



Operating Instructions wire**SENSOR**, Serie WPS

WPS-1500-K100-U
WPS-2500-K100-U
WPS-3500-K100-U
WPS-5000-K100-U
WPS-8000-K100-U

WPS-1500-K100-I
WPS-2500-K100-I
WPS-3500-K100-I
WPS-5000-K100-I
WPS-8000-K100-I

WPS-1500-K100-CR-P
WPS-2500-K100-CR-P
WPS-3500-K100-CR-P
WPS-5000-K100-CR-P
WPS-8000-K100-CR-P

WPS-1500-K100-SR12-CO
WPS-2500-K100-SR12-CO
WPS-3500-K100-SR12-CO
WPS-5000-K100-SR12-CO
WPS-8000-K100-SR12-CO

Declaration of Incorporation

Declaration of incorporation according to the EC Machinery Directive 2006/42/EC, Annex II B

The manufacturer and person authorized to compile the relevant technical documents

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Königbacher Straße 15
94496 Ortenburg / Germany

hereby declare that the machine designated below complies with the relevant fundamental health and safety requirements of the EC Machinery Directive, including modifications to it applicable at the time of this declaration, based on its design and construction and in the version put on the market by us – to the extent that the scope of supply allows.

Machine design: Draw-wire sensor (mechanics and models with potentiometer output)

Type designation: WDS-xxx, WPS-xxx

The following fundamental health and safety requirements according to Annex I of the directive specified above have been applied and complied with:

- No. 1.1.2. Principles of safety integration
- No. 1.7.3. Marking of machinery
- No. 1.7.4. Operating instructions

Furthermore, we declare compliance with the following directives and standards including the modifications applicable at the time this declaration is made:

- Directive 2006/42/EC (machinery)
 - EN ISO 13857:2019 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
 - EN 60204-1:2018 Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- Directive 2011/65/EU (RoHS)
 - EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic devices with respect to the restriction of hazardous substances

We also declare that the special technical documentation for this partially completed machine has been created in accordance with Annex VII, Part B, and commit ourselves to disclose this to the market surveillance authorities upon request. The commissioning of these partially completed machines is prohibited until the partially completed machine(s) has/have been installed in a machine that meets the requirements of the EC Machinery Directive and for which an EU Declaration of Conformity according to Annex II, Part A exists.



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Appendix

1. Safety

Sensor operation assumes knowledge of the operating instructions.

1.1 Symbols Used

The following symbols are used in these operating instructions:



Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.



Indicates a situation that may result in property damage if not avoided.



Indicates a user action.



Indicates a tip for users.

1.2 Warnings



Do not open the sensor housing.

- > Risk of injury due to pre-tensioned spring motor

Do not let the measuring wire snap.

- > Risk of injury due to whiplash of the wire with wire clips
- > Destruction of the wire and/or the sensor

Do not pull or loop the measuring wire around unprotected body parts.

- > Risk of injury

Connect the power supply according to the safety regulations for electrical equipment.

- > Risk of injury
- > Damage to or destruction of the sensor

NOTICE

Do not pull out the measuring wire beyond the measuring range listed.

> Destruction of the measuring wire and/or the sensor

The supply voltage must not exceed the specified limits

> Damage to or destruction of the sensor

Avoid shocks and impacts to the sensor.

> Damage to or destruction of the sensor

1.3 Notes on CE Marking

For WPS draw-wire displacement sensors with voltage, current, digital or encoder outputs, the EU Directives 2014/30/EU, 2011/65/EU shall apply. In addition, the Machinery Directive is taken into consideration (2006/42/EC.).

These sensors carry the CE mark and satisfy the requirements of the EU Directives cited and the European harmonized standards (EN) listed therein.

The EU Declaration of Conformity is available to the responsible authorities at:

MICRO-EPSILON MESSTECHNIK

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Draw-wire displacement sensors with potentiometer output are devices (components) which cannot be operated autonomously and do not carry a CE mark. For WPS draw-wire displacement sensors with potentiometer output, the directives 2006/42/EC and 2011/65/EU shall apply. Therefore, an EU Declaration of Conformity is not issued according to EMC law and the Machinery Directive. The Declaration of Incorporation shall apply.

Sources: EMVG (Electromagnetic Compatibility of Equipment law), guidelines on the application of Directive 2014/35/EU, Directive 2006/42/EC.

1.4 Intended Use

- Draw-wire displacement sensors are designed for use in industrial applications. It is used for
 - displacement and movement measurements,
 - measuring the position of parts or moving machine components.
- Sensors must only be operated within the limits specified in the technical data, [see 2.3](#).
- Draw-wire displacement sensors must be used only in such a way that no persons are endangered or machines and other material goods are damaged in the event of malfunction or total failure of the sensor.
- Take additional precautions for safety and damage prevention in case of safety-related applications.

1.5 Proper Environment

- Protection class: IP67
IP69K ¹
- Temperature range:
 - Operation: -40 ... +85 °C (-40 ... +185 °F)
 - Storage: -40 ... +85 °C (-40 ... +185 °F)
- Humidity: 5 - 95 % (non-condensing)
- Ambient pressure: Atmospheric pressure

1.6 Foreseeable Misuse

Do not pull out the measuring wire beyond the measuring range listed. This causes the wire to break and thus uncontrolled snapping of the measuring wire. Risk of injury.

Do not have sensor held by a second person while the measuring wire is pulled out. Risk of snapping and thus injury.

1) With plug version only when connected

2. Functional Principle, Technical Data

2.1 Measuring Principle

The draw-wire principle transforms a linear movement into a change in resistance.

A measuring wire made of highly flexible stainless-steel cores is wound onto a drum by using a durable spring motor.

The winding drum is coupled axially with a potentiometer.

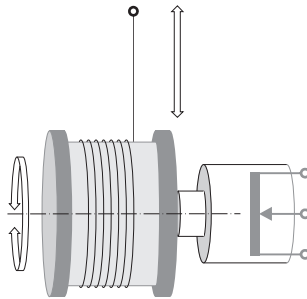


Fig. 1 Draw-wire displacement sensor with potentiometer

2.2 Structure

The draw-wire principle is applied in the housing design K100 with different measuring ranges from 1500 to 8000 mm.

There are 3 possible electrical connections:

- Potentiometer output (resistance divider)
- Voltage output (with integrated controller)
- Current output (with integrated controller)
- CANopen (with integrated controller)

2.3 Technical Data Analog

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	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.)	ca. 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 (-40 ... +185 °F)			
	Operation	-40 ... +85 °C (-40 ... +185 °F)			
Connector	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 (ISO 20653)	IP67 / IP69K ¹				
Weight	approx. 500 g				

FSO = Full Scale Output

2.4 Technical Data Digital

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	CANopen				
Resolution	0.37 mm	0.61 mm	0.85 mm	1.22 mm	1.95 mm
Linearity	≤ ±0.15 % d.M.	≤ ±2.25 mm	-	-	-
	≤ ±0.20 % d.M.	-	≤ ±5 mm	-	-
	≤ ±0.25 % d.M.	-	-	≤ ±8.75 mm	≤ ±12.5 mm
	≤ ±0.35 % d.M.	-	-	-	≤ ±28 mm
Sensor element	Hybrid potentiometer				
Wire extension force (max.)	approx. 10 N				
Wire retraction force (max.)	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			
Connector	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 (ISO 20653)	IP67 / IP69K ¹				
Weight	approx. 500 g				

FSO = Full Scale Output 2) With plug version only when connected. Available on request with two 5-pin M12x2 connectors (male-female, looped through).

3. Delivery

3.1 Unpacking/Included in Delivery

1 Sensor

4 Slot nuts

1 Assembly instruction

➡ Do not remove draw-wire displacement sensors from packaging using the wire or wire clip.

➡ Transport them in such a way that they cannot be damaged.

➡ Check the delivery for completeness and shipping damage immediately after unpacking.

➡ If there is damage or parts are missing, immediately contact the manufacturer or your supplier.

•
I The transport lock of the measuring wire must only be removed immediately prior to installation and only by technical staff.

Optional accessories are listed in the chapter Appendix.

3.2 Storage



Store sensors solely with the transport lock installed. This prevents the measuring wire from ever being pulled out and unintentional snapping.

> Risk of injury due to whiplash of the wire with wire clip

- Temperature range for storage: -40 ... +85 °C (-40 ... +185 °F)
- Humidity: 5 - 95 % (non-condensing)
- Atmospheric pressure

⚠ CAUTION

Free return of measuring wire not permitted!

- > Risk of injury due to whiplash of the wire with wire clip.
- > Destruction of the wire and/or the sensor.

Secure the measuring wire during installation work.

4. Installation and Assembly

4.1 Precautions

Do not pull out the measuring wire beyond the measuring range listed.

- > Damage to or destruction of the sensor

Do not damage the measuring wire.

Do not oil or grease the measuring wire.

Do not kink the measuring wire.

Do not pull the measuring wire diagonally.

Do not let the measuring wire drag around objects.

Attach the measuring wire to the measured object while the wire is retracted.

Do not wrap the measuring wire around body parts.

4.2 Sensor Mounting

- ➡ Mount the sensor either with M6 screws (through-hole) or with slot nuts (mounting grooves) according to the specifications in the following table and according to the following figures, [see Fig. 2](#), [see Fig. 3](#).

Model	Screws for through-hole	Slot nuts for mounting grooves
WPS-1500-K100	3 x M6	M6 x 3.2 mm
WPS-2500-K100	3 x M6	M6 x 3.2 mm
WPS-3500-K100	3 x M6	M6 x 3.2 mm
WPS-5000-K100	3 x M6	M6 x 3.2 mm
WPS-8000-K100	3 x M6	M6 x 3.2 mm

The slot nuts can be mounted on each side and positioned as desired.

Make sure that the thread length of the screws, which you use for the slot nuts, protrude from the sensor edge between 5 mm and 7 mm into the mounting groove.

> Damage of the sensor housing due to the screw being too long

The sensor does not have to be oriented in a special way.

- ➡ Select the installation position in such a way that damage to or contamination of the measuring wire is avoided.

- **i** If possible, prefer an installation position in which the measuring wire exits downward. This prevents liquids from entering the measuring wire outlet.
- **i** Do not let the measuring wire snap! There is no liability for material defects in case of damage due to snapping.

CAUTION

If a measuring wire is stretched in the area where operating personnel is located, injuries may occur.

NOTICE

Do not twist the measuring wire!

4.3 Dimensional Drawings
4.3.1 wireSENSOR WPS-XXXX-K100 Analog

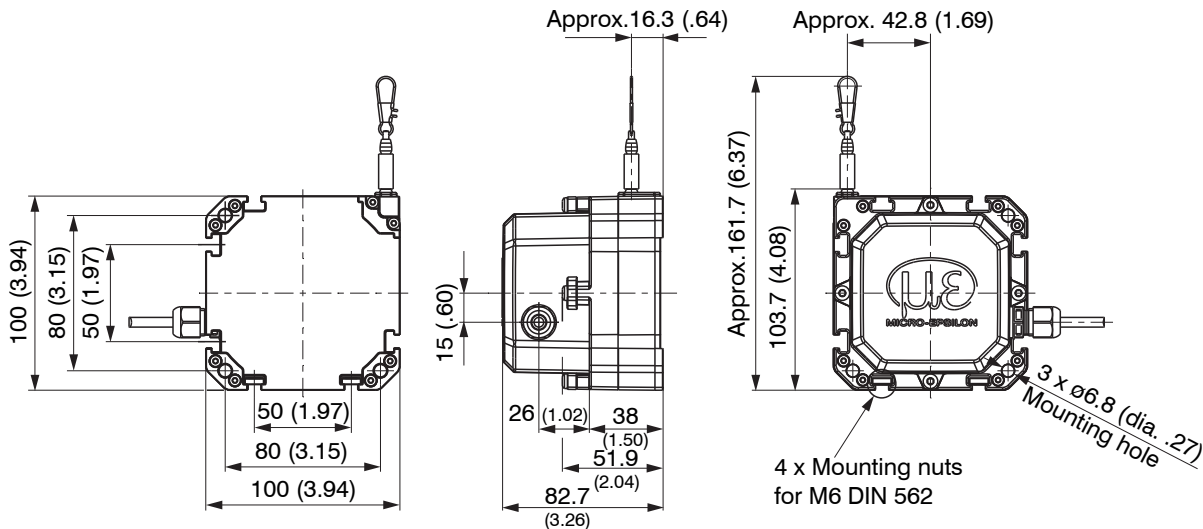


Fig. 2 Dimensional drawing 1500-K100, WPS-2500-K100, with integrated cable, radial, length 1 m, dimensions in mm (inches)

CAUTION

If a measuring wire is stretched in the area where operating personnel is located, injuries may occur.

NOTICE

Do not twist the measuring wire!

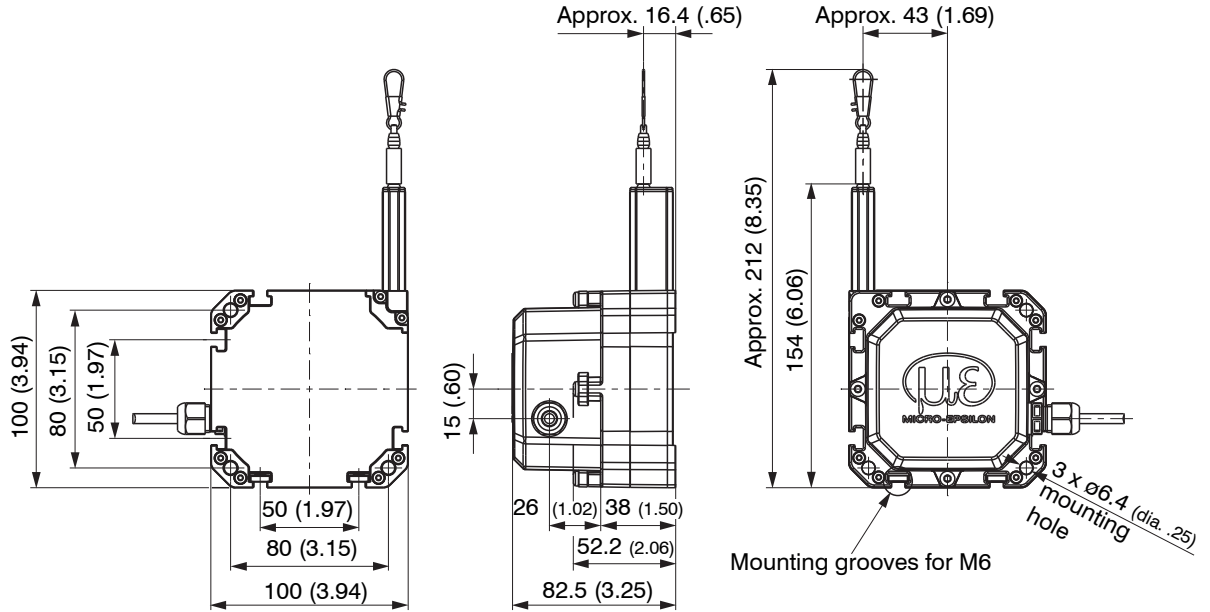


Fig. 3 Dimensional drawing WPS-3500-K100, WPS-5000-K100, WPS-8000-K100 with integrated cable, radial, length 1 m, dimensions in mm (inches)

CAUTION

If a measuring wire is stretched in the area where operating personnel is located, injuries may occur.

NOTICE

Do not twist the measuring wire!

4.3.2 wireSENSOR WPS-XXXX-K100 Digital

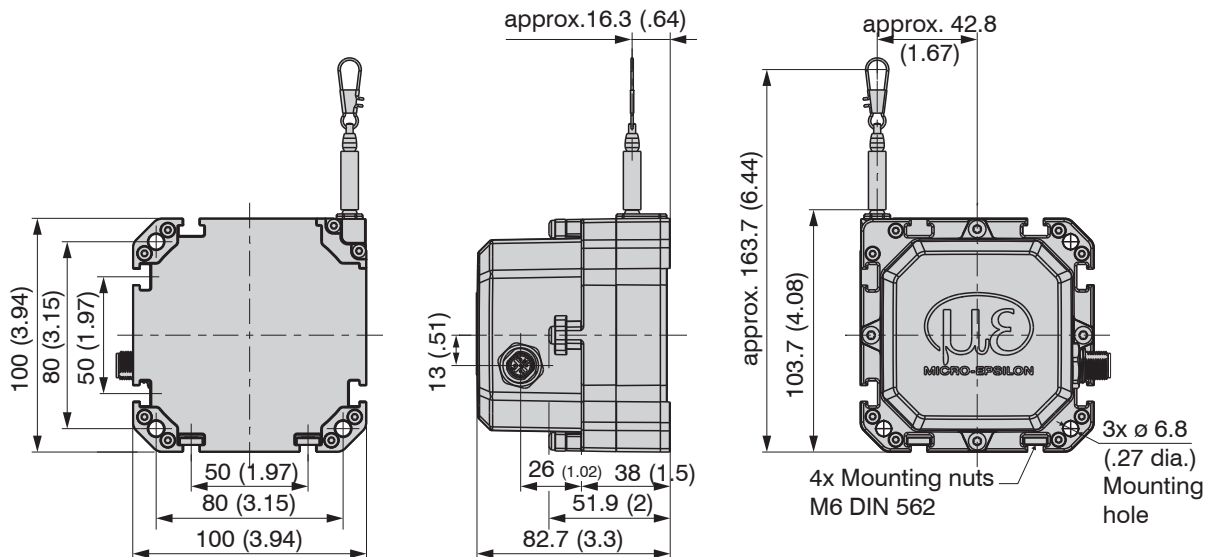


Fig. 4 Dimensional drawing WPS-1500-K100, WPS-2500-K100 with 5-pole M12x1 connector, dimensions in mm (inches)

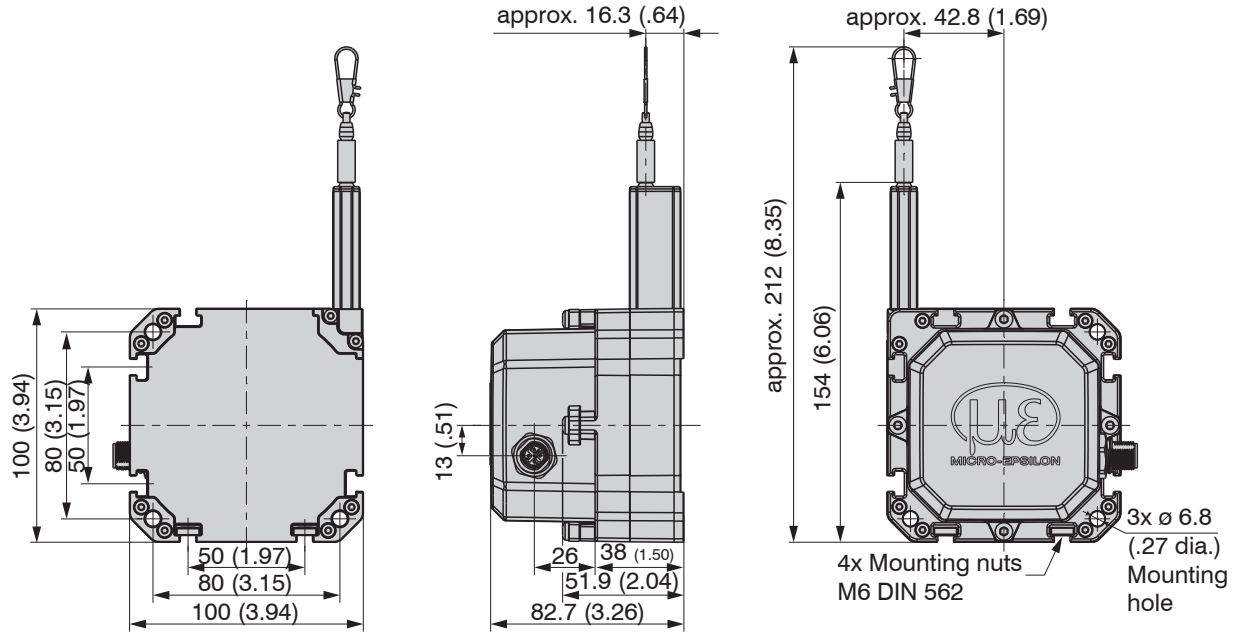


Fig. 5 Dimensional drawing, WPS-3500-K100, WPS-5000-K100, WPS-8000-K100 with 5-pole M12x1 connector, dimensions in mm (inches)

CAUTION

If a measuring wire is stretched in the area where operating personnel is located, injuries may occur.

NOTICE

Do not twist the measuring wire!

4.4 Guiding and Attaching the Wire

If the measuring wire must be pulled out of the sensor to guide the wire or attach it to the measured object:

- the sensor must not be held by a second person during that process,
- the measuring wire must not be pulled out beyond the measuring range listed,
- the area around the sensor must be protected against snapping of the measuring wire.

- ➔ Fix the measuring wire to the target using a wire clip.
- ➔ Guide the measuring wire vertically out of the sensor housing.

Diagonal pull is only permitted up to 3 degrees.

If you drag the measuring wire over the insertion hole or other objects, the measuring wire will be damaged and/or tear.

i If the measuring wire cannot be fed vertically out of the housing, it is essential to use a guide pulley (accessory TR1-WDS or TR3-WDS, see chapter Appendix).

- ➔ Guide the measuring wire in a protected area so that it cannot get caught or otherwise be damaged.

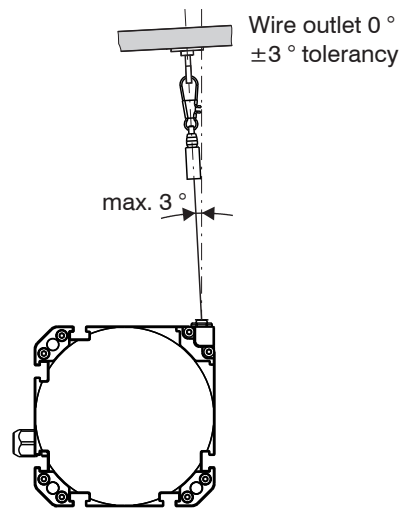
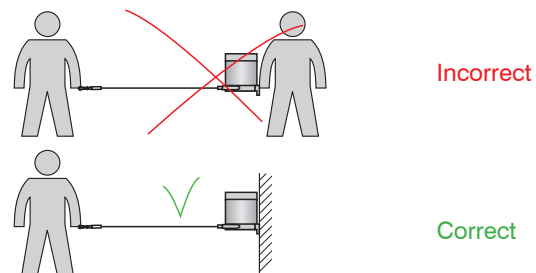


Fig. 6 Attachment and maximum diagonal pull of the measuring wire

4.5 Pin Assignment Analog

4.5.1 Potentiometer Output

Draw-wire displacement sensors with potentiometer output are connected according to the table, [see](#) .

Potentiometer output (P)		Integrated cable -CR
Input voltage	max. 32 VDC with 1 kOhm / max. 1 W	White = Input + Brown = Ground Green = Signal
Resistance	1 kOhm \pm 10 % (resistance divider)	
Temperature coefficient	\pm 0.0025 % FSO/ $^{\circ}$ C	
Contact current	\leq 10 μ A	
Sensitivity	Dependent on measuring range	

Table of potentiometer output

FSO = Full Scale Output

Use any potentiometer only when switched to voltage divider. Using it as a variable resistor destroys the component. Observe maximum contact currents.

i Use potentiometers only as voltage dividers, not as variable series resistors!

4.5.2 Voltage Output

Voltage output (U)		Integrated cable -CR
Supply voltage	14 ... 27 VDC (non-stabilized ¹⁾)	White = Supply Brown = Ground Green = Signal Yellow = Ground
Current consumption	max. 30 mA	
Output voltage	0 ... 10 VDC Options 0 ... 5 / ± 5 V	
Output current	2 mA max.	
Load resistance	> 5 kOhm	
Output noise	0.5 mV _{eff}	
Temperature coefficient	± 0.005 % FSO/ $^{\circ}$ C	

Fig. 7 Table for voltage output

FSO = Full Scale Output

1) Non-stabilized, measured on the input terminals of the sensor

4.5.3 Current Output

Current output (I)		Integrated cable -CR
Supply voltage	9 ... 32 VDC (non-stabilized ¹⁾)	White = Supply Brown = Ground
Output current	4 ... 20 mA	
Load	< 600 Ohm	
Output noise	1.6 μA_{eff}	
Temperature coefficient	± 0.005 % FSO/ $^{\circ}\text{C}$	

Fig. 8 Table for current output

FSO = Full Scale Output

1) Non-stabilized, measured on the input terminals of the sensor

4.6 Pin Assignment Digital

4.6.1 CANopen Pin Assignment


CANopen		
Pin	Assignment	
1	n.c.	<i>5-pin housing connector View on pin side A-coded</i>
2	V+ /7 ... 32 VDC)	
3	GND	
4	CAN-High	
5	CAN-Low	

Fig. 9 Table for pin assignment CANopen

4.6.2 CANopen Features

CANopen features	
Profile	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

Fig. 10 CANopen features

4.6.3 CANopen Setting the Baud Rate and the Subscriber Address (Node ID)

Setting the baud rate		Setting the Subscriber Address (Node ID)
Baud rate adjustable via LSS or object 0x3001		Address adjustable via LSS or object 0x3000 (1 ... 127, 1 = default)
0	1000 kBaud	
2	500 kBaud	
3	250 kBaud	
4	125 kBaud	
6	50 kBaud	
9	AutoBaud (default)	

Fig. 11 CANopen Setting the baud rate

A detailed supplementary description of the CANopen interface is available on request.

5. Operation and Maintenance

The measuring wire, wire drum, spring motor and potentiometer must not be greased or oiled.

Notes about how to guide the wire, [see 4.4](#), must be observed during operation.

Imperfect guiding of the wire can cause increased wear and early failure.

If third parties intervene, the claim for liability for material defects becomes void. Repairs are carried out exclusively by MICRO-EPSILON, [see 7](#).

6. Disclaimer

All components of the device have been checked and tested for functionality in the factory. However, should any defects occur despite careful quality control, these shall be reported immediately to MICRO-EPSILON or to your distributor / retailer.

MICRO-EPSILON undertakes no liability whatsoever for damage, loss or costs caused by or related in any way to the product, in particular consequential damage,

e.g., due to

- non-observance of these instructions/this manual,
- improper use or improper handling (in particular due to improper installation, commissioning, operation and maintenance) of the product,
- repairs or modifications by third parties,
- the use of force or other handling by unqualified persons.

This limitation of liability also applies to defects resulting from normal wear and tear (e.g., to wearing parts) and in the event of non-compliance with the specified maintenance intervals (if applicable).

MICRO-EPSILON is exclusively responsible for repairs. It is not permitted to make unauthorized structural and / or technical modifications or alterations to the product. In the interest of further development, MICRO-EPSILON reserves the right to modify the design.

In addition, the General Terms of Business of MICRO-EPSILON shall apply, which can be accessed under Legal details | Micro-Epsilon <https://www.micro-epsilon.com/impressum/>.

7. Service, Repair

In the event of a defect in the sensor, please send in the affected parts for repair or replacement.

If the cause of a fault cannot be clearly identified, please send the entire measuring system to:

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Koenigbacher Str. 15
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info@micro-epsilon.com
www.micro-epsilon.com

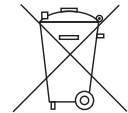
8. Decommissioning, Disposal

In order to avoid the release of environmentally harmful substances and to ensure the reuse of valuable raw materials, we draw your attention to the following regulations and obligations:

- Remove all cables from the sensor and/or controller.
- Dispose of the sensor and/or the controller, its components and accessories, as well as the packaging materials in compliance with the applicable country-specific waste treatment and disposal regulations of the region of use.
- You are obliged to comply with all relevant national laws and regulations.

For Germany / the EU, the following (disposal) instructions apply in particular:

- Waste equipment marked with a crossed garbage can must not be disposed of with normal industrial waste (e.g. residual waste can or the yellow recycling bin) and must be disposed of separately. This avoids hazards to the environment due to incorrect disposal and ensures proper recycling of the old appliances.



- A list of national laws and contacts in the EU member states can be found at https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en. Here you can inform yourself about the respective national collection and return points.
- Old devices can also be returned for disposal to MICRO-EPSILON at the address given in the imprint at <https://www.micro-epsilon.de/impressum/>.
- We would like to point out that you are responsible for deleting the measurement-specific and personal data on the old devices to be disposed of.
- Under the registration number WEEE-Reg.-Nr. DE28605721, we are registered at the foundation Elektro-Altgeräte Register, Nordostpark 72, 90411 Nuremberg, as a manufacturer of electrical and/or electronic equipment.

Appendix

Accessories

- TR1-WDS Wire deflection pulley with mounting foot, [see Fig. 12](#)
- TR3-WDS Wire deflection pulley with mounting foot, [see Fig. 13](#)
- WE-xxxx-CLIP Wire extension with wire clip and eyelet, [see Fig. 14](#), use for xxxx wire length in mm (max. 10,000 mm)

Adjust the distance, such that the wire cannot jump off!

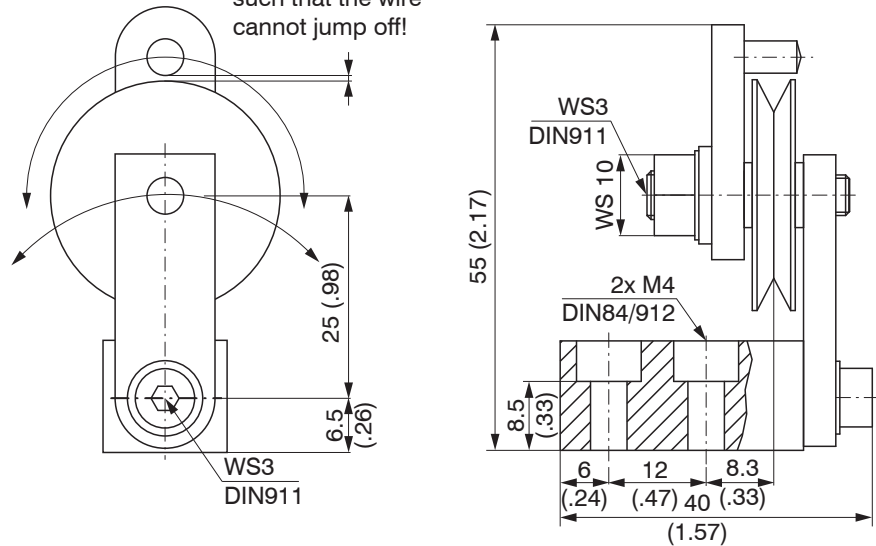


Fig. 12 Deflection pulley TR1-WDS with mounting foot, dimensions in mm

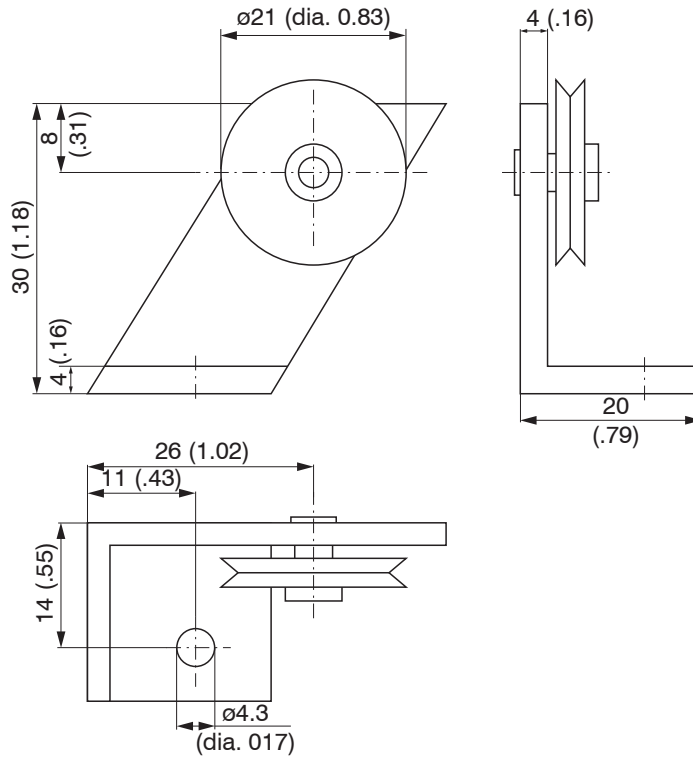


Fig. 13 Deflection pulley TR3-WDS with mounting foot, dimensions in mm

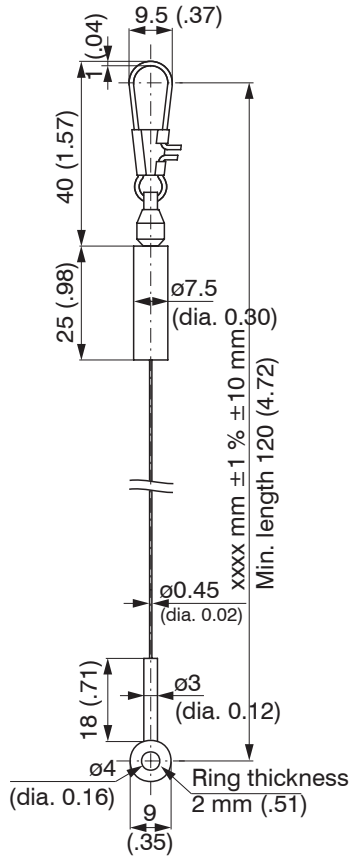


Fig. 14 Wire extension WE-xxxx-CLIP, dimensions in mm



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