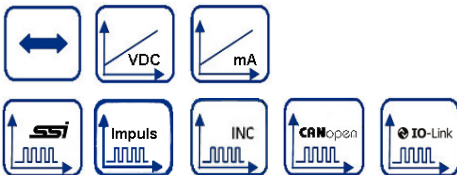
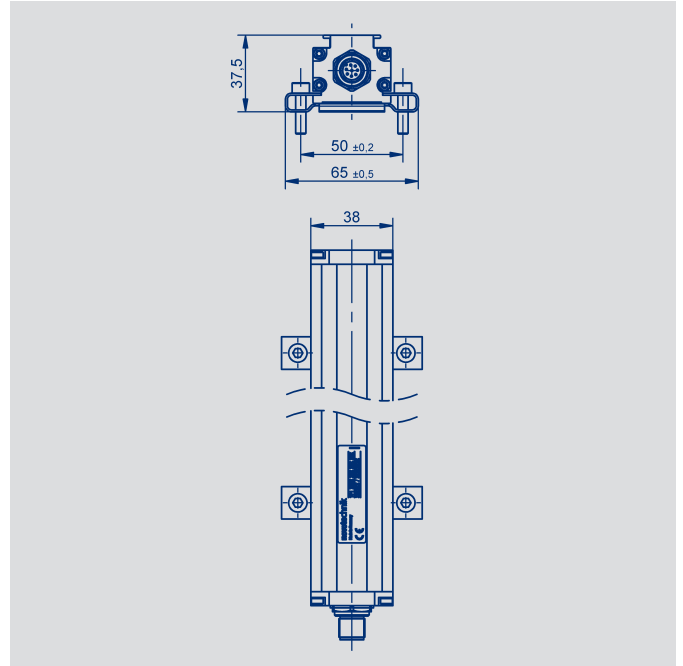
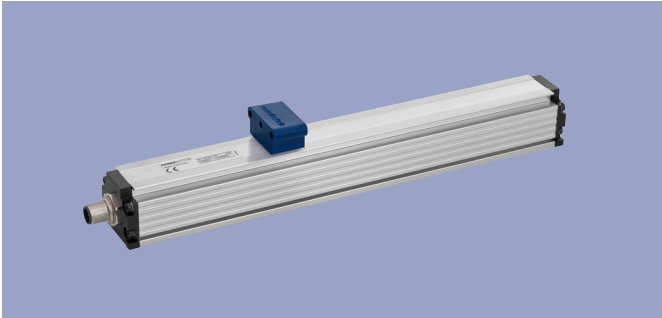


**NOVOSTRICTIVE**  
**Transducer**  
**up to 4250 mm**  
**touchless**

Series TP1



**Special features**

- Non-contacting magnetostrictive measurement technology
- Touchless position detection
- Wear-free, unlimited mechanical life
- Resolution up to 1  $\mu\text{m}$ , independently of length
- Low temperature coefficient <15 ppm/K
- Insensitive to shock and vibration
- Protection class IP67 / IP68
- Position-Teach-In
- Optionally galvanic isolated
- Interfaces: Analog, SSI, Impulse, Incremental, CANopen, IO-Link

**Applications**

- Manufacturing Engineering
  - Plastic injection molding
  - Textile
  - Packaging
  - Sheet metal working
  - Woodwork
- Automation Technology

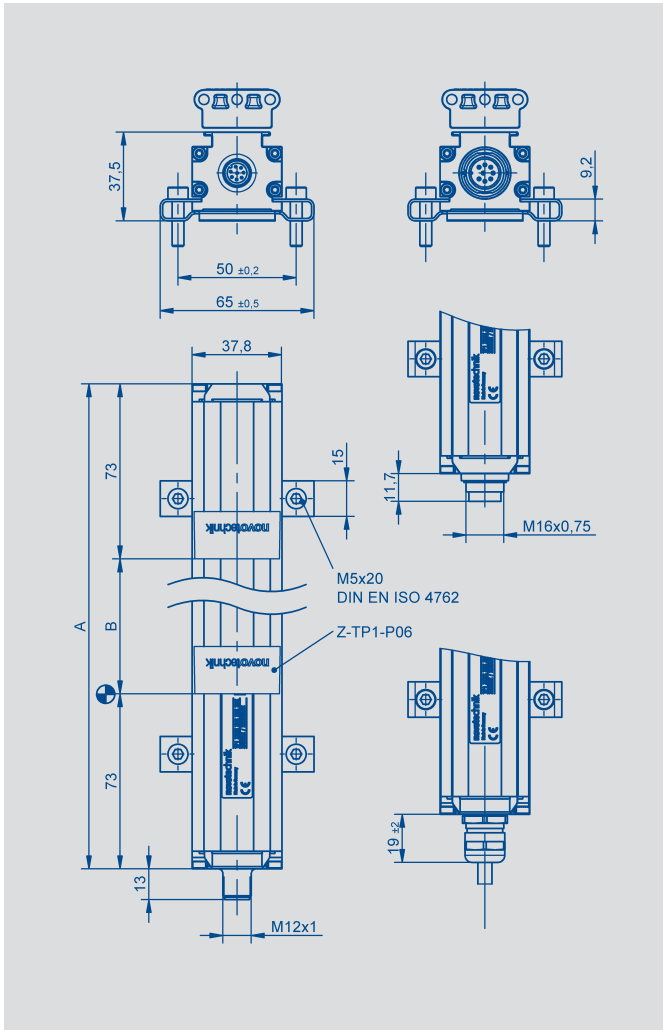
**Transducer in profile design with magnetostrictive technology** for highly accurate and reproducible position measurement for lengths up to 4250 mm. Mechanically decoupled and therefore wear-free when the floating position marker is used.

The transducer TP1 is insensitive to dirt, dust or moisture and thus proves itself in harsh industrial environments. Depending on the interface, up to three positions and speed can be measured.

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## Mechanical Data



Description	
Materials	Housing: Anodized aluminum, AlMgSi0,5 F22, 3.3206.71 End flanges: Aluminum G AISi12Cu1 (FE)
Mounting	Adjustable clamps (included in delivery)
Position marker	Floating position marker, plastic Guided position marker, plastic, with ball coupling
Electrical connections	Connector M12x1, 4-pin / 5-pin / 8-pin, shielded Connector M16x0.75 (IEC 130-9), 6-pin / 8-pin, shielded PUR-cable, 8 x 0.25 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
Length of housing (dimension A)	Dimension B + 146 mm
Electrical measuring range (dimension B)	0050 up to 0500 mm in 25 mm steps, 500 up to 1000 mm in 50 mm steps, 1000 up to 2000 mm in 100 mm steps, 2000 up to 4250 mm in 250 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 (with floating position marker)
Operating temperature range	-40 ... +85 °C
Storage temperature range	-40 ... +105 °C
Operating humidity range	0 ... 95 (no condensation) % R.H.

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

## Technical Data Analog Versions

Type designations	TP1- _____101 - 41 _ - ____ Voltage	TP1- _____101 - 42 _ - ____ Current
<b>Electrical Data</b>		
Electrical measuring range (dimension B)	0050 up to 4250	mm
Output signal	0.1 ... 10 V (load $\geq 5 \text{ k}\Omega$ ) -10 ... 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: 2 kHz, 750 ... < 2000 mm: 1 kHz, > 2000 mm: 0.5 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 with galvanic isolation	24 (18 ... 36)	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)	23	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-TP1-P06.



### Pin assignment

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

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

Connector code 103	Connector with cable (Accessories)	Analog voltage	Analog current
Pin 1	WH	0 (-10)...+10 V	0 (4)...20 mA
Pin 2	BN	Signal GND	Signal GND
Pin 3	BU	+10...0 (-10) V	do not connect
Pin 4	BK	GND	GND
Pin 5	GY	Supply voltage	Supply voltage
Pin 6	GN	GND	GND

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

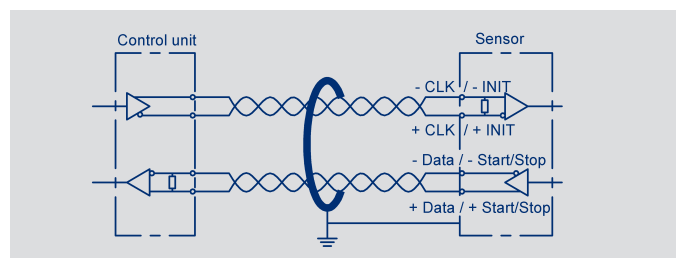
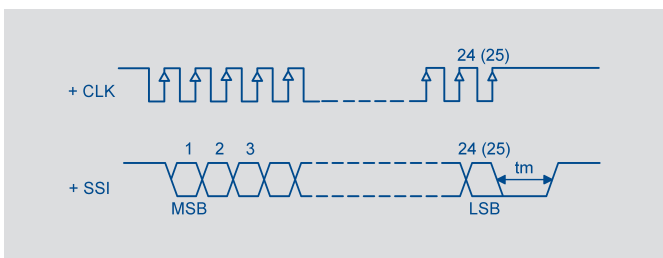
<p><b>Ordering specifications</b> Preferred types printed in bold</p>	<p>Mechanical version <b>101: Profile design</b></p>	<p>Electrical interface <b>4: Analog interface</b></p>	<p>Output signal analog interfaces 4 _ _ <b>1: Voltage output</b> <b>2: Current output</b></p>	<p>Output signal analog interfaces 4 _ _ <b>1: Voltage output</b> <b>2: Current output</b></p> <p><b>Analog interface voltage output 41_</b> 1: <b>0 ... 10 V and 10 ... 0 V *</b> 4: 0 ... 10 V and 10 ... 0 V galvanic isolated 6: -10 ... +10 V and +10 ... -10 V galvanic isolated</p> <p><b>Analog interface current output 42_</b> 1: 0 ... 20 mA * 2: 20 ... 0 mA * <b>3: 4 ... 20 mA *</b> 4: 20 ... 4 mA *</p> <p>*) With Teach-In-function</p> <p><b>Electrical connection</b> 101: Connector M16x0.75 (IEC 130-9), 8-pin <b>102: Connector M12x1, 8-pin</b> 103: Connector M16x0.75 (IEC 130-9), 6-pin <b>201: Cable, 8-pole, shielded, 1 m</b> 203: Cable, 8-pole, shielded, 3 m 205: Cable, 8-pole, shielded, 5 m</p>
<p><b>T P 1 - 0 8 0 0 - 1 0 1 - 4 1 1 - 1 0 2</b></p>				
<p>Series</p>	<p>Electrical measuring range <b>Standard lengths 0050 up to 4250 mm</b> 0050 up to 0500 mm in 25 mm-steps, 0500 up to 1000 mm in 50 mm-steps, 1000 up to 2000 mm in 100 mm-steps, 2000 up to 4250 mm in 250 mm-steps. Other lengths on request</p>			

**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>TP1 - - - - - 101 - 2 - - - - -</b> <b>Synchronous-serial interface (SSI)</b>
<b>Electrical Data</b>	
Electrical measuring range (dimension B)	0050 up to 4250 mm
Protocol	SSI 24 und 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
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)	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

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



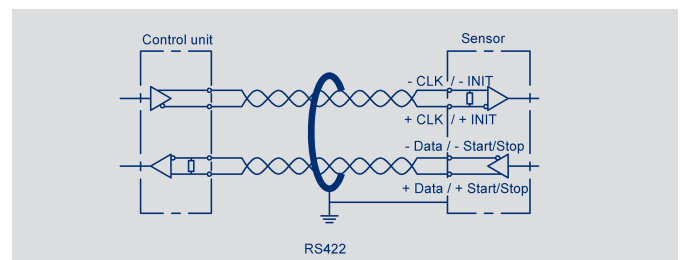
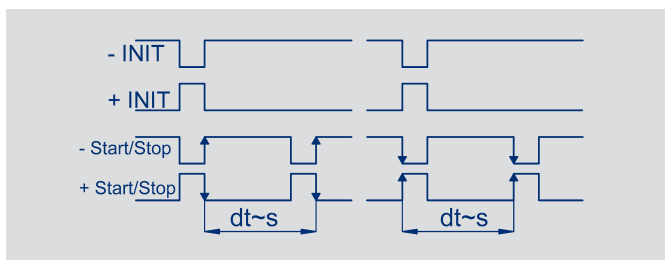
### Pin assignment

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

<b>Type designations</b>	<b>TP1- _ _ _ _ - 101 - 11 _ - _ _ _</b> <b>Start-Stop-Impulse-Interface</b>	
<b>Electrical Data</b>		
Electrical measuring range (dimension B)	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

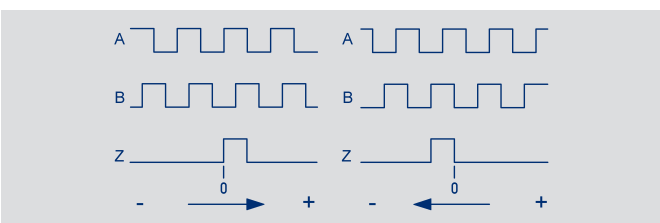
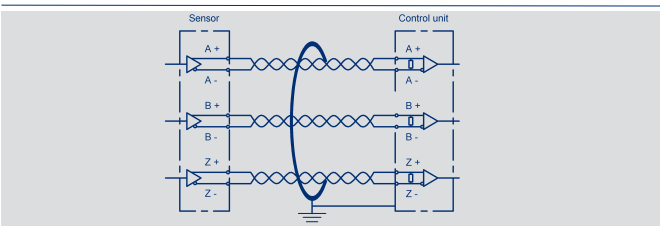
Connector code 101, 102	Cable code 20 _	Connector with cable (Accessories)	Start/Stop-Impulse-Interface
Pin 1	YE	WH	INIT +
Pin 2	GY	BN	Start/Stop +
Pin 3	PK	GN	INIT -
Pin 4	RD	YE	do not connect
Pin 5	GN	GY	Start/Stop -
Pin 6	BU	PK	GND
Pin 7	BN	BU	Supply voltage
Pin 8	WH	RD	do not connect

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

## Technical Data Incremental- Interface

<b>Type designations</b>	<b>TP1- _ _ _ _ - 101 - 8 _ _ _ _</b> <b>Incremental-Interface</b>		
<b>Electrical Data</b>			
Electrical measuring range (dimension B)	0050 up to 4250	mm	
Outputs	A+ / A- / B+ / B- / Z+ / Z-		
Level	RS422 differential		
Sampling rate / Update rate	< 750 mm: 2 kHz, 750 ... < 2000 mm: 1 kHz, > 2000 mm: 0.5 kHz Extrapolated to 16 kHz		
Resolution (with 4-fold interpretation)	1 or 5	µm	
Max. pulse frequency at power-on (initialising)	156 high speed mode 78 low speed mode	kHz	
Frequency A/B-signal	Variable, depending on operational speed, max. 148	kHz	
Missing increments when exceeding the max. operational speed	none		
Length Z-pulse	Distance between 2 edges A / B		
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	≤ 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	
Current consumption	≤ 100	mA	
Overvoltage protection	40 (permanent)	VDC	
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	
Insulation resistance (500 VDC)	≥ 10	MΩ	
<b>Environmental Data</b>			
Max. operating speed **	Resolution 1 µm	Resolution 5 µm	
High speed mode	0.45	2.2	ms <sup>-1</sup>
Low speed mode	0.22	1.1	ms <sup>-1</sup>
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		
FMC 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		

\*) Measured with resolution 1 µm.  
At resolution > 1 µm the permissible linearity error is increased by the resolution.  
\*\*) With valid output signal, when using a floating position marker.



### Pin assignment

Connector code 102	Cable code 20 _	Connector with cable (Accessories)	Incremental Interface
Pin 1	YE	WH	A+
Pin 2	GY	BN	B+
Pin 3	GN	GN	B-
Pin 4	WH	YE	Z+
Pin 5	RD	GY	Z-
Pin 6	BU	PK	GND
Pin 7	BN	BU	Supply voltage
Pin 8	PK	RD	A-



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

**Ordering specifications**

Preferred types printed in bold

**Mechanical version**

**101: Profile design**

**Electrical Interface**

- 1: Impulse-Interface**
- 2: SSI-Interface**
- 8: Incremental-Interface (A / B / Z)**

**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

**Output signal Incremental-Interface 8 \_ \_**  
**4: Resolution 5 µm, high speed mode, power-on burst**  
6: Resolution 1 µm, high speed mode, power-on burst  
7: Resolution 5 µm, low speed mode, power-on burst  
9: Resolution 1 µm, low speed mode, power-on burst

**Impulse-Interface Start-Stop Signal 11 \_**  
**1: For 1 position marker**  
2: For 2 position markers  
3: For 3 position markers

**Synchronous-Serial 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

**Incremental-Interface 8 \_ \_**  
**1: RS422 differential (A / B / Z)**

**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-pole, shielded, 1 m**
- 203: Cable, 8-pole, shielded, 3 m
- 205: Cable, 8-pole, shielded, 5 m
- \*) not for incremental interface

**T P 1 - 0 8 0 0 - 1 0 1 - 2 1 1 - 1 0 2**

Series

**Electrical measuring range**  
**Standard lengths 0050 up to 4250 mm**  
0050 up to 0500 mm in 25 mm-steps, 0500 up to 1000 mm in 50 mm-steps,  
1000 up to 2000 mm in 100 mm-steps, 2000 up to 4250 mm in 250 mm-steps.  
Other lengths on request

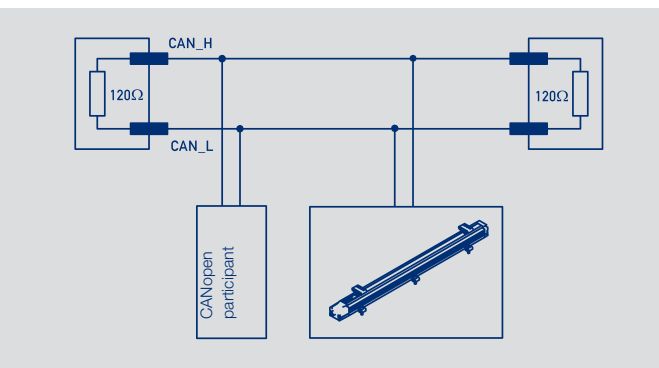
**Important:** Avoid equalizing currents in the cable shield caused by potential differences.  
Twisted pair cable (STP) is recommended.

Technical Data



<b>Type designations</b>	<b>TP1 - - - - -101- 6 - - - -</b> <b>CANopen-Interface</b>	
<b>Electrical Data</b>		
Measured variables	Position and speed	
Electrical measuring range (dimension B)	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		
Node-ID	1 ... 127 (default 127)	
Baud rate	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 and 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>TP1 - - - - -101- A _ _ - - - -</b> <b>IO-Link</b>		
<b>Electrical Data</b>			
Measured variables	Position, speed and temperature		
Electrical measuring range (dimension B)	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

Mechanical version  
**101: Profile design**

Electrical Interfaces  
**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

Baudrate 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 P 1 - 0 8 0 0 - 1 0 1 - 6 1 3 - 1 0 6**

Series

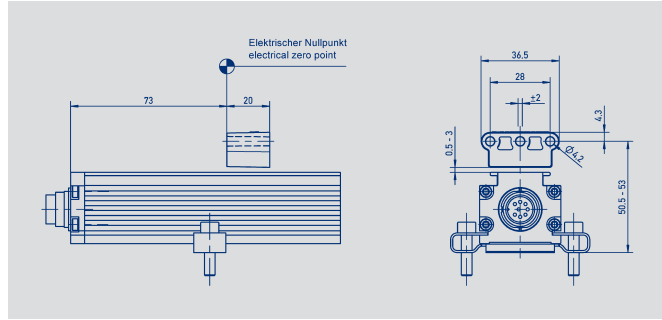
Electrical measuring range

**Standard lengths 0050 up to 4250 mm**

0050 up to 0500 mm in 25 mm-steps, 0500 up to 1000 mm in 50 mm-steps,  
1000 up to 2000 mm in 100 mm-steps, 2000 up to 4250 mm in 250 mm-steps.  
Other lengths on request

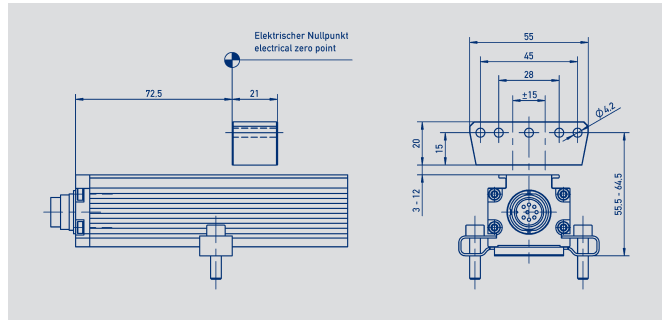
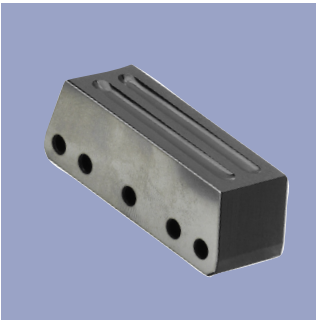
**Important:** Avoid equalizing currents in the cable shield caused by potential differences.  
Only CANopen: Twisted pair cable (STP) is recommended.

## Position Marker



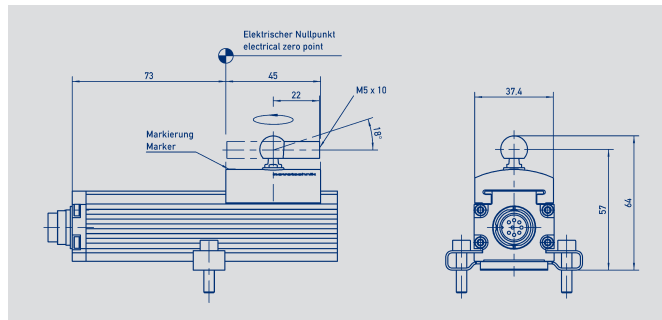
### Floating position marker

Material	PA6 GF25
Working distance	0.5 ... 3 mm
Weight	approx. 10 g
P/N 005693, Z-TP1-P06	



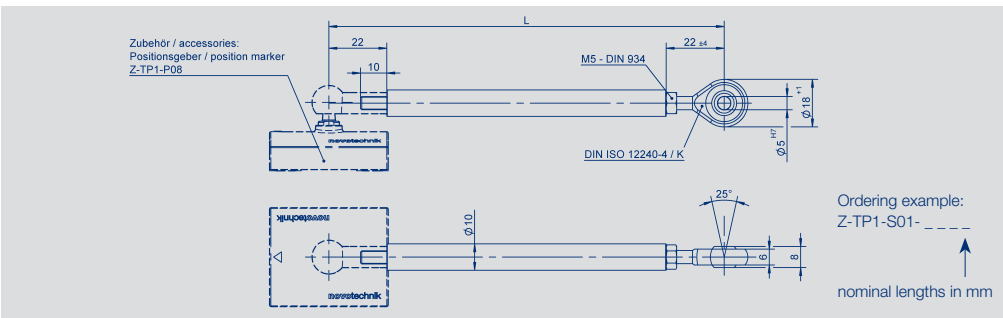
### Floating position marker for large distances

Material	PA6 GB30
Working distance	3 ... 12 mm
Weight	approx. 40 g
P/N 005694, Z-TP1-P07	



### Guided position marker

Material	POM
Weight	approx. 30 g
P/N 005695, Z-TP1-P08	

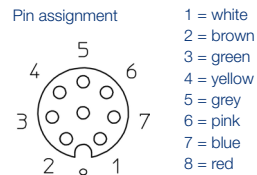
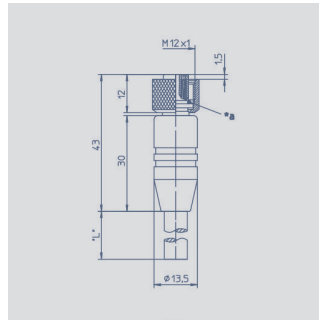


### Actuating rod for guided position marker Z-TP1-P08

Material	Aluminum
Weight	approx. 150 g
Standard-nominal lengths (mm)	0075, 0100, 0125, 0150, 0200, 0250, 0300, 0350, 0400, 0450, 0500, 0600, 0800, 1000, 1500, 2000
Z-TP1-S01- _____	

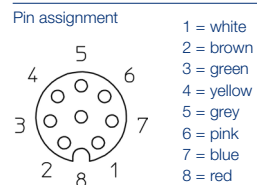
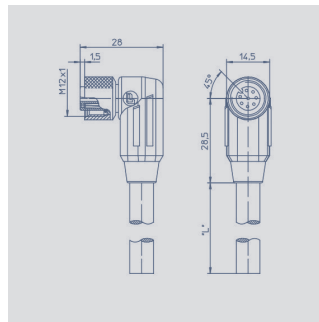
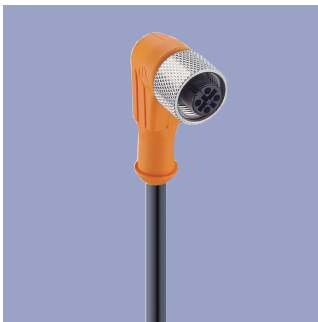
Environmental conditions, length of actuating rod, acceleration etc. have a direct influence on life time and accuracy of the whole system; it must be qualified by the user in the real application.

## Connector System M12



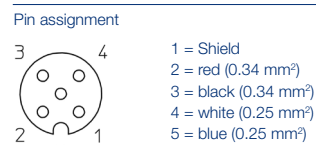
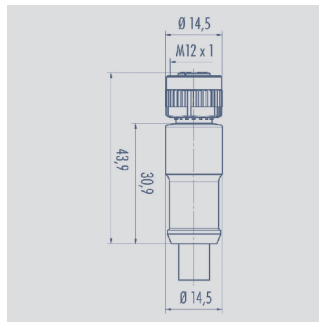
**M12x1 Mating female connector, 8-pin, straight, A-coded, with molded cable, shielded, IP67, open ended**

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



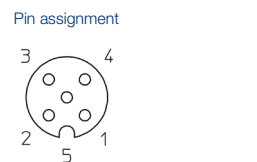
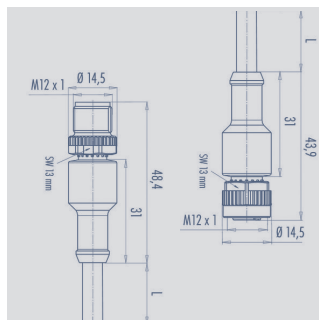
**M12x1 Mating female connector, 8-pin, angled, A-coded, with molded cable, shielded, IP67, open ended**

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 33-87	005630
5 m	EEM 33-91	005636
10 m	EEM 33-93	005638



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

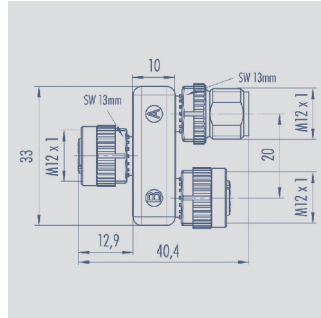
Connector housing	PUR	
Cable sheath	PUR Ø = max. 7.2 mm, -25 °C...+85 °C (moved)	
Wires	PP 2x 0.25 mm <sup>2</sup> + 2 x 0.34 mm <sup>2</sup>	
<b>Length</b>	<b>Type</b>	<b>P/N</b>
2 m	EEM 33-41	056141
5 m	EEM 33-42	056142
10 m	EEM 33-43	056143



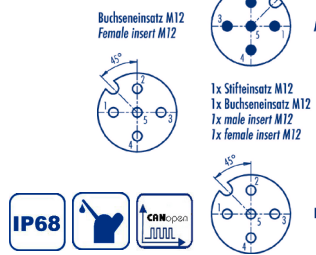
**M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP68, shielded, CAN-bus**

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

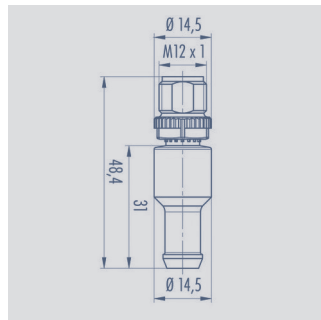


**T-connector M12x1, 5-pin, A-coded, IP68, 1:1 connection, female - male - female, CAN-bus**

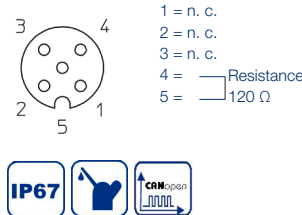
Connector housing PUR

Temperature range -25 °C... +85 °C

Type EEM 33-45, P/N 056145



### Pin assignment

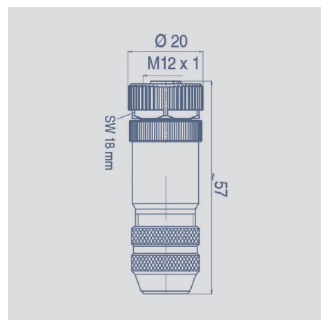


**Terminating resistor M12x1, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-bus**

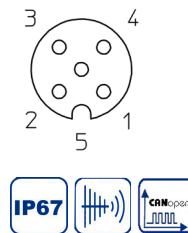
Connector housing PUR

Temperature range -25 °C... +85 °C

Type EEM 33-47, P/N 056147



### Pin assignment



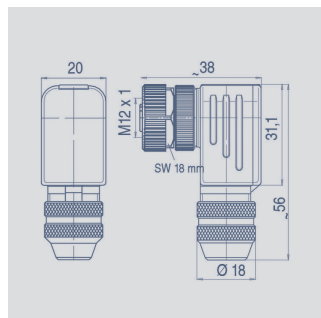
**M12x1 Mating female connector, 5-pin, straight, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN-bus**

Connector housing Metal

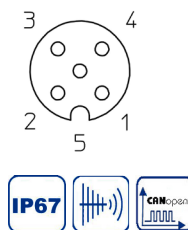
-40 °C...+85 °C

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 Metal

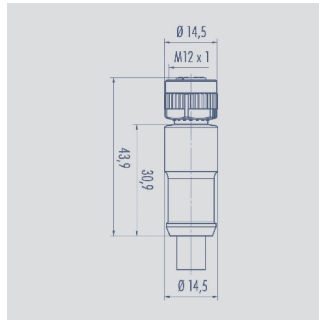
-40 °C...+85 °C

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

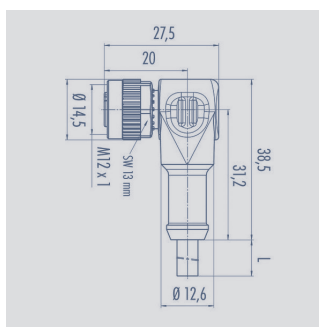


1 = brown  
2 = white  
3 = blue  
4 = black



**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

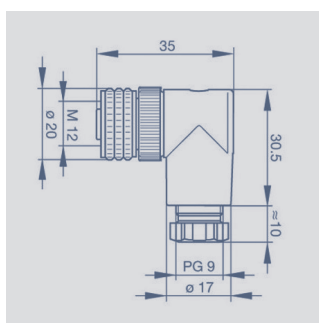


1 = brown  
2 = white  
3 = blue  
4 = black



**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

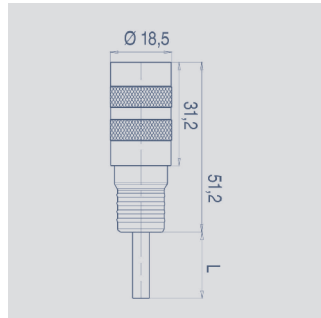


**M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shielded**

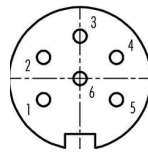
Connector housing	Plastic PBT -25 °C...+90 °C	
For wire gauge	6...8 mm, max. 0.75 mm <sup>2</sup>	
Type	EEM 33-89, P/N 005634	



## Connector System M16



### Pin assignment



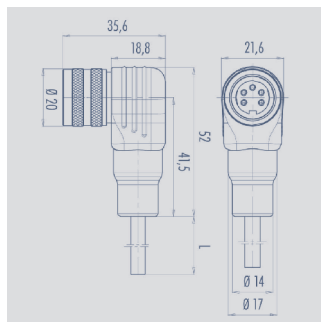
- 1 = red
- 2 = black
- 3 = yellow
- 4 = blue
- 5 = white
- 6 = green



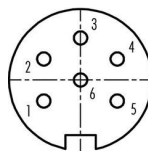
**M16x0.75 Mating female connector, 6-pin, straight, with molded cable, 2 m length, shielded, IP67, open ended**

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



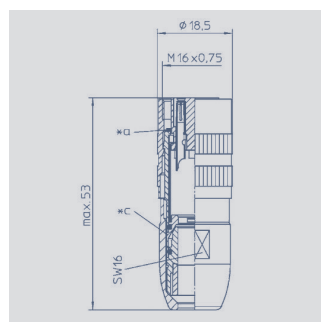
- 1 = red
- 2 = black
- 3 = yellow
- 4 = blue
- 5 = white
- 6 = green



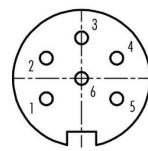
**M16x0.75 Mating female connector, 6-pin, angled, with molded cable, 2 m length, shielded, IP67, open ended**

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.

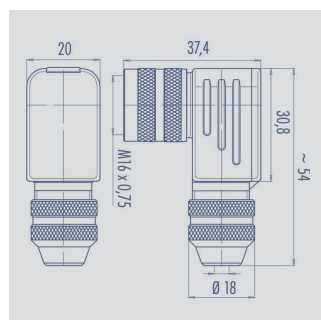


### Pin assignment

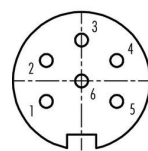


**M16x0.75 Mating female connector, 6-pin, straight, with coupling nut, solder terminal, IP68, shielded**

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



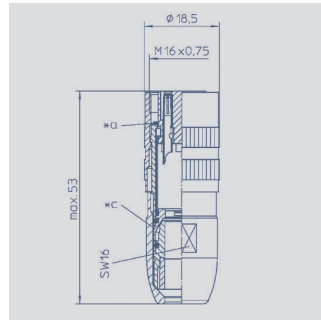
**M16x0.75 Mating female connector, 6-pin, angled, with coupling nut, solder terminal, IP67, shielded**

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	

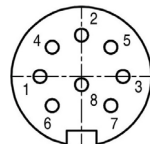
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Pin assignment

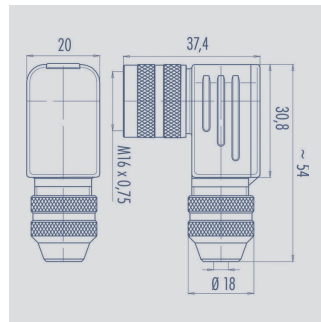


**M16x0.75 Mating female connector, 8-pin, straight, with coupling nut, solder terminal, IP68, shielded**

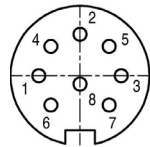
Connector housing	CuZn (Brass, nickel plated) -40 °C... +85 °C
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For wire gauge	4...8 mm, max. 0.75 mm <sup>2</sup>
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Type EEM 33-84, P/N 005627



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



Protection class IP67 to DIN EN 60529



Very good Electromagnetic Compatibility (EMC) and shield systems



Suited for applications in dragchains



Protection class IP68 to DIN EN 60529



Very good resistance to oils, coolants und lubricants



CAN-bus



UL - approved

**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.