



Operating Instructions
wireSENSOR, WPS
Draw-Wire Mechanisms

WPS-2400-MK60-M
WPS-2300-MK88-M
WPS-3500-MK88-M
WPS-5000-MK88-M

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.



Ortenburg, Germany
July 1, 2021

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Declaration of incorporation

Declaration of Incorporation of Partly Completed Machinery according to The Supply of Machinery (Safety) Regulations 2008, No. 1597 Annex II B

The manufacturer and person authorised to compile the relevant technical documentation

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hereby declare that the machine designated below complies with the essential health and safety requirements of the Supply of Machinery (Safety) Regulations 2008, No. 1597, 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 essential health and safety requirements according Annex II of o.g. regulation are applied and fulfilled:

- Nr. 1.1.2 “Principles of safety integration”
- Nr. 1.7.3 “Marking of machinery”
- Nr. 1.7.4 “Instruction”

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

- SI 2008 No. 1597: The Supply of Machinery (Safety) Regulations 2008
 - EN ISO 13857:2019 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
- SI 2012 No. 3032: The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
 - EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products 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 partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive, where appropriate.

A handwritten signature in blue ink, appearing to read 'E. Huber', is positioned above the printed name of the signatory.

Ortenburg, Germany
June 21, 2023

Dipl.-Ing.(FH) Eduard Huber, MBA
Quality Manager

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1. Safety

1.1 Symbols Used

Sensor operation assumes knowledge of the operating instructions.

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 pull or loop the measuring wire around unprotected body parts.

- > Risk of injury

Do not let the measuring wire snap.

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

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

- > Risk of injury
- > Destruction of the measuring wire, the sensor



Avoid shocks and impacts to the sensor.

- > Damage to or destruction of the sensor

1.3 Intended Use

- Draw-wire displacement sensors are used for
 - displacement and movement measurements,
 - measuring the position of parts or moving machine components.
- The sensor must only be operated within the limits specified in the technical data, [see 2](#).
- The sensor must be used 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.

1.4 Proper Environment

- Protection class: Depending on encoder
- Temperature range:
 - Operation: -20 ... +80 °C (-4 ... +176 °F); on request -40 ... +85 °C (-40 ... +185 °F))
 - Storage: -20 ... +80 °C (-4 ... +176 °F)
- Humidity: 5 ... 95 % RH (non-condensing)
- Ambient pressure: Atmospheric pressure
- Vibration: According to DIN EN 60068-2-6
- Shock: According to DIN EN 60068-2-27

1.5 Foreseeable Misuse

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

2. Functional Principle, Technical Data

2.1 Measuring Principle

Thanks to the draw-wire sensor principle a linear movement is converted into a rotary movement.

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 an encoder (rotary encoder).

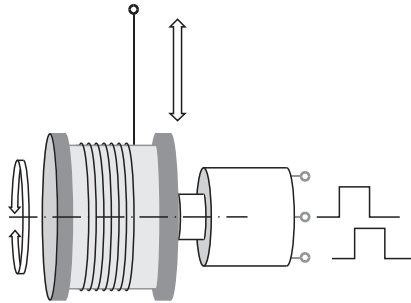


Fig. 1 Draw-wire displacement sensor with potentiometer

2.2 Structure

The draw-wire principle is applied in the housing designs MK60 and MK88 with different measuring ranges from 2300 to 5000 mm. The sensors ensure easy mounting of an incremental or absolute encoder. Therefore, the user can individually choose the interface, resolution and connection type.

2.3 Technical Data

2.3.1 MK60

Model		WPS-2400-MK60-M
Measuring range		2400 mm
Output type		Depending on encoder
Resolution		Depending on encoder
Linearity	$\leq \pm 0.1 \% \text{ FSO}$	$\leq \pm 2.4 \text{ mm}$
Mean distance per rotation		150.75 mm
Suitable encoder		Flange type Ø 58 mm: synchro flange Ø 6 mm shaft
Adapter flange for encoder Ø 58	Synchro flange	Included in delivery
Wire extension force (max.)		8 N
Wire retraction force (min.)		1 N
Wire acceleration (max.)		5 g
Material	Housing	Plastics
	Measuring wire	Polyamide-coated stainless steel (ø 0.45 mm)
Wire mounting		Wire clip
Installation		Mounting holes
Temperature range	Storage	-20 ... +80 °C (-4 ... +176 °F)
	Operation	-20 ... +80 °C (-4 ... +176 °F) (On request -40 ... +85 °C (-40 ... +185 °F))
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 Hz ... 2 kHz in 3 axes and 10 cycles each
Protection class (DIN EN 60529)		Depending on encoder
Weight		0.2 kg

FSO = Full Scale Output

2.3.2 MK88

Model		WPS-2300-MK88-M	WPS-3500-MK88-M	WPS-5000-MK88-M
Measuring range		2300 mm	3500 mm	5000 mm
Output type		Depending on encoder		
Resolution		Depending on encoder		
Linearity	≤ ±0.1 % FSO	≤ ±2.3 mm	-	-
	≤ ±0.3 % FSO	-	≤ ±10.5 mm	-
	≤ ±0.4 % FSO	-	-	≤ ±20 mm
Typical repeatability		≤ 1 mm	≤ 3 mm	≤ 8 mm
Mean distance per rotation		237.8 mm	239.1 mm	238.7 mm
Suitable encoder		Flange type Ø 58 mm: synchro flange Ø 6 mm shaft		
Adapter flange for encoder Ø 58	Synchro flange	Included in delivery		
Wire extension force (max.)		ca. 9 N		
Wire retraction force (min.)		ca. 4 N		
Wire acceleration (max.)		ca. 7 g		
Material	Housing	Plastics		
	Measuring wire	Polyamide-coated stainless steel (ø 0.45 mm)		
Wire mounting		Wire clip		
Installation		Mounting holes or mounting grooves on the sensor housing		
Temperature range	Storage	-20 ... +80 °C (-4 ... +176 °F)		
	Operation	-20 ... +80 °C (-4 ... +176 °F) (On request -40 ... +85 °C (-40 ... +185 °F))		
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 Hz ... 2 kHz in 3 axes and 10 cycles each		
Protection class (DIN EN 60529)		Depending on encoder		
Weight		0.5 kg		

FSO = Full Scale Output / All data refer to the mechanics without encoder

3. Delivery

3.1 Unpacking/Included in Delivery

1 Sensor

1 Synchro flange with mounting kit

1 Assembly Instructions

➡ Do not remove draw-wire displacement sensors from packaging using the measuring 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 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 appendix, [see A 1](#).

Return of packaging

Micro-Epsilon Messtechnik GmbH & Co. KG offers customers the opportunity to return the packaging of products purchased from Micro-Epsilon by prior arrangement so that it can be reused or recycled.

To arrange the return of packaging, for questions about the costs and / or the exact return procedure, please contact us directly at.

info@micro-epsilon.com



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 measuring wire with wire clip

Temperature range: -20 ... +80 °C (-4 ... +176 °F)

Humidity: 5 ... 95 % RH (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

➡ Install the sensor according to the information in the table below:

Model	Screws	Mounting clamp
WPS-2400-MK60	3 x M3	no
WPS-2300-MK88	3 x M4	yes
WPS-3500-MK88	3 x M4	yes
WPS-5000-MK88	3 x M4	yes

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!

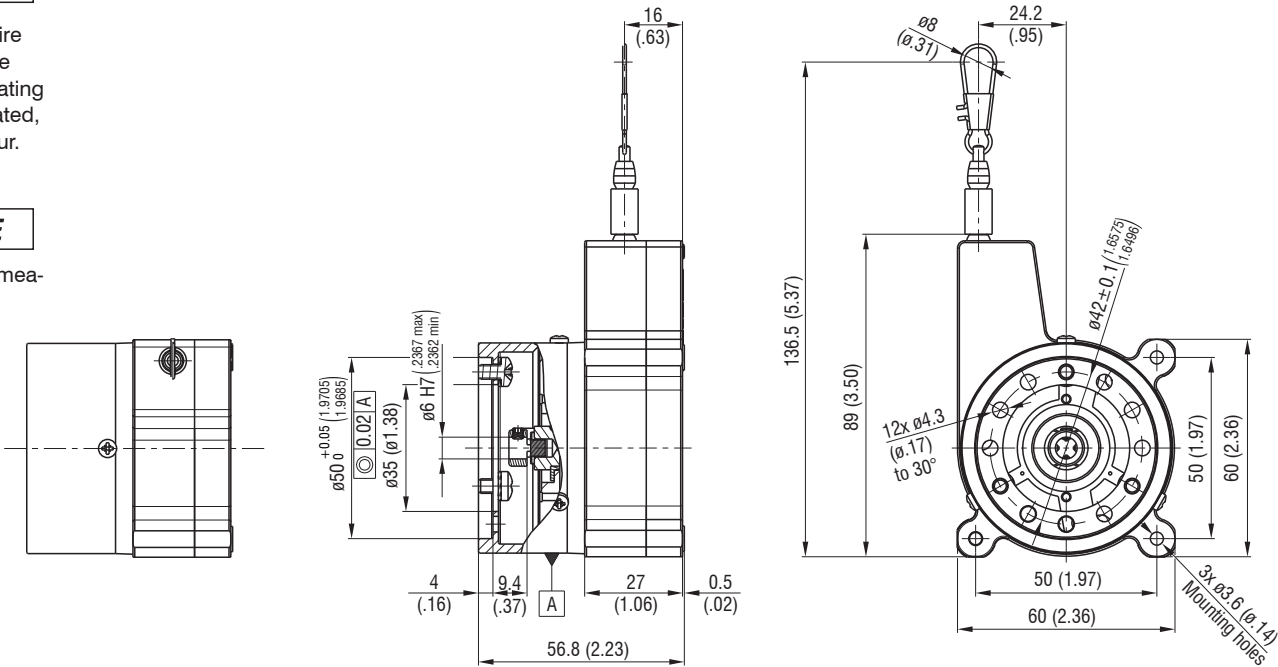


Fig. 2 Dimensional drawing of WPS-2400-MK60-M, dimensions in mm (inches, rounded off)

CAUTION

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

- > Risk of damage for measuring wire and sensor

NOTICE

Do not twist the measuring wire!

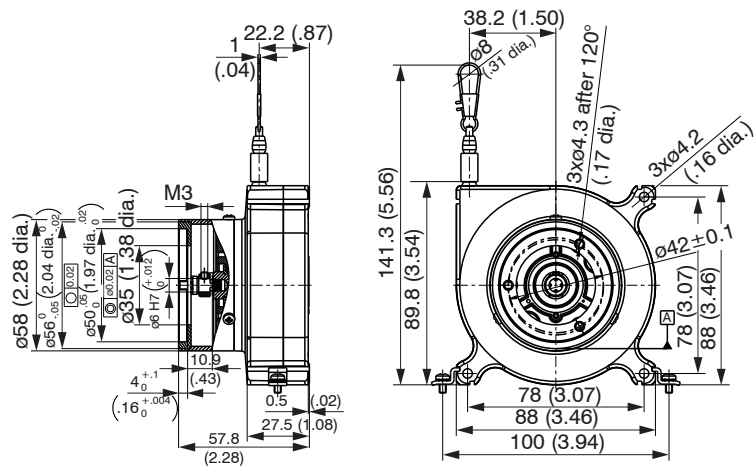


Fig. 3 Dimensional drawing of WPS-xxxx-MK88-M, dimensions in mm (inches, rounded off)

4.3 Installing the Encoder

- ➡ Fix the coupling half to the encoder shaft.
- ➡ Mount the flange on the encoder.
- ➡ Mount the encoder/flange assembly on the draw-wire mechanism.
- **i** Make sure that the measuring wire is always tensioned by the spring motor in order to prevent it from jumping off the cable drum.

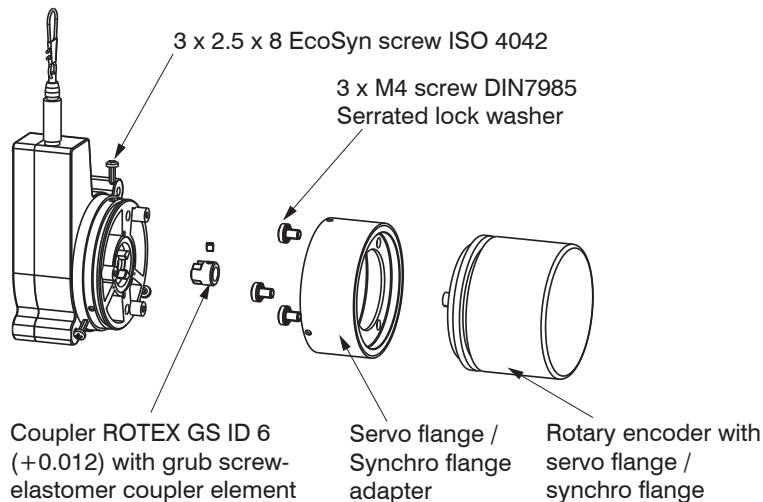


Fig. 4 Mounting of adapter flange and encoder, WPS-2400-MK60-M

- **i** Observe the installation instructions provided by the encoder manufacturer.

Recommended tightening torque: 0.5 Nm

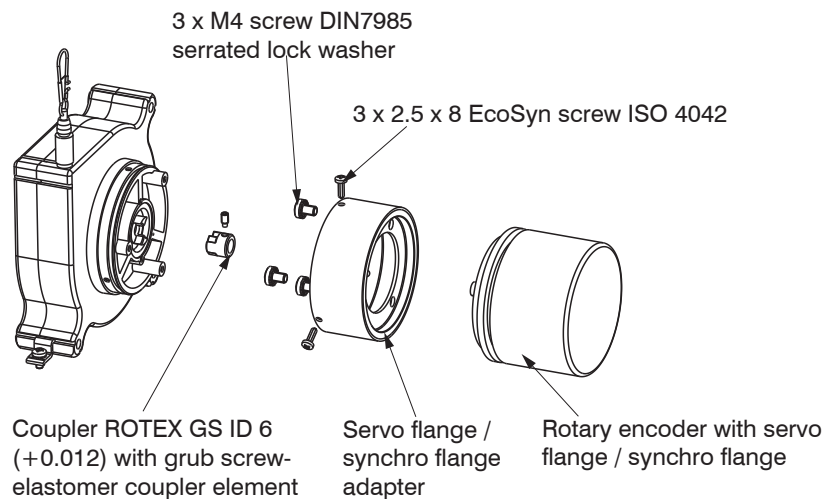


Fig. 5 Mounting of adapter flange and encoder, WPS-xxxx-MK88-M

CAUTION

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

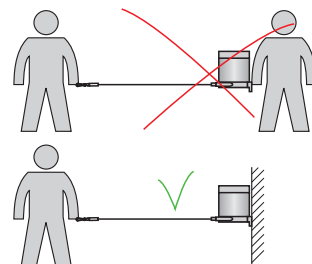
NOTICE

Do not twist the measuring wire!

4.4 Guiding and Attaching the Measuring Wire

If the measuring wire must be pulled out of the sensor to guide the measuring 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 the 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.

- 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 Optional Accessories, [see A 1](#)).

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

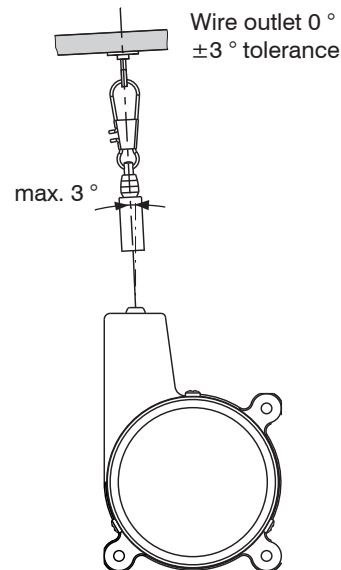


Fig. 6 Attachment and maximum diagonal pull of the measuring wire

4.5 Sensitivity Curve

Designed with a single-layered wire wound onto the drum, the WPS-2300-MK88-M draw-wire mechanics provides high measurement accuracy. The WPS-3500-MK88-M and WPS-5000-MK88-M models have a double-layered wire which enables a larger measuring range while maintaining the same housing size. Models with a multi-layer/double-layer winding provide reduced measurement accuracy at the start of the measuring range which is why they are primarily recommended as wire pre-extension.

The sensitivity curve throughout the entire measuring range is shown in the diagram, see Fig. 7.

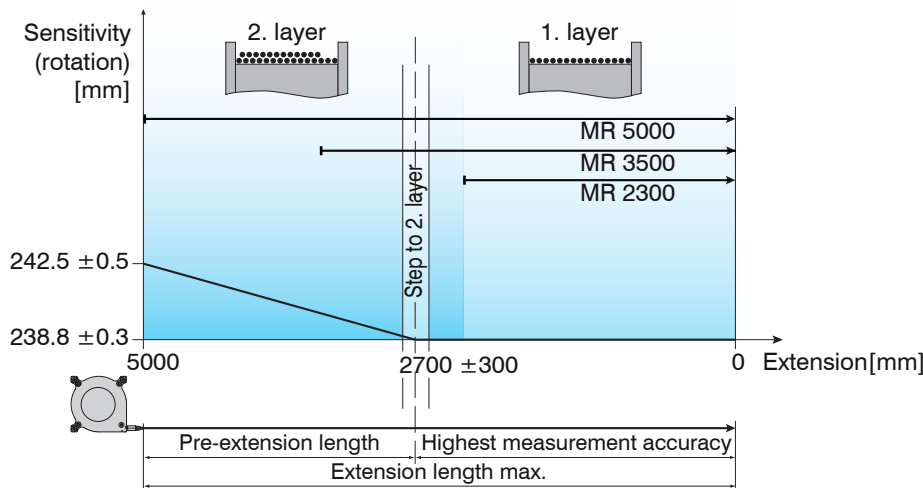


Fig. 7 Sensitivity curve of WPS-xxx-MK88-M, dimensions in mm

5. Operation and Maintenance

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

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

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

If third parties intervene, the claim for liability for material defects becomes void. Micro-Epsilon is exclusively responsible for repairs, [see 8](#).

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/legal-details/>.

7. 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 legal details at <https://www.micro-epsilon.com/legal-details/>.
- 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.



8. Service, Repair

If the sensor, sensor cable is defect, please send in the affected parts for repair or replacement:

If the cause of fault cannot be clearly identified, please send the entire system inc. cables to:

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Appendix

A 1 Optional Accessories and Spare Parts Lists

TR1-WDS	Wire deflection pulley with mounting foot, see Fig. 8
TR3-WDS	Wire deflection pulley with mounting foot, see Fig. 9
WE-xxxx-CLIP	Wire extension with wire clip and eyelet, see Fig. 10 , use for xxxx wire length in mm (max. 10,000 mm)

A 2 Dimensional Drawings for Accessories

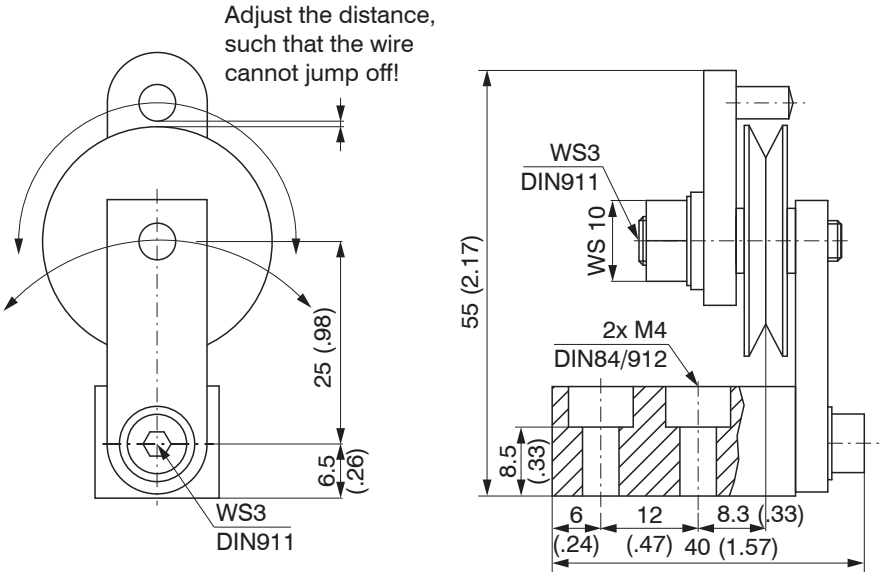


Fig. 8 Deflection pulley TR1-WDS with mounting foot, dimensions in mm (inches, rounded off)

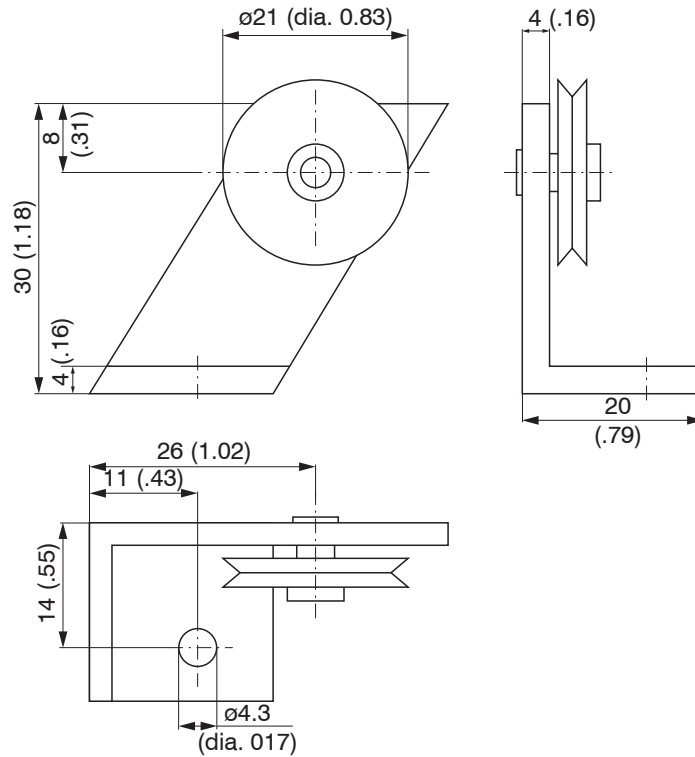


Fig. 9 Deflection pulley TR3-WDS with mounting foot, dimensions in mm (inches, rounded off)

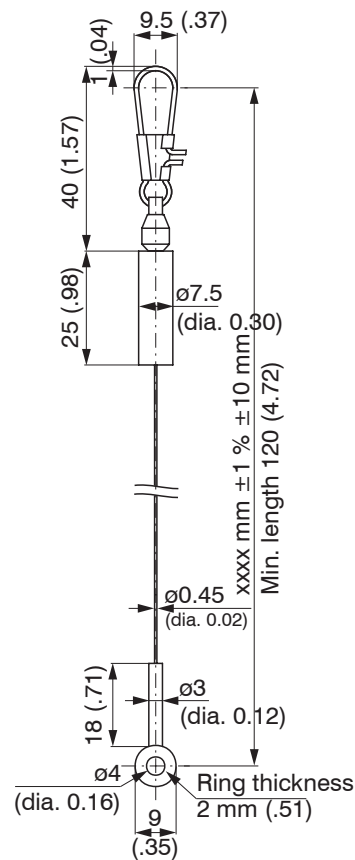


Fig. 10 Wire extension WE-xxxx-CLIP, dimensions in mm (inches, rounded off)



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