



Industrial Division Han®

Fibre Optic Components and Systems



Certified acc. to DIN EN ISO 9001
in design/ development, production,
installation and servicing.

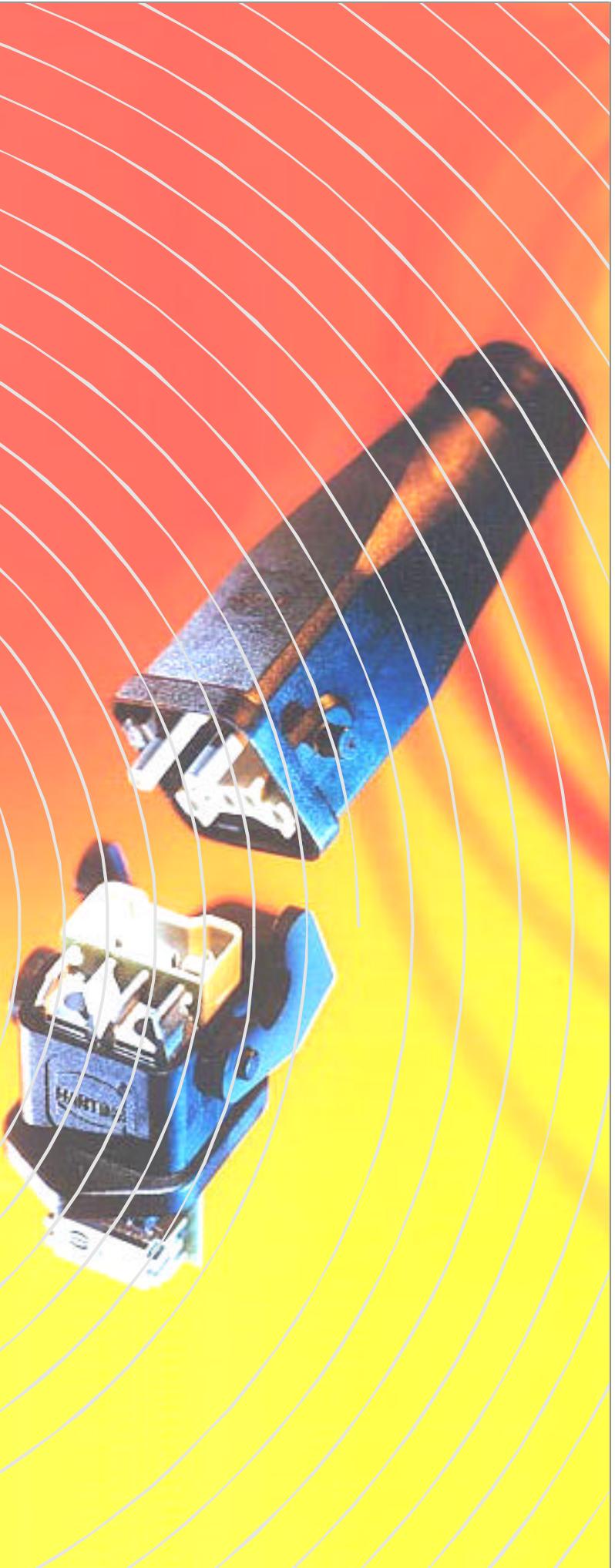


People
Power
Partnership

The best connections worldwide - connect with quality - specify HARTING

HARTING was founded in 1945 and is 100 % privately owned. Approximately 2,200 people are employed worldwide including 150 engineers and more than 100 sales engineers who provide the daily interface with our customers. HARTING with its 23 subsidiaries in Europe, America and Asia is today one of the world's leading connector manufacturers.

State of the art CAD-Systems are used both in the R & D department and the tool making department in order to bring new products to the market in the most efficient way. It is HARTING's philosophy that the target of permanent zero defect production is only achievable by the integration of fully automatic in-line inspection processes. The implementation of the above quality philosophy and associated processes are documented according to DIN EN ISO 9001 in the Quality Assurance Manual. In total approximately 60 quality control personnel are employed. The majority of these engineers and technicians are trained and certified by the German (DCQ) or Swiss (SAQ) quality organisations. The divisions printed circuit board connectors, heavy duty connectors Han® and solenoids are certified according to DIN EN ISO 9001 for design/R & D, production, assembly and customer service. The dedication to quality and the ability to deliver on a "Just in Time" basis have led to the development of strong relationships with leading original equipment manufacturers on the world market. HARTING is the market leader in several of its product ranges.



Contents



	Page
Basics of Fibre Optics	4
System Technique	5
Dimensioning of Fibre Optic Transmission Systems	6
Tables of Interface Standards and Fieldbus Systems	7
Media Converter for Bus Systems	
Media Converter for RS 485 based bus systems	8
Profibus FMS/DP	9
Profibus MCP12	10
Profibus MCP12P	11
RS 485 Interface	12
Modbus Plus	14
RS 422	15
ARCNET	17
RS 232 self-powered	19
RS 232 1 channel / 8 channel	20
Electro-Optic Converters	
F-SMA, FH-ST	23
Fibre Optic D-Sub	25
Multipole Versions	26
Han-Brid® Components	28
Quick Assembly Components for POF	
Connectors for polymer fibres	30
Connectors	
Single connectors for fibre optic cables POF	31
F.O. single connectors with glass fibres	32
Connectors for hybrid application	33
Connectors for industrial engineering plant and machinery	34
Cables	37
Fibre Optic Coupler / Splitter	35
Accessories	
Tools and test equipment	38
Accessories for cable installation	40
Power supply	41
Assembly Overview	42
List of Part Numbers	43
HARTING Product Range	46
Addresses	47

Introduction

Apart from applications in the field of telecommunications, fibre optic technology is of great importance in the industrial market sector.

In telecommunications there are requirements for:

- High transmission capacity
- Low cable attenuation
- No crosstalk

These features are also required in the industrial sector along with the following major considerations:

- Zero susceptibility to electromagnetic interference
- Electrical insulation between transmitter and receiver
- Small cable diameter

Fibre optic communication works by pulses of light. When feeding them in at one end of the fibre optic cable, the pulses are passed to the other end by total internal reflection.

Total internal reflection occurs at the boundary layer between core and cladding by virtue of the different values of optical refractive index (n) between the two materials ($n_{\text{cladding}} < n_{\text{core}}$).

There are three different types of optical fibres:

	Typical Dimensions Core/Cladding \varnothing	Attenuation
Step index (SI) fibre HCS / POF	200 / 230 mm 980 / 1000 mm	5 ... 8 dB/km 0.2 dB/m
Gradient index (GI) fibre	50 / 125 mm 62.5 / 125 mm	2.6 dB/km 3.2 dB/km
Single mode fibre	9 / 125 mm	< 0.3 dB/km

optical refractive index profile

The single-mode fibre is mainly used in telecommunications because of its low attenuation and wide bandwidth.

The gradient index fibre and the step fibre with their large core diameters are chiefly used as communication cables in industrial applications due to their easy handling and relatively low costs. The link length ranges from several meters to several kilometers.

Mounting of connectors for gradient fibres is achieved by the use of adhesive.

For POF²⁾ or HCS¹⁾ fibres, the crimping technique eases the connector attachment. With the advanced HARTING quick assembly components, POF-cables can be mounted without the need of special tools.

HARTING F.O. systems are designed for gradient index fibres with a core diameter of 50 and 62.5 mm as well as for 200 mm (HCS) and 1 mm (POF) step index fibres.

The typical operating wavelengths are 660 nm (POF, HCS), 850 nm (GI, HCS) and 1300 nm (GI).

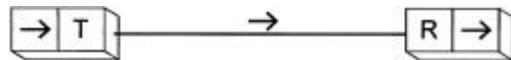
¹⁾ HCS® (=Hard Clad Silica) is registered trade mark of SpecTran Corporation

²⁾ POF = Polymer Optical Fibre

System Technique

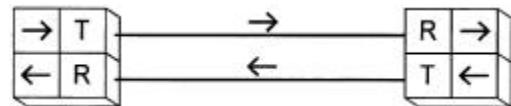
Electrical signals to be transmitted by fibre optic must be converted into pulses of light and vice versa. For this purpose there are electro-optic converters available as transmitter (T) and receiver (R) modules.

Simplex



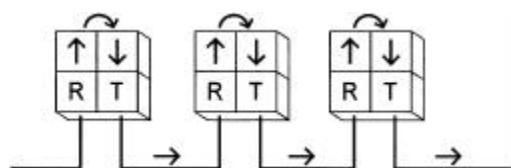
A simplex link is defined by the signal transmission in a single direction. Data transmission in two directions is performed in a duplex link. With these configurations, point-to-point links can be realized. Usually separate fibres for each direction are used.

Duplex



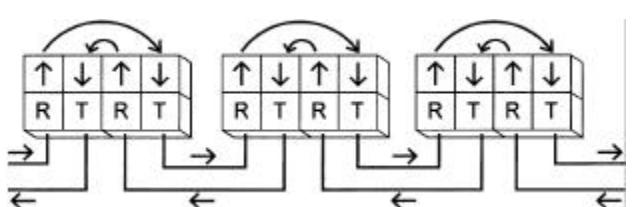
The interconnection of multiple units in a communication system can be achieved in different configurations at the optical line signals are passed through each participant in one direction only. Each participant transmits the received optical signal to the next station (repeater functionality). If the optical line is closed to a ring-structure, bi-directional communication between the participants, is possible.

Optical line, optical ring



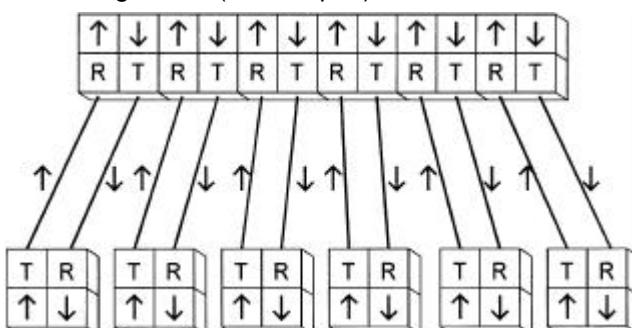
The linear duplex bus is the combination of two contrary lines. Each participant has two transmitting and receiving modules passing received optical signals to the opposite direction and vice versa (repeater functionality).

Linear duplex bus



In a star configuration a central point is the connection station for each participant. A transceiver module for each participant is installed at this point. Each star shaped split can be enlarged with the above mentioned configurations.

Star configuration (star coupler)



Dimensioning of F.O. Transmission Systems

For reliable operation of a F.O. data transmission system it is essential that the transmitted optical signals arrive at the receiver with sufficient amplitude. The incident power should at least exceed twice (+ 3 dB) the value of the minimum sensitivity of the receiver. Otherwise, the inherent noise of the system may result in increasing randomly distributed transmission errors in the data transfer. Therefore, in system design the power budget of the optical path has to be checked. The following aspects have to be considered:

- **Optical power output of the transmitter**

The optical power generated by the LED depends mainly on the applied forward current.

Typical power levels coupled into the core are

50/ 125 mm GI fibre:	80 mW	at	I = 850 nm
200/ 230 mm SI fibre:	250 mW		
980/1000 mm Polymer fibre:	600 mW	660 nm	

- **Specific attenuation-coefficient of the fibre**

The specific attenuation of optical fibres depends on the wavelength applied and is specified in dB/km.

Typical values for glass-fibres are

50/ 125 mm GI fibre:	---3 dB/km	at	I = 850 nm
200/ 230 mm HCS:	---5 dB/km		

for Polymer fibre:

980/1000 mm (PMMA): ---0.2 dB/m I = 660 nm.

The fibre loss usually contributes to the highest amount to the overall transmission index of the optical link.

- **Additional interconnections in the cable system**

Interconnections in the optical link create some further attenuation for the travelling optical signals.

Typical insertion loss is

for a spliced connection 0.3 dB

for a connector-set 0.8 - 0.5 dB

depending on the type of fibre and the connectors applied.

- **Sensitivity of the optical receiver**

DC-coupled optical receivers, commonly used, with SI-diodes as receiving elements show typical minimum sensitivities of

£ 3 mW at 850 nm (glass fibre systems)

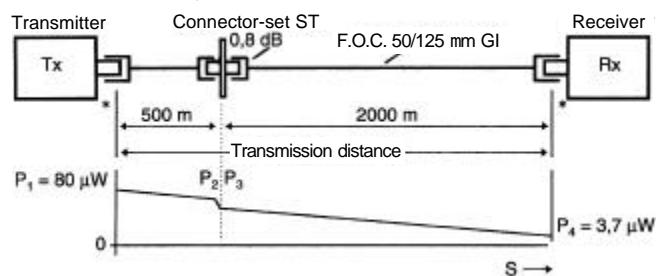
£ 5 mW at 660 nm (polymer fibre systems).

- **Temperature dependence and ageing of LED, thermal influence on cable loss**

These items should be taken into account with an amount of 2 dB. Thus, in total a system reserve of 5 dB has to be considered in the link power budget.

Examples

a) Glass fibre system (I = 850nm)



Link budget analysis:

Transmitter

$$P_1 = 80 \text{ mW} = -11 \text{ dBm}$$

power coupled into fibre core

$$\text{Cable Loss: } 2.5 \text{ km} \times 3 \text{ dB/km} = 7.5 \text{ dB}$$

$$\text{Loss per connector set ST} = 0.8 \text{ dB}$$

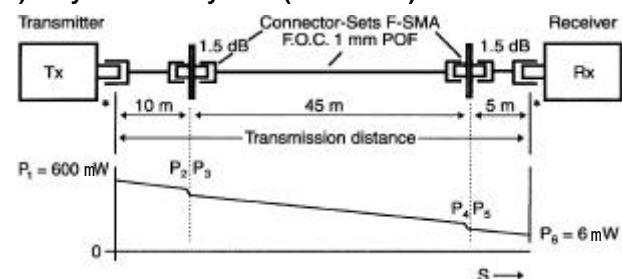
$$\text{System reserve (3 dB + 2 dB)} = 5.0 \text{ dB}$$

$$\text{Total system losses: } 13.3 \text{ dB}$$

Incident power at receiver: $P_4 = -24.3 \text{ dBm} = 3.7 \text{ mW}$
This satisfies the required minimum-conditions $\geq 3 \text{ mW}$

* The injection- and decoupling-loss at the transmitter- and receiver-ends of the fibre has not additionally to be taken into account as they are already included in the given power ratings of these elements.

b) Polymer fibre system (I = 660nm)



Link budget analysis:

Transmitter

$$P_1 = 600 \text{ mW} = -2.2 \text{ dBm}$$

power coupled into fibre core

$$\text{Cable loss: } 60 \text{ m} \times 0.2 \text{ dB/m} = 12 \text{ dB}$$

$$2 \text{ connector-sets F-SMA (2} \times 1.5 \text{ dB)} = 3.0 \text{ dB}$$

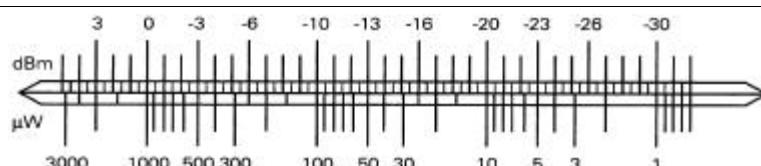
$$\text{System reserve (3 dB + 2 dB)} = 5.0 \text{ dB}$$

$$\text{Total system losses: } 20.0 \text{ dB}$$

Incident power at receiver: $P_6 = -22.2 \text{ dBm} = 6.0 \text{ mW}$
This satisfies the required minimum-conditions $\geq 5 \text{ mW}$

Omitting the additional interconnections in the cable (e.g. the 2 F-SMA connector sets) results in greater maximum transmission distances.

Conversion-Diagram



Tables of Interface Standards and Fieldbus Systems

HARTING can offer media converters and connector systems for most of the well known electrical interface standards and fieldbus protocols.

Table of electrical interface standards

	TTL	RS 232	RS 422	RS 485
Interface logic	voltage level	voltage level	differential voltage	differential voltage
Transmission principle	application specific	bi-directional fullduplex on min. 3 ¹⁾ to 9 ²⁾ wires	fullduplex, bi-directional on two twisted pair cables	halfduplex, bi-directional on one twisted pair cable
Logic level "high" Logic level "low"	2.4 ... 5 V 0 ... 0.8 V	-15 V ... -3 V +3 V ... +15 V	D U > 0.2 V D U < -0.2 V	D U > 0.2 V D U < -0.2 V
Max. data rate	application specific	19.2 kBit/s 115 kBit/s	12 MBit/s (20km) 100 kBit/s (1.2 km)	12 MBit/s (20km) 100 kBit/s (1.2 km)
Max. link length with Cu-wires	application specific	20 m	20 m - 1.2 km	100 m - 1.2 km

¹⁾ hardware-handshake, ²⁾ software-handshake

HARTING media converters for fieldbus systems

Fieldbus system	HARTING product	Page
Profibus FMS	Media Converter MCP 12 and MCP 12 P	9 - 11
Profibus DP		
Sinec L2		
Suconet P		
Suconet K	RS 485 Converter	12, 13
CS 31 (ABB)		
Modbus Plus	RS 485 MB + Converter	12, 14
Interbus-S	RS 422 Converter	15, 16
Suconet S		
ARCNET ^{®3)}	Arcnet Converter	17, 18

Concerning electro-magnetic compatibility HARTING Media Converters comply with the relevant specifications

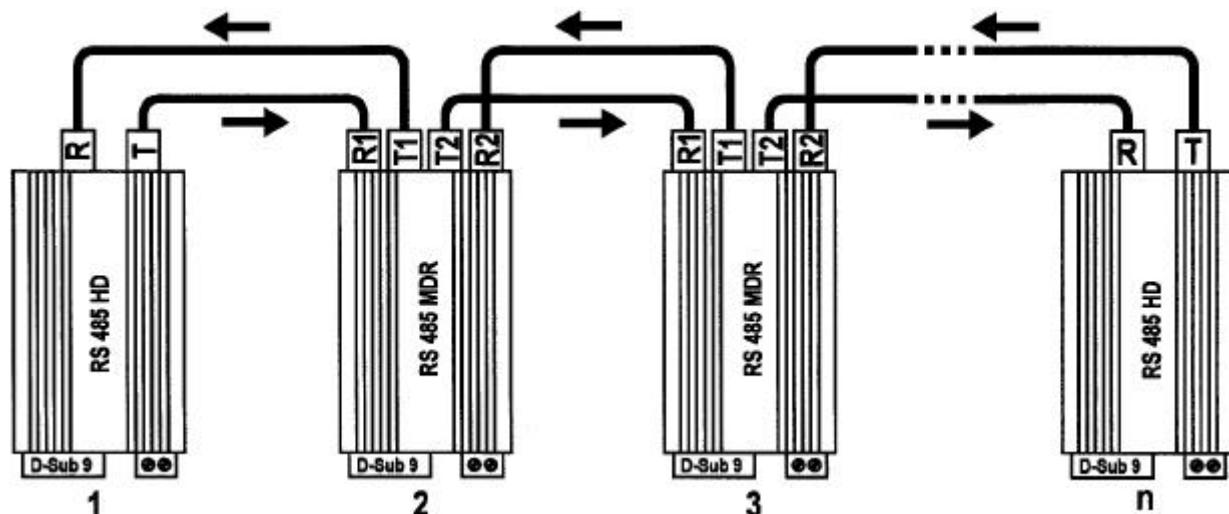
³⁾ ARCNET® is registered trade mark of Datapoint Corporation

Converter for RS 485-based bus systems

The HARTING media converter RS 485, RS 485 MB+, MCP12 and MCP12P are suitable for point-to-point links or linear duplex bus systems between units with an electrical interface according to the EIA RS 485 Standard. Typical applications can be found in data acquisition and process automation via fieldbus systems.

For point-to-point links converters with one electrical and one optical port are used (version HD).

For optical bus systems with several participants at the beginning and the end of the bus structure HD converters are used. As optical intermediate devices converters with two optical transceiver ports (MDR-version) are installed. Several optical linear duplex bus systems can be connected to each other by linking the electrical ports of the converter. Thus complex bus structures can be achieved.



Application for an optical linear duplex bus system.

Each participant in this bus system can communicate with each other. This bus structure is capable of multimaster operation. The link length between two converters depends on the converter and fibre used. Distances of several kilometers are possible. The total system's extension can be realized depending on the number of converters used.

Functional principle of the converter: received electrical data is directly transmitted from the optical ports. Similarly, received optical data is converted into electrical signals and with MDR-versions, reconverted into optical signals to be transmitted from the opposite optical port.

Due to physical effects of the electro-optical conversion, the signal is distorted.

The Media Converter for Profibus MCP12P completely compensates for this distortion. The number of these converters in a bus system is not limited by the adding of the pulse-width distortions in each converter. Only the total time delay of the system limits the width of the bus system. Due to the automatic data rate recognition these devices are not protocol transparent.

All remaining converters operate without the signal retiming. The maximum number of units in a bus system is limited by the maximum tolerable pulse-width distortion in the system. These converters are normally protocol transparent. Application hints are available on request.

Features

- Setup of optical bus systems
- Data rates of up to 12 MBit/s
- Automatic data rate recognition
- Bit retiming for theoretical unlimited cascading
- Two versions available. For panel mounting (MCP12) and for harsh environments (MCP12P)

¹⁾ HCS® (=Hard Clad Silica) is registered trade mark of SpecTran Corporation

²⁾ POF = Polymer Optical Fibre

MCP12

- Designed for HCS¹⁾, POF²⁾ or glass fibre cable
- Segment lengths up to 5 km
- Redundant power supply possible
- Small dimensions

MCP12P

- Designed for POF or HCS hybrid cable
- Equipped with hybrid-connector Han-Brid® (according to DESINA and Profibus standard)
- Power supply via hybrid cable, no additional power supply required
- Degree of protection: IP 65

Technical Details

Electrical interface	Profibus FMS/DP (acc. to EN 50170 / EIA-RS 485), galvanically separated
Data rate	9600 Bit/s bis 12 MBit/s, automatic data rate selection
Electromagnetic compatibility	acc. to EN 50081-1, EN 50082-2
Indicator LED's	Power supply, per channel: received data and fault
Ambient temperature	0 ... 50°C

MCP12

Optical connector	HP-Versatile Link (660 nm), ST (850 nm/1300 nm)
Electrical connector	9-pin D-Sub
Bus termination	Integrated, switchable
Power supply	24 V ± 20 %, typ. 80 mA (max. 150 mA), supply over 2 screw terminal pairs with possible redundancy
Mounting	Standard rail 35 mm acc. to DIN 50 022
Degree of protection	IP 20
Housing	Polystyrol, impact resistant
Dimensions (w x h x d)	Approx. 32 mm x 100 mm x 90 mm (excluding connectors)
Delivery	Media Converter, installation manual

MCP12P

Connector optical-hybrid	2 x Han-Brid®
Bus connection	Pg-sealing, cage clamp
Bus termination	Integrated, switchable
Power supply	24 V ± 20 %, typ. 100 mA (max. 150 mA), via hybrid cable
Current rating of electrical contacts	10 / 16 A
Mounting	Wall mounting with screws
Degree of protection	IP 65
Housing	Aluminium
Dimensions (w x h x d)	Approx. 125 mm x 80 mm x 57 mm (excluding connectors and cable gland)
Delivery	Media Converter, installation manual

Media Converter for Bus Systems



Media Converter Profibus MCP12

Identification	Part-Number	Drawing	Dimensions in mm
Media Converter			
MCP12 660 (660nm) MCP12 660 MDR	20 40 002 3646 20 40 004 3646		
MCP 12 850 (850 nm) MCP 12 850 MDR	20 50 002 3626 20 50 004 3626		

Power supply 24 V

see page 41

Technical Details

Maximum fibre length per segment

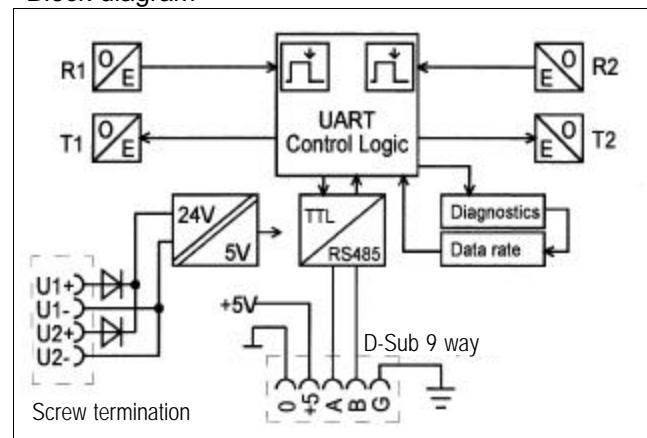
Fibre type	MCP12 660	MCP 12 850
POF 980/1000m	50 m	-
HCS 200/230m	300 m	-
GI 62,5/125 m	-	2500 m

Signal delay calculation

$$t = l_{\text{fibre}} \cdot 5 \cdot 10^{-6} + n_{\text{MCP12}} \cdot \frac{1,5}{f_{\text{Bit}}}$$

with
 l_{faser} = fibre length in m
 n_{MCP12} = number of cascaded MCP12(P)
 f_{Bit} = data rate in kBaud
 t = signal delay in ms

Block diagram



R 2 and T 2 only at MCP12 xxx MDR

Media Converter for other bus systems on request

Media Converter for Bus Systems



Media Converter Profibus MCP12P

Identification	Part-Number	Drawing	Dimensions in mm
Media Converter MCP12P	20 40 004 3647	<p>The drawing shows the front panel of the converter with three M12 connectors labeled PS (Profinet), Fibre 1, and Fibre 2. It also shows a 'Media Converter MCP12P' label and a CE mark. The rear panel dimensions are indicated: a width of 125.0mm, a height of 57.0mm, and a depth of 80.0mm.</p>	125.0mm 80.0mm Height 57.0 mm

Technical Details

Maximum fibre length per segment

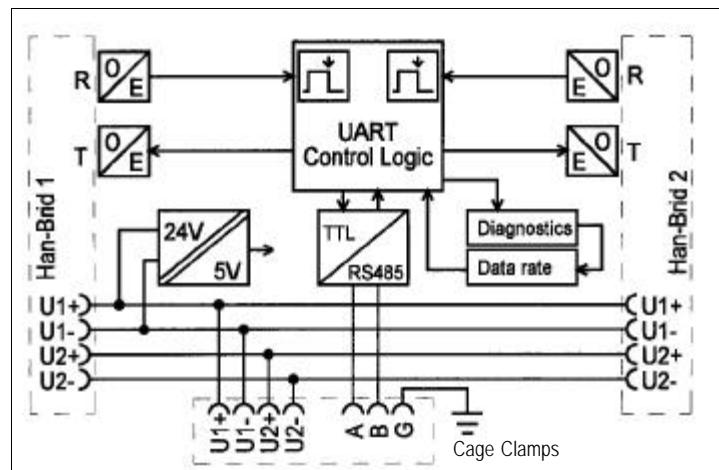
Fibre type	Fibre length
POF 980/1000m	50 m
HCS 200/230m	300 m

Signal delay calculation

$$t = l_{\text{fibre}} \cdot 5 \cdot 10^{-6} + n_{\text{MCP12}} \cdot \frac{1,5}{f_{\text{Bit}}}$$

with l_{fibre} = fibre length in m
 n_{MCP12} = number of cascaded MCP12(P)
 f_{Bit} = data rate in kBaud
 t = signal delay in ms

Block diagram



Media Converter for other bus systems on request

Media Converter for RS 485-Interfaces

- Point-to-point links or bus-structures between units with electrical interfaces according to EIA RS 485
- Data rate up to 2 MBit/s
- Protocol transparent conversion
- Multi-master capability
- Variants with different pin-outs
- Special versions for Modbus Plus-systems (MB +) with galvanically separated electrical interface

Technical Details

	RS 485 Standard	RS 485 MB +
Electrical interface	EIA RS 485	Modbus Plus - Bus termination
Data rate	max. 2 MBit/s	1 MBit/s Biphase S
Opt. port	F-SMA, FH-ST	FH-ST
Opt. wave-length	660 nm / 850 nm	850 nm
Mode of operation	halfduplex	
Bit-error rate	< 10 ⁻⁹	
Diagnostics	LED's for VCC, RxD	LED's for VCC, RxD + electr. diagnostics output
Power supply	9 ... 30 V DC via screw terminals	
Link length	POF: max. 80m, GI: max. 2000 m	max. 2000 m
Temperature range	Operation: 0 ... 60 °C	
Mounting	Standard rail 35 mm acc. to DIN 50 022	

Pin-out of the electrical connector D-Sub 9ways female:

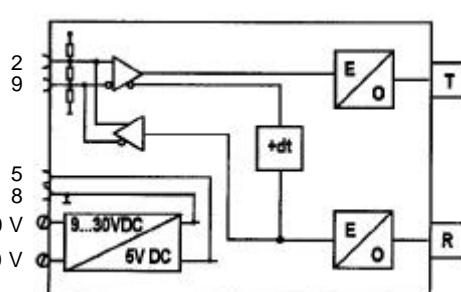
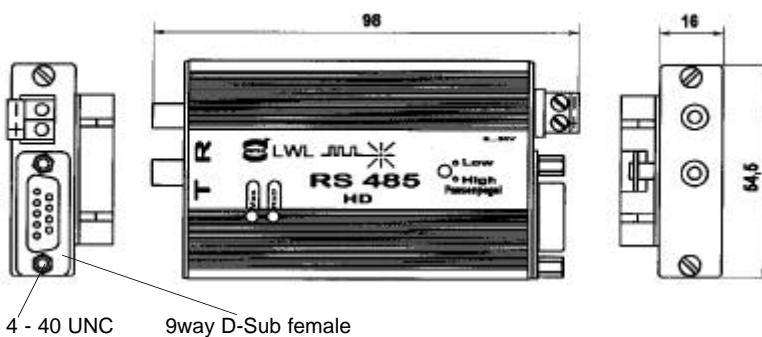
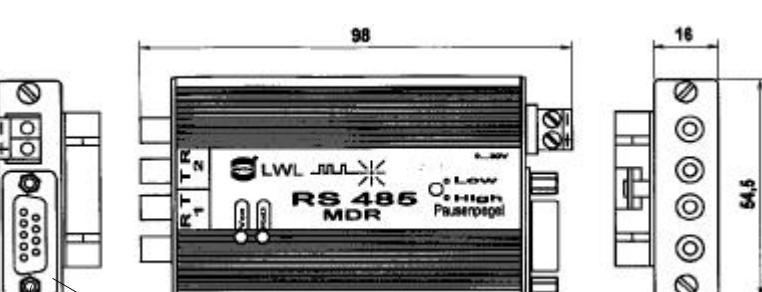
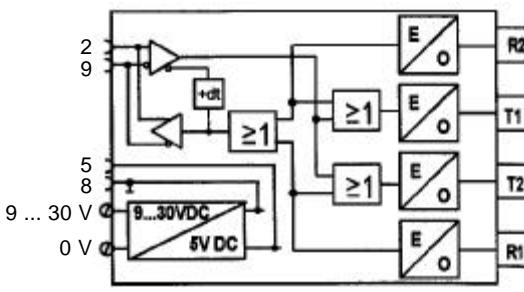
Pin-No	RS 485 Standard	RS 485 MB +
1	(shield / earth) ¹⁾	(shield / earth) ¹⁾
2	Data A	Data
3		Data
5	+ 5 V out	+ 5 V out
6		Gnd
8	Gnd	
9	Data B	

¹⁾ optional, shield / earth preferred via D-Sub-shell

Media Converter for Bus Systems



RS 485

Identification	Part-Number	Drawing	Dimensions in mm
Media Converter RS 485		The devices provide a selectable recessive bus-level "high" or "low"	
optical link: for POF ²⁾ F-SMA 660 nm	20 40 002 3612		
optical link: for GI FH-ST 850 nm	20 50 002 3622	 4 - 40 UNC 9way D-Sub female	98 16 54.5
Media Converter RS 485 MDR		Block diagram	
optical link: for POF ²⁾ F-SMA 660 nm	20 40 004 3611	 4 - 40 UNC 9way D-Sub female	98 16 54.5
optical link: for GI FH-ST 850 nm	20 50 004 3621	Block diagram RS 485 Multidrop	
Power supply	see page 41		

2) POF = Polymer optical fibre

Media Converter for Bus Systems



Modbus Plus



Description

- System diagnostics are given by a Rx-data signal via the screw terminals
- Rotary switch for the adaption of the optical output power

Identification	Part-Number	Drawing	Dimensions in mm
Media Converter RS 485 MB+			
optical link: for GI FH-ST 850 nm	20 50 002 3625	<p>4 - 40 UNC 9way D-Sub female</p>	
Media Converter RS 485 MB+ MDR			
optical link: for GI FH-ST 850 nm	20 50 004 3625	<p>4 - 40 UNC 9way D-Sub female</p>	
Power supply	see page 41	<p>Block diagram RS 485 MB+</p>	<p>RS 485 MB+ MDR</p>

RS 422

- Optical point-to-point interconnections or ring bus systems with units equipped with electrical interfaces acc. to EN RS 422 A / CCITT V.11 ("4-wire")
- Protocol transparent data transmission
- Repeater functionality can be manually and electrically controlled

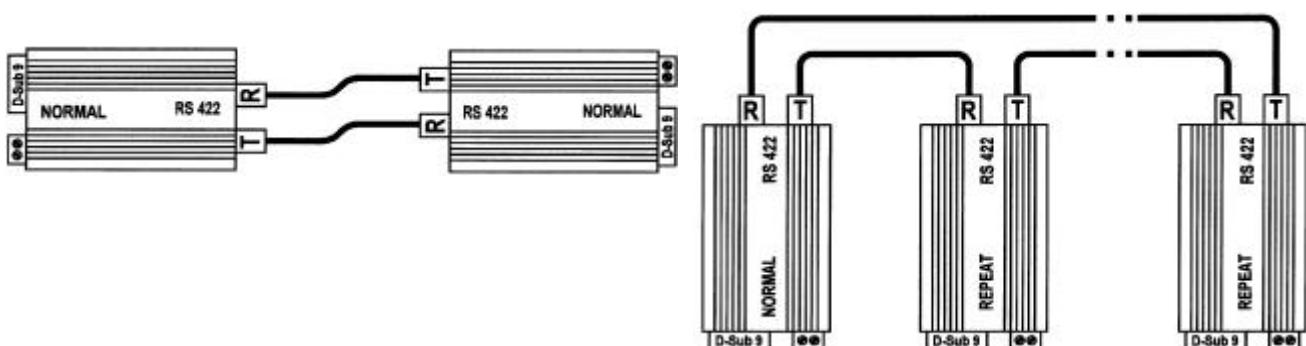
Technical Details

Electrical interface	: EIA RS 422, CCITT V.11
Data transmission rate	: 0 ... 5 MBit/s
Optical interface	: for FOC connectors type F-SMA or FH-ST
Wave-length	: λ = 850nm for glass fibre : λ = 660nm for plastic fibre
Mode of operation	: fullduplex anasynchronous
Bit error rate	: < 10 ⁻⁹ over the entire range of data transmission
Operational check	: internal monitoring, LED lamps
Supply voltage	: 9 ... 30 V DC via screw termination
Temperature range	: 0 ... 60°C during operation
Transmission distance	: max. 2000 m for glass fibre max. 80 m for plastic fibre
Mounting	: Standard rail (35 mm) mounting acc. to DIN 50 022

Variants of optical links

In point-to-point applications the wiper switches have to be in the "NORMAL" position at both interface units.

Ring bus systems require a "NORMAL" selection at one single device. All the other units work in the "REPEAT" mode, thus preventing optical oscillation.



Permissible tolerances in signal distortion and delay determine the number of subscribers in a ring bus system. Notes for dimensioning are available on request.

Media Converter for Bus Systems



RS 422

Identification	Part-Number	Drawing	Dimensions in mm	
Media Converter RS 422		The devices provide a mode selection for bus-applications (repeater).		
full duplex 4 wire transmission				
external power supply: 9 ... 30 V DC				
optical link: for POF ²⁾	F-SMA 660 nm			
optical link: for GI	FH-ST 850 nm			
			98	
			16	
			54.5	
Pin loading 9way D-Sub female				
<small>²⁾ POF = Polymer optical fibre</small>				
Power supply for RS 422	see page 41			



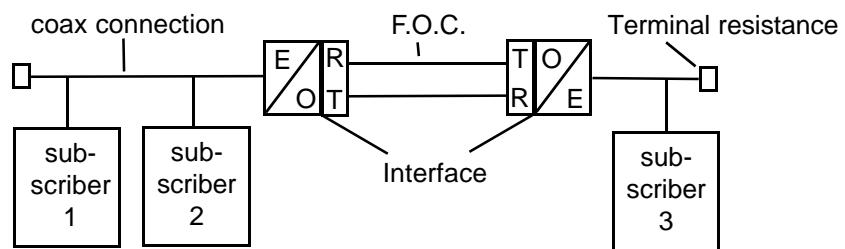
ARCNET®

Technical Details

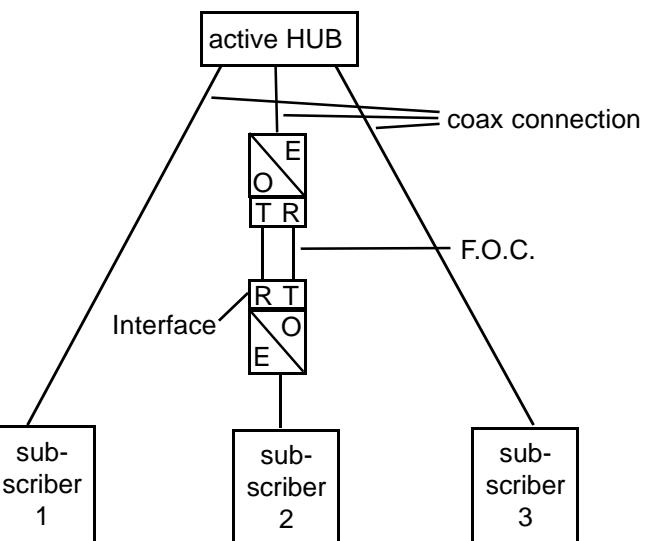
Supply voltage	: 9 ... 30 V DC (screw terminal)
Power consumption	: 300 mA max.
Data rate	: 2.5 MBit/s
Transmission range	: max. 2500 m with glass fibre ($\lambda = 850\text{nm}$) max. 80 m with plastic fibre (POF, $\lambda = 660\text{nm}$)
Temperature range	: 0 ... 60°C in operation
Mounting	: standard rail mounting (35 mm) acc. to DIN 50 022

Application

Bus topology



Star topology



Media Converter for Bus Systems



ARCNET®



Description

- Media Converter for the use in ARCNET®-networks
- Optical point-to-point connections over distances up to 2.5 km possible
- Applications in networks with bus or star topology possible
- Waveforms and data rate in accordance with ARCNET® standards
- No external termination resistor at the converter necessary

Identification	Part-Number	Drawing	Dimensions in mm
Media Converter ARCNET®			
optical link: for POF F-SMA 660 nm	20 40 002 3711		
optical link: for GI FH-ST 850 nm	20 50 002 3721		
		Block diagram	
Power supply for ARCNET®	see page 41		

Media Converter



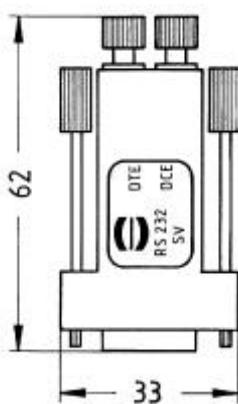
RS 232 self-powered

Description

This self-powered FO-interface is suitable for the interconnection of PCs and all peripheral devices equipped with RS 232 interface.

The benefits are

- no additional power supply required, the necessary power is directly extracted from the data signal
- connector-less FOC mounting
- small dimensions
- no special tools for mounting required

Identification	Part-Number	Drawing	Dimensions in mm
Media Converter RS 232 self-powered			
9way D-Sub female	20 40 002 3448		
male adaptor	20 80 000 3052		62 33 Depth: 15 mm

Pin-configuration:

9way D-Sub female
DCE / DTE selectable by switch

Pin 2: TxD / RxD
Pin 3: RxD / TxD
Pin 7/8: connected
Pin 1/4/6: connected
Pin 5: Gnd

Note:

This interface only transmits the signals of RxD- and TxD-lines (no handshake signals). A proper function of this device requires a permanent spacing-level according to RS 232 standard.

Transmission rate*: 50 m incl. 3dB power margin
Suitable fibre: POF 980/1000 mm

* Signal source with an internal resistance of 100 W. Lower (higher) source resistance may result in an increased (decreased) transmission range.

Media Converter



RS 232-1-channel
RS 232-8-channel



Description

RS 232-1-channel

- Suitable for systems with software handshake
- 25-pin version is designed for point-to-point links
- 9-pin version is designed for point-to-point and linear duplex bus structures (see page 5 and 8)
- Switch-over facility from DTE to DCE mode
- Possibility for change of interface between RS 422 and RS 232
- 9-pin and 25-pin versions are not compatible

RS 232-8-channel

- Suitable for the data transmission at interfaces according to EIA RS 232 / V 24 with all handshake-signals
- Pin configuration of the 25way D-Sub connectors corresponds to DCE according to CCITT standard for modems
- Transmission of 8 RS 232 channels via one fibre optic duplex link due to time multiplexing with synchronisation

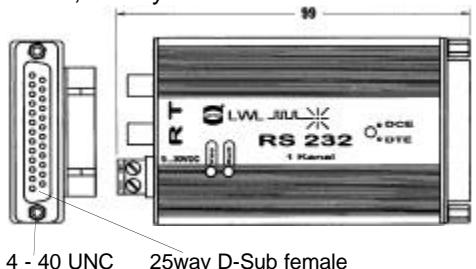
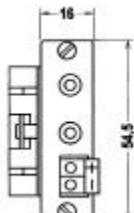
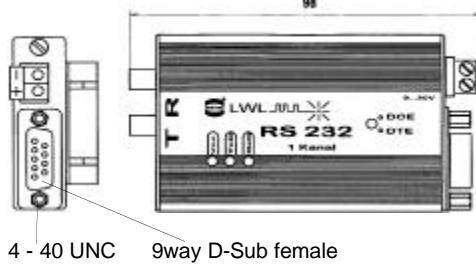
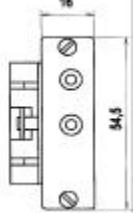
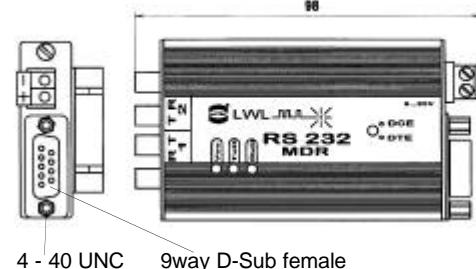
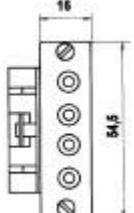
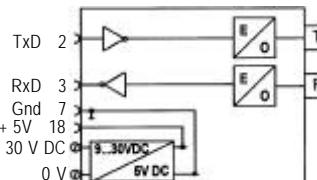
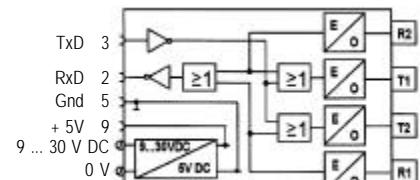
Technical Details

Technical Details	RS 232-1-channel	RS 232-8-channel
Electrical interface	RS 232-C / V 24 1-channel duplex	RS 232-C / V 24 8-channel duplex
Operating wave-length	$\lambda = 660 \text{ nm}$ for plastic fibre, $\lambda = 850 \text{ nm}$ for glass fibre	
Mode of operation	full duplex, asynchron	
Data rate	0 ... 120 kBis/s	0 ... 19.2 kBit/s
Bit error rate	$< 10^{-9}$	
Link length	max. 2500 m for glass fibre, max. 80 m for plastic fibre	
Power supply	9 ... 30 V DC / 170 mA via screw terminal	9 ... 30 V DC / 150 mA via screw terminal
Temperature range	0 ... + 60 °C	
Mounting	standard rail mounting (35 mm) acc. to DIN 50 022	

MediaConverter



RS 232-1-channel

Identification	Part-Number	Drawing	Dimensions in mm
Interface 1-channel duplex RS 232-C/V 24 Standard: electrical link 25way D-Sub female optical link: F-SMA for POF ²⁾ 660 nm	20 40 002 3411	RS 232-C / V 24, 25way  	98 16 54.5
optical link: FH-ST for GI 850 nm	20 50 002 3421		
<small>²⁾ POF = Polymer optical fibre</small>			
Interface 1-channel duplex RS 232-C/V 24 Standard: electrical link 9way D-Sub female optical link: F-SMA for POF ²⁾ 660 nm	20 40 002 3412	RS 232-C / V 24, 9way  	98 16 54.5
optical link: FH-ST for GI 850 nm	20 50 002 3422		
Interface 1-channel duplex RS 232-C/V 24 MDR Standard: electrical link 9way D-Sub female optical link: F-SMA for POF ²⁾ 660 nm	20 40 004 3411	RS 232-C / V 24 MDR, 9way  	98 16 54.5
optical link: FH-ST for GI 850 nm	20 50 004 3421		
Power supply	see page 41	Block diagram  	Contacts: 6, 8, 20 (DSR, DCD, DTR) connected 4, 5 (RTS, CTS) connected
			Contacts: 1, 4, 6 (DCD, DTR, DSR) connected 7, 8 (RTS, CTS) connected

Media Converter



RS 232-8-channel Multiplexer



Identification	Part-Number	Drawing	Dimensions in mm	
Multiplexer 8-channel duplex RS 232-C/V 24				
optical link: for POF ²⁾ F-SMA 660 nm	20 40 016 3411			
optical link: for GI FH-ST 850 nm	20 50 016 3421			
Block diagram of the 8-channel multiplexer				
Power supply	see page 41			

²⁾ POF = Polymer optical fibre

Pin loading of the RS 232 interface for DCE-mode

Symbol acc. to DIN 66 020 part 1	Description	Data Line	Control line	Timing	Pin loading	Direction of data
E 2 S-Ground	System ground				7	
D 1 TxD	Data transmitted	x			2	Input
D 2 RxD	Data received	x			3	Output
S 1.1 DTR	Switch on transmission line		x		20	Input
S 1.2	D/L system ready for operation					
M 1 DSR	Readiness for operation		x		6	Output
S 2 RTS	Switch on transmitter		x		4	Input
M 2 CTS	Readiness to transmit		x		5	Output
T 1 T-Set DTE	Timing of transmission pulses to the D/L end unit			x	24	Input
T 2 TC	Timing of transmission pulses from the D/L end unit			x	15	Output
S 4 DSRS	Switch on high data transmission rate	x			23	Input
M 4 RLSD	High data transmission rate	x			12	Output
STF	Legibility of reception	x			11	Input
M 6 SQ	Legibility of reception from D/L end unit	x			21	Output
T 4	Timing of reception from the D/L end unit			x	17	Output
T 3	Timing of reception to the D/L end unit			x	14	Input
M 5 DCD	Level of reception signal	x			8	Output
S 11	Switch on receiver	x			19	Input

Electro-Optic Converters



for fibre optic transmission

Identification	Part-Number	Drawing	Dimensions in mm
FO transmitter for PBC mounting receptacle (metal) LED 850 nm in F-SMA housing in FH-ST housing LED 660 nm in F-SMA housing in FH-ST housing	20 50 000 1111 20 50 000 1121 20 40 000 1111 20 40 000 1121		F-SMA FH-ST
F-SMA fixing nut	20 80 000 1072		

Technical Details

General data at T = 25°C

		LED 850 nm	LED 660 nm
Analog band-width	BWE :	80 MHz ($I_F = 100$ mA DC)	7 MHz ($I_F = 30$ mA)
Optical wave-length	I :	850 nm	660 nm
Spektral band-width	DI :	50 nm	30 nm
Drive current	$I_{Fmax.}$:	100 mA	70 mA
Forward voltage	U_V :	1.6 ... 1.8 V typ.	1.7 ... 2.0 V
Derating at 25°C	I_F :	0.8 mA/°C	0.93 mA/°C
Reverse voltage	$U_{Rmax.}$:	4 V	4 V
Storage temperature	T_{Str} :	-40 °C ... +100 °C	-35 °C ... +100 °C
Operating temperature	T_{Opr} :	-40 °C ... +100 °C	-30 °C ... + 85 °C
Power coupled into fibre (at $I_F = \text{max.}$)			
in 50/125 GI	P_s :	12 mW min.	
in 200/230 SI	P_s :	120 mW min.	
in 980/1000 POF	P_s :		600 mW min.

The technical specifications for the **SERCOS-Interface** are fulfilled by the LED 660 nm.

SERCOS = SERiel Realtime COmmunication System

Electro-Optic Converters



Identification	Part-Number	Drawing	Dimensions in mm
FO receiver for PBC mounting receptacle (metall) TTL 5 MBit/s in F-SMA housing in FH-ST housing	20 50 000 2112 20 50 000 2222		The mounted, integrated receivers are suitable for applications in combination with glass fibre as well as polymer fibre. Dimensions of housing see page 23.
Si-PIN Photodiode* in F-SMA housing in FH-ST housing	20 50 000 2119 20 50 000 2229		

* Technical data on request

Technical Details

General data at T = 25°C

Receiver type 0 ... 5 MBit/s
(DC coupled)

Supply voltage	V _{cc} :	4.5 ... 5.5 V DC
Supply current	I _{cc} :	15 mA max.
Opt. power input (minimum value)		3 mW min. 5 mW min.
Fan out	:	4
Storage temperature	T _{Str} :	-65 °C ... +100 °C
Operating temperature	T _{Opr} :	-55 °C ... + 70 °C

The technical specifications for the **SERCOS-Interface** are fulfilled by the LED 660 nm and the receiver 5 MBit/s.

SERCOS = SEriell Realtime COnnunication System

Electro-Optic Converters



in duplex style for short range transmission
with optical fibres ($\lambda = 660$ nm)



Description		Technical Details																												
<ul style="list-style-type: none"> • Electro-optical converters integrated into D-Sub connector shell housings • Cost-effective solution for fibre optic duplex links • Transmission distance up to 60 m • Standard accessories for D-Sub can be applied • Suitable for 1 mm Ø polymer optical fibres ($\lambda = 660$ nm) • Special housing for heavy duty applications is available 		<p>General data at $T = 25^\circ\text{C}$</p> <table> <thead> <tr> <th></th> <th>LED</th> <th>Receiver</th> </tr> </thead> <tbody> <tr> <td>Operating voltage</td> <td>70 mA</td> <td>5 V DC $\pm 5\%$</td> </tr> <tr> <td>Drive current (max)</td> <td>300 mW (bei 20 mA)</td> <td></td> </tr> <tr> <td>Optical power</td> <td>600 mW (bei 50 mA)</td> <td></td> </tr> <tr> <td>Dynamic range</td> <td>4 mW ... 80 mW</td> <td></td> </tr> <tr> <td>Wave-length</td> <td>660 nm</td> <td></td> </tr> <tr> <td>Transmission rate</td> <td>TTL, 5 MBit/s</td> <td></td> </tr> <tr> <td>Storage temperature</td> <td>-35 °C ... +100 °C</td> <td></td> </tr> <tr> <td>Operating temperature</td> <td>-30 °C ... + 85 °C</td> <td></td> </tr> </tbody> </table>			LED	Receiver	Operating voltage	70 mA	5 V DC $\pm 5\%$	Drive current (max)	300 mW (bei 20 mA)		Optical power	600 mW (bei 50 mA)		Dynamic range	4 mW ... 80 mW		Wave-length	660 nm		Transmission rate	TTL, 5 MBit/s		Storage temperature	-35 °C ... +100 °C		Operating temperature	-30 °C ... + 85 °C	
	LED	Receiver																												
Operating voltage	70 mA	5 V DC $\pm 5\%$																												
Drive current (max)	300 mW (bei 20 mA)																													
Optical power	600 mW (bei 50 mA)																													
Dynamic range	4 mW ... 80 mW																													
Wave-length	660 nm																													
Transmission rate	TTL, 5 MBit/s																													
Storage temperature	-35 °C ... +100 °C																													
Operating temperature	-30 °C ... + 85 °C																													
Identification	Part-Number	Drawing	Dimensions in mm																											
FO D-Sub T/E female connector	20 66 009 3811																													
angled	20 66 009 3811																													
straight	20 66 009 3812																													
(Outer dimensions like 9way D-Sub female)																														
FO D-Sub male connector	20 67 009 3811		Cavities are designed for HARTING POF ²⁾ ferrules.																											
(Outer dimensions like 9way D-Sub male)																														
Ferrule	20 10 001 3232		The mounting/endface-preparation of the ferrule can be achieved by crimping, hot-plate technique or by using adhesive.																											
²⁾ POF = Polymer optical fibre			The ferrules are snap-mounted into the male connector and can be released with aid of removal tool 09 99 000 0052 (see catalogue "Heavy Duty Connectors Han [®])																											

Electro-Optic Converters



For short range data transmission with polymer optical fibres ($\lambda = 660$ nm). Multipole versions

Description

- Electro-optic converters integrated in multi-mode connectors
- Up to 16 optical lines via one connection
- Cost-effective alternative to conventional connectors
- Compact type
- Suitable for circuit board mounting
- Suitable for 1 mm Ø polymer fibres ($\lambda = 660$ nm)
- Transmission distance up to 60 m
- Configuration in custom-made application possible

Identification	Part-Number	Drawing	Dimensions in mm
Mounting device 16 cables for 1 mm POF ²⁾ -fibres with HARTING POF ferrules	20 10 016 3211		
Mounting device 16 diodes solder straight with 8 x SFH 756 with 8 x SFH 551	20 40 016 3823		
Mounting device 7 cables for 1 mm POF ²⁾ -fibres with HARTING POF ferrules	20 10 007 3211		
Mounting device 7 diodes angled with 3 x SFH 756 with 3 x SFH 250	20 40 007 3821		

²⁾ POF = Polymer optical fibre

Electro-Optic Converters



For short range data transmission with polymer optical fibres ($\lambda = 660 \text{ nm}$).
Multipole versions

Identification	Part-Number	Drawing	Dimensions in mm
Mounting device 3 cables for 1 mm POF ²⁾ -fibres with HARTING POF ferrules	20 10 003 3211		
Mounting device 3 diodes angled with 1 x SFH 756 with 2 x SFH 551 with 2 x SFH 756 with 1 x SFH 551	20 40 003 3821 20 40 003 3822		
Ferrule 1 mm POF ²⁾	20 10 001 3232	see page 25	

²⁾ POF = Polymer optical fibre

Technical Details

Transmitter (LED): SFH 756	Wave-length: Switching times: Output power ($I=10\text{mA}$): Drive current max.: Forward voltage: Operating temperature:	660 nm 100 ns 200 mW (typ.) 100 mW (min.) 50 mA 2.1 V -40 ... +80 °C
Receiver (digital): SFH 551	Wave-length: Data rate: Optical input power: Electrical output: Operating voltage: Operating temperature:	600 ... 780 nm 5 MBit/s 6 ... 400 mW TTL, open collector 3 ... 15 V -55 ... +100 °C
Receiver (photo diode): SFH 250	Wave-length: Switching times: Photo current: Operating temperature:	400 ... 1100 nm 10 ns 3 mA (at $\lambda = 660 \text{ nm}$, input power 10 mW, reverse voltage 5 V) -40 ... +80 °C

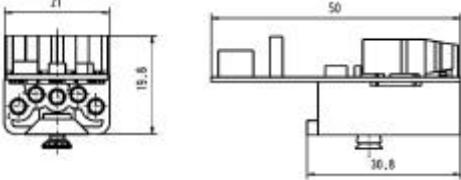
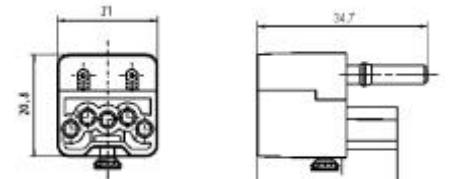
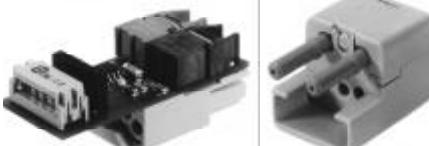
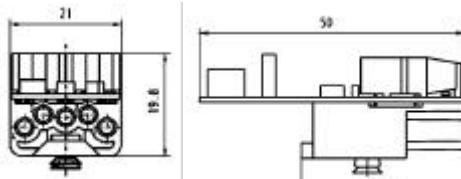
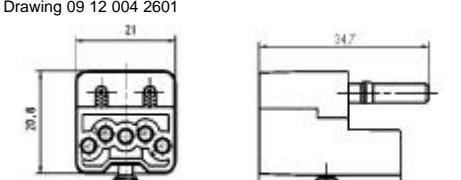
Hybrid Field Bus Connector
with FOC transmitter and receiver
+ 4 electrical contacts 10A
+ option for PE



DESINA conforming product 

For more information conc. DESINA: www.desina.de

For suitable contacts and housings see HARTING-catalogue "Heavy Duty Connectors Han®"

Insert	Part-Number	Drawing
<p>Possible combinations</p> <p>FOC(f) + Han-D®(m) FOC(m) + Han-D®(f)</p> 	<p>09 12 004 2611 09 12 004 2711</p>	<p>Drawing 09 12 004 2611</p> 
<p>also available without FOC devices</p> 	<p>09 12 004 3011 09 12 004 3111</p>	<p>Drawing 09 12 004 2711</p> 
<p>FOC(f) + Han-D®(f) FOC(m) + Han-D®(m)</p> 	<p>09 12 004 2701 09 12 004 2601</p>	<p>Drawing 09 12 004 2701</p> 
<p>also available without FOC devices</p> 	<p>09 12 004 3101 09 12 004 3001</p>	<p>Drawing 09 12 004 2601</p> 

General description

Power supply and TTL compatible signals for transmitted and received data represents the electrical device interface for the optical module. The electrical connection is realized by means of flat cables and IDCs (insulation displacement connector) or by means of a board stacker.

The devices are suitable for multimode fibre cables (980/1000m POF SI, 200/230m HCS⁽¹⁾ SI). The maximum transmission distance is 50m for POF⁽²⁾ and 300m for HCS. Data rates of 12 MBit/s NRZ are supported without having to consider the minimum link length. If requested, it is possible to realize versions with data rates up to 125 MBit/s.

Electrical Elements

- Insert for 5 Han-D® male or female contacts, possibility to combine with FOC transmitter and receiver or with FOC male contacts
- Han-D® male and female are standard crimp contacts
- Rated current: 10 A
- Rated voltage: 24 V
- Termination range: 0.14-2.5mm²

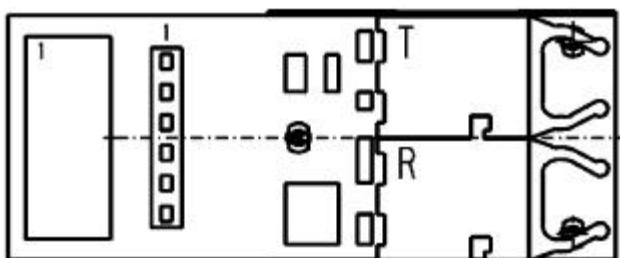
Optical Elements

- Han-Brid® offers the possibility to use all HP Versatile Link (Horizontal Package) transmitters and receivers
 - data rates up to 125 MBit/s
 - suitable for all common field bus systems
- Insert offers the possibility to use HP crimp contacts, suitable for POF⁽²⁾ (HCS⁽¹⁾ in preparation)

1) HCS® is registered trade mark of SpecTran Corporation
 2) POF = Polymer optical fibre

Optical module: Wiring plan

Technical Details



Pin Out				
	/R	GND	-5VDC	/T
Board stacker	5	4, 6	1, 3	2
IDC	8, 9	1, 4, 7, 10	2, 3	5, 6

Signal assignment:

- | | |
|-------|---|
| /R | Optical reception data (electrical output),
TTL-compatible, negative logic, I _{out max} : ±16mA |
| GND | Ground, Power supply, data |
| +5VDC | Power supply +5VDC ±5% |
| /T | Optical transmission data (electrical input),
TTL compatible, negative logic |

Optical elements: Laser classification I

Quick-Assembly Technique



Single connector for polymer fibres (POF²)

Description

Advantages of the HARTING quick-assembly technique:

- No special tools necessary
- Quick, cost-effective assembly
- No crimping, no glueing
- Fixed connection due to metallic type
- Suitable for 1 mm polymer fibre
2.2 mm jacket

Assembly of the single connectors:

- Cut the cable, strip the jacket, insert of the fibre, tighten the sleeve nut and polish the connector's tip

Assembly of the coupling sleeve:

- Cut the cable's ends, insert in the coupling sleeve and tighten the sleeve nut

Identification	Part-Number	Drawing	Dimensions in mm
Quick-assembly connector for 1 mm polymer fibre cable Ø 2.2mm			
F-SMA type with hexagonal nut bending - without protection	20 10 001 1212		
with knurled nut bending - without protection	20 10 001 1215		
- with bend protection sleeve	20 10 001 1217		
FH-ST type - without protection	20 10 001 2212		
Coupling sleeve for 1mm polymer fibre cable Ø 2.2 mm			
Standard-Set	20 80 000 1065	Delivery range: 4 x quick assembly cable coupler 1 x cutter	
Set consisting of 10 pcs	20 80 000 1066	10 x quick assembly cable coupler	

²⁾ POF = Polymer optical fibre

Connectors



Single connectors for fibre optical cables (POF²⁾)

Identification	Part-Number	Drawing	Dimensions in mm
FO connectors for 1 mm polymer fibre cable Ø 2.2 mm F-SMA type with hexagonal nut	20 10 001 1211		The connector for 1 mm POF ²⁾ may be directly attached to the fibre by crimping, glueing or by using a "hot plate". Insertion loss: POF < 2.5 dB
FH-ST type	20 10 001 2211		
Versatile Link type Crimp	20 10 001 7111		
Crimpless	20 10 001 7112		
for 1 mm polymer fibre cable 3.6 mm SERCOS F-SMA type with hexagonal nut	20 10 001 1241		
for 1 mm polymer fibre cable 6 mm SERCOS F-SMA type with hexagonal nut	20 10 001 1221		
F-TNC (IP 65) Male cable connector for 1 mm polymer fibre cable-type SERCOS Ø 6mm	20 10 001 6211		
Female cable connector for 1 mm polymer fibre cable-type Ø 2.2 mm	20 10 001 6233		

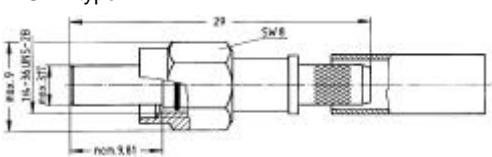
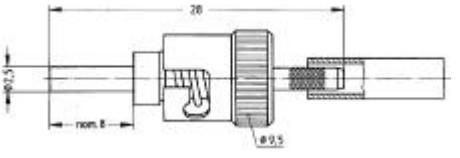
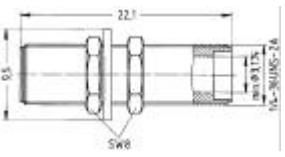
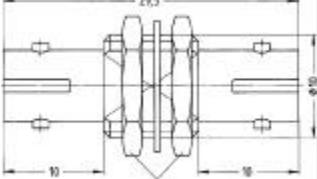
SERCOS = SEriell Realtime COmmunication System

²⁾ POF = Polymer optical fibre

Connectors



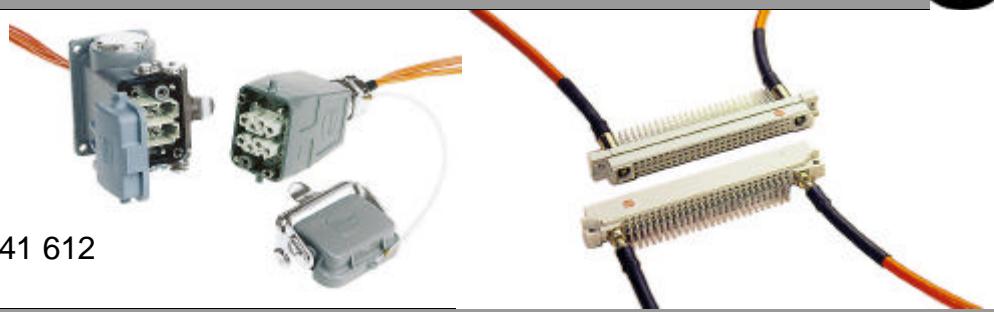
FO single connectors with glass fibres

Identification	Part-Number	Drawing	Dimensions in mm
FO connectors for GI-fibre 50-62.5/125 mm F-SMA type for cable Ø 2.8 mm FH-ST type for cable Ø 2.8 mm	20 10 125 1212 20 10 125 2212	F-SMA type  FH-ST type 	The ferrule of the FO connector for GI-fibre is ceramic
for SI-fibre (HCS) ¹⁾ 200/230 mm F-SMA type for cable Ø 2.8 mm FH-ST type for cable Ø 2.8 mm Versatile Link type for cable Ø 2.2 mm	20 10 230 1212 20 10 230 2212 20 10 230 7111		Insertion loss: F-SMA GI/SI < 1.0 dB FH-ST GI/SI < 0.5 dB
			¹⁾ HCS® (=Hard Clad Silica) is registered trade mark of SpecTran Corporation
Coupling sleeve F-SMA type	20 80 000 1071		F-SMA connector and coupling sleeve acc. to IEC 874-2
FH-ST type	20 80 000 1021		FH-ST connector and coupling sleeve acc. to IEC 874-10 CECC 86123-801

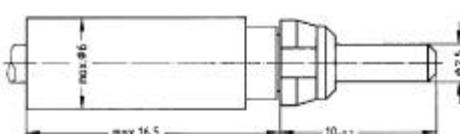
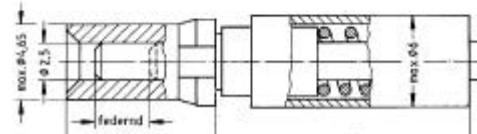
Connectors



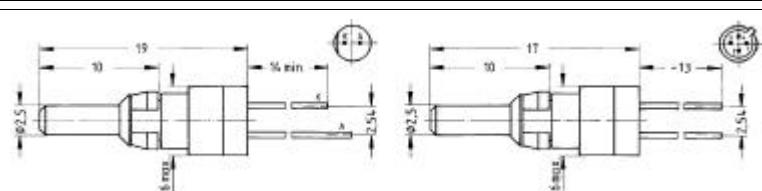
for hybrid applications



Gds A-M acc. to DIN 41 612
Han-Modular®

Identification	Part-Number	Drawing	Dimensions in mm
FO contacts acc. to CECC 78001-801 (prior 41 626 part 3) Male contact for GI-fibre 50 / 125 mm 62.5 / 125 mm metal ferrule ceramic ferrule for SI-fibre (HCS) ¹⁾ 200 / 230 mm for 1 mm POF	20 10 125 4211 20 10 125 4212 20 10 230 4211 20 10 001 4211	FO contacts for single cables and mixed loading of connectors according to: DIN 41 612 and (Gds A-M) DIN 41 652 (D-Sub) Han-Modular®	 
Female contact for GI-fibre 50 / 125 mm 62.5 / 125 mm metal ferrule ceramic ferrule for SI-fibre (HCS) ¹⁾ 200 / 230 mm for 1 mm POF ²⁾	20 10 125 4221 20 10 125 4222 20 10 230 4221 20 10 001 4221	Insertion loss: für GI/SI < 1.5 dB für POF < 2.5 dB Connector material: Stainless steel / German silver	

¹⁾ HCS® (=Hard Clad Silica) is registered trade mark of SpecTran Corporation

FO contacts acc. to CECC 78001-801 Male contact LED for 1 mm for 1 mm POF ²⁾ Male contact with receiver for 1 mm for 1 mm POF ²⁾	20 10 001 4231 20 10 001 4232	 <p>The male contact with LED for 1 mm polymer fibre contains a LED with $\lambda = 660$ nm wave-length. Technical details of the LED's see page 23.</p> <p>The male contact with receiver contains an integrated optical receiver with 5 MBit/s, TTL output. Technical details of the receiver see page 24. Other components are available on request.</p> <p>Termination technologies, contact loading and dimensions of the M-type connector acc. to DIN 41 612 as well as removal tools are to be found in the HARTING catalogue "Printed Circuit Board Connectors".</p>
--	--------------------------------------	---



High density, multipole, rugged construction connectors for industrial engineering plant and machinery

Description

HARTING connector for industrial applications

The standard hoods, housings and inserts can be used for mixed loading with contacts for fibre optic cables and for electrical applications.

- FO contacts for 1 mm POF²⁾
- Suitable for industrial connectors of the series Han® D, Han® E, Han® U, Han® K and Han-Modular®
- Mixed loading of electrical and optical contacts is possible
- Optical signals and electrical power supply in one connector
- Degree of protection IP 65, 67 and 68 for coupled connectors depends on the hoods and housings applied.

Identification	Part-Number	Drawing	Dimensions in mm								
FO contacts for Han® D contact chambers for connectors type R 15, Han® DD, Han® K Male contact Female contact	20 10 001 3211 20 10 001 3221	<table border="1"> <thead> <tr> <th>Ø</th> <th>a</th> </tr> </thead> <tbody> <tr> <td>3,7</td> <td>29,0</td> </tr> <tr> <td>3,7</td> <td>26,5</td> </tr> </tbody> </table>	Ø	a	3,7	29,0	3,7	26,5	<p>The FO contacts are only to use with the inserts of the above listed series. Details see catalogue "Heavy Duty Connectors Han®". Assembly with the aid of crimping tool 20 99 000 1032 (see page 39)</p>		
Ø	a										
3,7	29,0										
3,7	26,5										
for connectors type Han® 7, 40, 64 D Han® 8 U Male contact Han® 15 D male Female contact	20 10 001 3212 20 10 001 3213 20 10 001 3222	<table border="1"> <thead> <tr> <th>Ø</th> <th>a</th> </tr> </thead> <tbody> <tr> <td>4,0</td> <td>29,0</td> </tr> <tr> <td>4,0</td> <td>28,0</td> </tr> <tr> <td>4,0</td> <td>26,5</td> </tr> </tbody> </table>	Ø	a	4,0	29,0	4,0	28,0	4,0	26,5	
Ø	a										
4,0	29,0										
4,0	28,0										
4,0	26,5										
FO contacts for Han® E contact chambers Male contact	20 10 001 3311	<p>¹⁾ only for BUCHANAN-crimping tool in position Ø 1.45 mm</p>									
Female contact	20 10 001 3321										

²⁾ POF = Polymer optical fibre

Fibre Optic Coupler



Description

- Field of application: optical, passive networks
- Large temperature range (-30 ... +85°C)
- Robust design
- Small size
- Low attenuation
- Low crosstalk
- Especially suitable for applications in the field of automotive and sensors
- Light weight

Identification	Part-Number	Drawing	Dimensions in mm
1 x 2 coupler	20 30 001 1120		

Technical Details

Fibre: 980/1000 mm POF²
2.2 mm PE-jacket

Additional versions are available on request in different fibre lengths, in alternative fibres and pre-assembled with connectors.

Total length: 2 m

Face: polished, without connector

Fibre Optic Cables



Description

The components offered by HARTING in the field of fibre optical data transmission are suitable in combination with different types of FOC. With view to the optical transmission characteristics we differentiate between the following types of fibre:

Cables with Multimode-Gradient-Fibres (GI-Fibres)

- Suitable for transmission distances up to approx. 2 km (850 nm), approx. 5 km (1300 nm)
- Typical POF-connector termination: adhesive technique
- Typical wave length: 850/1300 nm

Cable with HCS-Step-Index-Fibres (HCS-Fibres)

- Suitable for transmission distances up to approx. 2 km (850 nm), approx. 400 m (660 nm)
- Typical POF-connector termination: Crimp termination
- Typical wave length: 660/850 nm

Cable with Plastic-Optical-Fibres (POF)

- Suitable for transmission distances up to approx. 100 m
- Typical POF-connector termination: Crimp termination, or HARTING quick assembly technique, no special tool necessary
- Typical wave length: 660 nm

¹⁾ HCS® = Hard Clad Silica, registered trade mark of SpecTran Corporation ²⁾ POF = Polymer Optical Fibre

Fibre Types (typical characteristics)

	Plastic-Optical Fibre	HCS-Optical Fibre	Glass-Optical Fibre	
Fibre type	SI	SI	GI	GI
Core / jacket Ø (mm)	980 / 1000	200 / 230	62.5 / 125	50 / 125
Attenuation coefficient (dB/km)				
at 660 nm	200	10	-	-
at 850 nm	2000	8	£ 3.5	£ 3.0
at 1300 nm	-	-	£ 0.80	£ 0.70
typ. wave length	660	660 / 850	850 / 1300	850 / 1300
Bandwidth (MHz*km)				
at 660 nm	10	-	-	-
at 850 nm	-	³⁾ 17	³⁾ 200	³⁾ 400

Cable Plastic Materials

Material designation		Polymers (Low Smoke Zero Halogen)	Polyvinylchloride	Polyethylene	Polyurethane	Polyamide
Abbreviation		LSOH	PVC	PE	PUR	PA
Halogen free		yes	no	yes	yes	yes
Fire behaviour		self-extinguishing	self-extinguishing	combustible	self-extinguishing	combustible
Resistance	to UV radiation	fair - good	fair	good	fair - good	good
	to oil	poor	fair	fair	fair - good	good
	with hydrolysis	fair	good	good	poor - fair	fair
Abrasion resistance		good	fair	good	excellent	good
Mechanical resistance		good	fair	good	good	good

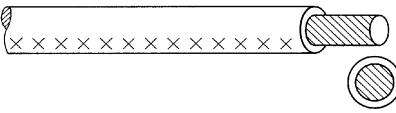
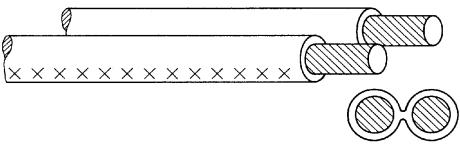
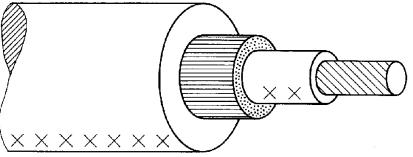
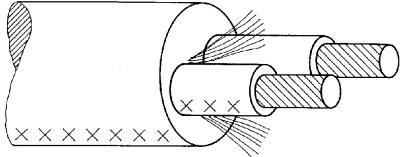
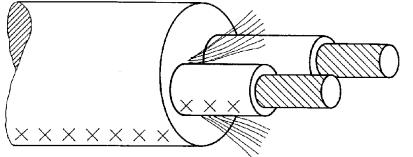
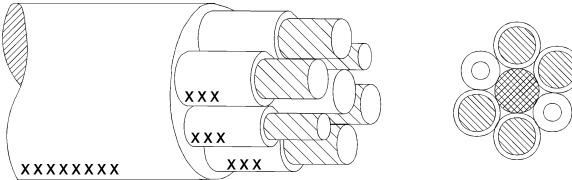
FO-Cables



for internal and external applications
with polymer fibres (POF²⁾)

Description

- Robust and cost-effective alternative to standard glass fibres
- SI-fibre with 980 µm PMMA-core
- For short distance transmission up to 100 m
- Operating wave length 660 nm
- Easy mechanical crimp technology

Identification	Part-Number	Drawing	Dimensions in mm
FO cable POF²⁾ Standard cable Simplex ø 2.2 mm PE fibre coating	20 20 001 1001		Technical Details: PMMA-Fibre: 980 / 1000 µm Temperature range: -40°C ... +85°C Bending radius min.: 30 mm
Duplex ø 2.2 x 4.4 mm PE fibre coating	20 20 001 1021		
Special cable with strain relief <small>suitable for SERCOS applications</small> Simplex ø 6.0 mm PE fibre coating PUR cable coating	20 21 001 1011		When ordering please specify cable length in metres.
Simplex ø 3.6 mm PE fibre coating PUR cable coating	20 21 001 1012		
Duplex round ø 5.5 mm PE fibre coating PUR cable coating	20 21 001 1021		
Hybrid-cable <small>suitable for DESINA® applications</small> PUR cable coating 2 x POF PA fibre coating 4 x 1.5 mm ² 300V/300V ø 10.6 mm	20 23 041 1023		

²⁾ POF = Polymer Optical Fibre

Tool and Test Equipment



for assembly and control of cables

Description

The tools of the HARTING FO tool kit are suitable for the installation of FO connectors in site conditions.

Detailed instructions for assembling the different connector types are included.

Identification	Part-Number	Drawing	Dimensions in mm
Tool kit POF ²⁾ without optical measuring device	20 99 000 3016		<p>Height : 360 mm Width : 470 mm Depth : 170 mm</p> <p>Tool kit for FO connector assembly to all POF²⁾ cables, without optical measuring instruments.</p>
Tool kit POF ²⁾ with optical measuring device	20 99 000 3013		<p>Height : 360 mm Width : 470 mm Depth : 170 mm</p> <p>Tool kit for FO connector assembly and control of the FO transmission links for 1 mm polymer-optical fibres (POF²⁾).</p> <p>When applying these tools, FO connector types F-SMA, FH-ST and R 15 can be assembled without adhesive and grinding. The measuring instruments are easy to handle and suitable for service and maintenance. The tool kit contains a complete set of tools and test equipment.</p>
FO kit measuring instruments	20 99 000 3014		<p>Suitable cables are included in the delivery range.</p>

²⁾ POF = Polymer optical fibre

Tool and Test Equipment



Identification	Part-Number	Drawing	Dimensions in mm
Tool kit GI-Faser	20 99 000 3015		<p>Height : 360 mm Width : 470 mm Depth : 170 mm</p> <p>Tool kit for connector mounting of glass fibres, using adhesive e.g.: GI 50/125 mm.</p>
HARTING Crimping tool for FO connector (glass fibre) SW 4.3 and 3.8 mm	20 99 000 1031		
HARTING Crimping tool for FO connector (plastic fibre) SW 6.95; 4.95 and 3.0 mm	20 99 000 1033		<p>For crimping the strain relief to the connector ... 1031 FO cable for glass fibre ... 1033 POF²⁾ and SERCOS cable Ø 6.0; 3.6</p>
Crimping tool Han-Brid® for electrical and optical crimp contacts	09 99 000 0362		
Cutting tool 2.2 mm POF ²⁾	20 99 000 1049		<p>Delivery range 10 pieces / set</p>
Fibre stripper 1 mm POF ²⁾	20 99 000 1041 20 99 000 1045 20 99 000 1046		<p>0.3 mm 1 mm 0.18/0.3 mm</p>
BUCHANAN Crimping tool for crimping installations of FO connectors to POF ²⁾ 1 mm Ø Positioning device POF-R 15 POF-F-SMA/ST/DIN Ferrule Han® E Plug gauge Ø 1.45 mm Ø 1.8 mm Ø 2.0 mm	20 99 000 1032 20 99 000 0036 20 99 000 0037 20 99 000 0038 20 99 001 1032 20 99 002 1032 20 99 003 1032		<p>Adjustable crimping tool setting: FOC R 15 Ø 1.45 mm POF²⁾ DIN 41 626 Ø 1.8 mm POF Ferrule Ø 1.8 mm POF F-SMA, -ST Ø 2.0 mm</p> <p>This tool is suitable only for FO contacts. Crimping tool for electrical contacts see catalogue "Heavy Duty Connectors Han®".</p> <p>Suitable plug gauges and positioning devices to be ordered separately.</p> <p>²⁾ POF = Polymer optical fibre</p>

Accessories



Identification	Part-Number	Drawing	Dimensions in mm
Polishing tool for FO connectors:			
F-SMA	20 99 000 1091		
DIN 41 626	20 99 000 1092		
POF ²⁾ cable Ø 2.2	20 99 000 1093		
F-TNC	20 99 000 1094		
FH-ST	20 99 000 1095		
Ferrule	20 99 000 1096		
Polishing kit	20 80 001 9914	Delivery range: Duplex polishing tool 2 x polish paper	
Epoxy adhesive glass fibre	20 80 001 9902	2 ml EPO-TEK 360 with hardener (10:1), 4g foil pack	
Polishing paper for POF ²⁾ -grain size 1000 for GI 9m-grain size for GI 1m-grain size	20 80 001 9911 20 80 001 9912 20 80 001 9913	Delivery range: Each part number ordered comprises 5 pieces.	

²⁾ POF = Polymer optical fibre

Power Supply



Identification	Part-Number	Drawing	Dimensions in mm
<p>Power supply for mounting on 35 mm standard rails acc. to DIN 50 022</p>	20 80 000 3022		<p>Termination: Screw Assembly: Standard rail, 53 mm acc. to DIN 50 022 Input voltage: AC 94-264 V, 50-60 Hz Output voltage: DC 24 V, 1.25 A Contact arrangement: Double clamp DC 24 V / 0 V, max. 2.5 mm² Triple clamp AC 94-264 V / N / PE max. 2.5 mm²</p>
<p>Power supply 230 V / 12 V</p>	20 80 000 3012		<p>Input voltage: AC 230 V, 50 Hz Output voltage: DC 8 - 12 V, 300 A</p>

Assembly Overview



Part Number	Description	Tools for assembling HARTING FO contacts						
		Fibre Stripper	Hexagonal Crimping Tool	BUCHANAN Crimping Tool	Locator	Adjustment Gauge	Polishing Tool	Epoxy Adhesive
20 10 001 1211	F-SMA connector 1mm/2.2mm POF with hexagonal nut	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 003 1032		20 80 001 9911
20 10 001 1212	F-SMA quick assembly connector 1mm/2.2mm POF with hexagonal nut	20 99 000 1045	20 99 000 1033	20 99 000 1032		20 99 000 1091	20 80 001 9911	20 80 001 9911
20 10 001 1213	F-SMA connector 1mm/2.2mm POF with knurled nut	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 003 1032	20 99 000 1091	20 80 001 9911
20 10 001 1215	F-SMA quick assembly connector 1mm/2.2mm POF with knurled nut	20 99 000 1045				20 99 000 1091	20 80 001 9911	20 80 001 9911
20 10 001 1217	F-SMA quick assembly connector 1mm/2.2mm POF with knurled nut and bending protection	20 99 000 1045				20 99 000 1091	20 80 001 9911	20 80 001 9911
20 10 001 1221	F-SMA connector POF/SERCOS 6.0 with hexagonal nut	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 003 1032	20 99 000 1091	20 80 001 9911
20 10 001 1223	F-SMA connector POF/SERCOS 6.0 with knurled nut	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 003 1032	20 99 000 1091	20 80 001 9911
20 10 001 1241	F-SMA connector POF/SERCOS 3.6 with hexagonal nut	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 003 1032	20 99 000 1091	20 80 001 9911
20 10 001 1243	F-SMA connector POF/SERCOS 3.6 with knurled nut	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 003 1032	20 99 000 1091	20 80 001 9911
20 10 001 1245	FH-SST connector 1mm/2.2mm POF	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 003 1032	20 99 000 1095	20 80 001 9911
20 10 001 2211	FH-SST quick assembly connector 1mm/2.2mm POF	20 99 000 1045				20 99 000 1095	20 80 001 9911	20 80 001 9911
20 10 001 2212	FH-SST quick assembly connector 1mm/2.2mm POF	20 99 000 1045				20 99 000 1095	20 80 001 9911	20 80 001 9911
20 10 001 3211	FO male contact 1mm/2.2mm POF for Han DD, Han K	20 99 000 1045	20 99 000 1032	20 99 000 0036	20 99 001 1032	20 99 000 1093	20 80 001 9911	20 80 001 9911
20 10 001 3212	FO male contact 1mm/2.2mm POF for Han D, Han U	20 99 000 1045	20 99 000 1032	20 99 000 0036	20 99 001 1032	20 99 000 1093	20 80 001 9911	20 80 001 9911
20 10 001 3213	FO male contact 1mm/2.2mm POF for Han 15 D	20 99 000 1045	20 99 000 1032	20 99 000 0036	20 99 001 1032	20 99 000 1093	20 80 001 9911	20 80 001 9911
20 10 001 3221	FO female contact 1mm/2.2mm POF for Han DD, Han K	20 99 000 1045	20 99 000 1032	20 99 000 0036	20 99 001 1032	20 99 000 1093	20 80 001 9911	20 80 001 9911
20 10 001 3222	FO female contact 1mm/2.2mm POF for Han D, Han U	20 99 000 1045	20 99 000 1032	20 99 000 0036	20 99 001 1032	20 99 000 1093	20 80 001 9911	20 80 001 9911
20 10 001 3232	FO ferrule 1mm/2.2mm POF	20 99 000 1045	20 99 000 1032	20 99 000 0037	20 99 002 1032	20 99 000 1096	20 80 001 9911	20 80 001 9911
20 10 001 3311	FO male contact 1mm/2.2mm POF for Han E	20 99 000 1045	20 99 000 1032	20 99 000 0036	20 99 001 1032	20 99 000 1093	20 80 001 9911	20 80 001 9911
20 10 001 3321	FO female contact 1mm/2.2mm POF for Han E	20 99 000 1045	20 99 000 1032	20 99 000 0038	20 99 001 1032	20 99 000 1093	20 80 001 9911	20 80 001 9911
20 10 001 4211	FO male contact 1mm/2.2mm POF for Han Multicontact-module	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 002 1032	20 99 000 1092	20 80 001 9911
20 10 001 4221	FO female contact 1mm/2.2mm POF for Han Multicontact-module	20 99 000 1045	20 99 000 1033	20 99 000 1032	20 99 000 0037	20 99 002 1032	20 99 000 1092	20 80 001 9911
20 10 001 6211	F-TNC male contact 1mm/2.2mm POF	20 99 000 1045				20 99 000 1094	20 80 001 9911	20 80 001 9911
20 10 001 6233	F-TNC female contact 1mm/2.2mm POF	20 99 000 1045				20 99 000 1094	20 80 001 9911	20 80 001 9911
20 10 001 7111	Versatile Link connector 1mm/2.2mm POF	20 99 000 1045				20 80 001 9914		
20 10 001 7112	Versatile Link connector 1mm/2.2mm POF, crimpless	20 99 000 1045				20 80 001 9914		
20 10 125 1212	F-SMA connector 1.25 Gi	20 99 000 1046	20 99 000 1031			20 99 000 1095	20 80 001 9902	20 80 001 9912/13
20 10 125 2212	FH-SST connector 1.25 Gi	20 99 000 1046	20 99 000 1031			20 99 000 1095	20 80 001 9902	20 80 001 9912/13
20 10 125 4211	FO male contact (metal) 1.25 Gi for Han Multicontact-module	20 99 000 1046				20 99 000 1092	20 80 001 9902	20 80 001 9912/13
20 10 125 4212	FO male contact (ceramic) 1.25 Gi for Han Multicontact-module	20 99 000 1046				20 99 000 1092	20 80 001 9902	20 80 001 9912/13
20 10 125 4221	FO female contact (metal) 1.25 Gi for Han Multicontact-module	20 99 000 1046				20 99 000 1092	20 80 001 9902	20 80 001 9912/13
20 10 125 4222	FO female contact (ceramic) 1.25 Gi for Han Multicontact-module	20 99 000 1046				20 99 000 1092	20 80 001 9902	20 80 001 9912/13
20 10 230 1212	F-SMA connector HCS, Crimp	20 99 000 1041	20 99 000 1031			20 99 000 1091	20 80 001 9912/13	
20 10 230 2212	FH-SST connector HCS	20 99 000 1041	20 99 000 1031			20 99 000 1095	20 80 001 9902	20 80 001 9912/13
20 10 230 4211	FO male contact HCS for Han Multicontact-module	20 99 000 1041				20 99 000 1092	20 80 001 9902	20 80 001 9912/13
20 10 230 4221	FO female contact HCS for Han Multicontact-module	20 99 000 1041				20 99 000 1092	20 80 001 9902	20 80 001 9912/13

List of Part Numbers					
Part Number	Page	Part Number	Page	Part Number	Page
09 12 004 2611	28	20 10 016 3211	26	20 40 004 3411	21
09 12 004 2701	28			20 40 004 3611	13
09 12 004 2711	28			20 40 004 3646	10
09 12 004 3001	28	20 10 125 1212	32	20 40 004 3647	11
09 12 004 3011	28				
09 12 004 3101	28	20 10 125 2212	32	20 40 007 3821	26
09 12 004 3111	28				
		20 10 125 4211	33	20 40 016 3411	22
		20 10 125 4212	33	20 40 016 3823	26
		20 10 125 4221	33		
09 99 000 0362	39	20 10 125 4222	33		
		20 10 125 4231	33	20 50 000 1111	23
		20 10 125 4232	33	20 50 000 1121	23
20 10 001 1211	31				
20 10 001 1212	30	20 10 230 1212	32	20 50 000 2112	24
20 10 001 1215	30			20 50 000 2119	24
20 10 001 1217	30	20 10 230 2212	32	20 50 000 2222	24
20 10 001 1221	31			20 50 000 2229	24
20 10 001 1241	31	20 10 230 4211	33	20 50 002 3421	21
		20 10 230 4221	33	20 50 002 3422	21
20 10 001 2211	31	20 10 230 7111	32	20 50 002 3521	16
20 10 001 2212	30			20 50 002 3622	13
				20 50 002 3625	14
				20 50 002 3626	10
20 10 001 3211	34	20 20 001 1001	37	20 50 002 3721	18
20 10 001 3212	34	20 20 001 1021	37		
20 10 001 3221	34			20 50 004 3421	21
20 10 001 3222	34	20 21 001 1011	37	20 50 004 3621	13
20 10 001 3232	25	20 21 001 1012	37	20 50 004 3625	14
		20 21 001 1021	37	20 50 004 3626	10
20 10 001 3311	34	20 23 041 1023	37		
20 10 001 3321	34			20 50 016 3421	22
20 10 001 4211	33	20 30 001 1120	35	20 66 009 3811	25
20 10 001 4221	33			20 66 009 3812	25
20 10 001 6211	31	20 40 000 1111	23		
20 10 001 6233	31	20 40 000 1121	23	20 67 009 3811	25
		20 40 002 3411	21		
20 10 001 7111	31	20 40 002 3412	21	20 80 000 1021	32
20 10 001 7112	31	20 40 002 3448	19	20 80 000 1065	30
		20 40 002 3511	16	20 80 000 1066	30
		20 40 002 3612	13	20 80 000 1071	32
20 10 003 3211	27	20 40 002 3646	10		
		20 40 002 3711	18	20 80 000 3012	40
				20 80 000 3022	40
20 10 007 3211	26	20 40 003 3821	27	20 80 000 3052	19
		20 40 003 3822	27		

List of Part Numbers



Part Number	Page
20 80 001 9902	41
20 80 001 9911	41
20 80 001 9912	41
20 80 001 9913	41
20 80 001 9914	40
20 99 000 0036	39
20 99 000 0037	39
20 99 000 0038	39
20 99 000 1031	39
20 99 000 1033	39
20 99 000 1045	39
20 99 000 1049	39
20 99 000 1091	41
20 99 000 1092	41
20 99 000 1093	41
20 99 000 1094	41
20 99 000 1095	41
20 99 000 1096	41
20 99 000 3013	38
20 99 000 3014	38
20 99 000 3015	39
20 99 000 3016	38
20 99 001 1032	39
20 99 002 1032	39
20 99 003 1032	39

General Information

It is the user's responsibility to check whether the components illustrated in this catalogue comply with different regulations from those stated in special fields of application which we are unable to foresee.

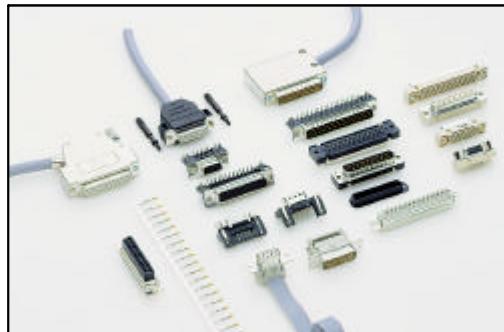
We reserve the right to modify designs in order to improve quality, keep pace with technological advancements or meet particular requirements in production.

This catalogue must not be used in any form or manner without our prior approval in writing (Copyright Law, Faire trading Law, Civil Code).
We are bound by the German version only!

Some of the components from the HARTING range



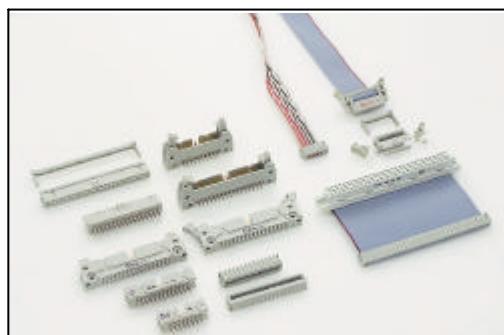
Heavy Duty Connectors Han®



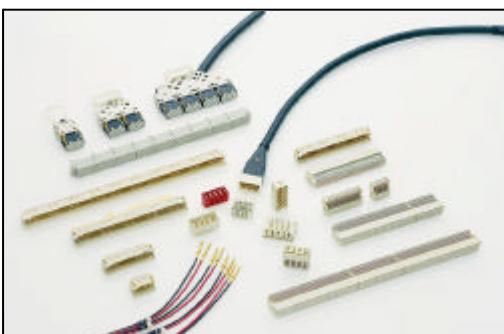
Subminiature D-Connectors DIN 41 652



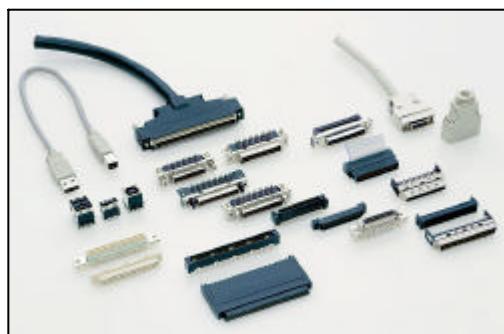
Printed Board Connectors DIN 41 612



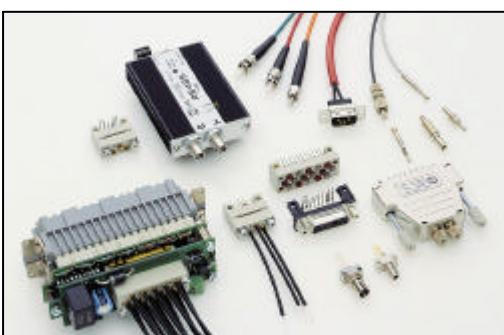
Flat Cable Connector System DIN 41 651



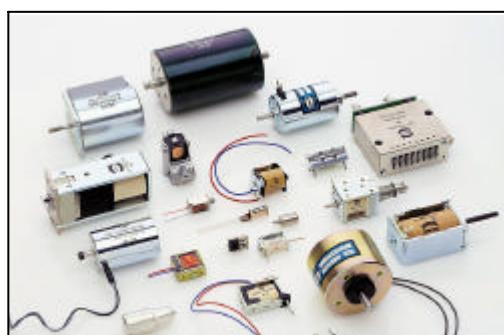
High Density, Metric Printed Board Connectors 2.5 mm • DIN 41 642



Micro-Electronic-Connectors
Contact Spacing 1.27 mm



Fibre Optic Data Link Systems



Solenoids

HARTING Subsidiaries

Austria

HARTING Ges.m.b.H;
Deutschstr. 3; A-1230 Wien
Tel. (+43)1/616 2121; Fax (+43)1/616 2121-21
E-Mail: at@HARTING.com

Belgium

HARTING N.V./S.A.; Doornveld 8;
B-1731 Zellik
Tel. (+32) 2/4660 190; Fax (+32) 2/4667 855
E-Mail: be@HARTING.com

Brazil

HARTING Ltda.
Av. Dr. Lino de Moraes Leme 255
04360-001 São Paulo - Brazil
Tel. (+55) 11/5360073; Fax (+55) 11/5334743
E-Mail: br@HARTING.com

China

HARTING Hong Kong Ltd.
4208 Metroplaza Tower 1; 223 Hing Fong Rd.; Kwai Fong, N.T.; Hong Kong
Tel. (+852) 24237338; Fax (+852) 24804378
E-Mail: AsiaPacific@HARTING.com.hk

HARTING (HK) Ltd.

Beijing Representative Office; 201, 3rd floor,
Mi Yang Tower; Yong An Dang Li; Jian Guo Meng Wai Ave.; Beijing 100022 - PR CHINA
Tel. (+86)10/6594 0464 Fax(+86)10/6594 0465
HARTING (HK) Ltd.
Shanghai Representative Office; RM 2302;
HongKong Plaza, 282-283 Huai Hai Rd. (M);
Shanghai, 200021 PR CHINA;
Tel. (+86) 21/6390-6935
Fax (+86) 21/6390-6399
E-Mail: ChinaSales@HARTING.com.cn

Zouhai HARTING Ltd.

Guangzhou Rd.; Zhangchong Industrial Area;
Xiangzhou District
Zuhai City; 519070 PR CHINA
Tel. (+86) 756 / 863-1808
Fax (+86) 756 / 863-1183

Czech Republic

HARTING S.R.O.; Mlynska 2;
16000 Praha 6 (+420) 2 203 80 450
Fax (+420) 2 203 80 451
E-Mail: HARTING@HARTING.cz

Finland

HARTING OY
Robert Huberin tie 2, FIN-01510 Vantaa;
Tel. (+358)935 087300; Fax (+358)935 087320
E-Mail: fi@HARTING.com

France

HARTING France; ZAC Paris Nord II
181, Av. des Nations, B.P. 60058
F-95972 Roissy Charles de Gaulle Cedex
Tel. (+33)1 4938 3400; Fax (+33)1 4989 0414
E-Mail: fr@HARTING.com

Great Britain

HARTING Ltd.
Caswell Road, Blackmills Industrial Estate
GB-Northampton, NN4 7PW
Tel. (+44)1604/766686, Fax (+44)1604/706777
E-Mail: gb@HARTING.com

Italy

HARTING SpA; Via Dell'Industria 7;
I-20090 Vimodrone (Milano)
Tel. (+39) 02 25 0801; Fax (+39) 02 265 0534
E-Mail: it@HARTING.com

Japan

HARTING K.K.
4F German Industry & Trade Centre 407
1-18-2, Hakusan 1-Chome, Midori-ku;
Yokohama 226/ Jp;
Tel. (+81)45/931-5715; Fax (+81)45/931-5719
E-Mail: HARTING@olive.ocn.ne.jp

Korea

HARTING Korea Ltd.
FKI Building, 14th Floor; 28-1 Yoldo-dong,
Yongdungpo-gu; Seoul 150-758, Sth. Korea
Tel. (+82)2/784 4614; Fax (+82)2/3776 0070
E-Mail: KoreaSales@HARTING.co.kr

Netherlands

HARTING B.V.; Larenweg 44
NL-5234 KA's-Hertogenbosch
Tel. (+31)73/641 0404; Fax (+31)73/644 0699
E-Mail: nl@HARTING.com

Norway

HARTING A/S
Østensjøveien 36, N-0667 Oslo
Tel. (+47)22-700-558; Fax (+47)22-700-570
E-Mail: no@HARTING.com

Russia

HARTING ZAO; ul. Tobolskaja 12
194044 Sankt Petersburg, Russland
Tel. (+7)812/327 6477; Fax (+7)812/327 6478
E-Mail: HARTING@mail.wplus.net

Singapore

HARTING Singapore Pte. Ltd.;
63B Pagoda St.; 059222 Singapore;
Tel. (+65) 225 52 85; Fax: (+65) 225 99 47
E-Mail: SEAAsiaSales@HARTING.com.my

Spain

HARTING S.A., Josep Tarradellas 20-30, 3-5
E-08029 Barcelona; Tel. (+34) 93/ 3 63 84 84
Fax (+34) 93 / 4 19 95 85;
E-Mail: es@HARTING.com

Sweden

HARTING AB; Fagerstagatan 18 A, 5. TR.
S-16353 Spånga
Tel. (+46) 8/ 445 7171; Fax (+46) 8/ 445 7170
E-Mail: se@HARTING.com

Switzerland

HARTING AG
Industriestr. 26; CH-8604 Volketswil
Tel. (+41)1/ 946 0966, Fax (+41) 1/946 0970
E-Mail: ch.zh@HARTING.com

Taiwan

HARTING Taiwan, Rm. 6, 10/F.
171, Sung Ten Road, TAIPEI 110 Taiwan
Tel. (+86)2877/38577; Fax: (+86)2877/38567

USA

HARTING Inc. of North America
1370 Bowes Road; Elgin, IL 60123
Tel. (+1) 847/741-1500; Fax (+1) 847/741-8257
E-Mail: us@HARTING.com

Eastern-Europe

HARTING Bauelemente GmbH;
Bamberger Str. 7; D-01187 Dresden;
Tel. (+49) 351 / 4361760;
Fax (+49) 351 / 43617701
E-Mail: dresden@t-online.de

South-Eastern-Europe and other foreign countries

HARTING Electric GmbH & Co. KG
P.O. Box 1473, D-32328 Espelkamp

Foreign Representatives

Australia

ADILAM Electronics Pty.Ltd.
14 Nicole Close; North Bayswater,3153
VICTORIA, Australia
Tel.(+61)39/7614466, Fax(+61)39/7614161

Denmark

Knud Wexøe A/S
Skaettekaeret 11, P.O. Box 152
DK-2840 Holte
Tel. (+45)45465800, Fax (+45)45465801

Finland

SKS AUTOMAATIO OY
Martinkyläntie 50, FIN-01721 Vantaa
Tel. (+385) 9 852 661
Fax (+385) 9 852 68 20

India

Sahajanand Impex Pvt. Ltd.
Acharya Donde Marg,
Opp. Thakre Udyan, Sewree
Mumbai, 400015
Tel.(+91)22/4135151, Fax (+91)22/4147820

Portugal

UNIMAQUE
Electronica e Electricidade Industrial, LDA.
Rua Augusto Gil, 22-B
P-1000 Lisboa
Tel. (+35) 1 / 7 96 67 32 / 85
Fax (+35) 1 / 7 96 09 24

South Afrika

Allcable (Pty) Ltd.; P.O. Box 13518
Witfield 1467, R.S.A.
Tel (+27) 11-845 33 25
Fax(+27) 11-845 40 77

Turkey

Gökhane Elektrik San. Tic. Ltd. Sti.
Perpa Elektrikçiler Is Merkezi A Blok
Kat: 7-8-9 No. 694
TR-80270 Okmeydani/Istanbul
Tel. (+90) 212-221 32 36/37
Fax (+90) 212-221 32 40

Electric Headquarters

HARTING Electric GmbH & Co. KG
Wilhelm-Hartung-Straße 1
D-32339 Espelkamp
P.O.Box 14 73; D-32328 Espelkamp
Tel. (+49) 5772 / 47-97100
Fax (+49) 5772 / 47-495
E-Mail: HARTING.Electric@HARTING.com
Internet: http://www.HARTING.com

Headquarters

HARTING Deutschland GmbH & Co.
KG
Simeonscarré 1; D-32427 Minden
P.O.Box 2451; D-32381 Minden
Tel. (+49) 571 / 88 96 - 0
Fax (+49) 571 / 88 96 - 282
E-Mail: de.sales@HARTING.com
Internet: http://www.HARTING.com

Branch Offices

HARTING Deutschland GmbH & Co.
KG
Branch Office Chemnitz
Blankenauer Straße 99
D-09113 Chemnitz

Production Plants

Espelkamp, Germany, plant 1-4
Northampton, Great Britain
Biel, Switzerland
Chicago, USA
Zhuhai, China



HARTING Electric GmbH & Co. KG

Wilhelm-Harting-Straße 1 • D-32339 Espelkamp

P.O.Box 14 73 • D-32328 Espelkamp

Germany

Phone: (+49) 5772/47-97100 • Fax: (+49) 5772/47-495

E-Mail: HARTING.Electric@HARTING.com

Internet: <http://www.HARTING.com>