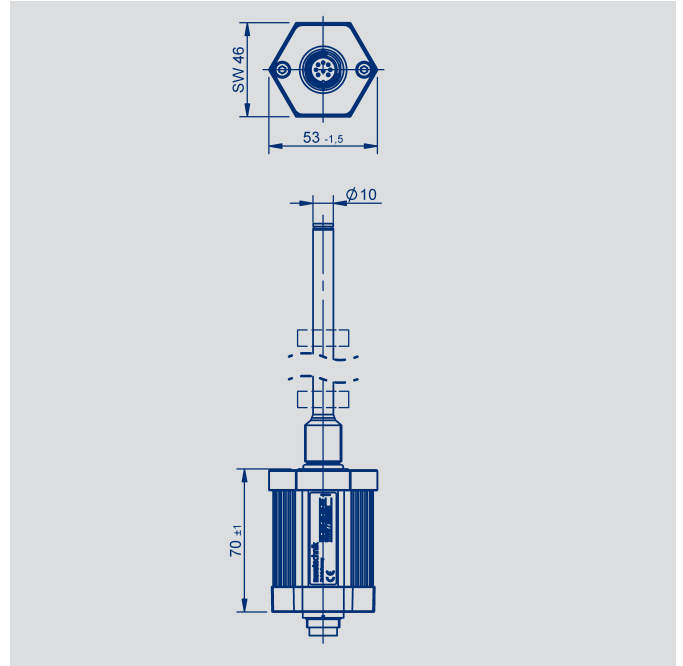
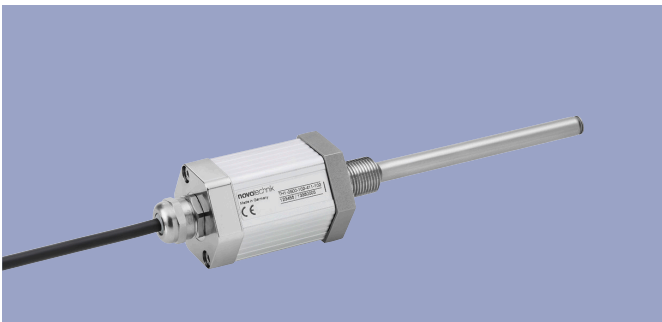
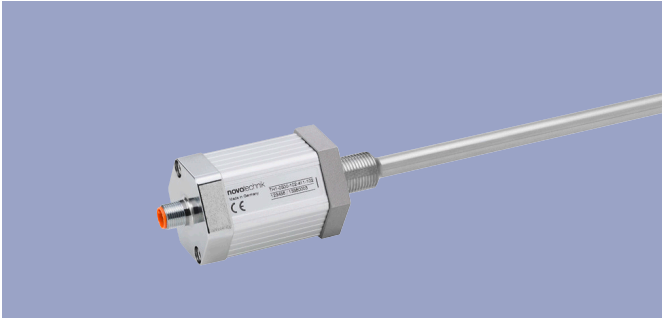


**NOVOSTRICTIVE  
Transducer  
up to 4250 mm  
touchless**

Series TH1



**Special features**

- Touchless magnetostrictive measurement technology
- Rod style transducer, integratable
- Non-contacting position detection with ring shaped position marker
- Unlimited mechanical life
- Resolution up to 1  $\mu\text{m}$ , independently of length
- Low temperature coefficient <15 ppm/K
- Position-Teach-In
- Insensitive to shock and vibration
- Operating pressure up to 350 bar
- Protection class IP67 / IP68
- Interfaces: Analog, SSI, Impulse, CANopen, IO-Link

**Applications**

- Fluid Power  
Pneumatic- or Hydraulic Cylinder
- Manufacturing Engineering
- Mobile Machinery

**High precision transducer with touchless magnetostrictive technology** for mechanically decoupled and therefore wear-free position measurement for lengths up to 4250 mm.

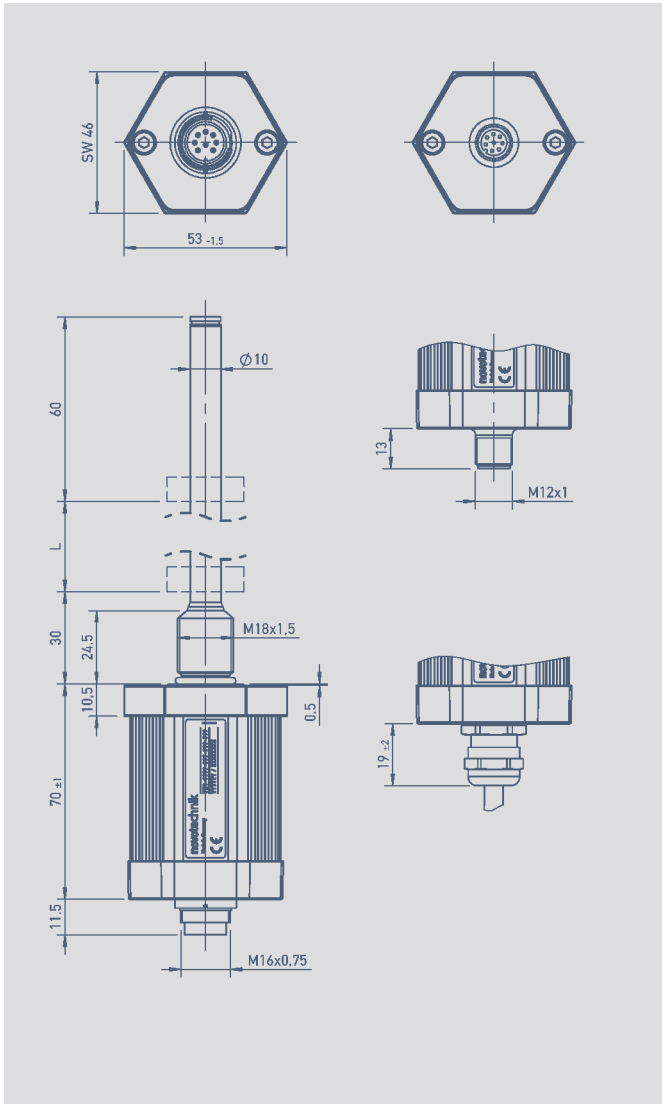
The integrable and pressure-resistant rod design with passive ring position markers allow the use inside of hydraulic cylinders. Here, the pressure area is sealed by an O-ring on the flange.

Depending on the interface, up to three positions and speed can be measured.

## Contents

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## Mechanical Data



### Description

Materials	Housing: Anodized aluminum, AlMgSi0,5 F22, 3.3206.71 Screw flange: stainless steel X2CrNiMoN 18-14-3, 1.3952 Rod: stainless steel X6CrNiMoTi 17-12-2, 1.4571
Mounting	Bushing M18x1,5 for screw plug hole per ISO6149 Bushing 3/4"-16UNF for screw plug hole per SAE J475
Position marker	Ring shaped position marker
Messverfahren	NOVOSTRICTIVE, touchless magnetostrictive
Electr. connections	Connector M12x1, 4-pol., 5-pol. / 8-pin., shielded Connector M16x0.75 (IEC 130-9), 6-pin. / 8-pin., shielded PUR-cable, 8x0.25 mm <sup>2</sup> , shielded; 1 m, 3 m oder 5 m length
Electronic	SMD with ASIC, integrated Connector casing (shield) is connected to the sensor housing. Housing is capacitively decoupled to the electronics

### Mechanical Data

Dimensions	see dimension drawing
Electrical measuring range (Dimension L)	0050 up to 4250 mm in 25 mm steps other lengths on request
Max. operational speed with valid output signal	10 ms <sup>-1</sup>
Max. operational acceleration with valid output signal	200 ms <sup>-2</sup>
Shock (IEC 60068-2-27)	100 (11 ms) (single hit) g
Vibration (IEC 60068-2-6)	20 (5...2000 Hz, Amax = 0.75 mm) g
Protection class (DIN EN 60529)	IP67 with fastened connector IP68 with cable connection
Life	Mechanically unlimited
Operating temperature range	-40 ... +85 °C
Storage temperature range	-40 ... +100 °C
Operating humidity range	0 ... 95 (no condensation) % R.H.
Pressure rating	
Operating pressure	≤ 350 bar
Pressure peaks	≤ 600 bar
Burst pressure	> 700 bar

CAD data see  
[www.novotechnik.de/en/download/cad-data/](http://www.novotechnik.de/en/download/cad-data/)

## Technical Data Analog Versions

Type designations	TH1- _ _ _ _ - 41 _ _ _ _ Voltage	TH1- _ _ _ _ - 42 _ _ _ _ Current	
<b>Electrical Data</b>			
Electrical measuring range (dimension L)	0050 up to 4250		mm
Output signal	0.1 ... 10 V (load $\geq 5 \text{ k}\Omega$ )	0.1 ... 20 mA (burden $\leq 500 \Omega$ ) 4 ... 20 mA (burden $\leq 500 \Omega$ )	
Number of channels	2	1	
Sampling rate / Update rate	< 750 mm: 2kHz, 750 ... < 2000 mm: 1 kHz, > 2000 mm: 05 kHz Extrapolated to 16 kHz		
Resolution	16		Bit
Absolute linearity *	$\leq \pm 0.02$ (min. $\pm 50 \mu\text{m}$ )		% FS
Tolerance of electr. zero point	$\pm 0.5$ (min. 2 x reproducibility)		mm
Reproducibility	$\leq 0.03$		% FS
Hysteresis	$\leq 0.01$		% FS
Temperature error	$\leq 30$ (min. 0,01 mm/K)		ppm/K
Supply voltage	24 (19 ... 30)		VDC
Supply voltage ripple	$\leq 10$		% Ub
Current consumption	$\leq 100$		mA
Overvoltage protection	40 (temporary / 1 min.)		VDC
Polarity protection	Yes, up to supply voltage max.		VDC
Short circuit protection	Yes (outputs vs. GND and supply voltage max.)		
Insulation resistance (500 VDC)	$\geq 10$		M $\Omega$
<b>Environmental Data</b>			
MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc)	28		Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us		
EMC compatibility	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Electrical fast transients (burst) 2 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 55011 Radiated disturbances class B		

\*) Valid for channel 1; channel 2 with additional offset and gradient tolerances (inverted signal from channel 1).  
Measured with position marker Z-TH1-P18 or Z-TH1-P19.



### Pin assignment

Connector code 101, 102	Cable code 20_	Connector with cable (Accessories)	Analog voltage	Analog current	Connector code 103	Connector with cable (Accessories)	Analog Voltage	Analog Current
Pin 1	YE	WH	do not connect	0(4)...20 mA	Pin 1	WH	0 ...+10 V	0 (4)...20 mA
Pin 2	GY	BN	Signal GND	Signal GND	Pin 2	BN	Signal GND	Signal GND
Pin 3	PK	GN	+10...0 V	do not connect	Pin 3	BU	+10...0 V	do not connect
Pin 4	RD	YE	DIAG *	DIAG *	Pin 4	BK	GND	GND
Pin 5	GN	GY	0...+10 V	do not connect	Pin 5	GY	Supply voltage	Supply voltage
Pin 6	BU	PK	GND	GND	Pin 6	GN	GND	GND
Pin 7	BN	BU	Supply voltage	Supply voltage				
Pin 8	WH	RD	PROG *	PROG *				

\*) Connect only for Teach-In-function (see manual).

**Ordering Specifications**  
**Analog Versions**  
**- Voltage**  
**- Current**

**Ordering Specifications**

Preferred types printed in bold

**Electrical interfaces**  
**4: Analog Interfaces**

**Output signal analog interfaces 4 \_ \_**

- 1: Voltage output**
- 2: Current output**

**Analog interface voltage output 41\_**

- 1: 0 ... 10 V and 10 ... 0 V**

**Analog interface current output 42\_**

- 1: 0 ... 20 mA
- 2: 20 ... 0 mA
- 3: 4 ... 20 mA**
- 4: 20 ... 4 mA

**Electrical connection**

- 101: Connector M16x0.75 (IEC 130-9), 8-pin
- 102: Connector M12x1, 8-pin**
- 103: Connector M16x0.75 (IEC 130-9), 6-pin
- 201: Cable, 8-pol., shielded, 1 m**
- 203: Cable, 8-pol., shielded, 3 m
- 205: Cable, 8-pol., shielded, 5 m
- Other cable lengths and assembled connectors on request

**T H 1 - 0 8 0 0 - 1 0 2 - 4 1 1 - 1 0 2**

Series

**Electrical measuring range**  
**Standard lengths**  
**0050 up to 4250 mm**  
in 25 mm-steps.  
Other lengths on request

**Mechanical version**

- 102: Screw flange M18x1.5, zero point at 30 mm**
- 103: Screw flange 3/4" - 16UNF, zero point at 30 mm
- 104: Screw flange M18x1.5, zero point at 51 mm
- 105: Screw flange 3/4" - 16UNF, zero point at 51 mm
- 106: Screw flange M18x1.5, zero point at 30 mm, for supporting at rod end \*
- 107: Screw flange 3/4" - 16UNF, zero point at 30 mm, for supporting at rod end \*
- 108: Screw flange M18x1.5, zero point at 51 mm, for supporting at rod end \*
- 109: Screw flange 3/4" - 16UNF, zero point at 51 mm, for supporting at rod end \*
- Other mechanical versions on request

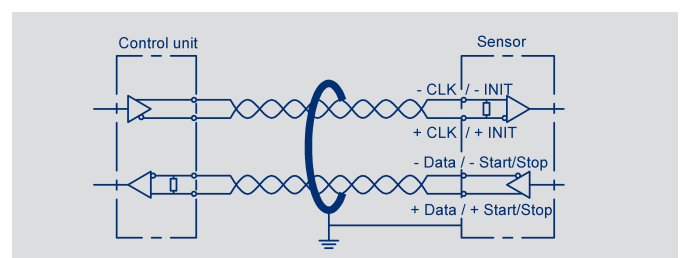
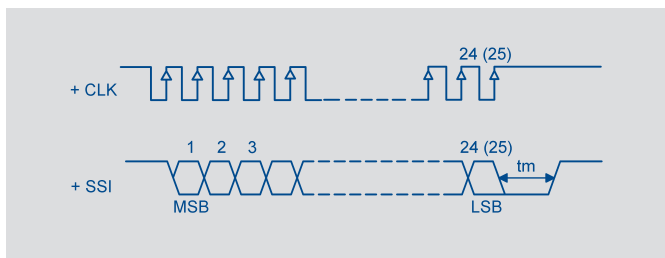
\*) with internal thread M4x6 at rod end and additional length 7.5 mm

**Important:** Avoid equalizing currents in the cable shield caused by potential differences.  
Twisted pair cable (STP) is recommended.

## Technical Data SSI-Interface

<b>Type designations</b>	<b>TH1 - - - - - 2 - - - - -</b> <b>Synchron-Serial-Interface (SSI)</b>	
<b>Electrical Data</b>		
Electrical measuring range (dimension L)	0050 up to 4250	mm
Protocol	SSI 24 and 25 bit (26 bit on request)	
Inputs	RS422	
Monoflop time (tm)	30	µs
Encoding	Gray, Binary	
Sampling rate / Update rate	< 750 mm: 2 kHz, 750 ... < 2000 mm: 1 kHz, > 2000 mm: 0.5 kHz Extrapolated to 16 kHz	kHz
Resolution (LSB)	1, 5 or 10 (other resolutions on request)	µm
Absolute linearity *	< 250 mm ≤ ±25 µm < 750 mm ≤ ±30 µm < 1000 mm ≤ ±50 µm < 2500 mm ≤ ±80 µm up to 4250 mm ≤ ±120 µm	
Tolerance of electr. zero point	± 0.5	mm
Reproducibility (rounded to LSB)	≤ 6	µm
Hysteresis (rounded to LSB)	≤ 4	µm
Temperature error	≤ 15 (min. 0.01 mm/K)	ppm/K
Supply voltage	24 (13 ... 34)	VDC
Supply voltage ripple	≤ 10	% Ub
Overvoltage protection	40 (permanent)	VDC
Current consumption	≤ 100	mA
Polarity protection	Yes, up to supply voltage max.	
Short circuit protection	Yes (outputs vs. GND and supply voltage up to 7 V)	
Ohmic load at outputs	> 120	Ω
Max. Clock rate	2	MHz
Insulation resistance (500 VDC)	≥ 10	MΩ
<b>Environmental Data</b>		
MTTF (DIN EN ISO 13849-1, parts count method, w/o load, wc)	32	Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us	
EMC compatibility	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Electrical fast transients (burst) 1 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 61000-4-8 Magnetfelder mit energietechnischen Frequenzen 3 A/m EN 55011 Radiated disturbances class B	

\*) Measured with resolution 1 µm.  
At resolution > 1 µm the permissible linearity error is increased by the resolution.



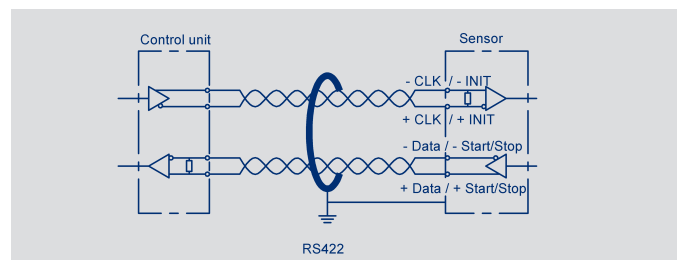
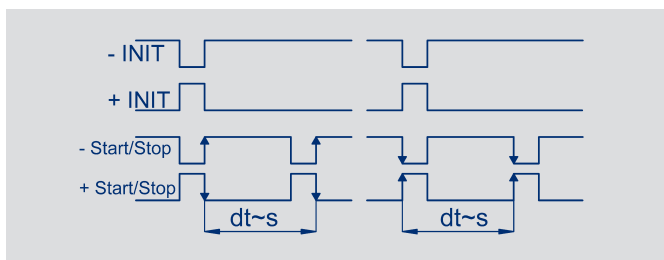
### Pin assignment

Connector code 101, 102	Cable code 20 _	Connector with cable (Accessories)	SSI Interface
Pin 1	YE	WH	Clk +
Pin 2	GY	BN	Data +
Pin 3	PK	GN	Clk -
Pin 4	RD	YE	do not connect
Pin 5	GN	GY	Data -
Pin 6	BU	PK	GND
Pin 7	BN	BU	Supply voltage
Pin 8	WH	RD	do not connect

Connector code 103	Connector with cable (Accessories)	SSI Interface
Pin 1	WH	Data -
Pin 2	BN	Data +
Pin 3	BU	Clk +
Pin 4	BK	Clk -
Pin 5	GY	Supply voltage
Pin 6	GN	GND

## Technical Data Impulse-Interface

Type designations	TH1- _ _ _ _ - _ _ _ _ - 11 _ - _ _ _ _ Start-Stop-Impulse-Interface	
<b>Electrical Data</b>		
Electrical measuring range (dimension L)	0050 up to 4250	mm
Number of position markers	1 up to 3	
Protocol	Impulse	
Inputs	RS422	
Sampling rate / Update rate	< 500 mm: 1 kHz, 500 ... < 2000 mm: 0.5 kHz, > 2000 mm: 0.25 kHz	kHz
Resolution	Depending on interpretation, normalized to 2800 ms <sup>-1</sup>	
Absolute linearity	< 1000 mm ≤ ±50 μm < 2500 mm ≤ ±80 μm up to 4250 mm ≤ ±120 μm	μm
Tolerance of electr. zero point	± 0.5	mm
Reproducibility	≤ 6	μm
Hysteresis	≤ 4	μm
Temperature error	≤ 15 (min. 0,01 mm/K)	ppm/K
Supply voltage	24 (13 ... 34)	VDC
Supply voltage ripple	≤ 10	% Ub
Overvoltage protection	40 (permanent)	VDC
Current consumption	≤ 100	mA
Polarity protection	Yes, up to supply voltage max.	
Short circuit protection	Yes (outputs vs. GND and supply voltage up to 7 V)	
Insulation resistance (500 VDC)	≥ 10	MΩ
<b>Environmental Data</b>		
MTTF (DIN EN ISO 13849-1, parts count method, w/o load, wc)	27	Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us	
EMC compatibility	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Electrical fast transients (burst) 2 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 55011 Radiated disturbances class B	



### Pin assignment

Connector code 101, 102	Cable code 20 _	Connector with cable (Accessories)	Start/Stop-Impulse Interface
PIN 1	YE	WH	INIT +
PIN 2	GY	BN	Start/Stop +
PIN 3	PK	GN	INIT -
PIN 4	RD	YE	do not connect
PIN 5	GN	GY	Start/Stop -
PIN 6	BU	PK	GND
PIN 7	BN	BU	Supply voltage
PIN 8	WH	RD	do not connect

Connector code 103	Connector with cable (Accessories)	Start/Stop-Impulse Interface
Pin 1	WH	Start/Stop -
Pin 2	BN	Start/Stop +
Pin 3	BU	INIT +
Pin 4	BK	INIT -
Pin 5	GY	Supply voltage
Pin 6	GN	GND

**Ordering Specifications**  
**Digital Versions**  
**- SSI**  
**- Start-Stop-Impulse**

**Ordering Specifications**

Preferred types printed in bold

**Electrical Interfaces**

- 1: Impulse Interface**  
**2: SSI Interface**

**Output Signal Impulse Interface 1 \_\_**

- 1: Impulse-Interface Start Stop Signal**

**Output Signal SSI Interface 2 \_\_**

- 1: SSI 24 bit**  
2: SSI 25 bit  
7: SSI 26 bit (25 = alarm, 26 = parity even) on request

**Impulse-Interface Start Stop Signal 11\_**

- 1: For 1 position marker**  
2: For 2 position markers  
3: For 3 position markers

**SSI-Interface 2 \_\_**

- 1: Binary code; resolution 5 µm**  
2: Gray code; resolution 5 µm  
4: Binary code; resolution 1 µm  
5: Gray code; resolution 1 µm  
7: Binary code; resolution 10 µm  
8: Gray code; resolution 10 µm

**Electrical connection**

- 101: Connector M16x0,75 (IEC 130-9), 8-pin  
**102: Connector M12x1, 8-pin**  
103: Connector M16x0,75 (IEC 130-9), 6-pin  
**201: Cable, 8-pol., shielded, 1 m**  
203: Cable, 8-pol., shielded, 3 m  
205: Cable, 8-pol., shielded, 5 m  
Other cable lengths and assembled connectors on request

**T H 1 - 0 8 0 0 - 1 0 2 - 2 1 1 - 1 0 2**

**Series**

**Electrical measuring range**

**Standard lengths**

**0050 up to 4250 mm**

in 25 mm-steps.

Other lengths on request

**Mechanical version**

**102: Screw flange M18x1.5, zero point at 30 mm**

103: Screw flange 3/4" - 16UNF, zero point at 30 mm

104: Screw flange M18x1.5, zero point at 51 mm

105: Screw flange 3/4" - 16UNF, zero point at 51 mm

106: Screw flange M18x1.5, zero point at 30 mm, for supporting at rod end \*

107: Screw flange 3/4" - 16UNF, zero point at 30 mm, for supporting at rod end \*

108: Screw flange M18x1.5, zero point at 51 mm, for supporting at rod end \*

109: Screw flange 3/4" - 16UNF, zero point at 51 mm, for supporting at rod end \*

Other mechanical versions on request

\*) with internal thread M4x6 at rod end and additional length 7.5 mm

**Important:** Avoid equalizing currents in the cable shield caused by potential differences.  
Twisted pair cable (STP) is recommended.

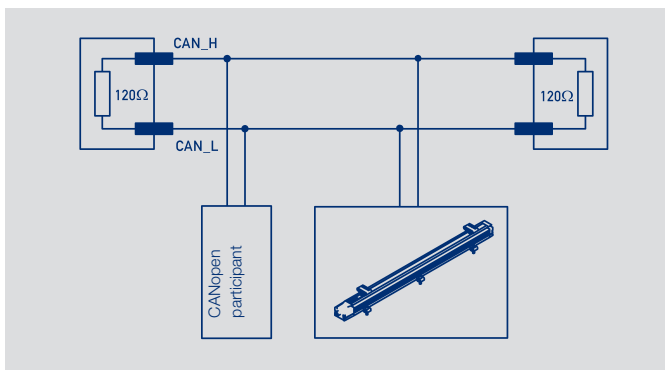


Technical Data



<b>Type designations</b>	<b>TH1 - - - - - 6 - - - - -</b> <b>CANopen-Interface</b>	
<b>Electrical Data</b>		
Measured variables	Position and speed	
Electrical measuring range (dimension L)	0050 up to 4250	mm
Measuring range speed	0 ... 10	ms <sup>-1</sup>
Number of position markers	1 / 2	
Output signal / Protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder class C2, LSS services to CiA DS-305 V1.1.2	
Programmable parameters	Position, speed, cams, working areas, temperature, node-ID, baud rate	
Node-ID	1 ... 127 (default 127)	
Baudrate	10 ... 1000 kBaud	
Resolution		
Position	1	5 μm
Speed	0.1	0.5 mms <sup>-1</sup>
Update rate	1 kHz (internal sampling rate < 750 mm: 2 kHz, 750 ... < 2000 mm: 1 kHz, > 2000 mm: 0.5 kHz)	
Absolute linearity *	< 250 mm ≤ ±25 μm < 750 mm ≤ ±30 μm < 1000 mm ≤ ±50 μm < 2500 mm ≤ ±80 μm up to 4250 mm ≤ ±120 μm	
Tolerance of electr. zero point	0.5	±mm
Reproducibility (rounded to resolution)	≤ 6	μm
Hysteresis (rounded to resolution)	≤ 4	μm
Temperature error	≤ 15 (min. 0.01 mm/K)	ppm/K
Supply voltage	24 (13 ... 34) VDC	
Supply voltage ripple	≤ 10	% Ub
Current consumption	≤ 100	mA
Overvoltage protection	40 (permanent) VDC	
Polarity protection	Yes, up to supply voltage max.	
Short circuit protection	Yes (outputs vs. GND und supply voltage max.)	
Insulation resistance (500 VDC)	≥ 10	MΩ
Bus termination internal	no	
<b>Environmental Data</b>		
MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc)	25	Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us	
EMC compatibility	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Electrical fast transients (burst) 1 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 55016-2-3 Noise radiation class B	

\*) Measured with resolution 1 μm.  
At resolution > 1 μm the permissible linearity error is increased by the resolution.



**Pin assignment**

Connector code 106	Connector code 105	CANopen Interface
Pin 1	Pin 3	CAN_SHLD ***
Pin 2	Pin 5	Supply voltage
Pin 3	Pin 6	GND
Pin 4	Pin 2	CAN_H
Pin 5	Pin 1	CAN_L
-	Pin 4	n/a

\*\*\*) CAN\_SHLD: CAN-shield, internally connected to housing

<b>Type designations</b>	<b>TH1 - - - - -101- A _ _ - - - -</b> <b>IO-Link</b>		
<b>Electrical Data</b>			
Measured variables	Position, speed and temperature		
Electrical measuring range (dimension L)	0050 up to 4250		mm
Number of position markers	1 up to 3		
Output signal / protocol	IO-Link Spec V1.1 to IEC 61131-9, Smart Sensor Profil (V1.0 compatible)		
Programmable parameters	Zero point offset, resolution, averaging		
Configurability	Number of position markers and measured variables (position, speed). All product versions listed in the ordering specifications (e.g. 1 x position) are also configurable by the customer (e.g. into 2 x position and 2 x speed)		
Transfer rate	COM 3 (230.4 kB)		
Frame type	2:2		
Minimum cycle time	1		ms
Update rate	1		kHz
	(internal sampling rate < 750 mm: 2 kHz, 750 ... < 2000 mm: 1 kHz, > 2000 mm: 0,5 kHz)		
Resolution			
Position	1	5	µm
Speed	0.1	0.5	mms <sup>-1</sup>
Reproducibility (rounded to resolution)	≤ 6		µm
Hysteresis (rounded to resolution)	≤ 4		µm
Absolute linearity *	< 250 mm ≤ ±25 µm < 750 mm ≤ ±30 µm < 1000 mm ≤ ±50 µm < 2500 mm ≤ ±80 µm up to 4250 mm ≤ ±120 µm		
Zero point tolerance	0.5		±mm
Temperature error	≤ 15 (min. 0.01 mm/K)		±ppm/K
Supply voltage	24 (18 ... 30)		VDC
Supply voltage ripple	max. 10		% Ub
Current consumption (w/o load)	≤ 100		mA
Reverse voltage	yes, up to supply voltage max.		
Short circuit protection	yes (C/Q vs. GND and supply voltage)		
Overvoltage protection	36 (permanent)		VDC
Insulation resistance (500 VDC)	≥ 10		MΩ
<b>Environmental Data</b>			
MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc)	> 28.6		Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us		
EMC compatibility	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Electrical fast transients (burst) 1 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 55016-2-3 Noise radiation class B		

\*) Measured with resolution 1 µm.  
At resolution > 1 µm the permissible linearity error is increased by the resolution.

**Pin assignment**

Connector M12 Code 107	Connector with cable (accessories)	IO-Link
PIN 1	BN	Supply voltage (L+)
PIN 2	WH	do not connect *
PIN 3	BU	GND (L-)
PIN 4	BK	C/Q

\*) alternatively on GND

Ordering  
Specifications



**Ordering Specifications**

Preferred types printed in bold

**Electrical interface**  
**6: CANopen-Interface**  
**A: IO-Link**

**Interface parameters for CANopen 6 \_ \_**

- 1: Resolution 5 µm, 1 x position and speed, 1 position marker fix**
- 3: Resolution 1 µm, 1 x position and speed, 1 position marker fix
- 5: Resolution 5 µm, 2 x position and speed, 2 position markers fix
- 6: Resolution 1 µm, 2 x position and speed, 2 position markers fix

**Interface parameters for IO-Link A \_ \_**

- 11: Resolution 5 µm, 1 x position, 1 position marker fix**
- 12: Resolution 5 µm, 1 x position and speed, 1 position marker fix**
- 13: Resolution 5 µm, 2 x position, 2 position markers fix
- 14: Resolution 5 µm, 2 x position and speed, 2 position markers fix
- 15: Resolution 5 µm, 3 x position, 3 position markers fix
- 31: Resolution 1 µm, 1 x position, 1 position marker fix
- 32: Resolution 1 µm, 1 x position and speed, 1 position marker fix
- 33: Resolution 1 µm, 2 x position, 2 position markers fix
- 34: Resolution 1 µm, 2 x position and speed, 2 position markers fix
- 35: Resolution 1 µm, 3 x position, 3 position markers fix

**Baud rate CANopen 6 \_ \_**

- 1: Baud rate 1000 kBaud
- 2: Baud rate 800 kBaud
- 3: Baud rate 500 kBaud**
- 4: Baud rate 250 kBaud
- 5: Baud rate 125 kBaud
- 7: Baud rate 50 kBaud
- 8: Baud rate 20 kBaud
- 9: Baud rate 10 kBaud

**Electrical connection CANopen**

- 105: Connector M16x0.75 (IEC130-9), 6-pin
- 106: Connector M12x1, 5-pin**

**Electrical connection IO-Link**

- 107: Connector M12x1, 4-pin**

**T H 1 - 0 8 0 0 - 1 0 2 - 6 1 3 - 1 0 6**

Series

**Electrical measuring range**  
**Standard lengths**  
**0050 up to 4250 mm**  
in 25 mm-steps.  
Other lengths on request

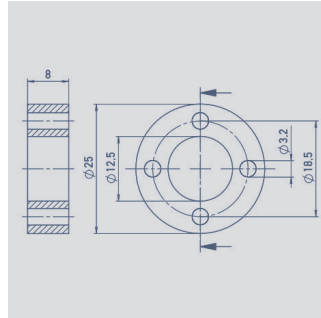
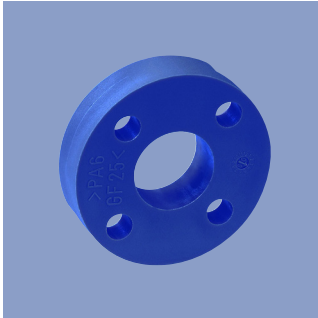
**Mechanical version**

- 102: Screw flange M18x1.5, zero point at 30 mm**
- 103: Screw flange 3/4" - 16UNF, zero point at 30 mm
- 104: Screw flange M18x1.5, zero point at 51 mm
- 105: Screw flange 3/4" - 16UNF, zero point at 51 mm
- 106: Screw flange M18x1.5, zero point at 30 mm, for supporting at rod end \*
- 107: Screw flange 3/4" - 16UNF, zero point at 30 mm, for supporting at rod end \*
- 108: Screw flange M18x1.5, Zero point at 51 mm, for supporting at rod end \*
- 109: Screw flange 3/4" - 16UNF, zero point at 51 mm, for supporting at rod end \*
- Other mechanical versions on request

\*) with internal thread M4x6 at rod end and additional length 7.5 mm

**Important:** Avoid equalizing currents in the cable shield caused by potential differences.  
Only CANopen: Twisted pair cable (STP) is recommended.

## Position marker

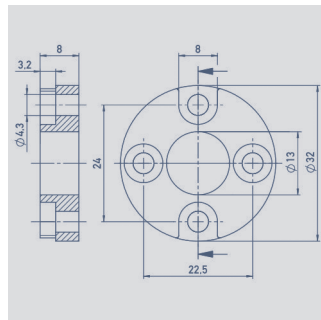
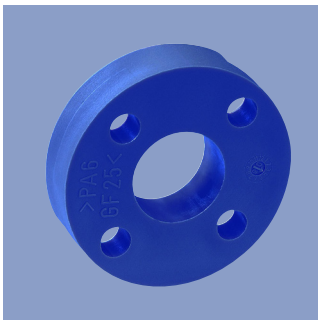


### Ring Position Marker Z-TH1-P18

P/N 005697

Series TH1 / TIM

Material	PA6-GF25
Weight approx.	12 g
Operating temperature	-40 ... +100° C
Surface pressure max.	40 N/mm <sup>2</sup>
Fastening torque of mounting screws, max.	1 Nm

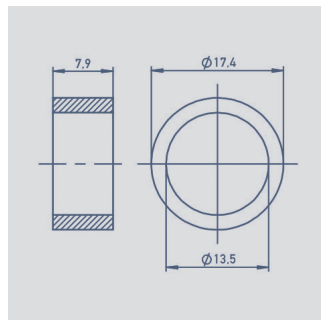
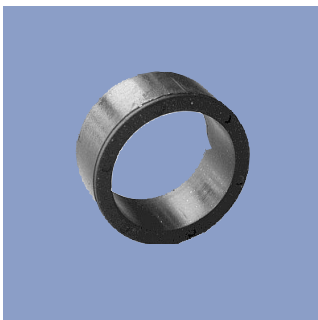


### Ring Position Marker Z-TH1-P19

P/N 005698

Series TH1 / TIM

Material	PA6-GF25
Weight approx.	14 g
Operating temperature	-40 ... +100°C
Surface pressure max.	40 N/mm <sup>2</sup>
Fastening torque of mounting screws, max.	1 Nm

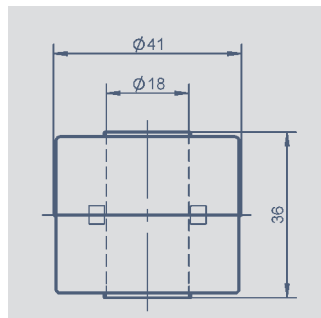
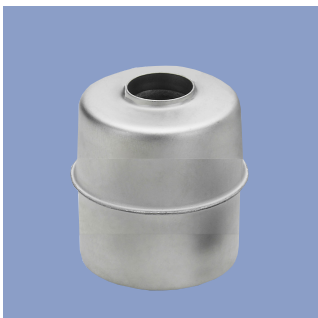


### Ring Position Marker Z-TIM-P20

P/N 005699

Series TH1 / TIM

Material	PA-Neonbond Compound
Weight approx.	5 g
Operating temperature	-40 ... +100°C
Surface pressure max.	10 N/mm <sup>2</sup>
Mounting via lock washer and lock ring	



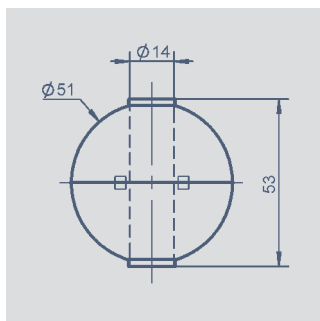
### Cylinder - Floating Position Marker Z-TH1-P21

P/N 056044

Series TH1 / TIM

Material	1.4404
Weight approx.	20 g
Operating temperature	-40 ... +100°C
Compression strength, min.	< 8 bar
Density	740 kg/m <sup>3</sup>
Immersion depth in water	26,6 mm

## Position marker Fastening elements

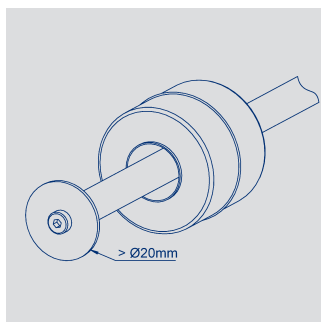


**Bowl - Floating Position Marker Z-TH1-P22**

P/N 056045

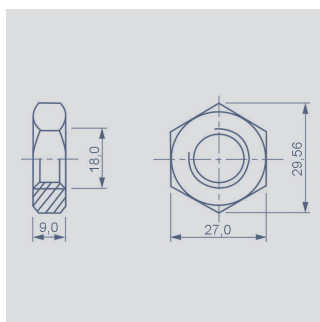
Series TH1 / TIM

Material	1.4571
Weight approx.	42 g
Operating temperature	-40 ... +100°C
Compression strength, min.	< 60 bar
Density	720 kg/m <sup>3</sup>
Immersion depth in water	36,7 mm



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end (s. drawing).

For this purpose, a sensor version with support at the rod end is required (s. ordering code).

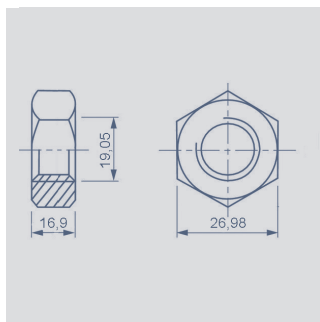


**Mounting nut ISO 8675,**

M18x1.5-A2

P/N 056090

Z-TH1-M01



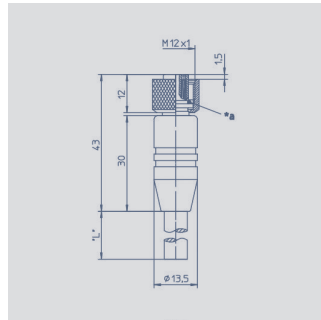
**Mounting nut DIN 934,**

3/4" - 16UNF-A2

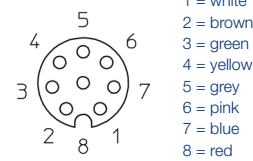
P/N 056091

Z-TH1-M02

## Connector System M12

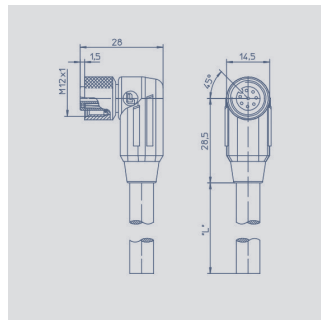
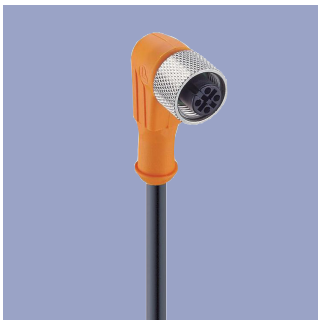


### Pin assignment

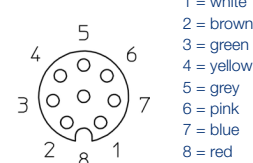


### M12x1 Mating female connector, 8-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

Connector housing	Plastic PA	
Cable sheath	PUR; Ø = max. 8 mm -25 °C...+80 °C (moved) -50 °C...+80 °C (fixed)	
Wires	PP, 0.25 mm <sup>2</sup>	
<b>Length</b>	<b>Type</b>	<b>P/N</b>
2 m	EEM 33-86	005629
5 m	EEM 33-90	005635
10 m	EEM 33-92	005637

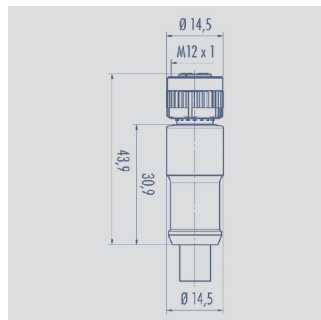


### Pin assignment

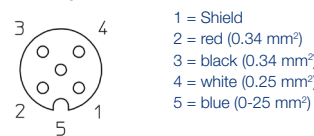


### M12x1 Mating female connector, 8-pin, angled, A-coded, with molded cable, shielded, IP67, open ended

Connecto housing	Plastic PA	
Cable sheath	PUR; Ø = max. 8 mm, -25 °C...+80 °C (moved) -50 °C...+80 °C (fixed)	
Wires	PP, 0.25 mm <sup>2</sup>	
<b>Length</b>	<b>Type</b>	<b>P/N</b>
2 m	EEM 33-87	005630
5 m	EEM 33-91	005636
10 m	EEM 33-93	005638

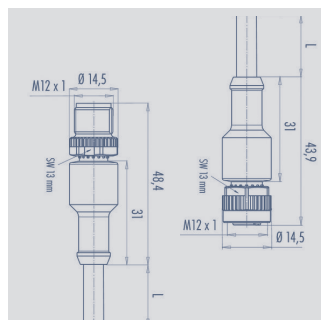


### Pin assignment

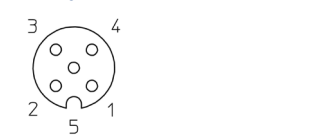


### M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded, open ended, CAN-bus

Connector housing	PUR	
Cable sheath	PUR Ø = max. 7.2 mm, -25 °C...+85 °C (moved)	
Wires	PP 2x 0.25 mm <sup>2</sup> + 2 x 0.34 mm <sup>2</sup>	
<b>Length</b>	<b>Type</b>	<b>P/N</b>
2 m	EEM 33-41	056141
5 m	EEM 33-42	056142
10 m	EEM 33-43	056143



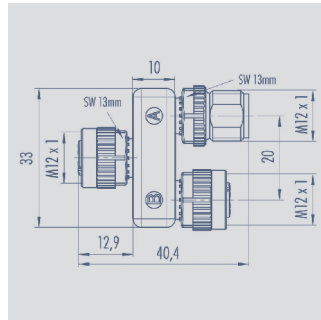
### Pin assignment



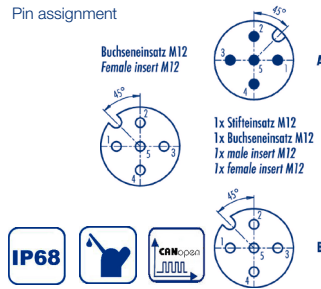
### M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP68, shielded, CAN-Bus

Connector housing	PUR	
Cable sheath	PUR; Ø 7.2 mm -25 °C... +85 °C (fixed)	
<b>Length</b>	<b>Type</b>	<b>P/N</b>
5 m	EEM 33-44	056144

## Connector System M12



### Pin assignment

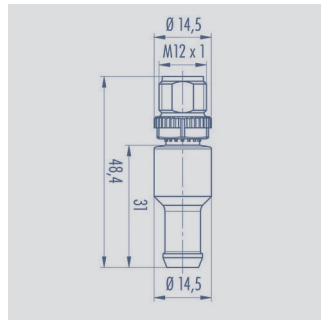


**M12x1 splitter / T-connector, 5-pin, A-coded, IP68, 1:1 connection, female - male - female, CAN-bus**

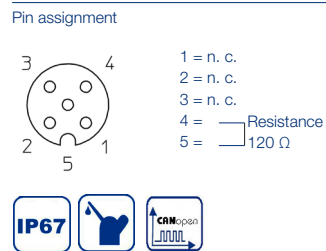
Connector housing PUR

Temperature range -25 °C... +85 °C

Type EEM 33-45, P/N 056145



### Pin assignment

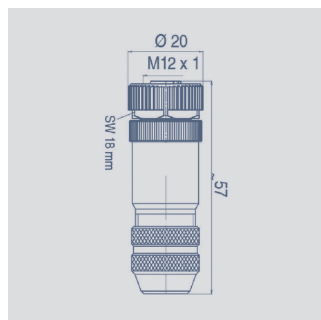


**M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-bus**

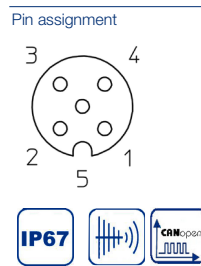
Connector housing PUR

Temperature range -25 °C... +85 °C

Type EEM 33-47, P/N 056147



### Pin assignment

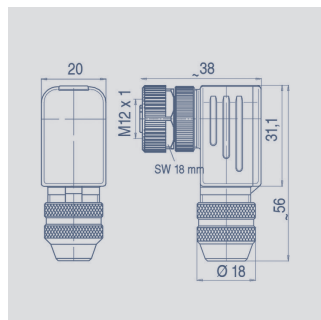


**M12x1 Mating female connector 5-pin, straight, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN-bus**

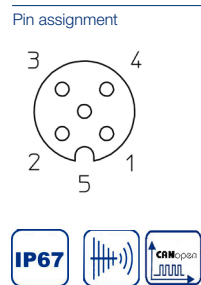
Connector housing Metall  
-40 °C...+85 °C

For wire gauge 6...8 mm, max. 0.75 mm<sup>2</sup>

Type EEM 33-73, P/N 005645



### Pin assignment



**M12x1 Mating female connector, 5-pin, angled, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN-Bus**

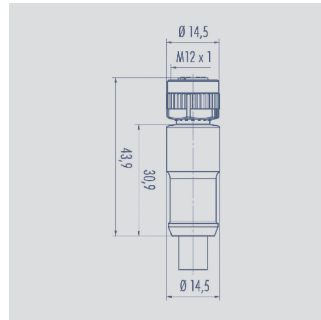
Connector housing Metall  
-40 °C...+85 °C

For wire gauge 6...8 mm, max. 0.75 mm<sup>2</sup>

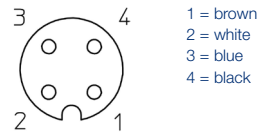
Type EEM 33-75, P/N 005646

It is possible to turn and fix the contact carrier in 90° positions.

## Connector System M12

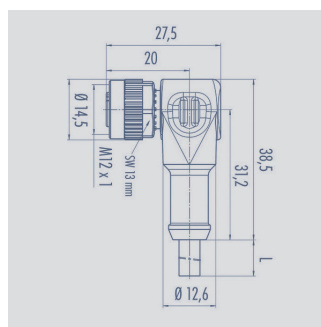


Pin assignment

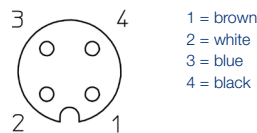


**M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, not shielded, IP67, open ended**

Connector housing	Plastic PA	
Cable sheath	PUR; Ø = max. 6 mm, -40 °C...+85 °C (fixed)	
Wires	PP, 0.34 mm <sup>2</sup>	
<b>Length</b>	<b>Type</b>	<b>P/N</b>
2 m	EEM 33-35	056135
5 m	EEM 33-36	056136
10 m	EEM 33-37	056137

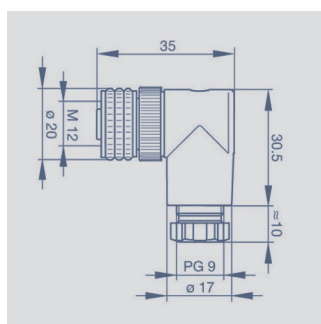


Pin assignment

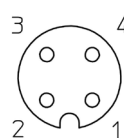


**M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended**

Connector housing	Plastic PA	
Cable sheath	PUR; Ø = max. 6 mm, -40 °C...+85 °C (fixed)	
Wires	PP, 0.34 mm <sup>2</sup>	
<b>Length</b>	<b>Type</b>	<b>P/N</b>
2 m	EEM 33-38	056138
5 m	EEM 33-39	056139
10 m	EEM 33-40	056140



Pin assignment

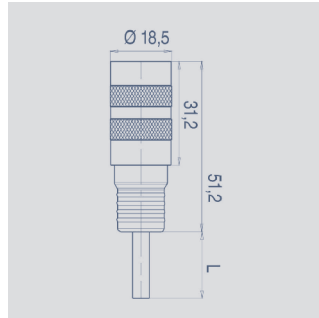


**M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shielded**

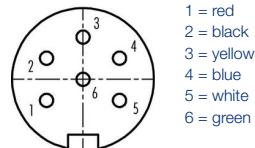
Connector housing	Plastic PBT	
	-25 °C...+90 °C	
For wire gauge	6...8 mm, max. 0.75 mm <sup>2</sup>	
Type	EEM 33-89, P/N 005634	



## Connector System M16



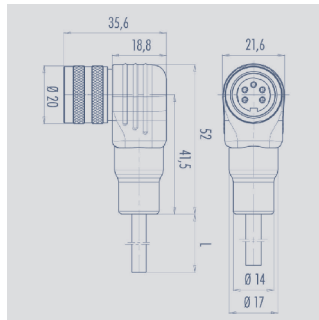
### Pin assignment



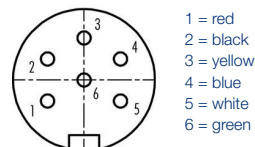
**M16x0.75 Mating female connector, 6-pin, straight, with molded cable, 2 m length, shielded, IP67, open ended**

Connector housing	PUR
Cable sheath	PUR; Ø max. 6 mm, -5...+70 °C (moved) -20...+70 °C (fixed)
Wires	PVC, 6 x 0,25 mm <sup>2</sup>
Type EEM 33-26, P/N 056126	

This coupling can be used in combination with 5-pin M16 connectors. Than „pin 6 / green“ is open.



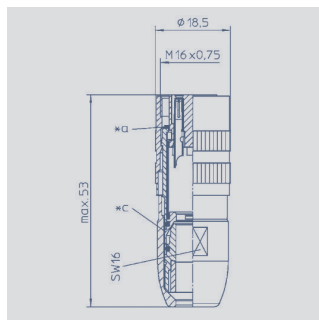
### Pin assignment



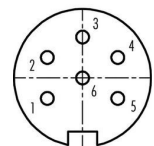
**M16x0.75 Mating female connector, 6-pin, angled, with molded cable, 2 m length, shielded, IP67, open ended**

Connector housing	PUR
Cable sheath	PUR; Ø max. 6 mm, -5...+70 °C (moved) -20...+70 °C (fixed)
Wires	PVC, 6 x 0,25 mm <sup>2</sup>
Type EEM 33-27, P/N 056127	

This coupling can be used in combination with 5-pin M16 connectors. Than „pin 6 / green“ is open.

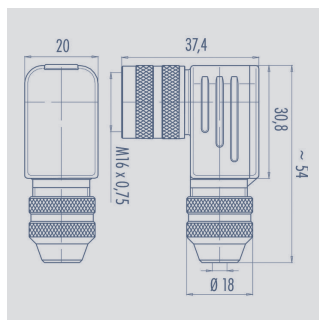


### Pin assignment

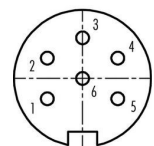


**M16x0.75 Mating female connector, 6-pin, straight, with coupling nut, solder terminal, IP68, shielded**

Connector housing	CuZn (Brass, nickel plated) -40 °C... +85 °C
For wire gauge	4...8 mm, max. 0.75 mm <sup>2</sup>
Type EEM 33-82, P/N 005639	



### Pin assignment



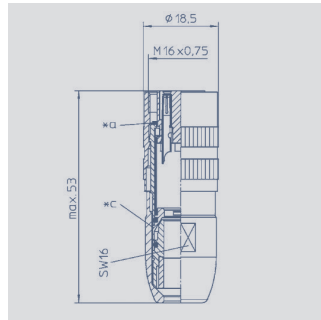
**M16x0.75 Mating female connector, 6-pin, angled, with coupling nut, solder terminal, IP67, shielded**

Connector housing	CuZn (Brass, nickel plated) -40 °C... +95 °C
For wire gauge	6...8 mm, PG 9 max. 0.75 mm <sup>2</sup>
Type EEM 33-94, P/N 005648	

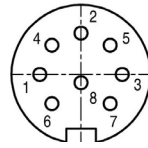
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Pin assignment

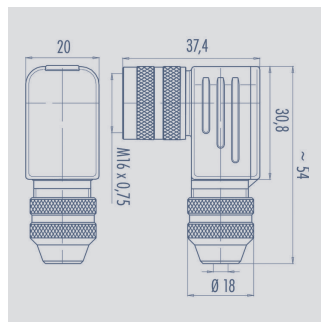


**M16x0.75 Mating female connector, 8-pin, straight, with coupling nut, solder terminal, IP68, shielded**

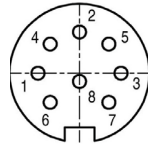
Connector housing	CuZn (Brass, nickel plated) -40 °C... +85 °C
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For wire gauge	4...8 mm, max. 0.75 mm <sup>2</sup>
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Type EEM 33-84, P/N 005627



Pin assignment



**M16x0.75 Mating female connector, 8-pin, angled, with coupling nut, solder terminal, IP67, shielded**

Connector housing	CuZn (Brass, nickel plated) -40 °C... +95 °C
-------------------	--

For wire gauge	6...8 mm, PG 9 max. 0.75 mm <sup>2</sup>
----------------	---

Type EEM 33-85, P/N 005628

**IP67** Protection class IP67 to DIN EN 60529

**IP68** Protection class IP68 to DIN EN 60529

**CANopen** CAN-bus

Very good Electromagnetic Compatibility (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

**UL** UL - approved

Suited for applications in dragchains

**Note:** The protection class is valid only in locked position with its plugs.

The application of these products in harsh environments must be checked in particular cases.

The specifications contained in our datasheets are intended solely for informational purposes. The documented specification values are based on ideal operational and environmental conditions and can vary significantly depending on the actual customer application. Using our products at or close to one or more of the specified performance ranges can lead to limitations regarding other performance parameters. It is therefore necessary that the end user verifies relevant performance parameters in the intended application. We reserve the right to change product specifications without notice.