MICRO-EPSILON

# More Precision

## **wire**SENSOR // Draw-wire displacement sensors

# Draw-wire sensors
# wireSENSOR

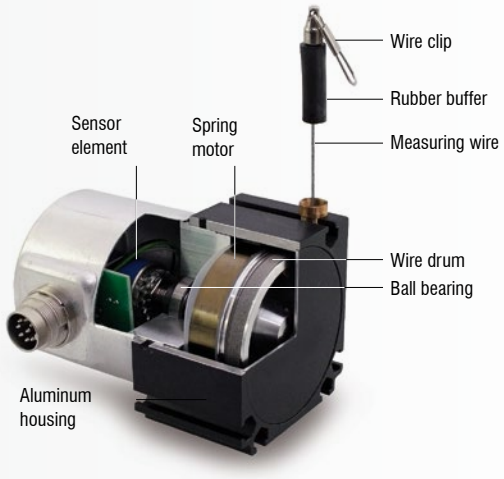
- Measuring ranges up to 50,000 mm
- Resolution towards infinity
- Compact design with large measuring range
- Easy, fast and flexible mounting
- High operational safety & long service life
- Analog and digital outputs

**Measuring principle**

Draw-wire displacement sensors measure linear movements using a highly flexible steel wire. The cable drum is attached to a sensor element which provides a displacement-proportional output signal. Measurements are performed with high accuracy and dynamics. High quality components ensure a long service life and high operational reliability.

Micro-Epsilon offers numerous models of different draw-wire displacement sensors with different output signal types. Therefore, you can choose the ideal sensor for your application. For special applications involving large numbers of pieces, we develop and manufacture individual OEM designs.

wireSENSOR models stand out due to their optimized ratio between measuring range and size, easy installation and handling. Their robust sensor design enables reliable measurements even in challenging ambient conditions.




**Sensor structure of a WDS-P60**

# Available sensor series
# wireSENSOR

| Draw-wire sensor | | Output | Linearity max. [%] | Protection class * | Max. measuring range (mm) | Page |
|---|---|---|---|---|---|---|
| **Draw-wire sensors for serial integration & OEM** | | | | | | |
|  | **MK30** | Potentiometer | ±0.1 | IP20 | 750 | 6 - 7 |
| | | Incremental encoder | ±0.05 | IP54 | | 8 - 9 |
|  | **MK46** | Potentiometer, voltage, current | ±0.1 | IP20 | 1,250 | 10 - 11 |
| | | Incremental encoder | ±0.05 | IP54 | | 12 - 13 |
|  | **MK77** | Potentiometer, voltage, current | ±0.25 | IP20 | 2,100 | 14 - 15 |
| | | Incremental encoder | ±0.05 | IP54 | | 16 - 17 |
|  | **MK60** | Potentiometer, voltage, current | ±0.15 | IP65 | 2,400 | 18 - 19 |
| | | Incremental encoder | ±0.05 | IP65 | | 20 - 21 |
|  | **MK88** | Potentiometer, voltage, current | ±0.15 | IP65 | 5,000 | 22 - 23 |
| | | Absolute encoder | | | | 24 - 25 |
|  | **MK120** | Potentiometer, voltage, current | ±0.15 | IP65 | 7,500 | 26 - 27 |
|  | **K100** | Potentiometer, voltage, current | ±0.25 | IP67 / IP69K | 8,000 | 28 - 29 |
| | | Absolute encoder | | | | 30 - 31 |
| **Industrial draw-wire sensors** | | | | | | |
|  | **P60** | Potentiometer, voltage, current | ±0.1 | IP65 | 1,500 | 32 - 33 |
| | | Incremental/absolute encoder | ±0.02 | IP65 | | 34 - 35 |
|  | **P96** | Potentiometer, voltage, current | ±0.1 | IP65 | 3,000 | 36 - 37 |
| | | Incremental/absolute encoder | ±0.02 | IP65 | | 38 - 39 |
|  | **P115** | Potentiometer, voltage, current | ±0.1 | IP65 | 15,000 | 40 - 41 |
| | | Incremental/absolute encoder | ±0.01 | IP65 | | 42 - 43 |
|  | **P200** | Incremental/absolute encoder | ±0.01 | IP65 | 50,000 | 44 - 45 |
| **Draw-wire sensors for fast measurement movements and high wire accelerations** | | | | | | |
|  | **MT** | Potentiometer | ±0.4 | IP50 | 130 | 46 - 47 |
|  | **MPM** | Potentiometer | ±0.2 | IP65 | 250 | 48 - 49 |
|  | **MP / MPW** | Potentiometer | ±0.1 | IP67 | 1,000 | 50 - 51 |

* Higher protection class available on request

# Applications
# **wire**SENSOR

## Mobile machines: booms, supports & telescopic loaders

Measurement of the extension length of telescopic booms

Variable support for mobile cranes

Measuring the lift height in telescopic loaders

## Lift tables: lifting platform, scissors lift tables

Measuring the lift height in synchronous lifting systems

Measuring the lift height in scissors lift tables

## Industrial vehicles & driverless transport systems

Measuring the lift height in forklift trucks

Measuring the lift height in driverless transport systems

## Medical technology: operating tables & mammography

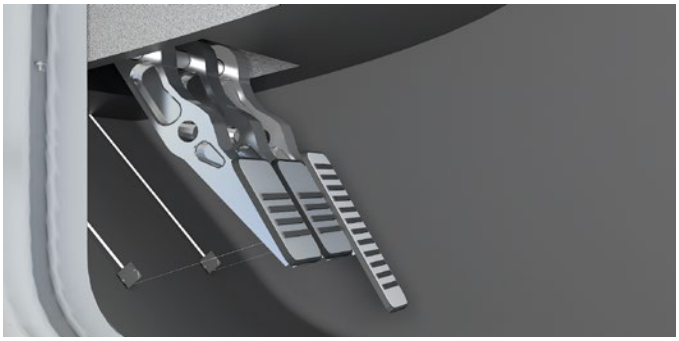
Position measurement in Computer Tomography (CT)

Positioning of operating tables

Position measurement in mammography

## Test bench construction and road tests: chassis test benches & crash tests

Spring travel measurement in road tests



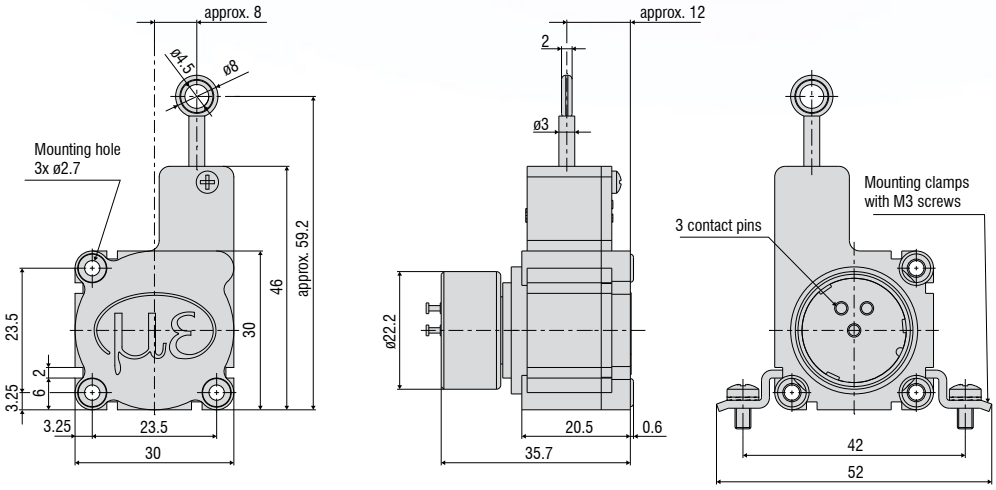
Measuring the pedal travel

Displacement measurement in crash tests

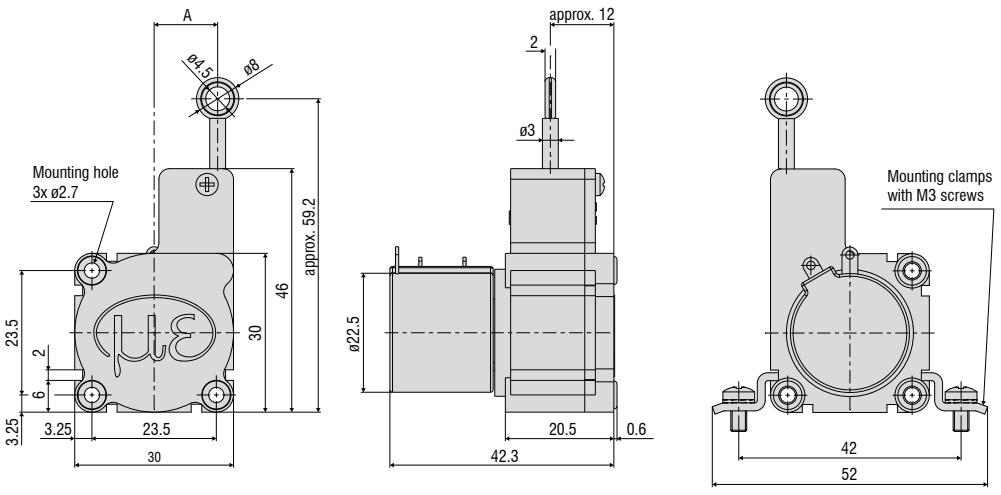
# Low-cost draw-wire sensors
# **wireSENSOR MK30 analog**

- Robust plastic housing
- Customer-specific designs
- Conductive plastic/wire/hybrid potentiometer
- Smallest design in its class

**Measuring range 50 mm**




**Measuring range 150/250/500/750 mm**




| Measuring range (mm) | A (mm) |
|---|---|
| 150 / 250 / 500 | approx. 8 |
| 750 | approx. 12 |

All dimensions in mm, not to scale

| Model | | | WPS-50-MK30 | WPS-150-MK30 | WPS-250-MK30 | WPS-500-MK30 | WPS-750-MK30 |
|---|---|---|---|---|---|---|---|
| Measuring range | | | 50 mm | 150 mm | 250 mm | 500 mm | 750 mm |
| Analog output [1] | | | Potentiometer | | | | |
| Resolution | Conductive plastic potentiometer | | towards infinity | - | - | - | - |
| | Wire potentiometer | | - | - | - | 0.15 mm | 0.2 mm |
| | Hybrid potentiometer | | - | towards infinity | | | |
| Linearity | Conductive plastic potentiometer P50 | ≤ ±0.5% FSO | ≤ ±0.25 mm | - | - | - | - |
| | Wire potentiometer P25 | ≤ ±0.25% FSO | - | - | - | ≤ ±1.25 mm | ≤ ±1.87 mm |
| | Hybrid potentiometer P25 | ≤ ±0.25% FSO | - | ≤ ±0.375 mm | ≤ ±0.625 mm | - | - |
| | Hybrid potentiometer P10 | ≤ ±0.1% FSO | - | - | ≤ ±0.25 mm | ≤ ±0.5 mm | ≤ ±0.75 mm |
| Sensor element | | | Conductive plastic potentiometer | Hybrid potentiometer | | Wire/hybrid potentiometer | |
| Wire extension force (max.) | | | approx. 2.5 N | | | | |
| Wire retraction force (min.) | | | approx. 1 N | | | | |
| Wire acceleration (max.) | | | approx. 5 g | | | | |
| Material | | Housing | Plastics | | | | |
| | | Measuring wire | Polyamide-coated stainless steel (ø 0.36 mm) | | | | |
| Wire mounting | | | Eyelet (ø 4.5 mm) | | | | |
| Mounting | | | Mounting holes or mounting grooves on the sensor housing | | | | |
| Temperature range | | Storage | -20 … +80 °C | | | | |
| | | Operation | -20 … +80 °C | | | | |
| Connection | | | Soldering tags | | | | |
| Shock (DIN EN 60068-2-27) | | | 50 g / 5 ms in 3 axes, 2 directions and 1000 shocks each | | | | |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each | | | | |
| Protection class (DIN EN 60529) | | | IP20 | | | | |
| Weight | | | approx. 45 g | | | | |

FSO = Full Scale Output

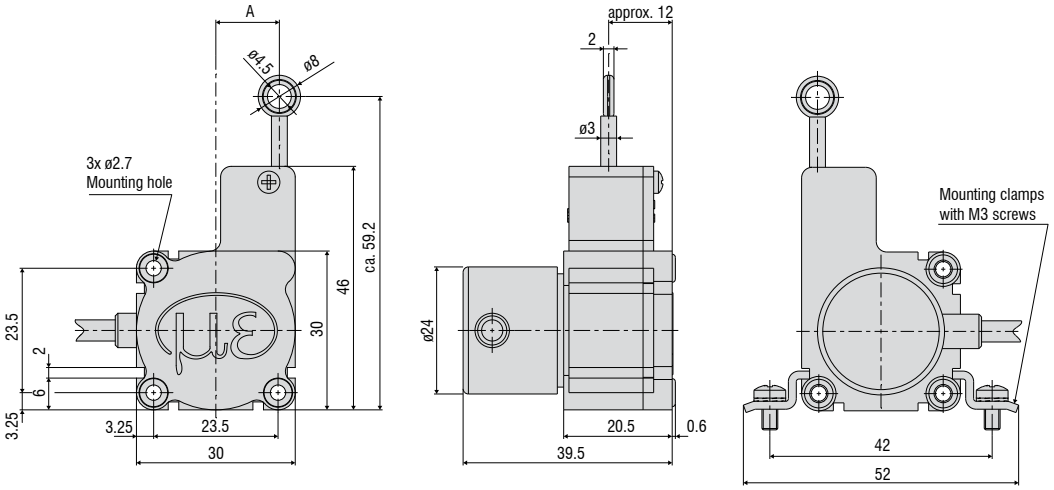
[1] Specifications for analog outputs from page 58 onwards.

### Article designation

| WPS - | 50 - | MK30 - | P25 |
|---|---|---|---|
| | | | Output type:<br>Potentiometer P50 (linearity ±0.5 % FSO)<br>Potentiometer P25 (linearity ±0.25 % FSO)<br>Potentiometer P10 (linearity ±0.1 % FSO) |
| | | MK30 series | |
| | Measuring range in mm | | |

# Low-cost draw-wire sensors
# **wireSENSOR MK30 digital**

- Robust plastic housing
- Customer-specific designs
- Incremental encoder
- Smallest design in its class




| Measuring range (mm) | A (mm) |
|---|---|
| 500 | approx. 8 |
| 750 | approx. 12 |

All dimensions in mm, not to scale

| Model | | WPS-500-MK30 | WPS-750-MK30 |
|---|---|---|---|
| Measuring range | | 500 mm | 750 mm |
| Digital output [1] | | Encoder: E (5 … 24 VDC) / Encoder E830 (8 … 30 VDC) | |
| Resolution | | 10 pulses/mm | 6.7 pulses/mm |
| | | 0.1 mm | 0.15 mm |
| Linearity | ≤ ±0.05% FSO | ≤ ±0.25 mm | ≤ ±0.375 mm |
| Sensor element | | Incremental encoder | |
| Wire extension force (max.) | | approx. 2.5 N | |
| Wire retraction force (min.) | | approx. 1 N | |
| Wire acceleration (max.) | | approx. 5 g | |
| Material | Housing | Plastics | |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.36 mm) | |
| Wire mounting | | Eyelet (ø 4.5 mm) | |
| Mounting | | Mounting holes or mounting grooves on the sensor housing | |
| Temperature range | Storage | -20 … +80 °C | |
| | Operation | -20 … +80 °C | |
| Connection | | integrated cable, radial, length 1 m | |
| Shock (DIN EN 60068-2-27) | | 50 g / 5 ms in 3 axes, 2 directions and 1000 shocks each | |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each | |
| Protection class (DIN EN 60529) | | IP54 | |
| Weight | | approx. 80 g (incl. cable) | |

FSO = Full Scale Output

[1] Specifications for digital outputs from page 59 onwards.

## Article designation

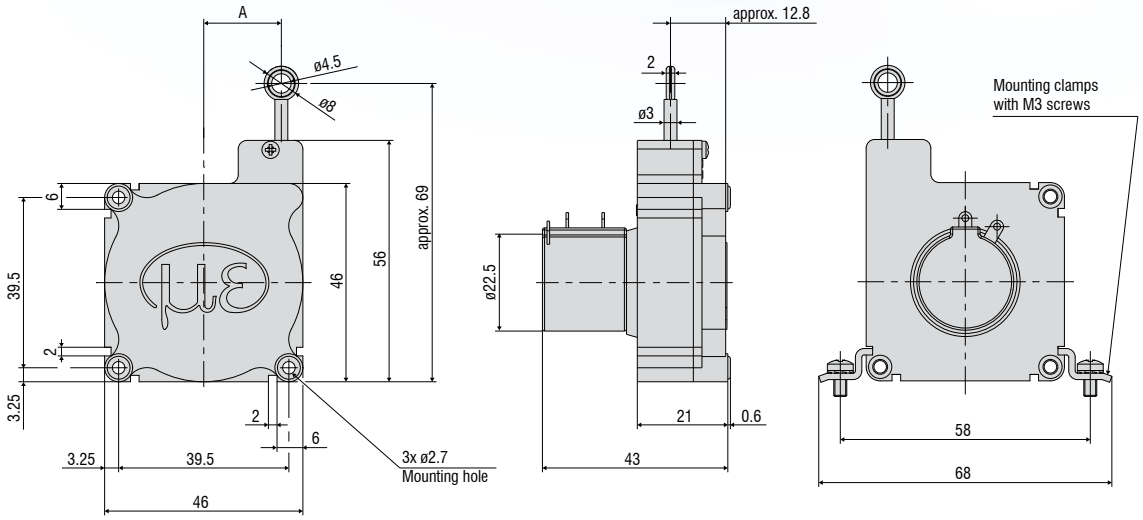
**WPS -** **500 -** **MK30 -** **E830**

- **E830**: Output type: Encoder E (5 ... 24 VDC) / Encoder E830 (8 ... 30 VDC)
- **MK30 -**: MK30 series
- **500 -**: Measuring range in mm

# Low-cost draw-wire sensors
# **wireSENSOR MK46 analog**

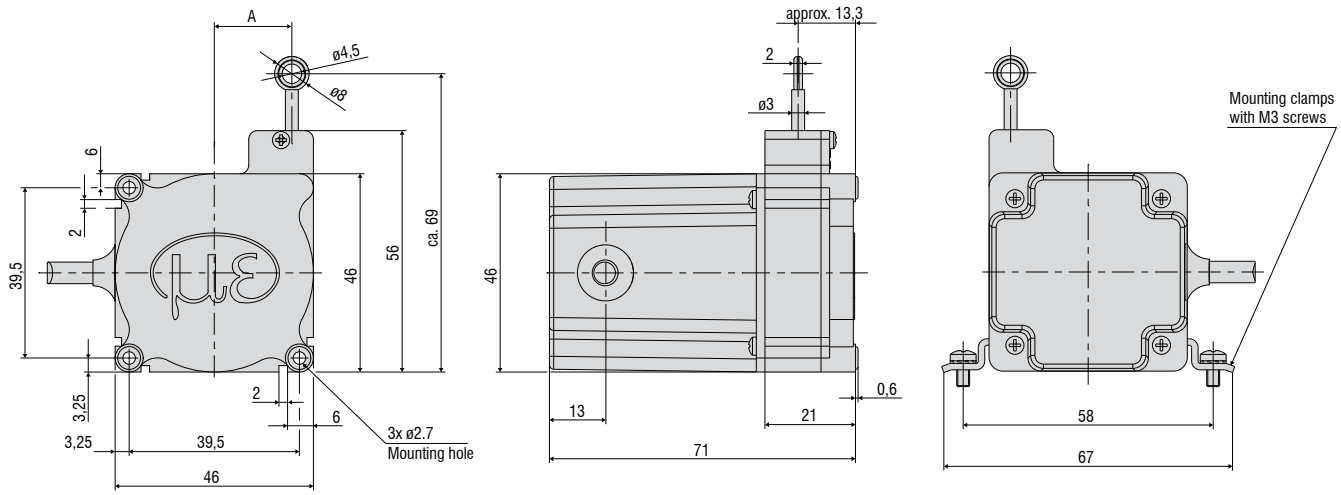
- Robust plastic housing
- Customer-specific designs
- Wire or hybrid potentiometer

**Output P10/P25**




| Measuring range (mm) | A (mm) |
|---|---|
| 1000 | approx. 18 |
| 1250 | approx. 20 |

**Output CR-P10/CR-P25/CR-U10/CR-I10**




All dimensions in mm, not to scale

| Model | | | WPS-1000-MK46 | WPS-1250-MK46 |
|---|---|---|---|---|
| Measuring range | | | 1000 mm | 1250 mm |
| Analog output | | | Potentiometer | Potentiometer, current, voltage |
| Resolution | Wire potentiometer P25 | | 0.3 mm | 0.4 mm |
| | Hybrid potentiometer P10/U10/I10 | | towards infinity | |
| Linearity | Wire potentiometer P25 | ≤ ±0.25% FSO | ≤ ±2.5 mm | ≤ ±3.12 mm |
| | Hybrid potentiometer P10/U10/I10 | ≤ ±0.1% FSO | ≤ ±1 mm | ≤ ±1.2 mm |
| Sensor element | | | Wire/hybrid potentiometer | |
| Wire extension force (max.) | | | approx. 1.6 N | approx. 1.5 N |
| Wire retraction force (min.) | | | approx. 1 N | |
| Wire acceleration (max.) | | | approx. 5 g | |
| Material | Housing | | Plastics | |
| | Measuring wire | | Polyamide-coated stainless steel (ø 0.36 mm) | |
| Wire mounting | | | Eyelet (ø 4.5 mm) | |
| Mounting | | | Mounting holes or mounting grooves on the sensor housing | |
| Temperature range | Storage | | -20 … +80 °C | |
| | Operation | | -20 … +80 °C | |
| Connection | P10/P25 | | Soldering tags | |
| | CR-P10/CR-P25/CR-U10/CR-I10 | | integrated cable, radial, length 1 m | |
| Shock (DIN EN 60068-2-27) | | | 50 g / 5 ms in 3 axes, 2 directions and 1000 shocks each | |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each | |
| Protection class (DIN EN 60529) | | | IP20 | |
| Weight | | | approx. 80 g | |

FSO = Full Scale Output

[1] Specifications for analog outputs from page 58 onwards.

## Article designation

**WPS - 1000 - MK46 - P25**

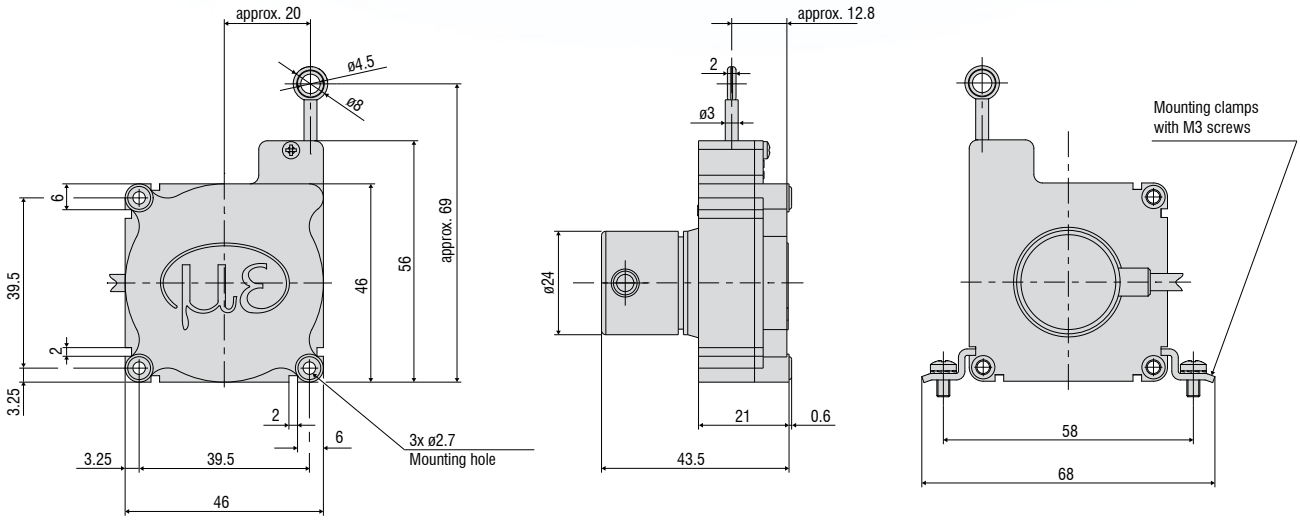
- **P25**: Output type:
  P10: Potentiometer
  P25: Potentiometer
  CR-P10/P25: potentiometer, integrated cable, radial, 1 m
- **MK46**: MK46 series
- **1000**: Measuring range in mm

**WPS - 1250 - MK46 - P25**

- **P25**: Output type:
  P10: Potentiometer
  P25: Potentiometer
  CR-P10/P25: potentiometer, integrated cable, radial, 1 m
  CR-U10: Voltage, integrated cable, radial, 1 m
  CR-I10: Current, integrated cable, radial, 1 m
- **MK46**: MK46 series
- **1250**: Measuring range in mm

# Low-cost draw-wire sensors
# **wireSENSOR MK46 digital**

- Robust plastic housing
- Customer-specific designs
- Incremental encoder




All dimensions in mm, not to scale

| Model | | WPS-1250-MK46 |
|---|---|---|
| Measuring range | | 1250 mm |
| Digital output [1] | | Encoder: E (5 … 24 VDC) / Encoder E830 (8 … 30 VDC) |
| Resolution | | 4 pulses/mm |
| | | 0.25 mm |
| Linearity | ≤ ±0.05% FSO | ≤ ±0.625 mm |
| Sensor element | | Incremental encoder |
| Wire extension force (max.) | | approx. 1.5 N |
| Wire retraction force (min.) | | approx. 1 N |
| Wire acceleration (max.) | | approx. 5 g |
| Material | Housing | Plastics |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.36 mm) |
| Wire mounting | | Eyelet (ø 4.5 mm) |
| Mounting | | Mounting holes or mounting grooves on the sensor housing |
| Temperature range | Storage | -20 … +80 °C |
| | Operation | -20 … +80 °C |
| Connection | | integrated cable, radial, length 1 m |
| Shock (DIN EN 60068-2-27) | | 50 g / 5 ms in 3 axes, 2 directions and 1000 shocks each |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each |
| Protection class (DIN EN 60529) | | IP54 |
| Weight | | approx. 120 g (incl. cable) |

FSO = Full Scale Output

[1] Specifications for digital outputs from page 59 onwards.

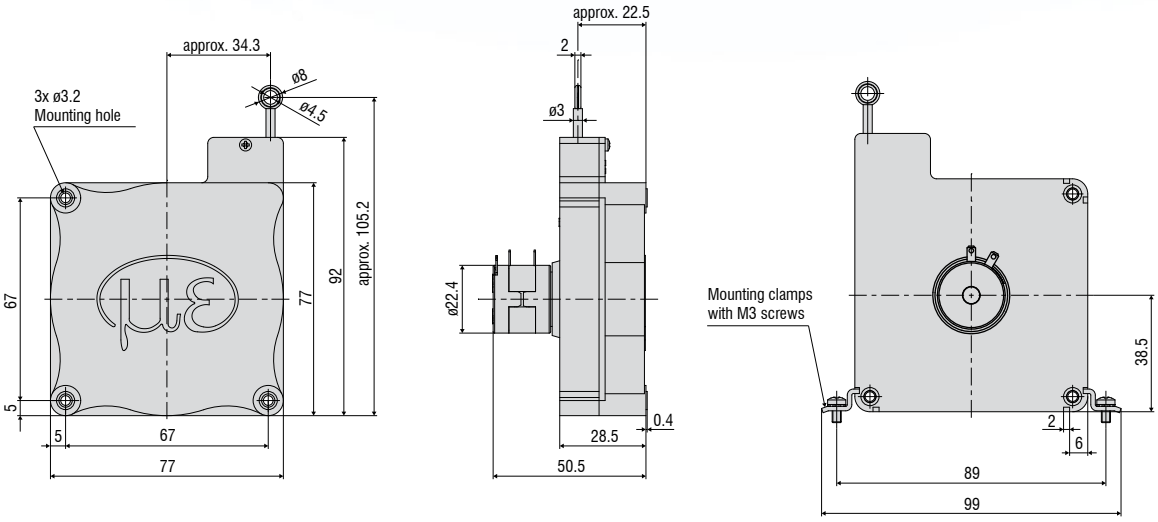
### Article designation

| WPS - | 1250 - | MK46 - | E |
|---|---|---|---|
| | | | Output type:<br>Encoder E (5 ... 24 VDC)<br>Encoder E830 (8 ... 30 VDC) |
| | | MK46 series | |
| | Measuring range in mm | | |

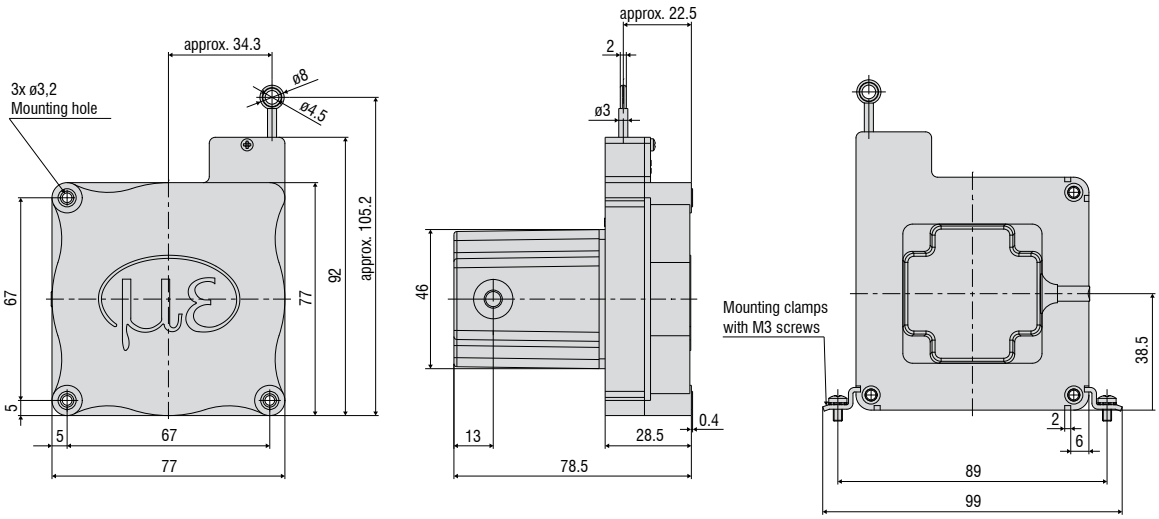
# Low-cost draw-wire sensors
# **wireSENSOR MK77 analog**

- Robust plastic housing
- Customer-specific designs
- Wire potentiometer

**Output P25**




**Output CR-P25**




All dimensions in mm, not to scale

| Model | | | WPS-2100-MK77 |
|---|---|---|---|
| Measuring range | | | 2100 mm |
| Analog output | | | Potentiometer |
| Resolution | | Wire potentiometer P25 | 0.55 mm |
| Linearity | Wire potentiometer P25 | ≤ ±0.25% FSO | ≤ ±5.25 mm |
| Sensor element | | | Wire potentiometer |
| Wire extension force (max.) | | | approx. 5 N |
| Wire retraction force (min.) | | | approx. 3.5 N |
| Wire acceleration (max.) | | | approx. 5 g |
| Material | | Housing | Plastics |
| | | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) |
| Wire mounting | | | Eyelet (ø 4.5 mm) |
| Mounting | | | Mounting holes or mounting grooves on the sensor housing |
| Temperature range | | Storage | -20 … +80 °C |
| | | Operation | -20 … +80 °C |
| Connection | | P25 | Soldering tags |
| | | CR-P25 | integrated cable, radial, length 1 m |
| Shock (DIN EN 60068-2-27) | | | 50 g / 5 ms in 3 axes, 2 directions and 1000 shocks each |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each |
| Protection class (DIN EN 60529) | | | IP20 |
| Weight | | P25 | approx. 220 g |
| | | CR-P25 | approx. 275 g (incl. cable) |

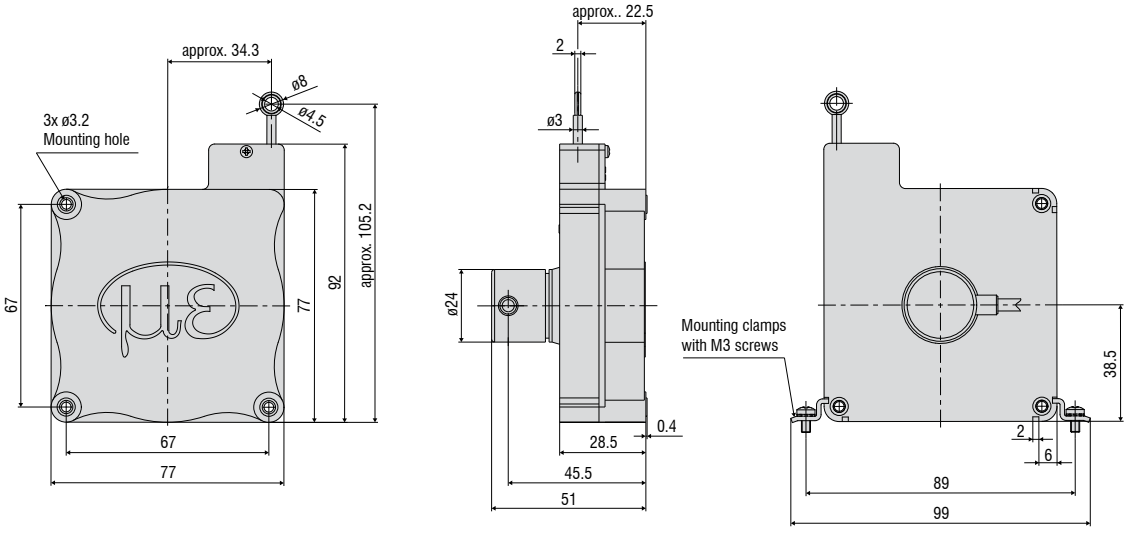
FSO = Full Scale Output
Specifications for analog outputs from page 58 onwards.

### Article designation

| WPS - | 2100 - | MK77 - | P25 |
|---|---|---|---|
| | | | Output type:<br>Potentiometer P25 (linearity ±0.25 % FSO)<br>CR-P25 potentiometer, integrated cable, radial, 1 m |
| | | MK77 series | |
| | Measuring range in mm | | |

# Low-cost draw-wire sensors
# **wireSENSOR MK77 digital**

- Robust plastic housing
- Customer-specific designs
- Incremental encoder




All dimensions in mm, not to scale

| Model | | WPS-2100-MK77 |
|---|---|---|
| Measuring range | | 2100 mm |
| Digital output [1] | | Encoder: E (5 … 24 VDC) / Encoder E830 (8 … 30 VDC) |
| Resolution | | 2.32 pulses/mm |
| | | 0.43 mm |
| Linearity | ≤ ±0.05% FSO | ≤ ±1.05 mm |
| Sensor element | | Incremental encoder |
| Wire extension force (max.) | | approx. 5 N |
| Wire retraction force (min.) | | approx. 3.5 N |
| Wire acceleration (max.) | | approx. 5 g |
| Material | Housing | Plastics |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) |
| Wire mounting | | Eyelet (ø 4.5 mm) |
| Mounting | | Mounting holes or mounting grooves on the sensor housing |
| Temperature range | Storage | -20 … +80 °C |
| | Operation | -20 … +80 °C |
| Connection | | integrated cable, radial, length 2 m |
| Shock (DIN EN 60068-2-27) | | 50 g / 5 ms in 3 axes, 2 directions and 1000 shocks each |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each |
| Protection class (DIN EN 60529) | | IP54 |
| Weight | | approx. 275 g (incl. cable) |

FSO = Full Scale Output

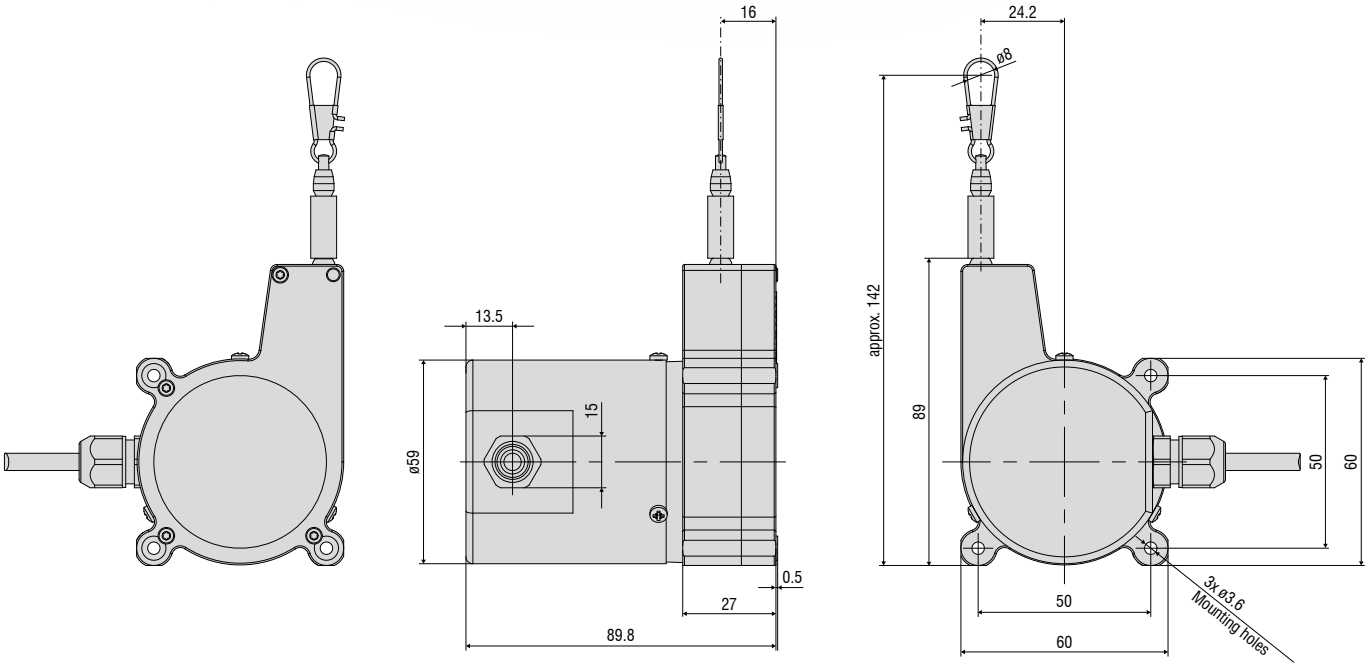
[1] Specifications for digital outputs from page 59 onwards.

## Article designation

| WPS - | 2100 - | MK77 - | E |
|---|---|---|---|
| | | | Output type:<br>Encoder E (5 ... 24 VDC)<br>Encoder E830 (8 ... 30 VDC) |
| | | MK77 series | |
| | Measuring range in mm | | |

# Low-cost draw-wire sensors
# **wireSENSOR MK60 analog**

- Robust plastic housing
- Customer-specific designs
- Potentiometer, current or voltage output




All dimensions in mm, not to scale

| Model | | | WPS-1500-MK60 |
|---|---|---|---|
| Measuring range | | | 1500 mm |
| Analog output [1] | | | Potentiometer, current, voltage |
| Resolution | | Hybrid potentiometer P10 | towards infinity |
| Linearity | Hybrid potentiometer P10 | ≤ ±0.15% FSO | ≤ ±2.25 mm |
| Sensor element | | | Hybrid potentiometer |
| Wire extension force (max.) | | | approx. 8 N |
| Wire retraction force (min.) | | | approx. 1 N |
| Wire acceleration (max.) | | | approx. 5 g |
| Material | | Housing | Glass-fiber reinforced plastic (PBT GF20) |
| | | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) |
| Wire mounting | | | Wire clip |
| Mounting | | | Mounting holes |
| Temperature range | | Storage | -20 … +80 °C |
| | | Operation | -20 … +80 °C |
| Connection | | | integrated cable, radial, length 1 m |
| Shock (DIN EN 60068-2-27) | | | 50 g / 5 ms in 3 axes, 2 directions and 1000 shocks each |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each |
| Protection class (DIN EN 60529) | | | IP65 |
| Weight | | | approx. 290 g (incl. cable) |

FSO = Full Scale Output

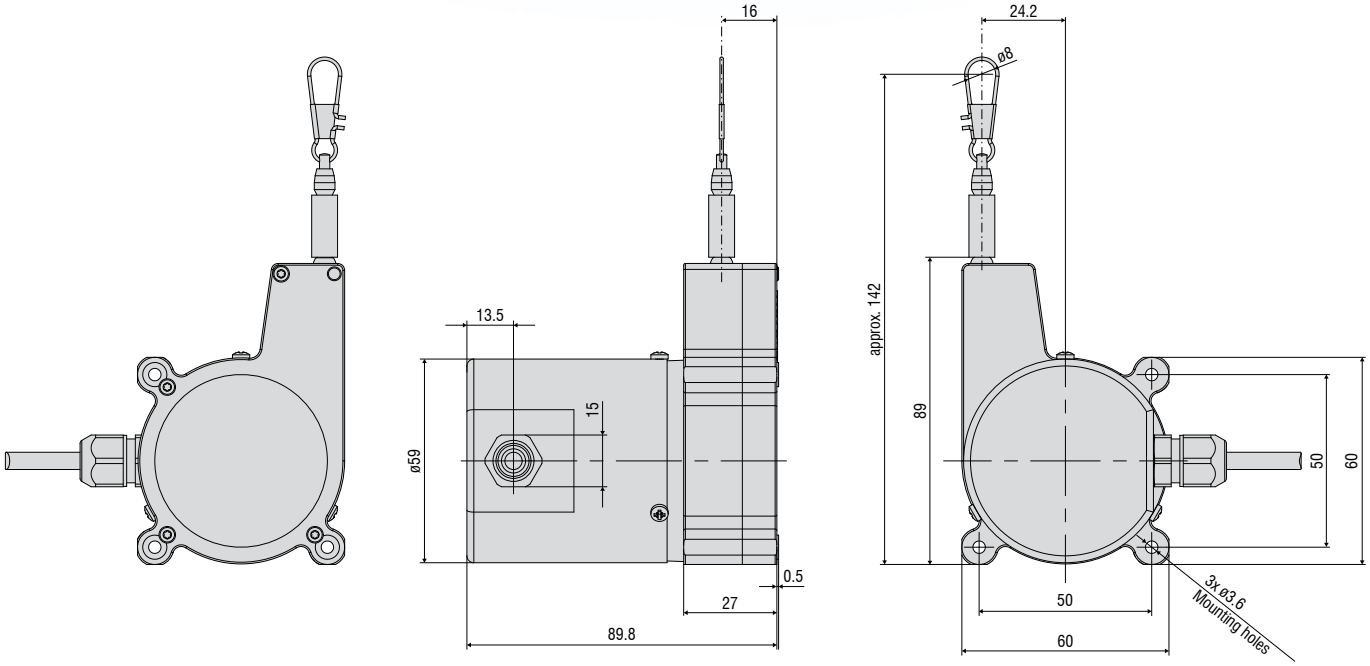
[1] Specifications for analog outputs from page 58 onwards.

### Article designation

| WPS - | 1500 - | MK60 - | CR - | P |
|---|---|---|---|---|
| | | | | Output:<br>P: potentiometer<br>U: voltage<br>I: current |
| | | | Connection CR: integrated cable, radial, 1 m | |
| | | MK60 series | | |
| | Measuring range in mm | | | |

# Low-cost draw-wire sensors
# **wireSENSOR MK60 digital**

- Robust plastic housing
- Customer-specific designs
- Incremental encoder




All dimensions in mm, not to scale

| Model | | WPS-2400-MK60 |
|---|---|---|
| Measuring range | | 2400 mm |
| Digital output [1] | | TTL01 (A, B, 0) / TTL02 (A, $\overline{A}$, B, $\overline{B}$, 0) |
| Resolution | | 6.83 pulses/mm |
| | | 0.146 mm |
| Linearity | ≤ ±0.05% FSO | ≤ ±1.2 mm |
| Sensor element | | Incremental encoder |
| Wire extension force (max.) | | approx. 8 N |
| Wire retraction force (min.) | | approx. 1 N |
| Wire acceleration (max.) | | approx. 5 g |
| Material | Housing | Glass-fiber reinforced plastic (PBT GF20) |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) |
| Wire mounting | | Wire clip |
| Mounting | | Mounting holes |
| Temperature range | Storage | -20 … +80 °C |
| | Operation | -20 … +80 °C |
| Connection | | integrated cable, radial, length 1 m |
| Shock (DIN EN 60068-2-27) | | 50 g / 5 ms in 3 axes, 2 directions and 1000 shocks each |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each |
| Protection class (DIN EN 60529) | | IP65 |
| Weight | | approx. 290 g (incl. cable) |

FSO = Full Scale Output

[1] Specifications for digital outputs from page 59 onwards.

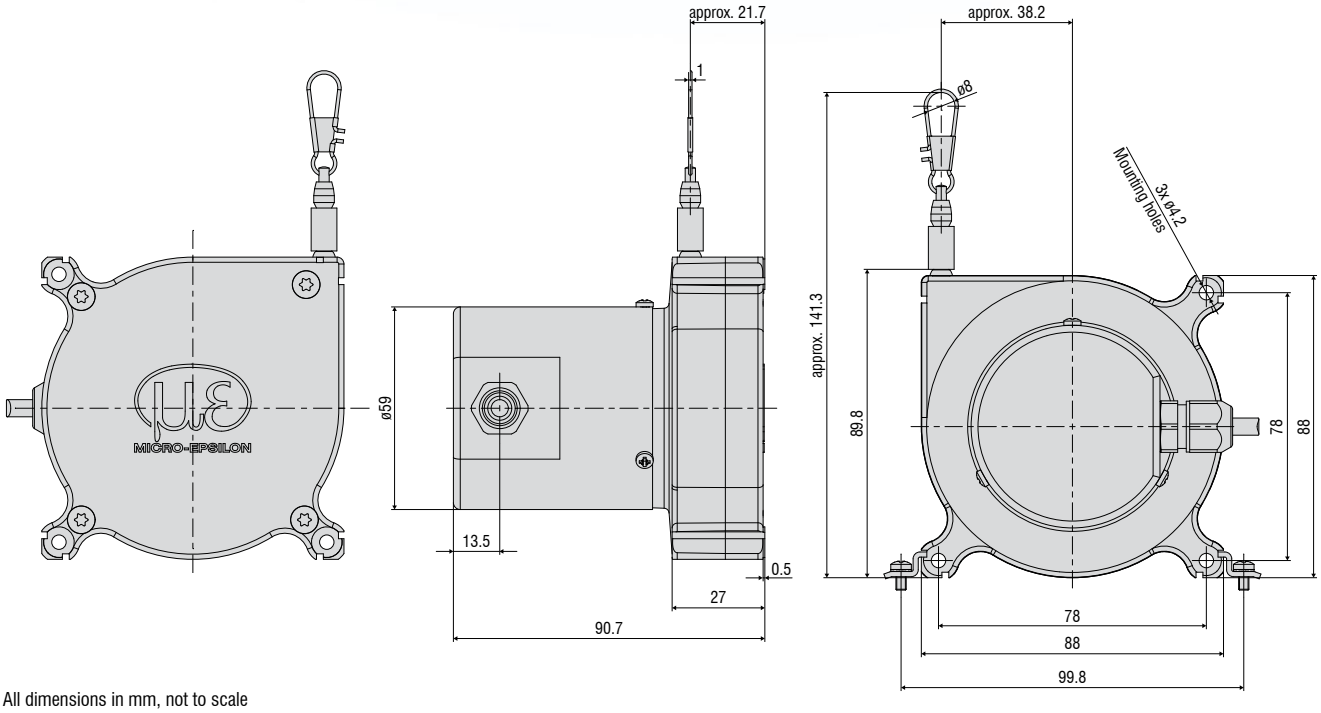
### Article designation

**WPS - 2400 MK60 - CR - TTL01**

- TTL01: Output: TTL01: A, B, 0 / TTL02: A, $\overline{A}$, B, $\overline{B}$, 0
- CR: Connection CR: integrated cable, radial, 1 m
- MK60: MK60 series
- 2400: Measuring range in mm

# Low-cost draw-wire sensors
# wireSENSOR MK88 analog

- Robust plastic housing
- Customer-specific designs
- Potentiometer, current or voltage output



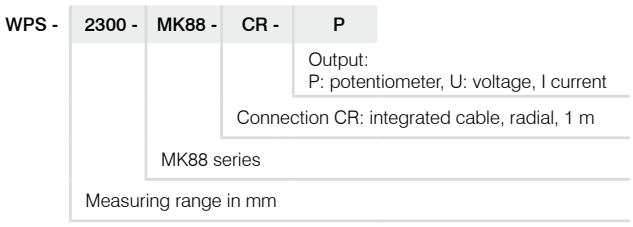

All dimensions in mm, not to scale

| Model | | | WPS-2300-MK88 | WPS-3500-MK88 | WPS-5000-MK88 |
|---|---|---|---|---|---|
| Measuring range | | | 2300 mm | 3500 mm | 5000 mm |
| Analog output [1] | | | Potentiometer, current, voltage | | |
| Resolution | | Hybrid potentiometer P10 | towards infinity | | |
| Linearity | Hybrid potentiometer P10 | ≤ ±0.15% FSO | ≤ ±3.45 mm | - | - |
| | Hybrid potentiometer P10 | ≤ ±0.3% FSO | - | ≤ ±10.5 mm | - |
| | Hybrid potentiometer P10 | ≤ ±0.4% FSO | - | - | ≤ ±20 mm |
| Sensor element | | | Hybrid potentiometer | | |
| Wire extension force (max.) | | | approx. 9 N | | |
| Wire retraction force (min.) | | | approx. 4 N | | |
| Wire acceleration (max.) | | | approx. 7 g | | |
| Material | | Housing | Glass-fiber reinforced plastic (PA 6 GF30) | | |
| | | Protection cap | Glass-fiber reinforced plastic (PBT GF20) | | |
| | | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) | | |
| Wire mounting | | | Wire clip | | |
| Mounting | | | Mounting holes or mounting grooves on the sensor housing | | |
| Temperature range | | Storage | -20 … +80 °C | | |
| | | Operation | -20 … +80 °C (on request -40 … +85 °C) | | |
| Connection | | | integrated cable, radial, length 1 m | | |
| Shock (DIN EN 60068-2-27) | | | 50 g / 10 ms in 3 axes, 2 directions and 1000 shocks each | | |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each | | |
| Protection class (DIN EN 60529) | | | IP65 (on request IP67) | | |
| Weight | | | approx. 400 - 430 g (incl. cable) | | |

FSO = Full Scale Output

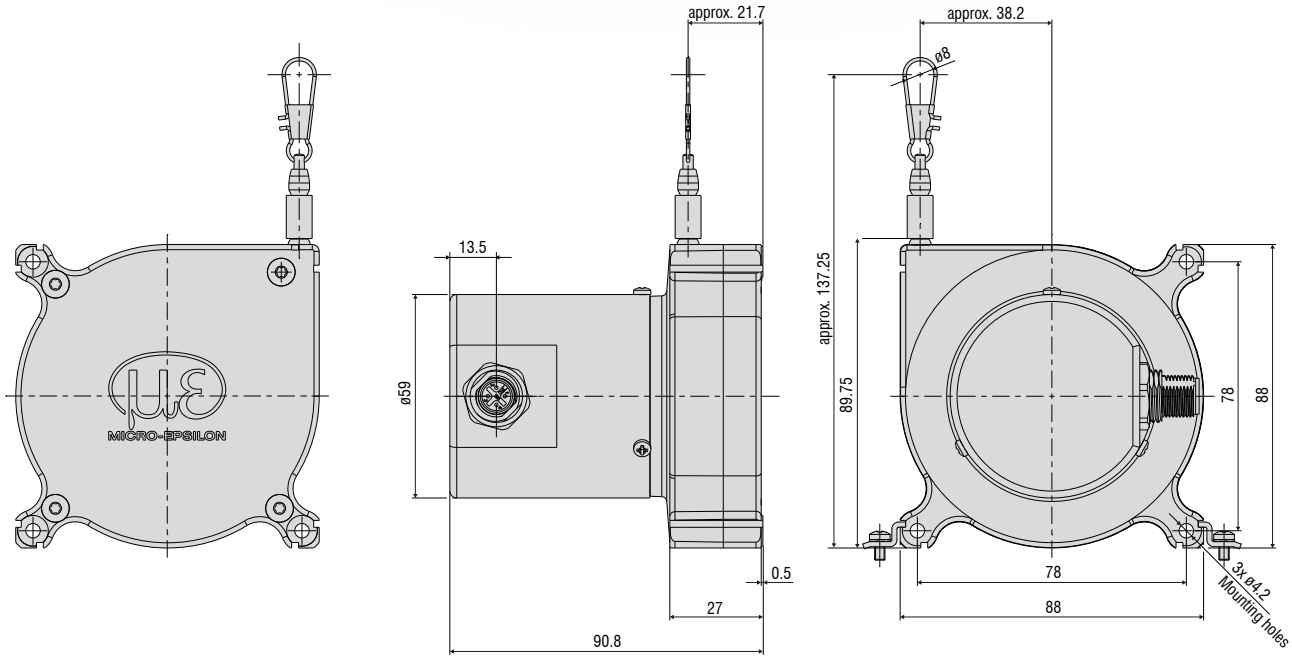
[1] Specifications for analog outputs from page 58 onwards.

### Article designation



# Low-cost draw-wire sensors
# wireSENSOR MK88 digital

- Robust plastic housing
- Customer-specific designs
- CANopen Interface




All dimensions in mm, not to scale

| Model | | | WPS-2300-MK88 | WPS-3500-MK88 | WPS-5000-MK88 |
|---|---|---|---|---|---|
| Measuring range | | | 2300 mm | 3500 mm | 5000 mm |
| Digital interface [1] | | | CANopen | | |
| Resolution | | | 0.56 mm | 0.85 mm | 1.22 mm |
| Linearity | Hybrid potentiometer P10 | ≤ ±0.15% FSO | ≤ ±3.45 mm | - | - |
| | Hybrid potentiometer P10 | ≤ ±0.3% FSO | - | ≤ ±10.5 mm | - |
| | Hybrid potentiometer P10 | ≤ ±0.4% FSO | - | - | ≤ ±20 mm |
| Sensor element | | | Hybrid potentiometer | | |
| Wire extension force (max.) | | | approx. 9 N | | |
| Wire retraction force (min.) | | | approx. 4 N | | |
| Wire acceleration (max.) | | | approx. 7 g | | |
| Material | | Housing | Glass-fiber reinforced plastic (PA 6 GF30) | | |
| | | Protection cap | Glass-fiber reinforced plastic (PBT GF20) | | |
| | | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) | | |
| Wire mounting | | | Wire clip | | |
| Mounting | | | Mounting holes or mounting grooves on the sensor housing | | |
| Temperature range | | Storage | -20 … +80 °C | | |
| | | Operation | -20 … +80 °C (on request -40 … +85 °C) | | |
| Connection | | | 5-pole M12x1 connector, radial | | |
| Shock (DIN EN 60068-2-27) | | | 50 g / 10 ms in 3 axes, 2 directions and 1000 shocks each | | |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 20 … 2000 Hz in 3 axes and 10 cycles each | | |
| Protection class (DIN EN 60529) | | | IP65 (on request IP67) [2] | | |
| Weight | | | approx. 400 - 430 g (incl. cable) | | |

FSO = Full Scale Output
[1] Specifications for digital outputs from page 59 onwards.
[2] With plug version only when connected

### Article designation

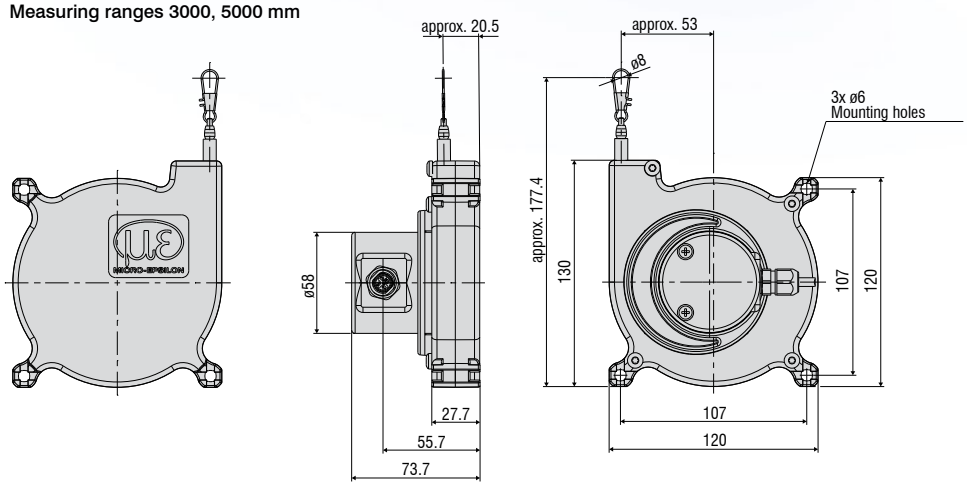
**WPS - 2300 - MK88 - SR12 - CO**

- 2300 – Measuring range in mm
- MK88 – MK88 series
- SR12 – Connection SR12: 5-pin SA connector M12
- CO – Output type: CO: CANopen

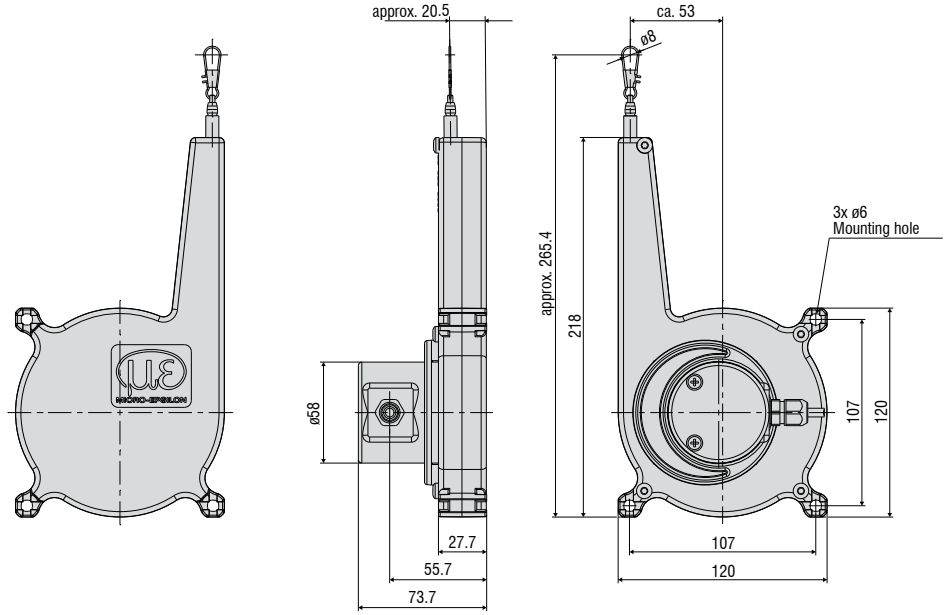
# Low-cost draw-wire sensors
# wireSENSOR MK120 analog

- Robust plastic housing
- Customer-specific designs
- Potentiometer, current or voltage output

**Measuring ranges 3000, 5000 mm**




**Measuring range 7500 mm**




All dimensions in mm, not to scale

| Model | | | WPS-3000-MK120 | WPS-5000-MK120 | WPS-7500-MK120 |
|---|---|---|---|---|---|
| Measuring range | | | 3000 mm | 5000 mm | 7500 mm |
| Analog output [1] | | | Potentiometer, current, voltage | | |
| Resolution | | Hybrid potentiometer P10 | towards infinity | | |
| Linearity | Hybrid potentiometer P10 | ≤ ±0.15% FSO | ≤ ±4.5 mm | ≤ ±7.5 mm | ≤ ±11.25 mm |
| Sensor element | | | Hybrid potentiometer | | |
| Wire extension force (max.) | | | approx. 10 N | | |
| Wire retraction force (min.) | | | approx. 4 N | | |
| Wire acceleration (max.) | | | approx. 6 g | | |
| Material | | Housing | Plastics (PA 6) | | |
| | | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) | | |
| Wire mounting | | | Wire clip | | |
| Mounting | | | Mounting holes or mounting grooves on the sensor housing | | |
| Temperature range | | Storage | -20 … +80 °C | | |
| | | Operation | -20 … +80 °C | | |
| Connection | | | integrated cable, radial, length 1 m | | |
| Shock (DIN EN 60068-2-27) | | | 40 g / 6 ms in 3 axes, 2 directions and 3000 shocks each | | |
| Vibration (DIN EN 60068-2-6) | | | 3 g / 10 … 5000 Hz in 3 axes and 10 cycles each | | |
| Protection class (DIN EN 60529) | | | IP65 | | |
| Weight | | | approx. 850 g (incl. cable) | | |

FSO = Full Scale Output

[1] Specifications for analog outputs from page 58 onwards.

### Article designation

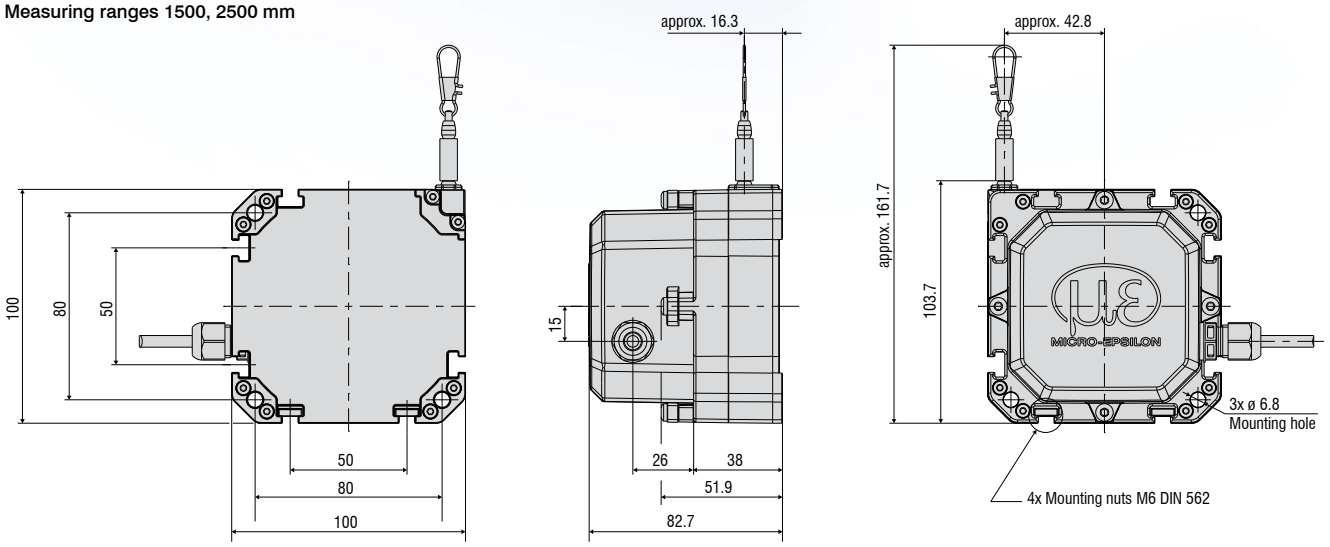
| WPS - | 3000 - | MK120 - | CR - | P |
|---|---|---|---|---|

- P: Output: P: potentiometer, U: voltage, I current
- CR: Connection CR: integrated cable, radial, 1 m
- MK120: MK120 series
- 3000: Measuring range in mm

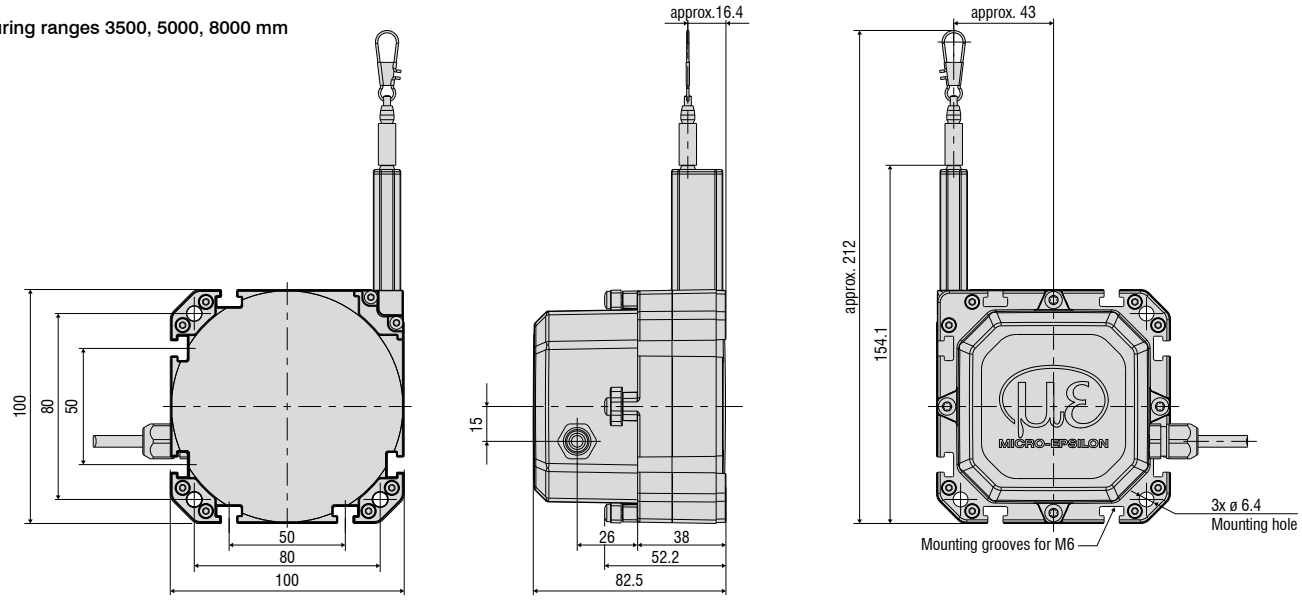
# Robust draw-wire sensors for OEM
# wireSENSOR K100 analog

- Durable and robust sensor design (IP67/IP69K)
- Compact sensor with large measuring range
- Large temperature range from -40 to +85 °C
- Potentiometer, current or voltage output

**Measuring ranges 1500, 2500 mm**




**Measuring ranges 3500, 5000, 8000 mm**




All dimensions in mm, not to scale

| Model | | WPS-1500-K100 | WPS-2500-K100 | WPS-3500-K100 | WPS-5000-K100 | WPS-8000-K100 |
|---|---|---|---|---|---|---|
| Measuring range | | 1500 mm | 2500 mm | 3500 mm | 5000 mm | 8000 mm |
| Analog output [1] | | Potentiometer, current, voltage | | | | |
| Resolution | | towards infinity | | | | |
| Linearity | ≤ ±0.15% FSO | ≤ ±2.25 mm | - | - | - | - |
| | ≤ ±0.20% FSO | - | ≤ ±5 mm | - | - | - |
| | ≤ ±0.25% FSO | - | - | ≤ ±8.75 mm | ≤ ±12.5 mm | - |
| | ≤ ±0.35% FSO | - | - | - | - | ≤ ±28 mm |
| Sensor element | | Hybrid potentiometer | | | | |
| Wire extension force (max.) | | approx. 10 N | | | | |
| Wire retraction force (min.) | | approx. 2 N | | | | approx. 1.5 N |
| Wire acceleration (max.) | | approx. 5 g | | | | |
| Material | Housing | Glass-fiber reinforced plastic | | | | |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.61 mm) | | | Polyamide-coated stainless steel (ø 0.45 mm) | |
| Wire mounting | | Wire clip | | | | |
| Mounting | | Through-bores Ø 6.4 mm and mounting nuts (for M6) on the sensor housing | | | | |
| Temperature range | Storage | -40 … +85 °C | | | | |
| | Operation | -40 … +85 °C | | | | |
| Connection | | integrated cable, radial, length 1 m | | | | |
| Shock (DIN EN 60068-2-27) | | 50 g / 8 ms in 3 axes, 2 directions and 1000 shocks each | | | | |
| Vibration (DIN EN 60068-2-6) | | 5 g / 10 … 150 Hz in 3 axes and 20 cycles each | | | | |
| Protection class (DIN EN 60529) | | IP67 / IP69K | | | | |
| Weight | | approx. 500 g | | | | |

FSO = Full Scale Output

[1] Specifications for analog outputs from page 58 onwards.

### Article designation

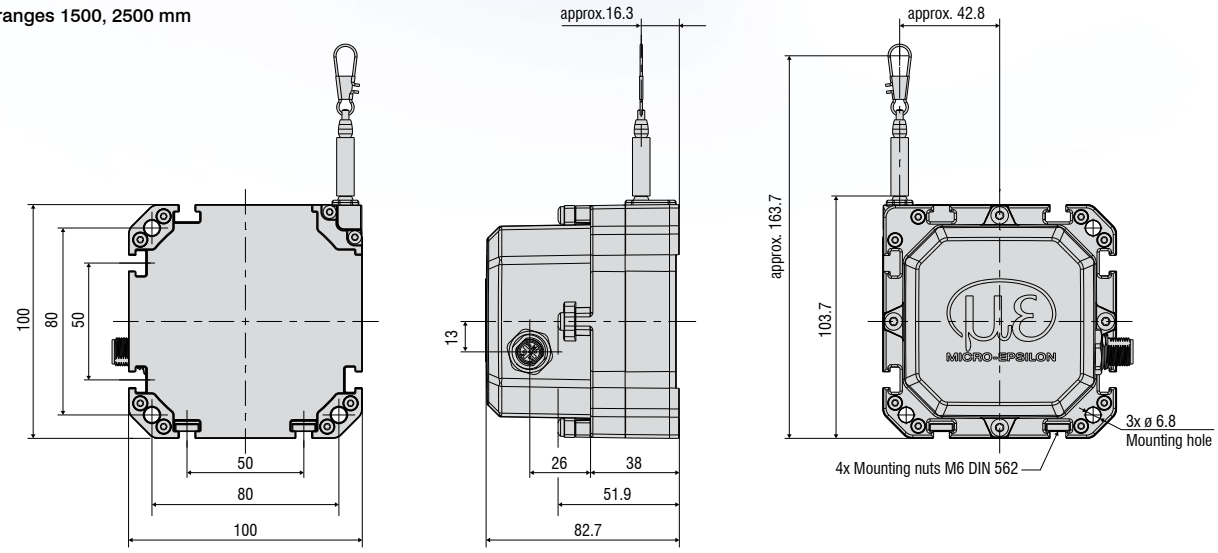
| WPS - | 1500 - | K100 - | CR - | P |
|---|---|---|---|---|

- P: Output: P: potentiometer, U: voltage, I current
- CR: Connection CR: integrated cable, radial, 1 m
- K100: K100 series
- 1500: Measuring range in mm

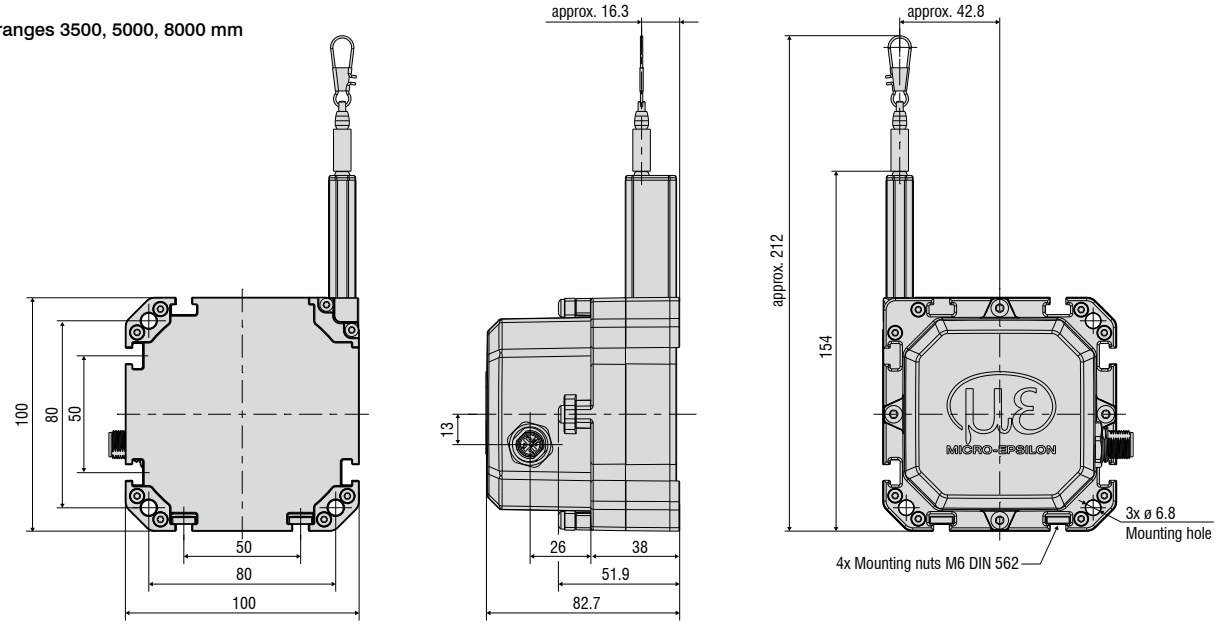
# Robust draw-wire sensors for OEM
# wireSENSOR K100 digital

- Durable and robust sensor design (IP67/IP69K)
- Compact sensor with large measuring range
- Large temperature range from -40 to +85 °C
- CANopen Interface

**Measuring ranges 1500, 2500 mm**




**Measuring ranges 3500, 5000, 8000 mm**




All dimensions in mm, not to scale

| Model | | WPS-1500-K100 | WPS-2500-K100 | WPS-3500-K100 | WPS-5000-K100 | WPS-8000-K100 |
|---|---|---|---|---|---|---|
| Measuring range | | 1500 mm | 2500 mm | 3500 mm | 5000 mm | 8000 mm |
| Digital interface [1] | | CANopen | | | | |
| Resolution | | 0.37 mm | 0.61 mm | 0.85 mm | 1.22 mm | 1.95 mm |
| Linearity | ≤ ±0.15% FSO | ≤ ±2.25 mm | - | - | - | - |
| | ≤ ±0.20% FSO | - | ≤ ±5 mm | - | - | - |
| | ≤ ±0.25% FSO | - | - | ≤ ±8.75 mm | ≤ ±12.5 mm | - |
| | ≤ ±0.35% FSO | - | - | - | - | ≤ ±28 mm |
| Sensor element | | Hybrid potentiometer | | | | |
| Wire extension force (max.) | | approx. 10 N | | | | |
| Wire retraction force (min.) | | approx. 2 N | | | | approx. 1.5 N |
| Wire acceleration (max.) | | approx. 5 g | | | | |
| Material | Housing | Glass-fiber reinforced plastic | | | | |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.61 mm) | | | Polyamide-coated stainless steel (ø 0.45 mm) | |
| Wire mounting | | Wire clip | | | | |
| Mounting | | Through-bores Ø 6.4 mm and mounting nuts (for M6) on the sensor housing (optional: for series applications with additional M12 socket) | | | | |
| Temperature range | Storage | -40 … +85 °C | | | | |
| | Operation | -40 … +85 °C | | | | |
| Connection | | 5-pole M12x1 connector | | | | |
| Shock (DIN EN 60068-2-27) | | 50 g / 8 ms in 3 axes, 2 directions and 1000 shocks each | | | | |
| Vibration (DIN EN 60068-2-6) | | 5 g / 10 … 150 Hz in 3 axes and 20 cycles each | | | | |
| Protection class (DIN EN 60529) | | IP67 / IP69K [2] | | | | |
| Weight | | approx. 500 g | | | | |

FSO = Full Scale Output

[1] Specifications for digital outputs from page 59 onwards. Available with SAE J1939 on request.

[2] With plug version only when connected. Available on request with two 5-pin M12x2 connectors (male-female, looped through).

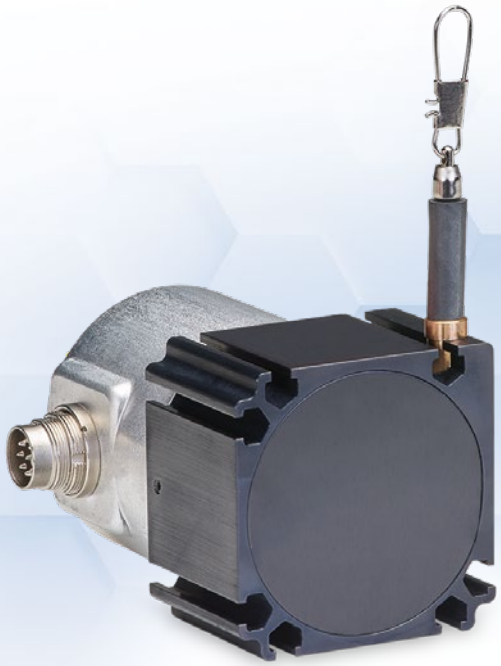
### Article designation

**WPS - 1500 - K100 - SR12 - CO**

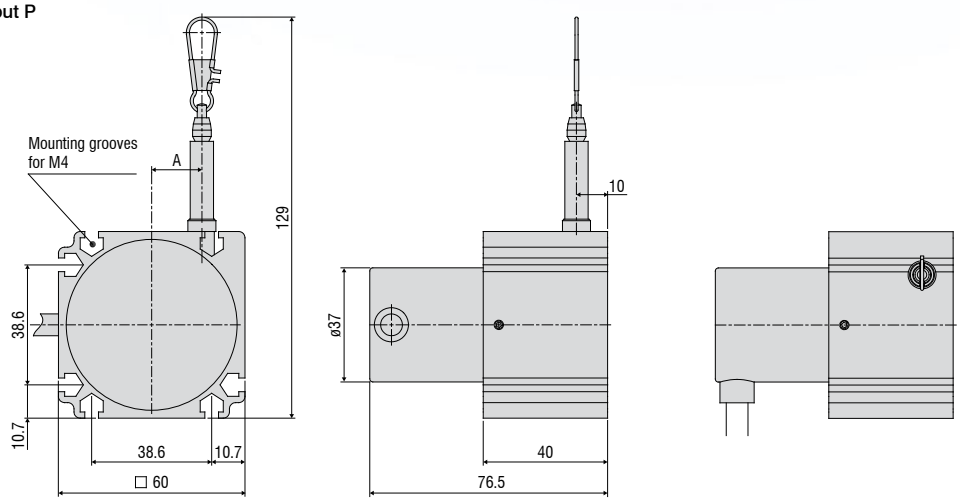
- CO: Output type: CANopen
- SR12: Connection SR12: 5-pin SA connector M12
- K100: K100 series
- 1500: Measuring range in mm

# Industrial draw-wire sensors
# **wireSENSOR P60 analog**

- Robust aluminum profile housing
- Customer-specific designs
- Potentiometer, current or voltage output

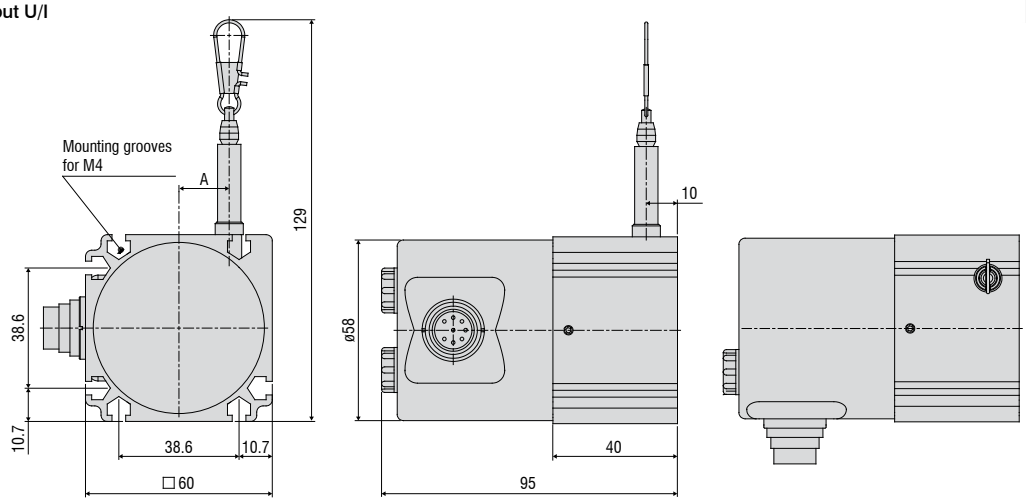


**Output P**




| Measuring range (mm) | A (mm) |
|---|---|
| 100 / 300 / 500 / 1000 | approx. 16.5 |
| 150 / 750 / 1500 | approx 24.2 |

**Output U/I**




All dimensions in mm, not to scale

| Model | | | WDS-100-P60 | WDS-150-P60 | WDS-300-P60 | WDS-500-P60 | WDS-750-P60 | WDS-1000-P60 | WDS-1500-P60 |
|---|---|---|---|---|---|---|---|---|---|
| Measuring range | | | 100 mm | 150 mm | 300 mm | 500 mm | 750 mm | 1000 mm | 1500 mm |
| Analog output [1] | | | Potentiometer, current, voltage | | | | | | |
| Resolution | | | towards infinity | | | | | | |
| Linearity | Hybrid potentiometer P10 | ≤ ±0.1% FSO | - | - | - | ≤ ±0.5 mm | ≤ ±0.75 mm | ≤ ±1 mm | ≤ ±1.5 mm |
| | Hybrid potentiometer P25 | ≤ ±0.25% FSO | - | - | ≤ ±0.75 mm | - | - | - | - |
| | Conductive plastic/wire potentiometer P25 | ≤ ±0.5% FSO | ≤ ±0.5 mm | ≤ ±0.75 mm | - | - | - | - | - |
| Sensor element | | | Conductive plastic/wire potentiometer | | Hybrid potentiometer | | | | |
| Wire extension force (max.) | | | approx. 7.5 N | approx. 5.5 N | approx. 7.5 N | approx. 7.5 N | approx. 5.5 N | approx. 7.5 N | approx. 5.5 N |
| Wire retraction force (min.) | | | approx. 6.5 N | approx. 4.5 N | approx. 6 N | approx. 6 N | approx. 4 N | approx. 5 N | approx. 3.5 N |
| Wire acceleration (max.) | | | approx. 10 ... 15 g (depending on measuring range) | | | | | | |
| Material | | Housing | Aluminum | | | | | | |
| | | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) | | | | | | |
| Wire mounting | | | Wire clip | | | | | | |
| Mounting | | | Mounting grooves on the sensor housing | | | | | | |
| Temperature range | | Storage | -20 … +80 °C | | | | | | |
| | | Operation | -20 … +80 °C | | | | | | |
| Connection | | Potentiometer | integrated cable, radial, length 1 m | | | | | | |
| | | Current, voltage | pluggable cable via 8-pin flange connector (DIN45326), radial | | | | | | |
| Shock (DIN EN 60068-2-27) | | | 50 g / 10 ms in 3 axes, 1000 shocks each | | | | | | |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 10 … 2000 Hz in 3 axes, 10 cycles each | | | | | | |
| Protection class (DIN EN 60529) | | | IP65 [2] | | | | | | |
| Weight | | | approx. 370 g | | | | | | |

FSO = Full Scale Output

[1] Specifications for analog outputs from page 58 onwards.

[2] With plug version only when connected.

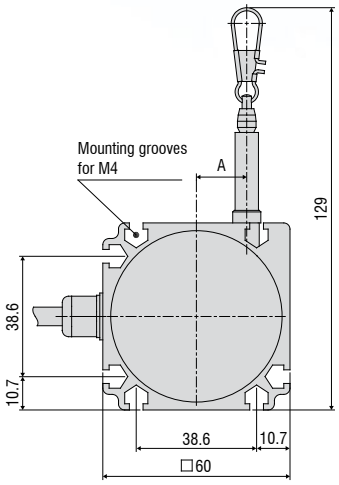
### Article designation

| WDS - | 100 - | P60 - | CR - | P |
|---|---|---|---|---|

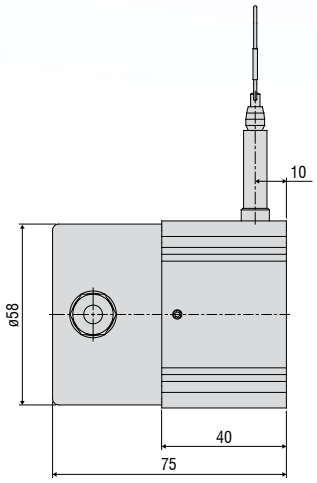
- P: Output type: P: potentiometer (with connection CR) U: voltage (with connection SR) I: current (with connection SR)
- CR: Connection: SR: radial plug CR: integrated cable, radial, 1 m
- P60: P60 series
- 100: Measuring range in mm

# Industrial draw-wire sensors
# **wireSENSOR P60 digital**

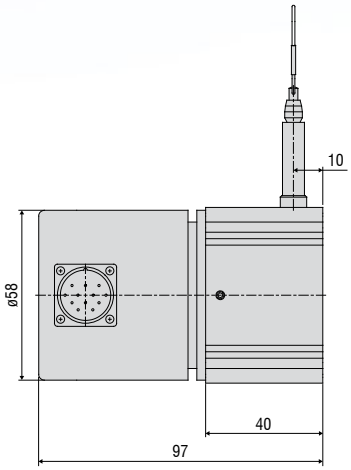
- Robust aluminum profile housing
- Customer-specific designs
- Absolute or incremental encoder



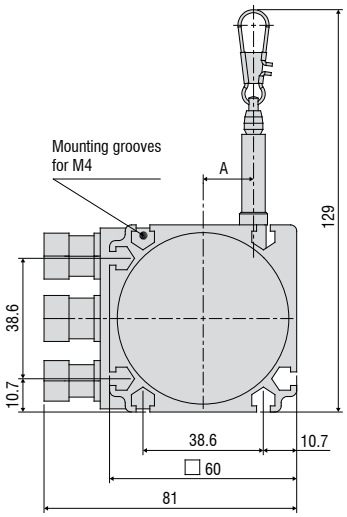

HTL/TTL output

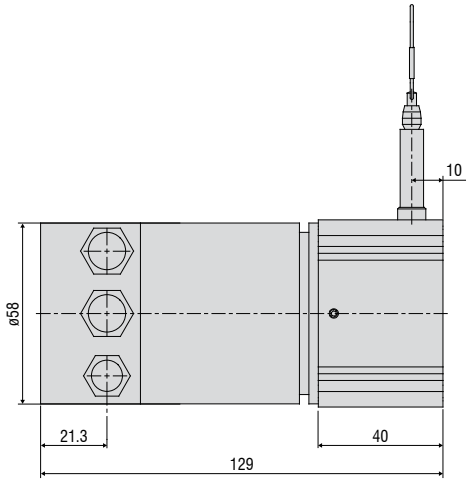



SSI output




CO / PB / PN / ENIP / CAT output




| Measuring range (mm) | A (mm) |
|---|---|
| 1000 | approx. 16.15 |
| 1500 | approx 24.2 |

All dimensions in mm, not to scale

| Model | | WDS-1000-P60 | WDS-1500-P60 |
|---|---|---|---|
| Measuring range | | 1000 mm | 1500 mm |
| Digital interface [1] | | PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | |
| Digital output [1] | | HTL, TTL, SSI | |
| Resolution | HTL, TTL | 0.067 mm (15 pulses/mm) | 0.1 mm (10 pulses/mm) |
| | SSI, PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | 0.012 mm | 0.018 mm |
| Linearity | ≤ ±0.02% FSO | ≤ ±0.2 mm | ≤ ±0.3 mm |
| Sensor element | | Incremental encoder | |
| Wire extension force (max.) | | approx. 7.5 N | approx. 5.5 N |
| Wire retraction force (min.) | | approx. 5 N | approx. 3.5 N |
| Wire acceleration (max.) | | approx. 10 g | approx. 15 g |
| Material | Housing | Aluminum | |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) | |
| Wire mounting | | Wire clip | |
| Mounting | | Mounting grooves on the sensor housing | |
| Temperature range | Storage | -20 … +80 °C | |
| | Operation | -20 … +80 °C | |
| Connection | HTL, TTL | integrated cable, radial, length 1 m | |
| | SSI | 12-pin flange connector, radial | |
| | PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | Bus cover | |
| Shock (DIN EN 60068-2-27) | | 50 g / 10 ms in 3 axes, 1000 shocks each | |
| Vibration (DIN EN 60068-2-6) | | 20 g / 10 … 2000 Hz in 3 axes, 10 cycles each | |
| Protection class (DIN EN 60529) | | IP65 [2] | |
| Weight | | Approx. 1 kg | |

FSO = Full Scale Output
[1] Specifications for digital outputs from page 59 onwards.
[2] With plug version only when connected

### Article designation

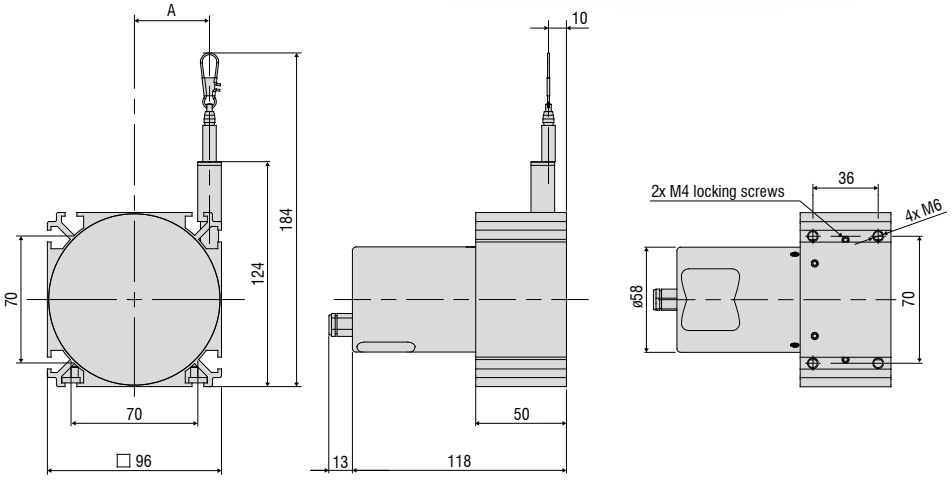
**WDS -** **1000 -** **P60 -** **CR -** **TTL**

- **TTL** – Output:
  HTL
  TTL
  CO: CANopen
  PB: Profibus DP
  SSI: Gray Code
  PN: PROFINET
  ENIP: EtherNet/IP
  CAT: EtherCAT
- **CR -** – Connection:
  SR (with SSI output): plug, radial
  CR (with HTL, TTL output): integrated cable, radial, 1 m
  BH (with CO, PB, PN, ENIP, CAT output): bus cover
- **P60 -** – P60 series
- **1000 -** – Measuring range in mm

# Industrial draw-wire sensors
# wireSENSOR P96 analog

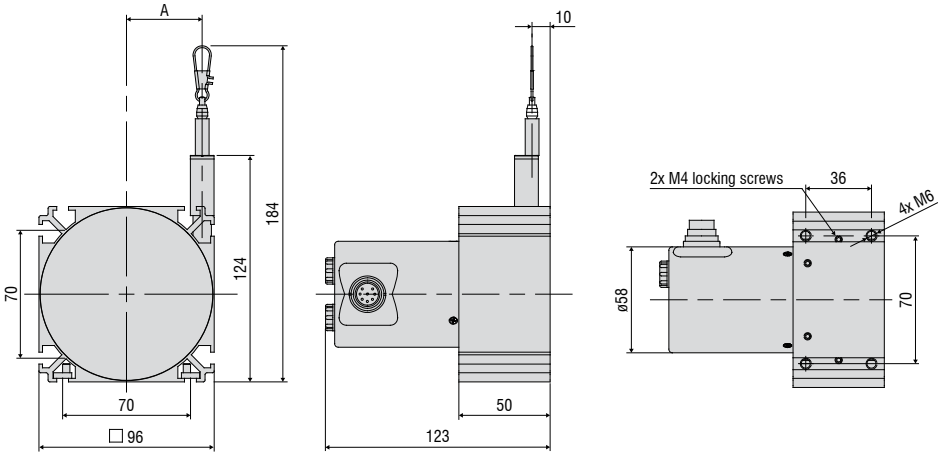
- Robust aluminum profile housing
- Customer-specific designs
- Potentiometer, current or voltage output

**Output P**




| Measuring range (mm) | A (mm) |
|---|---|
| 2000 | approx. 32 |
| 2500 | approx. 41.4 |

**Output U/I**




All dimensions in mm, not to scale

| Model | | WDS-2000-P96 | WDS-2500-P96 |
|---|---|---|---|
| Measuring range | | 2000 mm | 2500 mm |
| Analog output [1] | | Potentiometer, current, voltage | |
| Resolution | | towards infinity | |
| Linearity | ≤ ±0.1% FSO | ≤ ±2 mm | ≤ ±2.5 mm |
| Sensor element | | Hybrid potentiometer | |
| Wire extension force (max.) | | approx. 11 N | approx. 9 N |
| Wire retraction force (min.) | | approx. 7.5 N | approx. 5.5 N |
| Wire acceleration (max.) | | approx. 8 g | |
| Material | Housing | Aluminum | |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.8 mm) | |
| Wire mounting | | Wire clip | |
| Mounting | | Mounting grooves on the sensor housing | |
| Temperature range | Storage | -20 … +80 °C | |
| | Operation | -20 … +80 °C | |
| Connection | Potentiometer | integrated cable, axial, length 1 m | |
| | Current, voltage | pluggable cable via 8-pin flange connector (DIN45326), radial | |
| Shock (DIN EN 60068-2-27) | | 50 g / 10 ms in 3 axes, 1000 shocks each | |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes, 10 cycles each | |
| Protection class (DIN EN 60529) | | IP65 [2] | |
| Weight | | approx. 1.1 kg | |

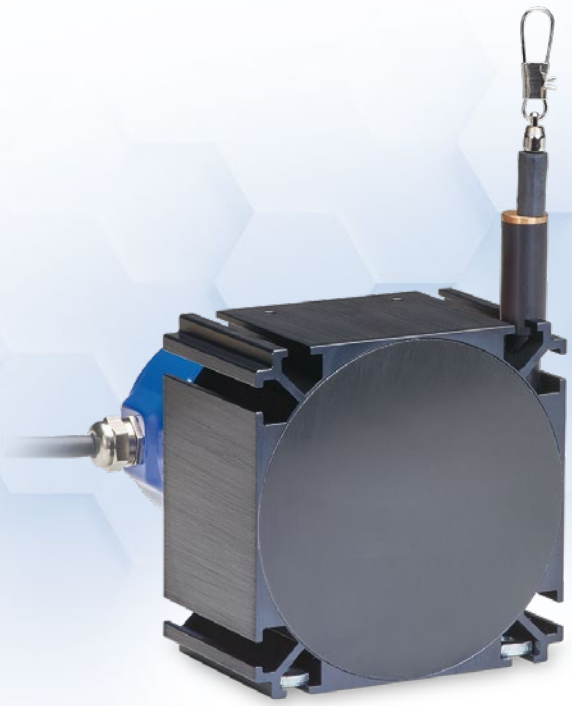
FSO = Full Scale Output
[1] Specifications for analog outputs from page 58 onwards.
[2] With plug version only when connected.

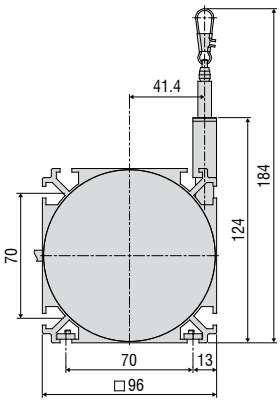
### Article designation

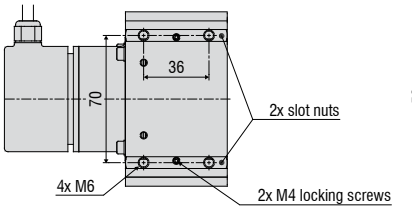
| WDS - | 2000 - | P96 - | CA - | P |
|---|---|---|---|---|
| | | | | Output type:<br>P: potentiometer (with CA connection)<br>U: voltage (with connection SR)<br>I: current (with connection SR) |
| | | | Connection:<br>SR: radial plug<br>CA: integrated cable, axial, 1 m | |
| | | P96 series | | |
| | Measuring range in mm | | | |

# Industrial draw-wire sensors
# wireSENSOR P96 digital

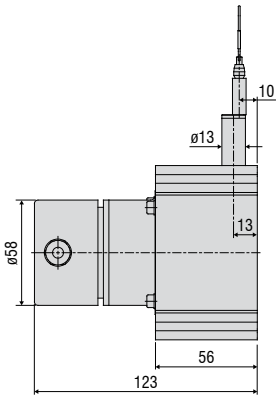
- Robust aluminum profile housing
- Absolute or incremental encoder



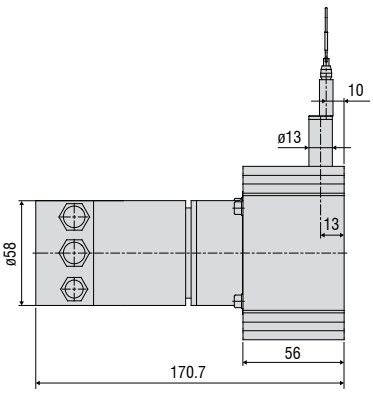


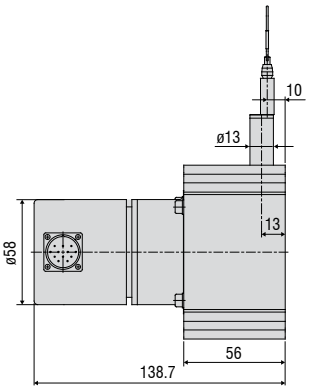

**HTL/TTL output**




**CO/PB/PN/ENIP/CAT output**




**SSI output**




All dimensions in mm, not to scale

| Model | | WDS-3000-P96 |
|---|---|---|
| Measuring range | | 3000 mm |
| Digital interface [1] | | PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT |
| Digital output [1] | | HTL, TTL, SSI |
| Resolution | HTL, TTL | 0.087 mm (11.53 pulses/mm) |
| | SSI, PROFINET Profibus DP, CANopen, EtherNet/IP, EtherCAT | 0.032 mm |
| Linearity | ≤ ±0.02% FSO | ≤ ±0.6 mm |
| Sensor element | | Incremental/absolute encoder |
| Wire extension force (max.) | | approx. 9 N |
| Wire retraction force (min.) | | approx. 5.5 N |
| Wire acceleration (max.) | | approx. 7 g |
| Material | Housing | Aluminum |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.8 mm) |
| Wire mounting | | Wire clip |
| Mounting | | Mounting grooves on the sensor housing |
| Temperature range | Storage | -20 … +80 °C |
| | Operation | -20 … +80 °C |
| Connection | HTL, TTL | integrated cable, radial, length 1 m |
| | SSI | 12-pin flange connector, radial |
| | PROFINET Profibus DP, CANopen, EtherNet/IP, EtherCAT | Bus cover |
| Shock (DIN EN 60068-2-27) | | 50 g / 10 ms in 3 axes, 1000 shocks each |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes, 10 cycles each |
| Protection class (DIN EN 60529) | | IP65 [2] |
| Weight | | approx. 1.7 kg |

FSO = Full Scale Output
[1] Specifications for digital outputs from page 59 onwards.
[2] With plug version only when connected

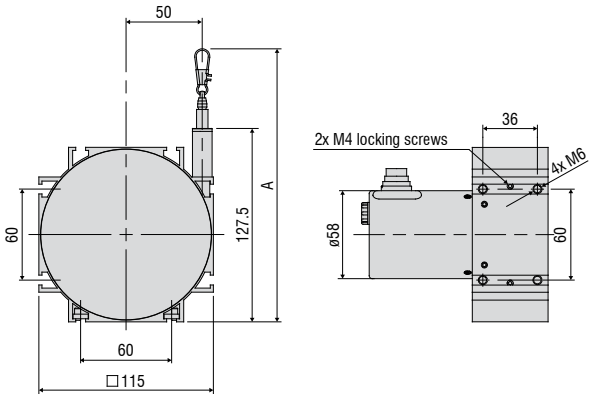
### Article designation

| WDS - | 3000 - | P96 - | CR - | TTL |
|---|---|---|---|---|
| | | | | Output:<br>HTL<br>TTL<br>CO: CANopen<br>PB: Profibus DP<br>SSI: Gray Code<br>PN: PROFINET<br>ENIP: EtherNet/IP<br>CAT: EtherCAT |
| | | | Connection:<br>SR (with SSI output): plug, radial<br>CR (with HTL, TTL output): integrated cable, radial, 1 m<br>BH (with CO, PB, PN, ENIP, CAT output): bus cover | |
| | | P96 series | | |
| | Measuring range in mm | | | |

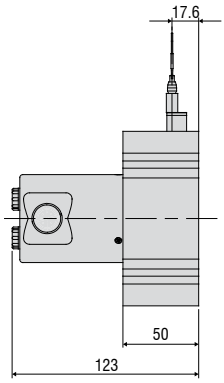
# Industrial draw-wire sensors
# **wireSENSOR P115 analog**

- Robust aluminum profile housing
- Customer-specific designs
- Potentiometer, current or voltage output

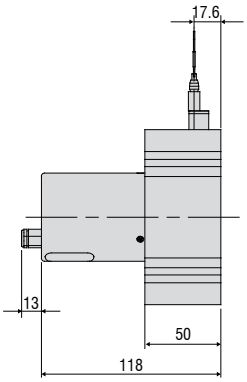
**Measuring range 3000/4000/5000 mm**




**Output U/I**

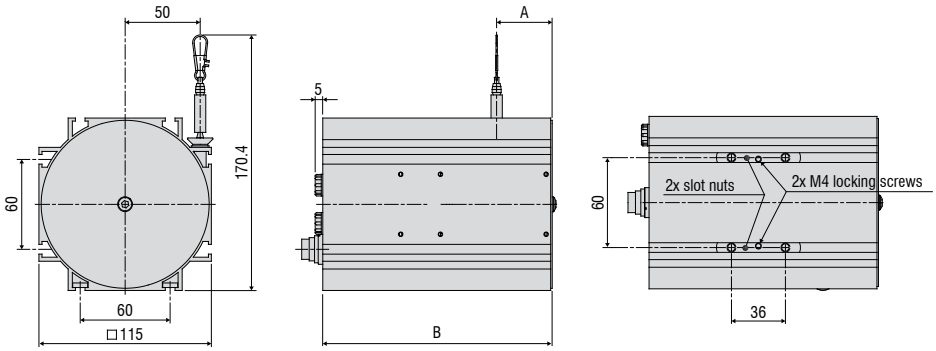



**Output P**




| Measuring range (mm) | A (mm) |
|---|---|
| 3000 | approx. 186 |
| 4000 / 5000 | approx. 180 |

**Measuring range 7500/10000/15000 mm**




| Measuring range (mm) | A (mm) | B (mm) |
|---|---|---|
| 7500 | 37 | 153 |
| 10000 | 44.5 | 198 |
| 15000 | 60.5 | 228 |

All dimensions in mm, not to scale

| Model | | WDS-3000-P115 | WDS-4000-P115 | WDS-5000-P115 | WDS-7500-P115 | WDS-10000-P115 | WDS-15000-P115 |
|---|---|---|---|---|---|---|---|
| Measuring range | | 3000 mm | 4000 mm | 5000 mm | 7500 mm | 10000 mm | 15000 mm |
| Analog output [1] | | Potentiometer, current, voltage | | | | | |
| Resolution | | towards infinity | | | | | |
| Linearity | ≤ ±0.1% FSO | ≤ ±3 mm | - | - | - | - | - |
| | ≤ ±0.15% FSO | - | ≤ ±6 mm | ≤ ±7.5 mm | ≤ ±11.3 mm | ≤ ±15 mm | ≤ ±22.5 mm |
| Sensor element | | Hybrid potentiometer | | | | | |
| Wire extension force (max.) | | approx. 8 N | approx. 8.5 N | approx. 9 N | approx. 24 N | approx. 21 N | approx. 25 N |
| Wire retraction force (min.) | | approx. 4 N | approx. 4 N | approx. 4 N | approx. 8 N | approx. 8 N | approx. 8 N |
| Wire acceleration (max.) | | approx. 6 g | | | | | |
| Material | Housing | Aluminum | | | | | |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.45 mm) | | | Polyamide-coated stainless steel (ø 1 mm) | | |
| Wire mounting | | Wire clip | | | | | |
| Mounting | | Mounting grooves on the sensor housing | | | | | |
| Temperature range | Storage | -20 … +80 °C | | | | | |
| | Operation | -20 … +80 °C | | | | | |
| Connection | Potentiometer | integrated cable, axial, length 1 m | | | | | |
| | Current, voltage | pluggable cable via 8-pin flange connector (DIN45326), radial | | | | | |
| Shock (DIN EN 60068-2-27) | | 50 g / 10 ms in 3 axes, 1000 shocks each | | | | | |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes, 10 cycles each | | | | | |
| Protection class (DIN EN 60529) | | IP65 [2] | | | | | |
| Weight | | approx. 1.1 kg | | | approx. 2.2 kg | approx. 3.2 kg | approx. 3.5 kg |

FSO = Full Scale Output

[1] Specifications for analog outputs from page 58 onwards.

[2] With plug version only when connected.

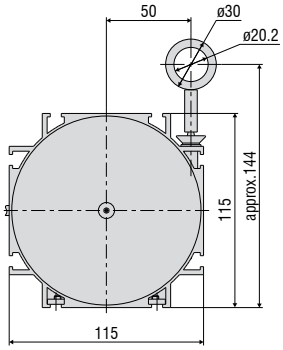
### Article designation

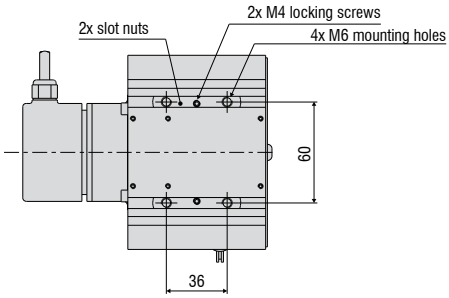
| WDS - | 3000 - | P115 - | CA - | P |
|---|---|---|---|---|

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

# Industrial draw-wire sensors
# **wireSENSOR P115 digital**

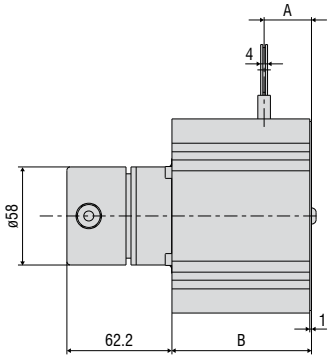
- Robust aluminum profile housing
- Customer-specific designs
- Absolute or incremental encoder



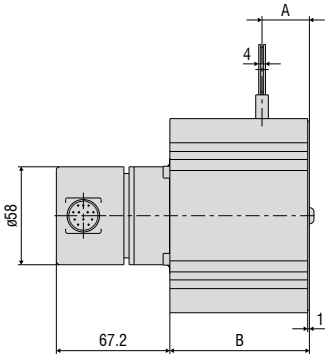




| Measuring range (mm) | A (mm) | B (mm) |
|---|---|---|
| 5000 | approx. 28 | 82.5 |
| 7500 | approx. 37 | 105.5 |
| 10000 | approx. 44.5 | 148.5 |
| 15000 | approx. 61 | 180.5 |

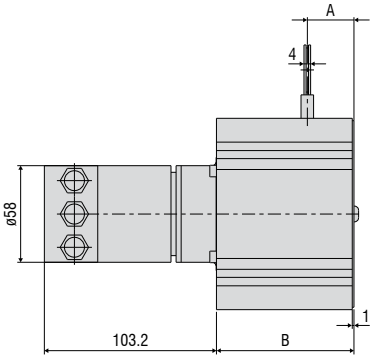
**HTL/TTL output**




**SSI output**




**CO / PB / PN / ENIP / CAT output**




All dimensions in mm, not to scale

| Model | | WDS-5000-P115 | WDS-7500-P115 | WDS-10000-P115 | WDS-15000-P115 |
|---|---|---|---|---|---|
| Measuring range | | 5000 mm | 7500 mm | 10000 mm | 15000 mm |
| Digital interface [1] | | PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | | | |
| Digital output [1] | | HTL, TTL, SSI | | | |
| Resolution | HTL, TTL | 0.105 mm (9.52 pulses/mm) | | | |
| | SSI, PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | 0.038 mm | | | |
| Linearity | ≤ ±0.01% FSO | - | - | ≤ ±1 mm | ≤ ±1.5 mm |
| | ≤ ±0.02% FSO | ≤ ±1 mm | ≤ ±1.5 mm | - | - |
| Sensor element | | Incremental/absolute encoder | | | |
| Wire extension force (max.) | | approx. 16 N | approx. 24 N | approx. 21 N | approx. 25 N |
| Wire retraction force (min.) | | approx. 4 N | approx. 8 N | approx. 8 N | approx. 8 N |
| Wire acceleration (max.) | | approx. 5 g | approx. 6 g | approx. 3 g | approx. 3 g |
| Material | Housing | Aluminum | | | |
| | Measuring wire | Polyamide-coated stainless steel (ø 1 mm) | | | |
| Wire mounting | | Eyelet (ø 20.2 mm) | | | |
| Mounting | | Mounting grooves on the sensor housing | | | |
| Temperature range | Storage | -20 … +80 °C | | | |
| | Operation | -20 … +80 °C | | | |
| Connection | HTL, TTL | integrated cable, radial, length 1 m | | | |
| | SSI | 12-pin flange connector, radial | | | |
| | PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | Bus cover | | | |
| Shock (DIN EN 60068-2-27) | | 50 g / 10 ms in 3 axes, 1000 shocks each | | | |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes, 10 cycles each | | | |
| Protection class (DIN EN 60529) | | IP65 [2] | | | |
| Weight | | approx. 2 kg | approx. 2.5 kg | approx. 3.5 kg | approx. 4.5 kg |

FSO = Full Scale Output
[1] Specifications for digital outputs from page 59 onwards.
[2] With plug version only when connected

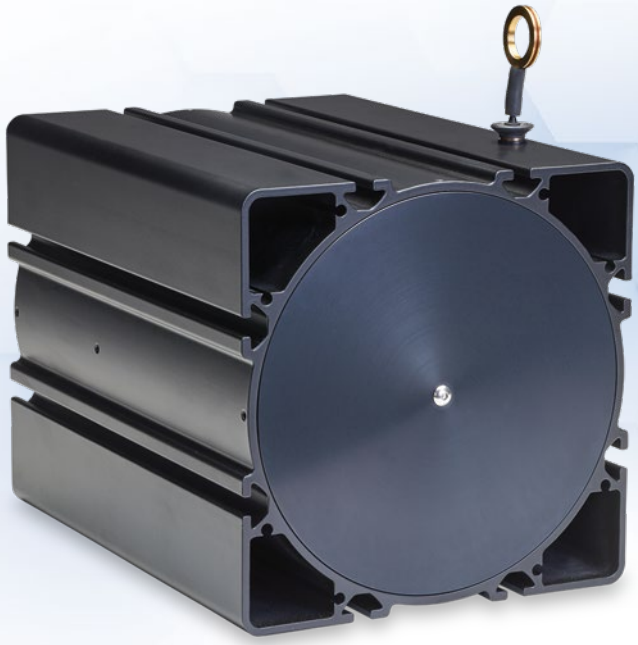
### Article designation

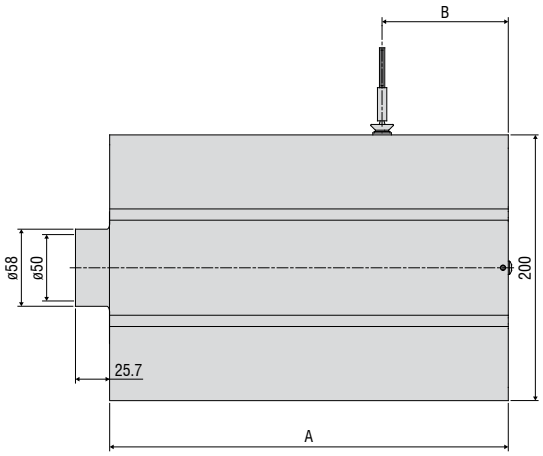
**WDS -** **5000 -** **P115 -** **CR -** **TTL**

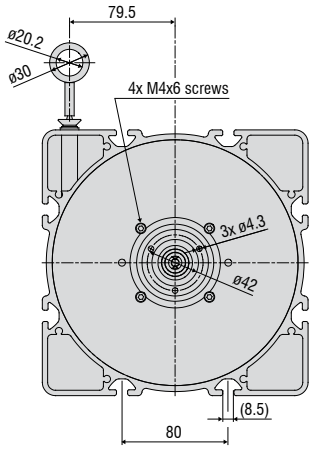
- **TTL** – Output:
  HTL
  TTL
  CO: CANopen
  PB: Profibus DP
  SSI: Gray Code
  PN: PROFINET
  ENIP: EtherNET/IP
  CAT: EtherCAT
- **CR -** – Connection:
  SR (with SSI output): plug, radial
  CR (with HTL, TTL output): integrated cable, radial, 1 m
  BH (with CO, PB, PN, ENIP, CAT output): bus cover
- **P115 -** – P115 series
- **5000 -** – Measuring range in mm

# Draw-wire long-range sensors
# wireSENSOR P200 digital

- Robust aluminum profile housing
- Customer-specific designs
- Absolute or incremental encoder

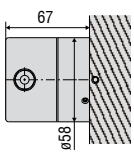




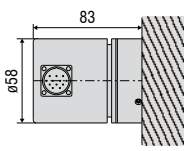




| Measuring range (mm) | A (mm) | B (mm) |
|---|---|---|
| 30000 | 268 | 75 |
| 40000 | 300 | 95 |
| 50000 | 333.5 | 95 |

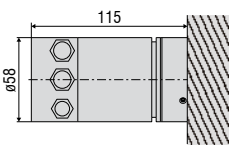
**HTL/TTL output**




**SSI output**




**CO / PB / PN / ENIP / CAT output**




All dimensions in mm, not to scale

| Model | | WDS-30000-P200 | WDS-40000-P200 | WDS-50000-P200 |
|---|---|---|---|---|
| Measuring range | | 30000 mm | 40000 mm | 50000 mm |
| Digital interface [1] | | PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | | |
| Digital output [1] | | HTL, TTL, SSI | | |
| Resolution | HTL, TTL | 0.167 mm (6 pulses/mm) | | |
| | SSI, PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | 0.061 mm | | |
| Linearity | ≤ ±0.01% FSO | ≤ ±3 mm | ≤ ±4 mm | ≤ ±5 mm |
| Sensor element | | Incremental/absolute encoder | | |
| Wire extension force (max.) | | approx. 22 N | approx. 22 N | approx. 24 N |
| Wire retraction force (min.) | | approx. 12 N | approx. 11 N | approx. 11 N |
| Wire acceleration (max.) | | approx. 2 g | | |
| Material | Housing | Aluminum | | |
| | Measuring wire | Polyamide-coated stainless steel (ø 0.8 mm) | | |
| Wire mounting | | Eyelet (ø 20.2 mm) | | |
| Mounting | | Mounting grooves on the sensor housing | | |
| Temperature range | Storage | -20 … +80 °C | | |
| | Operation | -20 … +80 °C | | |
| Connection | HTL, TTL | integrated cable, radial, length 1 m | | |
| | SSI | 12-pin flange connector, radial | | |
| | PROFINET, Profibus DP, CANopen, EtherNet/IP, EtherCAT | Bus cover | | |
| Shock (DIN EN 60068-2-27) | | 50 g / 10 ms in 3 axes, 1000 shocks each | | |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes, 10 cycles each | | |
| Protection class (DIN EN 60529) | | IP65 [2] | | |
| Weight | | Approx. 10 kg | approx. 11 kg | approx. 12 kg |

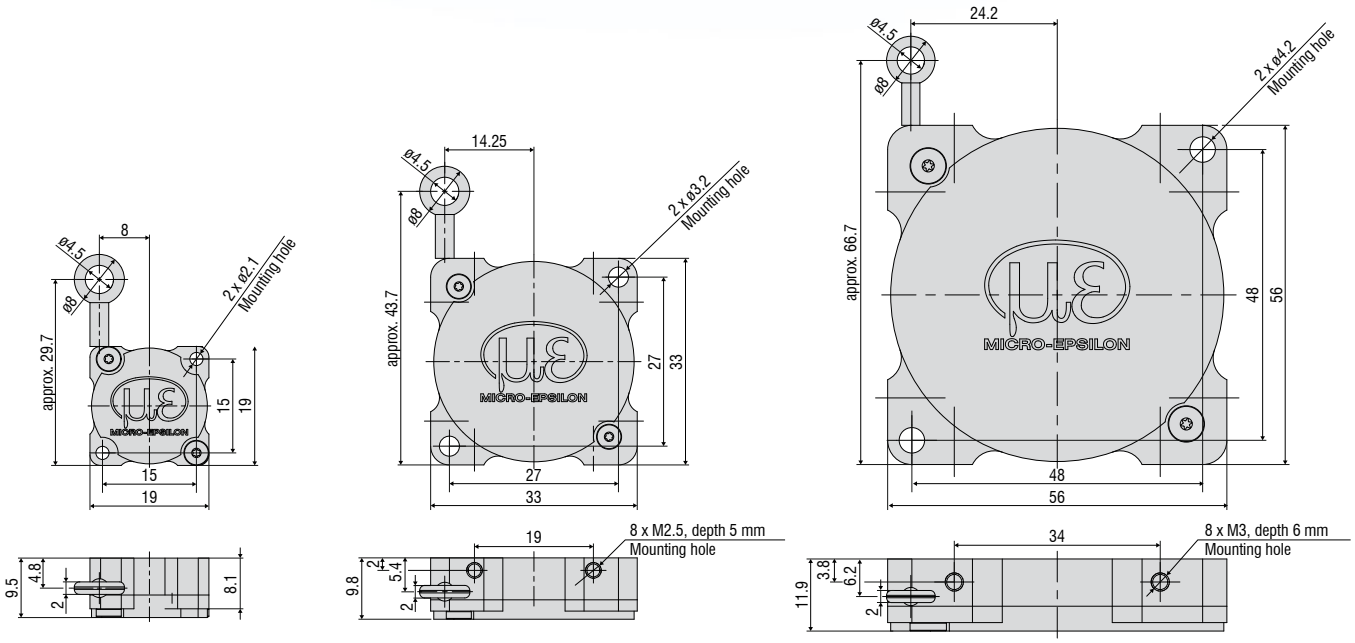
FSO = Full Scale Output
[1] Specifications for digital outputs from page 59 onwards.
[2] With plug version only when connected

### Article designation

| WDS - | 30000 - | P200 - | CR - | TTL |
|---|---|---|---|---|
| | | | | Output:<br>HTL<br>TTL<br>CO: CANopen<br>PB: Profibus DP<br>SSI: Gray Code<br>PN: PROFINET<br>ENIP: EtherNet/IP<br>CAT: EtherCAT |
| | | | Connection:<br>SR (with SSI output): radial plug<br>CR (with HTL, TTL output): integrated cable, radial, 1 m<br>BH (with CO, PB, PN, ENIP, CAT output): bus cover | |
| | | P200 series | | |
| | Measuring range in mm | | | |

# Miniature draw-wire sensors for test applications
# wireSENSOR MT

- Miniature sensor size
- Ideal for extremely high accelerations
- Easy, fast and flexible mounting
- Potentiometer Output


All dimensions in mm, not to scale

| Model | | WDS-40-MT19-P | WDS-80-MT33-P | WDS-130-MT56-P |
|---|---|---|---|---|
| Measuring range | | 40 mm | 80 mm | 130 mm |
| Analog output [1] | | Potentiometer | | |
| Resolution | | towards infinity | | |
| Linearity | ≤ ±0.4 % FSO | - | ≤ ±0.32 mm | ≤ ±0.52 mm |
| | ≤ ±1 % FSO | ≤ ±0.4 mm | - | - |
| Sensor element | | Conductive plastic potentiometer | | |
| Wire extension force (max.) | | approx. 2 N | approx. 1.5 N | approx. 1 N |
| Wire retraction force (min.) | | approx. 0.7 N | approx. 0.5 N | approx. 0.3 N |
| Wire acceleration (max.) | | approx. 60 g | approx. 60 g | approx. 15 g |
| Material | Housing | Aluminum | | |
| | Measuring wire | Polyamide-coated stainless steel (Ø 0.36) | Polyamide-coated stainless steel (Ø 0.45) | |
| Wire mounting | | Eyelet (ø 4.5 mm) | | |
| Mounting | | Through-holes ø 2.1 mm | Through-holes ø 3.2 mm | Through-holes ø 4.2 mm |
| Temperature range | Storage | -40 … +85 °C | | |
| | Operation | -40 … +85 °C | | |
| Connection | | Stranded wires, approx. 6 cm | | |
| Shock (DIN EN 60068-2-27) | | 50 g / 10 ms in 1 direction, 1000 shocks | | |
| Vibration (DIN EN 60068-2-6) | | 20 g / 20 … 2000 Hz in 3 axes, 10 cycles each | | |
| Protection class (DIN EN 60529) | | IP50 | | |
| Weight | | approx. 8 g | approx. 22 g | approx. 82 g |

FSO = Full Scale Output

[1] Specifications for analog outputs from page 58 onwards.

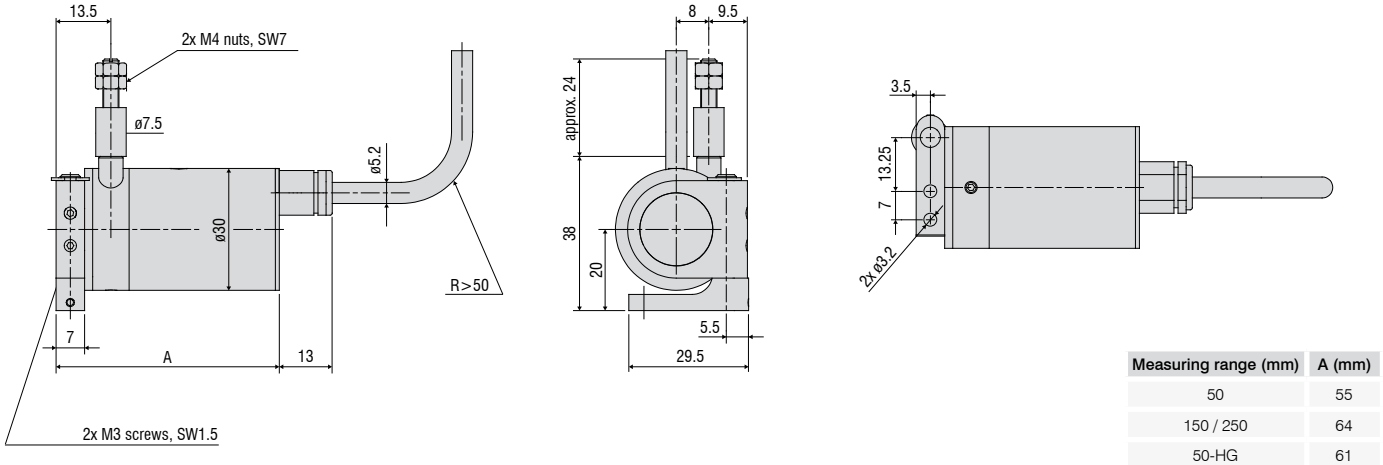
### Article designation

**WDS - 40 - MT - P**

- P: Output type: P: potentiometer
- MT: MT series
- 40: Measuring range in mm

# Robust miniature draw-wire sensors
# **wireSENSOR MPM analog**

- Compact miniature design
- Flexible mounting options due to swiveling mounting flange
- For very fast measurement movements, wire accelerations up to 100 g




| Measuring range (mm) | A (mm) |
|---|---|
| 50 | 55 |
| 150 / 250 | 64 |
| 50-HG | 61 |
| 150 / 250-HG | 70 |

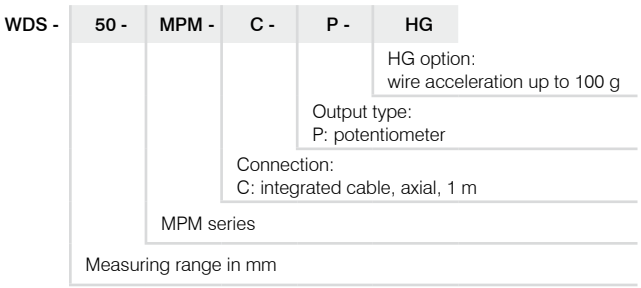
All dimensions in mm, not to scale

| Model | | | WDS-50-MPM | WDS-150-MPM | WDS-250-MPM |
|---|---|---|---|---|---|
| Measuring range | | | 50 mm | 150 mm | 250 mm |
| Analog output [1] | | | Potentiometer | | |
| Resolution | | | towards infinity | | |
| Linearity | Conductive plastic potentiometer P20 | ≤ ±0.2% FSO | ≤ ±0.125 mm | - | - |
| | Hybrid potentiometer P25 | ≤ ±0.25% FSO | - | ≤ ±0.3 mm | ≤ ±0.5 mm |
| Sensor element | | | Conductive plastic potentiometer | Hybrid potentiometer | |
| Wire extension force (max.) | | | approx. 3.5 N (HG option: 17 N) | | |
| Wire retraction force (min.) | | | approx. 1.5 N (HG option: 10 N) | | |
| Wire acceleration (max.) | | | approx. 25 g (HG option: 100 g) | | |
| Material | | Housing | Aluminum | | |
| | | Measuring wire | Stainless steel (ø 0.45 mm) | | |
| Wire mounting | | | M4 threaded bolts | | |
| Mounting | | | Mounting flange rotatable in two axes 180° / 360° | | |
| Temperature range | | Storage | -20 … +80 °C | | |
| | | Operation | -20 … +80 °C | | |
| Connection | | | integrated cable, axial, length 1 m | | |
| Shock (DIN EN 60068-2-27) | | | 50 g / 20 ms in 3 axes, 1000 shocks each | | |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 20 … 2000 Hz in 3 axes, 10 cycles each | | |
| Protection class (DIN EN 60529) | | | IP65 | | |
| Weight | | | approx. 150 g (incl. cable) | | |

FSO = Full Scale Output

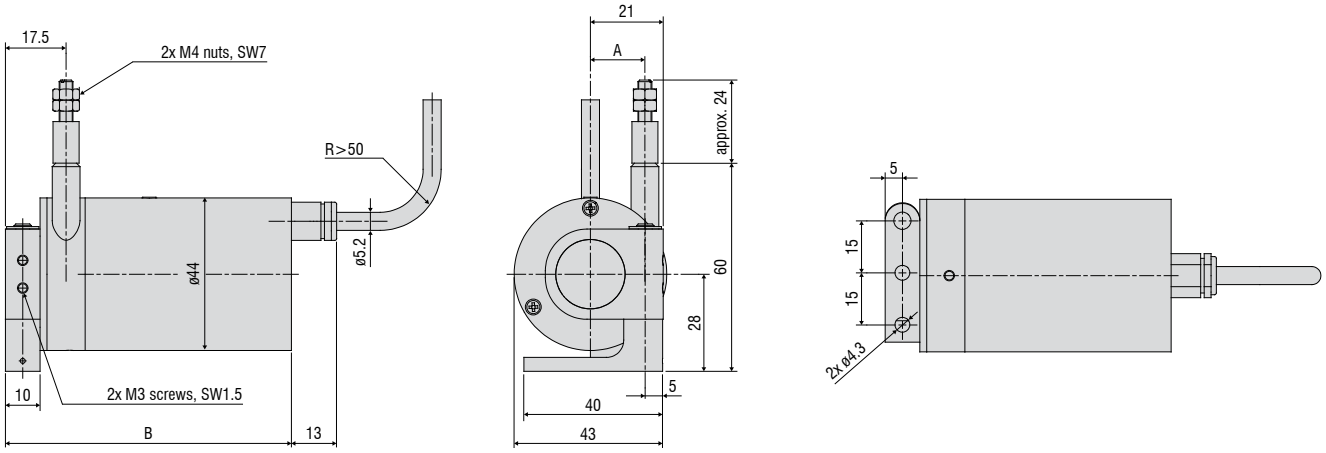
[1] Specifications for analog outputs from page 58 onwards.

### Article designation



# Robust miniature draw-wire sensors
# wireSENSOR MP / MPW analog

- Miniature design
- High protection class IP67 (MPW)
- For fast movements and harsh application environments



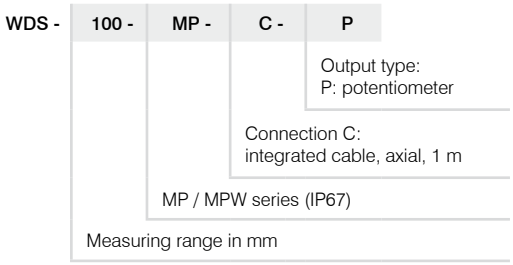

All dimensions in mm, not to scale

| Measuring range (mm) | A (mm) | B (mm) |
|---|---|---|
| 100 / 300 / 500 / 1000-MP | 15.7 | 82.5 |
| 100 / 300 / 500 / 1000-MPW | 15.7 | 86.5 |

| Model | | | WDS-100-MP(W) | WDS-300-MP(W) | WDS-500-MP(W) | WDS-1000-MP(W) |
|---|---|---|---|---|---|---|
| Measuring range | | | 100 mm | 300 mm | 500 mm | 1000 mm |
| Analog output [1] | | | Potentiometer | | | |
| Resolution | | | 0.15 mm | 0.2 mm | towards infinity | |
| Linearity | Hybrid potentiometer P10 | ≤ ±0.1% FSO | - | - | ≤ ±0.5 mm | ≤ ±1 mm |
| | Wire potentiometer P25 | ≤ ±0.25% FSO | - | ≤ ±0.75 mm | - | |
| | Wire potentiometer P50 | ≤ ±0.5% FSO | ≤ ±0.5 mm | - | - | - |
| Sensor element | | | Wire potentiometer | | Hybrid potentiometer | |
| Wire extension force (max.) | | | approx. 8.5 N | approx. 8.5 N | approx. 8.5 N | approx. 8 N |
| Wire retraction force (min.) | | | approx. 7 N | approx. 7 N | approx. 6.5 N | approx. 5 N |
| Wire acceleration (max.) | | | approx. 30 g | | | |
| Material | | Housing | Aluminum | | | |
| | | Measuring wire | Stainless steel (ø 0.45 mm) | | | |
| Wire mounting | | | M4 threaded bolts | | | |
| Mounting | | | Mounting flange rotatable in two axes 180° / 360° | | | |
| Temperature range | | Storage | -20 … +80 °C | | | |
| | | Operation | -20 … +80 °C | | | |
| Connection | | | integrated cable, axial, length 1 m | | | |
| Shock (DIN EN 60068-2-27) | | | 50 g / 20 ms in 3 axes, 1000 shocks each | | | |
| Vibration (DIN EN 60068-2-6) | | | 20 g / 20 … 2000 Hz in 3 axes, 10 cycles each | | | |
| Protection class (DIN EN 60529) | | MP series | IP65 | | | |
| | | MPW series | IP67 | | | |
| Weight | | | approx. 270 g (incl. cable) | | | |

FSO = Full Scale Output
[1] Specifications for analog outputs from page 58 onwards.

### Article designation



# Options
# wireSENSOR

**Customer-specific modifications for your series application**

If the standard models do not meet certain specific requirements, draw-wire sensors from the standard range can be adapted accordingly by Micro-Epsilon. Cost-effective implementation can already be achieved with medium-sized quantities (depending on the type and number of changes).

**Wire attachment**
- Wire clip
- Eyelet
- Thread
- Wire extension

**Measuring wire**
- Plastics
- Stainless steel (coated/uncoated)
- Different diameters
- Thicker wire for improved snap protection

**Connection/Output signal**
- Different cable lengths
- Different plug variants
- Redundant sensor element
- Adaption of supply voltage
- Inverted signal
- Redundant signal outputs
- Alignment cable/connector outlet

**Sensor mounting**
- Mounting bracket
- Mounting plate
- Magnetic holder

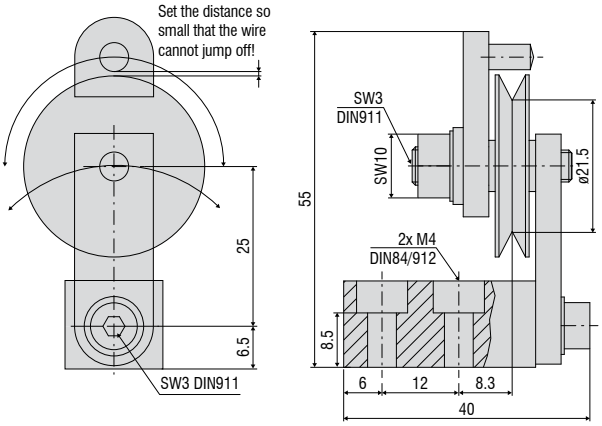
**Wire guide**
- Wire wiper
- Different designs of integrated deflection pulleys
- Wire outlet socket from ceramics for increased diagonal pull up to 15°

**Housing and environment**
- Wire outlet right (standard) / left
- Protection class up to IP69K
- Drainage holes
- Stainless steel spring
- Housing material
- Wire acceleration
- Snap protection

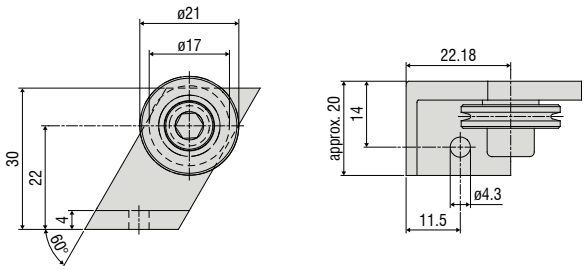
* Some options cannot be combined with each other; availability of options on request

## Wire deflection pulleys for external installation

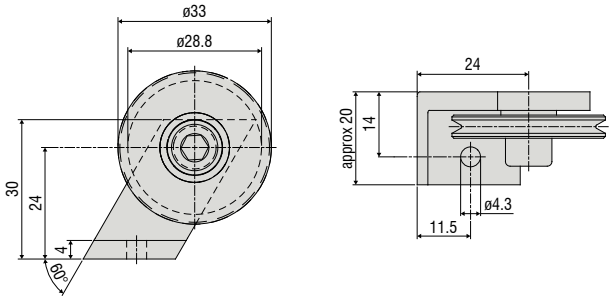
**TR1-WDS**
Wire deflection pulley, adjustable, for sensors with a wire diameter ≤ 0.45 mm




**TR3-WDS**
Wire deflection pulley, fixed, for sensors with a wire diameter ≤ 0.45 mm

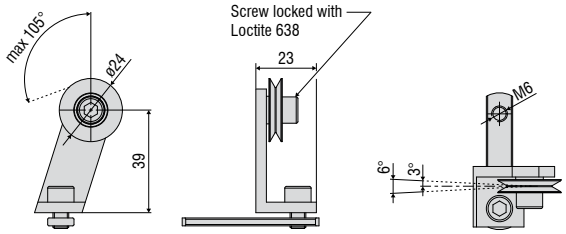



**TR4-WDS**
Wire deflection pulley, fixed, for sensors with a wire diameter of 0.8 mm to 1 mm



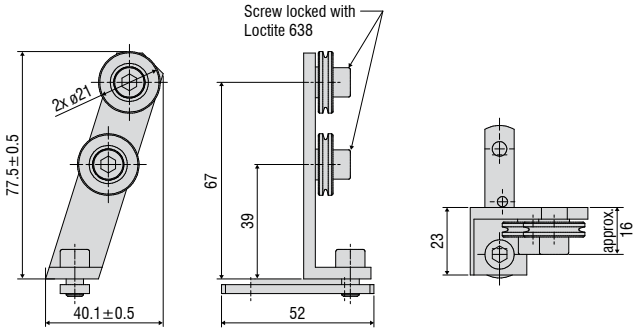

## Wire deflection pulley for direct installation on the sensor housing

**TR5-WDS**
Integrated wire deflection pulley for P115 sensors with a wire diameter of 0.45 mm

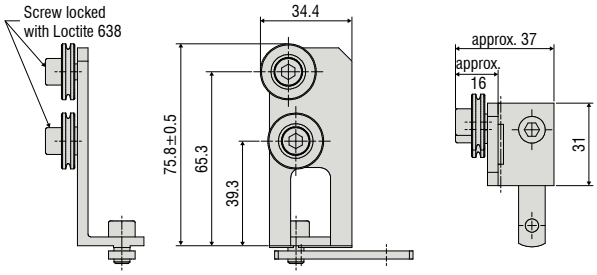



All dimensions in mm, not to scale

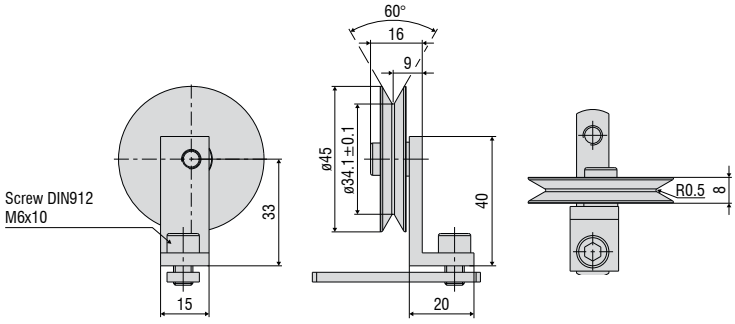
**TR5-WDS(03)**
Integrated double deflection pulley for P115 sensors with a wire diameter of 0.45 mm



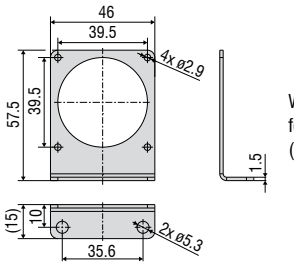

**TR5-WDS(04)**
Integrated double deflection pulley, 90° angled, for P115 sensors with a wire diameter of 0.45 mm



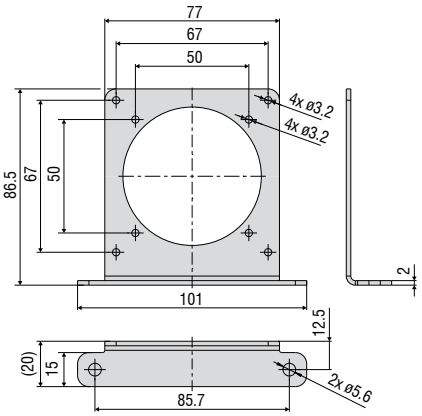

**TR6-WDS(01)**
Integrated wire deflection pulley for the P115 sensors with a wire diameter of 1 mm



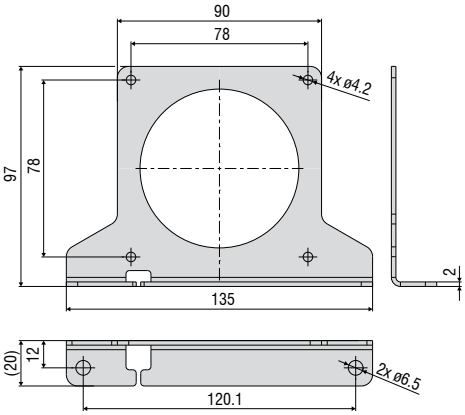

## Mounting bracket set




WPS-MB46
for the MK46 series
(Output types: P10/P25/E/E830)




WPS-MB77
for the MK77 series

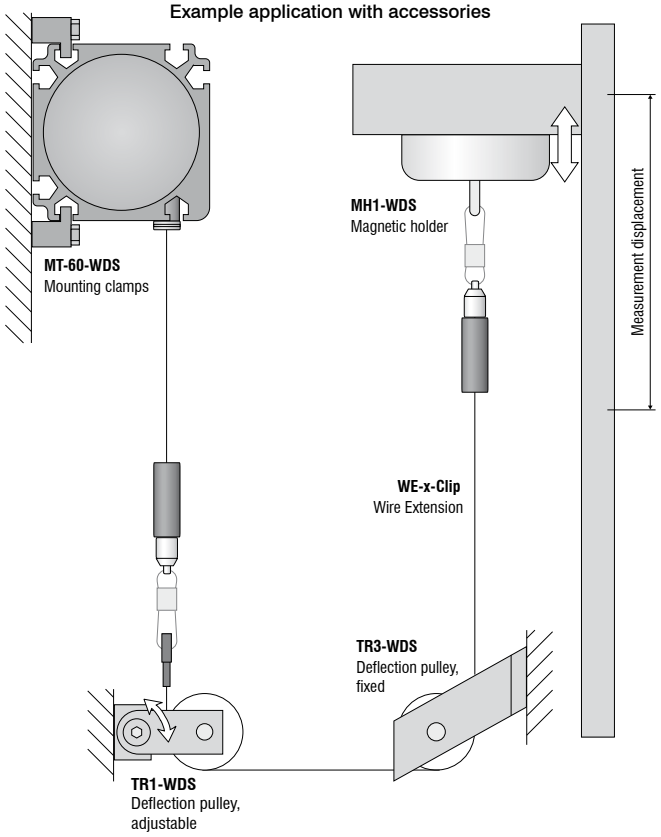



WPS-MB88
for the MK88 series

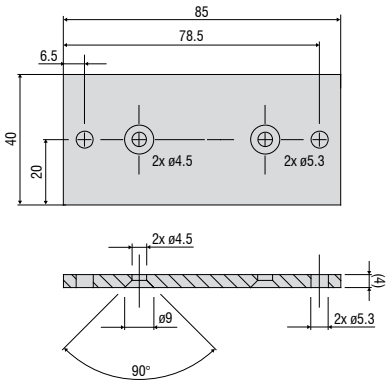
# Accessories & Notes for installation
# wireSENSOR

| Accessories | |
|---|---|
| WE-xxxx-M4 | Wire extension with M4 wire connection, x=wire length |
| WE-xxxx-Clip | Wire extension with eyelet, x = wire length |
| WE-xxx-Clip-WSS | Wire extension with clip and uncoated wire d=0.45 mm |
| WE-xxxx-Ring-PW | Wire extension with plastic ring and para-aramid wire, 1 mm |
| GK1-WDS | Fork head for M4 |
| MH1-WDS | Magnetic holder for wire attachment |
| MH2-WDS | Magnetic holder for sensor mounting |
| MT-60-WDS | Mounting clamps for WDS-P60 |
| FC8 | Mating plug for WDS straight, 8-pin |
| FC8/90 | Mating plug, 90° angled for WDS |
| PC3/8-WDS | Sensor cable, 3 m long, for WDS with 8-pin cable connector |
| WDS-MP60 | Mounting plate for P60 models |
| WPS-MB46 | Mounting bracket set for the MK46 series (output type: P10/P25/E/E830) |
| WPS-MB77 | Mounting bracket set for the MK77 series |
| WPS-MB88 | Mounting bracket set for the MK88 series |
| PC2/10-WDS-A | Cable for SSI encoder, 2 m long |
| PC10/10-WDS-A | Cable for SSI encoder, 10 m long |
| PC5/5-IWT | Sensor cable, 5 m long, M12x1 connector, 5-pin, A-coding |

Example application with accessories




**WDS-MP60**
Mounting plate for P60 models



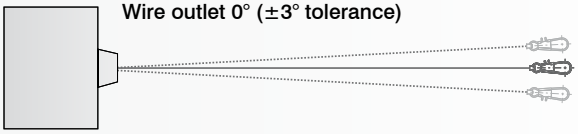

All dimensions in mm, not to scale

**Installation instructions:**

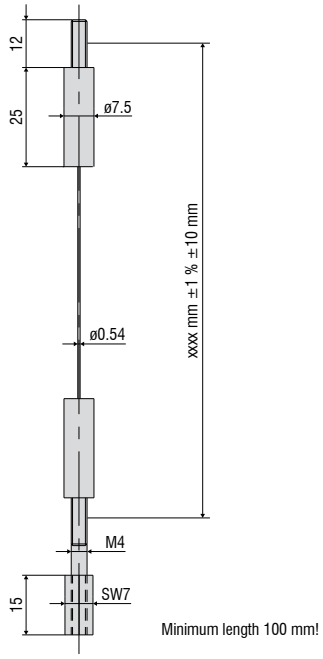
Wire attachment: during installation, do not allow at any time the measuring wire to freely return.

Angle of wire outlet: Make sure during installation that the wire outlet is straight (tolerance of ±3°). Exceeding this tolerance leads to increased wear of the wire material and on the wire outlet.

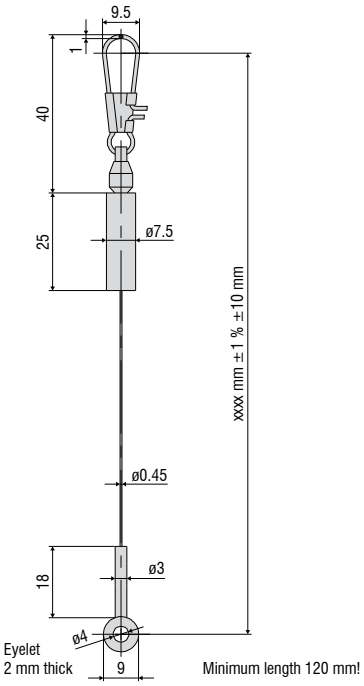
**Wire outlet 0° (±3° tolerance)**



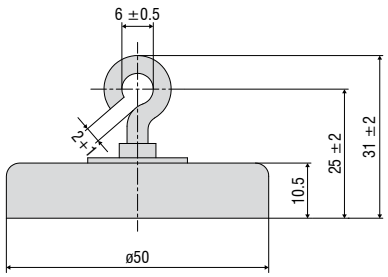
**WE-xxxx-M4**
Wire extension with M4 wire connection, x=wire length



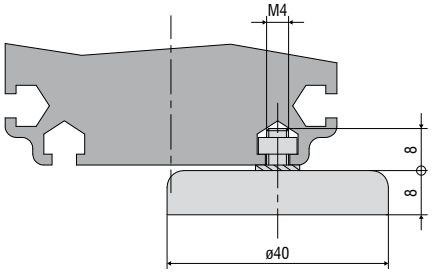

**WE-xxxx-Clip**
Wire extension with eyelet, x = wire length



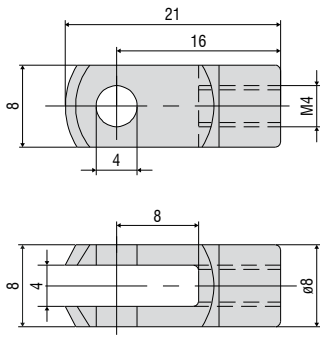

**MH1-WDS**
Magnetic holder for wire attachment



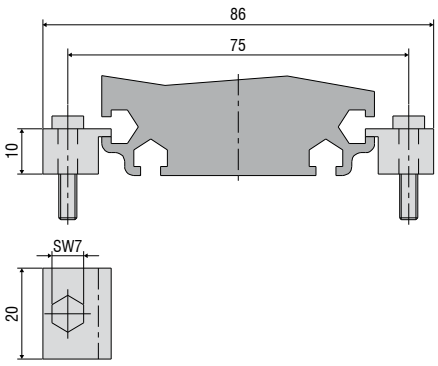

**MH2-WDS**
Magnetic holder for sensor mounting




**GK1-WDS**
Fork head for M4

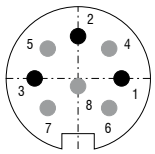
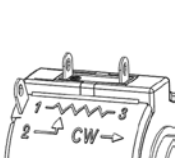
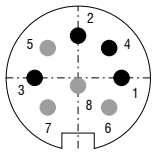
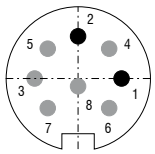



**MT-60-WDS**
Mounting clamps for WDS-P60



# Output specifications
# wireSENSOR

## Analog

| Output | Connector M16<br>-SA / -SR | Integrated cable<br>-CA / -CR | Open contacts |
|---|---|---|---|
| **Potentiometer output (P)** | | | |
| Input voltage: max. 32 VDC with 1 kOhm / max. 1 W<br>Resistance: 1 kOhm ±10 % (resistance divider)<br>Temperature coefficient: ±0.0025 % FSO/°C |  <br>Sensor side<br>1 = Input +<br>2 = Ground<br>3 = Signal | White = Input +<br>Brown = Ground<br>Green = Signal |  <br>1 = Input +<br>2 = Signal<br>3 = Ground |
| **Voltage output (U)** | | | |
| Supply voltage: 14 ... 27 VDC (non-stabilized)<br>Current consumption: max. 30 mA<br>Output voltage: 0 ... 10 VDC<br>Option 0 ... 5 / ±5 V<br>Load resistance: >5 kOhm<br>Output noise: 0.5 $mV_{eff}$<br>Temperature coefficient: ±0.005 % FSO/°C<br>Electromagnetic compatibility (EMC): EN 61000-6-4<br>EN 61000-6-2 |  <br>Sensor side | | |
| **Adjustment range** (if supported by the model)<br>Zero: ±20 % FSO<br>Sensitivity: ±20 % | 1 = Power supply<br>2 = Ground<br>3 = Signal<br>4 = Ground | White = Supply<br>Brown = Ground<br>Green = Signal<br>Yellow = Ground | |
| **Current output (I)** | | | |
| Supply voltage: 14 ... 27 VDC (non-stabilized)<br>Current consumption: max. 35 mA<br>Output current: 4 ... 20 mA<br>Load: <600 Ohm<br>Output noise: <1.6 $\mu A_{eff}$<br>Temperature coefficient: ±0.01 % FSO/°C<br>Electromagnetic compatibility (EMC): EN 61000-6-4<br>EN 61000-6-2 |  <br>Sensor side | | |
| **Adjustment range** (if supported by the model)<br>Zero: ±18 % FSO<br>Sensitivity: ±15 % | 1 = Power supply<br>2 = Ground | White = Supply<br>Brown = Ground | |

# CANopen

## (for the MK88 and K100 series)

| CANopen features | |
|---|---|
| Profiles | Communication profile CiA 301. Device profile CiA 406 (absolute linear encoder) |
| SDO | 1x SDO server |
| PDO | 2x TxPDO |
| PDO modes | Event/time-triggered, synchronous (cyclic/acyclic) |
| Preset value | The "Preset" parameter can be used to set the current measured value to any value. The difference from the original value is stored in the object. |
| Direction | Via the operating parameter, the counting direction of the measured values can be reversed |
| Diagnosis | Heartbeat, Emergency Message |
| Default setting | AutoBaud(9), Node-ID 1 |

| Setting the baud rate | |
|---|---|
| Baud rate adjustable via LSS or object 0x3001 | |
| 0 | 1000 kBaud |
| 2 | 500 kBaud |
| 3 | 250 kBaud |
| 4 | 125 kBaud |
| 6 | 50 kBaud |
| 9 | AutoBaud (default) |

| Description of the connections | |
|---|---|
| Pin | Assignment |
| 1 | n. c. |
| 2 | V+ (7…32VDC) |
| 3 | GND |
| 4 | CAN-High |
| 5 | CAN-Low |

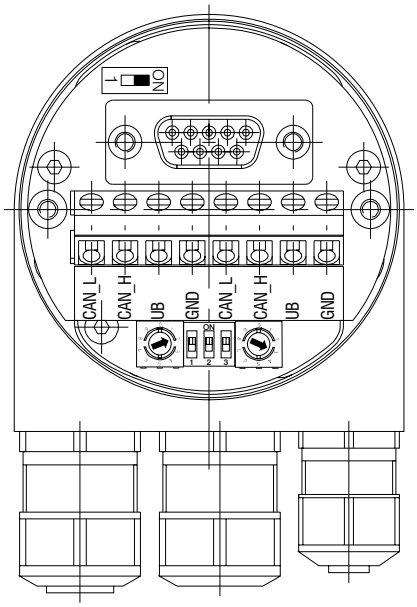

5-pin
housing connector
View on pin side
A-coded

| Setting the subscriber address (node ID) |
|---|
| Address adjustable via LSS or object 0x3000 (1....127, 1=default) |

# Output specifications
# wireSENSOR

## CANopen
(for P60, P96, P115 and P200 series)

| 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 transmits the current actual process value without a request by a master. The cycle time can be parameterized for values between 1 and 65,535 ms. Synch mode (synch-cyclic). The encoder transmits the current actual process value after receiving a synch telegram sent by a master. The synch counter in the encoder can be parameterized such that the position value is transmitted only 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. |
| Rotary direction | With the operating parameter the rotary direction in which the output code is to increase or decrease can be parameterized. |
| Scaling | The steps per rotation and the total revolution can be parameterized. |
| Diagnosis | The encoder supports the following error messages:<br>- Position and parameter errors<br>- Lithium cell voltage at lower limit value (multi-turn) |
| Default setting | 50 kbit/s, node number 1 |




Setting of the terminating resistor CANopen


ON = Last participant

OFF = Participant X

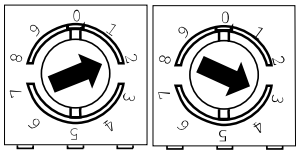
| Setting the CANopen baud rate | | | |
|---|---|---|---|
| Baud rate | DIP switch setting | | |
| | 1 | 2 | 3 |
| 10 kBit/s | OFF | OFF | OFF |
| 20 kBit/s | OFF | OFF | ON |
| 50 kBit/s | OFF | ON | OFF |
| 125 kBit/s | OFF | ON | ON |
| 250 kBit/s | ON | OFF | OFF |
| 500 kBit/s | ON | OFF | ON |
| 800 kBit/s | ON | ON | OFF |
| 1 MBit/s | ON | ON | ON |

| Description of the CANopen connections | |
|---|---|
| CAN_L | CAN bus signal (dominant Low) |
| CAN_H | CAN bus signal (dominant High) |
| V+ | Supply voltage 10 ... 30 VDC |
| GND | Ground connection for V+ |

(Terminals with the same designation are internally interconnected)

**Settings of the CANopen participant address**

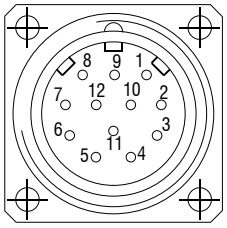
Address can be set with rotary switch. Example: Participant address 23



# SSI (Gray Code)

| Connections | |
|---|---|
| 1 V+ | Supply connection of rotary encoder |
| 2 GND | Ground connection of rotary encoder<br>The voltage drawn to GND is V+ |
| 3 Pulses + | Positive SSI clock 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 point within the total resolution.<br>The zeroing process is triggered by a High pulse (pulse duration ≥100 ms) and must take place after the rotating direction selection (F/R). 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 clock input. Pulse - forms a current loop with Pulse +. A current of approx. 7 mA in direction of the clock input generates a logical 0 in positive logic. |
| 8 / 10 DATAVALID / DATAVALID MT | Diagnosis outputs DV and DV MT Jumps in data word, e.g., due to defective LED or photo receiver, are displayed via the DV output. In addition, the power supply of the multi-turn sensor unit is monitored and the DV MT output is set when the voltage falls below a specified level. Both outputs are low-active, i.e. are switched through to GND in the event of an error. |
| 9 F/R | Forward/reverse counting direction input. When not connected, this input is on High. F/R High means increasing output data with a clockwise rotating shaft when looking at the flange. F/R Low means increasing values with a counterclockwise rotating shaft when looking at the flange. |
| 11 / 12 | Not assigned |

| Pin assignment | | |
|---|---|---|
| Connector | Cable color | Assignment |
| 1 | brown | V+ |
| 2 | black | GND |
| 3 | blue | Pulse + |
| 4 | beige | Data + |
| 5 | green | ZERO |
| 6 | yellow | Data - |
| 7 | purple | Pulse - |
| 8 | brown-yellow | $\overline{\text{DATAVALID}}$ |
| 9 | pink | F/R |
| 10 | black-yellow | $\overline{\text{DATAVALID}}$ $\overline{\text{MT}}$ |
| 11 | - | - |
| 12 | - | - |




Use twisted-pair cables as extension cables.

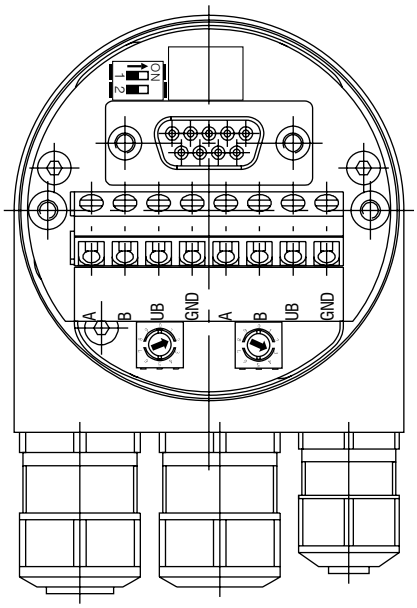
| Inputs | |
|---|---|
| Control signals F/$\overline{\text{R}}$ and zero | |
| High level | > 0.7 V+ |
| Low level | < 0.3 V+ |
| Circuitry | F/$\overline{\text{R}}$ input with 10 kOhm against V+,<br>Zero-setting input with 10 kOhm against GND. |
| SSI clock | |
| Optocoupler inputs for galvanic isolation | |

| Outputs | | |
|---|---|---|
| SSI data | RS485 driver | |
| Diagnosis outputs | | |
| Push-pull outputs, short circuit proof | | |
| High level | > V+ -3.5 V | (with I = -20 mA) |
| Low level | ≤ 0.5 V | (with I = 20 mA) |

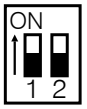
# Output specifications
# wireSENSOR

## PROFIBUS

| Profibus DP features | |
|---|---|
| Bus protocol | Profibus DP |
| Profibus features | Device class 1 and 2 |
| Data Exch. Functions | Input: Position value<br>Additional configurable speed signal (output 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 | Rotary direction: With the operating parameter the rotary direction for which the output code is to increase or decrease can be parameterized.<br>Scaling: The steps per rotation and the total revolution can be parameterized. |
| Diagnosis | The encoder supports the following error messages:<br>- Position error<br>- Lithium cell voltage at lower limit value (multi-turn) |
| Default setting | Participant address 00 |

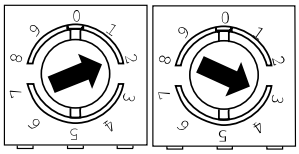



Setting of the terminating resistor Profibus DP




ON = Last participant
OFF = Participant X

| Settings of the Profibus participant address |
|---|
| Address can be set with rotary switch. Example: Participant address 23 |

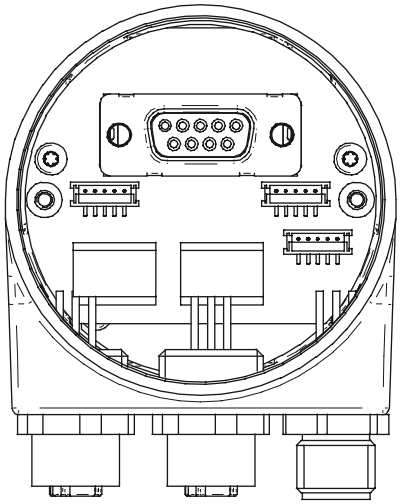


| Profibus DP connections |
|---|
| A Negative serial data line |
| B Positive serial data line |
| V+ supply voltage 10 ... 30 VDC |
| GND ground connection for V+ |

(Terminals with the same designation are internally interconnected)

# PROFINET

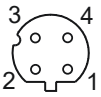
| PROFINET features | |
|---|---|
| Bus protocol | PROFINET |
| Device profile | Encoder profile PNO 3.162 Version 4.1 |
| Features | - 100 MBaud Fast Ethernet<br>- Automatic address assignment<br>- Real-time (RT) Class 1, IRT Class 2, IRT Class 3 |
| Process data | - Position value 32-Bit input data with/without rotational speed 16/32 Bit<br>- Telegram 81-83 of the Profidrive profile |



| Pin assignment | | |
|---|---|---|
| Supply voltage | | |
| Connector | Connection | Description |
| Pin 1 | V+ | Supply voltage |
| Pin 2 | N.C. | Not assigned |
| Pin 3 | GND | Ground connection |
| Pin 4 | N.C. | Not assigned |


1x M12 connector (pin), A-coded

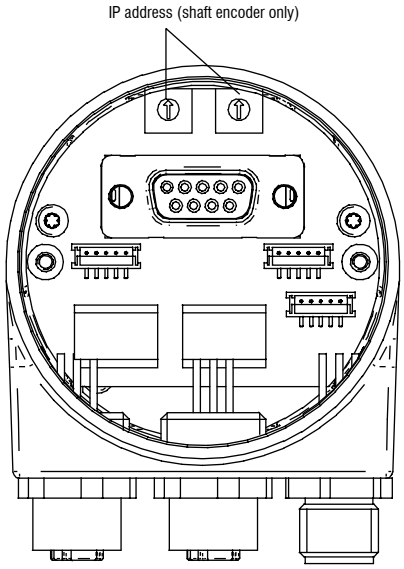
| PROFINET (data line) | | |
|---|---|---|
| Connector | Connection | Description |
| Pin 1 | TxD+ | Transmitted data+ |
| Pin 2 | RxD+ | Received data+ |
| Pin 3 | TxD- | Transmitted data- |
| Pin 4 | RxD- | Received data- |




1x M12 connector (pin), A-coded

# EtherNet/IP

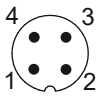
| Characteristics - EtherNet/IP | |
|---|---|
| Bus protocol | EtherNet/IP |
| Device profile | Encoder Device, Type22hex,<br>according to CIP specification |
| Features | - 100 MBaud Fast Ethernet<br>- Programmable IP address<br>- Automatic IP address assignment (DHCP)<br>- Direction of rotation, resolution, total resolution and preset programmable according to CIP specification |
| Process data | Position value, warning flag, alert flag<br>Assembly Instances 1 and 2 according to<br>CIP specification |




**Pin assignment**

**Supply voltage**

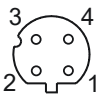
| Connector | Connection | Description |
|---|---|---|
| Pin 1 | UB | Supply voltage |
| Pin 2 | N.C. | Not assigned |
| Pin 3 | GND | Ground connection |
| Pin 4 | N.C. | Not assigned |




1x M12 connector (pin), A-coded

**EtherNet/IP (data line)**

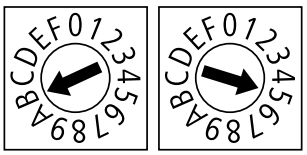
| Connector | Connection | Description |
|---|---|---|
| Pin 1 | TxD+ | Transmitted data+ |
| Pin 2 | RxD+ | Received data+ |
| Pin 3 | TxD- | Transmitted data- |
| Pin 4 | RxD- | Received data- |




2x M12 connectors (socket), D-coded

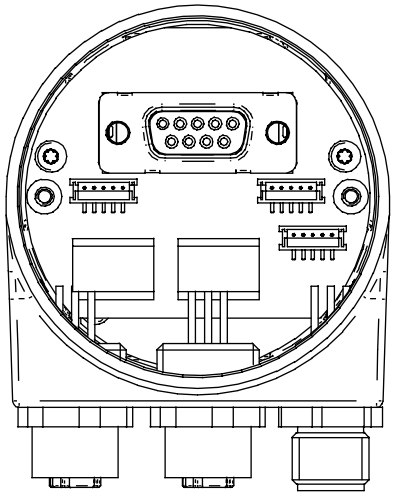
**IP address**

Adjustable via HEX rotary switch. Example: IP address$B5_{hex}$
Configuration via DHCP: 00hex



# EtherCAT

| Characteristics - EtherCAT | |
|---|---|
| Bus protocol | EtherCAT |
| Device profile | CoE (CANopen over EtherCAT)<br>DSP406 |
| Features | - 100 MBaud Ethernet<br>- Automatic address assignment<br>- Distributed-Clock for precise synchronization.<br>Device can be configured as „Reference Clock“<br>- Default 10 byte PDO, configurable<br>4 byte PDO / 2 byte PDO for shorter cycle times |
| Process data | Position value<br>Warnings<br>System time |
| Cycle times | Depending on sensor type, activated scaling function and PDO length.<br>Min. cycle time: 62.5 $\mu$s |
| Synchronization | 0x00 Free Run, not synchronized<br>0x03 Distributed clocks DC, synchronized with SYNCO/SYNC1 event |



**Pin assignment**

**Supply voltage**

| Connector | Connection | Description |
|---|---|---|
| Pin 1 | UB | Supply voltage |
| Pin 2 | N.C. | Not assigned |
| Pin 3 | GND | Ground connection |
| Pin 4 | N.C. | Not assigned |


1x M12 connector (pin), A-coded

**EtherCAT (data line)**

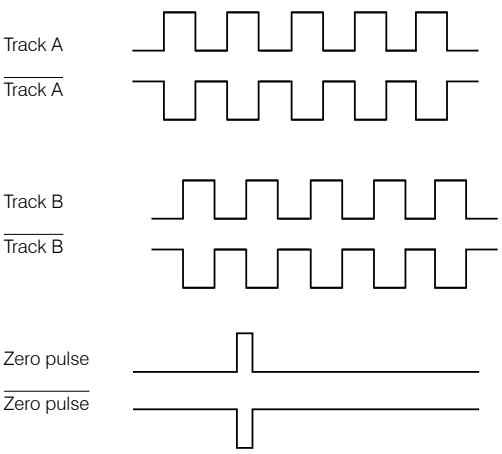
| Connector | Connection | Description |
|---|---|---|
| Pin 1 | TxD+ | Transmitted data+ |
| Pin 2 | RxD+ | Received data+ |
| Pin 3 | TxD- | Transmitted data- |
| Pin 4 | RxD- | Received data- |


2x M12 connectors (socket), D-coded

# Output specifications
# wireSENSOR

## Incremental encoder

**Output signals**




| TTL Output | Line driver (5 VDC) | |
|---|---|---|
| High level | ≥ 2.5 V | (with I = -20 mA) |
| Low level | ≤ 0.5 V | (with I = 20 mA) |
| High load | ≤ 20 mA | |
| Tracks | A, $\overline{A}$, B, $\overline{B}$, 0 | |

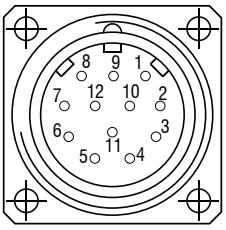
| Output TTL01/ TTL02 | NPN (5 VDC ±5 %) |
|---|---|
| High level | > 4.5 V |
| Low level | < 1.0 V |
| High load | ≤ 3 mA |
| Tracks (TTL01) | A, B, 0 |
| Tracks (TTL02) | A, $\overline{A}$, B, $\overline{B}$, 0 |

| Output HTL | Push-pull (10 ... 30 VDC) | |
|---|---|---|
| High level | ≥ V+ -3 V | (with I = -20 mA) |
| Low level | ≤ 1.5 V | (with I = 20 mA) |
| High load | ≤ 40 mA | |
| Tracks | A, $\overline{A}$, B, $\overline{B}$, 0 | |

| Output E | Push-pull (5 VDC) |
|---|---|
| High level | ≥ V+ -2.5 V |
| Low level | ≤ 0.5 V |
| High load | ≤ 50 mA |
| Tracks | A, B, 0 |

| Output E830 | Push-pull (8 ... 30 VDC) |
|---|---|
| High level | ≥ V+ -3 V |
| Low level | ≤ 2.5 V |
| High load | ≤ 50 mA |
| Tracks | A, B, 0 |

| Pin assignment TTL, HTL | | |
|---|---|---|
| Connector | Cable color | Assignment |
| Pin 1 | pink | Track B inv. |
| Pin 2 | blue | V+ Sense |
| Pin 3 | red | Track N (zero pulse) |
| Pin 4 | black | Track N inv. (zero pulse inv.) |
| Pin 5 | brown | Track A |
| Pin 6 | green | Track inv. |
| Pin 7 | - | - |
| Pin 8 | gray | Track B |
| Pin 9 | - | - |
| Pin 10 | white-green | GND |
| Pin 11 | white | GND Sense |
| Pin 12 | brown-green | V+ |




V+ Sense and GND Sense are directly connected to V+ or GND. Recommendation: Use twisted-pair cables (e.g. A/A inv.) from a cable length of 10 m.

| Pin assignment E, E830 | |
|---|---|
| Cable color | Assignment |
| white | 0 V |
| brown | V+ |
| green | A |
| - | $\overline{A}$ |
| yellow | B |
| - | $\overline{B}$ |
| gray | 0 |

| Pin assignment TTL01 | |
|---|---|
| Cable color | Assignment |
| brown | 0 V |
| gray | V+ |
| white | A |
| green | B |
| yellow | 0 |

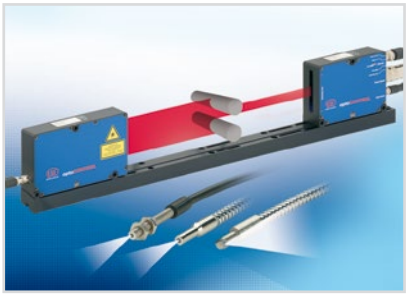
| Pin assignment TTL02 | |
|---|---|
| Cable color | Assignment |
| red | V+ |
| black | 0 V |
| brown | A |
| black | $\overline{A}$ |
| orange | B |
| black | $\overline{B}$ |
| yellow | 0 |
| black | n. c. |

## Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

Sensors and measurement devices for non-contact temperature measurement

Measuring and inspection systems for metal strips, plastics and rubber



Optical micrometers and fiber optics, measuring and test amplifiers

Color recognition sensors, LED analyzers and inline color spectrometers

3D measurement technology for dimensional testing and surface inspection



MICRO-EPSILON

MICRO-EPSILON Headquarters
Koenigbacher Str. 15 · 94496 Ortenburg / Germany
Tel. +49 (0) 8542 / 168-0 · Fax +49 (0) 8542 / 168-90
info@micro-epsilon.com · **www.micro-epsilon.com**