

# POSIWIRE<sup>®</sup>

Cable Extension Position Sensors

**WS10SG**  
**Position Sensor**

Datasheet



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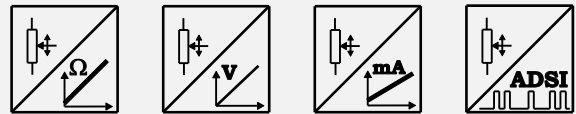
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## Analog output, SSI output



### Sensor features

- Measurement range up to 1250 mm
- Protection class IP65 (with mating connector only)
- Analog output, SSI output



## Specifications

<b>Output</b>	<b>R1K</b> = Potentiometer 1 kΩ <b>10V</b> = Voltage 0 ... 10 V <b>420A</b> = Current 4 ... 20 mA, 2 wire <b>420T</b> = Current 4 ... 20 mA, 3 wire <b>PMUI</b> = Current output, programmable <b>PMUV</b> = Voltage output, programmable <b>ADSI</b> = Signal conditioner SSI 12 bit, replaced by MSS112 <b>ADSI14</b> = Signal conditioner SSI 14 bit, replaced by MSS114 <b>ADSI16</b> = Signal conditioner SSI 16 bit, replaced by MSS116
<b>Resolution</b>	Analog: quasi infinite
<b>Linearity</b>	±0.10% f.s. (standard) ±0.05% f.s. (optional)
<b>Sensing device</b>	Precision potentiometer
<b>Housing material</b>	Plastic, aluminium measuring cable: stainless steel
<b>Protection class</b>	IP65 (with mating connector only)
<b>Connection</b>	Connector M12, 8 pin
<b>Temperature range</b>	-20 ... +85 °C
<b>Weight</b>	approx. 450 g
<b>EMC</b>	DIN EN 61326-1:2013

<b>Cable forces</b> typical at = 20 °C	<b>Measurement range</b>	<b>Maximum pull-out force</b>	<b>Minimum pull-in force</b>
	[mm]	[N]	[N]
	100	4,7	3,0
	125	4,6	2,4
	375	7,4	3,9
	500	5,5	2,8
	750	7,6	3,8
	1000	5,3	2,9
	1250	4,6	2,4

**Order code**

**WS10SG** – 1 – 2 – 3 – 4 – 5

**1 Measurement range (in mm)**

100 / 125 / 375 / 500 / 750 / 1000 / 1250

**2 Output**

- R1K** = Potentiometer 1 kΩ
- 10V** = Voltage 0 ... 10 V
- 420A** = Current 4 ... 20 mA, 2 wire
- 420T** = Current 4 ... 20 mA, 3 wire
- PMUI** = Current output, programmable
- PMUV** = Voltage output, programmable
  
- ADSI** = Signal conditioner SSI 12 bit, replaced by MSS112
- ADSI14** = Signal conditioner SSI 14 bit, replaced by MSS114
- ADSI16** = Signal conditioner SSI 16 bit, replaced by MSS116

**3 Linearity**

- L10** = ±0.10% f.s. (standard)
- L05** = ±0.05% f.s. (optional)

**4 Cable fixing**

- M4** = M4 cable fixing
- SB0** = cable clip

**5 Connection**

- M12** = Connector M12, 8 pin

**Order example**

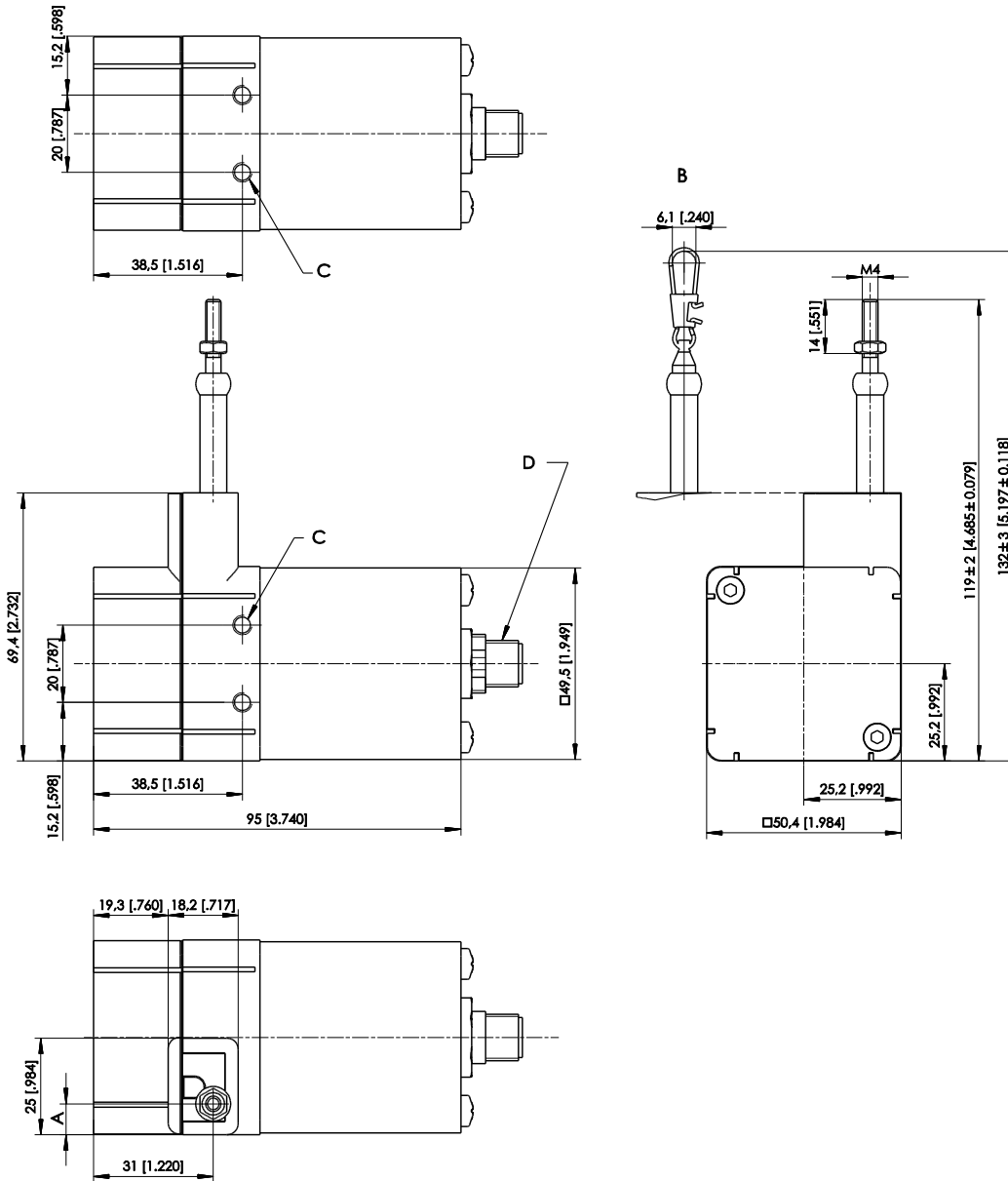
**WS10SG – 1250 – 10V – L10 – M4 – M12**

**Accessories:**

**Connector cable (see page 45)**

## Dimensions

Measurement range 100 ... 1250 mm, analog output, SSI output



Dimensions in mm	Measurement range	A
	375; 750	12.4
	100; 125; 500; 1000; 1250	8

B – Option SB0  
C – M5 - 8 [.315] deep  
D – Connector M12

Dimensions in mm [inch]  
Dimensions informative only.  
For guaranteed dimensions consult factory.

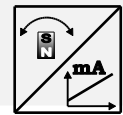
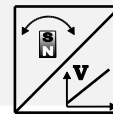


## Magnetic encoder, analog output



### Sensor features

- With magnetic absolute encoder
- Measurement range up to 2000 mm
- Protection class IP65 (with mating connector only)
- Analog output
- Absolute measurement



### Specifications

<b>Output</b>	<b>U2</b> = Voltage 0.5 ... 10 V <b>U8</b> = Voltage 0.5 ... 4.5 V <b>I1</b> = Current 4 ... 20 mA, 3 wire
<b>Resolution</b>	<0.002% f.s.
<b>Linearity</b>	±0.10% f.s. (standard) ±0.05% f.s. (optional)
<b>Sensing device</b>	Magnetic absolute encoder
<b>Housing material</b>	Plastic, aluminium measuring cable: stainless steel
<b>Protection class</b>	IP65 (with mating connector only)
<b>Connection</b>	Connector M12, 5 pin (standard) Connector M12, 8 pin ( optional)
<b>Shock</b>	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
<b>Vibration</b>	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
<b>Temperature range</b>	-20 ... +85 °C
<b>Weight</b>	approx. 450 g
<b>EMC</b>	DIN EN 61326-1:2013

**Order code**

**WS10SG** – 1 – 2 – 3 – 4 – 5 – 6

**1 Measurement range (in mm)**

250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000

**2 Output**

**U2** = Voltage 0.5 ... 10 V  
**U8** = Voltage 0.5 ... 4.5 V  
**I1** = Current 4 ... 20 mA, 3 wire

**3 Signal characteristics**

**A** = increasing signal (e.g. 4 ... 20 mA)  
**D** = decreasing signal (e.g. 20 ... 4 mA)

**4 Linearity**

**L10** = ±0.10% f.s. (standard)  
**L05** = ±0.05% f.s. (optional)

**5 Cable fixing**

**M4** = M4 cable fixing  
**SB0** = cable clip

**6 Connection**

**M12A5** = Connector M12, 5 pin (standard)  
**M12A8** = Connector M12, 8 pin (optional)

**Order example**

**WS10SG – 1250 – U2 – A – L10 – M4 – M12A5**

**Accessories:**

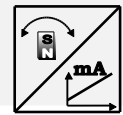
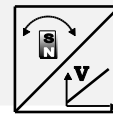
**Connector cable (see page 43)**

## Magnetic encoder, analog output, programmable



### Sensor features

- With magnetic absolute encoder
- Measurement range up to 2000 mm
- Protection class IP65 (with mating connector only)
- Analog output, programmable
- Absolute measurement



### Specifications

<b>Output</b>	<b>U2/PMU</b> = Voltage 0.5 ... 10 V, programmable <b>U8/PMU</b> = Voltage 0.5 ... 4.5 V, programmable <b>I1/PMU</b> = Current 4 ... 20 mA, 3 wire, programmable
<b>Resolution</b>	<0.002% f.s.
<b>Linearity</b>	±0.10% f.s. (standard) ±0.05% f.s. (optional)
<b>Sensing device</b>	Magnetic absolute encoder
<b>Housing material</b>	Plastic, aluminium measuring cable: stainless steel
<b>Protection class</b>	IP65 (with mating connector only)
<b>Connection</b>	Connector M12, 5 pin
<b>Shock</b>	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
<b>Vibration</b>	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
<b>Temperature range</b>	-20 ... +85 °C
<b>Weight</b>	approx. 450 g
<b>EMC</b>	DIN EN 61326-1:2013

**Order code**

**WS10SG** – 1 – 2 – 3 – 4 – 5 – 6

**1 Measurement range (in mm)**

250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000

**2 Output**

**U2/PMU** = Voltage 0.5 ... 10 V, programmable  
**U8/PMU** = Voltage 0.5 ... 4.5 V, programmable  
**I1/PMU** = Current 4 ... 20 mA, 3 wire, programmable

**3 Signal characteristics**

**A** = increasing signal (e.g. 4 ... 20 mA)  
**D** = decreasing signal (e.g. 20 ... 4 mA)

**4 Linearity**

**L10** = ±0.10% f.s. (standard)  
**L05** = ±0.05% f.s. (optional)

**5 Cable fixing**

**M4** = M4 cable fixing  
**SB0** = cable clip

**6 Connection**

**M12A5** = Connector M12, 5 pin

**Order example**

**WS10SG – 1250 – U2/PMU – A – L10 – M4 – M12A5**

**Accessories:**

**Connector cable (see page 44)**

## Magnetic encoder, digital output SSI



### Sensor features

- With magnetic absolute encoder
- Measurement range up to 2000 mm
- Protection class IP65 (with mating connector only)
- Digital output SSI
- Absolute measurement



### Specifications

<b>Output</b>	<b>MSSI</b> = SSI synchronous serial interface
<b>Resolution</b>	10 / 50 / 100
<b>Linearity</b>	±0.10% f.s. (standard) ±0.05% f.s. (optional)
<b>Sensing device</b>	Magnetic absolute encoder
<b>Housing material</b>	Plastic, aluminium measuring cable: stainless steel
<b>Protection class</b>	IP65 (with mating connector only)
<b>Connection</b>	Connector M12, 8 pin
<b>Shock</b>	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
<b>Vibration</b>	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
<b>Temperature range</b>	-20 ... +85 °C
<b>Weight</b>	approx. 450 g
<b>EMC</b>	DIN EN 61326-1:2013

**Order code**WS10SG – 1 – 2 – 3 – 4 – 5 – 6**1 Measurement range (in mm)**

250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000

**2 Resolution (in µm)**

10 / 50 / 100

**3 Output****MSSI** = SSI synchronous serial interface**4 Linearity****L10** = ±0.10% f.s. (standard)**L05** = ±0.05% f.s. (optional)**5 Cable fixing****M4** = M4 cable fixing**SB0** = cable clip**6 Connection****M12A8** = Connector M12, 8 pin**Order example****WS10SG – 1250 – 50 – MSSI – L10 – M4 – M12A8****Accessories:****Connector cable (see page 45)**

## Magnetic encoder, digital output CAN Bus



### Sensor features

- With magnetic absolute encoder
- Measurement range up to 2000 mm
- Protection class IP65 (with mating connector only)
- Digital output CAN Bus
- Absolute measurement
- Optional redundant CAN Bus



### Specifications

<b>Output</b>	<b>MCANOP</b> = CANopen <b>MCANJ1939</b> = CAN SAE J1939
<b>Resolution</b>	setting via CAN Bus
<b>Linearity</b>	±0.10% f.s. (standard) ±0.05% f.s. (optional)
<b>Sensing device</b>	Magnetic absolute encoder
<b>Housing material</b>	Plastic, aluminium measuring cable: stainless steel
<b>Protection class</b>	IP65 (with mating connector only)
<b>Connection</b>	Connector M12, 5 pin
<b>Temperature range</b>	-20 ... +85 °C
<b>Weight</b>	approx. 450 g
<b>EMC</b>	DIN EN 61326-1:2013

**Order code**

**WS10SG** – 1 – 2 – 3 – 4 – 5

**1 Measurement range (in mm)**

250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000

**2 Output**

**MCANOP** = CANopen  
**MCANJ1939** = CAN SAE J1939

**3 Linearity**

**L10** = ±0.10% f.s. (standard)  
**L05** = ±0.05% f.s. (optional)

**4 Cable fixing**

**M4** = M4 cable fixing  
**SB0** = cable clip

**5 Connection**

**M12/CAN** = Connector M12, 5 pin

**Order example**

**WS10SG – 1250 – MCANOP – L10 – M4 – M12/CAN**

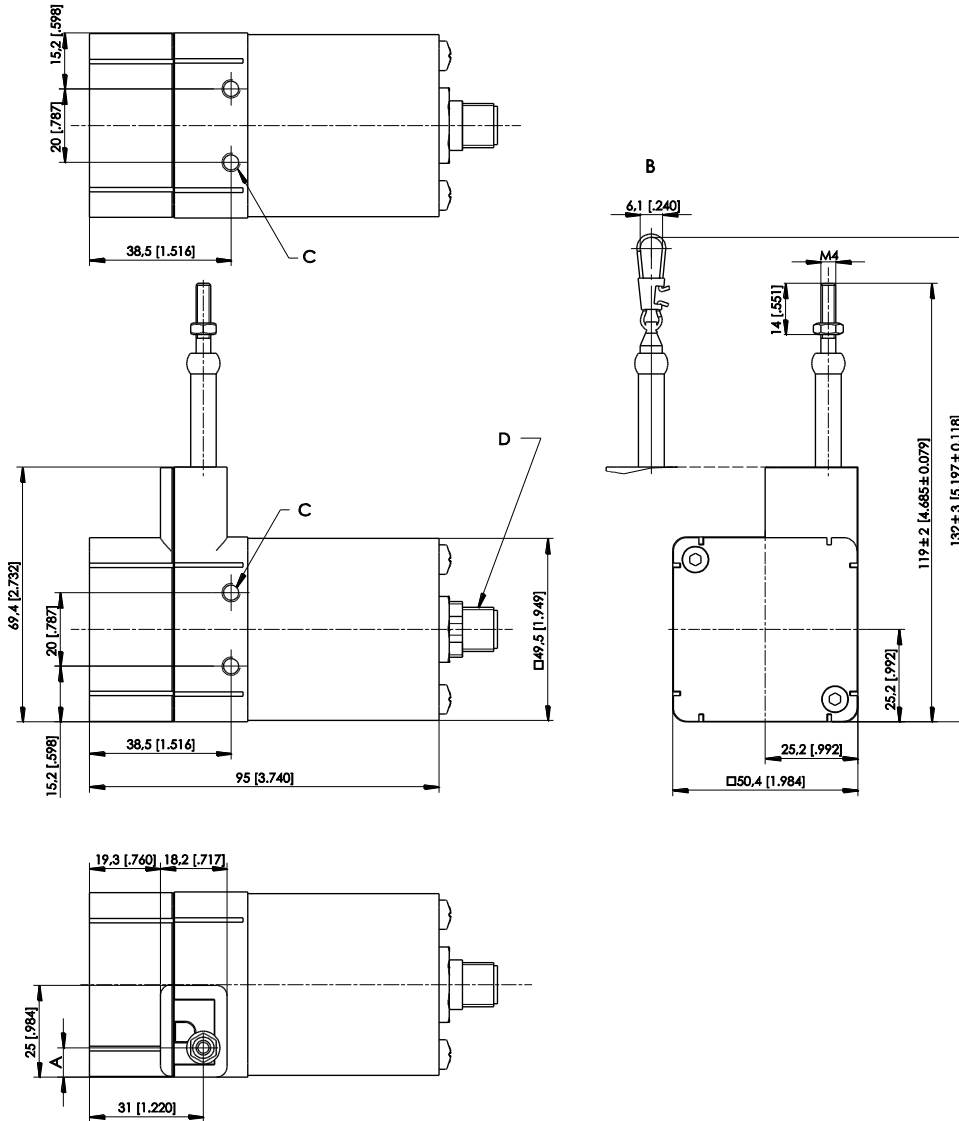
**Accessories:**

**Connector cable (see page 46)**



## Dimensions

Measurement range 250 ... 1250 mm, magnetic encoder output

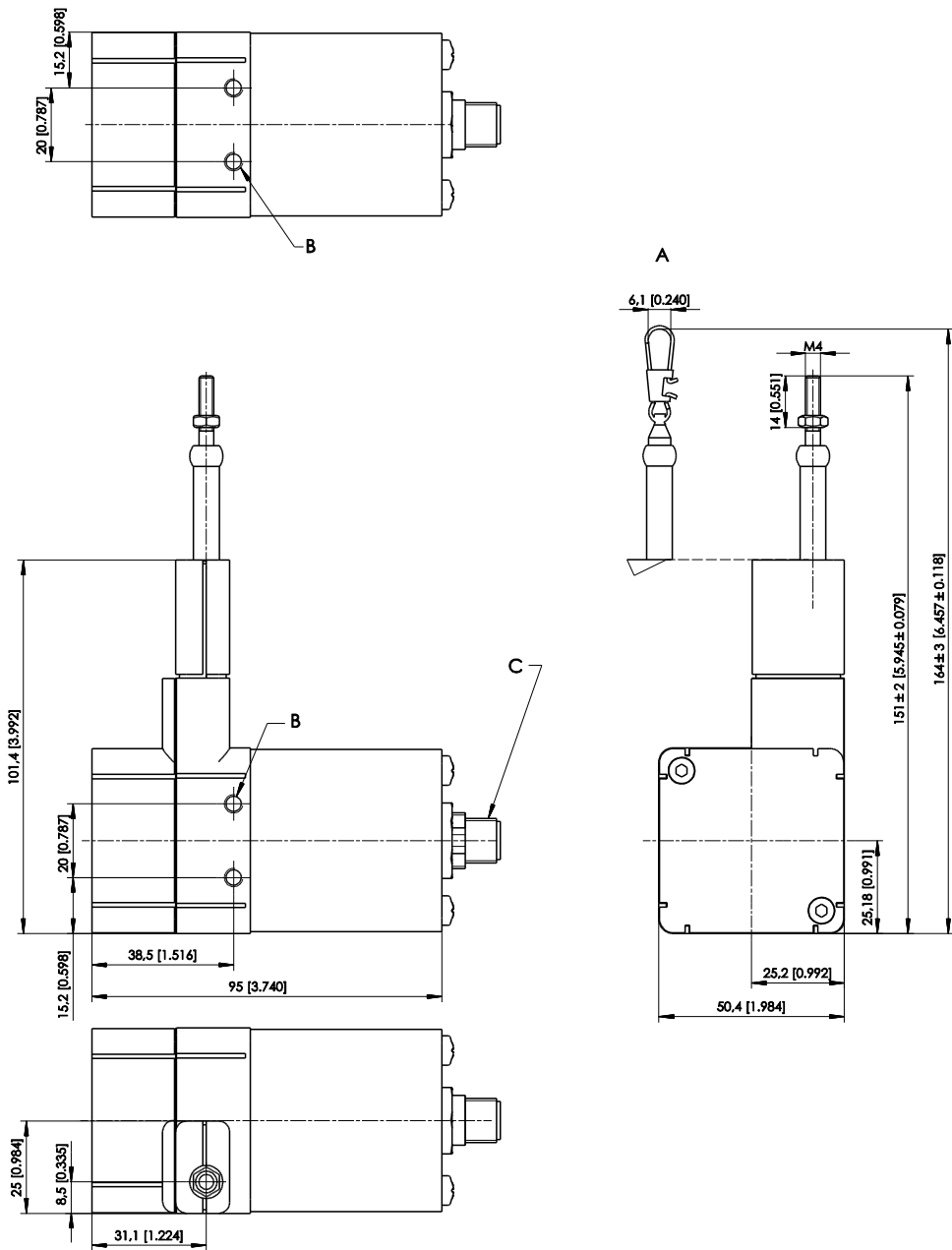


Dimensions in mm	Measurement range	A
	250	16.5
	375; 750	12.3
	500; 1000; 1250	8

B – Option SB0  
C – M5 - 8 [.315] deep  
D – Connector M12

Dimensions in mm [inch]  
Dimensions informative only.  
For guaranteed dimensions consult factory.

**Measurement range 1500 ... 2000 mm, magnetic encoder output**



A - Option SB0  
B – M5 - 8 [.315] deep  
D – Connector M12

Dimensions in mm [inch]  
Dimensions informative only.  
For guaranteed dimensions consult factory.

**Cable forces for sensors with magnetic encoder**

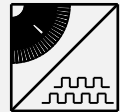
<b>Cable forces</b> typical at = 20 °C	<b>Measurement range</b>	<b>Maximum pull-out force</b>	<b>Minimum pull-in force</b>
	[mm]	[N]	[N]
	250	4.6	2.4
	375	7.4	3.9
	500	5.5	2.8
	750	7.6	3.8
	1000	5.3	2.9
	1250	4.6	2.4
	1500	3.8	2.4
	2000	3.8	2.4

## Incremental encoder output



### Sensor features

- Measurement range up to 1250 mm
- Protection class IP65 (with mating connector only)
- Incremental encoder output



## Specifications

<b>Output</b>	<b>PP530</b> = Incremental output 5 ... 30 V <b>IE41LI</b> = Incremental encoder TTL compatible <b>IE41HI</b> = Incremental encoder HTL compatible
<b>Resolution</b>	10 or 25 pulses / mm (40 or 100 edges / mm)
<b>Linearity</b>	±0.05% f.s.
<b>Sensing device</b>	Incremental encoder
<b>Housing material</b>	Plastic, aluminium measuring cable: stainless steel
<b>Protection class</b>	IP65 (with mating connector only)
<b>Connection</b>	Connector M12, 8 pin
<b>Temperature range</b>	-20 ... +85 °C
<b>Weight</b>	approx. 450 g
<b>EMC</b>	DIN EN 61326-1:2013

Cable forces	Measurement range	Maximum pull-out force	Minimum pull-in force
Typical at = 20 °C	[mm]	[N]	[N]
	1250	5,8	3,0

**Order code**

**WS10SG** – 1 – 2 – 3 – 4 – 5

**1 Measurement range (in mm)**

1250

**2 Resolution**

**10** = 10 pulses / mm  
**25** = 25 pulses / mm  
 other number of pulses on request

**3 Output**

**PP530** = Incremental output 5 ... 30 V  
**IE41LI** = Incremental encoder TTL compatible  
**IE41HI** = Incremental encoder HTL compatible

**4 Cable fixing**

**M4** = M4 cable fixing  
**SB0** = cable clip

**5 Connection**

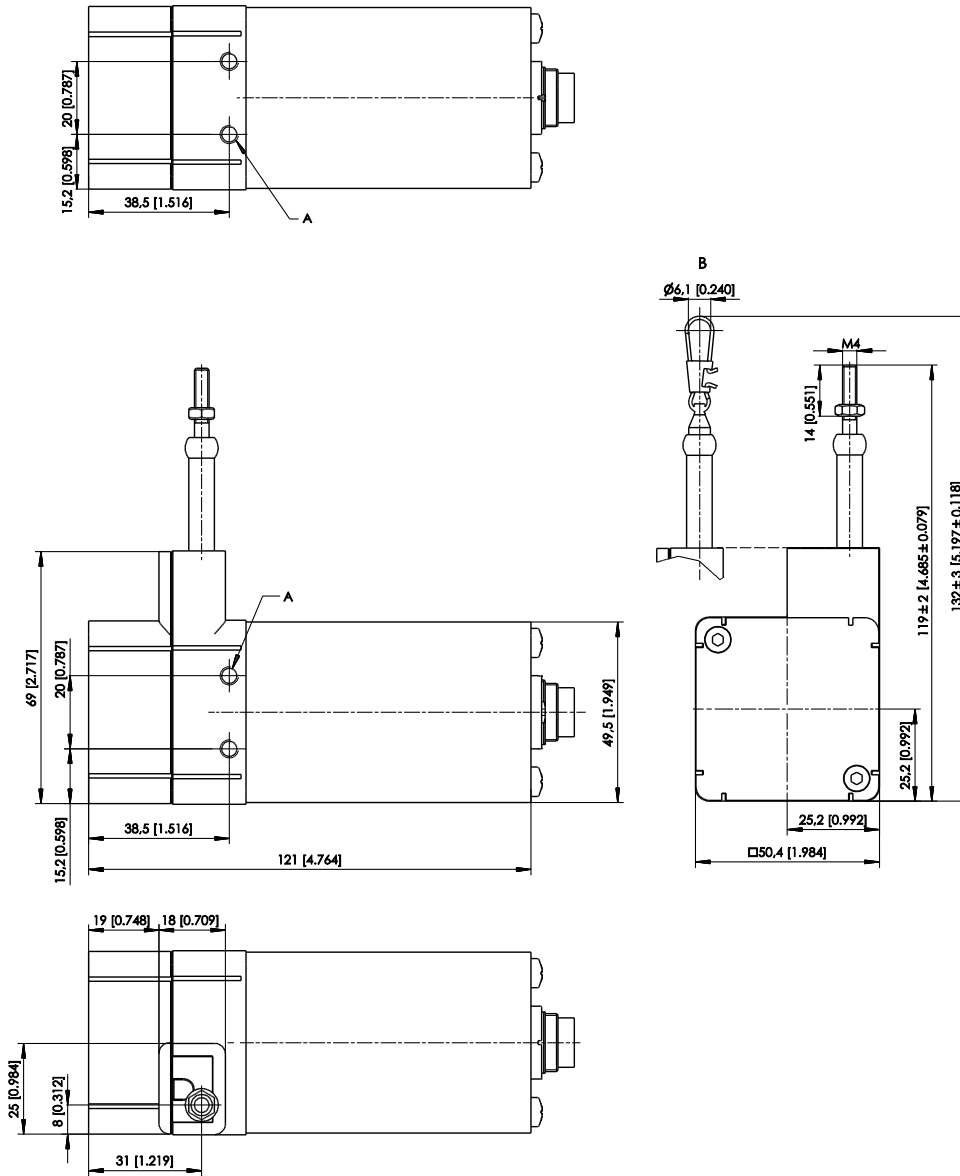
**M12** = Connector M12, 8 pin

**Order example**

**WS10SG – 1250 – 10 – PP530 – M4 – M12**

## Dimensions

Measurement range 1250 mm, incremental encoder output




A – M5 - 8 [.315] deep  
B – Option SB0

Dimensions in mm [inch]  
Dimensions informative only.  
For guaranteed dimensions consult factory.

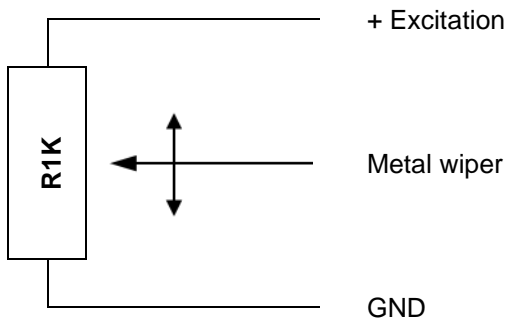
## Output specifications

### Analog outputs

#### Voltage divider R1K

Potentiometer 	Excitation voltage	32 V DC max. at 1 kΩ (max. power 1 W)
	Potentiometer impedance	1 kΩ ±10 %
	Thermal coefficient	±25 x 10 <sup>-6</sup> / °C f.s.
	Sensitivity	Depends on the measuring range, individual sensitivity of the sensor is specified on the label
	Voltage divider utilization range	approx. 3 % ... 97 %
	Operating temperature	Refer to output specification
	EMC	DIN EN 61326-1:2013

#### Output signals



**Note:**

**The metal wiper of the potentiometer must be protected against current load!**

Electrical current flow impact on the wiper causes linearity errors and shortens the lifetime of the potentiometer.

Additional information:

[http://www.asm-sensor.com/asm/pdf/pro/ws\\_poti\\_technote\\_en.pdf](http://www.asm-sensor.com/asm/pdf/pro/ws_poti_technote_en.pdf)

#### Signal wiring

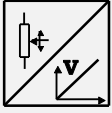
Signal	Connector pin no.	Cable color	Cable color
Poti +	1	white	brown
Poti GND	2	brown	white
Poti slider	3	green	blue
-	4	yellow	black
-	5	grey	-
-	6	pink	-
-	7	blue	-
-	8	red	-

#### View to sensor connector

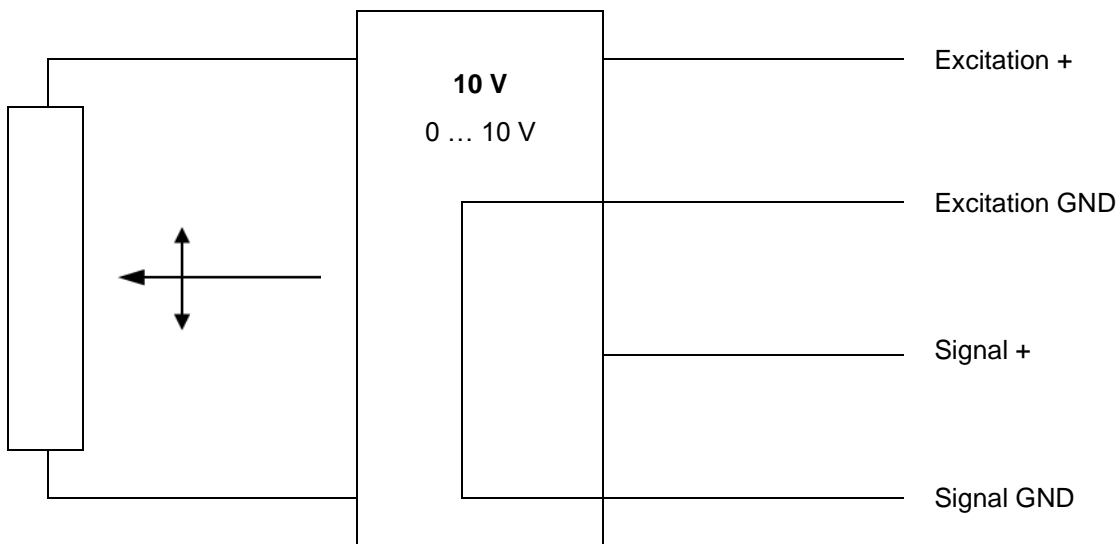


CONN-M12-8F


**Signal conditioner 10V and 10V5**

Voltage output 	Excitation voltage	18 ... 27 V DC non stabilized
	Excitation current	20 mA max.
	Output voltage	<b>10V:</b> 0 ... 10 V DC; <b>10V5:</b> 0.5 ... 10 V DC
	Output current	2 mA max.
	Output load	> 5 kΩ
	Stability (temperature)	±50 x 10 <sup>-6</sup> / °C f.s.
	Protection	Reverse polarity, short circuit
	Output noise	0.5 mV <sub>RMS</sub>
	Operating temperature	Refer to output specification
	EMC	DIN EN 61326-1:2013

**Output signals**

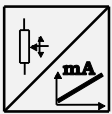


**Signal wiring**

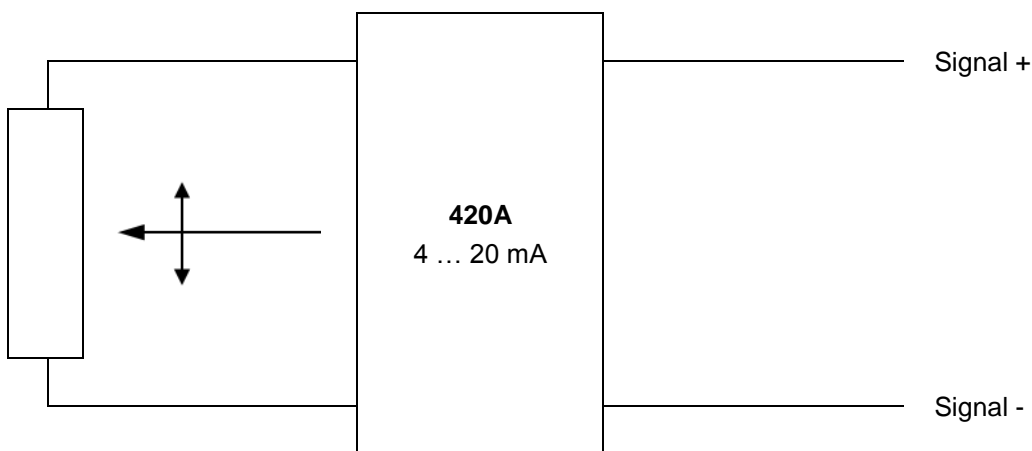
Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	 CONN-M12-8F
Excitation GND	2	brown	
Signal +	3	green	
Signal GND	4	yellow	
Not connected	5	grey	
Not connected	6	pink	
Not connected	7	blue	
Not connected	8	red	




**Signal conditioner 420A**

Current output (2 wire) 	Excitation voltage	12 ... 27 V DC non stabilized, measured at the sensor terminals
	Excitation current	35 mA max.
	Output current	4 ... 20 mA equivalent for 0 ... 100 % range
	Stability (temperature)	$\pm 100 \times 10^{-6} / ^\circ\text{C}$ f.s.
	Protection	Reversed polarity, short circuit
	Output noise	0.5 mV <sub>eff</sub>
	Operating temperature	Refer to output specification
	EMC	DIN EN 61326-1:2013

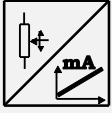
**Output signals**



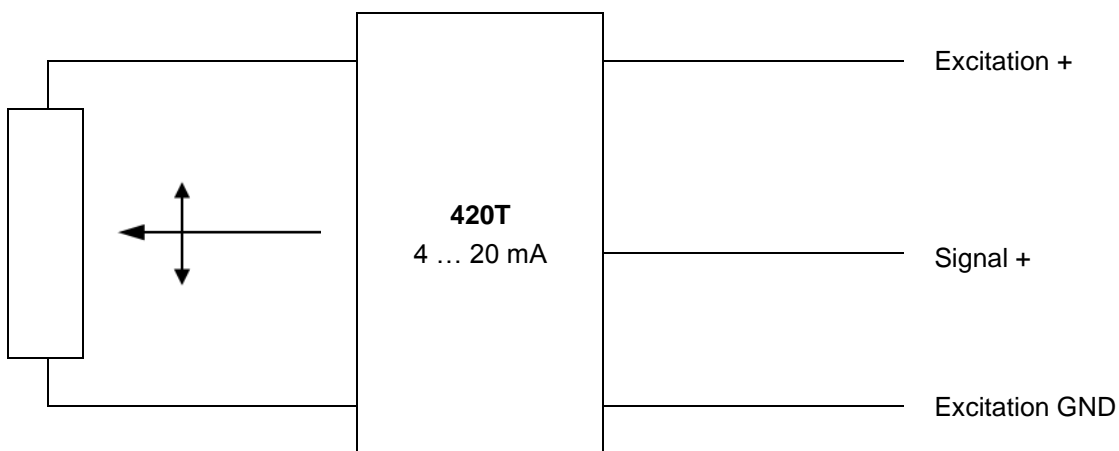
**Signal wiring**

Signal	Connector pin no.	Cable color	View to sensor connector
Signal +	1	white	 CONN-M12-8F
Signal -	2	brown	
Not connected	3	green	
Not connected	4	yellow	
Not connected	5	grey	
Not connected	6	pink	
Not connected	7	blue	
Not connected	8	red	


**Signal conditioner 420T**

Current output (3 wire) 	Excitation voltage	18 ... 27 V DC non stabilized
	Excitation current	40 mA max.
	Load resistor	350 Ω max.
	Output current	4 ... 20 mA equivalent for 0 ... 100 % range
	Stability (temperature)	±50 x 10 <sup>-6</sup> / °C f.s.
	Protection	Reverse polarity, short circuit
	Output noise	0.5 mV <sub>RMS</sub>
	Operating temperature	Refer to output specification
	EMC	DIN EN 61326-1:2013

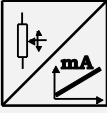
**Output signals**



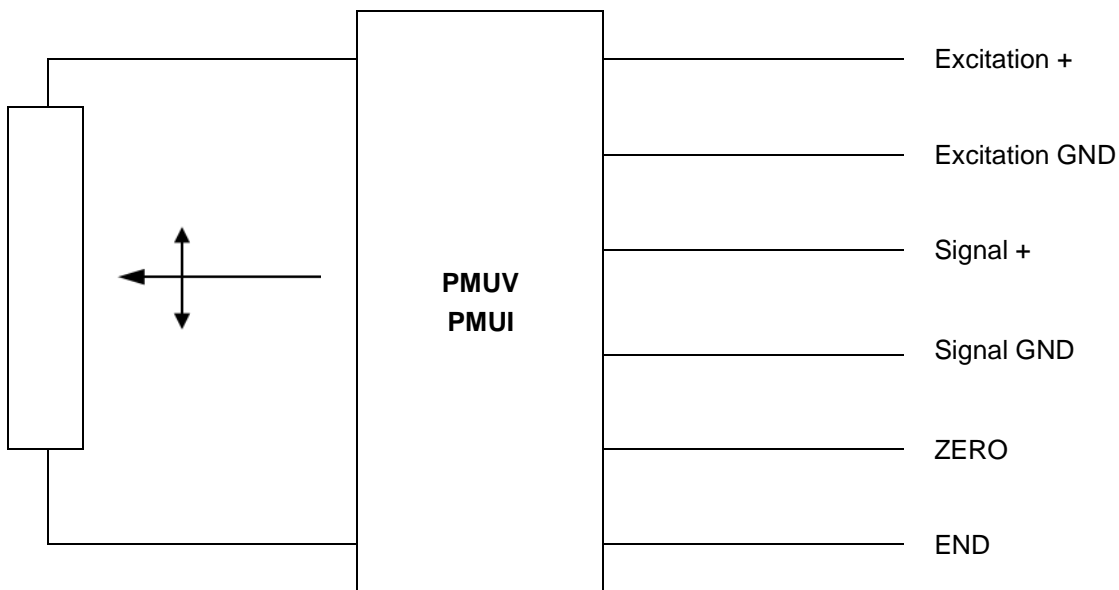
**Signal wiring**

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
Signal +	3	green	
Not connected	4	yellow	
Not connected	5	grey	
Not connected	6	pink	
Not connected	7	blue	
Not connected	8	red	


**Signal conditioner PMUI / PMUV**

Voltage or current output (3 wire)  	Excitation voltage	18 ... 27 V DC
	Excitation current	50 mA max.
	Voltage output <b>PMUV</b>	0 ... 10 V
	Output current	10 mA max.
	Output load	1 kΩ min.
	Current output <b>PMUI</b>	4 ... 20 mA (3 wire)
	Working resistance	500 Ω max.
	Scaling	
	Activation of offset and gain adjust	Connect with excitation GND (0 V)
	Scalable range	90 % max. f.s.
	Stability (temperature)	±50 x 10 <sup>-6</sup> / °C f.s.
	Operating temperature	Refer to output specification
	Protection	Reversed polarity, short circuit
	EMC	DIN EN 61326-1:2013


**Output signals**



**Signal wiring PMUV / PMUI**

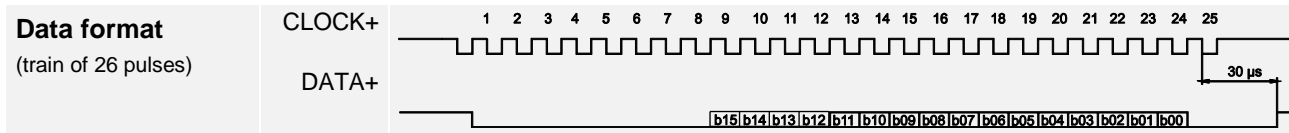
Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	 <p>CONN-M12-8F</p>
Excitation GND	2	brown	
Signal +	3	green	
Signal GND	4	yellow	
Not connected	5	grey	
Not connected	6	pink	
ZERO	7	blue	
END	8	red	

**Signal wiring PMUI2**

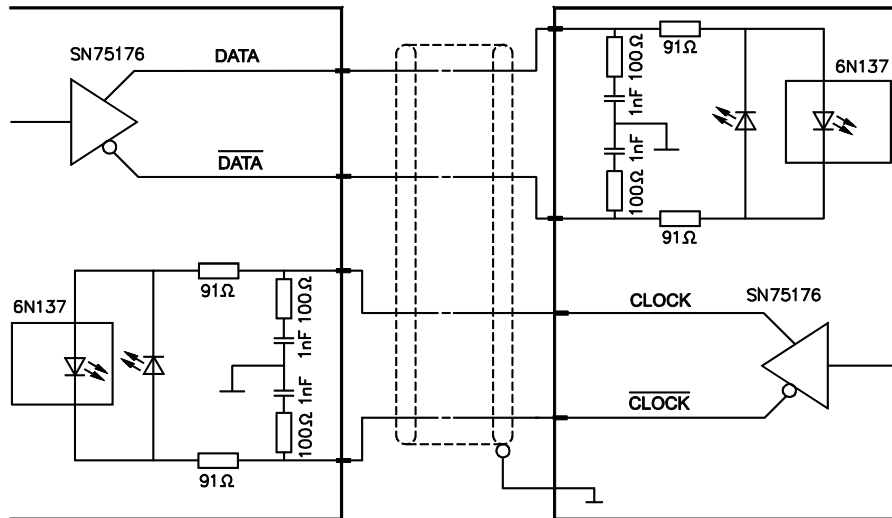
Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	 <p>CONN-M12-8F</p>
Excitation GND	2	brown	
Not connected	3	green	
Not connected	4	yellow	
Signal +	5	grey	
Signal GND	6	pink	
ZERO	7	blue	
END	8	red	

**Signal conditioner ADSI**

A/D converted synchronous serial  	Excitation volatge	11 ... 27 V DC
	Excitation current	200 mA max.
	Interface	EIA RS422, RS485, short-circuit proof
	Clock frequency	70 ... 500 kHz
	Code	Gray-Code, continuous progression
	Delay between pulse trains	30 µs min.
	Resolution	ADSI16: 16 bit (65536 counts) f.s. ADSI14: 14 bit (16384 counts) f.s. ADSI: 12 bit (4096 counts) f.s.
	Stability (temperature)	±50 x 10 <sup>-6</sup> / °C f.s.
	Operating temperature	-20 ... +85 °C
	EMC	DIN EN 61326-1:2013



**Recommended processing circuit**



Transmission rate	Cable length	Baud rate
	< 50 m	< 300 kHz
	< 100 m	< 100 kHz

**Note:**

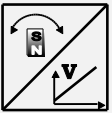
Extension of the cable length will reduce the maximum transmission rate.

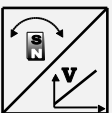
**Signal wiring**

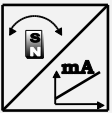
Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND (0 V)	2	brown	
CLOCK	3	green	
$\overline{\text{CLOCK}}$	4	yellow	
DATA	5	grey	
$\overline{\text{DATA}}$	6	pink	
Shield, not connected	7	blue	
Not connected	8	red	

CONN-M12-8F

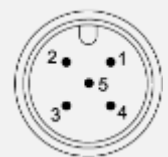
**Magnetic encoder, analog output**

<p><b>U2</b></p> <p>Voltage output 0.5 ... 10 V</p> 	Excitation voltage	8 ... 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 50 mA
	Output voltage	0.5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	DIN EN 61326-1:2013

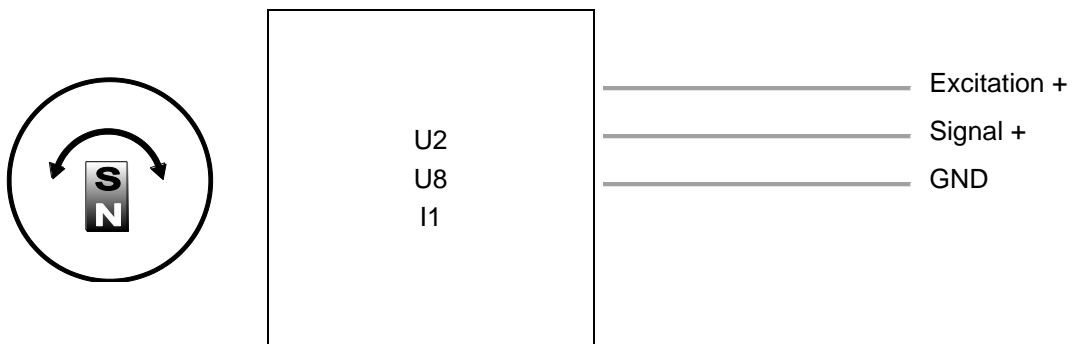
<p><b>U8</b></p> <p>Voltage output 0.5 ... 4.5 V</p> 	Excitation voltage	8 ... 36 V DC
	Excitation current	17 mA typical at 24 V DC 32 mA typical at 12 V DC 50 mA max.
	Output voltage	0.5 ... 4.5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	DIN EN 61326-1:2013

<p><b>I1</b></p> <p>Current output 4 ... 20 mA, 3 wires</p> 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC 120 mA max.
	Load R <sub>L</sub>	500 Ω max.
	Output current	4 ... 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	DIN EN 61326-1:2013

**Signal wiring**

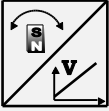
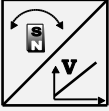
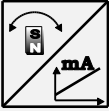
Signal	Connector pin no.	Cable connection	View to the sensor connector
Excitation +	1	brown	
Signal	2	white	
GND	3	blue	
Do not connect!	4	black	
Do not connect!	5	(grey)	

**Signal diagram**

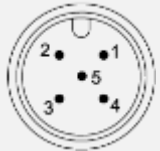




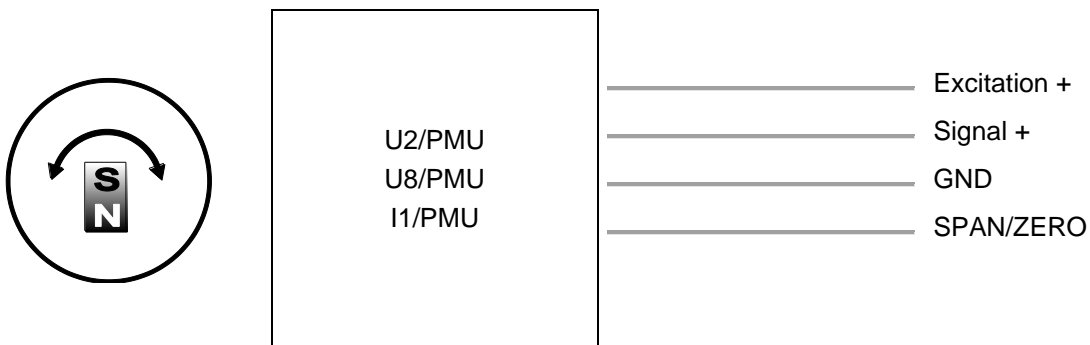
**Magnetic encoder, analog output, programmable**

<p><b>U2/PMU</b></p> <p>Voltage output 0.5 ... 10 V</p> 	Excitation voltage	8 ... 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 50 mA
	Output voltage	0,5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	EN 61326-1:2013
	<p><b>U8/PMU</b></p> <p>Voltage output 0.5 ... 4.5 V</p> 	Excitation voltage
Excitation current		17 mA typical at 24 V DC 32 mA typical at 12 V DC max. 50 mA
Output voltage		0.5 ... 4.5 V DC
Output current		2 mA max.
Measuring rate		1 kHz standard
Stabilität (Temperatur)		$\pm 50 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical)
Protection		Reverse polarity, short circuit
Operating temperature		See specification of the respective sensor
EMC		DIN EN 61326-1:2013
<p><b>I1/PMU</b></p> <p>Current output 4 ... 20 mA, 3 wires</p> 		Excitation voltage
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC max. 120 mA
	Load $R_L$	500 $\Omega$ max.
	Output current	4 ... 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	DIN EN 61326-1:2013

**Signal wiring**

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	brown	
Signal	2	white	
GND	3	blue	
Do not connect!	4	black	
SPAN/ZERO	5	grey	

**Signal diagram**



**Option -PMU**

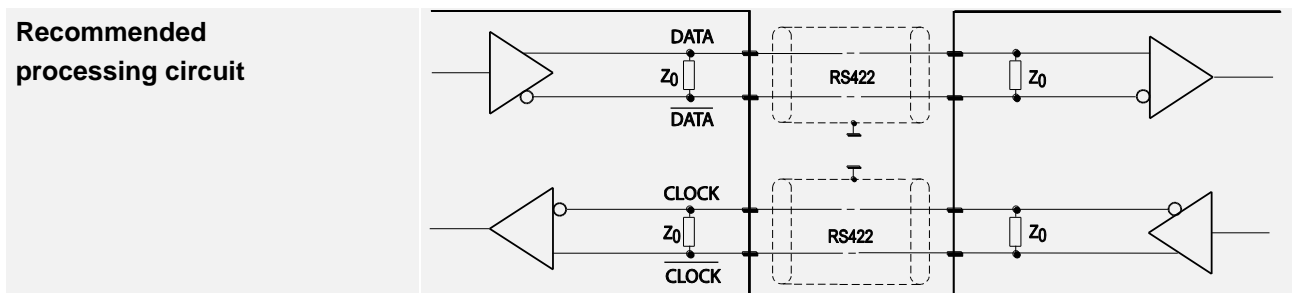
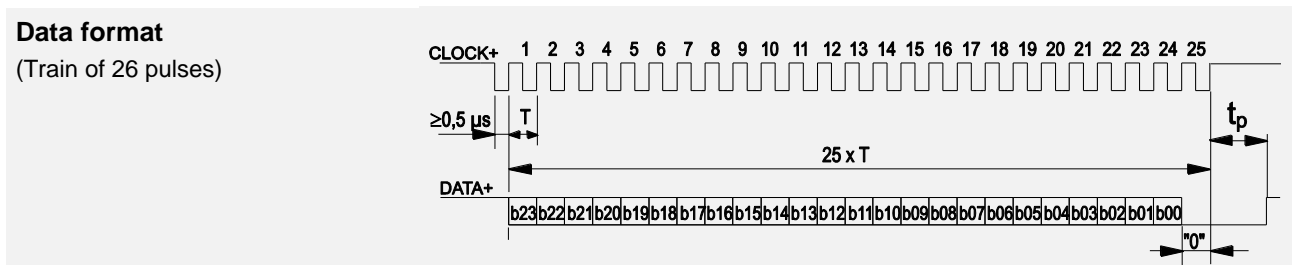
**Programming of the start and end value by the customer**

Teach-In of start and end value for the options U2/PMU, I1/PMU, U8/PMU is provided by a binary signal SPAN/ZERO. At the start position connect signal SPAN/ZERO for a period of 2 ... 3 seconds to GND via push button. At the end position connect signal SPAN/ZERO for a period of 5 ... 6 seconds to GND via a push button. The scaling taught in that way will be stored non-volatile.

To reset the sensor to factory default signal ZERO/END must be connected to ground while powering up the sensor for 2 ... 3 seconds. For the option PMZ only teach-in of ZERO position is possible.

### Magnetic encoder, digital output SSI


<b>MSSI</b> Synchronous serial SSI 	Interface	EIA RS-422
	Excitation voltage	8 ... 36 V DC
	Excitation current	19 mA typical at 24 V DC 35 mA typical at 12 V DC max. 80 mA
	Clock frequency	100 kHz ... 500 kHz
	Code	Gray-Code, continuous progression
	Delay between pulse trains ( $t_p$ )	30 $\mu$ s min.
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical)
	Operating temperature	See specification of the respective sensor
	Protection	Reverse polarity, short circuit
	EMC	DIN EN 61326-1:2013




Transmission rate	Cable length	Baud rate
	50 m	100-400 kHz
	100 m	100-300 kHz

**Note:**  
Extension of the cable length will reduce the maximum transmission rate.


**Signal wiring**

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
CLOCK	3	green	
$\overline{\text{CLOCK}}$	4	yellow	
DATA	5	grey	
$\overline{\text{DATA}}$	6	pink	
-	7	blue	
-	8	red	


## Magnetic encoder, digital output CANopen

<b>MCANOP, CANOPR</b> CANopen 	CAN specification	ISO 11898, Basic and Full CAN 2.0 B
	Communication profile	CANopen CiA 301 V 4.02, Slave
	Encoder profile	Encoder CiA 406 V 3.2
	Error Control	Node Guarding, Heartbeat, Emergency Message
	Node ID	Adjustable via LSS or SDO, default: 127
	PDO	3 TxPDO, 0 RxPDO, no linking, static mapping
	PDO Modes	Event-/Time triggered, Remote-request, Sync cyclic/acyclic
	SDO	1 Server, 0 Client
	CAM	8 cams
	Certified	Yes
	Transmission rate	50 kBit bis 1 Mbit, adjustable via LSS or SDO, default: 125 kBit
	Bus connection	M12 connector, 5 pin
	Integrated bus terminating resistor	120Ω adjustable by the customer
	Bus, galvanic isolated	no

<b>Specifications</b>	Excitation voltage	8 ... 36 V DC
	Excitation current	20 mA typical at 24 V DC 40 mA typical at 12 V DC 80 mA max.
	Measuring rate	1 kHz (asynchronous)
	Stability (temperature)	±50 x 10 <sup>-6</sup> /°C f.s. (typical)
	Repeatability	1 LSB
	Operating temperature	See specification of the respective sensor
	Protection	Reverse polarity, short circuit
	Dielectric strength	1 kV (V AC, 50 Hz, 1 min.)
	EMC	EN 61326-1:2013

Signal wiring	Signal	Connector pin no.	View to the sensor connector
	Shield	1	
	Excitation +	2	
	GND	3	
	CAN-H	4	
	CAN-L	5	


## Magnetic encoder, digital output CAN SAE J1939

<b>MCANJ1939/R</b> CAN SAE J1939 	CAN Specification	ISO 11898, Basic and Full CAN 2.0 B
	Transceiver	24V-compliant, not isolated
	Communication profile	SAE J1939
	Baud Rate	250 kbit/s
	Internal termination resistor	120 Ω adjustable by the customer
	Address	Default 247d, configurable

<b>NAME Fields</b>	Arbitrary address capable	1	Yes
	Industry group	0	Global
	Vehicle system	7Fh (127d)	Non specific
	Vehicle system instance	0	
	Function	FFh (255d)	Non specific
	Function instance	0	
	ECU instance	0	
	Manufacturer	145h (325d)	Manufacturer ID
	Identity number	0nnn	Serial number 21 bit

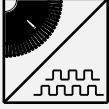
<b>Parameter Group Numbers (PGN)</b>	Configuration data	PGN EF00h	Proprietary-A (PDU1 peer-to-peer)
	Process data	PGN FFnnh	Proprietary-B (PDU2 broadcast); nn Group Extension (PS) configurable

<b>Specifications</b>	Excitation voltage	8 ... 36 V DC
	Excitation current	20 mA typical at 24 V DC 40 mA typical at 12 V DC, max. 80 mA
	Measuring rate	1 kHz (asynchronous)
	Stability (temperature)	±50 x 10 <sup>-6</sup> /°C f.s. (typical)
	Repeatability	1 LSB
	Operating temperature	See specification of the respective sensor
	Protection	Reverse polarity, short circuit
	Dielectric strength	1 kV (V AC, 50 Hz, 1 min.)
EMV	EN 61326-1:2013	

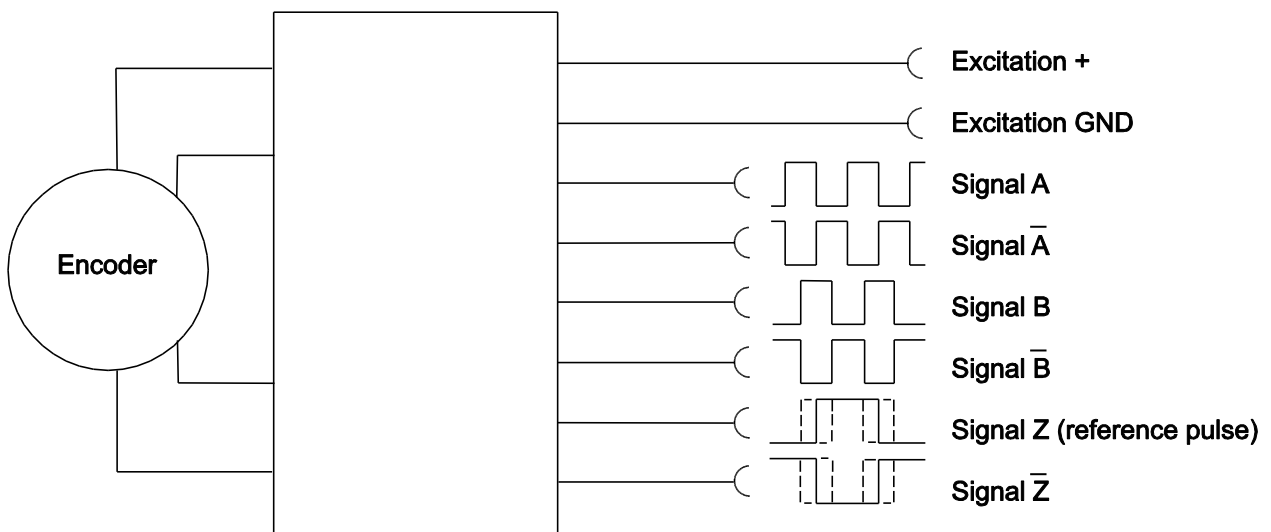
Signal wiring	Signal	Connector pin no.	View to the sensor connector
	Shield	1	
	Excitation +	2	
	GND	3	
	CAN-H	4	
	CAN-L	5	

## Incremental outputs

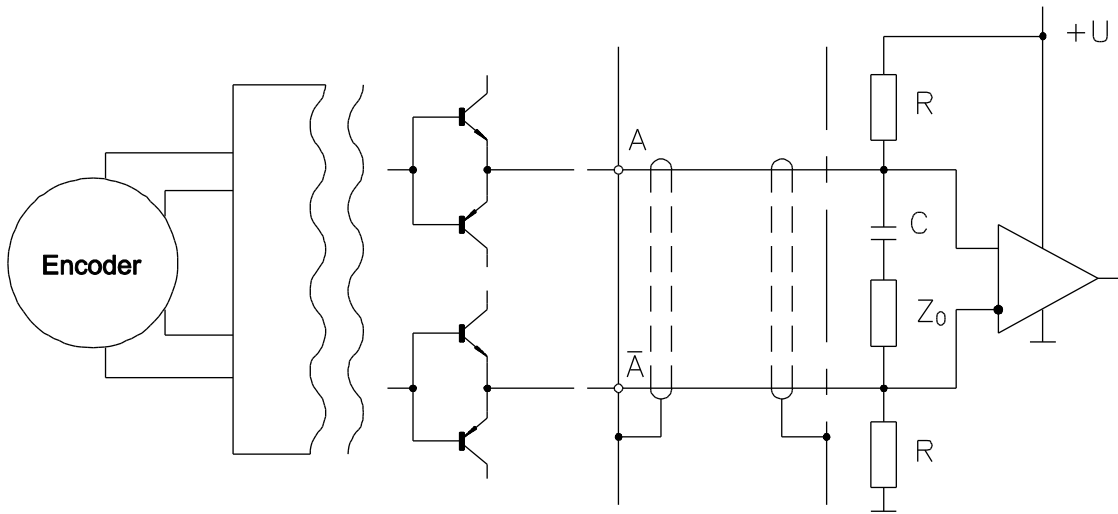
### Signal conditioner PP530

Incremental 	Excitation voltage	5 ... 30 V DC
	Excitation current	25 mA typ. (w/o load), 200 mA max.
	Output frequency	200 kHz max.
	Output	Linedriver, Push-Pull, CMOS, TTL and HTL compatible
	Output current	30 mA max.
	Output voltage	Depends on the excitation voltage
	Saturation voltage high/low	$I_a < 10 \text{ mA}, U_b 5 \text{ V}/24 \text{ V}: < 0,5 \text{ V}$ $I_a < 30 \text{ mA}, U_b 5 \text{ V}/24 \text{ V}: < 1 \text{ V}$
	Stability (temperature)	$\pm 20 \times 10^{-6} / ^\circ\text{C}$ f.s. (sensor mechanism)
	Operation temperature	-10 ... +70 °C
	Storage temperature	-30 ... +80 °C
	Transition time positive edge	< 200 ns
	Transition time negative edge	< 200 ns
	Protection	Reverse polarity, short circuit
	EMC	DIN EN 61326-1:2013

### Output signals



Recommended processing circuit




Signal wiring

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	<p>CONN-M12-8F</p>
Excitation GND	2	brown	
Signal A	4	yellow	
Signal $\bar{A}$	6	pink	
Signal B (A + 90°)	3	green	
Signal $\bar{B}$	5	grey	
Signal Z (reference pulse)	7	blue	
Signal $\bar{Z}$	8	red	



**Signal conditioner IE41LI and IE41HI**

Incremental 		<b>IE41LI</b>	<b>IE41HI</b>
	Excitation voltage	5 V DC ±10 %	10 ... 30 V DC
	Excitation current	150 mA max. (w/o load)	
	Output frequency	300 kHz max.	200 kHz max.
	Output	RS422	Push-pull antivalent
	Output current	±30 mA max.	30 mA
	Output voltage	Depending on the excitation voltage	
	Stability (temperature)	±20 x 10 <sup>-6</sup> / °C f.s. (sensor mechanism)	
	Operating temperature	-10 ... +70 °C	
	Protection against short circuit	One channel for 1 s	yes
EMC	DIN EN 61326-1:2013		

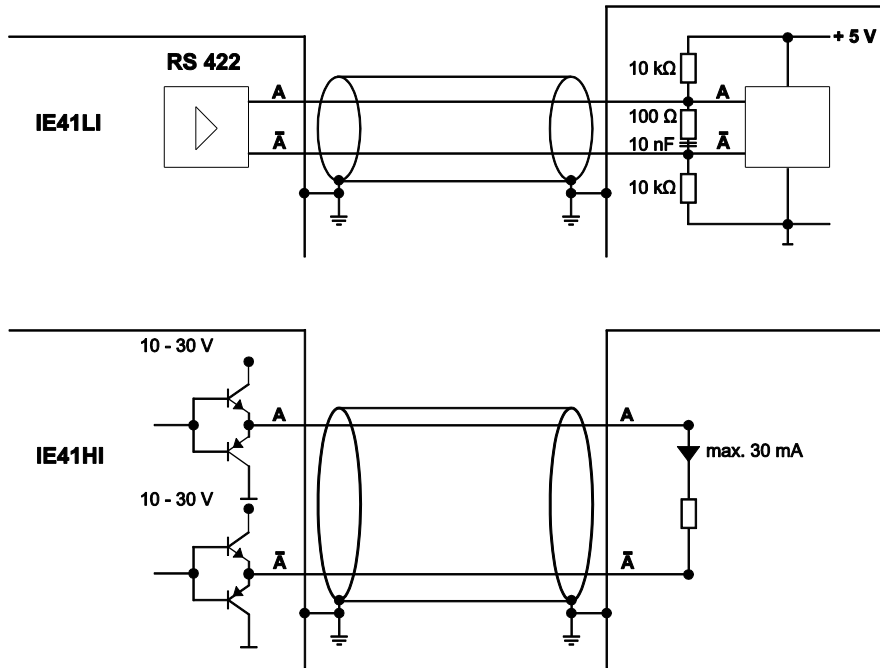
**Signal wiring WS10**

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	 <p>CONN-M12-8F</p>
Excitation GND	2	brown	
Signal A	4	yellow	
Signal $\bar{A}$	6	pink	
Signal B (A + 90°)	3	green	
Signal $\bar{B}$	5	grey	
Signal Z (reference pulse)	7	blue	
Signal $\bar{Z}$	8	red	

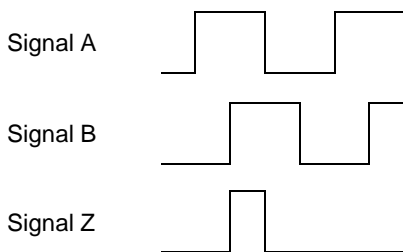
**Signal wiring WS12**

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	 <p>CONN-M12-8F</p>
Excitation GND	2	brown	
Signal A	3	green	
Signal $\bar{A}$	5	grey	
Signal B (A + 90°)	4	yellow	
Signal $\bar{B}$	6	pink	
Signal Z (reference pulse)	7	blue	
Signal $\bar{Z}$	8	red	

**Recommended processing circuit**



**Output signals**



## Accessories

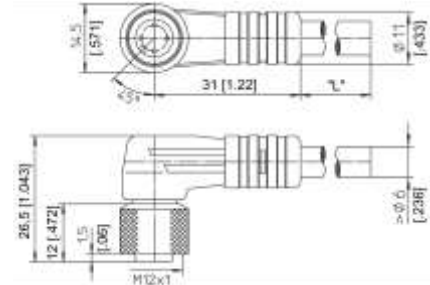
### Connector cable M12, 4 pin

#### (angular coupling)

shielded connector

Suitable for 5-pin sensor connectors

The 4-core screened cable is supplied with a mating 4-pin 90° M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.34 mm<sup>2</sup> Cable diameter: 5.6 ±0.2 mm



#### Order code

**KAB - xM - M12/4F/W - LITZE**

IP69: **KAB - xM - M12/4F/W/69K - LITZE**

xM = length in m

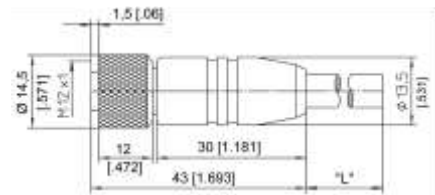
### Connector cable M12, 4 pin

#### (straight coupling)

shielded connector

Suitable for 5-pin sensor connectors

The 4-core screened cable is supplied with a mating 4-pin M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.34 mm<sup>2</sup> Cable diameter: 5.6 ±0.2 mm



#### Order code

**KAB - xM - M12/4F/G - LITZE**

IP69: **KAB - xM - M12/4F/G/69K - LITZE**

xM = length in m

Signal wiring	Plug connection / cable color			
	M12, 4 pin	1	2	3
	brown	white	blue	black

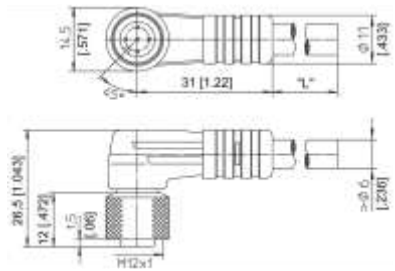
#### Applicable for cable carriers

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s <sup>2</sup>
Minimum bending radius	10 x cable diameter

**Connector cable M12, 5 pin  
(angular coupling)**

shielded connector

The 5-core screened cable is supplied with a mating 5-pin 90° M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m.  
Wire: cross sectional area 0.34 mm<sup>2</sup>  
Cable diameter: 5.6 ±0.2 mm



**Order code**

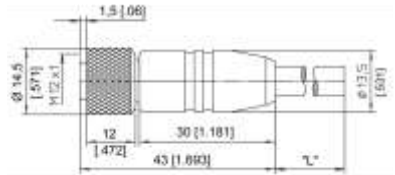
	<b>KAB - xM - M12/5F/W - LITZE</b>
IP69:	<b>KAB - xM - M12/5F/W/69K - LITZE</b>

xM = length in m

**Connector cable M12, 5 pin  
(straight coupling)**

shielded connector

The 5-core screened cable is supplied with a mating 5-pin M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m.  
Wire: cross sectional area 0.34 mm<sup>2</sup>  
Cable diameter: 5.6 ±0.2 mm



**Order code**

	<b>KAB - xM - M12/5F/G - LITZE</b>
IP69:	<b>KAB - xM - M12/5F/G/69K - LITZE</b>

xM = length in m

Signal wiring	Plug connection / Cable color				
	1	2	3	4	5
M12, 5 pin	brown	white	blue	black	grey

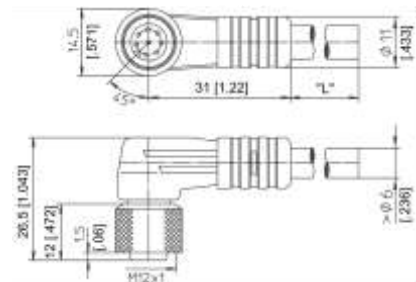
**Applicable for cable carriers**

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s <sup>2</sup>
Minimum bending radius	10 x cable diameter

**Connector cable M12, 8 pin  
(angular coupling)**

shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin 90° M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.25 mm<sup>2</sup> Cable diameter: 6.3 ±0.2 mm



**Order code**

**KAB - xM - M12/8F/W - LITZE**

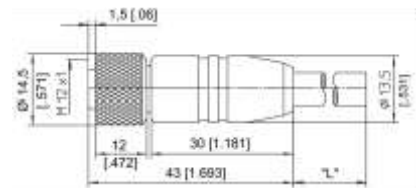
IP69: **KAB - xM - M12/8F/W/69K - LITZE**

xM = length in m

**Connector cable M12, 8 pin  
(straight coupling)**

shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.25 mm<sup>2</sup> Cable diameter: 6.3 ±0.2 mm



**Order code**

**KAB - xM - M12/8F/G - LITZE**

IP69: **KAB - xM - M12/8F/G/69K - LITZE**

xM = length in m

Signal wiring	Plug connection / cable color							
	1	2	3	4	5	6	7	8
M12, 8 pin	white	brown	green	yellow	grey	pink	blue	red

**Applicable for cable carriers**

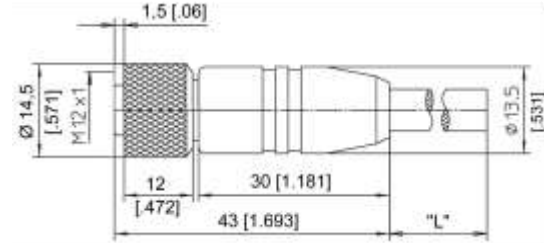
Maximum movement speed	3 m/s
Maximum acceleration	5 m/s <sup>2</sup>
Minimum bending radius	10 x cable diameter

**Connector/bus cable M12, 5 pin CAN-Bus**

The 5-lead shielded cable is supplied with a female 5 pin M12 connector at one end and a male 5 pin M12 connector at the other end.

Available lengths are 0.3 m, 2 m, 5 and 10 m.

Cable diameter: 6.7 ±0.2 mm



**Order code**

**KAB - xM - M12/5F/G - M12/5M/G - CAN**

IP69: **KAB - xM - M12/5F/G/69K - M12/5M/G/69K - CAN**

xM = length in m

**T-connector for bus cable M12, 5 pin CAN-Bus**

**Order code**

**KAB - TCONN - M12/5M - 2M12/5F - CAN**



**Terminating resistor M12, 5 pin CAN-Bus**

**Order code**

**KAB - RTERM - M12/5M/G - CAN**



**Applicable for cable carriers**

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s <sup>2</sup>
Minimum bending radius	10 x cable diameter

**Plug-in connector M12, 8 pin (straight coupling)**

Order code:

**CONN-M12-8F-G**

Cable diameter  
max. 6 ... 8 mm

