

 **WS10SG**


Displacement sensor with  
measurement length up to  
2,000 mm



- Protection class IP65
- High-performance POM/aluminium housing
- Optional with magnetic absolute encoder

### Product versions


   Analog output, SSI output

 Analog output with magnetic encoder

  Analog output with magnetic encoder, programmable

 Digital output SSI with magnetic encoder

 Digital output CAN Bus with magnetic encoder

 Incremental encoder output



WS10SG - Cable Extension Position Sensor  
Version with analog output, SSI output

Specifications

|                   |   | Order options   |
|-------------------|---|---|
| Measurement range | 100 / 125 / 375 / 500 / 750 / 1000 / 1250 mm  | <b>1</b> 100 / 125 / 375 / 500 / 750 / 1000 / 1250                              |
| Resolution        | Analog: quasi infinite  |   |
| Output            | Potentiometer 1 kΩ<br>Voltage 0 ... 10 V<br>Current 4 ... 20 mA, 2 wire<br>Current 4 ... 20 mA, 3 wire<br>Current output, programmable<br>Voltage output, programmable<br>Signal conditioner SSI 12 bit<br>Signal conditioner SSI 14 bit<br>Signal conditioner SSI 16 bit | <b>2</b> R1K<br>10V<br>420A<br>420T<br>PMUI<br>PMUV<br>ADSI<br>ADSI14<br>ADSI16 |
| Linearity         | ±0.10% f.s. (standard)<br>±0.05% f.s. (optional)  | <b>3</b> L10<br>L05   |
| Sensing device    | Precision potentiometer   |   |
| Material          | POM, aluminum<br>measuring cable: stainless steel   |   |
| Protection class  | IP65 (with mating connector only)   |   |
| Cable fixing      | M4 cable fixing<br>Cable clip   | <b>4</b> M4<br>SB0  |
| Connection        | Connector M12, 8 pin  | <b>5</b> M12  |
| Temperature range | -20 ... +85 °C  |   |
| Weight            | approx. 450 g   |   |
| EMC               | DIN EN 61326-1:2013   |   |

Order code

|        |   |          |   |          |   |          |   |          |   |          |
|--------|---|----------|---|----------|---|----------|---|----------|---|----------|
| WS10SG | - | <b>1</b> | - | <b>2</b> | - | <b>3</b> | - | <b>4</b> | - | <b>5</b> |
|--------|---|----------|---|----------|---|----------|---|----------|---|----------|

Order example: WS10SG – 1250 – 10V – L10 – M4 – M12

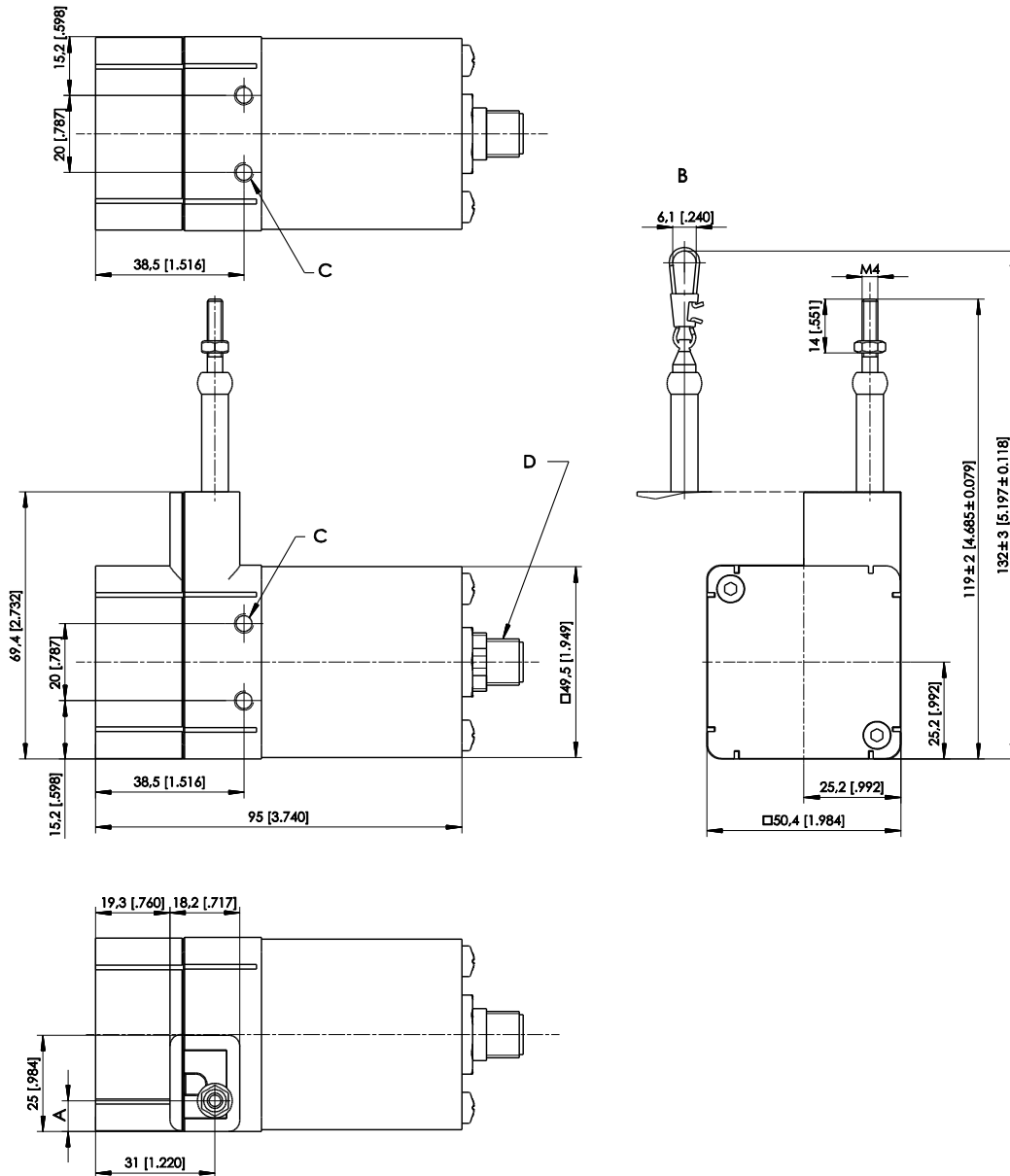
Accessories:

Connector cable (see page 34)

| Cable forces<br>typical at = 20 °C | Measurement range | Maximum pull-out<br>force | Minimum pull-in force |
|------------------------------------|-------------------|---------------------------|-----------------------|
|                                    | [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                   |

## 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.



WS10SG - Cable Extension Position Sensor  
Version with analog output with magnetic encoder

Specifications

|                        |  | Order options  |
|------------------------|--|--|
| Measurement range      | 250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000 mm                         | <b>1</b> 250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000 |
| Resolution             | <0.002% f.s.   |  |
| Output                 | Voltage 0.5 ... 10 V<br>Voltage 0.5 ... 4.5 V<br>Current 4 ... 20 mA, 3 wire | <b>2</b> U2<br>U8<br>I1                                    |
| Signal characteristics | Increasing signal (e.g. 4 ... 20 mA)<br>Decreasing signal (e.g. 20 ... 4 mA) | <b>3</b> A<br>D  |
| Linearity              | ±0.10% f.s. (standard)<br>±0.05% f.s. (optional)                             | <b>4</b> L10<br>L05  |
| Sensing device         | Magnetic absolute encoder  |  |
| Material               | POM, aluminum<br>measuring cable: stainless steel                            |  |
| Protection class       | IP65 (with mating connector only)  |  |
| Cable fixing           | M4 cable fixing<br>Cable clip  | <b>5</b> M4<br>SB0   |
| Connection             | Connector M12, 5 pin (standard)<br>Connector M12, 8 pin (optional)           | <b>6</b> M12A5<br>M12A8                                    |
| Shock                  | DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks                              |  |
| Vibration              | DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles                           |  |
| Temperature range      | -20 ... +85 °C   |  |
| Weight                 | approx. 450 g  |  |
| EMC                    | DIN EN 61326-1:2013  |  |

Order code

WS10SG – **1** – **2** – **3** – **4** – **5** – **6**

Order example: WS10SG – 1250 – U2 – A – L10 – M4 – M12A5

Accessories:

Connector cable (see page 32)



## WS10SG - Cable Extension Position Sensor

### Version with analog output with magnetic encoder, programmable

#### Specifications

|                        |  | Order options  |
|------------------------|--|--|
| Measurement range      | 250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000 mm   | <b>1</b> 250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000 |
| Resolution             | <0.002% f.s.   |  |
| Output                 | Voltage 0.5 ... 10 V, programmable<br>Voltage 0.5 ... 4.5 V, programmable<br>Current 4 ... 20 mA, 3 wire, programmable | <b>2</b> U2/PMU<br>U8/PMU<br>I1/PMU                        |
| Signal characteristics | Increasing signal (e.g. 4 ... 20 mA)<br>Decreasing signal (e.g. 20 ... 4 mA)   | <b>3</b> A<br>D  |
| Linearity              | ±0.10% f.s. (standard)<br>±0.05% f.s. (optional)   | <b>4</b> L10<br>L05  |
| Sensing device         | Magnetic absolute encoder  |  |
| Material               | POM, aluminum<br>measuring cable: stainless steel  |  |
| Protection class       | IP65 (with mating connector only)  |  |
| Cable fixing           | M4 cable fixing<br>Cable clip  | <b>5</b> M4<br>SB0   |
| Connection             | Connector M12, 5 pin   | <b>6</b> M12A5   |
| Shock                  | DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks  |  |
| Vibration              | DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles   |  |
| Temperature range      | -20 ... +85 °C   |  |
| Weight                 | approx. 450 g  |  |
| EMC                    | DIN EN 61326-1:2013  |  |

#### Order code

WS10SG – **1** – **2** – **3** – **4** – **5** – **6**

**Order example:** WS10SG – 1250 – U2/PMU – A – L10 – M4 – M12A5

#### Accessories:

**Connector cable (see page 33)**



WS10SG - Cable Extension Position Sensor  
Version with digital output SSI with magnetic encoder

Specifications

|                   |  | Order options  |
|-------------------|--|--|
| Measurement range | 250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000 mm | <b>1</b> 250 / 375 / 500 / 750 / 1000 / 1250 / 1500 / 2000 |
| Resolution        | 10 µm<br>50 µm<br>100 µm                             | <b>2</b> 10<br>50<br>100                                   |
| Output            | SSI synchronous serial interface                     | <b>3</b> MSSl  |
| Linearity         | ±0.10% f.s. (standard)<br>±0.05% f.s. (optional)     | <b>4</b> L10<br>L05  |
| Sensing device    | Magnetic absolute encoder                            |  |
| Material          | POM, aluminum<br>measuring cable: stainless steel    |  |
| Protection class  | IP65 (with mating connector only)                    |  |
| Cable fixing      | M4 cable fixing<br>Cable clip                        | <b>5</b> M4<br>SB0   |
| Connection        | Connector M12, 8 pin                                 | <b>6</b> M12A8   |
| Shock             | DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks      |  |
| Vibration         | DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles   |  |
| Temperature range | -20 ... +85 °C                                       |  |
| Weight            | approx. 450 g  |  |
| EMC               | DIN EN 61326-1:2013                                  |  |

Order code

|        |   |          |   |          |   |          |   |          |   |          |   |          |
|--------|---|----------|---|----------|---|----------|---|----------|---|----------|---|----------|
| WS10SG | - | <b>1</b> | - | <b>2</b> | - | <b>3</b> | - | <b>4</b> | - | <b>5</b> | - | <b>6</b> |
|--------|---|----------|---|----------|---|----------|---|----------|---|----------|---|----------|

Order example: WS10SG – 1250 – 50 – MSSl – L10 – M4 – M12A8

Accessories:

Connector cable (see page 34)



WS10SG - Cable Extension Position Sensor  
Version with digital output CAN Bus with magnetic encoder

Specifications

|                   |  | Order options |  |
|-------------------|--|---------------|--|
| Measurement range | 100 / 125 / 375 / 500 / 750 / 1000 / 1250 / 2000mm | <b>1</b>      | 100 / 125 / 375 / 500 / 750 / 1000 / 1250 / 2000 |
| Resolution        | setting via CAN Bus                                |               |  |
| Output            | CANopen<br>CAN SAE J1939                           | <b>2</b>      | MCANOP<br>MCANJ1939                              |
| Linearity         | ±0.10% f.s. (standard)<br>±0.05% f.s. (optional)   | <b>3</b>      | L10<br>L05                                       |
| Sensing device    | Magnetic absolute encoder                          |               |  |
| Material          | POM, aluminum<br>measuring cable: stainless steel  |               |  |
| Protection class  | IP65 (with mating connector only)                  |               |  |
| Cable fixing      | M4 cable fixing<br>Cable clip                      | <b>4</b>      | M4<br>SB0  |
| Connection        | Connector M12, 5 pin                               | <b>5</b>      | M12/CAN  |
| Shock             | DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks    |               |  |
| Vibration         | DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles |               |  |
| Temperature range | -20 ... +85 °C                                     |               |  |
| Weight            | approx. 450 g                                      |               |  |
| EMC               | DIN EN 61326-1:2013                                |               |  |

Order code

WS10SG – **1** – **2** – **3** – **4** – **5**

Order example: WS10SG – 1250 – MCANOP – L10 – M4 – M12/CAN

Accessories:

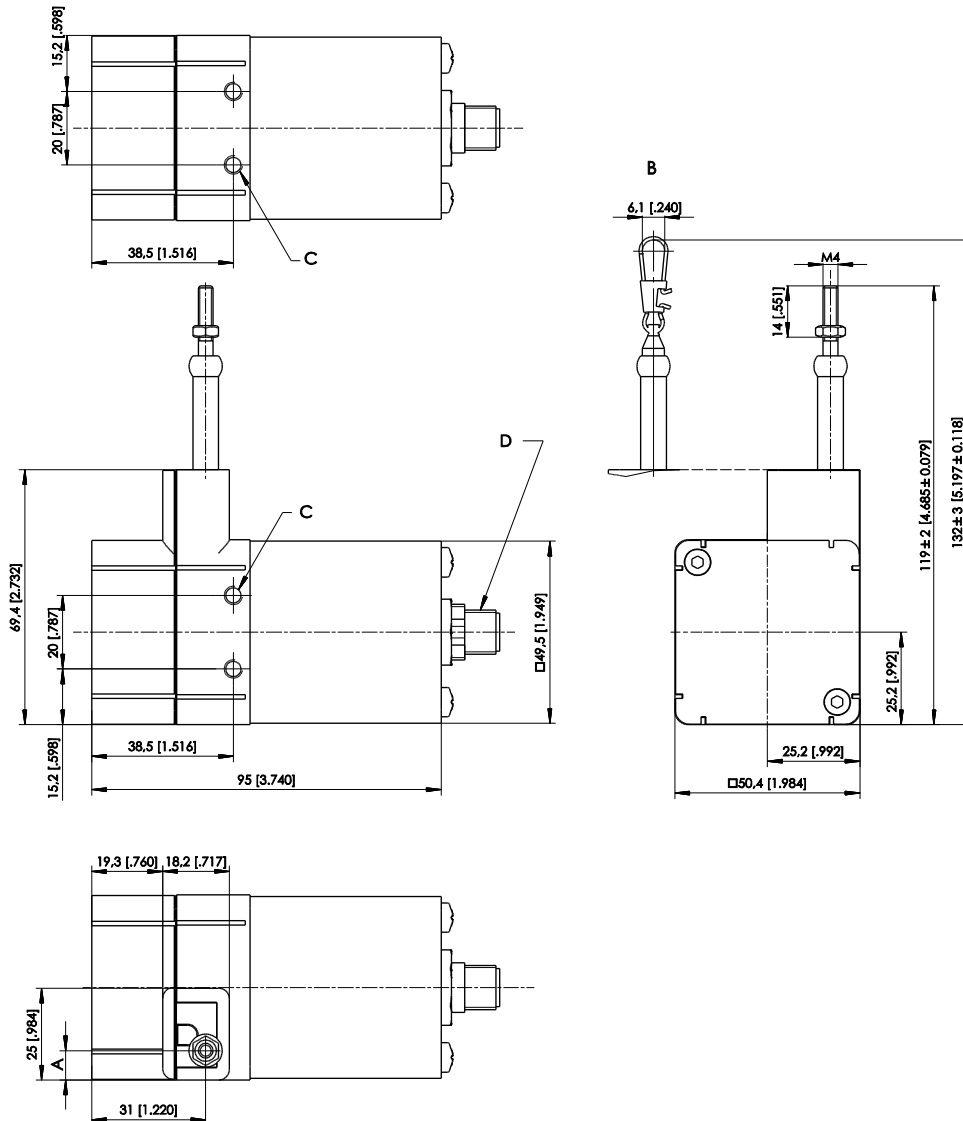
Connector cable (see page 35)



| Cable forces<br>typical at = 20 °C | Measurement range | Maximum pull-out force | Minimum pull-in force |
|------------------------------------|-------------------|------------------------|-----------------------|
|                                    | [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                   |

## Dimensions

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

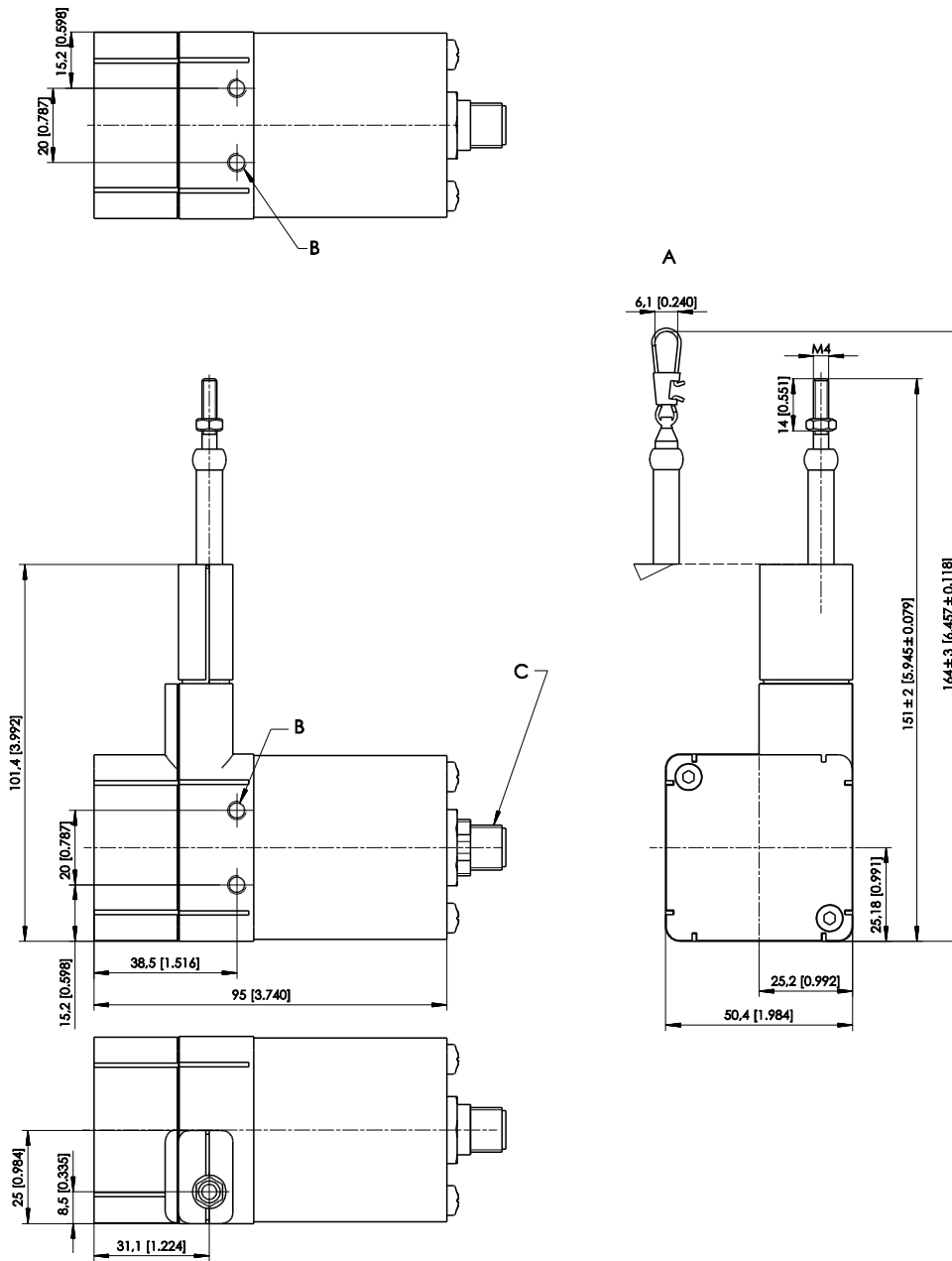


| Dimensions in mm | Measurement range | A    |
|------------------|-------------------|------|
|                  | 250               | 16.5 |
|                  | 375; 750          | 12.3 |
|                  | 500; 1000; 1250   | 8    |

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

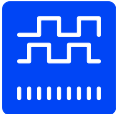
Dimensions in mm [inch]  
Dimensions informative only.  
For guaranteed dimensions consult factory.

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



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

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



WS10SG - Cable Extension Position Sensor  
Version with incremental encoder output

Specifications

|                   |   | Order options                     |
|-------------------|---|-----------------------------------|
| Measurement range | 1250 mm   | <b>1</b> 1250                     |
| Resolution        | 10 pulses/mm or 40 edges/mm<br>25 pulses/mm or 100 edges/mm<br>(other numbers of pulses on request)       | <b>2</b> 10<br>25                 |
| Output            | Incremental output 5 ... 30 V<br>Incremental encoder TTL compatible<br>Incremental encoder HTL compatible | <b>3</b> PP530<br>IE41L<br>IE41HI |
| Linearity         | ±0.05% f.s.   |                                   |
| Cable fixing      | M4 cable fixing<br>Cable clip   | <b>4</b> M4<br>SB0                |
| Sensing device    | Incremental encoder   |                                   |
| Material          | POM, aluminum<br>measuring cable: stainless steel   |                                   |
| Protection class  | IP65 (with mating connector only)   |                                   |
| Connection        | Connector M12, 8 pin  | <b>5</b> M12                      |
| Temperature range | -20 ... +85 °C  |                                   |
| Weight            | approx. 450 g   |                                   |
| EMC               | DIN EN 61326-1:2013   |                                   |

Order code

WS10SG – **1** – **2** – **3** – **4** – **5**

Order example: WS10SG – 1250 – 10 – PP530 – M4 – M12

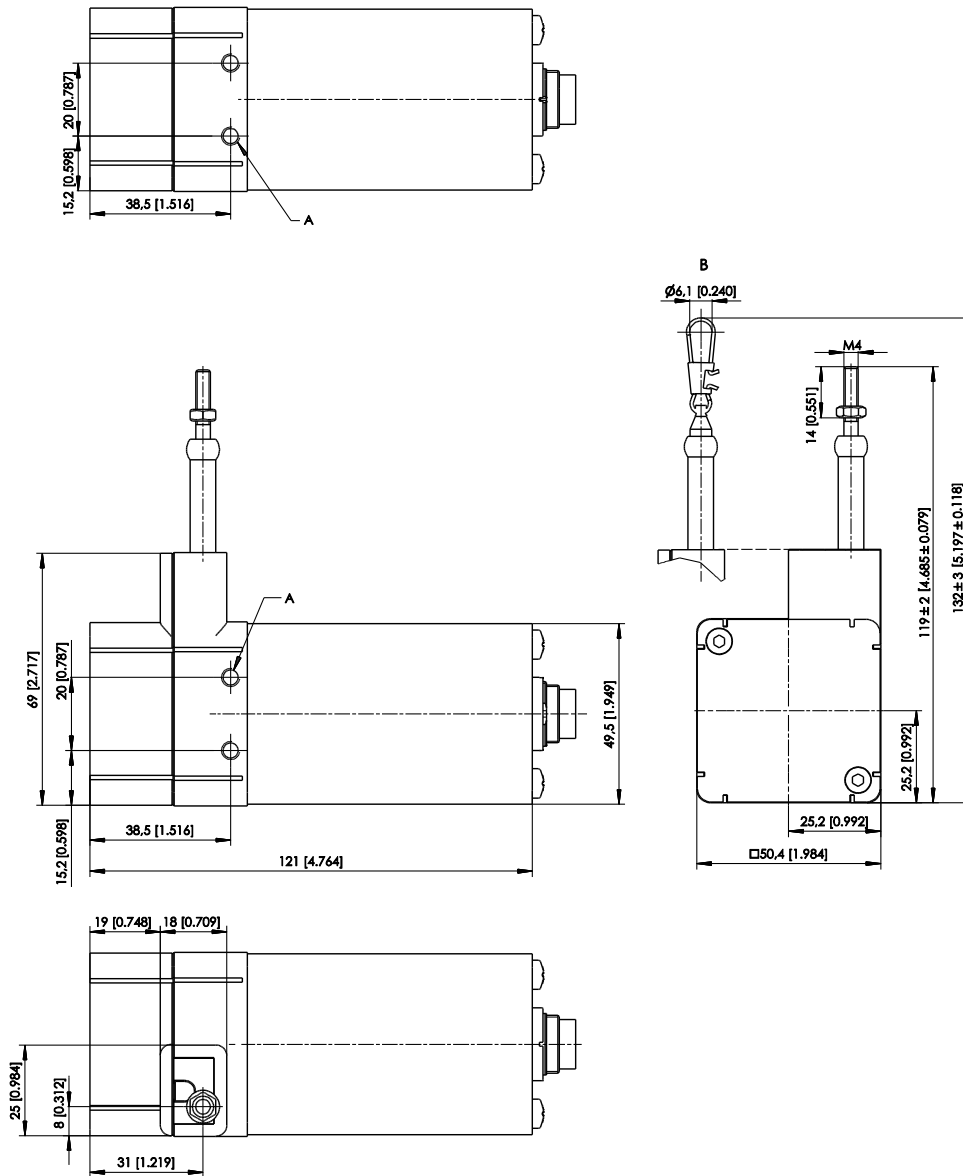
Accessories:

Connector cable (see page 34)

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

## 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

|  |                                   |  |
|--|-----------------------------------|--|
| <b>R1K</b><br>Potentiometer<br> | 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 % ... approx. 97 %   |
|  | Operating temperature             | Refer to output specification  |
|  | EMC                               | DIN EN 61326-1:2013  |

#### NOTICE

#### The potentiometer must be connected as a voltage divider!

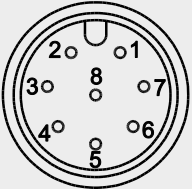
The following processing circuit has to be implemented according to the circuit scheme in the Appendix (see „Output information“)


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

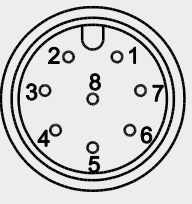
- The metal wiper of the potentiometer must be protected against current load

Additional information:


[https://www.asm-sensor.com/en/downloads.html?file=files/asmTheme/pdf/ws\\_poti\\_technote\\_en.pdf](https://www.asm-sensor.com/en/downloads.html?file=files/asmTheme/pdf/ws_poti_technote_en.pdf)

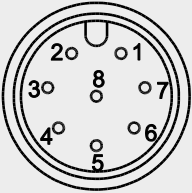
| Signal wiring  | Signal      | Connector pin no. | Cable color |
|--|-------------|-------------------|-------------|
| <b>Connector M12, 8 pin</b><br><br>View to the sensor connector | Poti +      | 1                 | white       |
|  | Poti GND    | 2                 | brown       |
|  | Poti slider | 3                 | green       |
|  | -           | 4                 | yellow      |
|  | -           | 5                 | grey        |
|  | -           | 6                 | pink        |
|  | -           | 7                 | blue        |
|  | -           | 8                 | red         |

|   |                         |                                  |
|---|-------------------------|----------------------------------|
| <b>10V</b><br>Voltage output<br> | Excitation voltage      | 18 ... 27 V DC non stabilized    |
|   | Excitation current      | 20 mA max.                       |
|   | Output voltage          | 0 ... 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              |


| Signal wiring   | Output signals  | Connector pin no. | Cable color |
|---|-----------------|-------------------|-------------|
| <b>Connector M12, 8 pin</b><br><br>View to the soldering side of mating connector | Excitation +    | 1                 | white       |
|   | 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         |

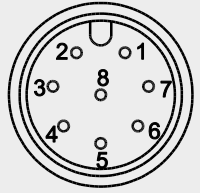
\*: internally connected

|   |                         |   |
|---|-------------------------|---|
| <b>420A</b><br>Current output (2 wire)<br> | Excitation voltage      | 18 ... 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) | $\pm 100 \times 10^{-6}$ / °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   |


| Signal wiring  | Output signals | Connector pin no. | Cable color |
|--|----------------|-------------------|-------------|
| <b>Connector M12, 8 pin</b><br><br>View to the sensor connector | Signal +       | 1                 | white       |
|  | 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         |



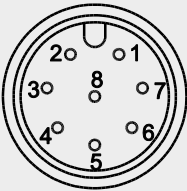
|   |                         |  |
|---|-------------------------|--|
| <b>420T</b><br>Current output (3 wire)<br> | Excitation voltage      | 18 ... 27 V DC non stabilized                |
|   | Excitation current      | 40 mA max.                                   |
|   | Load resistor           | 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                          |

| Signal wiring  | Output signals  | Connector pin no. | Cable color |
|--|-----------------|-------------------|-------------|
| <b>Connector M12, 8 pin</b><br><br>View to soldering side of mating connector | Excitation +    | 1                 | white       |
|  | 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         |

\*: internally connected

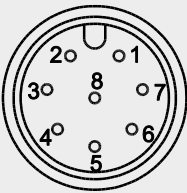
|   |                                      |                                   |
|---|--------------------------------------|-----------------------------------|
| <b>PMUV</b><br>Voltage output programmable<br><b>PMUI</b><br>Current output programmable<br> | Excitation voltage                   | 18 ... 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                  |                                   |

**PMUV / PMUI**

| Signal wiring<br>Connector M12, 8 pin   | Output signals  | Connector pin no. | Cable color |
|---|-----------------|-------------------|-------------|
|  <p>View to soldering side of mating connector</p> | Excitation +    | 1                 | white       |
|   | Excitation GND* | 2                 | brown       |
|   | Signal +        |                   | 3           |
|   | Signal GND*     | 4                 | yellow      |
|   | Not connected   | 5                 | grey        |
|   | Not connected   | 6                 | pink        |
|   | ZERO            | 7                 | blue        |
|   | END             | 8                 | red         |

\*: internally connected

**PMUI2**

| Signal wiring<br>Connector M12, 8 pin   | Output signals  | Connector pin no. | Cable color |
|---|-----------------|-------------------|-------------|
|  <p>View to soldering side of mating connector</p> | Excitation +    | 1                 | white       |
|   | Excitation GND* | 2                 | brown       |
|   | Not connected   |                   | 3           |
|   | Not connected   | 4                 | yellow      |
|   | Signal +        | 5                 | grey        |
|   | Signal GND*     | 6                 | pink        |
|   | ZERO            | 7                 | blue        |
|   | END             | 8                 | red         |

\*: internally connected


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## Outputs .../PMUV, PMUI, PMUI2

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

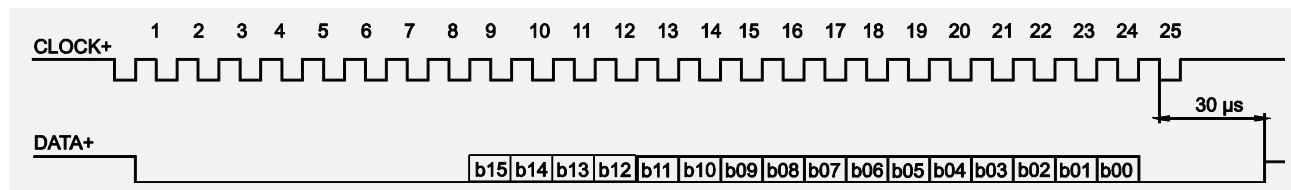
Teach-In of start and end value for the outputs PMUV, PMUV and PMUI2 is provided by two binary signals ZERO and END. At the start position connect signal ZERO for a short period to GND via push button. At the end position connect signal END for a short period to GND. The scaling range will be stored non-volatile. To reset the sensor to factory default both signals ZERO and END must be connected to ground while powering up the sensor.

### Digital Interfaces

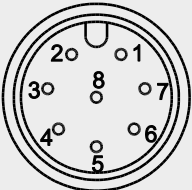
|   |                            |   |
|---|----------------------------|---|
| <b>ADSI</b><br>A/D converted<br>synchronous serial<br> | Excitation voltage         | 11 ... 27 V DC  |
|   | Excitation current         | 200 mA max.   |
|   | Interface                  | EIA RS422, RS485, short-circuit 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.<br>ADSI14: 14 bit (16384 counts) f.s.<br>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   |

### Data format


(train of 26 pulses)





| Transmission rate | Cable length | Baud rate | Note:  |
|-------------------|--------------|-----------|--|
|                   | < 50 m       | < 300 kHz | Extension of the cable length will reduce the maximum transmission rate. |
|                   | < 100 m      | < 100 kHz |  |

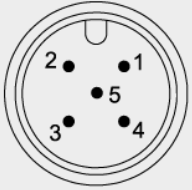
| Signal wiring  | Output signals            | Connector pin no. | Cable color |
|--|---------------------------|-------------------|-------------|
| <b>Connector M12, 8 pin</b><br><br>View to soldering side of mating connector | Excitation +              | 1                 | white       |
|  | Excitation GND (0 V)      | 2                 | brown       |
|  | CLOCK                     | 3                 | green       |
|  | $\overline{\text{CLOCK}}$ | 4                 | yellow      |
|  | DATA                      | 5                 | grey        |
|  | $\overline{\text{DATA}}$  | 6                 | pink        |
|  | Not connected             | 7                 | blue        |
|  | Not connected             | 8                 | red         |

### Magnetic encoder, analog output


|  |                         |  |
|--|-------------------------|--|
| <b>U2</b><br>Voltage output<br>0.5 ... 10 V<br> | Excitation voltage      | 8 ... 36 V DC  |
|  | Excitation current      | 20 mA typical at 24 V DC<br>38 mA typical at 12 V DC<br>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  |


|  |                         |  |
|--|-------------------------|--|
| <b>U8</b><br>Voltage output<br>0.5 ... 4.5 V<br> | Excitation voltage      | 8 ... 36 V DC  |
|  | Excitation current      | 17 mA typical at 24 V DC<br>32 mA typical at 12 V DC<br>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  |


|  |                         |   |
|--|-------------------------|---|
| <b>I1</b><br>Current output<br>4 ... 20 mA, 3 wires<br> | Excitation voltage      | 8 ... 36 V DC   |
|  | Excitation current      | typical 36 mA at 24 V DC<br>typical 70 mA at 12 V DC<br>120 mA max. |
|  | Load $R_L$              | 500 $\Omega$ 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   |

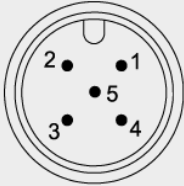
| Signal wiring  | Output signals  | Connector pin no. | Cable color |
|--|-----------------|-------------------|-------------|
| <b>Connector M12, 5 pin</b><br><br>View to the sensor connector | Excitation +    | 1                 | brown       |
|  | Signal          | 2                 | white       |
|  | GND             | 3                 | blue        |
|  | Do not connect! | 4                 | black       |
|  | Do not connect! | 5                 | (grey)      |

**Magnetic encoder, analog output, programmable**

|  |                         |  |
|--|-------------------------|--|
| <b>U2/PMU</b><br>Voltage output<br>0.5 ... 10 V<br> | Excitation voltage      | 8 ... 36 V DC  |
|  | Excitation current      | 20 mA typical at 24 V DC<br>38 mA typical at 12 V DC<br>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                     | EN 61326-1:2013  |

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

|  |                         |   |
|--|-------------------------|---|
| <b>I1/PMU</b><br>Current output<br>4 ... 20 mA, 3 wires<br> | Excitation voltage      | 8 ... 36 V DC   |
|  | Excitation current      | typical 36 mA at 24 V DC<br>typical 70 mA at 12 V DC<br>max. 120 mA |
|  | 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  | Output signals  | Connector pin no. | Cable color |
|--|-----------------|-------------------|-------------|
| <b>Connector M12, 5 pin</b><br><br>View to the sensor connector | Excitation +    | 1                 | brown       |
|  | Signal          | 2                 | white       |
|  | GND             | 3                 | blue        |
|  | Do not connect! | 4                 | black       |
|  | SPAN/ZERO       | 5                 | grey        |

## Output .../PMU


### Programming of the start and end value by the customer (programmable)

Teach-In of start and end value for the analog outputs U2/PMU, U8/PMU, I1/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 range will be stored non-volatile.

To reset the sensor to factory default ZERO/END must be connected to ground while powering up the sensor for 2 ... 3 seconds.

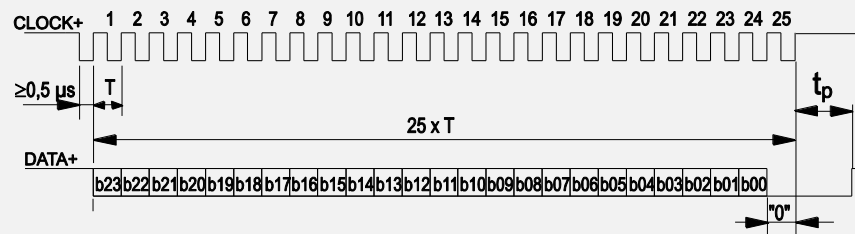


## Magnetic encoder, digital output

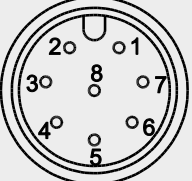
|  |                                      |  |
|--|--------------------------------------|--|
| <b>MSSI</b><br>Synchronous serial SSI<br> SSI | Interface                            | EIA RS-422   |
|  | Excitation voltage                   | 8 ... 36 V DC  |
|  | Excitation current                   | 19 mA typical at 24 V DC<br>35 mA typical at 12 V DC<br>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  |


### Data format

(Train of 26 pulses)

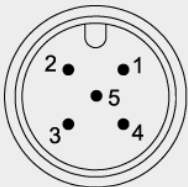


| Transmission rate | Cable length | Baud rate   | Note:  |
|-------------------|--------------|-------------|--|
|                   | 50 m         | 100-400 kHz | Extension of the cable length will reduce the maximum transmission rate. |
|                   | 100 m        | 100-300 kHz |  |

| Signal wiring  | Output signals            | Connector pin no. | Cable color |
|--|---------------------------|-------------------|-------------|
| <b>Connector M12, 8 pin</b><br><br>View to the 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         |

|   |                                     |  |
|---|-------------------------------------|--|
| <b>MCANOP</b><br>CANopen<br> | 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<br>40 mA typical at 12 V DC<br>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  | Output signals | Connector pin no. | Cable color |
|--|----------------|-------------------|-------------|
| <b>Connector M12, 5 pin</b><br> | Shield         | 1                 | brown       |
|  | Excitation +   | 2                 | white       |
|  | GND            | 3                 | blue        |
|  | CAN-H          | 4                 | black       |
|  | CAN-L          | 5                 | grey        |

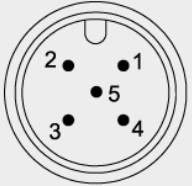
View to the sensor connector

|  |                               |                                     |
|--|-------------------------------|-------------------------------------|
| <b>MCANJ1939</b><br>SAE J1939<br> | 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          |

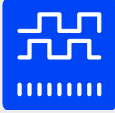
|                    |                           |             |                      |
|--------------------|---------------------------|-------------|----------------------|
| <b>NAME Fields</b> | Arbitrary address capable | 1           | Yes                  |
|                    | Industry group            | 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<br>(PDU1 peer-to-peer)  |
|                                      | Process data       | PGN FFnnh | Proprietary-B<br>(PDU2 broadcast);<br>nn Group Extension (PS)<br>configurable |

|                       |                         |  |
|-----------------------|-------------------------|--|
| <b>Specifications</b> | Excitation voltage      | 8 ... 36 V DC  |
|                       | Excitation current      | 20 mA typical at 24 V DC<br>40 mA typical at 12 V DC<br>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  | Output signals | Connector pin no. | Cable color |
|--|----------------|-------------------|-------------|
| <b>Connector M12, 5 pin</b><br><br>View to the sensor connector | Shield         | 1                 | brown       |
|  | Excitation +   | 2                 | white       |
|  | GND            | 3                 | blue        |
|  | CAN-H          | 4                 | black       |
|  | CAN-L          | 5                 | grey        |

## Incremental output

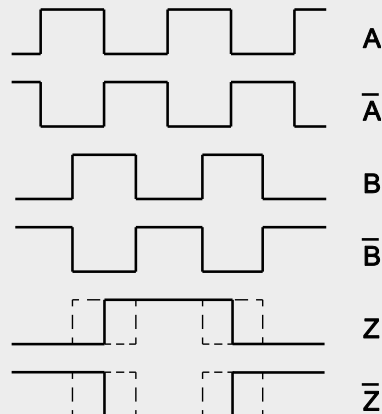
|  |                               |  |
|--|-------------------------------|--|
| <b>PP530</b><br>Incremental interface<br> | Excitation voltage            | 5 ... 30 V DC  |
|  | Excitation current            | 25 mA typ. (w/o load), 200 mA max.   |
|  | Output frequency              | 200 kHz max.   |
|  | 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   | $I_a < 10 \text{ mA}, U_b 5 \text{ V}/24 \text{ V}: < 0,5 \text{ V}$<br>$I_a < 30 \text{ mA}, U_b 5 \text{ V}/24 \text{ V}: < 1 \text{ V}$ |
|  | 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  |

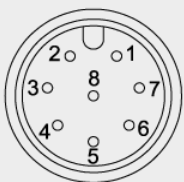
### NOTICE

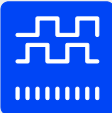
\*) Line driver may get damaged in case of shorted output for unlimited time

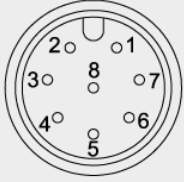
- Prevent unused output signals (e.g.  $\overline{A}/\overline{B}/\overline{Z}$ ) from unintentionally being shorted with each other or any other voltage like ground, excitation + or shield.
- Isolate and secure unused output wires.

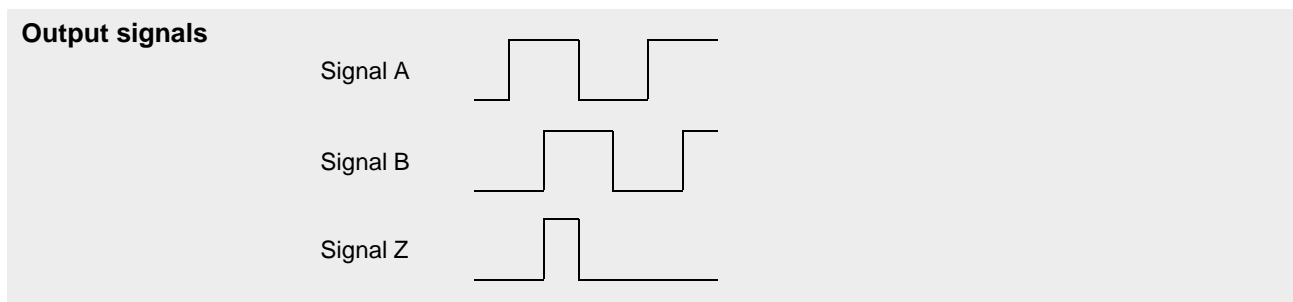
### Output signals



| Signal wiring  | Output signals             | Connector pin no. | Cable color |
|--|----------------------------|-------------------|-------------|
| <b>Connector M12, 8 pin</b><br><br>View to soldering side of mating connector | Excitation +               | 1                 | white       |
|  | 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         |

| IE41LI and IE41HI<br>Incremental interface  | IE41LI                           | IE41HI  |                      |
|---|----------------------------------|---|----------------------|
|  | 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<br>Connector M12, 8 pin   | Output signals             | Connector pin no. | Cable color |
|--|----------------------------|-------------------|-------------|
|  <p>View to the sensor connector</p> | Excitation +               | 1                 | white       |
|  | 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         |

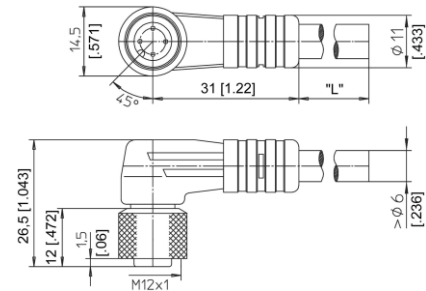


## Accessories

### 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

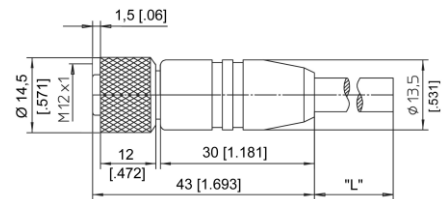
|       |  |
|-------|--|
|       | <b>KAB - xM - M12/4F/W - LITZE</b>     |
| IP69: | <b>KAB - xM - M12/4F/W/69K - LITZE</b> |

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

|       |  |
|-------|--|
|       | <b>KAB - xM - M12/4F/G - LITZE</b>     |
| IP69: | <b>KAB - xM - M12/4F/G/69K - LITZE</b> |

xM = length in m

| Signal wiring<br>M12, 4 pin | Plug connection / cable color |       |      |       |
|-----------------------------|-------------------------------|-------|------|-------|
|                             | 1                             | 2     | 3    | 4     |
|                             | 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 |



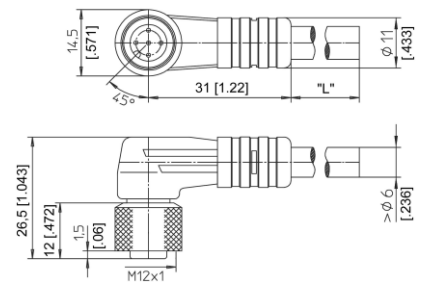
## Connector cable M12, 5 pin (angular coupling)

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

**KAB - xM - M12/5F/W - LITZE**

IP69: **KAB - xM - M12/5F/W/69K - LITZE**

xM = length in m

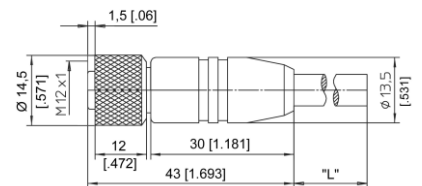
## Connector cable M12, 5 pin (straight coupling)

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

**KAB - xM - M12/5F/G - LITZE**

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

xM = length in m

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

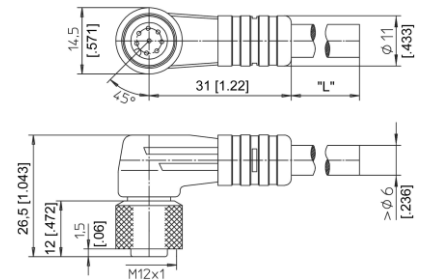
### Applicable for cable carriers

|                        |                     |
|------------------------|---------------------|
| 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**

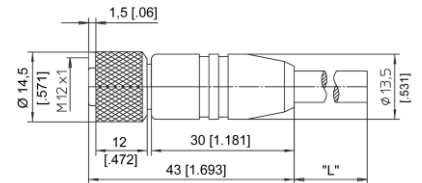
IP69: **KAB - xM - M12/8F/W/69K - LITZE**

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<br>M12, 8 pin | Plug connection / cable color |       |       |        |      |      |      |     |
|-----------------------------|-------------------------------|-------|-------|--------|------|------|------|-----|
|                             | 1                             | 2     | 3     | 4      | 5    | 6    | 7    | 8   |
|                             | white                         | brown | green | yellow | grey | pink | blue | red |

#### Applicable for cable carriers

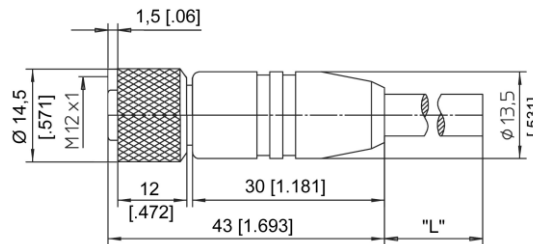
|                        |                     |
|------------------------|---------------------|
| Maximum movement speed | 3 m/s               |
| Maximum acceleration   | 5 m/s <sup>2</sup>  |
| Minimum bending radius | 10 x cable diameter |

## 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

