



# More Precision

**wireSENSOR** // Draw-wire displacement sensors



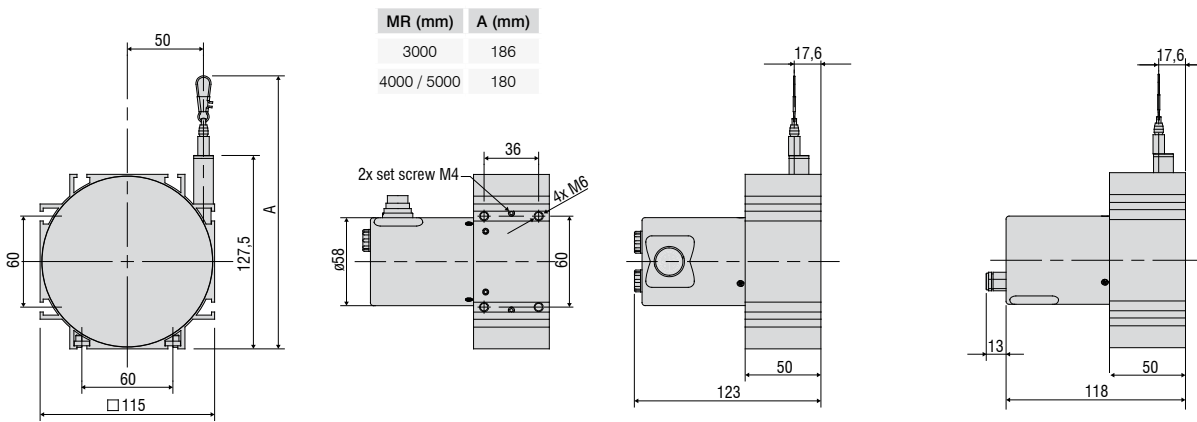


- Robust aluminum profile housing
- Customized versions for OEM
- Potentiometer, current and voltage output

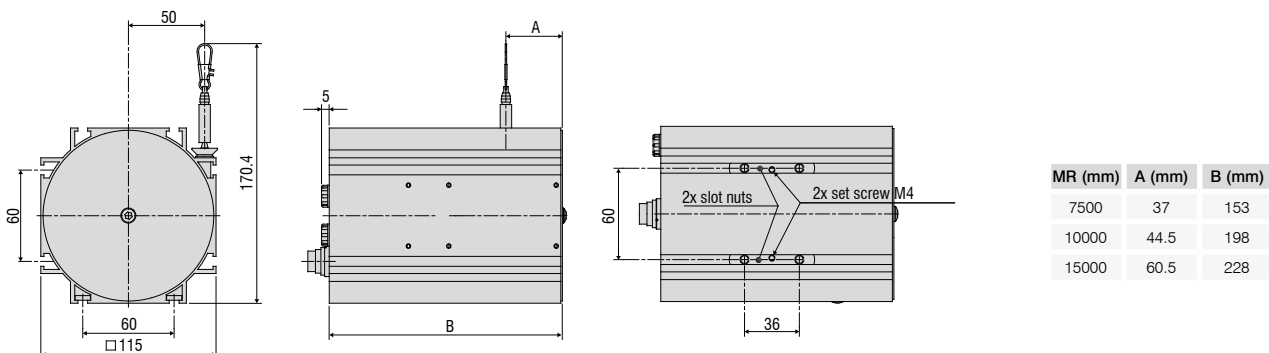
Model P115 (Measuring range 3000/4000/5000mm)

Output U/I

Output P



Model P115 (Measuring range 7500/10000/15000mm)



| Model                       | WDS-3000-P115            | WDS-4000-P115                               | WDS-5000-P115 | WDS-7500-P115 | WDS-10000-P115                             | WDS-15000-P115 |
|-----------------------------|--------------------------|---|---------------|---------------|--|----------------|
| Measuring range             | 3000mm                   | 4000mm                                      | 5000mm        | 7500mm        | 10000mm                                    | 15000mm        |
| Output                      | P, U, I                  |   |               |               |  |                |
| Linearity                   | ±0.1% FSO                | ±3mm  | -             | -             | -  | -              |
|                             | ±0.15% FSO               | -   | ±6mm          | ±7.5mm        | ±11.3mm                                    | ±15mm          |
| Resolution                  | towards infinity         |   |               |               |  |                |
| Sensor element              | hybrid potentiometer     |   |               |               |  |                |
| Temperature range           | -20 °C ... +80 °C        |   |               |               |  |                |
| Material                    | housing                  | aluminum                                    |               |               |  |                |
|                             | draw-wire                | coated polyamide stainless steel (ø 0.45mm) |               |               | coated polyamide stainless steel (ø 1.0mm) |                |
| Sensor mounting             | slot nut                 |   |               |               |  |                |
| Wire mounting               | wire clip                |   |               |               |  |                |
| Wire acceleration           | approx. 6g               |   |               |               |  |                |
| Wire retraction force (min) | 4.5N                     | 4N  | 4N            | 8N            | 8N   | 8N             |
| Wire extension force (max)  | 8N                       | 8.5N  | 9N            | 24N           | 21N  | 25N            |
| Protection class            | IP65 (only if connected) |   |               |               |  |                |
| Vibration                   | 20g, 20Hz - 2kHz         |   |               |               |  |                |
| Mechanical shock            | 50g, 20ms                |   |               |               |  |                |
| Electrical connection       | P                        | integrated cable, axial, 1m                 |               |               |  |                |
|                             | U, I                     | flange connector, radial, 8-pin, DIN45326   |               |               |  |                |
| Weight                      | approx. 1.1kg            |   |               | 2.2kg         | 3.2kg                                      | 3.5kg          |

FSO = Full Scale Output

Specifications for analog outputs on page 51.

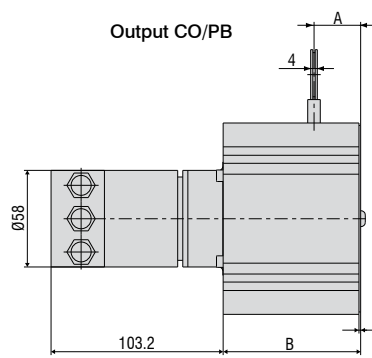
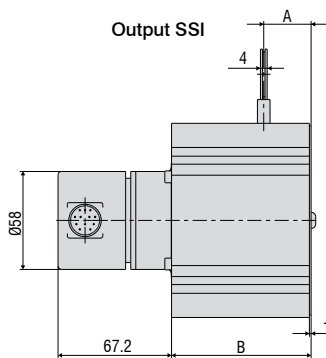
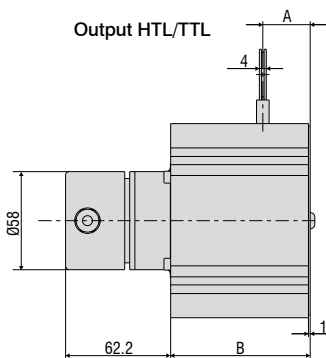
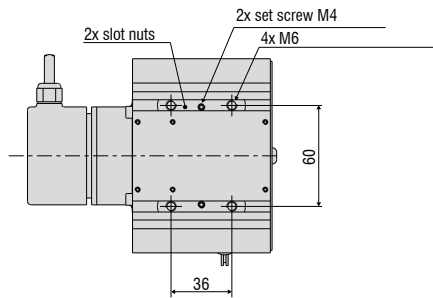
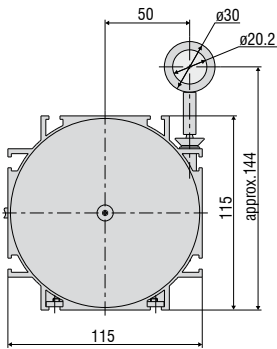
## Article description

| WDS - | 3000 - | P115 - | CA - | P   |
|-------|--------|--------|------|---|
|       |        |        |      | P: potentiometer connection CA: P115-3000/4000/5000<br>connection SA: P115-7500/10000/15000<br>U: voltage connection SR: P115-3000/4000/5000<br>connection SA: P115-7500/10000/15000<br>I: current connection SR: P115-3000/4000/5000<br>connection SA: P115-7500/10000/15000 |
|       |        |        |      | Connection:<br>SR: radial plug<br>SA: axial plug<br>CA: integrated cable, axial, 1m   |
|       |        |        |      | Model P115  |
|       |        |        |      | Measuring range in mm   |



- Robust aluminum profile housing
- Customized versions for OEM
- Incremental/absolute encoder

Model P115



| MR (mm) | A (mm) | B (mm) |
|---------|--------|--------|
| 5000    | 28     | 82.5   |
| 7500    | 37     | 105.5  |
| 10000   | 44.5   | 148.5  |
| 15000   | 61     | 180.5  |

| Model                       | WDS-5000-P115                | WDS-7500-P115                              | WDS-10000-P115 | WDS-15000-P115 |
|-----------------------------|------------------------------|--|----------------|----------------|
| Measuring range             | 5000mm                       | 7500mm                                     | 10000mm        | 15000mm        |
| Output                      | HTL, TTL, SSI, PB, CO        |  |                |                |
| Linearity                   | ±0.01% FSO                   | -  | -              | ±1mm           |
|                             | ±0.02% FSO                   | ±1mm                                       | ±1.5mm         | -              |
| Resolution                  | HTL, TTL                     | 0.105mm (9.52 pulses/mm)                   |                |                |
|                             | SSI, PB, CO                  | 0.038mm                                    |                |                |
| Sensor element              | incremental/absolute encoder |  |                |                |
| Temperature range           | -20 °C ... +80 °C            |  |                |                |
| Material                    | housing                      | aluminum                                   |                |                |
|                             | draw-wire                    | coated polyamide stainless steel (ø 1.0mm) |                |                |
| Sensor mounting             | slot nuts                    |  |                |                |
| Wire mounting               | eyelet                       |  |                |                |
| Wire acceleration           | 5g                           | 6g   | 3g             | 3g             |
| Wire retraction force (min) | 4N                           | 8N   | 8N             | 8N             |
| Wire extension force (max)  | 16N                          | 24N  | 21N            | 25N            |
| Protection class            | IP65 (only if connected)     |  |                |                |
| Vibration                   | 20g, 20Hz - 2kHz             |  |                |                |
| Mechanical shock            | 50g, 10ms                    |  |                |                |
| Electrical connection       | HTL, TTL                     | integrated cable, radial, 1m               |                |                |
|                             | SSI                          | flange connector, radial, 12-pin           |                |                |
|                             | PB, CO                       | bus cover                                  |                |                |
| Weight                      | approx. 2kg                  | approx. 2.5kg                              | approx. 3.5kg  | approx. 4.5kg  |

FSO = Full Scale Output

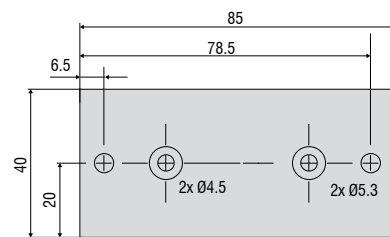
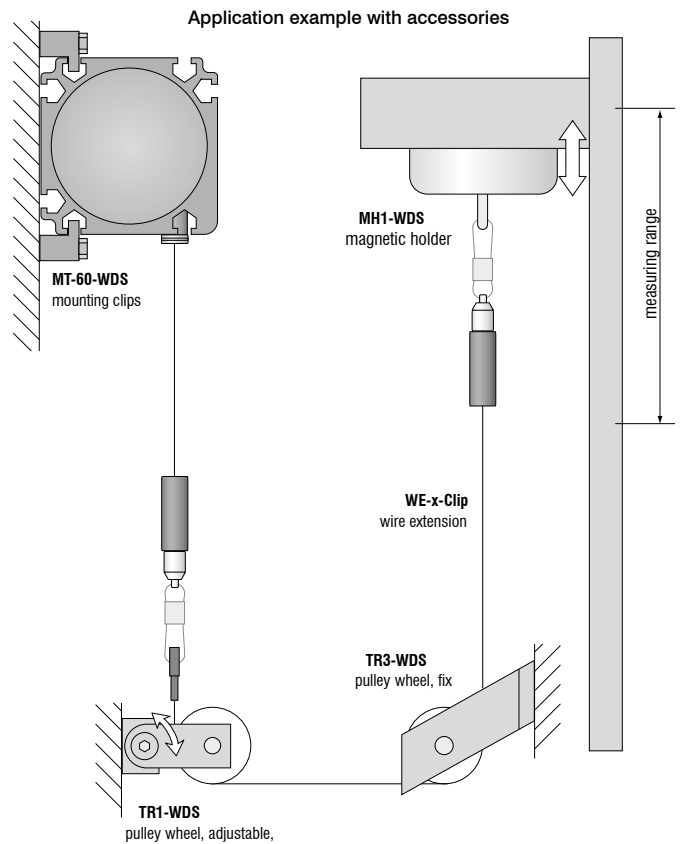
Specifications for digital outputs on page 52.

## Article description

| WDS - | 5000 - | P115 - | CR - | TTL  |
|-------|--------|--------|------|--|
|       |        |        |      | Output option:<br>HTL<br>TTL<br>CO: CANopen<br>PB: Profibus DP<br>SSI  |
|       |        |        |      | Connection:<br>SR (Output SSI): radial plug<br>CR (Output HTL, TTL): integrated cable, radial, 1m<br>BH (Output CO, PB): bus cover |
|       |        |        |      | Model P115   |
|       |        |        |      | Measuring range in mm  |

**Accessories:**

|             |   |
|-------------|---|
| WE-xxx-M4   | Wire extension with M4-wire connection, x=length  |
| WE-xxx-Clip | Wire extension with eyelet, x=length  |
| TR1-WDS     | Pulley wheel, adjustable  |
| TR3-WDS     | Pulley wheel, fixed   |
| GK1-WDS     | Attachment head for M4  |
| MH1-WDS     | Magnetic holder for wire mounting   |
| MH2-WDS     | Magnetic holder for sensor mounting   |
| MT-60-WDS   | Mounting clamp for WDS-P60  |
| FC8         | Female connector for WDS, 8-pin   |
| FC8/90      | Female connector 90° for WDS  |
| PC 3/8-WDS  | Sensor cable, length 3m   |
| PS 2020     | (Power Supply 24 V / 2,5 A, Input 100 - 240 VAC, output 24 VDC / 2.5 A, for snap in mounting on DIN 50022 rail) |
| WDS-MP60    | Mounting plate for P60 sensors  |



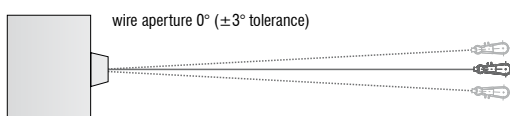
Mounting plate WDS-MP60

**Installation information:**

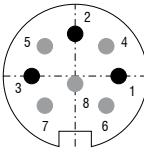
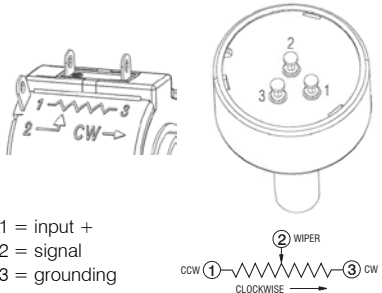
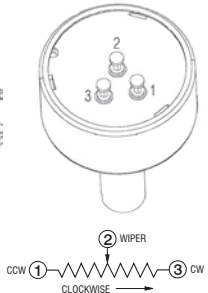
**Wire attachment:** The free return of the measurement wire is not permissible and it is essential that this is avoided during installation.

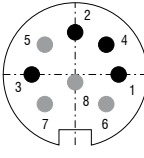
**Wire exit angle:**

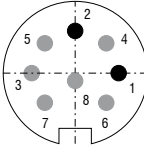
When mounting a draw-wire displacement sensor, a straight wire exit ( $\pm 3^\circ$  tolerance) must be taken into account. If this tolerance is exceeded, increased material wear on the wire and at the wire aperture must be expected.



| Output | Plug M16<br>-SA / -SR | Integrated cable<br>-CA / -CR | Open contacts |
|--------|-----------------------|-------------------------------|---------------|
|--------|-----------------------|-------------------------------|---------------|

| Potentiometric output (P) |                              |  |   |   |
|---------------------------|------------------------------|--|---|---|
| Supply voltage            | max. 32VDC at 1kOhm / 1 Wmax |  <p>sensor side</p> | <p>1 = input +<br/>2 = grounding<br/>3 = signal</p> | <p>white = input +<br/>brown = grounding<br/>green = signal</p>   |
| Resistance                | 1kOhm ±10% (potentiometer)   |  |   |   |
| Temperature coefficient   | ±0.0025% FSO/°C              |  |   |   |
|                           |                              |  |   |  <p>1 = input +<br/>2 = signal<br/>3 = grounding</p>  |

| Voltage output (U)                                   |                                     |   |   |  |
|--|-------------------------------------|---|---|--|
| Supply voltage                                       | 14 ... 27VDC (non stabilized)       |  <p>sensor side</p> | <p>1 = supply<br/>2 = grounding<br/>3 = signal<br/>4 = ground</p> | <p>white = supply<br/>brown = grounding<br/>green = signal<br/>yellow = ground</p> |
| Current consumption                                  | max. 30mA                           |   |   |  |
| Output voltage                                       | 0 ... 10VDC<br>Option 0 ... 5 / ±5V |   |   |  |
| Load impedance                                       | >5kOhm                              |   |   |  |
| Signal noise   | 0.5mV <sub>eff</sub>                |   |   |  |
| Temperature coefficient                              | ±0.005% FSO/°C                      |   |   |  |
| Electromagnetic compatibility (EMC)                  | EN 61000-6-4<br>EN 61000-6-2        |   |   |  |
| <b>Adjustment ranges</b> (if supported by the model) |                                     |   |   |  |
| Zero   | ±20% FSO                            |   |   |  |
| Sensitivity  | ±20%                                |   |   |  |

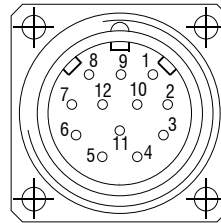
| Current Output (I)                                  |                               |  |                                     |   |
|---|-------------------------------|--|-------------------------------------|---|
| Supply voltage                                      | 14 ... 27VDC (non stabilized) |  <p>sensor side</p> | <p>1 = supply<br/>2 = grounding</p> | <p>white = supply<br/>brown = grounding</p> |
| Current consumption                                 | max. 35mA                     |  |                                     |   |
| Output current                                      | 4 ... 20mA                    |  |                                     |   |
| Load  | <600Ohm                       |  |                                     |   |
| Signal noise  | <1,6 μA <sub>eff</sub>        |  |                                     |   |
| Temperature coefficient                             | ±0.01% FSO/°C                 |  |                                     |   |
| Electromagnetic compatibility (EMC)                 | EN 61000-6-4<br>EN 61000-6-2  |  |                                     |   |
| <b>Adjustment range</b> (if supported by the model) |                               |  |                                     |   |
| Zero  | ±18% FSO                      |  |                                     |   |
| Sensitivity   | ±15%                          |  |                                     |   |

**Contact description**

|   |   |
|---|---|
| 1 UB  | Encoder power supply connection   |
| 2 GND   | Encoder ground connection.<br>The voltage drawn to GND is UB.   |
| 3 Pulses +  | Positive SSI pulse input. Pulse + forms a current loop with pulse -. A current of approx. 7 mA in direction of pulse + input generates a logical 1 in positive logic.   |
| 4 Data +  | Positive, serial data output of the differential line driver. A High level at the output corresponds to logical 1 in positive logic.  |
| 5 ZERO  | Zero setting input for setting a zero point at any desired point within the entire resolution. The zeroing process is triggered by a High pulse (pulse duration $\geq 100$ ms) and must take place after the rotating direction selection (UP/DOWN). For maximum interference immunity, the input must be connected to GND after zeroing.                                   |
| 6 Data -  | Negative, serial data output of the differential line driver. A High level at the output corresponds to logical 0 in positive logic.  |
| 7 Pulses -  | Negative SSI pulse input. Pulse - forms a current loop with pulse +. A current of approx. 7 mA in direction of pulse - input generates a logical 0 in positive logic.   |
| 8 / 10<br><u>DATAVALID</u><br><u>DATAVALID MT</u> | Diagnosis outputs DV and DV MT Jumps in data word, e.g. due to defective LED or photoreceiver, are displayed via the DV output. In addition, the power supply of the multiturn sensor unit is monitored and the DV MT output is set when a specified voltage level is dropped below. Both outputs are Low-active, i.e. are switched through to GND in the case of an error. |
| 9 UP/DOWN   | UP/DOWN counting direction input. When not connected, this input is on High. UP/ DOWN-High means increasing output data with a clockwise shaft rotating direction when looking at the flange. UP/ DOWN-Low means increasing values with a counter-clockwise shaft rotating direction when looking at the flange.  |
| 11 / 12   | Not in use  |

**Pin assignment**

| Pin | Cable color  | Assignment                 |
|-----|--------------|----------------------------|
| 1   | brown        | UB                         |
| 2   | black        | GND                        |
| 3   | blue         | Pulses +                   |
| 4   | beige        | Data +                     |
| 5   | green        | ZERO                       |
| 6   | yellow       | Data -                     |
| 7   | violet       | Pulses -                   |
| 8   | brown/yellow | <u>DATAVALID</u>           |
| 9   | pink         | UP/ DOWN                   |
| 10  | black/yellow | <u>DATAVALID</u> <u>MT</u> |
| 11  | -            | -                          |
| 12  | -            | -                          |



Please use leads twisted in pairs for extension cables.

**Inputs**

Control signals UP/DOWN and Zero

Level High > 0.7 UB

Level Low < 0.3 UB

Connection: UP/DOWN input with 10kohms to UB, zeroing input with 10kohms to GND.

SSI pulse

Optocoupler inputs for electrical isolation

**Outputs**

SSI data RS485 driver

Diagnostic outputs

Push-pull outputs are short-circuit-proof

Level High > UB -3.5V (with I = -20mA)

Level Low  $\leq 0.5V$  (with I = 20mA)

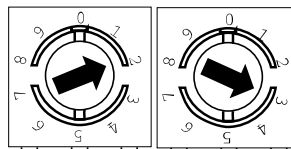
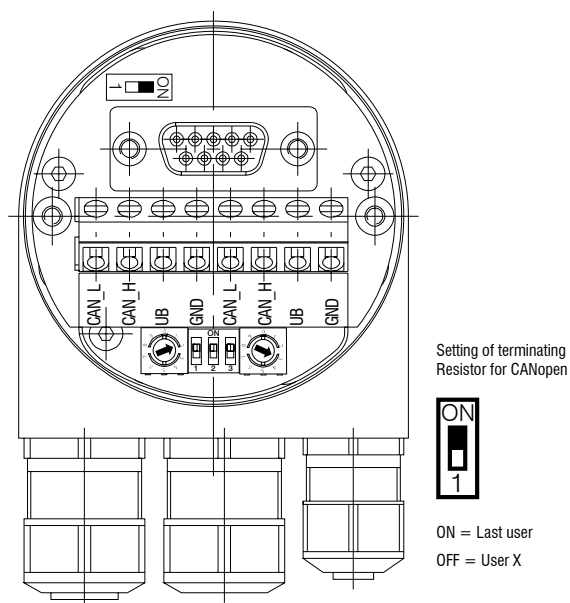


| CANopen features                  |  |
|-----------------------------------|--|
| Bus protocol                      | CANopen  |
| Device profile                    | CANopen - CiA DSP 406, V 3.0   |
| CANopen Features                  | Device Class 2, CAN 2.0B   |
| Operating modes (with SDO progr.) | Polling Mode (asynch, via SDO)<br>Cyclic Mode (asynch-cyclic) The encoder cyclically sends the current process actual value without a request by a master. The cycle time can be parameterized for values between 1 and 65535 ms.<br>Synch Mode (synch-cyclic) The encoder sends the current actual process value after receiving a synch telegram sent by a master. The synch counter in the encoder can be parameterized so that the position value is not sent until after a defined number of synch telegrams.<br>Acyclic Mode (synch-acyclic) |
| Preset value                      | With the "Preset" parameter the encoder can be set to a desired actual process value that corresponds to the defined axis position of the system. The offset value between the encoder zero point and the mechanical zero point of the system is saved in the encoder.   |
| Rotating direction                | With the operating parameter the rotating direction in which the output code is to increase or decrease can be parameterized. Scaling The steps per revolution and the total revolution can be parameterized.  |
| Scaling                           | The steps per revolution and the total revolution can be parameterized.  |
| Diagnose                          | The encoder supports the following error messages:<br>- Position and parameter error<br>- Lithium cell voltage at lower limit (Multiturn)  |
| Default setting                   | 50kbit/s, node number 1  |

| Baud rate | Setting Dip Switch |     |     |
|-----------|--------------------|-----|-----|
|           | 1                  | 2   | 3   |
| 10kBit/s  | OFF                | OFF | OFF |
| 20kBit/s  | OFF                | OFF | ON  |
| 50kBit/s  | OFF                | ON  | OFF |
| 125kBit/s | OFF                | ON  | ON  |
| 250kBit/s | ON                 | OFF | OFF |
| 500kBit/s | ON                 | OFF | ON  |
| 800kBit/s | ON                 | ON  | OFF |
| 1MBit/s   | ON                 | ON  | ON  |

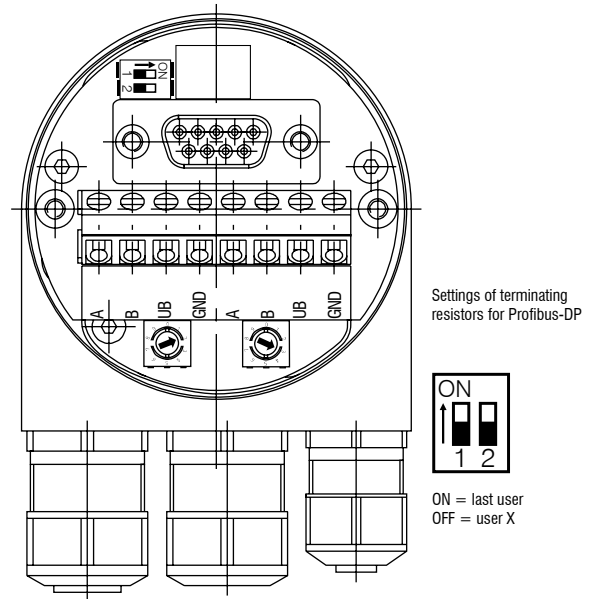
| Contact description CANopen   |                                |
|---|--------------------------------|
| CAN_L   | CAN Bus Signal (dominant Low)  |
| CAN_H   | CAN Bus Signal (dominant High) |
| UB  | Supply voltage 10...30VDC      |
| GND   | Ground contact for UB          |
| (Terminals with the same designation are internally interconnected) |                                |

**Settings of user address for CANopen**  
 Address can be set with rotary switch. Example: User address 23

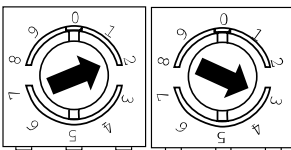


**Profibus-DP features**

|                      |  |
|----------------------|--|
| Bus protocol         | Profibus-DP  |
| Profibus features    | Device Class 1 and 2   |
| Data exch. functions | Input: Position value<br>Additional parameterized speed signal (readout of the current rotary speed)<br>Output: Preset value                       |
| Preset value         | With the "Preset" parameter the encoder can be set to a desired actual value that corresponds to the defined axis position of the system.          |
| Parameter functions  | Rotating direction: With the operating parameter the rotating direction for which the output code is to increase or decrease can be parameterized. |
| Diagnose             | The encoder supports the following error messages:<br>- Position error<br>- Lithium cell voltage at lower limit (Multiturn)                        |
| Default setting      | User address 00  |

**Settings of user address for Profibus-DP**

Settings of user address for Profibus-DP

**Contact description Profibus-DP**

A Negative serial data line

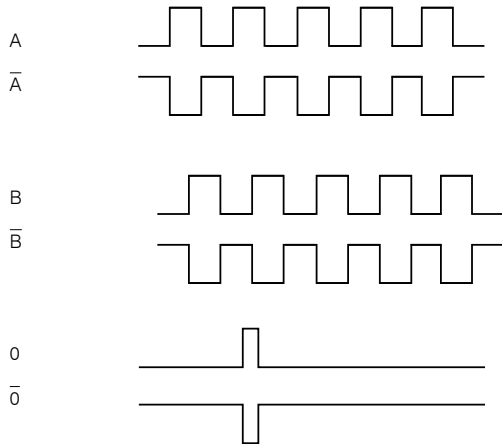
B Positive serial data line

UB Supply voltage 10...30VDC

GND Ground contact for UB

(Terminals with the same designation are internally interconnected)

**Signal output**



| Output TTL | Linedriver (5 VDC)              |                  |
|------------|---------------------------------|------------------|
| Level High | $\geq 2.5V$                     | (with I = -20mA) |
| Pegel Low  | $\leq 0.5V$                     | (with I = 20mA)  |
| Load High  | $\leq 20mA$                     |                  |
| Output     | A, $\bar{A}$ , B, $\bar{B}$ , 0 |                  |

| Output TTL01/TTL02 | NPN (5 VDC $\pm 5\%$ )          |  |
|--------------------|---------------------------------|--|
| Level High         | $> 4.5V$                        |  |
| Level Low          | $< 1.0V$                        |  |
| Load High          | $\leq 3mA$                      |  |
| Output (TTL01)     | A, B, 0                         |  |
| Output (TTL02)     | A, $\bar{A}$ , B, $\bar{B}$ , 0 |  |

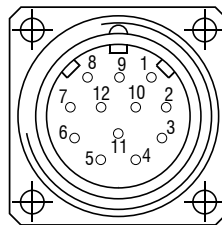
| Output HTL | Push-pull (10 ... 30 VDC)       |                  |
|------------|---------------------------------|------------------|
| Level High | $\geq UB - 3V$                  | (with I = -20mA) |
| Level Low  | $\leq 1.5V$                     | (with I = 20mA)  |
| Load High  | $\leq 40mA$                     |                  |
| Output     | A, $\bar{A}$ , B, $\bar{B}$ , 0 |                  |

| Output E   | Push-pull ((5 VDC) |  |
|------------|--------------------|--|
| Level High | $\geq UB - 2.5V$   |  |
| Level Low  | $\leq 0.5V$        |  |
| Load High  | $\leq 50mA$        |  |
| Output     | A, B, 0            |  |

| Output E830 | Push-pull ((8 ... 30 VDC) |  |
|-------------|---------------------------|--|
| Level High  | $\geq UB - 3V$            |  |
| Level Low   | $\leq 2.5V$               |  |
| Load High   | $\leq 50mA$               |  |
| Output      | A, B, 0                   |  |

**Pin assignment TTL, HTL**

| Pin    | Cable color | Assignment                 |
|--------|-------------|----------------------------|
| Pin 1  | pink        | B inv.                     |
| Pin 2  | blue        | UB Sense                   |
| Pin 3  | red         | N (zero impulse)           |
| Pin 4  | black       | N inv. (zero impulse inv.) |
| Pin 5  | brown       | A                          |
| Pin 6  | green       | A inv.                     |
| Pin 7  | -           | -                          |
| Pin 8  | gray        | B                          |
| Pin 9  | -           | -                          |
| Pin 10 | white/green | GND                        |
| Pin 11 | white       | GND Sense                  |
| Pin 12 | brown/green | UB                         |



Pin 2 and Pin 12 are internally connected as well as Pin 11 and 10. For cable length >10m twisted pair wires are required.

**Connection assignment E, E830**

| Cable color | Assignment |
|-------------|------------|
| white       | 0V         |
| brown       | +UB        |
| green       | A          |
| -           | $\bar{A}$  |
| yellow      | B          |
| -           | $\bar{B}$  |
| gray        | 0          |

**Connection assignment TTL01**

| Cable color | Assignment |
|-------------|------------|
| brown       | 0V         |
| gray        | +UB        |
| white       | A          |
| green       | B          |
| yellow      | 0          |

**Connection assignment TTL02**

| Cable color | Assignment |
|-------------|------------|
| red         | +UB        |
| black       | 0V         |
| brown       | A          |
| black       | $\bar{A}$  |
| orange      | B          |
| black       | $\bar{B}$  |
| yellow      | 0          |
| black       | n.c.       |

## High performance sensors made by Micro-Epsilon



Sensors and systems for displacement and position



Sensors and measurement devices for non-contact temperature measurement



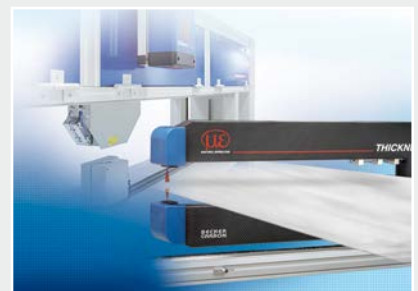
2D/3D profile sensors (laser scanner)



Optical micrometers, fiber optic sensors and fiber optics



Color recognition sensors, LED analysers and color inline spectrometer



Measurement and inspection systems