skin effect (current displacement) reduces the effective conductor cross section as frequency increases. The frequency dependence of the selected core insulation material also determines additional capacitive loss resistances between the conductors. Cable attenuation, which is usually specified at a reference length of 100 m, defines the ratio of transmission level to reception level.

## Near-end crosstalk NEXT, $\alpha_{NN}$ [dB]

Crosstalk describes the undesired passover of signal energy into a neighbouring line channel. In this process, the electromagnetic field of the wanted signal of a conductor pair generates an interference signal on the same cable side (NEAR-END) in a neighbouring core pair. Near-end crosstalk (NEXT) results from the power ratio "Input power on the interfering pair to output power on the disturbed pair", but at the same end of the cable.

## Far-end crosstalk FEXT, $\alpha_{FN}$ [dB]

The electromagnetic field of the wanted signal at the input of the pair generates an interference signal at the output side (FAR-END) of a neighbouring pair. Far end crosstalk (FEXT) results from the power ratio "Input power on the interfering core pair to output power on the disturbed pair", but at the opposite end of the cable.

## ELFEXT

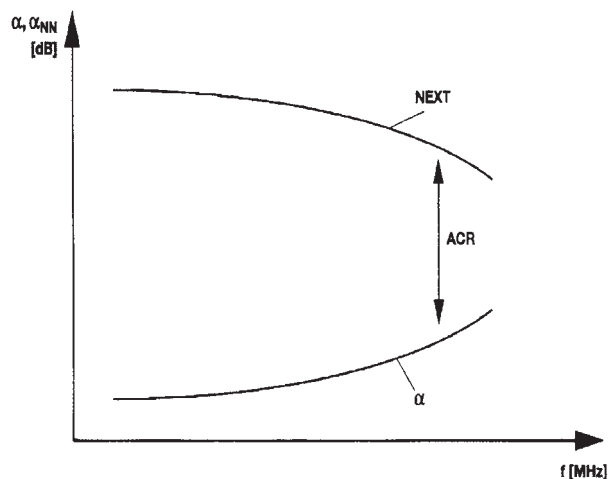
ELFEXT is a relative value that defines the ratio of the crosstalk output level to the actual output level. The interference level interspersed on the second pair is placed in the ratio to the output level. The ELFEXT value has the advantage relative to the FEXT value that it is not dependent on channel length, because the interference signal as well as the output signal depend on the channel length, and are determined on the same remote point.

## Attenuation to Crosstalk Ratio - ACR [dB]

The ACR value is determined by the difference of near-end crosstalk and line attenuation, measured at the same frequency.

## ACR(f) NEXT(f) - $\alpha$ (f)

Thus, in order to ensure problem-free transmission, the ACR must be as high as possible (high NEXT and low wave attenuation). The ACR value is a characteristic value used for simple evaluation of a cable's transmission quality. For cables, the ACR should be at least 10dB at the highest signal transmission frequency.



## Power Sum NEXT [dB]

Crosstalk is the signal portion induced in one line channel from a neighbouring line channel. The power sum is calculated from the addition of the crosstalk values of all elements contained in the cable.

## PSACR

Power Sum ACR defines the sum of all ACRs detected for the individual pairs (difference NEXT to attenuation).

## PSELFEXT

The power sum FEXT comprises the powersum of the far-end crosstalk. This is the sum of all interference signals that are coupled in a pair. For 2 pair cable the PSELFEXT corresponds to the FEXT; if the number of conductor pairs is higher, then the differences become ever greater because the interference signals from all pairs are interspersed in one pair.

## Return loss attenuation [dB]

If there are different wave resistances (e.g. between cable and a component), then a portion of the supplied signal energy is reflected at this interference point. Such reflections must be kept to a minimum to ensure problem-free transmission.

## Delay Skew

This refers to the runtime differences of the individual pairs.

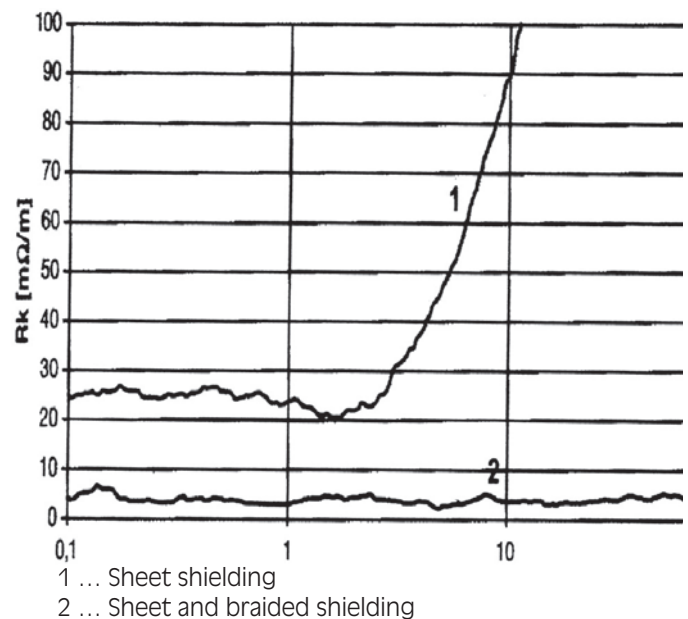
# Important cable parameters

## Transfer impedance $R_k$ [ $\Omega/m$ ]

As the transmission frequency for data lines increases, electromagnetic compatibility (EMC) becomes increasingly more important. To protect the cables from the effects of unwanted interference or to protect any surrounding electrical systems from disruptive emanations from the cable, more attention is being paid to adequate shielding for data transmission lines.

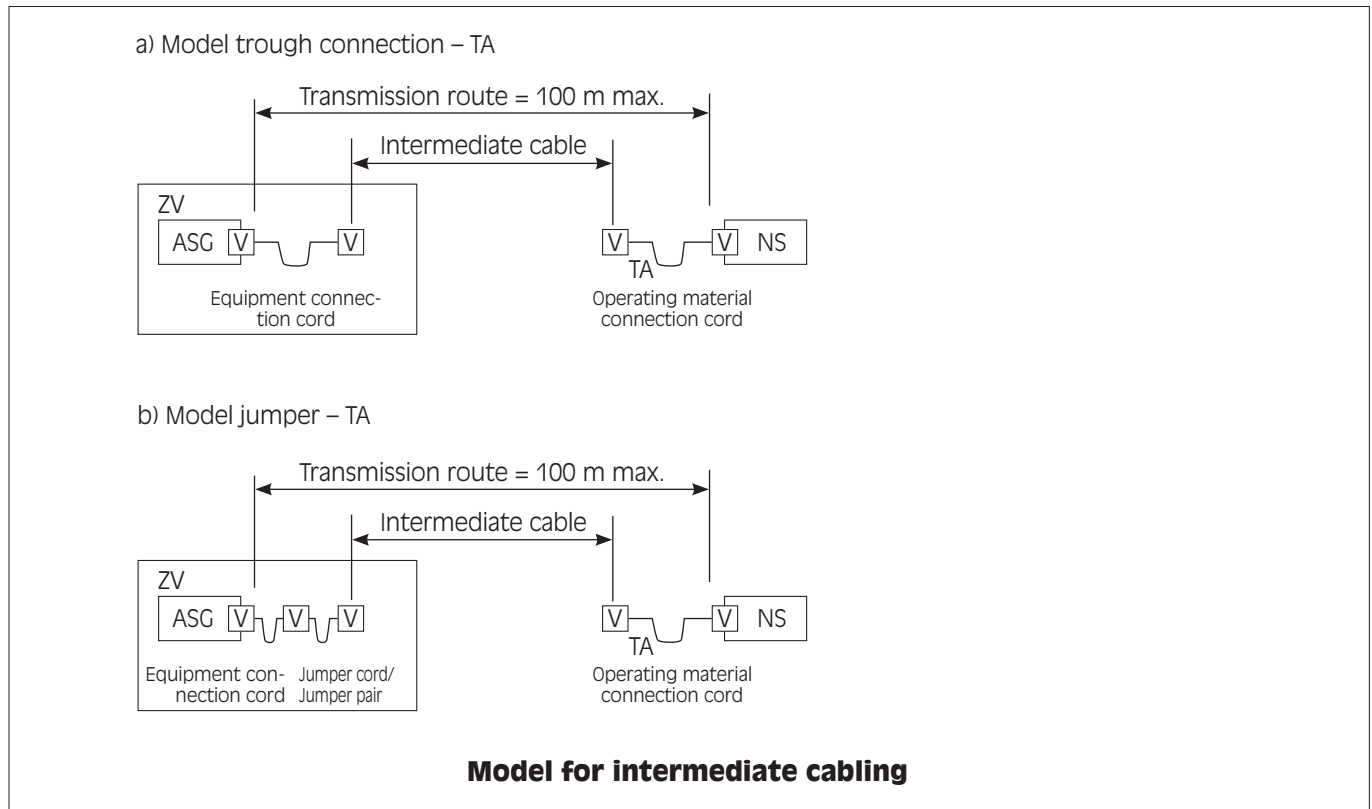
The magnetic field of a pair of conductors can largely be compensated for by twisting the wires, but the electrical field has to be countered by attaching sheet shielding and/or

braided shielding. The transfer impedance (coupling resistance) is frequency-dependent and increases with the length of the cable (linear). The coupling resistance is therefore specified in  $\Omega/m$  and should be as low as possible. The lower the coupling resistance, the more efficient the shielding effect and the more significantly it contributes toward optimizing the EMC values of the entire system. Another important factor for the shielding effect is the choice and quality of the grounding point, which should have as low a resistance value as possible over the entire frequency range. By using double shielding (sheet and braided shielding), a vastly improved shielding effect can be obtained, particularly in the higher frequency range.



# Patch cable

EN 50173-3:2007



## Equations for the transmission routes of intermediate cabling

Model	Image	Model equation		
		Class D	Class E	Class F
Through connection – TA	a)	$H = 109 - F \times X$	$H = 107 - 3^a - F \times X$	$H = 107 - 2^a - F \times X$
Jumper ring – TA	b)	$H = 107 - F \times X$	$H = 106 - 3^a - F \times X$	$H = 106 - 2^a - F \times X$

$H$  largest length of the intermediate cable (m).

$F$  total length of the jumper cable, jumper pairs, operating material connection and equipment connection cords (m).

$X$  Ratio of damping of flexible cables (dB/m) to the damping of permanently installed intermediate cables (dB/m) – see section 9 (> 1)

<sup>a</sup> The length reduction represents an allocated reserve to consider the insertion damping variations.

For operating temperatures above 20 °C,  $H$  must be reduced by 0.2% for shielded cables and by 0.4% for unshielded cables for each °C (20 °C to 40 °C) and by 0.6% for each °C (> 40 °C to 60 °C). The documents of the manufacturer or the supplier must be consulted if the intended operating temperature exceeds 60 °C.

The following general restrictions apply:

- The physical length of the transmission distance must not exceed 100 m;
- the physical length of the intermediate cable must not exceed 90 m and – depending on the cord used and the number of plug connection – it can be less;
- the individual length of the jumper cords or jumper pairs must not exceed 5 m.

The largest length of the intermediate cable depends on the total length of the cord, which must be supported on a transmission route.

An administration system must be installed during the operation of the installed cabling to ensure that the cords used for the generation of the transmission route are in accordance with the draft rules for the floor, the building or the installation.

# EN (European) Standards

(as of 07/2010)

## EN 50173 Channel Class C / Cat. 3, low-frequency (phone, DSL)

Wire Map	Resolution $\Omega$	Length Max.	Prop. Delay nS	Delay Skew nS	Freq. MHz	Insertion Loss dB	NEXT dB	RL dB	ACR-N dB	ACR-F dB	PS NEXT dB	PS ACR-N dB	PS ACR-F dB	
12345678	40	i	555	50	1	4,2	39,1	15,0	34,9					
12345678					4	7,6	29,2	15,0	21,6					
					8	10,4	24,3	15,0	13,9					
12345678S					10	11,5	22,7	15,0	11,2					
12345678S					16	14,4	19,4	15,0	5,0					

## EN 50173 Channel Class D / Cat. 5, Ethernet up to 100 MBit/s (4-pairs)

Wire Map	Resolution $\Omega$	Length Max.	Prop. Delay nS	Delay Skew nS	Freq. MHz	Insertion Loss dB	NEXT dB	RL dB	ACR-N dB	ACR-F dB	PS NEXT dB	PS ACR-N dB	PS ACR-F dB
12345678	25	i	555	50	1	4,2	60,0	17,0	56,0	57,4	57,0	53,0	54,4
12345678					4	4,5	53,5	17,0	49,0	45,4	50,5	46,0	42,4
					8	6,4	48,6	17,0	42,2	39,3	45,6	39,2	36,3
12345678S					10	7,2	47,0	17,0	39,8	37,4	44,0	36,8	34,4
12345678S					16	9,1	43,6	17,0	34,5	33,3	40,6	31,5	30,3
					20	10,2	42,0	17,0	31,8	31,4	39,0	28,8	28,4
					25	11,5	40,3	16,0	28,9	29,4	37,3	25,9	26,4
					31,25	12,9	38,7	15,1	25,8	27,5	35,7	22,8	24,5
					62,5	18,6	33,6	12,0	15,0	21,5	30,6	12,0	18,5
					100	24,0	30,1	10,0	6,1	17,4	27,1	3,1	14,4

## EN 50173 Channel Class E / Cat. 6, Ethernet 200 MBit/s (4-pair), up to 1000 MBit/s

Wire Map	Resolution $\Omega$	Length Max.	Prop. Delay nS	Delay Skew nS	Freq. MHz	Insertion Loss dB	NEXT dB	RL dB	ACR-N dB	ACR-F dB	PS NEXT dB	PS ACR-N dB	PS ACR-F dB
12345678	25	i	555	50	1	4,0	65,0	19,0	61,0	63,3	62,0	58,0	60,3
12345678					4	4,2	63,0	19,0	58,9	51,2	60,5	56,4	48,2
					8	5,9	58,2	19,0	52,3	45,2	55,6	49,7	42,2
12345678S					10	6,6	56,6	19,0	50,0	43,3	54,0	47,4	40,3
12345678S					16	8,3	53,2	18,0	44,9	39,2	50,6	42,3	36,2
					20	9,3	51,6	17,5	42,3	37,2	49,0	39,7	34,2
					25	10,5	50,0	17,0	39,6	35,3	47,3	36,9	32,3
					31,25	11,7	48,4	16,5	36,7	33,4	45,7	34,0	30,4
					62,5	16,9	43,4	14,0	26,5	27,3	40,6	23,7	24,3
					100	21,7	39,9	12,0	18,2	23,3	37,1	15,4	20,3
					200	31,7	34,8	9,0	3,1	17,2	31,9	0,1	14,2
					250	35,9	33,1	8,0	-2,8	15,3	30,2	-5,8	12,3



# EN (European) Standards

(as of 07/2010)

## EN 50173 Channel Class EA / Cat. 6A, Ethernet up to 10 Gbit/s, short-length

Wire Map	Resolution $\Omega$	Length Max.	Prop. Delay nS	Delay Skew nS	Freq. MHz	Insertion Loss dB	NEXT dB	RL dB	ACR-N dB	ACR-F dB	PS NEXT dB	PS ACR-N dB	PS ACR-F dB
12345678	25	i	555	50	1	4,0	65,0	19,0	61,0	63,3	62,0	58,0	60,3
12345678					4	4,2	63,0	19,0	58,9	51,2	60,5	56,4	48,2
12345678S 12345678S					8	5,8	58,2	19,0	52,4	45,2	55,6	49,8	42,2
					10	6,5	56,6	19,0	50,1	43,3	54,0	47,5	40,3
					16	8,2	53,2	18,0	45,0	39,2	50,6	42,4	36,2
					20	9,2	51,6	17,5	42,5	37,2	49,0	39,8	34,2
					25	10,2	50,0	17,0	39,8	35,3	47,3	37,1	32,3
					31,25	11,5	48,4	16,5	36,9	33,4	45,7	34,2	30,4
					62,5	16,4	43,4	14,0	27,0	27,3	40,6	24,2	24,3
					100	20,9	39,9	12,0	19,0	23,3	37,1	16,2	20,3
					200	30,1	34,8	9,0	4,7	17,2	31,9	1,8	14,2
					250	33,9	33,1	8,0	-0,8	15,3	30,2	-3,7	12,3
					350	40,6	30,6	6,6	-10,0	12,4	27,6	-13,0	9,4
					500	49,3	27,9	6,0	-21,4	9,3	24,8	-24,5	6,3

## EN 50173 Channel Class F / Cat. 7, Ethernet up to 1000 Mbit/s, Ethernet up to 10 Gbit/s, short-length

Wire Map	Resolution $\Omega$	Length Max.	Prop. Delay nS	Delay Skew nS	Freq. MHz	Insertion Loss dB	NEXT dB	RL dB	ACR-N dB	ACR-F dB	PS NEXT dB	PS ACR-N dB	PS ACR-F dB
12345678	25	i	555	30	1	4,0	65,0	19,0	61,0	65,0	62,0	58,0	62,0
12345678					4	4,1	65,0	19,0	60,9	65,0	62,0	57,9	62,0
12345678S 12345678S					8	5,7	65,0	19,0	59,3	62,4	62,0	56,3	59,4
					10	6,4	65,0	19,0	58,6	60,8	62,0	55,6	57,8
					16	8,1	65,0	18,0	56,9	57,5	62,0	53,9	54,5
					20	9,1	65,0	17,5	55,9	55,9	62,0	52,9	52,9
					25	10,2	65,0	17,0	54,8	54,4	62,0	51,8	51,4
					31,25	11,4	65,0	16,5	53,6	52,8	62,0	50,6	49,8
					62,5	16,3	65,0	14,0	48,7	47,8	62,0	45,7	44,8
					100	20,8	62,9	12,0	42,1	44,4	59,9	39,1	41,4
					200	30,0	58,3	9,0	28,4	39,4	55,3	25,4	36,4
					250	33,8	56,9	8,0	23,1	37,8	53,9	20,1	34,8
					600	54,6	51,2	8,0	-3,4	31,3	48,2	-6,4	28,3

## EN 50173 Channel Class FA / Cat. 7A, Ethernet up to 10 Gbit/s (IEEE 802.3an)

Wire Map	Resolution $\Omega$	Length Max.	Prop. Delay nS	Delay Skew nS	Freq. MHz	Insertion Loss dB	NEXT dB	RL dB	ACR-N dB	ACR-F dB	PS NEXT dB	PS ACR-N dB	PS ACR-F dB
12345678	25	i	555	30	1	4,0	65,0	19,0	61,0	65,0	62,0	58,0	62,0
12345678					4	4,1	65,0	19,0	60,9	65,0	62,0	57,9	62,0
12345678S 12345678S					8	5,7	65,0	19,0	59,3	65,0	62,0	56,3	62,0
					10	6,4	65,0	19,0	58,6	65,0	62,0	55,6	62,0
					16	8	65,0	18,0	57,0	63,3	62,0	54,0	60,3
					20	9	65,0	17,5	56,0	61,4	62,0	53,0	58,4
					25	10	65,0	17,0	55,0	59,4	62,0	52,0	56,4
					31,25	11,2	65,0	16,5	53,8	57,5	62,0	50,8	54,5
					62,5	15,9	65,0	14,0	49,1	51,5	62,0	46,1	48,5
					100	20,3	65,0	12,0	44,7	47,4	62,0	41,7	44,4
					200	28,9	60,9	9,0	32,0	41,4	57,9	29,0	38,4
					250	32,5	59,1	8,0	26,7	39,4	56,1	23,7	36,4
					600	51,4	51,2	8,0	0,7	31,8	49,1	-2,3	28,8



# Classification of fibre optic cables / transmission ranges

## Transmission distances according to ISO/IEC11801 (2nd Edition) and EN 50173

### Attenuation of the transmission distance

Class	Attenuation [dB]			
	Multimode fibre optic 50 µm and 62.5 µm		Single mode fibre optic	
	850 nm	1300 nm	1310 nm	1550 nm
OF 300	2,55	1,95	1,80	1,80
OF 500	3,25	2,25	2,00	2,00
OF 2000	8,50	4,50	3,50	3,50

OF ... = Optical fibre with transmission distance in m

### Specification for 10 Mbit/s up to 1 Gbit/s

Application	Fibre type							
	OM 1		OM 2		OM 3		OS 1	
	850 nm	1300 nm	850 nm	1300 nm	850 nm	1300 nm	1310 nm	1550 nm
FOIRL	OF 2000		OF 2000		OF 2000			
10 BASE-FL, -FP and -FB	OF 2000		OF 2000		OF 2000			
100 BASE-FX		OF 2000		OF 2000		OF 2000		
1000 BASE-SX	OF 300		OF 500		OF 500			
1000 BASE-LX		OF 500		OF 500		OF 500	OF 2000	

### Specification for 10 Gbit/s

Application	Fibre type							
	OM 1		OM 2		OM 3		OS 1	
	850 nm	1300 nm	850 nm	1300 nm	850 nm	1300 nm	1310 nm	1550 nm
10 BASE-LX4		OF 300		OF 300				
10 BASE-ER/EW								OF 2000
10 BASE-SR/SW					OF 300			
10 BASE-LR/LW							OF 2000	

### Ranges for 10/100/1000/10000 Mbit/s Ethernet

	Medium	Cable	Range <sup>1)</sup>
<b>Ethernet</b>	AUI		50 m
	10BASE2	Thin Ethernet	185 m
	10BASE5	Thick Ethernet	500 m
	10BASE-T	Twisted Pair	100 m
	10BASE-FL	62,5 µm, 50 µm Multimode fibre optic	2 000 m
<b>Fast Ethernet</b>	100BASE-TX	Twisted Pair	100 m
	100BASE-FX	62,5 µm, 50 µm Multimode fibre optic HDX	412 m
		62,5 µm, 50 µm Multimode fibre optic FDX	2 000 m
<b>Gigabit Ethernet</b>	1000BASE-CX	Coax	25 m
	1000BASE-T	Twisted Pair, Cat. 5	100 m
	1000BASE-SX	62.5 µm multimode fibre optic	275 m
		50 µm multimode fibre optic	550 m
	1000BASE-LX	62.5 µm multimode fibre optic	550 m
		50 µm multimode fibre optic	550 m
		9 µm single mode fibre optic	5 000 m
<b>10 Gigabit Ethernet</b>	10GBASE-LX4	Multimode fibre optic	300 m
	10GBASE-SR/SW	Multimode fibre optic	66 m
	10GBASE-LR/LW	Single mode fibre optic	10 000 m
	10GBASE-ER/EW	Single mode fibre optic	40 000 m

<sup>1)</sup> minimum supported value

# Networks and field buses

## Ethernet



## Profibus



<b>Topology</b>	Star topology where star points are made via active equipment (hub or switch).	Profibus-DP is designed as point-to-point topology. The bus is terminated at both ends with a resistance network connected to the power supply.																															
<b>Electrical interface, Data transmission</b>	Symmetrical interface, full duplex. Galvanic Decoupling via carrier.	based on symmetrical RS 485 interface																															
<b>Data transfer rate</b>	10/100/1000/10000 Mbit/s	9,6 Kbit/s - 12 Mbit/s																															
<b>Electrical interface Energy transfer</b>	RJ 45, 8-pin. PoE+, 8023at, 802.3af	RS 485																															
<b>Signal designation, Core assignment</b>	<table border="0"> <tr><td>Transmit +</td><td>orange</td></tr> <tr><td>Transmit -</td><td>white/orange</td></tr> <tr><td>Receive +</td><td>green</td></tr> <tr><td>Receive -</td><td>white/green</td></tr> </table>	Transmit +	orange	Transmit -	white/orange	Receive +	green	Receive -	white/green	<table border="0"> <tr><td>A-line</td><td>green</td></tr> <tr><td>B-line</td><td>red</td></tr> </table>	A-line	green	B-line	red																			
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A-line	green																																
B-line	red																																
<b>Plug connectors for IP20 or higher</b>	RJ 45 for Light-Duty	D-SUB 9																															
<b>Plug connectors for IP67 or higher</b>	RJ 45 for Heavy-Duty M12, 4-pole, D-coded	D-SUB 9 M12,5-pole, B-coded																															
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<b>Bus length</b>	up to 100 m from the hub/switch to the terminal device	up to 1,200 m per segment																															
<b>Number of participants</b>	unlimited	uo to 126, up to 32 per bus segment																															
<b>Directive</b>	Industrial Ethernet Planning, EN 50173 and Installation Guide, PNO (Profinet)	Guideline 2.142, PNO EN 50170																															
<b>Normung</b>	IEE 802.3	EN 50170																															

# Networks and field buses

## CAN



## Interbus



<b>Topology</b>	CAN is designed as point-to-point topology. The bus is terminated at both ends with a terminating resistor	The Interbus is designed as an active ring. In order to overcome the disadvantage of doubled cable layout, the outgoing and return signals are included in one cable so that the user has the impression of a point-to-point topology.																																																	
<b>Electrical interface, Data transmission</b>	Symmetrical interface, with special definition using CAN transceiver chips	based on symmetrical S 485 interface																																																	
<b>Data transfer rate</b>	up to 1Mbit/s	500 kBit/s or 2 Mbit/s																																																	
<b>Electrical interface, Energy transfer</b>	not in the standard configuration	not in the standard configuration																																																	
<b>Signal designation, Core assignment</b>	<table border="1"> <tr><td>CAN_L</td><td>green</td></tr> <tr><td>CAN_H</td><td>yellow</td></tr> <tr><td>CAN_GND</td><td>brown</td></tr> </table>	CAN_L	green	CAN_H	yellow	CAN_GND	brown	<table border="1"> <tr><td>DO</td><td>yellow</td></tr> <tr><td>DO</td><td>green</td></tr> <tr><td>DI</td><td>grey</td></tr> <tr><td>DI</td><td>pink</td></tr> <tr><td>COM</td><td>brown</td></tr> </table>	DO	yellow	DO	green	DI	grey	DI	pink	COM	brown																																	
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<b>Plug connectors for IP20 or higher</b>	COMBICON D-SUB 9 RJ 45	D-SUB 9																																																	
<b>Plug connectors for IP67 or higher</b>	M12, 5-pole, A-coded 7/8", 5-pole	D-SUB 9 M12, 5-pole, B-coded																																																	
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DI	7	4																																																	
COM	3	5																																																	
<b>Bus length</b>	up to 1000 m	up to 400 m between two participants, up to 13 km total length																																																	
<b>Number of participants</b>	up to 640	up to 4096																																																	
<b>Directive</b>	CiA DR-303-1	INTERBUS-conformity test																																																	
<b>Standardisation</b>	Not specified	IEC 61158																																																	

# Networks and field buses

## Device Net



### Topology

Like CAN, another power supply is also transmitted. The series line is called the "trunk line" and the stubs are called "drop lines". The "thick cable" is used for the trunk line and "thin cable" is used for the drop or trunk line.

### Electrical interface, data transmission

Symmetrical interface with special definition using CAN transceiver chips

### Data transfer rate

up to 500 KBit/s

### Electrical interface, Energy transfer

24 V DC  
8 A for thick cable  
3 A for thin cable

### Signal designation, Core assignment

CAN_L	blue
CAN_H	white
V-	red
V+	black
drain	colourless

### Plug connectors for IP20 or higher

COMBICON

### Plug connectors for IP67 or higher

M12, 5-pole, A-coded  
7/8", 5-pole

### Pin assignment

Signal designation	Plug connectors		
	COMBICON	M12	7/8"
CAN_L	2	5	5
CAN_H	4	4	4
V+	5	2	2
V-	1	3	3
Drain	3	1	1

### Bus length

up to 500 m

### Number of participants

up to 2048

### Directive

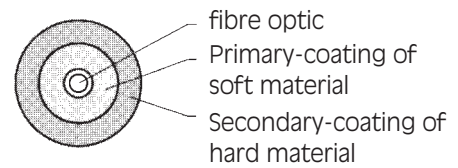
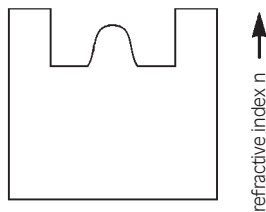
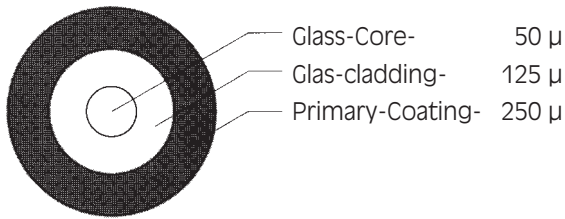
DeviceNet Connector Profiles

### Standardisation

Not specified

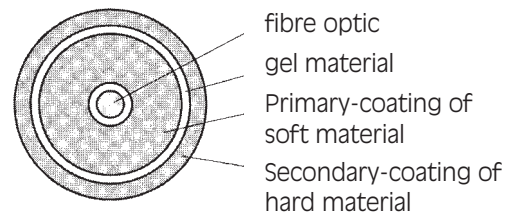
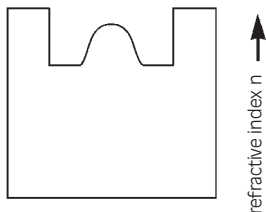
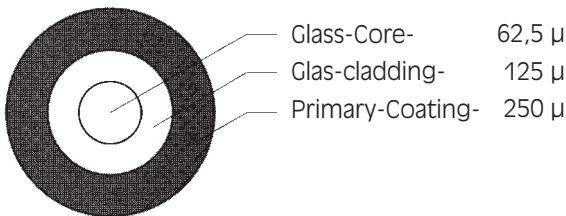
# Cross-Sections of fibre optics and cores

## Graded index fibre G 50/125



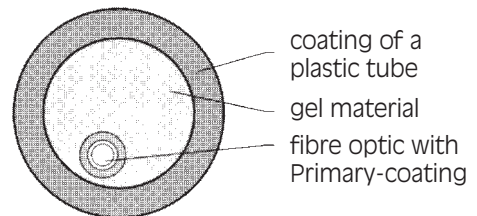
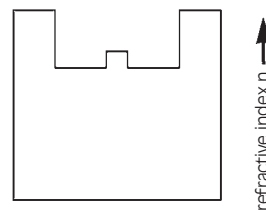
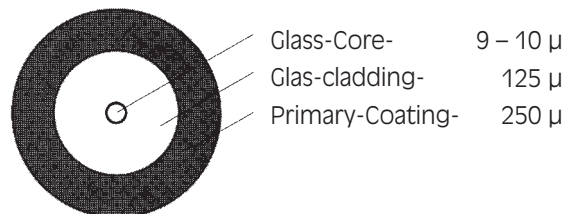
**Tight buffer**

## Graded index fibre G 62,5/125

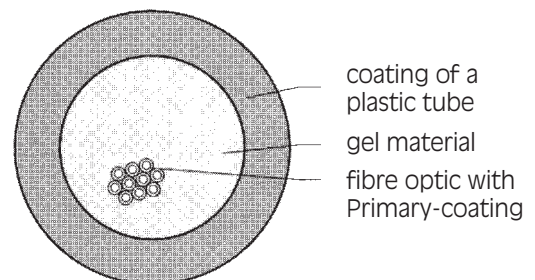


**Semi-tight-fibre**

## Single-mode fibre E 9 . . 10/125



**Loose buffer filled**



**Multifibre buffer filled**

<b>Graded index fibres (multimode)</b>			
<b>Specification</b>		<b>Fibre type G 50/125</b>	<b>Fibre type G 62,5/125</b>
Fibre categorie		OM2 Standardfibre	OM1 Standardfibre
Core diameter		50 ± 3 µm	62,5 ± 3 µm
Numerical aperture		0,200 ± 0,015	0,275 ± 0,015
Typ. attenuation	850 nm	2,8 dB/km	3,0 dB/km
	1300 nm	0,7 dB/km	1,0 dB/km
Min. bandwidth	850 nm	500 MHz x km	200 MHz x km
	1300 nm	800 MHz x km	500 MHz x km
Cladding diameter		125 ± 1 µm	
Primary coating diameter		245 ± 10 µm	
Core noncircularity		< 5 %	
Cladding concentricity error		< 3,0 µm	
Cladding noncircularity		< 2,0 %	

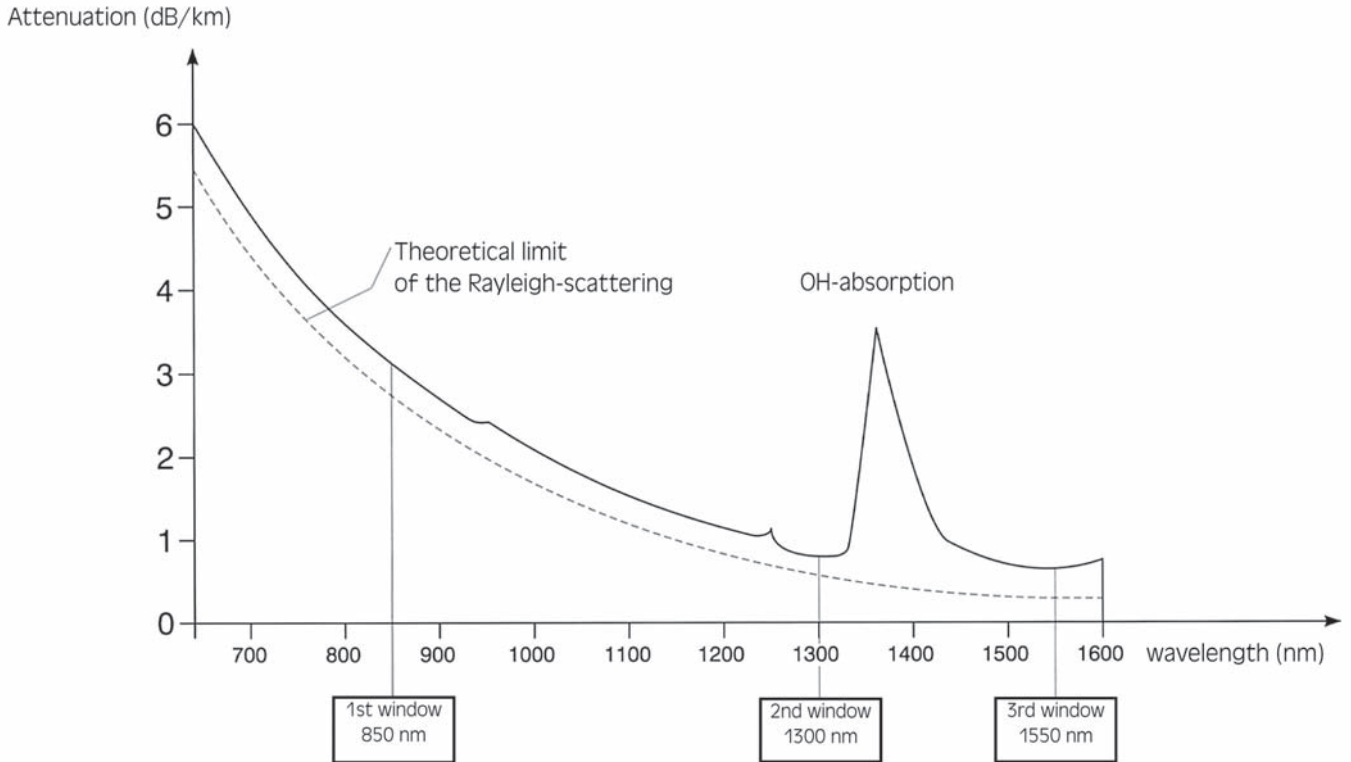
<b>Specification</b>		<b>Fibre type G 50/125</b>	
Fibre categorie		OM3 Standardfibre	OM4 Standardfibre
Core diameter		50 ± 3 µm	50 ± 3 µm
Numerical aperture		0,200 ± 0,015	0,200 ± 0,015
Typ. attenuation	850 nm	2,5 dB/km	3,0 dB/km
	1300 nm	0,5 dB/km	1,0 dB/km
Min. bandwidth	850 nm	1500 MHz x km	3500 MHz x km
	1300 nm	500 MHz x km	500 MHz x km
Cladding diameter		125 ± 1 µm	125 ± 1 µm
Primary coating diameter		245 ± 10 µm	245 ± 10 µm
Core noncircularity		< 5 %	< 5 %
Cladding concentricity error		< 3,0 µm	< 6,0 µm
Cladding noncircularity		< 2,0 %	< 2,0 %

<b>Single-Mode-Fibre</b>			
<b>Specification</b>		<b>Fibre type E9...10/125 (single mode)</b>	
Fibre categorie		ITU-T G. 652.d	
Attenuation	1300 nm	0,36 dB/km	
	1550 nm	0,22 dB/km	
Dispersion	1285 - 1330 nm	< 3,5 ps/(nm x km)	
	1550 nm	< 19 ps/(nm x km)	
Wave length		1312 nm	
Mode field diameter at 1310		9,3 ± 0,5 µm	
Cladding diameter		125 ± 1 µm	
Primary coating diameter		245 ± 10 µm	
Cut-off wavelength		< 1250 nm	
Cladding concentricity error		≤ 0,8 µm	
Cladding noncircularity		< 1,0 %	

<b>POF and HCS-Fibre</b>			
<b>Specification</b>		<b>Fibre type POF P980/1000</b>	<b>Fibre type HCS K200/230</b>
Core diameter		980 µm	200 µm
Numerical aperture		0,5	0,37
Typ. attenuation	650 nm	160 dB/km	10 db/km
	850 nm	-	8 dB/km
Min. Bandwidth	650 nm	10 MHz x 100 m	17 MHz x km
	850 nm	-	20 MHz x km
Wallthickness		1000 µm	230 µm

Fibres with other parameters on request

# Spectral attenuation characteristic of glass

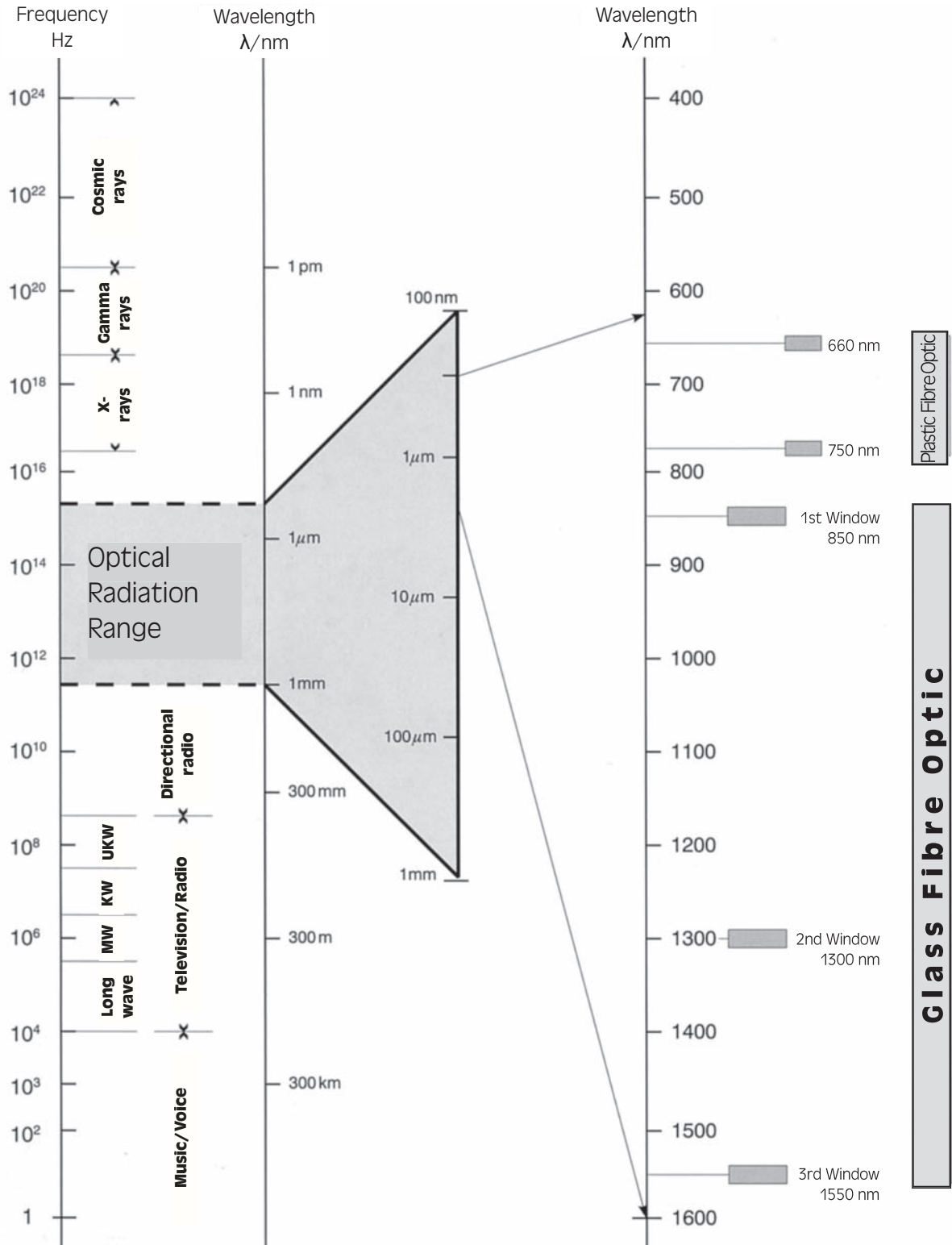


Rayleigh-scattering means the losses that result from the continuous dispersion of light. This continuous dispersion originates in a local change of the refractive index. The refractive index is changed by irregularities of the density of fused silica glass. The Rayleigh-scattering decreases with the increasing of wavelength. Entering of moisture produces OH-ions which cause limited but very high peaks of attenuation at ca. 950, 1200 and 1400 nm.

## Index profiles and characteristics

Fibre-cross-section	Profile of refractive index	Wave propagation (modes) and change of pulse	Characteristics
<p>Step index</p>	<p>Multimode fibre</p>	<p>Input pulse</p> <p>Output pulse</p>	<ul style="list-style-type: none"> <li>• Bandwidth &lt;100 MHz /km</li> <li>• Dispersion 10...150 ns /km</li> <li>• Long impulse spreading for short distances &lt; 500 m</li> <li>• Attenuation: middle-high</li> </ul>
<p>Graded index</p>	<p>Multimode fibre</p>	<p>Input pulse</p> <p>Output pulse</p>	<ul style="list-style-type: none"> <li>• Bandwidth &lt;1 GHz /km</li> <li>• Dispersion 1...5 ns /km</li> <li>• Short impulse spreading for middle distances &gt; 500 m</li> <li>• Attenuation: low</li> </ul>
<p>Step index</p>	<p>Single mode fibre</p>	<p>Input pulse</p> <p>Output pulse</p>	<ul style="list-style-type: none"> <li>• Bandwidth &lt;10 GHz /km</li> <li>• Dispersion 4...150 ns /km</li> <li>• No impulse spreading for long distances &gt; 500 m</li> <li>• Attenuation: very low</li> </ul>

# The Electromagnetic Spectrum



## Visible rays, light

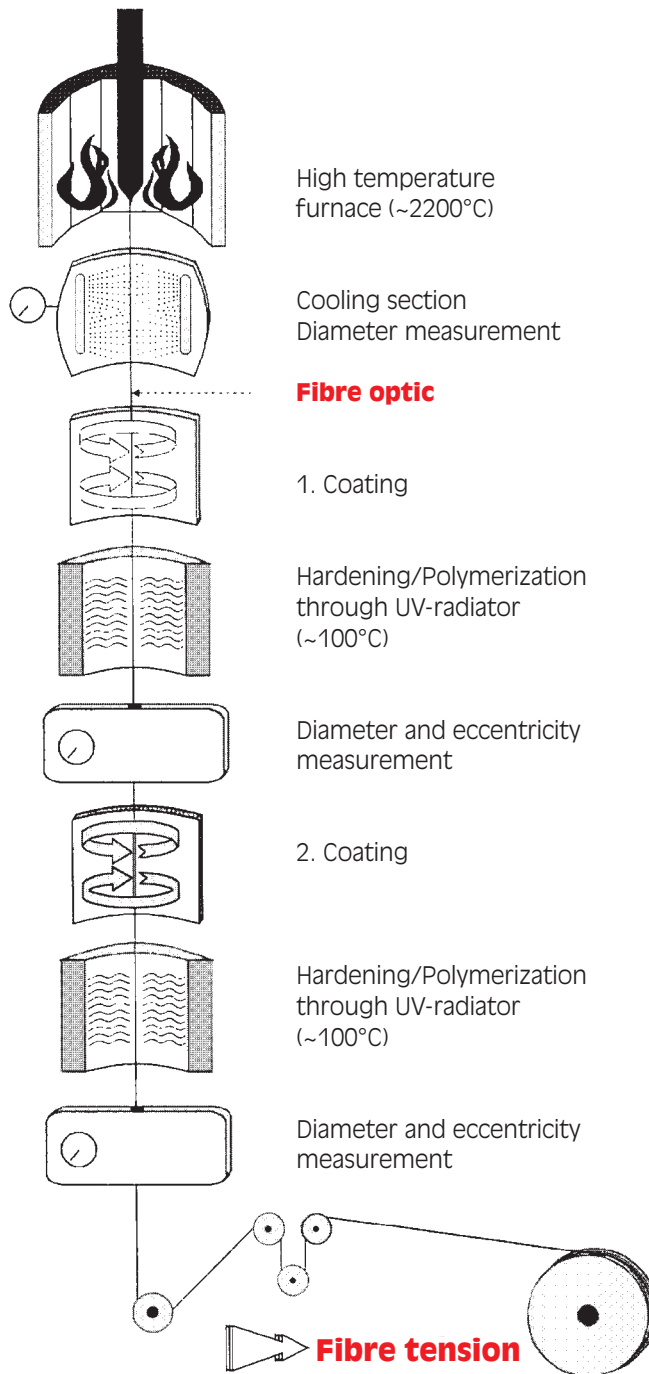
- violett 380 - 420 nm
- blue 420 - 490 nm
- green 530 - 650 nm
- red 650 - 780 nm

## Infra-red ray

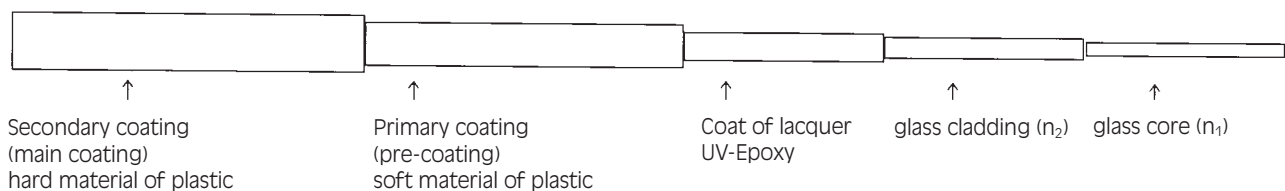
780 nm - 1 mm



# Fibre optic Drawing Tower-Design



## Fibre optic with plastic coating

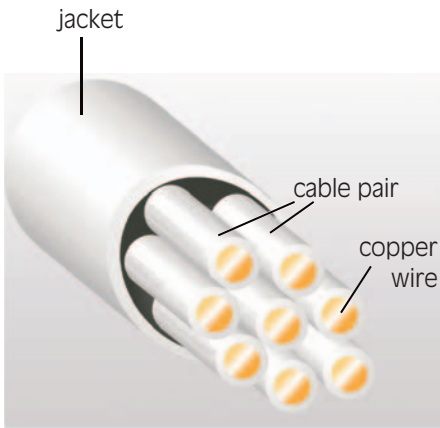


### Diameter range and coating thickness:

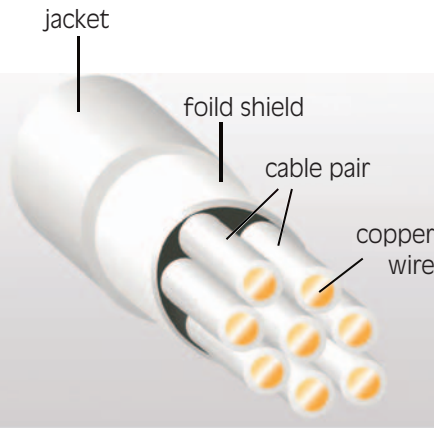
- glass core diameter - 10 to 100  $\mu\text{m}$
- glass cladding diameter - 125 to 150  $\mu\text{m}$
- thickness of lacquer coating - 2 to 5  $\mu\text{m}$
- primary coating diameter - 150 to 500  $\mu\text{m}$
- secondary coating diameter - 250 or 900  $\mu\text{m}$

# LAN-Cabel designation

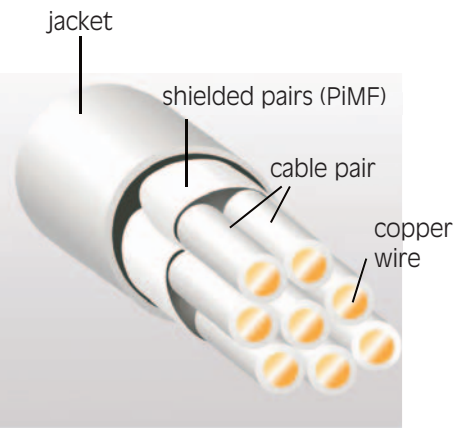
**U/UTP (UTP\*)**



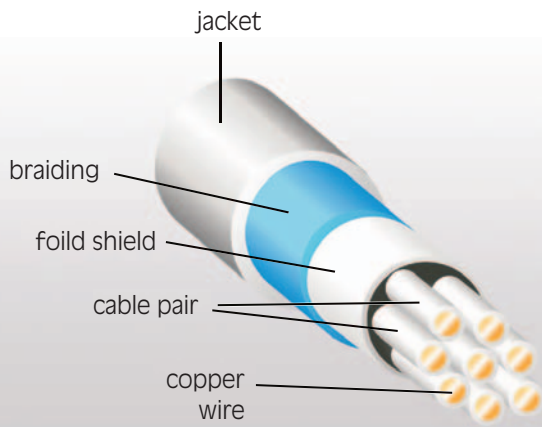
**F/UTP (FTP\*)**



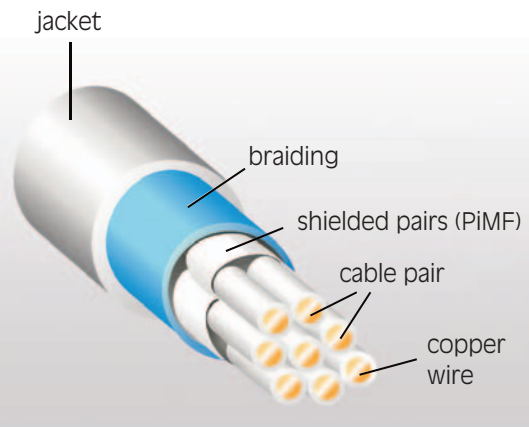
**U/FTP (STP\*)**



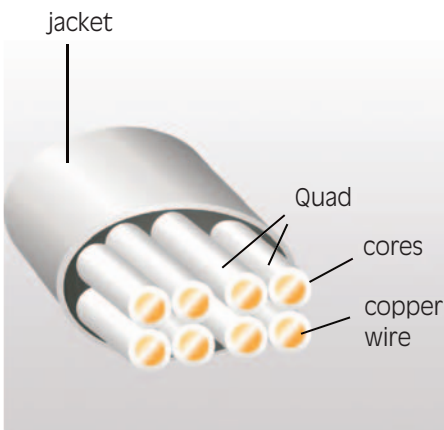
**SF/UTP (S-FTP\*)**



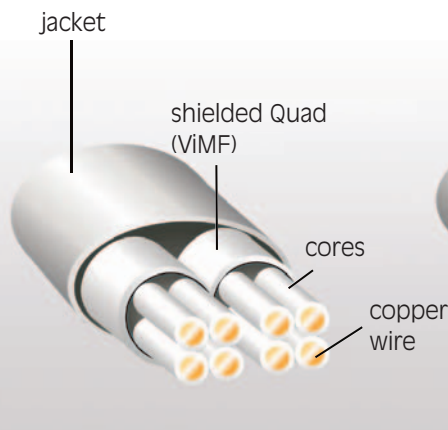
**S/FTP (S-STP\*)**



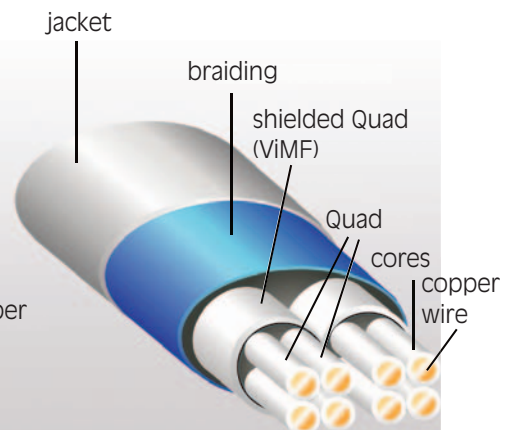
**U/UTP (UTQ\*)**



**U/FTP (S-STQ\*)**



**S/FTP (S-STQ\*)**



\*Old term

# Code-designation-explanations for cables and insulated wire

A-	Outdoor cable	-OZ	cable without green-yellow earth core and cores with imprinted numbers
A	approved national design	ö	oil-resistant
AB	Outdoor cable with lightning protection	O2Y	Foam-PE, insulation (cellular PE)
AD	Outdoor cable with differential protection	Q	Steel wire braiding
AJ-	Outdoor cable with induction protection	(R...)	round wire, diameter in mm
ASLH	self-supporting communication cables for high voltage overhead lines	RAGL-	Compensating cable for thermocoupling
B	armouring	RD-	Rhenomatic cable
B	spinning of textile yarn	RE	Computer cable
b	armouring	RC-	Coaxial cable according MIL specification
(1B...)	one layer of steel tape... thickness of the steel tape in mm	re	round, single wire
(2B...)	two layers of steel tape... thickness of the steel tape in mm	rm	round, multiwire
BD	unit-type stranding	RS-	computer switchboard cable
BLK	bare copper-conductor without insulation	S	silk whipping
BZ	bronze conductor	S	signal cables for railways
C	screen of copper wire braiding	(S...)	nominal value of mutual capacitance (nF /km)
C	screen of copper wire spinning	-S	signal cable for German Railway
C	outer protection of jute and viscous compound	S-	Switchboard cable
Cu	copper wire	SL	flexible sheathed cable
(-Cu)	total cross-section of copper screens (mm <sup>2</sup> )	2S	two layers of silk whipping
D	screen of copper wires	St	star quad for phantom circuits
(D)	screen of helically applied copper wires	St I	star quad in telephone cables for larger distance
DM	Dieselhorst-Martin quad	St III	star quad in local cables
Dreier	three cores in triple stranded	(St)	static screen
E	copper drain wire	Staku	copper clad steel wire
E(e)	protective covering of viscous compound with embedded layer of plastic tape	Staku-Li	copper clad steel stranded wires
e	single wire, solid	...t	termite protection
F	cable cores assembly with petrol-jelly	T	supporting element for overhead cable
F	foil wrapping	T-	fan out cable
F	flat cable	TF	carrier frequency of pairs or quads triple
F	star quad for railway cable	TiC	triple in copper wire braid
F	star quad for phantom circuits	TiMF	triple in metal foil
(F...)	flat wire armouring... thickness in mm	U	braiding of textile fibres
OF	jelly filled cable core, filling compound of hard substances	VGD	gold-plated
FR	flame retardant	VN	nickel-plated; VS silver-plated
f	flexible, fine wire stranding	VZK	galvanized; VZN tinned
ff	extra fine wire stranding	W	corrugated steel sheath
G	insulation or sheath material of rubber (NR) or (SBR)	W	high heat resistant
G-	Mining cable	W	corrugated steel sheath
GJ	Mining cable with induction protection	X	cross-linked polyvinylchlorid (X-PVC) or other materials
GS	glass fibre whipping or braiding	XPE	cross-linked polyethylene (X-PE)
2G	insulation or jacket of silicone rubber, (SIR)	2X	cross-linked polyethylene
3G	insulation or jacket of ethylene propylene rubber, (EPR)	7X	cross-linked Ethylentetrafluorethylen (X-ETFE)
4G	insulation or jacket of ethylene vinylacetate rubber (EVA)	10X	cross-linked Polyvinylidenfluorid (X-PVDF)
5G	insulation or jacket of chloroprene rubber (CR)	Y	PVC, polyvinylchloride
6G	insulation or jacket of chlorosulphonated polyethylene (CSM), Hypalon	Yu	PVC, polyvinylchloride, non-flammable, flame-retardant
7G	insulation or jacket of Fluoroelastomer (FKM)	Yv	PVC, polyvinylchloride, with reinforced sheath
8G	insulation or jacket of Nitrile rubber (NBR)	YV	Equipment wires with tinned conductor
9G	PE-C rubber (CM)	Yw	PVC, polyvinylchlorid, heat resistant upto 90°C
53G	CM, chlorinated Polyethylene	2Y	Polyethylene (PE)
H	insulation or jacket of halogen-free compound	2Yv	Polyethylene, reinforced sheath
H	Harmonized Documents	O2Y	Cellular polyethylene
(H...)	maximal value of mutual capacitance (nF /km)	O2YS	insulation of cellular polyethylene with outer PE-skin
(HS)	semi-conducting tape of layer	2YHO	insulation of air-spaced polyethylene
HX	cross-linked, halogen-free polymer compound	3Y	insulation polystyrene (PS), Styroflex
...IMF	individual stranding element (pairs or single cores etc.) in metal foil and drain wire	4Y	insulation or jacket of polyamide (PA)
IMF	several stranding elements in metalfoil and drain wire	5Y	insulation or jacket of polytetrafluorethylen (PTFE), HELUFLO <sup>®</sup>
-J	cable with green-yellow earth core	5YX	Perfluoralkoxy (PFA)
-JZ	cable with green-yellow earth core and cores with imprinted numbers	6Y	Perfluoroethylene-propylene (FEP), HELUFLO <sup>®</sup>
K	copper-tape	7Y	insulation or jacket of ethylentetrafluorethylen (ETFE)
(K)	inner sheath and longitudinally folded copper tape	8Y	insulation of polyimid (PI), Kapton <sup>®</sup>
LA	tinsel conductor (flat copper wire stranded over the thread of synthetic fibres)	9Y	polypropylen (PP)
LD	corrugated aluminium sheath	10Y	PVDF, Polyvinylidene fluoride
Lg	in layers stranding	11Y	polyurethan (PUR)
Li	stranded wires conductor	12Y	TPE-E, TPE
(LY)	laminated sheath Al-tape and PVC-jacket	13Y	TPE-EE, TPE on base of Polyester-Ester
(LY2)	laminated sheath Al-tape and PE-jacket	31Y	TPE-S, TPE on base of Polystyrol
2L	double enamel coating as insulation	41Y	TPE-A, TPE on base of Polyamide
M	plastic-sheath cable	51Y	PFA, Perfluor-Alkoxylalkane
M	lead sheath	71Y	ECTFE, Monochlorotrifluorethylen
Mz	alloyed lead sheath	91Y	TPE-O, TPE on base of Polyester-Ester
(mS)	magnetic shield	-Z	core imprinted with numbers
N	VDE standard	Z	twin cable
(N)	in adapted to VDE standard	(Z)	high-tensile braid of steel wires
NC	non-corrosiv, smoke-gase	(ZG)	high-tensile element of glass fibre yarn
NF	natural colour	(ZN)	high-tensile of non-metallic elements
-O	cable without green-yellow earth core		

# US-American and British units

## Conversion of usual measuring units

### Units for cables and wires

In the US the measurements are mainly used in AWG-numbers (AWG = American Wire Gauge).  
The AWG-numbers conform the british B&S-numbers (B&S = Brown & Sharp)

AWG No.	Cross-section mm <sup>2</sup>	Dia-meter mm	Conductor resistance Ohm/km	AWG No.	Cross-section mm <sup>2</sup>	Dia-meter mm	Conductor resistance Ohm/km
1000 MCM*	507	25,4	0,035	14	2,08	1,63	8,79
750	380	22,0	0,047	15	1,65	1,45	11,20
600	304	19,7	0,059	16	1,31	1,29	14,70
500	254	20,7	0,07	17	1,04	1,15	17,80
400	203	18,9	0,09	18	0,8230	1,0240	23,0
350	178	17,3	0,10	19	0,6530	0,9120	28,3
300	152	16,0	0,12	20	0,5190	0,8120	34,5
250	127	14,6	0,14	21	0,4120	0,7230	44,0
4/0	107,20	11,68	0,18	22	0,3250	0,6440	54,8
3/0	85,00	10,40	0,23	23	0,2590	0,5730	70,1
2/0	67,50	9,27	0,29	24	0,2050	0,5110	89,2
0	53,40	8,25	0,37	25	0,1630	0,4550	111,0
1	42,40	7,35	0,47	26	0,1280	0,4050	146,0
2	33,60	6,54	0,57	27	0,1020	0,3610	176,0
3	26,70	5,83	0,71	28	0,0804	0,3210	232,0
4	21,20	5,19	0,91	29	0,0646	0,2860	282,0
5	16,80	4,62	1,12	30	0,0503	0,2550	350,0
6	13,30	4,11	1,44	31	0,0400	0,2270	446,0
7	10,60	3,67	1,78	32	0,0320	0,2020	578,0
8	8,366	3,26	2,36	33	0,0252	0,1800	710,0
9	6,63	2,91	2,77	34	0,0200	0,1600	899,0
10	5,26	2,59	3,64	35	0,0161	0,1430	1125,0
11	4,15	2,30	4,44	36	0,0123	0,1270	1426,0
12	3,30	2,05	5,41	37	0,0100	0,1130	1800,0
13	2,62	1,83	7,02	38	0,00795	0,1010	2255,0
				39	0,00632	0,0897	2860,0

4/0 is also stated: 0000; 1 mil = 0,001 inch = 0,0254 mm  
\* for bigger cross-section the sizes in MCM (circular mils)

1 CM = 1 Circ. mil. = 0,0005067 mm<sup>2</sup>  
1 MCM = 1000 Circ. mils = 0,5067 mm<sup>2</sup>

### General measuring units

#### Length

1 mil	= 0,0254 mm
1 in (inch)	= 25,4 mm
1 ft (foot)	= 0,3048 m
1 yd (yard)	= 0,9144 m
1 ch (chain)	= 20,1 m
1 mile (land mile)	= 1,609 km
	= 1760 yards
1 mile (nautic mile)	= 1,852 km
1 mm	= 0,039370 inches
1 m	= 39,370079 inches

#### Area

1 CM (circ. mil)	= 0,507 · 10 <sup>-3</sup> mm <sup>2</sup>
1 MCM	= 0,5067 mm <sup>2</sup>
1 sq. inch (sq. inch)	= 645,16 mm <sup>2</sup>
1 sq. ft. (sq. foot)	= 0,0929 m <sup>2</sup>
1 square yard	= 0,836 m <sup>2</sup>
1 acre	= 4047 m <sup>2</sup>
1 square mile	= 2,59 km <sup>2</sup>

#### Density

1 cu. in. (cubic inch)	= 16,39 cm <sup>3</sup>
1 cu. ft. (cubic foot)	= 0,0283 m <sup>3</sup>
1 cu. yd. (cubic yard)	= 0,7646 m <sup>3</sup>
1 gal. (US gallon)	= 3,785 l
1 gal. (brit gallon)	= 4,546 l
1 US pint	= 0,473 l
1 US quart	= 0,946 l
1 US barrel	= 158,8 l

#### Temperature

F (Fahrenheit)	= (1,8 · C) + 3°
C (Celsius)	= 0,5556 · (F-32°)

#### Weight

1 grain	= 64,8 mg
1 dram	= 1,77 g

1 oz (ounce)	= 28,35 g
1 lb (pound)	= 0,4536 Kg
1 stone	= 6,35 Kp
1 qu (quarter)	= 12,7 Kp
1 US-cwt (hundred-weight)	= 45,36 Kp
1 US ton (short ton)	= 0,907 t
1 brit. ton (long ton)	= 1,016 t

#### Force

1 lb	= 4,448 N
1 brit. ton	= 9954 N
1 pdl (Poundal)	= 0,1383 N
1 kp	= 9,81 N
1 N	= 0,102 kp

#### Velocity

1 mile/h	= 1,609 km/h
1 Knoten	= 1,852 km/h
1 ft/s	= 0,305 m/s
1 ft/min	= 5,08 · 10 <sup>-3</sup> m/s

#### Energy

1 lb/mile	= 0,282 kg/m
1 lb/yd	= 0,496 kg/m
1 lb/foot	= 1,488 kg/m

#### Radiation absorbed dose

1 Gray	= 1 J/kg
1 rad	= 10 <sup>-2</sup> J/kg = 1 Centi Gy
	= 0,01 Gy
1 Centi	= 100 Joule
1 rad	= cJ/kg = 0,01Gy
1 Mrad	= 1 · 10 <sup>6</sup> cJ/kg

#### Pressure

1 psi (lb/sq.)	= 68,95 mbar
	= 6,895 · 10 <sup>-3</sup> Nmm <sup>2</sup>

1 lb/sq. ft.	= 0,478 mbar
1 pdl/sq. ft.	= 1,489 N/m <sup>2</sup>
1 in Hg	= 33,86 mbar
1 ft H <sub>2</sub> O	= 29,89 mbar
1 in H <sub>2</sub> O	= 2,491 mbar
1 N/mm <sup>2</sup>	= 145 psi
	= 10 bar

1 kp/mm <sup>2</sup>	= 1422 psi
1 at	= 736 Torr
	= 1 kp/cm <sup>2</sup>
1 Torr	= 1 mm Hg
1 bar	= 0,1 H Pa
1 Pa	= 1 N/m <sup>2</sup>

#### Density

1 lb/cu. ft.	= 16,02 kg/m <sup>3</sup>
1 lb/cu. in.	= 27,68 t/m <sup>3</sup>

#### Horse power

1 hp · h	= 1,0139 PS · h
	= 2,684 · 10 <sup>6</sup> Joule
	= 746 W · h
1 BTU (brit. therm. unit)	= 1055 Joule

#### Electrical units

1 ohm/1000 yd	= 1,0936 Ω/km
1 ohm/1000 ft	= 3,28 Ω/km
1 μF/mile	= 0,62 μF/km
1 megohm/mile	= 1,61 MΩ/km
1 μuf/foot	= 3,28 pF/m
1 decibel/mile	= 71,5 mN/m

#### Power rate

1 PS	= 0,736 kW
1 kW	= 1,36 PS
1 hp	= 0,7457 kW
1 kW	= 1,31 hp

# Copper and Alu-Price Calculation

Calculation examples:

- Assumption:
- DEL-Quotation 194,29 EUR/100 kg for copper
  - Daily rate 173,84 EUR/100 kg for aluminium
  - Individual discount, e. g. 20%

## 1. Profibus 1 x 2 x 0,64 mm, PVC, Part no. 81448

Quantity ordered 1000 m

Price brutto (Copper base)= 150 EUR	1400,00 EUR/km
minus 20% (discount)	<u>280,00 EUR/km</u>
	1120,00 EUR/km

+ Copper surcharge:

$\frac{(194,29 + 1,9429) - 150}{100}$  x Copper value

equal, 0,4623 EUR/kg x 22 kg/km =	<u>10,17 EUR/km</u>
	1130,17 EUR/km

## 2. NYCWY 3 x 70/35 sm, 0,6/1 kV, Part No. 32268

Quantity ordered 1000 m

Copper base = 0	14780,00 EUR/km
minus 20% (discount)	<u>2956,00 EUR/km</u>
	11824,00 EUR/km

+ Copper surcharge (Conductor + screen):

$\frac{(194,29 + 1,9429) - 0}{100}$  x Copper value

equal, 1,962 EUR/kg x 2410 kg/km =	<u>4728,42 EUR/km</u>
	16552,42 EUR/km

## 3. NA2XSY 1 x 70 sm/16, 12/20 kV, Part No. 32454

Quantity ordered 1000 m

- Aluminium conductor  
- Copper screen

Copper base = 0	9500,00 EUR/km
minus 20% (discount)	<u>1900,00 EUR/km</u>
	7600,00 EUR/km

+ Copper surcharge (screen):

$\frac{(194,29 + 1,9429) - 0}{100}$  x Copper value

equal, 1,962 EUR/kg x 182 kg/km =	357,08 EUR/km
-----------------------------------	---------------

+ Aluminium (Conductor):

Aluminium value x daily rate  
203 kg/km x 1,74 EUR/kg

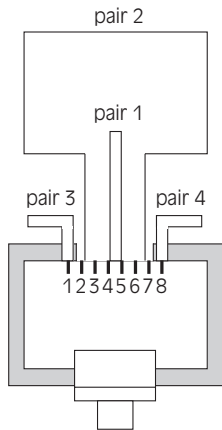
	<u>353,22 EUR/km</u>
	8310,30 EUR/km

# RJ45 connector pin assignment for Ethernet applications

## Ethernet RJ45

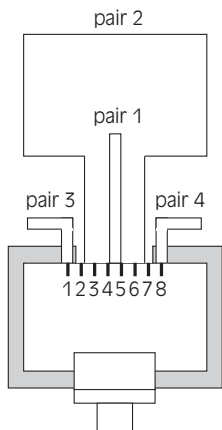
The connection diagram according to EIA/TIA T568A and EIA/TIA T568B has the 8-pole RJ45 plug connector. The twisted pair cable must be connected to 8-pole RJ45 sockets and comply with one of the two standards. The standard mainly used is EIA/TIA T568B while EIA/TIA T568A (AT&T) is less common.

### MDI (EIA/TIA T568A)



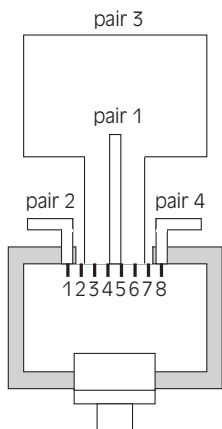
Pin	Colour code Wire	Assignment 10BASE-T, 100BASE-TX	Assignment 1000BASE-TX
1	WHT/GRN	Tx+	BI_DA+
2	GRN	Tx-	BI_DA-
3	WHT/ORG	Rx+	BI_DB+
4	BLU		BI_DC+
5	WHT/BLU		BI_DC-
6	ORG	Rx-	BI_DB-
7	WHT/BRN		BI_DD+
8	BRN		BI_DD-

### MDI-X



Pin	Colour code Wire	Assignment 10BASE-T, 100BASE-TX	Assignment 1000BASE-TX
1	WHT/ORG	Rx+	BI_DB+
2	ORG	Rx-	BI_DB-
3	WHT/GRN	Tx+	BI_DA+
4	BLU		BI_DD+
5	WHT/BLU		BI_DD-
6	GRN	Tx-	BI_DA-
7	WHT/BRN		BI_DC+
8	BRN		BI_DC-

### MDI (EIA/TIA T568B)



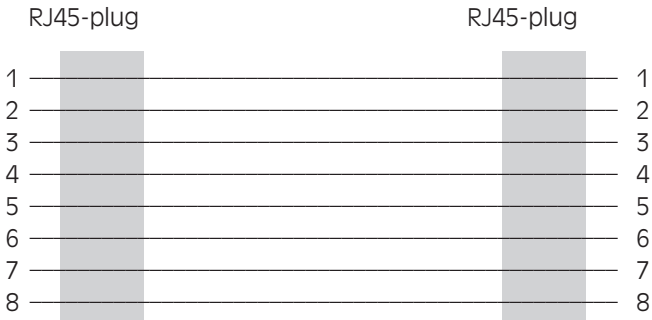
Pin	Colour code Wire	Assignment 10BASE-T, 100BASE-TX	Assignment 1000BASE-TX
1	WHT/ORG	Tx+	BI_DA+
2	ORG	Tx-	BI_DA-
3	WHT/GRN	Rx+	BI_DB+
4	BLU		BI_DC+
5	WHT/BLU		BI_DC-
6	GRN	Rx-	BI_DB-
7	WHT/BRN		BI_DD+
8	BRN		BI_DD-

**Note:** Other technologies such as Token Ring, FDDI etc. use different pin assignments

# RJ45 wiring options

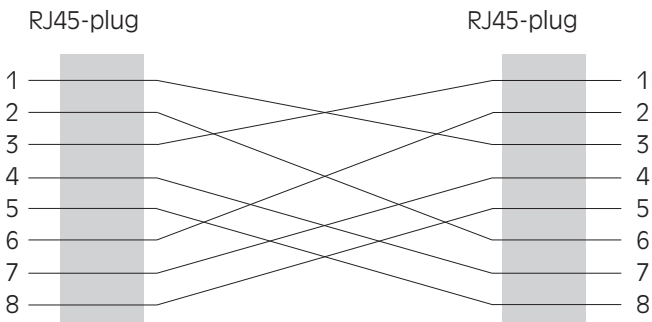
Two different patch cables are used in Ethernet networks - the straight-through and the crossover cable.

## Straight-through patch cable



A straight-through cable is used if an Ethernet switch should be connected to the network connection of a computer.

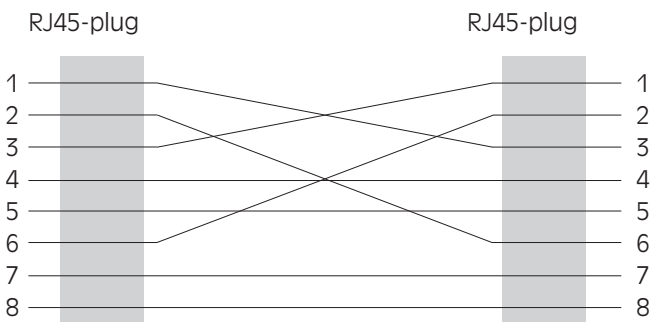
## Crossover cable



A crossover cable is used if two Ethernet switches or two computers should be connected with each other via their network connections.

**Note:** Suitable for all Ethernet technologies

## Semi crossover



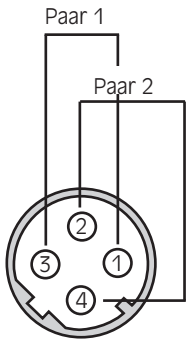
A crossover cable is used if two Ethernet switches or two computers should be connected with each other via their network connections.

**Note:** Not suitable for Gigabit Ethernet because this technology uses all pins.

# M12 connector pin assignment

## Ethernet M12 connection diagram

(IEC 61076-2-101)

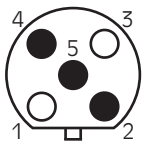


Pin	Colour code Wire	Assignment 10BASE-T 100BASE-TX
1	BLU/YEL	Tx+
2	YEL/WHT	Rx+
3	WHT/ORG	Tx-
4	ORG/BLU	Rx-

D-coding for Industrial Ethernet

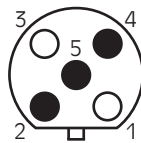
## Profibus M12 connection diagram

5-pole Plug



PIN 2:  
PIN 4:  
PIN 5:  
Threaded connection:

5-pole Adapter

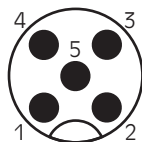


A-line (green)  
A-line (red)  
Shield  
Shield

B-coding for Profibus

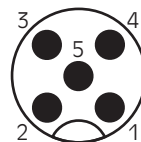
## DeviceNet™ M12 connection diagram

5-pole Plug



PIN 1:  
PIN 2:  
PIN 3:  
PIN 4:  
PIN 5:  
Threaded connection:

5-pole Adapter

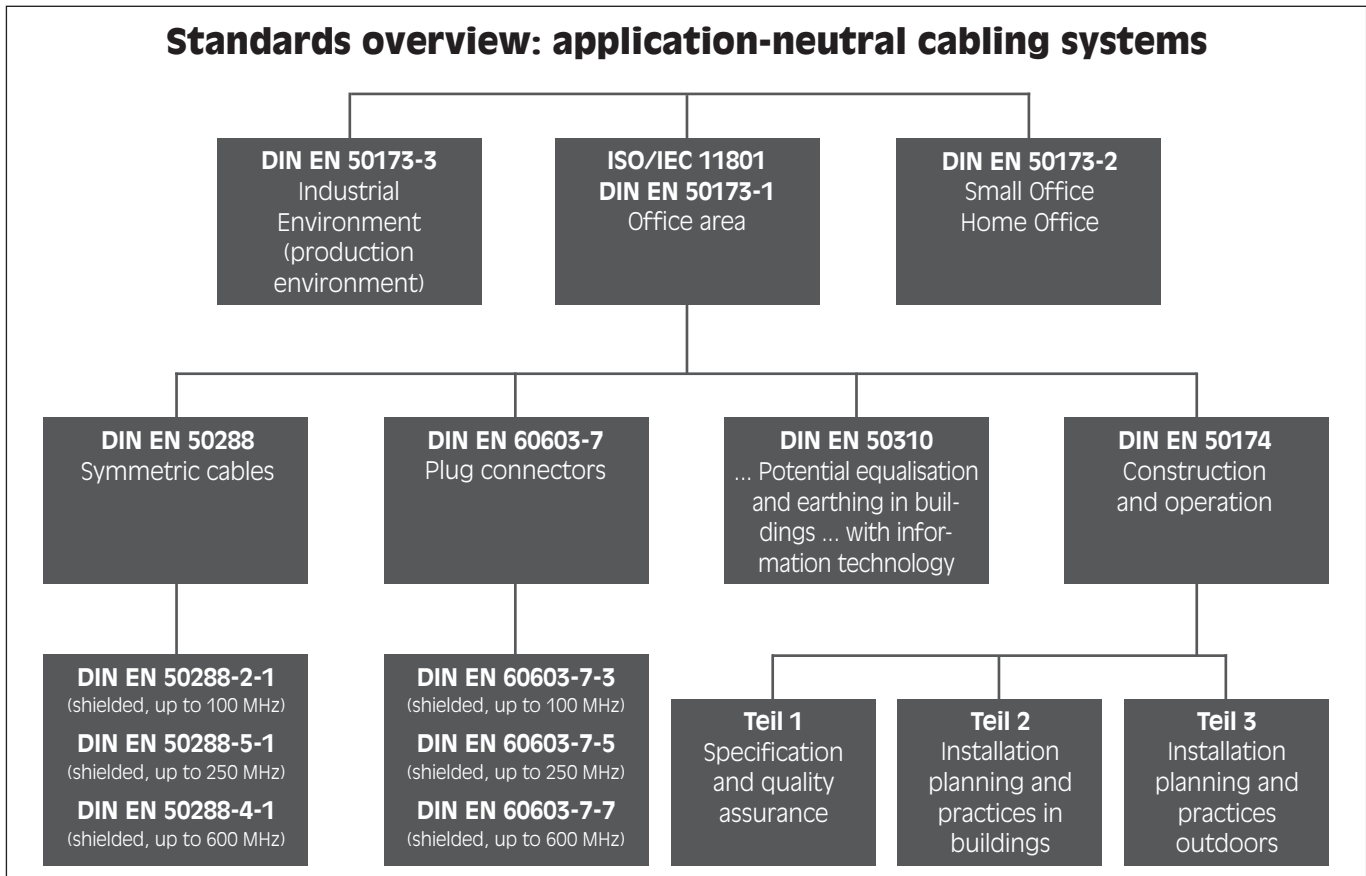


Shield  
V+  
V-  
CAN\_H  
CAN\_L  
Shield

A-coding for DeviceNet™



# Standards overview



The EN 50173 and ISO/IEC 11801 standards today are largely identical and contain the same requirements for cables and components.

Both standards are currently being revised and a complete harmonisation is being striven for.

The requirements for components (categories) are also specified in the following standards:

- Cables EN 50288
- Mating faces EN 60603-7 and IEC 61076-3-104
- Measuring equipment EN 651935

The EN standards also include the European EMC regulations:

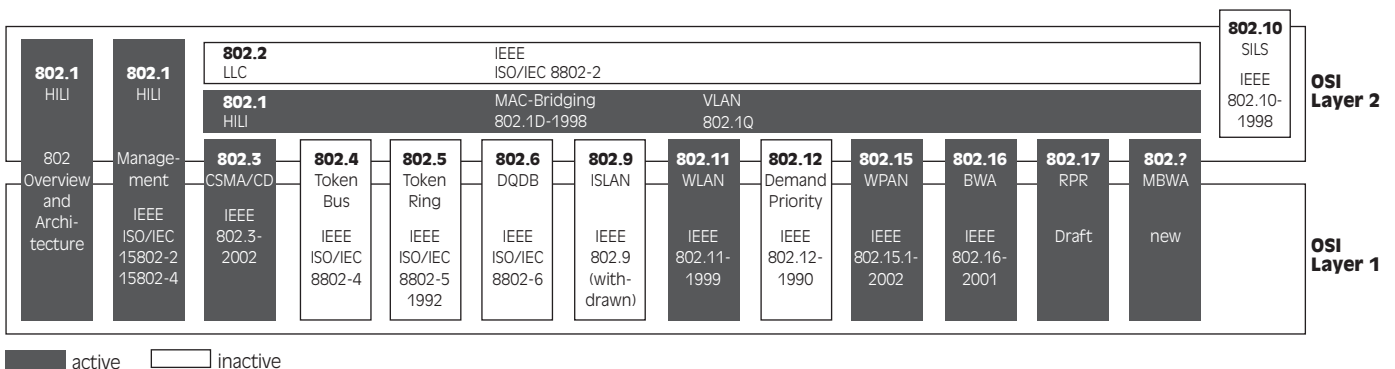
- Radiation Class A/B EN 55022
- Interference resistance EM 50082-1

Building cabling in EN 50173 just like in ISO/IEC 11801 is divided into three areas:

- Primary or campus area for connecting the buildings of one site with each other
- Secondary or vertical area for connecting the separate floors of a building
- Tertiary or horizontal area for connecting the connection units (e.g. wall sockets) with the floor distributor

The IEEE Standards Association (IEEE-SA) is an organisation where all activities and programmes concerning IEEE standards are carried out under one roof.

The IEEE 802 LAN/MAN Standards Committee develops standards for local area networks and metropolitan area networks.



# Fire performance and fire propagation in accordance with EN 60332-X

European standards EN 50167, EN 50168, and EN 50169, require not only data lines with shielding, they also require data lines with halogen-free sheathing. Consideration and compliance with these standards is particularly recommended for public facilities such as hospitals, schools, and airports. We also recommend the use of halogen-free cable for buildings with high concentration of personnel or material assets.

## Cable with PVC sheath

If there is a fire, standard PVC material can propagate fires and form hydrochloric acid through the liberation of hydrogen chloride gas (HCl) in combination with moisture (e.g. water for fire fighting). In addition, burning PVC (polyvinyl chloride) produces high smoke density and the corrosive damage to buildings and equipment can often assume devastating proportions that far exceed the actual fire damage. HELUKAT® data lines are manufactured in accordance with IEC 60332-1 relative to fire propagation behaviour.

## Cable with halogen-free sheath

Here materials are used that do not contain halogens (such as chloride) and that do not release corrosive gases in the event of fire. The portion of toxic gases is also reduced to a minimum, and smoke density and fire propagation are hardly present or possible. Markings on the cable include the abbreviations FRNC or LSOH. These markings specifically refer to the following:

- FR** flame retardant (inhibits fire propagation)
- NC** non-corrosive (no corrosive components)
- LS** low smoke (low smoke density)
- OH** zero halogen (halogen-free)

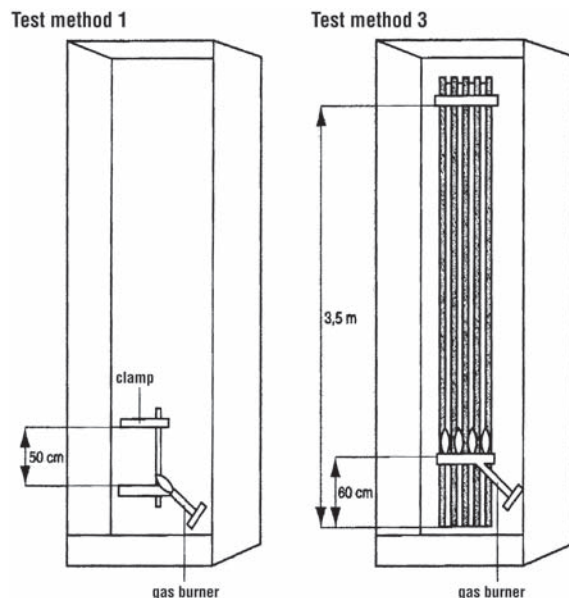
For safety, when using such materials, it is essential that the view of passageways and emergency exits remains unobstructed. For this, however, it is necessary to also consider the use of such materials for other products such as power cables or cable guide channels. In terms of fire propagation behaviour, HELUKAT(r) data lines are manufactured in accordance with IEC 60332-1 or in accordance with the more rigorous IEC 60332-3.

## Caloric load [kWh/m] [MJ/m]

There is a wide variety of different combustible fixtures or products in every building. These include (even if concealed in suspended ceilings or channels) cables and lines that can represent a significant part of the facility, particularly in commercial premises. These cables have different energies (heating values) and they can significantly increase the total caloric value of a building. Consequently, in the planning stage ensure that caloric value quantities are kept as low as possible.

## Test methods for fire propagation

The verification or definition of how effectively or how well cable must counter fire propagation and thus the spread of the fire is specified in the standards IEC 60332-1, IEC 60332-2 and IEC 60332-3. For test method 1, a 50 cm long cable is exposed to flame from a gas burner for 1 minute, and must then extinguish any flame on its own, and it may be burned up to a maximum of 5 cm under the upper clamp. For test method 3, an entire bundle of cable, 3.5 m long is mounted vertically on a ladder in a cabinet and exposed to flame for 20 minutes. After turning off the gas burner, the flame must extinguish on its own within 1 hour and the distance between burner and the fire damage on the cables furthest removed from the burner must not exceed 2.5 m.



**This test is a very realistic representation of a possible fire in a cabling chute.**

# Norm-Glossary

## IEEE 802

Overview and Architecture

## IEEE 802

LMSC

LAN MAN Standard Committee

## IEEE 802.1

Higher Layer Interface Standards

## IEEE 802.1B-1995

LAN/MAN Management (ISO/IEC 15802-2:1995)

## IEEE 802.1D-1998

Media access control (MAC) bridges (includes IEEE 802.1p Priority and Dynamic Multicast Filtering, GARP, GMRP)

## IEEE 802.1E-1994

System load protocol (ISO/IEC 15802-4 : 1994)

## IEEE 802.1F-1993

Common Definitions and Procedures for IEEE 802 Management Information

## IEEE 802.1G-1998

Remote Media Access Control (MAC) bridging (ISO/IEC 15802-5 : 1998)

## IEEE 802.1H-1997

Media Access Control (MAC) Bridging of Ethernet V2.0 in Local Area Networks (ISO/IEC TR 11802-5 : 1997)

## IEEE 802.1Q-1998

IEEE Standard for Virtual Bridged Local Area Networks (VLAN Tagging, GVRP)

## IEEE 802.1W-2001

IEEE Standard for Rapid Reconfiguration

## IEEE 802.1X-2001

IEEE Standard for Port-Based Network Access Control

## IEEE 802.2

LLC

Logical Link Control

## IEEE 802.3

CSMA/CD

Carrier Sense Multiple Access with Collision Detection (Ethernet)

## IEEE 802.3a-1988 (Clause 10)

10 Mb/s MAU 10BASE2

## IEEE 802.3b-1985 (Clause 11)

10 Mb/s Broadband MAU, 10BROAD36

## IEEE 802.3c-1985 (9.1-9.8)

10 Mb/s Baseband Repeater

## IEEE 802.3d-1987 (9.9)

10 Mb/s Fibre MAU, FOIRL

## IEEE 802.3e-1987 (Clause 12)

1 Mb/s MAU and Hub 1BASE5

## IEEE 802.3h-1990 (Clause 5)

10 Mb/s Layer Management, DTEs

## IEEE 802.3i-1990 (Clauses 13 and 14)

10 Mb/s UTP MAU, 10 BASE-TP

## IEEE 802.3j-1993 (Clauses 15-18)

10 Mb/s Fibre MAUs 10BASE-FP, FB and FL

## IEEE 802.3k-1993 (Clause 19)

10 Mb/s Layer Management, Repeaters

## IEEE 802.3l-1992 (14.10)

10 Mb/s PICS proforma 10BASE-T MAU

## IEEE 802.3m-1995

Maintenance 2

## IEEE 802.3n-1995

Maintenance 3

## IEEE 802.3p-1993 (Clause 20)

Management, 10 Mb/s Integrated MAUs

## IEEE 802.3q-1993 (Clause 5)

10 Mb/s Layer Management, GDMO Format

## IEEE 802.3r-1996 (8.8)

Type 10BASE5 Medium Attachment Unit PICS proforma

## IEEE 802.3s-1995

Maintenance 4

## IEEE 802.3t-1995

120 Ohm informative annex to 10BASE-T

## IEEE 802.3u-1995 (Clauses 21-30)

Type 100BASE-T MAC parameters, Physical Layer, MAUs and Repeater for 100 Mb/s

## IEEE 802.3v-1995

150 Ohm informative annex to 10BASE-T

## IEEE 802.3x-1997 and 802.3y-1997

(Revisions to 802.3, Clauses 31 and 32), Full Duplex Operation and Type 100BASE-T2

## IEEE 802.3z-1998 (Clauses 34-39,41-42)

Type 1000BASE-X MAC Parameters, Physical Layer, Repeater and Management Parameters for 1000 Mb/s Operation

## IEEE 802.3aa-1998

Maintenance 5

## IEEE 802.9ac-1998

Frame Extensions for Virtual Bridged Local Area Network (VLAN) Tagging on 802.3 Networks

## IEEE 802.3ab-1999 (Clause 40)

Physical Layer Parameters and Specifications for 1000 Mb/s Operation Over 4 Pair of Category 5 Balanced Copper Cabling, Type 1000BASE-T

## IEEE 802.3ad-2000 (Clause 43)

Aggregation of Multiple Link Segments

**An additional standard, 1802.3** provides conformance test information for 10BASE-T

## IEEE 802.3ae-2002

Media Access Control (MAC) Parameters, Physical Layer, and Management Parameters for 10 Gb/s Operation

## IEEE 802.af

in work DTE Power via MDI

## IEEE 802.3ah

in work Ethernet in the First Mile

## IEEE 802.4

TBUS

Token bus

## IEEE 802.5

TRING

Token Ring

## IEEE 802.6

DQDB

Distributed Queue Dual Bus

## IEEE 802.7

BBTAG

Broadband Technical Advisory Group

## IEEE 802.8

FOTAG

Fibre Optic Technical Advisory Group

## IEEE 802.9

ISLAN

Integrated Services LAN

## IEEE 802.10

SILS

Standard for Interoperable LAN Security

## IEEE 802.11

WLAN

Wireless LANs

# Norm-Glossary

## **IEEE 802.12**

DPAP  
Demand Priority Access Protocol

## **IEEE 802.14**

CATV  
LANs in Cable Television Networks

## **IEEE 802.15**

WPAN  
Wireless Personal Area Networks

## **IEEE 802.16**

BWA  
Broadband Wireless Access

## **IEEE 802.17**

RPR  
Resilient Packet Ring

## **IEEE 802.18**

RRTAG  
Radiation Regulatory Technical Advisory Group

## **IEEE 802.19**

CTAG  
Coexistence Technical Advisory Group

## **IEEE 802.20**

MBWA  
Mobile Broadband Wireless Access

## **Important standards for network components and network environments DIN EN**

### **DIN EN 50081-1**

Electromagnetic compatibility (EMC) Generic standards: emission standard; Part 1: residential, commercial and light industrial environments

### **DIN EN 50082-1**

Electromagnetic compatibility (EMC) Generic standards: emission standard; Part 1: residential, commercial and light industrial environments

### **DIN EN 50098-1**

Information technology cabling of building complexes - Part 1: ISDN basic connection

### **DIN EN 50173-1**

Information technology - application-neutral communication cable systems, general requirements and office environments (cf ISO/IEC 11801)

### **DIN EN 50173-2**

Information technology - application-neutral communication systems, residential (cf ISO/IEC 11801) (SOHO area)

### **DIN EN 50173-3**

Information technology - application-neutral communication systems, industrial (cf ISO/IEC 11801)

### **DIN EN 50174-1**

Information technology - installation of communication cabling - Part 1: Specification and quality assurance

### **DIN EN 50174-2**

Information technology - installation of communication cabling - Part 2: Installation planning and practices in buildings

### **DIN EN 50174-3**

Information technology - installation of communication cabling - Part 3: Installation planning and practices outdoors

### **DIN EN 50288-4-1**

Multicore metallic data and control cables for analogue and digital transmission - Part 2-1: Generic specification for shielded cable up to 600 MHz; cables for the horizontal and vertical area

### **DIN EN 50288-4-2**

Multicore metallic data and control cables for analogue and digital transmission - Part 2-2: Generic specification for shielded cable up to 600 MHz; device connection cables and switchboard cables

### **DIN EN 50288-2-1**

Symmetric cable, shielded up to 100 MHz

### **DIN EN 50288-5-1**

Symmetric cable, shielded up to 250 MHz

### **DIN EN 50288-4-1**

Symmetric cable, shielded up to 600 MHz

### **DIN EN 50310**

Application of measures for potential equalisation and earthing in buildings with information technology equipment

### **DIN EN 55022**

Information technology equipment - radio interference properties - thresholds and measuring methods (IEC/CISPR 22:1997, modified + A1:2000)

### **DIN EN 55024**

Information technology equipment - interference resistance characteristics - thresholds and test methods (IEC/CISPR 24:1997, modified)

### **DIN EN 60068-1**

Environmental tests - Part 1: General and guideline (IEC 60068-1:1988 + Corrigendum 1988 + A1: 1992)

### **DIN EN 60068-2-2**

Environmental tests - Part 2: Tests; Test group B: Dry heat (IEC 60068-2-2:1974 + IEC 68-2-2A:1976 + A1:1993)

### **DIN EN 60068-2-6**

Environmental tests - Part 2: Tests; Test Fc: vibrations, sinusoidal (IEC 60068-2-6:1995 + Corrigendum 1995)

### **DIN EN 60068-2-14**

Environmental tests - Part 2: Tests; Test N; temperature change (IEC 60068-2-14:1984 + A1:1986)

### **DIN EN 60068-2-27**

Environmental tests - Part 2: Tests; Test Ea and guideline: Shocks (IEC 60068-2-27:1987)

### **DIN EN 60068-2-30**

Environmental tests - Part 2: Tests Db and guideline: moist heat, cyclic (12+12 hours cycle) (IEC 60068-2-30:1980+A1:1985)

### **DIN EN 60068-2-32**

Environmental tests - Part 2: Tests; Test Ed: free falling (IEC 60068-2-32:1975+A1:1982+A2:1990)

### **DIN EN 60603-7-3**

Connectors, shielded up to 100 MHz

### **DIN EN 60603-7-5**

Connectors, shielded up to 250 MHz

### **DIN EN 60603-7-7**

Connectors, shielded up to 600 MHz

### **DIN EN 60794-3**

Fibre optic cables - Part 3: pipeline, underground and aerial cables: generic specification (IEC 60794-3:1998)

### **DIN EN 60811-1-1**

Insulation and sheathing materials for cables and insulated conductors - General test method - Part 1-1: General application; measuring the wall thickness and the external dimensions; method for determining the mechanical properties (IEC 60811-1-1:1993 + A1:2001)

### **DIN EN 60825-2**

Safety of laser equipment - Part 2: safety of fibre optic cable communication systems (IEC 60825-2:2000)

### **DIN EN 60950**

Safety of information technology equipment

### **DIN V ENV 61000-2-2**

Electromagnetic compatibility (EMC) Part 2-2: Environmental conditions; main section 2: Compatibility level for low frequency cable propagated interference factors and signal transmission in public low voltage networks (IEC 61000-2-2:1990, modified)

### **DIN EN 61000-3-2**

Electromagnetic compatibility (EMC) Part 3-2: Limits; Limits for harmonic current emissions (equipment Input current up to and including 16 A per conductor) (IEC 61000-3-2:2000, modified)

### **DIN EN 61000-4-1**

Electromagnetic compatibility (EMC) Part 4-1: Test and measuring methods; Overview of the series IEC 61000-4 (IEC 61000-4-1:2000)

# Norm-Glossary

## **DIN EN 61000-4-2**

Electromagnetic compatibility (EMC) - Part 4: Test and measuring methods - Main section 2: Interference resistance to static electricity discharge - EMC Basic standard (IEC 61000-4-2:1995)

## **DIN EN 61000-4-3**

Electromagnetic compatibility (EMC) Part 4-3: Test and measuring methods; Testing the interference resistance against high frequency magnetic fields (IEC 61000-4-3:2002)

## **DIN EN 61000-4-4**

Electromagnetic compatibility (EMC) - Part 4: Test and measuring methods - Main section 4: Testing the Interference resistance against fast transient electrical interference factors/Burst-EMC Basic standard (IEC 61000-4-4:1995)

## **DIN EN 61000-4-5**

Electromagnetic compatibility (EMC) - Part 4: Test and measuring methods - Main section 5: Testing the interference resistance against surge voltages (IEC 61000-4-5:1995)

## **DIN EN 61000-4-6**

Electromagnetic compatibility (EMC) - Part 4: Test and measuring methods - Main section 6: Cable-propagated interference factors, induced by high frequency fields (IEC 61000-4-6:1996)

## **DIN EN 61000-6-1**

Electromagnetic compatibility (EMC) Part 6-1: Generic standards - immunity for residential, commercial and light industrial environments (IEC 61000-6-1:1997, modified)

## **DIN EN 61000-6-2**

Electromagnetic compatibility (EMC) Part 6-2: Generic standards; interference resistance for industrial environment (IEC 61000-6-2:1999, modified)

## **DIN EN 61000-6-3**

Electromagnetic compatibility (EMC) Part 6-3: Generic standards; Generic standard Interference emission for residential, commercial and light industrial environments (IEC 61000-6-3:1996, modified)

## **DIN EN 61000-6-4**

Electromagnetic compatibility (EMC) Part 6-4: Generic standards; Generic standard interference emission for industrial environment (IEC 61000-6-4:1997, modified)

## **DIN EN 61131-2**

Programmable Logic Controllers - Part 2: Equipment requirements and testing (IEC 61131-2:1992)

## **DIN EN 187000**

Generic standard specification; Fibre optic cable

## **DIN EN 187101**

Family specification: Fibre optic telephone, underground and pipeline cables  
DIN EN 188000  
Generic specification: Fibre optics

## **DIN EN 188100**

Generic specification: Single mode fibre optics

## **DIN EN 188101**

Family specification: Non-dispersion-shifted single mode fibre optic cables (Type B1:1)

## **DIN EN 188201**

Family specification: Multimode fibre optic cables - Category A1a

## **DIN EN 188202**

Family specification: Multimode fibre optic cables - Category A1b

## **IEC**

### **IEC 60096-1**

High frequency cables; Part 1: General requirements and measurement methods

### **IEC 60793-2**

Fibre optics - Part 2: Product specification

### **IEC 60794-2**

Fibre optic cables; Part 2: Indoor cables - product specification

## **IEC 60874-10**

Connectors for fibre optics; Part 10: Generic specification; Fibre optics connector Type BFOC/2,5 (ST)

## **IEC 1156-1**

Generic specification of the symmetric data cable for message transmission

## **IEC 1156-2**

Generic specification for floor cables

## **IEC 1156-3**

Generic specification for patch and device connection cables

## **IEC 1156-4**

Generic specification for building connection and vertical cables

## **EN ISO/IEC**

### **DIN EN ISO/IEC 9314-3**

Information processing systems - distributed data interface with fibre optics (FDDI) - Part 3: Medium-specific specifications for the bit transmission layer (PMD) (ISO/IEC 9314-3:1990)

## **ISO/IEC**

### **ISO/IEC 11801**

Information technology - application-neutral site cabling (cf EN 50173) 2nd edition 2003  
ISO/IEC 24702

## **DIN VDE**

### **DIN VDE 0100-540**

Erection of power installations with rated voltages up to 1000 V; selection and setting up electrical equipment; earthing, earth conductor, potential equalisation conductor

## **UL**

### **UL 508**

Industrial Control Equipment; Standard for Safety

### **UL 1604**

Industrial Control Equipment for Use in Hazardous Locations

### **UL 60950**

Safety of Information Technology Equipment

## **Germanischer Lloyd**

### **Germanischer Lloyd**

Classification and construction regulations, VI-7-3-Part 1

## **CENELEC standards**

European guidelines, in Europe "normative" (CENELEC is the European committee for electronic standardisation)

## **EN 50173**

describes the performance requirements for the application-neutral cabling system

## **HD 608**

Generic specification of the symmetric data cable for message transmission

## **EN 50167**

Generic specification for shielded floor cables

## **EN 50168**

Generic specification for shielded patch and device connection cables

## **EN 50169**

Generic specification for shielded building connection and vertical cables

## **EN 55022**

(concerning EMC). Contains limits and methods for measuring radio interference for information technology equipment.

## **Note:**

In the standards EN 50167 EN 50168 and EN 50169 data cables with shielding and halogen-free outside covering are specified

# Glossar

## 10 Base FX

Standard for 10 Mbit/s Ethernet data transfer on fibre optic cables. Every connection is made using two fibres, one fibre for "send data" and another one for "receive data".

## 10 Base T

Standard for 10 Mbit/s Ethernet data transfer on twisted pair cables. Every connection is made using two pairs of cores, one pair for "send data" and another one for "receive data".

## 100 Base FX

Standard for 100 Mbit/s Ethernet data transfer on fibre optic cables. Every connection is made using two fibres, one fibre for "send data" and another one for "receive data".

## 100 Base TX

Standard for 100 Mbit/s Ethernet data transfer on twisted pair cables. Every connection is made using two pairs of cores, one pair for "send data" and another one for "receive data".

## 1000 Base FX

Standard for 1000 Mbit/s Ethernet data transfer on fibre optic cables. Every connection is made using two fibres, one fibre for "send data" and another one for "receive data".

## 1000 Base TX

Standard for 1000 Mbit/s Ethernet data transfer on twisted pair cables. Every connection is made using two pairs of cores, one pair for "send data" and another one for "receive data".

## Absorption

The weakening (loss) of radiation when passing through material. A part of the radiant energy of light is converted, for example, to heat.

## Access protocol

Access method. Regulates access to the medium. Ethernet: CSMA/CD ; Token-Ring: Token; FDDI: Append Token; WLAN: CSMA/CA

## Account

Account

## ACL

Agent Communication Language - communication language for information exchange between agents.

## ACR (attenuation to crosstalk ratio):

The ACR value shows the difference between near-end crosstalk and wave attenuation. The value should be as large as possible.

## Active components

In electrical engineering: Conductors and conductive parts of operating materials which are usually earthed when live.

## Active redundancy

Action for increasing system availability. During fault-free operation, all of several available system components are involved in performing the function. In the case of failure, the intact components take over the task of the defective components.

## Actuator, actor

Control components, e.g. adjustment motor, switch coupling, power switch for accessing the process, i.e. for using information for influencing material or energy flows in a well-controlled object.

## ADM

User Association DIN-Messbus.

## ADSL

Asymmetric Digital Subscriber Line - digital subscriber connection line with asymmetrically distributed bandwidth from and to the subscriber.

## AFNOR

Association Française de NORmalisation (France)

## Ageing

Process for updating data, special address storage. After expiry of a time period, an address is flagged as "old" and is deleted on the next cycle if it has not been detected at a port by then.

## Alignment

Optimal positioning of the ends of the optical fibre for splice connections (splicing). When connecting single-mode fibre optics, the alignment of the fibres is made with the LID system.

## Analogue signal

Signal whose information parameter can take any of many values within technically specified limits. Theoretically an infinite resolving capacity, however limited practically.

## Analogue signal:

A physically measurable value (such as a voltage for example), modifiable in frequency and amplitude for information transfer.

## ANSI

American National Standards Institute promotes and manages industry standards

## APC

Advanced Process Control - advanced methods of process control. They imply model predictive control (MPC) rules, fuzzy control, KNN and softensors. APC methods are used particularly in the process industry. In chemical mass production for example, they are used for controlling reactors, distillation columns, centrifuges and coupled systems and for the optimal control of starting, loading and product change procedures. Critical process factor fluctuations can be reduced, faults can be rectified more quickly and thus raw material and energy consumption can be minimised and output and product quality can be increased.

## API

Application Programming Interface - interface which the applications use for communication.

## Apparatus

Equipment, device, machine, tool, mechanism. For the purpose of the EMC law, an apparatus is an end product with an independent function, its own enclosure and if needed interfaces and connections for the functional and proper power supply integration in its usage environment.

## Application Layer

Application Layer - layer 7 of the OSI reference model. Applications access network services. Services are provided which support the applications, e.g. software for data transfer.

## Arcnet

Real-time capable field bus for industrial high-speed applications, especially for networking intelligent units, e.g. for communication between controllers or PLC systems with PC applications.

## ARP

Address Resolution Protocol requests the associated MAC address via the IP address.

## AS

Active star coupler

## AS

Australian Standard

## ASI

Actuator Sensor Interface - bus systems for the lowest automation level. Enables the simple connection of sensors, actuators and integrated systems to the first control level.

## ASIC

Application Specific Integrated Circuit

## ASN.1

Abstract Syntax Notation One. Programming language of the MIB

## ASRS

Automatic Storage and Retrieval System - automatic high bay warehouse

## ASTM

American Standard of Testing Materials (USA)

## ATM

Asynchronous Transfer Mode. Based on cells of 53 bytes. Suitable for telephone, video and other data transfer. Mainly used in WAN applications.

## Attenuation

Reduction of the signal output between two cross section areas of a fibre. It is dependent on the wavelength: Main causes: Dispersion, absorption. Its unit of measure is "dB", specified as  $10\log P(L1)/P(L2)$ .

# Glossar

## **Attenuation coefficient**

This is the attenuation of the cable in relation to the length in stationary condition (unit: dB/km or dB/100 m)

## **Attenuation:**

Damping

## **AUI**

Attachment Unit Interface. Interface for physical separation of transceivers from Ethernet controllers.

## **Auto negotiation**

A process defined in Fast Ethernet using which the participants agree a common transfer mode before the actual data transfer (100 Mbit/s or 10 Mbit/s, Full Duplex or Half Duplex)

## **Auto negotiation**

Detects the transfer parameters such as speed, duplex mode, flow control at the port of the connected device and sets the optimal values accordingly.

## **Autocrossing**

Automatic crossover of the send and receive lines at twisted pair interfaces is possible with this function. Participants, e.g. switches, which support this function can be connected with each other using a straight through cable instead of a crossover cable.

## **Automatic machine.**

An automatic machine, derived from the Greek "automatos" = self-moving, from the technical realisation perspective is every piece of equipment which automatically runs an intended process after fulfilling specified start conditions after the granting of the start command.

## **Automation**

Application of technology, using which operating equipment completely or partially performs specified operations according to preset programs without human intervention.

## **Automation pyramid**

Classically consists of five levels: field level (sensor / actuator), control level (process control, forming production cells), HMI level, MES level, ERP level

## **AWG:**

American Wire Gauge, a unit for wire diameter.

## **Back scattering technique**

A method for measuring length, reflection and attenuation curve in a data cable. A small proportion of the signal is reflected to the sender and evaluated.

## **Backbone (network)**

Connects several LAN or WAN networks to a large network.

## **Backpressure**

Simulates a collision in HDX mode by generating a jam signal.

## **Balun:**

Device for joining balanced (the currents are equal in magnitude and opposite in phase such as twisted pair) and unbalanced (one side is connected to earth and the other carries the signal such as coax) lines, but also for resistance transformation (wave resistance adaptation).

## **Bandwidth**

As well as the attenuation, the bandwidth is the second parameter for designating the properties of a fibre optic cable. The bandwidth represents a measure of the dispersion behaviour of a fibre optic cable.

## **Bandwidth**

Amount of data which can be transported within one second. For an individual connection, this is analogous to speed, e.g. 10 Mbit/s, 100 Gbit/s.

## **Batch processing**

Batch processing - processing a quantity of objects in a defined sequence, e.g. a list of requests, instructions or other data to be transmitted.

## **Baud rate:**

Measure for the number of symbols transferred per second. Also called symbol rate, symbol speed or step speed. Unit = baud. If a symbol is only represented by one bit (0 or 1), the baud rate corresponds to the bit rate. If a symbol has several bits, the bit rate is larger than the baud rate.

## **BDM**

Basic Drive Module: includes the converter part and the drive specific controller and regulation.

## **Bending radius**

Smallest radius which the conductor can be bent without additional attenuation.

## **BFOC**

Bayonet Fibre Optical Connector. Also known as ST connector. Fibre optic connector with bayonet connection. Standardised as the only connector for 10 Mbit/s Ethernet. Also available for multimode and single mode glass fibres and for POF.

## **BGP**

Border Gateway Protocol Routing Protocol in the WAN.

## **Binary signal**

Signal whose information parameter can only take two values.

## **Bit:**

Binary Digit - binary position, binary character, binary number. Basic unit for information in digital transfer systems (0/1, On/Off).

## **Bit rate**

Number of bits which are transferred within a time unit. Measure for the transfer speed of binary data.

## **bit serial**

The individual bits of a character are transferred one after the other in time on a single line.

## **BITBUS**

Field bus based on standard technologies such as RS485 and SDLC. Easy to use communication system.

## **BLP**

Bandwidth length product

## **BOOTP**

Bootstrap Protocol. Provides the statically assigned IP address to a given MAC address.

## **BPDU**

Bridge Protocol Data Unit. Signalisation packet between switches, used for spanning tree.

## **bps**

Bits per second: Measure for data transfer speed.

## **Bridge**

A device which connects two LANs with each other.

## **Broadcast telegram**

Broadcast to all network participants.

## **BS**

British Standard (UK)

## **BSI**

British Standards Institute (UK)

## **BT**

Bit time. Duration of a bit.

## **Buffered fibre cable**

Consists of several loose fibres in a common sleeve.

## **Building automation**

Computer based control, observation and monitoring of all relevant functions for the operation or use of one or several buildings, e.g. heating, ventilation, air conditioning, lighting, ...

## **Bundles**

The fibres are arranged parallel to each other and joined flat with each other at equal spacing (e.g. directly glued or between two adhesive films). Several bundles can be grouped in stacks in one cable.

## **Bus, bus system**

Basically, a distinction between serial and parallel buses must be made. Serial bus systems (cable bus systems) transfer data bit serial between widely distributed components of a system using a common medium (two-wire or four-wire, coaxial cable, fibre optic cable or radio waves) and in this way drastically reduce the wiring complexity as compared with a conventional star configuration.

# Glossar

## **BV**

Bureau Veritas (France)

## **Byte**

Data format or unit for characterising information quantities and storage capacities. 1 byte = 8 bits. Common multiples: kB, MB, GB

## **Cable**

Means for transferring signals. It consists of one or several electric conductors insulated from each other in a common sleeve installed in the cable covering.

## **Cable core**

The whole of the stranded elements present in the cable and the wrapping over all these elements.

## **Cable covering**

Sheath, generally made of polyethylene (PE), polyvinyl chloride (PVC) or halogen-free material (H) which protects the cable core from environmental influences.

## **Cable screen**

Conductive sleeve of a cable or a conductor for protecting individual cores or the complete stranded elements against electromagnetic influences from the outside.

## **CAE**

Computer Aided Engineering - computer supported planning, design, development and project planning. (computer supported engineering work in the broadest sense)

## **Caloric load**

Total of the caloric load values of all combustible materials in a room (unit for cable: MJ/m or in kWh/m)

## **CAM**

Computer Aided Manufacturing - computer supported production (production in computer automated manufacturing systems).

## **CAN**

Controller Area Network: Serial bus system, car manufacturing, industrial control equipment, design according to ISO 11898 bus medium twisted pair conductor.

## **CAP**

Computer Aided Planning - computer supported planning (e.g. of processes, work operations, work sequences, operating material usage etc.).

## **CAQA**

Computer Aided Quality Assurance - computer supported quality assurance (planning and realisation of the operational quality assurance tasks).

## **CATV**

Community Antenna Television (International)

## **CC-Link**

Control & Communication Link - field bus system which makes high-speed communication up to 10 Mbps possible between the field equipment.

## **CDM**

Complete Drive Module - it consists of a so-called Basic Drive Module (BDM) and possible accessories such as power supply equipment for example.

## **CEBEC**

Comite Electrotechnique Belge (Belgium)

## **CEE**

International Commission on Rules for the Approval of Electrical Equipment (international commission)

## **CEI**

Commission Electrotechnique Internationale (International)

## **CEMP**

Centre d'Etude des Matières Plastiques (France)

## **CEN**

Comité Européen de Normalisation (European Committee for Standardisation)

## **CENELEC**

Comité Européen de Normalisation Electrotechnique (European Committee for Electrical Engineering Standardisation) Responsible for the harmonisation of electrical engineering standards in the European Union.

## **CENELEC**

Comité Européen de Normalisation Electrotechnique

## **Channel:**

Connection path between two operating points from and including distribution equipment (e.g. hub) up to and including work place connection cable.

## **Central drive technology**

Design technique for drive concepts with several motors where the central power supply, the converter, the motor controller, possibly required motor regulators and diverse switching equipment are combined in one switch cabinet.

## **CIA**

CAN in Automation e.V.: International user and manufacturer association founded in 1992. This provides technical, product-specific and general information with the aim of disseminating knowledge about CAN.

## **CIP**

Control & Information Protocol.

## **Client**

A workstation connected to a network, e.g. a PC, which uses the services of a server. The client sends user requests in a special protocol to the server, receives its responses and displays these in legible form on the user's screen.

## **Client Server Network**

Tasks are clearly divided. The server provides services and the clients use these services.

## **CLPA**

CC-Link Partner Association

## **CNC**

Computerised Numerical Control.

## **CNET**

Centre National d'Etude de Télécommunication (France)

## **CNOMO**

Comité de Normalisation des Moyens de Production (France) - commission for standardisation of tools and machine tools in the French automobile industry

## **Coating**

A plastic coating applied to the fibre covering surface as mechanical protection.

## **Coaxial cable**

Concentric conductor pair consisting of an inside and an outside conductor which completely encloses the inside conductor. Inside conductor and outside conductor are insulated from each other with a homogenous material or a combination of fixed supporting shells and a gas.

## **Collision domain:**

For the CSMA/CD access method, the runtime of a data packet from one participant to the other is limited. Dependent on the data rate, this produces a spatially limited network, the so-called collision domain. The maximum expansion of a collision domain is 4250 m for 10 Mbit/s (Ethernet) and 412 m for 100 Mbit/s (Fast Ethernet). Full duplex operation of a connection makes expansion beyond these limits possible as it rules out collisions. The precondition for this is the use of bridges or switches.

## **Compact fibre**

A combination of single fibre loose buffer and tight buffered cable. The small hollow space between fibre and sheathing is filled with a non-stick coating.

## **Component based Automation**

Component based automation

## **Component based automation**

New concept at TIA for applications with distributed intelligence. It is based on the new PROFinet standard of the PROFIBUS user organisation (PNO) and supports consequent modularisation using the component technology in machine construction and engineering.



# Glossar

## Conductor

The conductor is used for forwarding the electrical carriers and thus consists of an electrically conductive material (metal). The conductor is usually round.

## Conductor resistance

The conductor resistance is determined by the quality of the copper used and the conductor cross section. It increases linearly with the length of the cable and is decisive for the attenuation.

## Core

The core is a conductor enclosed in an insulation sleeve. The insulation sleeve can be air or any other non-conductive material (usually plastic).

## Corrosivity

Produced by corrosive gases and acids when burning cables and wires. Non-corrosive cables should be used for laying in buildings. Halogen-free cables are generally non-corrosive.

## Coupler

Passive component for transferring / branching light to one or several fibres. The arriving optical light power is divided or combined from another view direction.

## Coupling mechanism

Physical mechanism over which electromagnetic interferences, assuming sources affect sinks and based on the electromagnetic interference energy process from source to sink are transferred.

## Coupling resistance

Measurement for the quality of the screening. It is defined as the ratio of the voltage along the screen of the disturbed system to the current of the interfering system.

## CP

Communication Processor - controls the process of the communication protocol between the components of a system

## CPU

Central Processing Unit

## Crimping

A mechanical protection is made by pressing a sleeve around the fibres.

## Crosstalk

Interference produced in a neighbouring pair from the usage signal in a wire pair.

## Crosstalk

Undesired transfer of energy, e.g. between two neighbouring fibres of a cable.

## CSA

Canadian Standards Association (Canada)

## CSMA/CD method

Carrier Sense Multiple Access/Collision Detection - access method for Ethernet according to IEEE 802.3. Each participant checks whether the transfer medium is free before sending a message. (Carrier Sense). Afterwards, it begins to send and simultaneously checks whether other participants (Multiple Access) have also started to transmit data. A collision occurs if two or more participants send at the same time. The participants end their data transmission (Collision Detection). The next attempt for a free line is started after a random time. For the CSMA/CD method, the network expansion is determined by a maximum permissible running time of the data signals on the network which is dependent on the data rate.

## CSTB

Centre Scientifique et Technique du Bâtiment (France)

## Cut-Through

Switching process where a packet is already forwarded after recognition of the destination address. In this way, the latency time is low; however defective packets are also forwarded. Also known as "on the fly packet switching".

## CVI

Complete Vertical Integration: This means the continuous information flow in automated production from the sensors and actuators via the control level to the management level. Its efficient realisation requires that office and factory automation are based on the same information technology platform and that the interfaces between the individual levels are standardised across all manufacturers,

## Data

Characters or continuous functions which represent information based on known or implied arrangements for processing purposes.

## Data Link Layer

Layer 2 in the OSI reference model: the data packets to be sent are converted into so-called frames and sent, whereby the receiving side acknowledgement of the frames transmitted is waited for.

## dB

Decibel: Unit which has been used to express the level for logarithmic relationship factors such as transfer factor, amplification factor, attenuation factor as the logarithm of the decimal logarithm.  $1 \text{ dB} \approx 0.115 \text{ Np}$

## DCOM

Decentralised Control Systems

## DCS

Digital Communications System

## DCS

Distance Control System

## DDL

Device Description Language

## DDR-SDRAM

Double Data Rate SDRAM: new type of memory which uses the rising and the falling edge of the clock signal for data transfer. Read/write speed increases.

## Decentralised drive technology

In contrast to centralised drive technology, here only the power supply and parts, if needed, of a central controller are installed in a switch cabinet for drive systems with several motors while all other functional parts such as converters and regulators are installed directly at the location for the individual motors.

## Decibel (dB):

Unit for transmission strength, attenuation and output level.

## DEMKO

Danmarks Elektriske Materielkontrol (Denmark)

## DES

Data Encryption Standard

## DESINA

Decentralised and standardised installation technology for machine tools and production systems (comprehensive overall concept for the standardisation and decentralisation of the fluid technical and electrical installation of machines and systems).

## Destination address

Destination address for Ethernet.

## Device Description

DD - Device Description: it provides an expanded text description of every individual device in the virtual field device.

## DeviceNet

Simple CAN-based communication system for networking industrial automation equipment with superordinate controllers. Two twisted pair shielded pairs within a cable are used for transmission. One is used for communication and the other for supplying power to the connected equipment.

## DFÜ

Dial-up connection

## DHCP

Dynamic Host Configuration Protocol. On request, communicates its IP address to a device which is permanently allocated via the associated MAC address or is dynamically granted.

## Dielectric

An electrically non-conductive substance which an electrical field goes through. Increases the capacity of a plate condenser.

## Dielectric constant

Dielectric value. Substance-specific constant for the polarisability factor of the substance. The higher the dielectric constant of a dielectric the higher the capacity of the corresponding condenser.

# Glossar

## Digital signal

A digital signal has several information parameters, e.g. 8, 16, 32 or 64, which are provided one after the other chronologically for serial signals and in parallel chronologically for parallel signals. The 1/0 coded representation of information such as digits and letters or the bit patterns from analogue signals (sounds, images, videos, measurement values etc) produced by scanning and quantisation.

## Digital/Analogue converter

Functional unit which converts a digital signal to an analogue signal.

## DIN

Deutsches Institut für Normung

## DIN rail

Support rail, construction element for simple mounting of modules. As well as the mechanical support function, support rails are very often used as PE collecting bars.

## DIN-Messbus (Measurement Bus)

Bus system designed for the reliable and cost-effective communication of equipment for measuring, monitoring and recording process and operation data. Practically any bus and branching cables, transfer rates 110 bps to 1 Mbps, full duplex operation. Areas of application: production measuring technology, quality assurance, statistical process control, operating and machine data recording and also in conjunction with programmable logic controllers.

## DIS

Draft International Standard

## Dispersion

Light impulses in a fibre have time diversification due to the dispersion. Distinctions are made between mode, material and wave dispersion.

## DKE

Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE. As national organisation for developing standards in electrical engineering and information technology, the DKE ensures important cross section concerns such as safety, EMC, components and performance of classic electricity grids through mobile radio communication up to software and Internet protocols.

## DMA

Digital Motion Access

## DMC

Digital Motion Control

## DNS

Domain Name System. Translates host names to IP addresses via DNS server or statically with the "hosts" file.

## Domains

Broadcast domain - network segment only limited by routers where a broadcast spreads freely. Collision domain: Network segment limited by switches or routers where collisions spread freely.

## DP

Decentralised Periphery (Profibus application layer, layer 7 in the OSI reference model)

## DPI

Dots Per Inch

## DTE

Data Terminal Equipment

## DTE

Data Terminal Equipment

## Duplex connector

Two fibre optic connectors combined with a clip or their design which are usually used as send and receive line.

## DVMRP

Distance Vector Multicast Routing Protocol. Internetwork Gateway Protocol, largely based on RIP. DVMRP uses IGMP to exchange routing datagrams with its neighbours.

## DWDM

Dense Wavelength Division Multiplex

## EANTC

European Advanced Networking Test Centre.

## Earth

In the context of electrotechnical matters, this means the more or less good electrically conductive earth which shows no potential differences outside the influence range of earth connections or other electrical phenomena.

## Earth conductor

Conductor which connects the body of an apparatus to be earthed with an earth connector or several earth connectors provided this conductor is insulated in the earth or laid outside it.

## EC Motors

Electronically Commutated Motors - electronic motors

## EFAC

European Factory Automation Committee

## EIA

Electronic Industries Alliance (USA)

## EIA

Electronic Industries Association

## EIB

European Installation Bus

## EIBA

EIB Association

## Elastomer

Materials which can be reversibly expanded to at least double their starting length and have a low elasticity modulus and high recoil elasticity.

## Electric motors

are electromechanical energy converters which can operate as motor and generator i.e. driving and braking.

## Electromagnetic interference

Irradiation of interference during signal transmission caused by electromagnetic fields.

## ELM

Electrical Link Module

## EMC

Electromagnetic Compatibility

## EMC

Electromagnetic compatibility is the capability of an electric apparatus to operate satisfactorily in its electromagnetic environment without abnormally influencing this environment (which also includes other equipment) or itself being influenced by it.

## EMC

Electromagnetic compatibility RFI immunity and emissions behaviour, Class A/B.

## EMC Directive, Cable

European Commission Electromagnetic Compatibility Directive 89/336/EC. Plays a role in passive cabling in conjunction with the active components. Therefore, shielded systems should be used exclusively for information technology cabling.

## EMC Directives, general

Basic requirements for electromagnetic compatibility are specified in this new EMC Directive which equipment must comply with so that it can be placed on the market and put into service. "Equipment" is the higher-level concept for the objects included in the Directive, which on the one hand are "apparatus" and on the other hand "stationary systems". For the purposes of the Directive, equipment also means components and assemblies installed in a device by the end user and mobile systems, which are defined as a combination of devices and other components which can be operated at various locations. Stationary systems in the new EMC Directive also includes large machines, high-voltage systems, electricity grids and telecommunication networks. These must be designed according to the recognised technology regulations, however do not require a conformity assessment before being put into service.

## EN

European Norm

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## EN

European Standards (European Norms)

### Encoder

Coder, encrypter - in information technology, an encoder is a hardware or software based system for converting data in order to convey a certain amount of information faster over a slow transport path for example, or to require less storage space for archiving. In both cases, the information content remains the same, but the amount of data is reduced. Afterwards, at the other end of the line or after reading the stored data, the reverse procedure is required in order to restore the original data format. This is done using a decoder. An encoder is called a rotary encoder in industrial automation. This is an electromechanical precision device which converts analogue angle values at the input side on its shaft as compared with a reference point into electric digital output signals.

### Encoding

A mechanical device on a connection system which ensures a non-reversed connection or prevents the insertion of a plug into a socket of the same connector type, i.e.. switched to a different use.

### EPC

Electronic Product Code - electronic numbering system for physical objects such as, e.g. products, pallets, packets, individually packaged goods and also livestock.

### EPDM

Ethylene Propylene Diene Monomer - synthetic rubber Produced by polymerisation.

### EPSC

Ethernet Powerlink Standardisation Group

### ESD

Electrostatic Discharge

### ETC

EtherCAD Technology Group

### EtherCAT

Ethernet for Control and Automation Technology. Ethernet solution for industrial automation. Thanks to the optimal usage of the Ethernet bandwidth, small quantities of data can also be transferred efficiently with Ether CAT. Extremely short cycle times and high transfer performance are the result. For example, any 1,000 distributed digital I/Os can be queried with EtherCAT in 30 µs with reading and writing in full duplex. 50 µs are needed for 200 analogue values and 100 axes are checked in 100 µs. EtherCAT is particularly suitable for fast PC-based control technology. The master does not need any special plug-in card and can be implemented with a very simple interface on any available Ethernet controllers. EtherCAT is also well suited for small and medium control technology and will also open up completely new application areas for distributed I/Os there.

### Ethernet

Based on the CSMA/CD access method. Coaxial cable or twisted pair wires are used as transfer medium. Widely used technology for networking computers in a LAN. Ethernet technology has generally established itself in the office environment.

### Ethernet-Powerlink

is an expansion of the standard Ethernet. It enables data exchange under hard real-time conditions with cycle times down to 200 µs and jitter of less than 1 µs. Thus, Ethernet can be used in automation technology on all communication levels from the control level to the I/Os.

### Ethernet/IP

Ethernet Industrial Protocol

### EtherNet/IP

Protocol stack for Ethernet which has been developed for industrial applications. It is based on the standard TCP/IP protocol and uses a common application layer with DeviceNet. It this makes information exchange between device level networks and information systems at the operating level easier.

### ETSI

European Telecommunication Standards Institute

### Factory automation

Factory Automation

### Failure rate

Measure for the failure behaviour of system units (e.g. components). The proportion of failures per time period with respect to the total number of a system quantity is designated as the failure rate.

### FAN

Field Area Network - field bus system: Network for real-time capable exchange of data and information between automation components, equipment and power units inside the technology area of systems.

### FAR

Federal Air Regulation

### Fast Ethernet

100 Mbps transfer rate

### FCS

Frame Check Sequence. Checksum at the end of the Ethernet packet; calculated and recorded by the sender. The recipient calculates the checksum based on the packet received and compares this with the value entered.

### FDDI (Fibre Distributed Data Interface)

Fibre optic network with dual opposite ring topology and 100 Mbit/s transfer rate. The FDDI is fault tolerant to cable or node failure.

### FDIS

Final Draft International Standard

### FDMA

Frequency Division Multiple Access - multiple access in the frequency multiplex

### FDT

Field Device Tool: industry standard created by ZVEI and PNO, which makes the integration of measuring and automation equipment in the process and system control systems easier.

### FDX

Full duplex - transfer mode of a component: sending and receiving is possible simultaneously. No access method is necessary.

### FEXT

A form of crosstalk where signals from participants on the opposite side of a twisted pair line overlap.

### FF

Field bus Foundation

### Fibre core

Core of a glass fibre with a higher refractive index than the cladding glass.

### Fibre multiplex

Transmission method where one fibre is assigned to each transmission channel.

### Fibre optics

Transparent dielectric waveguide for transferring electromagnetic waves in the visible light range. Conductor based on glass fibre or plastic fibre; not sensitive to electromagnetic interference.

### Field bus

Bus system near the process for direct connection of sensors and actuators with their own intelligence. Small quantities of data are transferred in digital form between sensors, actuators and controller on a field bus.

### Field bus barrier

Device for increasing the number of field bus participants in the Ex-area.

### FI

Factory Implementation Protocol or Flux Information Process

### FITL (Fibre In The Loop)

Fibre in the local connection network. The following are distinguished depending on the end point of the fibre path: FTTB Fibre to the building; FTTC Fibre to the curb / kerb; FTTH Fibre to the home; FTTD Fibre to the desk

### Flame resistance

Description of the behaviour of products against fire propagation

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## Flame retardant

Flame retardant, i.e. fire propagation in the case of fire is delayed (FR)

## Frequency

Number of complete oscillations per second (in Hz)

## Frequency converters

are devices based on power electronic semiconductor components which operate in switched mode, i.e. only in the on-state or in the off-state. Especially in variable speed alternating current drive systems, they have the task of producing a usually three-phase modifiable frequency and voltage amplitude for feeding the rotary motor from a single or three phase mains alternating current constant frequency and amplitude.

## FRNC

Flame retardant and non corrosive

## FTP

File Transfer Protocol: Rules for transferring data from one computer via a network to another computer. The protocol is based on TCP/IP which has established itself as quasi standard for data transfer via Ethernet networks. FTP is one of the most used protocols on the Internet. It is defined in RFC 959 in the official regulations for Internet communication.

## FTP

1. File Transfer Protocol. Protocol on Layer 5, uses TCP for transport, therefore usage in WAN 2. Foiled Twisted-Pair.

## FTTD

Fibre To The Desk

## FTZ

Fernmeldetechnisches Zentralamt

## Full duplex

Data transfer process in which information is transmitted simultaneously in both directions.

## Full Duplex operation (two-way transfer)

Information transfer in both directions on one fibre.

## GARP

Generic Attribute Registration Protocol. Protocol family for exchanging parameters between switches on Layer 2 gateway device for connecting two networks which have different protocols.

## Gbit

GigaBit, 109 Bit

## Gbps

Gigabits per second

## Gigabit Ethernet

Fast data network specified in 1999 in IEEE 802.3

## Glass cladding

The glass enclosing the core of a glass fibre; the cladding glass has a lower refractive index than the core glass.

## GMA

VDE/VDI-Gesellschaft Mess- und Automatisierungstechnik

## GOST

USSR-Standards

## Graded index fibre

The graded index fibre is a fibre optic cable with a graded index profile

## Graded index profile

Fibre whose refraction index profile decreases parabolically from the inside to the outside across the cross section of the core surface.

## GRP Element

Antibuckling and strength, ember made of glass filaments (GRP: Glass Reinforced Plastic).

## Half duplex

Operating mode, where a device can either send or receive data. Ethernet collision detection is active for half duplex. The network expansion is limited by the runtime delays of the equipment and transmission media.

## Half-life

(A radionuclid) is the time in which the activity is reduced by half.

## Halogen-free

No halides (e.g. chlorine) in use. Halogen-free cables are used for increased fire protection requirements with respect to protection of persons or on account of high material concentration. In the case of fire they release non-corrosive gases and the released quantity of toxic gases is significantly lower than for PVC materials.

## HCS

Half duplex - transfer mode of a component: either sending or receiving is possible.

## HD

Harmonisation Document (international)

## HID

Human Interface Devices - user interfaces: any device for interaction between human and computer.

## HMI

Human Machine Interface

## HN

Harmonisation des Normes (France)

## Hollow core

Consists of a fibre and a loose sleeve enclosing it.

## Horizontal Integration

Connects the MES solutions with each other in an enterprise pyramid. In this way, all information is available online and multiple data entries and doubled data retention are avoided.

## HRTS

Hard Real-Time System - system that is able to meet hard real-time requirements.

## HSE

High Speed Ethernet Industrial Ethernet solution of the Fieldbus Foundation FF

## HSLAN

High Speed LAN: local network with transfer rates around 100 Mbps and higher.

## HTML

Hyper Text Markup Language - programming language with hypertext links. Language used for most Websites.

## HTML

HyperText Markup Language.

## HTTP

Hyper Text Transfer Protocol - data transfer protocol for the transfer of HTML pages and the files of all kinds linked to them. It is the protocol on which the whole World Wide Web is based; this means it regulates the interaction between Web browser and Web server.

It is active for every mouse click on a hyperlink and ensures that the browser is provided with the respective next piece of desired information.

## Hub

Central connecting device in a network with star topology which distributes arriving data packets to all connected end devices.

## Hybrid cable

Consists of at least two different types of cable (e.g. fibre optic and copper cables) in a common sleeve.

## IAONA

Industrial Automation Open Networking Alliance: Alliance of leading international automation equipment manufacturers for dissemination of open network standards such as Ethernet as world wide standard for industrial communication.

## ICMP

Internet Control Message Protocol. Most well-known command: Ping.

## ID

Identifier

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## IDA

Interface for Distributed Automation. Open interface on top of the TCP/IP stack for automation applications.

## IEA

International Ethernet Association - association for promoting the use of industrial Ethernet

## IEC

International Electrotechnical Commission

## IEC

International Electrotechnical commission (International)

## IEE

Institution of Electrical Engineers (Great Britain)

## IEEE

Institute of Electrical and Electronics Engineers

## IETF

Internet Engineering Task Force.

## IFG

Inter Frame Gap. minimum gap between two packets.

## IGMP

Internet Group Management Protocol. Layer 3 protocol for multicast transport.

## IGP

Interior Gateway Protocol.

## IGRP

Interior Gateway Routing Protocol.

## Impedance

Impedance of the electrical quadripole; it is composed of the ohmic resistance and the reactance, the frequency-dependent resistances and capacitances. The impedance is constructively specified by the dimensions of the internal conductor, dielectric and shielding.

## Indoor cable:

Cable for applications inside buildings. They are not suitable for laying outdoors.

## Industrial Ethernet

Designation for Ethernet in automation technology. Due to the industrial usage environments, the network components must comply with expanded temperature ranges and increased requirements with respect to the reliability and safety of the network.

## Insertion loss

For assessment of the transfer quality of a plug connector, its insertion loss is taken into account, i.e. it is determined what amount the attenuation of an optical transmission path increases when a plug connection is inserted into this transmission path.

## Insulation resistance

It is determined by the insulation material whereby the material properties are more significant than the insulation thickness. The insulation resistance is dependent on the length. The higher the specific resistance of a material, the more suitable the material is for insulation; the unit is [m]; for cables and wires, the derived units [Mkm] or [Gkm] are common.

## INTERBUS

Bus system which is designed from its technical characteristics specially for use with industrial sensors/actuators and continuous networking from the controller level right up to the last limit switch.

## Interface

Intersection point at which two different systems are connected for the purpose of data transfer.

## Interface

From the hardware standpoint, an interface identifies the connection point between two assemblies/devices/systems.

## Interference

Fault, adverse effect, reduction of functionality

## Interference resistance

Ability of a device, of a unit or of a system to operate without reduction of functionality in the presence of electromagnetic interference.

## Intrinsic safety

Protection class of explosion proof electrical equipment. This is achieved in the course of designing this equipment by limiting the energy in the intrinsic electrical circuits.

## IP

Internet Protocol : protocol according to which the data within a network, e.g. in the Internet or intranet reach one computer from another. Every computer present in the network is uniquely identified by its IP address.

## IP address

Internet Protocol address: numeric address which is assigned to a computer in the Internet and which makes it uniquely identifiable. It consists of a sequence of four groups of numbers, each with maximum three digits, separated by periods.

## IP protection classes

They characterise the protection of electrical equipment by enclosure, cover or casing and in fact the protection of persons against access to dangerous parts inside the cover and protection against the ingress of foreign bodies and water.

## IPC

Industrial PC

## ISDN

Integrated Services Digital Network. A digital network in which all types of data such as, e.g. voice, text or images are transmitted to and from the participant via a single line.

## ISDN

Integrated Services Digital Network. WAN transfer protocol.

## ISO

International Standards Organisation: world wide federation of national standards institutions from more than 130 countries.

## ISO/OSI

OSI reference model

## ITU-T

International Telecommunication Union, Telecommunication Standardisation Sector Standardisation Committee

## Jabber

Defective frames for Ethernet with more than 1518 bytes.

## Jitter

Term for time fluctuations of cyclic events.

## KB

Kilobyte -> 1 KB = 210 or 1024 bytes

## kbps

Kilobits per second

## KEMA

Keuring van Elektrotechnische Materialen (Netherlands)

## L-PAS

The video image evaluation L-PAS (Lens Profile Alignment System) is a system for splice process control. The ends of the fibres to be spliced are constructed with one or several CCD cameras. The video signal is used on the one hand for displaying the fibres on the monitor and for controlling the fibre positioning and on the other hand for the splice attenuation assessment.

## LACP

Link Aggregation Control Protocol.

## LAN

Local Area Network: spatially limited system for high speed information transfer between a limited number of independent terminals with equal rights. 3

## LAN

Local Area Network. local area network, e.g. Ethernet, FDDI and Token Ring

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## LAP

Link Access Protocol.

## LASER

Light Amplification by Stimulated Emission of Radiation: Amplifier for electromagnetic waves in the visible light spectrum.

## Latency

Delay time.

## time

Period of time needed by a device to react to an input event at the output or also the time which, e.g. a data packet needs to traverse a network from sender to recipient or how long it remains in a network device before it is forwarded.

## Latency

## Launch angle

Angle between the propagation direction of the light occurring and the optical axis of a fibre optic cable. In order for the light occurring to be coupled, this angle must be between zero and a maximum value which depends on the location on the front surface of the thread or on its local refraction difference as compared with the switching.

## Lay-length

The axial length along the centre axis of a cable according to which a stranding element is wrapped completely (360°) once around the axis.

## LCIE

Laboratoire Central des Industries Electriques (France)

## LED

Light Emitting Diode

## LID-System (Local Injection and Detection System)

The LID system provides highly precise positioning of the fibres in the x/y and z directions. It consists of two bending couplers (sender and receiver). The light is coupled into the fibres on the sending side. The transmitted light power is measured at the receiving side. Criterion for the optimal alignment of the fibres is the maximum of the light power transmitted over the splice.

## Light speed

v0 2, 998 x 108 m/sec

## Light waves

Electromagnetic waves in the optical frequencies range. The term "light" originally referred to the visible radiation with the human eye with a wavelength between 400 and 800 nm. However, it is also common to describe radiation in the adjacent spectral ranges (e.g. infrared) as light.

## Link

Connection path between two nodes from and including the distribution patch panel up to and including the work place connection socket.

## Link Aggregation

Combination of several ports (max, 4) into one virtual port. Parallel connection transfer with redundancy if a port fails. Standard IEEE 802.3. Commonly called "Trunking".

## LON

Local Operating Network: open bus system which makes possible the interaction of components from different manufacturers.

Loss (attenuation) e.g. of a transfer line.

## Loop resistance

Ohmic complete resistance from transmit and return conductors (unit: W/km)

## Low Voltage Directive

The aim of the directive is to ensure the safety of the consumers. It concerns all electrical equipment for generating, transmitting, distributing, storing electrical energy, e.g. generators, cables, switches, sockets and many others, for use with a rated voltage between 50 and 1,000 Volts for alternating current and between 75 and 1,500 Volts for direct current. Exceptions are regulated in Appendix II of the Directive. Such equipment, according to the Directive, is only allowed to be brought into circulation if it is manufactured according to the state of safety technology specified in the European Union, it does not endanger people, productive livestock and property during proper installation and maintenance and during proper use, it has been subjected to a conformity assessment procedure by the manufacturer, there is a corresponding declaration of conformity and it is marked with the CE marking.

## LSOH

Low smoke and halogen-free (LS = low smoke)  
(OH = zero halogen)

## LWL

Fibre optics

## MAC

Medium Access Control

## Machine

According to the Machines Directive, a machine means a totality of parts, at least one of which is moveable, connected with each other. As well as the mechanical components, operating, control and energy components also belong to the machine.

## MAN

Metropolitan Area Network (large area network, e.g. connection of several LANs within a city).

## MAN

Metropolitan Area Network. For connecting different LANs within a city.

## MAP

Manufacturing Automation Protocol - data transfer protocol for automated manufacturing.

## Master

Central bus participant which regulates the bus access. All other participants operate as slaves.

## Master/Slave Concept

Master element determines, slave element follows the instructions of the master. For example, an automation device as master element grants the access rights for the other components for the decentralised bus controller.

## MC

Motion Control

## MDI

Medium Dependent Interface

## MDI-X

MDI-Crossover

## Meshed structure

Every participant is connected with several others. Several independent transmission paths can exist between two stations. This redundancy can be used for assurance of the data transport if there is an interruption of one transmission path.

## MIB

Management Information Base. Contains the description of the connected objects and functions in a network.

## Microbending

Bending of a fibre which produces light losses and thus attenuation increases.

## Migration

Process of porting data or software to a different technical platform

## MII

Media Independent Interface

## MIL

Military Specification (USA)

## MLPPP

Multi Link PPP. See also PPP.

## MMI

Man Machine Interface

## MMS

Man Machine Interface (MMI)

## MODbus

Master / Slave network which makes it possible, for example, for a master computer to communicate with one or several PLCs or Remote I/Os, to perform program processes, data transfers or other operations.

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## **Modem**

Device which converts the signals from one form into another in order to make the compatibility with another system.

## **Modes**

All waveguides capable of propagation in a fibre optic cable

## **Motion Control**

Motion control

## **MPLS**

Multiprotocol Label Switching. Layer 3-Protocol.

## **MSB**

Most Significant Bit.

## **MTBF**

Mean Time Between Failure.

## **Multi-vendor system**

In such a system, the problem-free collaboration of automation components from different manufacturers is made possible based on manufacturer-neutral communication media and transfer protocols.

## **Multicast**

Data packet which is destined for a group of devices, e.g. to all Hirschmann equipment.

## **Multicast telegram**

Is sent to a group of defined recipients. This group can be reached using one address.

## **Multimode fibre**

Fibre optic cable whose core diameter is large in comparison with the wavelength of the light so that two or more modes are capable of propagation.

## **Multiplexing**

Combination of two or several information channels on a common transfer medium.

## **Multistage profile**

Fibre with a sharp drop of the refraction index between core and cladding, whereby the refraction indexes of core and cladding in themselves remain constant. Transmitting width: The frequency at which the amount of the transfer function of a fibre optic cable has dropped to a specified value. The transmitting width of a fibre optic cable is approximately reciprocal to its length.

## **NAT**

Network Address Translation

## **NC**

Numerical Control

## **NEC**

National Electrical Code (USA)

## **NEMA**

National Electrical Manufacturers Association (USA)

## **NEMKO**

Norges Elektriske Materiekkontroll (Norway)

## **NEN**

Nederlands Normalisatie Instituut (Netherlands)

## **NetBEUI**

NetBIOS Extend User Interface. Extended version of the NetBIOS protocol which is used by network software such as LAN Manager, LAN Server, Windows for Workgroups and Windows NT.

## **Network**

Connection structure made up of individual elements which are connected with each other and/or which have a defined interaction with each other (road networks, electricity supply grids, communication networks)

## **Network**

System with the associated transfer method that is supported by message coding cabling.

## **Network Layer**

Network Layer: Layer 3 in the OSI reference model: The data packets are addressed here and logical names and addresses are converted into physical ones and the transmission paths are determined.

## **NEXT**

Near End Crosstalk, in dB, calculated from the power ratio of the wanted signal power to the interference signal power at the same end of the cable.

## **NF**

Normes Françaises (France)

## **NFC**

Normes Françaises Class C (France)

## **NIC**

Network Interface Card. network interface in the computer.

## **NMS**

Network Management System

## **Node**

Branching point in a network.

## **Node**

Participant in the data network, e.g. computer, printer, hub, switch, ...

## **NRZ**

Non Return to Zero. Signal code.

## **NVP**

Nominal Velocity of Propagation - reduction factor of a data cable in [%] as compared to a line with a dielectric constant of 1 of the insulating material (air). Among other things, it is used for calculating the runtime (e.g. NVP 77 % produces a runtime of approx. 0.33 / NVP 4.2 ns/m).

## **ODVA**

Open DeviceNet Vendor Association: independent organisation which supports the further development, use and dissemination of DeviceNet world wide.

## **ODVA**

Open Device Vendor Association - is an organisation which promotes the world wide dissemination of DeviceNet and EtherNet/IP network technologies and standards in industrial automation.

## **OLE**

Object Linking and Embedding - is a technology for transferring various data between devices.

## **OLM**

Optical Link Module: Bus component for the construction of fibre optics networks and the transition from copper conductors to fibre optic cable.

## **OLP**

Optical Link Plug: Bus component, slave connection, industrial communication.

## **OPC**

OLE for Process Control. Protocol in process automation for the standardised data exchange between Windows applications.

## **Open Systems**

An Open System is not sectioned off, but has active connections to its environment, i.e. it can exchange material, energy and information flows with its environment. According to IEEE, an open technical system provides the precondition for the portability of applications to many platforms from different manufacturers, the ability for the collaboration of different applications and for a consistent appearance to the user. This requires the manufacturer-neutral free choice of software and hardware components based on uniform and standardised interfaces and the simple configurability of application-specific system options according to the plug and play principle.

## **Operating capacity**

Effective line capacity

## **Operation control level**

Level at which the relevant decisions for operation management are made. The occurrence of technical and organisation data from various areas is characteristic. The required communication system can range over several enterprise components or premises.

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## **OSI**

Open Systems Interconnection. International standardisation programme, established by ISO and ITU-T in order to create standards for data networks which ensure the compatibility of equipment from different manufacturers.

## **OSI reference model**

Has been presented by the ISO with the objective of making it possible to connect networks from different manufacturers with different topologies. The OSI reference model thereby describes a standard which classifies and specifies according to which principles the communication, using various protocols, between the components to a network takes place. Altogether, it consists of seven Layers: Physical Layer; Data Link Layer; Network Layer; Transport Layer; Session Layer; Presentation Layer and Application Layer.

## **OTDR**

Optical Time Domain Reflectometer. Measuring apparatus.

## **OUI**

Organisationally Unique Identifier. The first three bytes of the MAC address identify the manufacturer of the component.

## **Outdoor cable**

Cables which are constructed so that they are sufficient for all requirements such as those which occur for underground and pipeline cable systems.

## **ÖVE**

Austrian Association of Electrotechnique

## **P-NET**

Field bus for process automation. The electrical specification of P-Net is based on the RS-485 standard and uses a shielded two-wire cable. This allows cable lengths up to 1,200 m without repeaters.

## **Packet size**

Frame size

## **Parallel Detection**

Partial function of auto negotiation in order to adjust to a partner which does not support auto negotiation. A port detects the speed due to FLP or NLP and adjusts accordingly to 100 Mbit/s or 10 Mbit/s. HDX is always used as duplex mode.

## **PAS**

Process Automation System

## **Patch cable**

Flexible connection cable for connecting two components e.g. in a distribution cabinet.

## **PB**

Petabyte -> 1PB = 250

## **PD**

Powered Device - describes the end device in the draft of the IEEE P802.3af standard. IEEE 3af defines how a power supply can be done using an Ethernet twisted pair cable.

## **PDU**

Protocol Data Unit

## **PFM**

Plant Floor Machinery - production system

## **PHY**

Physical sublayer. Physical layer / component.

## **Physical Layer**

Layer 1 in the OSI reference model: Bit transfer layer, lowest level, electrical and mechanical specifications for cables and network adapters are defined and also the mode for how the bits are sent via the cable.

## **Pigtail**

Short piece of fibre optic cable for coupling components where one end has a connector and the other end is spliced.

## **PIMF**

Pair in metal foil.

## **PLC**

Programmable Logic Controller - calculation based control device whose functionality is specified by a so-called application program.

## **PLS**

Process control system

## **PLT**

Process control technology

## **Plug connection**

Easily removable connection with plugs. The insertion loss of a plug connection is usually higher than the transfer loss of a splice connection.

## **PMD**

PROFinet Machine Distributor: central signal distributor with individual connections to all terminal equipment of the network.

## **PMD**

Physical Medium Dependent. Physical Layer / Component on Level 1a.

## **PNO**

Profibus Nutzerorganisation (Profibus User Organisation)

## **POF**

Polymer Optical Fibre - designation for a fibre optic cable whose optical core and sheath are made using plastic. POF fibres have a typical core diameter of 0.98 mm.

## **Point-to-point structure**

All participants are on a common transmission path.

Only one message can be transported from one station to another at a time.

## **Polling**

Method for synchronisation during the data transfer. During polling one partner queries the master and the other slaves cyclically whether they want to send something or can receive something.

## **Port Mirroring**

The data traffic of one port is mirrored at a different port in order to, for example, examine this with an analyser.

## **Potential equalisation**

Electrical connection which brings the bodies of electrical equipment and external conductive parts to approximately the same potential.

## **Power switch**

Circuit breaker, mechanical switch that can switch on the current under proper operating conditions, carry this without time limit and switch off, which can also under defined extraordinary conditions, e.g. short-circuit currents, switch on, carry for a specified time and switch off.

## **Presentation Layer**

Presentation layer: Layer 6 in the OSI reference model: This layer determines the text formatting and display. Furthermore, it is responsible for data security. It also makes data compression possible.

## **Pressure sensor**

Measuring element which converts the physical pressure factor into an output factor proportional to the pressure.

## **Primary cabling:**

A connection of the individual building distributors on the works premises.

## **Prioritisation**

Data packets are processed in priority order according to defined criteria.

## **Process**

Process, procedure or sequence in which time continuous or discontinuous quantitative or qualitative modification of the parameters and/or the status of a real or virtual observation object or medium are ensured.

## **Process automation**

In the context of the given explanations of process and automation, this generally means the use of technical equipment resources for the automatic execution of any processes.

## **Process industry**

Designation for industrial sectors in whose systems there are technical processes running, i.e. those in which the material, bulk goods or energy flows involved in the main process are treated or processed continuously or discontinuously such as, for example, in chemical large systems, in pharmaceutical industry systems, steel production and cement manufacturing, foodstuffs, semi-luxury food and drinks industry, and in waste incineration plants, foundries and others.



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## Process optimisation

The processes running in technical systems are always operated with the objective, taking account of certain given conditions, of achieving the best possible process result.

## Product bandwidth length

This describes the effect that the bandwidth of a given product is inversely proportional to its length. The product bandwidth length is usually stated in Mhz x km or GHz x km.

## Product bandwidth length

Used for estimating the distance supported by a multimode fibre for a specified data rate (speed). Thereby, the gross rate must be used, e.g. 125 Mbit/s for Fast Ethernet.

## Production automation

Automation market segment for the industrial areas of circuit, assembly, component, device and power unit production.

## PROFIBUS

Process Field Bus

## PROFIBUS-DP

Profibus for the area of "decentralised peripherals".

Simple digital and analogue input / output components and intelligent signal and process data processing units can be relocated locally and thus, among other things, significantly reduce costs for the cabling complexity. Mainly for time-critical applications in production automation.

## PROFIBUS-FMS

Profibus Fieldbus Message Specification: Field bus for use at the system level with relatively low real-time requirements, industry standard.

## PROFIBUS-PA

Process Field Bus for Process Automation

## PROFinet

Open component-based industrial communication system based on Ethernet for distributed automation systems. Load-bearing components are the object-oriented modelling of systems and their functional parts based on COM, runtime communication based on TCP/IP and DCOM and manufacturer-independent engineering concept for the system project planning of a PROFinet system with a graphical circuit diagram editor. Technology promoted and supported by PNO.

## Profinet CbA

Solution for distributed decentralised intelligence. Standardised module specification. Open communication between modules. Engineering with drag and drop.

## Profinet IO

Direct connection of decentralised field equipment to Ethernet is possible.

## Profinet IRT

Isochronous Real Time: is hardware supported real-time communication with isochronous data transfer.

## ProfiSafe

Safety profile: allows the transfer of safety-integrated and standard data on one bus line.

## Proprietary

property rights assigned

## Protocol

Series of procedures for making and controlling a communication.

## PSE

Power Sourcing Equipment - describes the power providing device in the draft of the IEEE P802.3af standard. IEEE 3af defines how a power supply can be done using an Ethernet twisted pair cable.

## PVV

Path Variability Value. expressed in bit times.

## QoS

Quality of Service. quality of the transfer, e.g. speed, bandwidth, latency, safety or priority. Only realised for priority on Layer 2 in IEEE 802.1D.

## Quadro Star

Strand element which consists of four wires twisted with each other whereby the respectively opposite wires form a transmission path (trunk). Front surface coupling (star surface coupling)  
Signal transfer via fibre ends connected at the front.

## Queue/Queuing

Generally describes the queue of elements or tasks. A queue in a data transfer system is a queue of messages or data packets which are waiting for further processing or forwarding. They are sorted temporarily and processed one after the other using a corresponding queuing method.

## RAM

Random Access Memory. Volatile memory.

## RARP

Remote Access System.

## RAS

Remote Access System.

## Real-time

A system operates in real-time or is capable of real-time operation if it accepts input factors in a defined time period, processes these and provides the results in good time for a partner system or the system environment.

## Real-time classes

The real-time requirements for calculation, control, regulation and communication systems are determined by the partner systems they interact with.

## Real-time requirements

Real-time systems have the characteristic of reliably reacting to an external stimulation within a defined time period. As regards compliance with the time limitation, a distinction must be made between hard and soft real-time requirements. Hard real-time requirement: if all required system responses to an external stimulation must be made absolutely reliably within a fixed, specified time period. Soft real-time requirement: if exceeding a specified time limit can be tolerated to a certain extent.

## Real-time system

System which responds to an external event within a specified time period. The focus here is not absolutely on speed. Rather, the necessary reaction speed depends on the environment or partner object which the system is co-operating with in a concrete application. For example, fast digital regulations require real-time systems whose reaction times are in microseconds; on the other hand, automation solutions with programmable logic controllers have reaction times in milliseconds, and for slower systems in the process industry, e.g. temperature regulations, reaction times in seconds or even minutes are sufficient. As regards compliance with the time limit, a distinction must be made between hard and soft real-time requirements. There is a hard real-time requirement if all required system responses to an external stimulation must absolutely be made reliably under all possible conditions within a fixed, specified time period, otherwise there is a risk of serious damage. On the other hand, there is a soft real-time requirement if exceeding a specified time limit can be tolerated to a certain extent as no serious consequences are to be expected. The real-time capability of a system is itself dependent on many influencing factors. Especially for automation technology, signal running times, cycle times, latency times, jitter, synchronicity requirements and the data throughput play a significant role.

## Receiver

Assembly for converting optical signals to electrical signals. It consists of a photo diode which converts the incoming optical signal into photocurrent which is amplified afterwards in a (low-noise) amplifier; if needed there are other downstream electronic circuits, e.g. decoder, for the signal preparation.

## Redundancy

Abundance, excess, surplus

## Reflection

Reflection of rays (waves) at border surfaces between two different substances.

## Refraction

Direction change made by an electromagnetic wave (e.g. light) when it passes from one material into another and there is a large difference in the refraction index for both materials.

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## Refraction index

The factor at which the light speed in an optical medium (e.g. glass) is smaller than in a vacuum.

## Reinforcement

Protection element (usually made of steel wires or belts) used for cables with special usage conditions such as for use at sea and in mines.

## Repeater

Repeater, amplifier - apparatus for amplifying and regenerating signals and a network. It can cover larger distances. Simple, economic means of extending a LAN.

## Repeater

Component for signal regeneration on level 1. Regenerates amplitude, signal edge and clock signal. Repeaters with more than two ports are called hubs.

## Resistance difference

Difference of the ohmic resistance between two cores of a cable (unit W)

## Return loss

Measure for matching systems; when the correct termination resistance of a cable (wave resistance) is selected, the reflection factor is 0 and thus also the return loss.

## RG58

Coaxial cable with 50 Ohm wave resistance. Also called Thin Wire or 10BASE2.

## Ring structure

All participants are connected with each other in a ring. There is no centre. All participants have equal rights.

## RIP

Routing Information Protocol - for exchanging routing information between routers in the LAN. There are two versions: RIP V1 and RIP V2.

## RJ45

Connector for twisted pair.

## RMON

Remote Monitoring.

## Rotary encoders

are small electromechanical precision devices which convert the angle positions of a mechanical shaft which they are connected to into coded data which can be evaluated electrically. They are also called angle sensors, angle encoders and angle coders. Basically, a distinction between incremental and absolute systems must be made.

## Rotary field magnets

are alternating current asynchronous motors with squirrel cage rotor which are designed for permanent standstill operation. This means they are thermally dimensioned so that they can remain switched on at the rated voltage with a fully braked shaft and thereby develop their greatest torque.

## Rotary magnets

are electromagnetic actuators with and without return springs activated by direct or alternating current which enable limited angle movements. They are used for demanding applications in automation technology.

## Router

Component on Layer 3 of the ISO/OSI reference model. Connects networks on Layer 3. Using additional routes to the destination, it provides a choice of routes depending on definable criteria such as route costs.

## RS232

Recommended Standard Number 232, the oldest and most widely used interface standard, also called V.24 Interface; all signals are related to earth so that it is an unbalanced to ground interface.

## RS422

Recommended Standard Number 422; balanced to ground operation, thus higher interference resistance. High Level: 2 -6 V; Low Level: +2...+6 V; four-wire connection

## RS485

Recommended Standard Number 485; expanded interface standard as compared with RS422; High Level: 1.5 -6 V; Low Level: +1,5...+6 V; two-wire connection -> half duplex operation or four-wire connection -> full duplex operation.

## RSVP

Resource Reservation Protocol. reserved bandwidths in the WAN.

## RTCP

Real-time Transport Control Protocol.

## Rx

Receive.

## SA

Source Address

## SAE

Society of Automotive Engineers

## SafetyBUS p

Field bus system for serial transfer of safety-related information. Safety systems and products such as light barriers, safety door and emergency stop circuits can thus be safely and decentralised connected with each other.

## SAN

Storage Area Network - network for connecting servers and storage subsystems such as discs, RAID and tape systems. Usually based on Fibre Channel.

## SC

Straight Connector. Connector.

## Screen

Cable structural element for shielding. The design of the screen depends on whether protection against electrical fields (capacitive coupling) or against magnetic fields (inductive coupling) or both is aimed for. The screen material against magnetic fields should always have high electrical conductivity and low inductivity which is why copper is usually used for the conductor.

## SDLC

Synchronous Data Link Control - synchronous data transfer procedure

## Secondary cabling

Internal building connection of the building distributor with the individual floor distributors. (Backbone).

## See also Cut Through

Interference sensitivity, electromagnetic inability of a device, of a unit or of a system to operate without reduction of functionality in the presence of electromagnetic interference.

## Segmentation / Network segmentation

Provides the limit of collision domains and enables a performance improvement of Ethernet networks. The network segmentation is achieved using, e.g. switches.

## SEK

Svenska Elektriska Kommissionen (Sweden)

## Selfcentering effect

The selfcentering effect is the striving caused by the surface tension of the melted glass by the glass fibre to form an homogenous, preferably not offset connection.

## SEMKO

Svenska Elektriska Materielkontrollanstalten (Sweden)

## Sensor

Apparatus which converts a physical factor based on a physical effect into an electric, pneumatic or hydraulic signal for further processing. These sensors are used in automation technology to obtain necessary information for process execution. For example, the recording of power unit and machine statuses or for recording process data such as temperature, pressure, speed, filling level, flow rate, paths, angles etc.

## SERCOS Interface

Serial Real-time Communications Standard Interface - digital drive position. Communications standard for precise Motion Control applications, e.g. for information exchange between a CNC controller and digital servo drives and decentralised I/Os. Enables very fast and precise real-time communication between a master and several slaves using a fibre optic cable.

## Servomotors

Electric motors for activating mechanical components, for example

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valves or for position-controlled return or positioning of mechanical axes in machine tools, robots and in many other applications.

## Session Layer

Session layer / communication control layer in the OSI reference model, Layer 5: This allows using two applications on different computers and ending them again. It realises the dialogue management, regulates the length of the data transfer and takes care of which participant sends or receives when, and the session synchronisation and the recreation of sessions after a failure

## SETI

Sähkötekniikan tutkimuskeskus (Finland)

## SEV

Schweizerischer Elektrotechnischer Verein (Switzerland)

## Shield

Screening which should prevent the transfer of interference signals, e.g. those from electrical fields for data cables, usually braided with aluminium or copper.

## Signal

Time-modifiable physical factor, e.g. a voltage or a current, which has a parameter that gives concrete information about further processing of a different physical factor.

## Shielding attenuation

Measure of the reduction or attenuation of the electromagnetic field strength at a point in the room, caused by inserting an electromagnetic shield between the field source and this point; usually expressed in dB.

## Single mode fibre

Fibre optic cable whose core diameter is so small in comparison with the wavelength of the light that only one mode is capable of propagation.

## Skin Effect

The tendency of alternating current to flow on the surface of a conductor as the frequency increases (reduction of the effective conductor cross section and thus increase of the electrical resistance).

## Slave

Participant in a network which can only participate in data transfer after being approached by the master.

## SLIP

Serial Line Internet Protocol. Standard protocol for serial point-to-point connections, uses serial interface for IP traffic.

## Slotted core cable

Cable where the fibres are in grooves made in the surface of the central element.

## Smoke density

Measure for smoke development when burning a cable. Attention should be paid to a low smoke density for laying in buildings (typical value: 50%).

## SMTP

Simple Mail Transfer Protocol. Internet protocol which provides email services.

## SNAP

Subnetwork Access Protocol.

## SNMP

Simple Network Management Protocol

## SNV

Schweizerischer Normenverband

## SOHO

Small Office Home Office. Networks for small offices / branches and teleworkers

## Spanning Tree

Protocol which automatically resolves network loops. When switches are installed, effects redundant paths for additional security in the case of a connection failure. Changeover time 30s to 60s.

## Splice

A permanent cable connection, e.g. a splicing of two fibres for fibre optic cables.

## Splitter

Optical component for dividing the light output from one onto several fibres.

## SQE

Signal Quality Error. Signal returned to the LAN controller from a transceiver to communicate whether the packet has been sent correctly. Also called heartbeat.

## SRS

Safety Requirements Specification: it forms the starting point for the development of safe systems.

## SRTS

Soft Real-Time System - real-time system which can only meet soft real-time requirements.

## Star coupler

Active or passive component which ensures a uniform light output distribution for an equally large number of incoming and outgoing fibres.

## Star topology

All participants are connected to a central node. Every communication runs via this node. Direct communication between the participants is not possible.

## Store & Forward

Switching process where a packet is first completely stored and then forwarded.

## STP

Shielded Twisted Pair.

## STQ

Shielded Twisted Quad.

## Switch

Device, similar to a hub, which forwards received data packets in a network in contrast to a hub not to all network nodes but only to the respective addresses. This means, that in contrast to a hub, a switch looks after targeted communication within a network which only plays back a message between sender and receiver. Network nodes not involved are not affected.

## Switched Network

Designation for an Ethernet network which is constructed with switches.

## System

Interconnection of apparatus, systems or electrical or electronic components at a given location. These components perform a specific task with each other.

## System part (unit)

Consists of various devices. Each device usually contains one or more instrument loops which operate in parallel with each other. Examples: pump, compressor, pipeline, ...

## System safety

Avoidance of dangerous operating conditions in process systems or their environment. This often concerns avoidance of the risk of explosion.

## System types

Subdivision in single-purpose systems or single-product systems which are designed for precise manufacture of one product and into multipurpose systems and multiple product systems.

## Tag field

Optional field inserted in Ethernet packets after the source data.

## TCO

Total Cost of Ownership.

## TCP

Transmission Control Protocol: Protocol which is used together with the Internet Protocol (IP) to transfer data from one computer to another in the Internet.

## Tertiary cabling

Horizontal connection of the floor distributor with the connection units at the work place.

## TGL

DDR-Standards: Technical standards, "Product regulations and delivery conditions" (former German Democratic Republic)

# Glossar

## **TIA**

Telecommunications Industries Association.

## **TIA**

Telecommunication Industry Association.  
Standardisation Committee

## **Time multiplex**

Transfer process where several pieces of information are transferred simultaneously with different wavelengths on one fibre.

## **Token**

Mark, character, sign: Transmission authorisation token in networks with collision-free access

## **Token Process**

Bus access process: during this process, the token is forwarded from one participant to the next. The participant in possession of the token has permission to send and can access the common transfer medium.

## **Topology**

The physical or logical structure of network connections and nodes (star ring and bus configuration).

## **TOS**

Type of Service. Field in the IP packet for prioritisation.

## **TP**

Twisted-Pair. Data cable.

## **TPDDI**

Twisted Pair Distributed Data Interface.

## **Traceability**

Traceability

## **Transceiver**

Transmitter/Receiver - data transmitter/receiver combined in one unit.

## **Transfer rate**

Speed of the transfer, also bandwidth. Ethernet: 10,100,1000,10000 Mbit/s ; Token-Ring: 4 Mbit/s, 16 Mbit/s ; FDDI: 100 Mbit/s

## **Transponder**

In measuring and monitoring technology, this means a microchip with a sending and receiving antenna, a control logic and data and energy storage which enables contactless communication with a corresponding reading system.

## **Transport Layer**

Transport layer: Layer 4 in the OSI reference model: is responsible for the correct provision of data. For this, it converts the flow of transmission data into small data packets for the transfer or when receiving converts the data packets back into a data stream. This layer is also responsible for sending acknowledgements. The main tasks are thus the creation and dismantling of participant connections and the safe transfer of the data.

## **Tree structure**

Combination of star structure, point-to-point structure, ring structure and meshed structure

## **Tx**

Transmit.

## **UDP**

User Datagram Protocol - network protocol

## **UL**

Underwriters Laboratories. Independent authority in the USA, which carries out product safety examinations.

## **UL**

Unterwriters Laboratories Inc. (USA)

## **UNI**

Unificazione nazionale Italiana (Italy)

## **Unicast**

Data packet which is only addressed to one recipient, in contrast to multicast and broadcast.

## **Unsymmetrical to ground / earth**

Often also called e-coupling - is the difference between the earthing capacities of both conductors.

## **UPS**

Uninterruptible Power Supply

## **UTE**

Union Technique de l' Electricité

## **Utility Automation**

Automation market segment for the public supply areas of electricity, water/ sewerage, pipelines etc.

## **UTP**

Unshielded Twisted Pair.

## **UTQ**

Unshielded Twisted Quad.

## **Validation of Profibus Systems**

Guideline which specifies the validation supporting functions in conjunction with the use of Profibus in foodstuffs or pharmaceutical systems.

## **VDE**

Verband der Elektrotechnik Elektronik Informationstechnik e.V.

## **VDEW**

Vereinigung Deutscher Elektrizitätswerke e.V.

## **VDI**

Verein Deutscher Ingenieure

## **VDMA**

Verband Deutscher Maschinen- und Anlagenbau e.V.

## **VDSI**

Verband Deutscher Sicherheitsingenieure e.V.

## **VLAN**

Virtual LAN, constructed with switches. Goal: broadcast limitation to the network area where the broadcast is useful. Is also used for segmenting networks for security reasons.

## **Tight buffer**

A fibre which is applied immediately above the protective coating of a plastic sleeve.

## **VPN**

Virtual Private Network. The complete data traffic is encrypted in a VPN for secure transfer via public TCP/IP networks. A VPN uses "tunnelling" in order to encrypt all information at the IP level.

## **VRRP**

Virtual Redundant Router Protocol. Protocol for controlling redundant routers.

## **WAN**

Wide Area Network Network which includes the connection between elements over a large geographic distance.

## **Wave resistance**

Complex specification factor of the relationship of the wave voltages to the wave currents at every point of the conductor.

## **Wavelength**

Length of a complete oscillation (period) of a wave. Three wavelength ranges are usually used in optical message technology. These are 850 nm, 1310 nm and 1550 nm.

## **Wavelength multiplex**

Transfer process where several parallel incoming data signals are transferred on a fibre in one serial data stream.

## **WDM**

Wavelength Division Multiplex.

## **WFO**

Weighted Fair Queuing. Method for elaborating the priority queues in a switch. The highest priority queue, for example, receives 50% of the bandwidth, the next receives 25%, etc. .

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**WLAN**

Wireless LAN

**Work area cabling**

Connection of the connection unit at the work place with the data terminal equipment.

**WWDW**

The transfer capacity of the optical fibres in fibre optic networks can be increased with the WWDW system. The system multiplexes several optical single mode signals to an optical composite signal. Thus several applications can be transferred simultaneously using one fibre optic cable pair. This makes the installation of additional fibre optic cables unnecessary and this significantly reduces costs.

**XML**

Extended Markup Language.

**ZVEH**

Zentralverband der Deutschen Elektrohandwerke e.V.

**ZVEI**

Zentralverband Elektrotechnik- und Elektronikindustrie e.V.

# Capacity of KTG-Pool drums

## Wooden drums (standard)

Drumcode-numbers	Drumsize	Flange Ø	Drum-Barrel Ø	Bore Ø	Width over all	Width for windings	Load bearing capacity max.	Drumweight
		Fd	Kd	Bd	l1	l2		
		mm	mm	mm	mm	mm	kg	kg
051	05	500	150	56	470	410	100	8
061	06	630	315	56	415	315	250	17
071	07	710	355	80	520	400	250	25
081	08	800	400	80	520	400	400	31
091	09	900	450	80	690	560	750	47
101	10	1000	500	80	710	560	900	71
121	12	1250	630	80	890	670	1700	144
141	14	1400	710	80	890	670	2000	175
161	16/8	1600	800	80	1100	850	3000	280
181	18/10	1800	1000	100	1100	840	4000	380
201	20/12	2000	1250	100	1350	1045	5000	550
221	22/12	2240	1400	125	1450	1140	6000	710
250	25/14	2500	1400	125	1450	1140	7500	875
251	25/16	2500	1600	125	1450	1130	7500	900
281	28/18	2800	1800	140	1635	1280	10000	1175

## Plastic drums

Drumcode-numbers	Flange Ø	Drum-Barrel Ø	Width over all	Width for windings	Load bearing capacity max.	Drumweight
	FD	Kd	l1	l2		
	mm	mm	mm	mm	kg	kg
050	500	150	456	404	100	4
070	710	355	510	400	250	15
080	800	400	510	400	350	16
090	900	450	680	560	400	23
100	1000	500	704	560	500	32

## One-way wooden drums

Drumcode-numbers	Flange Ø	Drum-Barrel Ø	Width over all	Width for windings	Boremax Ø	Drumweight
	Fd	Kd	l1	l2	Bd	
	mm	mm	mm	mm	mm	kg
HE 350	350	150	320	300	56	18
HE 400	400	150	320	300	56	21
HE 401	400	150	425	405	56	23
HE 501	500	150	320	300	56	30
HE 500	500	150	425	405	56	33
HE 600	600	150	425	405	56	45
HE 760	760	300	425	400	80	80

# Order form

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Item No.	Description	Order quantity	desired packaging	Price € Net	desired Delivery date

Our general terms and conditions of delivery and payment apply.

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- Please send us your current data, networking and bus technology catalogue
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- We would like to receive regular news about your products
- We have a current requirement and would like to request information about:

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I would like to make an appointment with your technical consultant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

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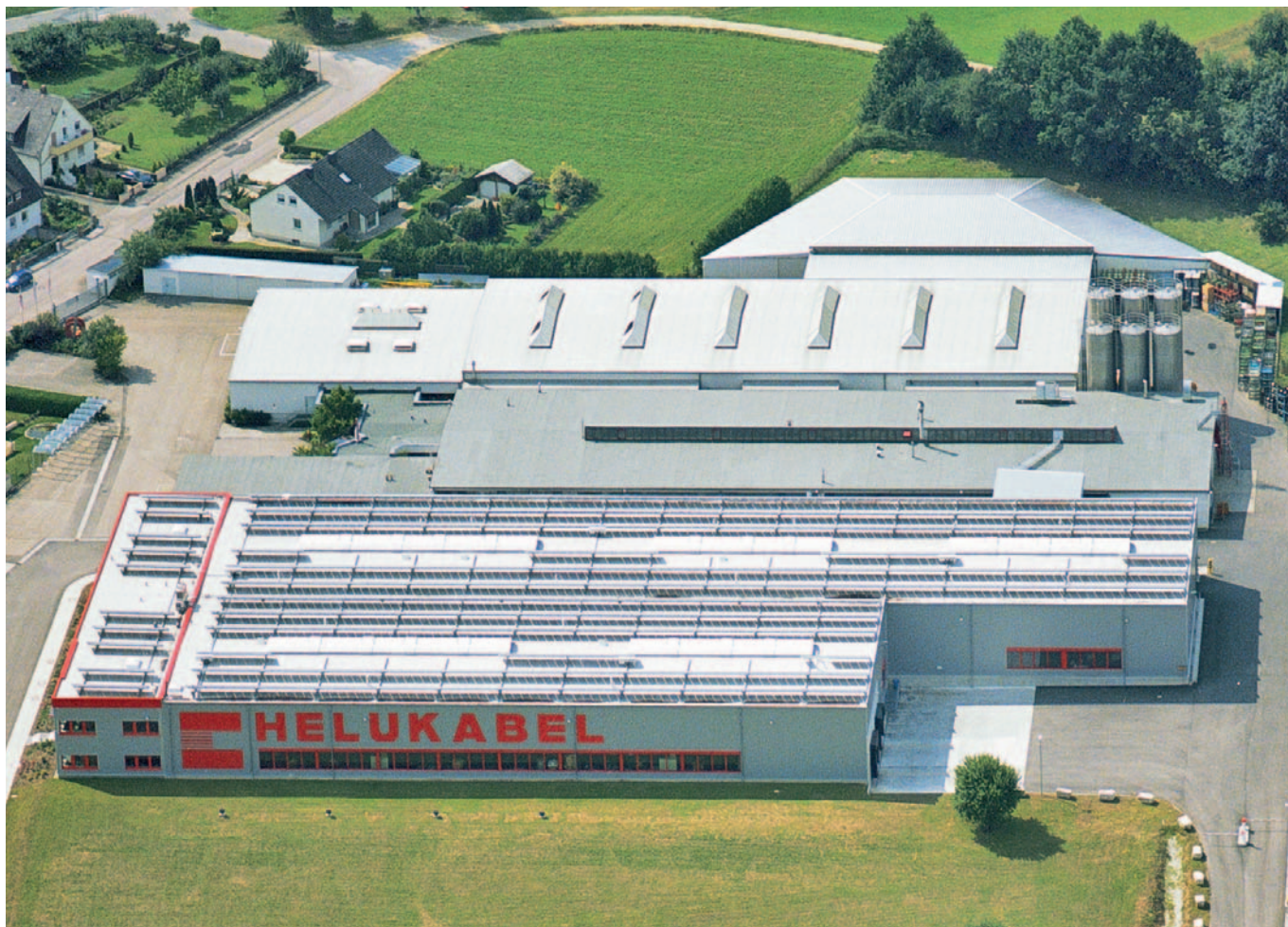


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## Note

### Technical alternations

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### The length marking

The length marking, which is not calibratable, represents a tool, e.g. for a simple material allowance determination or for the specifications of the residual length that remains on the drum. The deviation of the wire length represented by the length marking can be up to 1%. Incomplete length markings, length markings missing on sections or deviations of the wire length represented by the length marking do not establish a statutory duty. Only calibrated measuring devices must be used to determine the wire length.

### Safety instructions

The cables and wires described in the catalog are manufactured in accordance with domestic and international standards as well as in-house standards. Adherence to the then valid safety guidelines, standards and legal regulations is provided for application safety. Product specific dangers can be excluded assumed a proper and professional installation and usage is guaranteed. For each product, this catalog describes general information for usage. Independent of the above, the specifications of the appropriate DIN VDE specifications are valid. However, the installation and processing can only be performed by professional electricians.



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