



Operating Instructions  
**wire**SENSOR, WPS

WPS - x - MK30  
WPS - x - MK46  
WPS - x - MK60  
WPS - x - MK77

WPS - x - MK88  
WPS - x - MK120

## **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  
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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  
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## Appendix

## 1. Safety

System 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



The supply voltage must not exceed the specified limits.

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

Do not open the sensor housing.

- > Risk of injury from pre-tensioned spring motor

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

- > Risk of injury

Do not let the measuring wire rewind without control (snap back).

- > Risk of injury from whiplash effect of the wire with wire clip / eyelet
- > Destruction of the measuring wire and/or the sensor

Do not pull the measuring wire over measuring range.

- > Risk of injury
- > Destruction of the measuring wire and/or the sensor

**NOTICE**

Connect the power supply and the display/output device according to the safety regulations for electrical equipment.

> 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 Product Marking

For WPS draw-wire displacement sensors with voltage, current, digital or encoder outputs, the EU Directives 2014/30/EU and 2011/65/EU shall apply for CE, or SI 2016 No. 1091 and SI 2012 No. 3032 shall apply for UKCA. In addition, the Machinery Directive is taken into consideration (2006/42/EC or SI 2008 No. 1597).

These sensors carry the CE / UKCA marking and satisfy the requirements of the EU Directives / UK regulations cited and the European harmonized standards (EN) listed therein.

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

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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 / UKCA marking. For WPS draw-wire displacement sensors with potentiometer output, the Directives 2006/42/EC and 2011/65/EU shall apply for CE, or SI 2008 No. 1597 and SI 2012 No. 3032 shall apply for UKCA. Therefore, an EU Declaration of Conformity is not issued. The Declaration of Incorporation shall apply.

## 1.4 Intended Use

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

## 1.5 Proper Environment

- Protection class: IP20<sup>1</sup>  
IP65 (MK60, MK88, MK120)
- Temperature range:
  - Operation: -20 ... +80 °C (-4 ... +176 °F)
  - Storage: -40 ... +80 °C (-40 ... +176 °F)
- Humidity: 5 ... 95 % RH (non-condensing)
- Ambient pressure: Atmospheric pressure

**i** Note the slight power dissipation of the potentiometer above +40°C (+104 °F)! (-0.15 W/10 K)!

## 1.6 Foreseeable Misuse

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

1) For models with potentiometer. For models with encoder depends on encoder type.

## 2. Functional Principle, Technical Data

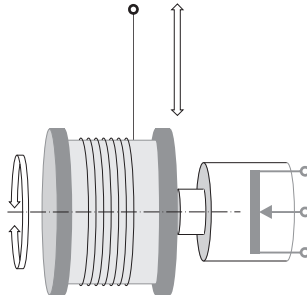
### 2.1 Functional Principle

With the wire principle, a linear motion is transformed into a change in resistance by a rotation.

A measuring wire made of highly flexible stainless steel wires is wound onto a drum with the aid of a long life spring motor.

The winding drum is coupled axially with a

- multi-turn potentiometer (Type WPS-...-MKxx-...-P/U/I) respectively with an
- encoder (Type WPS-...-MKxx-E).



*Fig. 1 Draw-wire sensor with potentiometer*

### 2.2 Structure

The draw wire principle is used in the housing design MK30, MK46, MK77, MK60, MK88 and MK120 with different measuring lengths from 50 to 7500 mm (1.69 to 295.2 in).

Two versions of the electrical connection are possible:

- Potentiometer output (resistance divider)
- Voltage output (with integrated electronics)
- Current output (with integrated electronics)
- Incremental encoder (with integral electronics, HTL or TTL output)
- CANopen output (with integrated electronics)

## 2.3 Technical Data MK30 Analog

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	Potentiometer				
Resolution	Conductive plastic potentiometer	towards infinity	-	-	-
	Wire potentiometer	-	-	0.15 mm	0.2 mm
	Hybrid potentiometer	-	towards infinity		
Linearity	Conductive plastic potentiometer P50	$\leq \pm 0.5$ % FSO	$\leq \pm 0.25$ mm	-	-
	Wire potentiometer P25	$\leq \pm 0.25$ % FSO	-	-	$\leq \pm 1.25$ mm
	Hybrid potentiometer P25	$\leq \pm 0.25$ % FSO	-	$\leq \pm 0.375$ mm	$\leq \pm 0.625$ mm
	Hybrid potentiometer P10	$\leq \pm 0.1$ % FSO	-	-	$\leq \pm 0.25$ mm
Sensor element	Conductive plastic potentiometer	Hybrid potentiometer		Wire/hybrid potentiometer	
Wire extension force (max.)	ca. 2.5 N				
Wire retraction force (max.)	ca. 1 N				
Wire acceleration (max.)	ca. 5 g				
Material	Housing	Plastics			
	Measuring wire	Polyamide-coated stainless steel ( $\varnothing$ 0.36 mm)			
Wire mounting	Eyelet ( $\varnothing$ 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

wireSENSOR, WPS

## 2.4 Technical Data MK46 Analog

<b>Model</b>		<b>WPS-1000-MK46</b>	<b>WPS-1250-MK46</b>
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	$\leq \pm 2.5$ mm	$\leq \pm 3.12$ mm
	Hybrid potentiometer P10/U10/I10	$\leq \pm 1$ mm	$\leq \pm 1.2$ mm
Sensor element		Wire/hybrid potentiometer	
Wire extension force (max.)		approx. 1.6 N	approx. 1.5 N
Wire retraction force (min.) approx.		approx. 1 N	
Wire acceleration (max.)		approx. 5 g	
Material	Housing	Plastics	
	Measuring wire	Polyamide-coated stainless steel ( $\varnothing$ 0.36 mm)	
Wire mounting		Eyelet ( $\varnothing$ 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

## 2.5 Technical Data MK77 Analog

<b>Model</b>	<b>WPS-2100-MK77</b>	
Measuring range	2100 mm	
Analog output	Potentiometer	
Resolution	Wire potentiometer P25	0.55 mm
Linearity	Wire potentiometer P25	$\leq \pm 0.25\%$ FSO
Sensor element	Wire potentiometer	
Wire extension force (max.)	approx. 5 N	
Wire retraction force (max.)	approx. 3.5 N	
Maximale Seilbeschleunigung	approx. 5 g	
Material	Housing	Plastics
	Measuring wire	Polyamide-coated stainless steel ( $\varnothing$ 0.45 mm)
Wire mounting	Eyelet ( $\varnothing$ 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

## 2.6 Technical Data MK60 Analog

<b>Model</b>		<b>WPS-1500-MK60</b>
Measuring range		1500 mm
Analog output		Potentiometer, current, voltage
Resolution		Hybrid potentiometer P10 towards infinity
Linearity	Hybrid potentiometer P10	$\leq \pm 0.15\%$ d.M. $\leq \pm 2.25$ mm
Sensor element		Hybrid potentiometer
Wire extension force (max.)		approx. 8 N
Wire retraction force (max.)		approx. 1 N
Wire acceleration (max.)		approx. 5 g
Material	Housing	Glass-fiber reinforced plastic (PBT GF20)
	Measuring wire	Polyamide-coated stainless steel ( $\varnothing$ 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

## 2.7 Technical Data MK88 Analog

Model			WPS-2300-MK88	WPS-3500-MK88	WPS-5000-MK88
Measuring range			2300 mm	3500 mm	5000 mm
Analog output			Potentiometer, current, voltage		
Resolution			Hybrid potentiometer P10 towards infinity		
Linearity	Hybrid potentiometer P10	$\leq \pm 0.15 \% \text{ d.M.}$	$\leq \pm 3.45 \text{ mm}$	-	-
	Hybrid potentiometer P10	$\leq \pm 0.3 \% \text{ d.M.}$	-	$\leq \pm 10.5 \text{ mm}$	-
	Hybrid potentiometer P10	$\leq \pm 0.4 \% \text{ d.M.}$	-	-	$\leq \pm 20 \text{ mm}$
Sensor element			Hybrid potentiometer		
Wire extension force (max.)			approx. 9 N		
Wire retraction force (min.)			approx. 3 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 ( $\varnothing 0.45 \text{ mm}$ )		
Wire mounting			Wire clip		
Mounting			Mounting holes or mounting grooves on the sensor housing		
Temperature range	Storage		$-20 \dots +80 \text{ }^\circ\text{C}$		
	Operation		$20 \dots +80 \text{ }^\circ\text{C}$ (on request $-40 \dots +85 \text{ }^\circ\text{C}$ )		
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



## 2.8 Technical Data MK120 Analog

Model	WPS-3000-MK120		WPS-5000-MK120	WPS-7500-MK120	
Measuring range	3000 mm		5000 mm	7500 mm	
Analog output	Potentiometer, current, voltage				
Resolution	Hybrid potentiometer P10		towards infinity		
Linearity	Hybrid potentiometer P10	$\leq \pm 0.15\%$ FSO	$\leq \pm 4.5$ mm	$\leq \pm 7.5$ mm	$\leq \pm 11.25$ 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 ( $\varnothing$ 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

## 2.9 Technical Data MK30 Digital

Model	WPS-500-MK30	WPS-750-MK30
Measuring range	500 mm	750 mm
Digital output	Encoder: E (5 ... 24 VDC) / Encoder E830 (8 ... 30 VDC)	
Resolution	10 Pulse / mm	6.7 Pulse / mm
	0.1 mm	0.15 mm
Linearity $\leq \pm 0.5\%$ FSO	$\leq \pm 0.25$ mm	$\leq \pm 0.375$ 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 ( $\varnothing$ 0.36 mm)
Wire mounting	Eyelet ( $\varnothing$ 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

## 2.10 Technical Data MK46 Digital

<b>Model</b>	<b>WPS-1250-MK46</b>	
Measuring range	1250 mm	
Digital output	Encoder: E (5 ... 24 VDC) / Encoder E830 (8 ... 30 VDC)	
Resolution	4 Pulse / mm	
	0.25 mm	
Linearity	$\leq \pm 0.05 \% \text{ FSO}$	$\leq \pm 0.625 \text{ mm}$
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 ( $\varnothing$ 0.36 mm)
Wire mounting	Eyelet ( $\varnothing$ 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	ca. 120 g (incl. cable)	

FSO = Full Scale Output

## 2.11 Technical Data MK77 Digital

<b>Model</b>	<b>WPS-2100-MK77</b>	
Measuring range	2100 mm	
Digital output	Encoder: E (5 ... 24 VDC) / Encoder E830 (8 ... 30 VDC)	
Resolution	2.32 Pulse / mm	
	0.43 mm	
Linearity	$\leq \pm 0.05 \% \text{ FSO}$	$\leq \pm 1.05 \text{ mm}$
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 ( $\varnothing$ 0.45 mm)
Wire mounting	Eyelet ( $\varnothing$ 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	ca. 275 g (incl. cable)	

FSO = Full Scale Output

## 2.12 Technical Data MK60 Digital

<b>Model</b>	<b>WPS-2400-MK60-CR</b>	
Measuring range	2400 mm	
Digital output	TTL01 (A, B, 0) / TTL02 (A, B, /B, 0)	
Resolution	6.83 Pulse / mm	
	0.146 mm	
Linearity	$\leq \pm 0.05 \% \text{ FSO}$	$\leq \pm 1.2 \text{ mm}$
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 ( $\varnothing 0.45 \text{ mm}$ )
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

## 2.13 Technical Data MK88 Digital

Model			WPS-2300-MK88	WPS-3500-MK88	WPS-5000-MK88
Measuring range			2300 mm	3500 mm	5000 mm
Digital interface			CANopen		
Resolution			0.56 mm	0.85 mm	1.22 mm
Linearity	Hybrid potentiometer P10	$\leq \pm 0.15 \% \text{ FSO}$	$\leq \pm 3.45 \text{ mm}$	-	-
	Hybrid potentiometer P10	$\leq \pm 0.3 \% \text{ FSO}$	-	$\leq \pm 10.5 \text{ mm}$	-
	Hybrid potentiometer P10	$\leq \pm 0.4 \% \text{ FSO}$	-	-	$\leq \pm 20 \text{ mm}$
Sensor element			Hybrid potentiometer		
Wire extension force (max.)			approx. 9 N		
Wire retraction force (min.)			approx. 3 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		olyamide-coated stainless steel ( $\varnothing 0.45 \text{ mm}$ )		
Wire mounting			Wire clip		
Mounting			Mounting holes or mounting grooves on the sensor housing		
Temperature range	Storage		$-20 \dots +80 \text{ }^\circ\text{C}$		
	Operation		$-20 \dots +80 \text{ }^\circ\text{C}$ (on request $-40 \dots +85 \text{ }^\circ\text{C}$ )		
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) <sup>1</sup>		
Weight			approx. 400 - 430 g (incl. cable)		

FSO = Full Scale Output

1) With plug version only when connected

### 3. Delivery

#### 3.1 Unpacking, Included in Delivery

1 Sensor

1 Assembly Instructions

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

#### 3.2 Storage



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

> Risk of injury due to whiplash of the wire, the wire clip or the eyelet.

Storage temperature (storage): -40 °C ... +80 °C (-40 ... +176 °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 or eyelet
- > 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 the screws or with mounting clamps according to the specifications in the following table and according to the figures, see Fig. 2 et seq.

Model	Screws for through-hole	Mounting clamp
MK30	3 x M2.5	yes
MK46	3 x M2.5	yes
MK77	3 x M3	yes
MK60	3 x M3	no
MK88	3 x M4	yes
MK120	3 x M6	no

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 penetrating 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.

### 4.3 Dimensional Drawings

#### 4.3.1 wireSENSOR WPS MK30 Analog

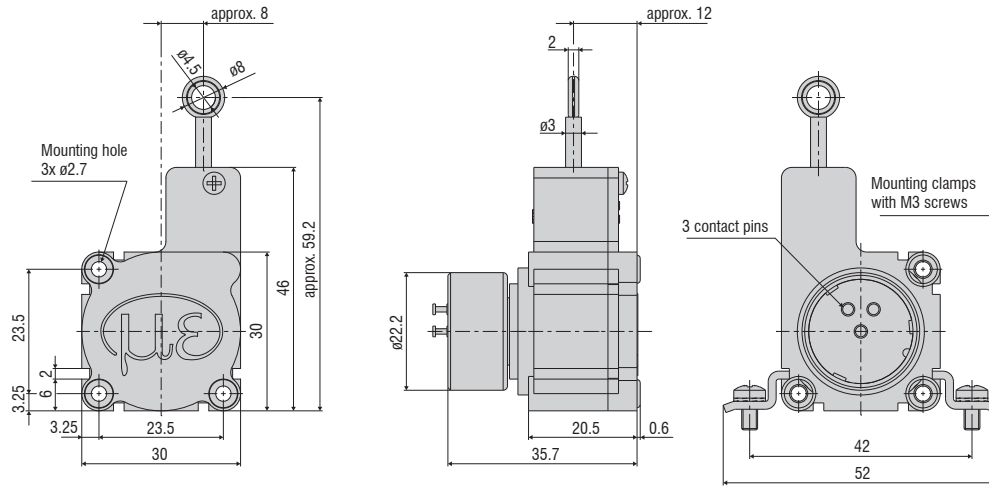


Fig. 2 Dimensional drawing WPS-50-MK30-Pxx with potentiometer, dimensions in mm (inches)

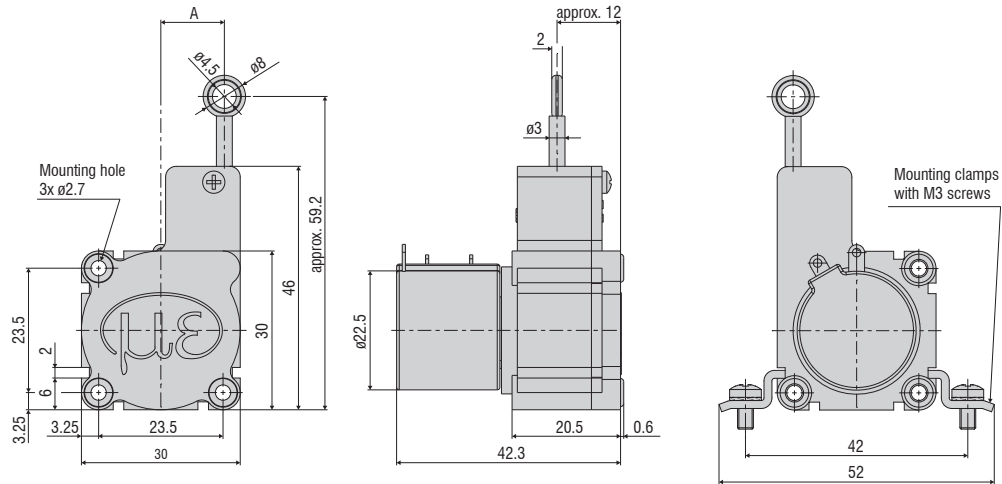


Fig. 3 Dimensional drawing WPS-xxx-MK30-Pxx with potentiometer, dimensions in mm (inches)

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

### 4.3.2 wireSENSOR WPS MK30 Digital

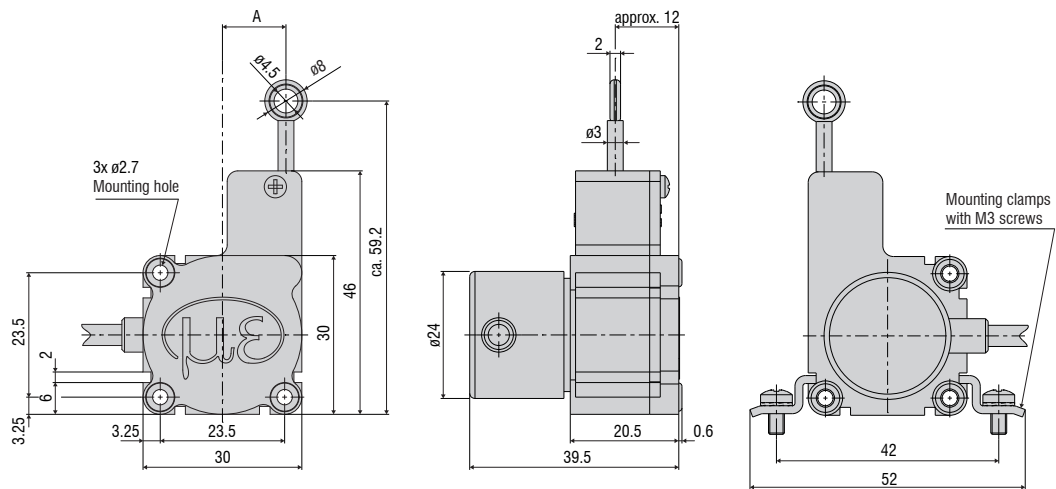


Fig. 4 Dimensional drawing WPS-xxx-MK30-Exxx with encoder, dimensions in mm (inches)

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

### 4.3.3 wireSENSOR WPS MK46 Analog

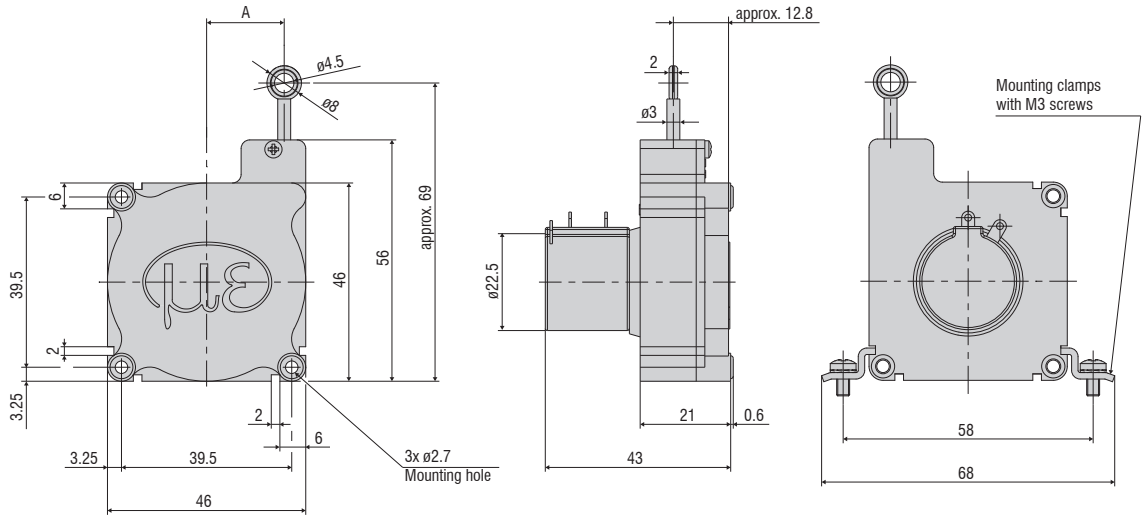


Fig. 5 Dimensional drawing WPS-xxx-MK46-Pxx with potentiometer, dimensions in mm (inches)

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

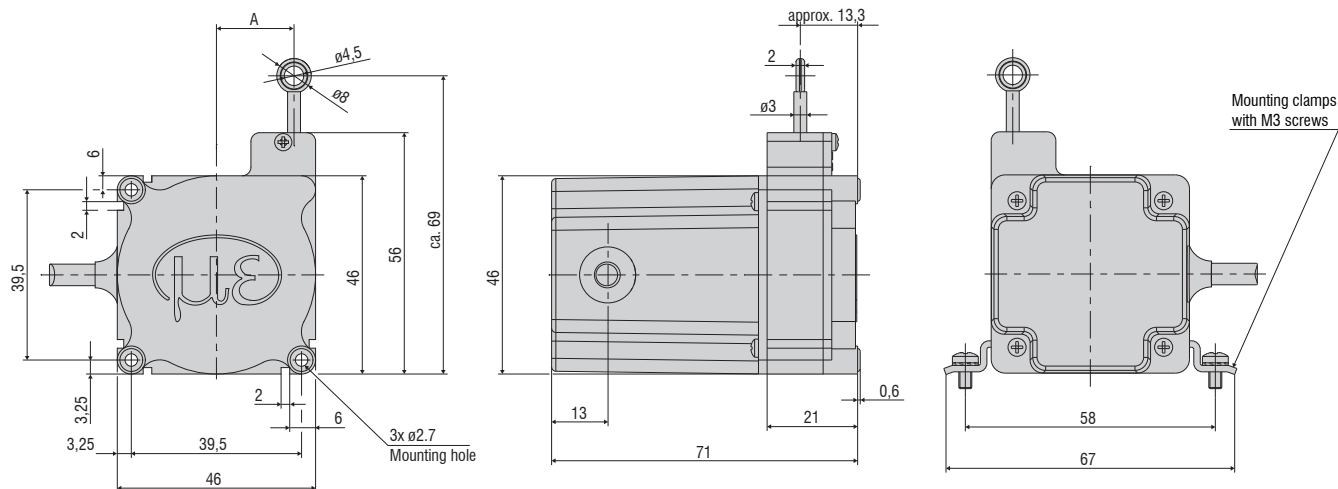


Fig. 6 Dimensional drawing WPS-xxxx-MK46-P10 | -MK46-CR-P25 | -MK46-U10| -MK46-I10 with potentiometer, current, voltage, dimensions in mm (inches)

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

### 4.3.4 wireSENSOR WPS MK46 Digital

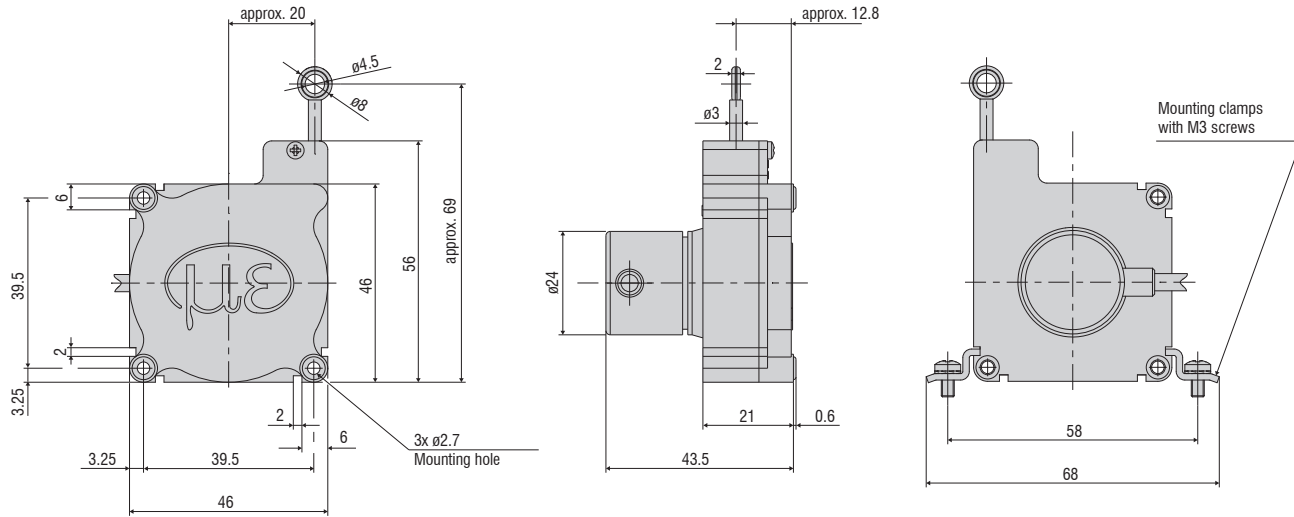


Fig. 7 Dimensional drawing WPS-xxxx-MK46-Exxx with encoder, dimensions in mm (inches)

### 4.3.5 wireSENSOR WPS MK77 Analog

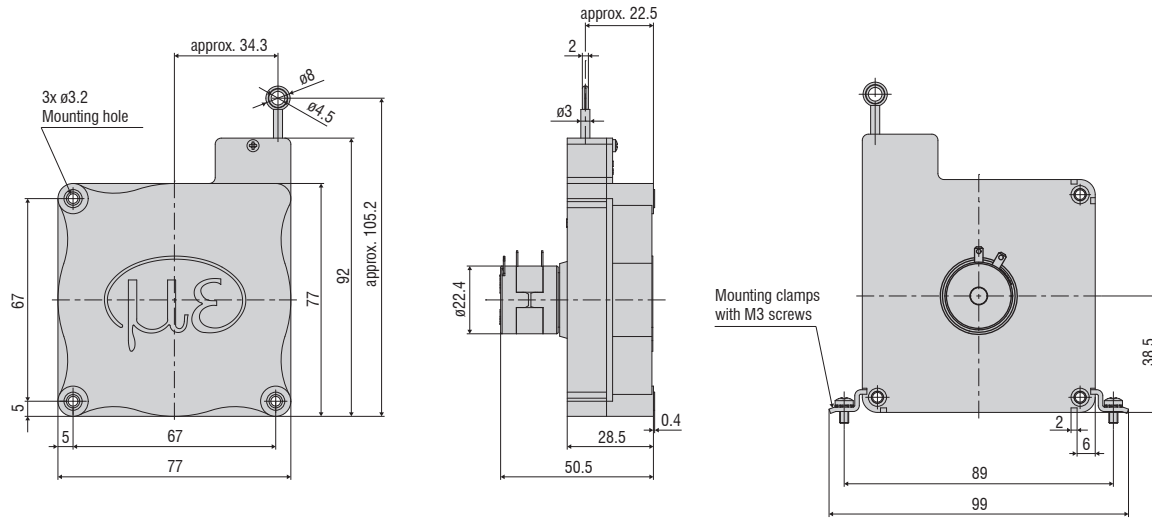


Fig. 8 Dimensional drawing WPS-xxx-MK77-P25 with potentiometer, dimensions in mm (inches)



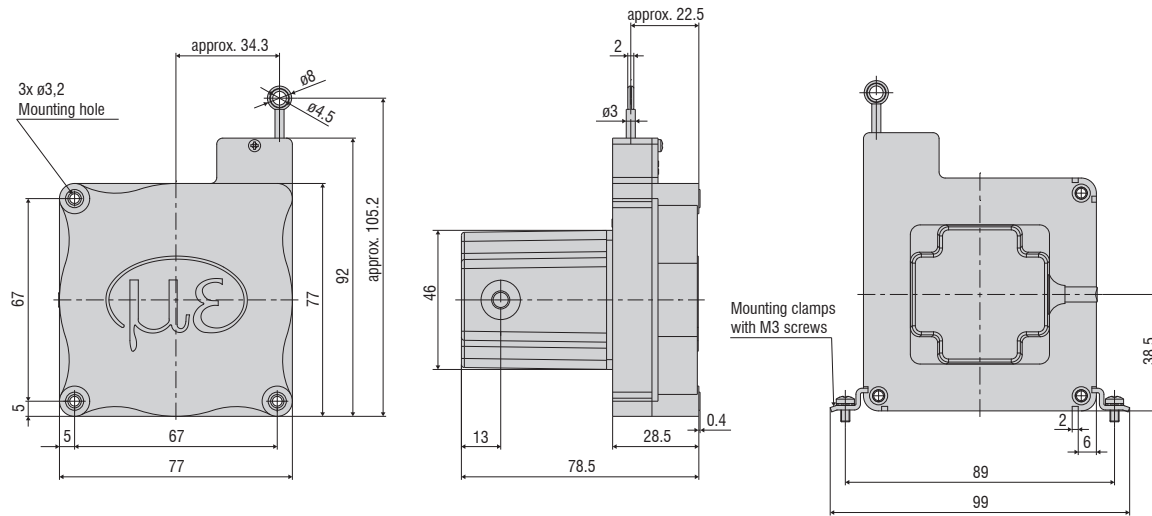


Fig. 9 Dimensional drawing WPS-xxxx-MK77-CR-P25 with potentiometer, dimensions in mm (inches)

### 4.3.6 wireSENSOR WPS MK77 Digital

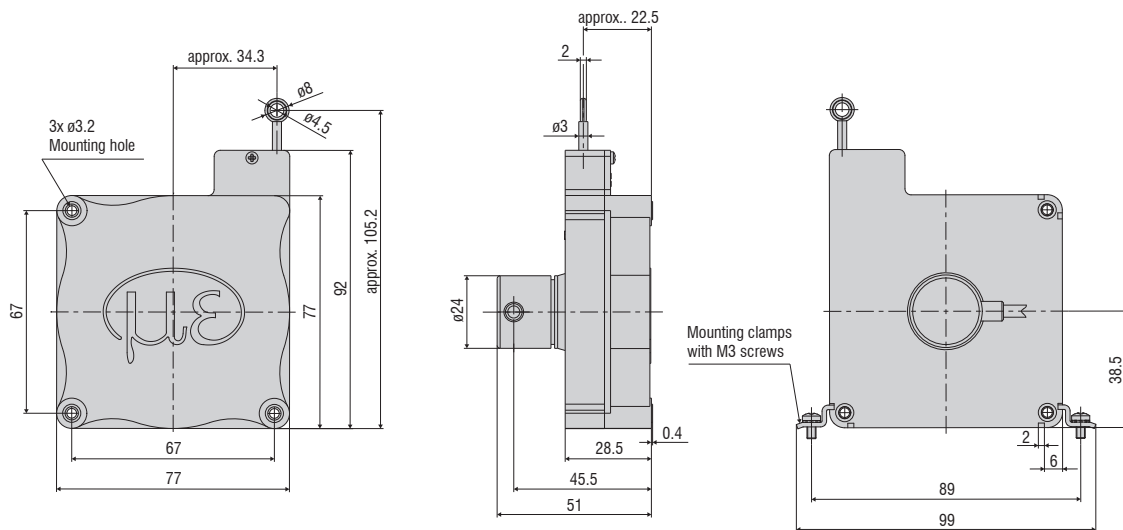


Fig. 10 Dimensional drawing WPS-xxxx-MK77-Exxx with encoder, dimensions in mm (inches)

4.3.7 wireSENSOR WPS MK60 Analog

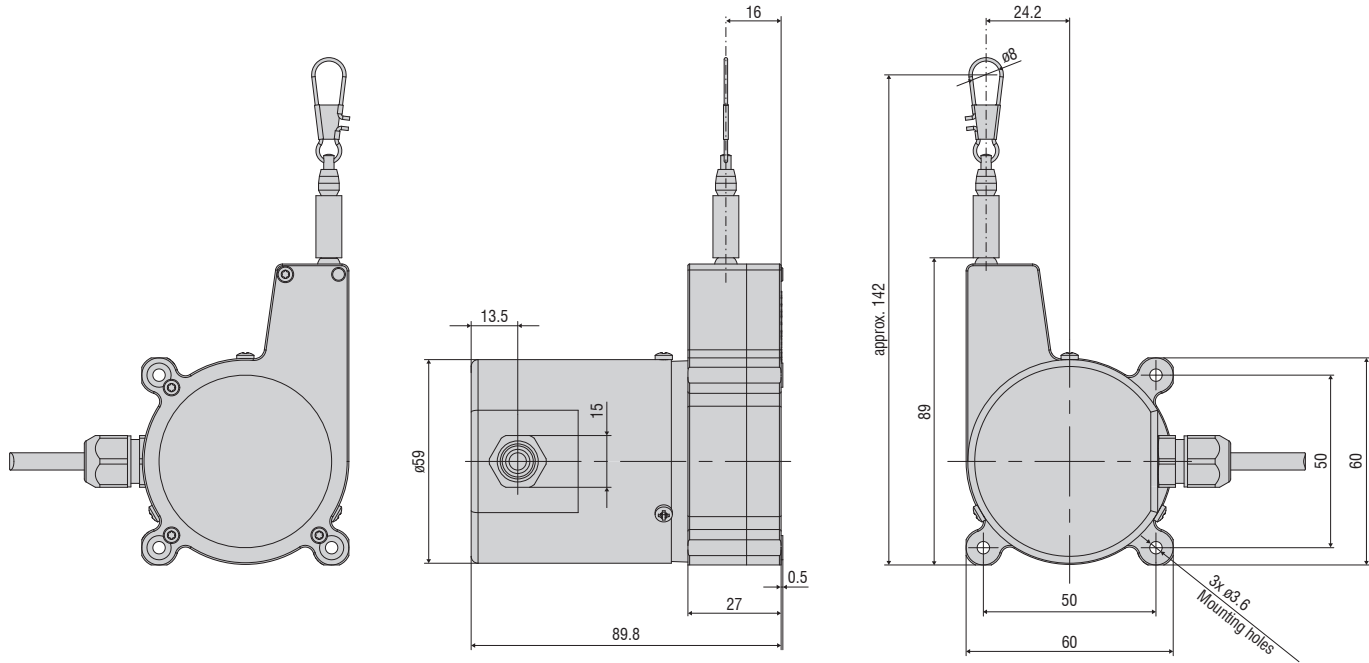


Fig. 11 Dimensional drawing WPS-xxxx-MK60-CR-x with potentiometer, current, voltage, dimensions in mm (inches)

### 4.3.8 wireSENSOR WPS MK60 Digital

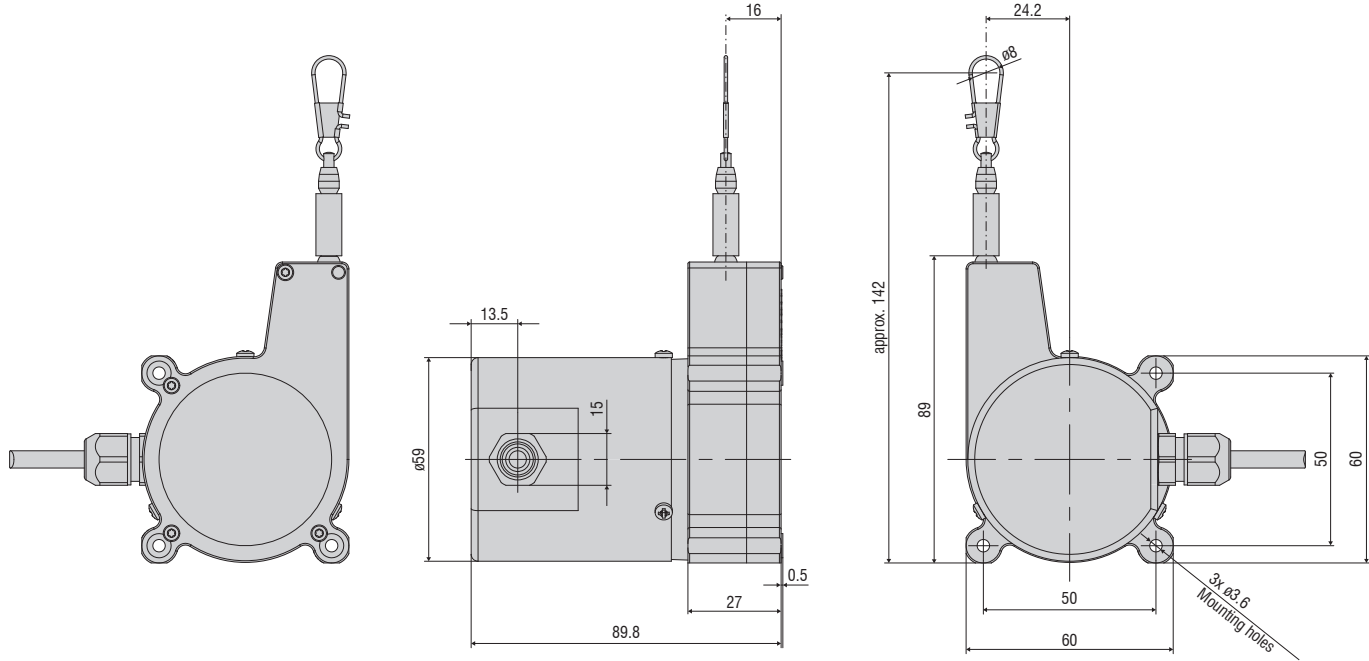


Fig. 12 Dimensional drawing WPS-xxxx-MK60-CR-TTLxx with TTL01, TTL02, dimensions in mm (inches)

4.3.9 wireSENSOR WPS MK88 Analog

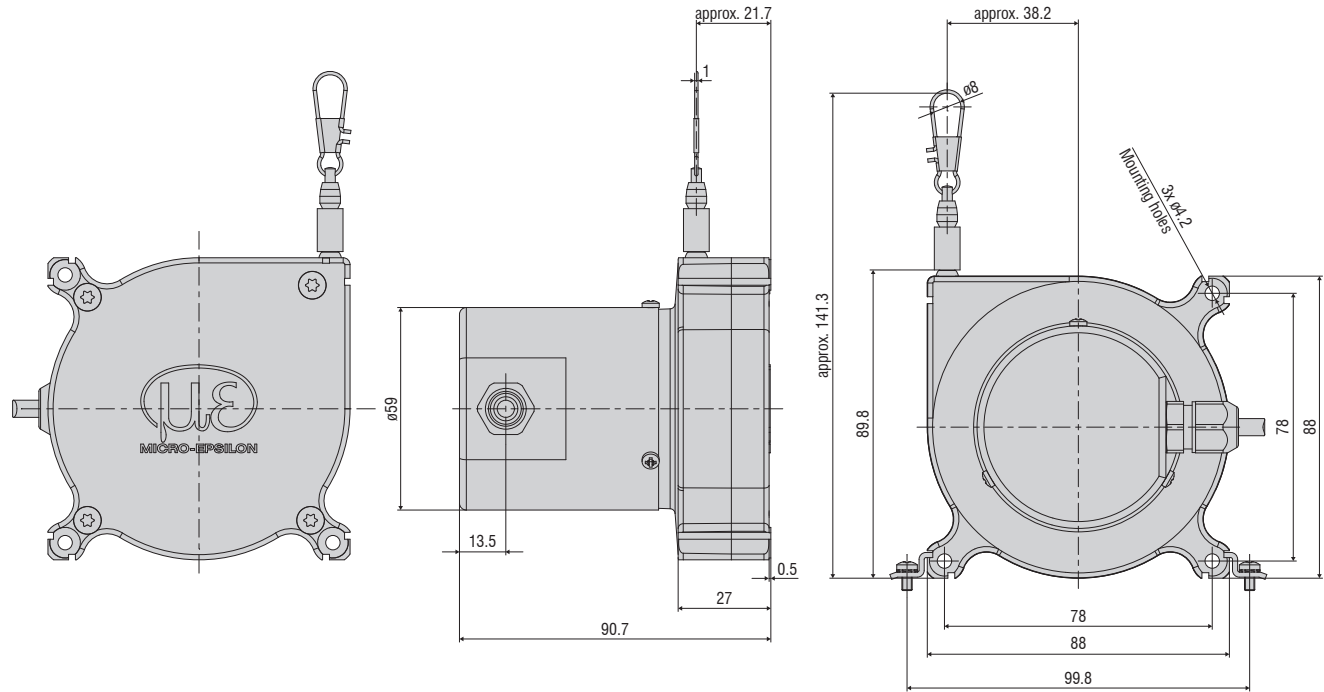


Fig. 13 Dimensional drawing WPS-xxxx-MK88-CR-x with potentiometer, current, voltage, dimensions in mm (inches)

4.3.10 wireSENSOR WPS MK88 Digital

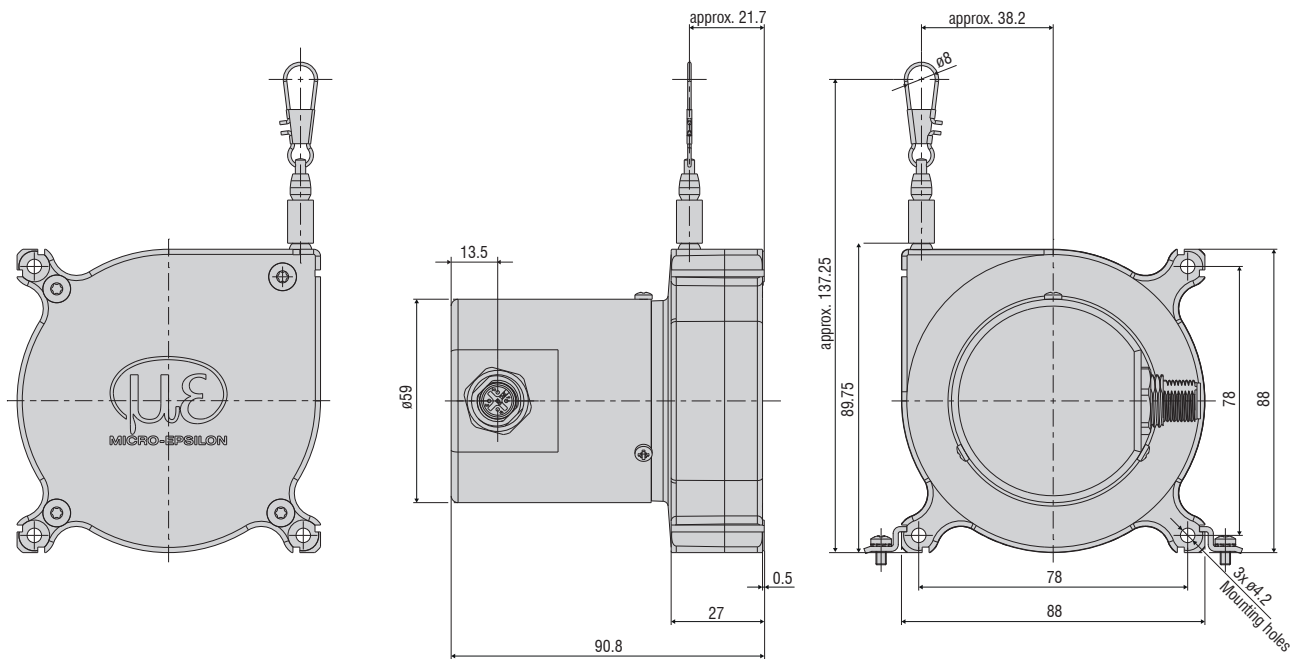


Fig. 14 Dimensional drawing WPS-xxxx-MK88-SR12-CO with CANopen, dimensions in mm (inches)

### 4.3.11 wireSENSOR WPS MK120 Analog

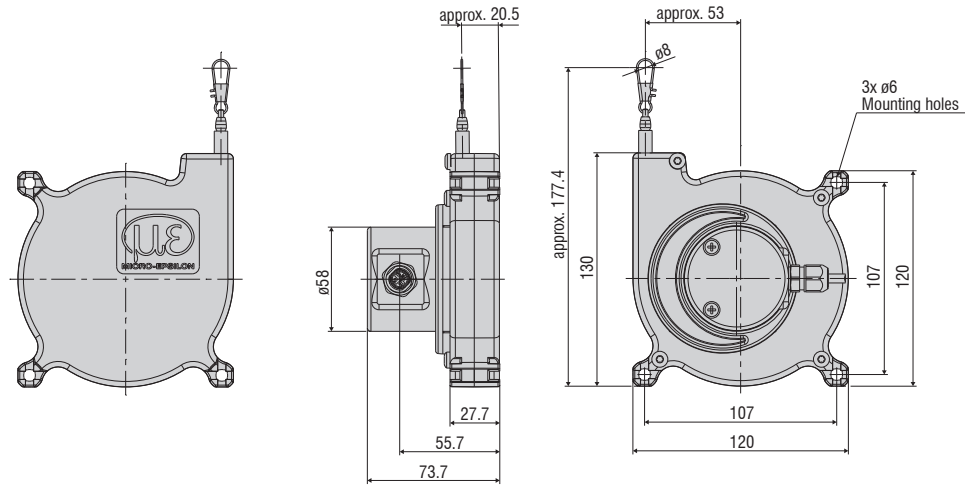


Fig. 15 Dimensional drawing WPS-xxx-MK120-CR-x, measuring ranges 3000, 5000 mm, with potentiometer, current, voltage, dimensions in mm (inches)

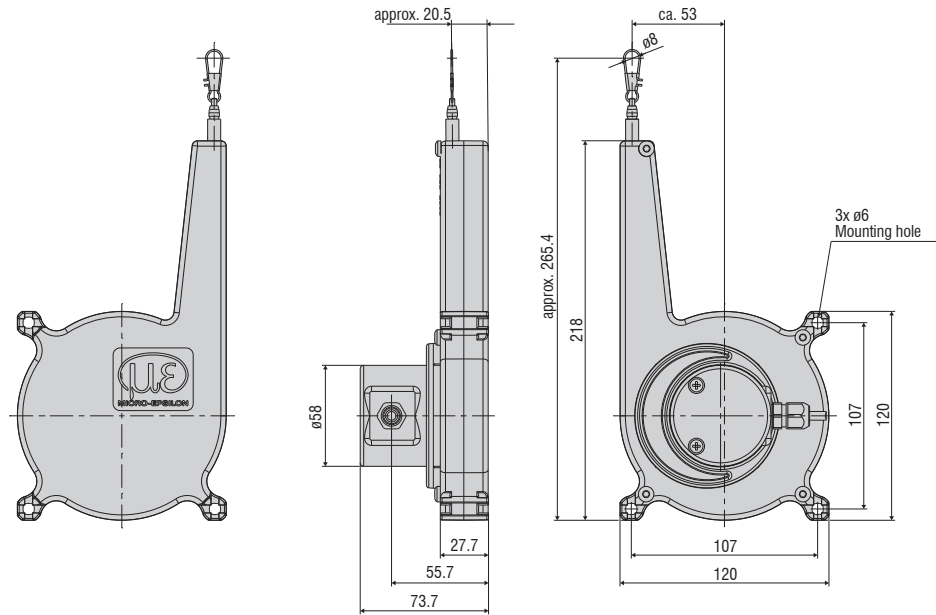


Fig. 16 Dimensional drawing WPS-xxx-MK120-CR-x, measuring range 7500 mm, with potentiometer, current, voltage, dimensions in mm (inches)



#### 4.4 Wire Guide and Fastening

### CAUTION

A measuring wire under tension where operators are standing can lead to injuries.

### NOTICE

Do not twist the measuring wire!

If the measuring wire has to be extracted from the sensor to guide the wire respectively to fix it to the target

- the sensor may not be held by another person
- the measuring wire may not be further extracted but only to the specified measuring range
- the surroundings of the sensor have to be protected against snapping of the measuring wire

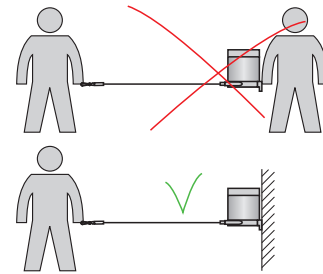
- ➔ Fix the measuring wire to the target using a wire clip.
- ➔ Guide the measuring wire vertically out of the sensor housing.

Misalignment only permissible up to 3 degrees.

Dragging of the measuring wire on the inlet hole or other objects leads to damage and/or breakage of the measuring wire.

**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 Accessories).

- ➔ Keep measuring wire in an area where it cannot be snagged or otherwise be violated.



Wrong

Correct

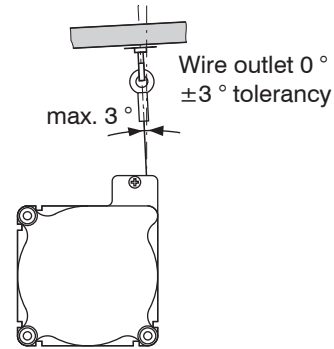


Fig. 17 Wire fastening and misalignment

## 4.5 Pin Assignment Analog

### 4.5.1 Potentiometer Output

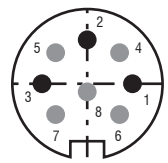
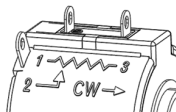
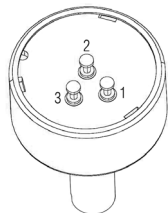
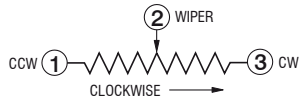
Output		Plug M16 -SA / -SR	Integrated cable- CA / -CR	Open contacts	
<b>Potentiometer output (P)</b>		 <p>View 1</p>			
Supply voltage	max. 32 VDC at 1 kOhm / max. 1 W				
Resistance	1 kOhm ±10 % (resistance divider)				
Temperature coefficient	±0.0025 % FSO/°C				
Viper current	≤ 10 μA				
Sensitivity	Depends on measuring range	1 = Input + 2 = Ground 3 = Signal	White = Input + Brown = Ground Green = Signal	1 = input + 2 = Signal 3 = Ground	

Fig. 18 Table potentiometer output

Draw wire sensors with potentiometer output are connected according table, see Fig. 18.

All potentiometers must only be used in a voltage divider circuit. Using them as a variable resistor, destroys the element. Ensure that the maximum current through the wiper is limited.

**i** Use potentiometer only as voltage divider, not as variable series resistor!

1) Pin side sensor plug or solder side cable socket

### 4.5.2 Voltage Output

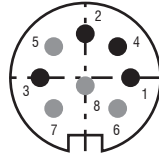
<b>Voltage output (U)</b>			
Supply voltage	14 ... 27 VDC (non stabilized <sup>1)</sup> )	 <p>View <sup>2</sup></p>	
Current consumption	max. 30 mA		
Output voltage	0 ... 10 VDC Options 0 ... 5 / $\pm 5$ V		
Output current	2 mA max.		
Load impedance	> 5 kOhm		
Signal noise	0.5 mV <sub>eff</sub>		
Temperature coefficient	$\pm 0.005$ % FSO/ $^{\circ}$ C		
Electromagnetic compatibility (EMC)	EN 61000-6-4 EN 61000-6-2		
<b>Adjustment range</b> (if supported by the model)		1 = Supply	White = Supply
Zero	$\pm 20$ % FSO	2 = Ground	Brown = Ground
Sensitivity	$\pm 20$ %	3 = Signal	Green = Signal
		4 = Ground	Yellow = Ground

Fig. 19 Table voltage output

- 1) Non stabilized, measured on the input terminal of the sensor
- 2) Pin side sensor plug or solder side cable socket

### 4.5.3 Current Output

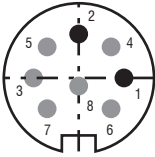
<b>Current output (I)</b>			
Supply voltage	14 ... 27 VDC (non stabilized <sup>1)</sup> )	 <p>View <sup>2</sup></p>	
Current consumption	max. 35 mA		
Output current	4 ... 20 mA		
Load	< 600 Ohm		
Signal noise	< 1.6 $\mu A_{\text{eff}}$		
Temperature coefficient	$\pm 0.01$ % FSO/K		
Electromagnetic compatibility (EMC)	EN 61000-6-4 EN 61000-6-2		
<b>Adjustment range (if supported by the model)</b>			
Zero	$\pm 18$ % FSO	1 = Supply 2 = Ground	White = Supply Brown = Ground
Sensitivity	$\pm 15$ %		

Fig. 20 Table current output

1) Non stabilized, measured on the input terminal of the sensor

2) Pin side sensor plug or solder side cable socket

## 4.6 Pin Assignment Digital

### 4.6.1 CANopen

#### 4.6.1.1 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. 21 Table for pin assignment CANopen

#### 4.6.1.2 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. 22 CANopen features

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

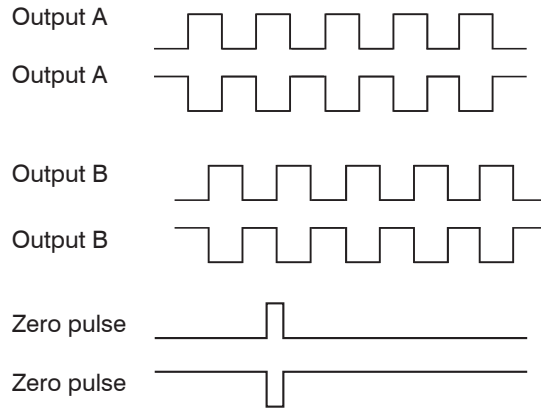
Setting the baud rate		Setting the Subscriber Address (Node ID)
Baud rate adjustable via LSS or object 0x3001		Address adjustable via LSS or object 0x3000 (1 ... 127, 1 = default)
0	1000 kBaud	
2	500 kBaud	
3	250 kBaud	
4	125 kBaud	
6	50 kBaud	
9	AutoBaud (default)	

Fig. 23 CANopen Setting the baud rate

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

## 4.6.2 Incremental Encoder

### 4.6.2.1 Signal Output



*Fig. 24 Signal output*

<b>Output TTL01</b>	<b>NPN (5 VDC ±5 %)</b>	
Level High	≥ UB - 0.2 V	
Level Low	0.55 - 0.75 V	
Load High	≤ 1.85 mA	
Output	A, B, 0	
<b>Output TTL02</b>	<b>Linedriver (5 VDC ±5 %)</b>	
Level High	≥ 2.0 V	(with I= -40 mA)
Level Low	≤ 0.5 V	(with I= 40 mA)
Load High	≤ 40 mA	
Output	A, $\bar{A}$ , B, $\bar{B}$ , 0	

<b>Output E</b>	<b>Push-pull (5 VDC)</b>	
Level High	≥ UB -2.5 V	
Level Low	≤ 0.5 V	
Load High	≤ 50 mA	
Output	A, B, 0	
<b>Output E830</b>	<b>Push-pull (8 ... 30 VDC)</b>	
Level High	≥ UB -3 V	
Level Low	≤ 2.5 V	
Load High	≤ 50 mA	
Output	A, B, 0	



#### 4.6.2.2 Pin Assignment

<b>Pin assignment E, E830</b>	
Cable color	Assignment
White	0 V
Brown	+UB
Green	A
-	$\bar{A}$
Yellow	B
-	$\bar{B}$
Gray	0

*Fig. 25 Pin assignment E, E830*

<b>Pin assignment TTL01</b>	
Cable color	Assignment
Brown	0 V
Gray	+UB
White	A
Green	B
Yellow	0

*Fig. 26 Pin assignment TTL01*

<b>Pin assignment TTL02</b>	
Cable color	Assignment
Red	+UB
Black	0 V
Brown	A
Black	$\bar{A}$
Orange	B
Black	$\bar{B}$
Yellow	0
Black	n.c.

*Fig. 27 Pin assignment TTL02*

Note the pin assignment for draw-wire displacement sensors with encoder output. The sensor contains an additional supplement for detailed information.

## 5. Operation

For draw wire sensors with potentiometer output (P) or encoder output (E) there are no adjustment and setting elements.

## 6. Operation and Maintenance

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

The notes on wire guiding, [see 4.4](#), must be observed during operation.

Imperfect wire guiding can lead to increased wear and premature defects.

The warranty and all liability claims are null and void if the device is manipulated by unauthorized persons.

Repairs are to be made exclusively by Micro-Epsilon, [see 8](#).

## 7. 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 <https://www.micro-epsilon.com/impressum/> Legal details | Micro-Epsilon For translations into other languages, the German version shall prevail.

## **8. Service, Repair**

If the sensor is defective, please send us the effected parts for repair or exchange.

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  
94496 Ortenburg / Germany

Tel. +49 (0) 8542/ 168-0  
Fax +49 (0) 8542/ 168-90  
info@micro-epsilon.com  
www.micro-epsilon.com

## 9. 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](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 and Spare Parts

- TR1-WDS Guide pulley adjustable with mounting socket, see [Fig. 21](#)  
TR3-WDS Guide pulley fix with mounting socket, see [Fig. 22](#)  
WE-xxxx-CLIP Wire extension with wire clip, see [Fig. 23](#), wire length in millimeters for xxxx, max. 10.000 mm (33 ft)

Adjust the distance,  
that the wire  
can't snap off!

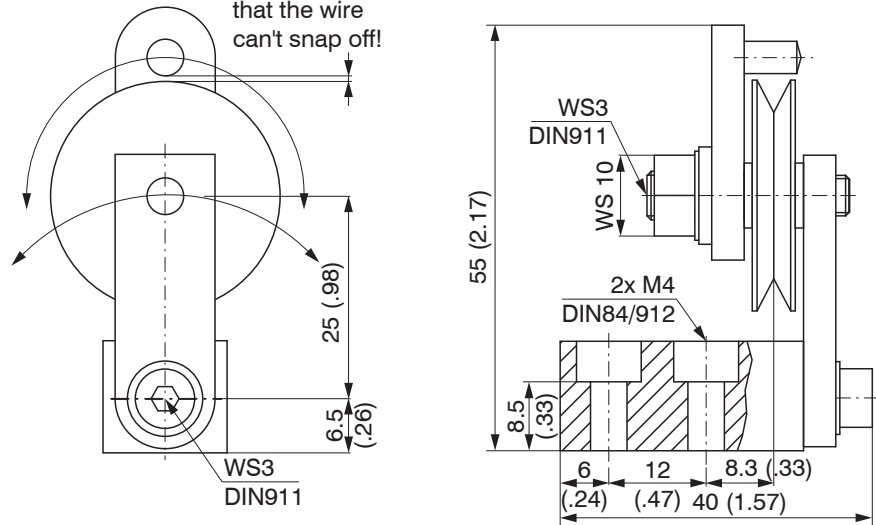


Fig. 28 Guide pulley TR1-WDS with mounting socket, dimensions in mm (inches)

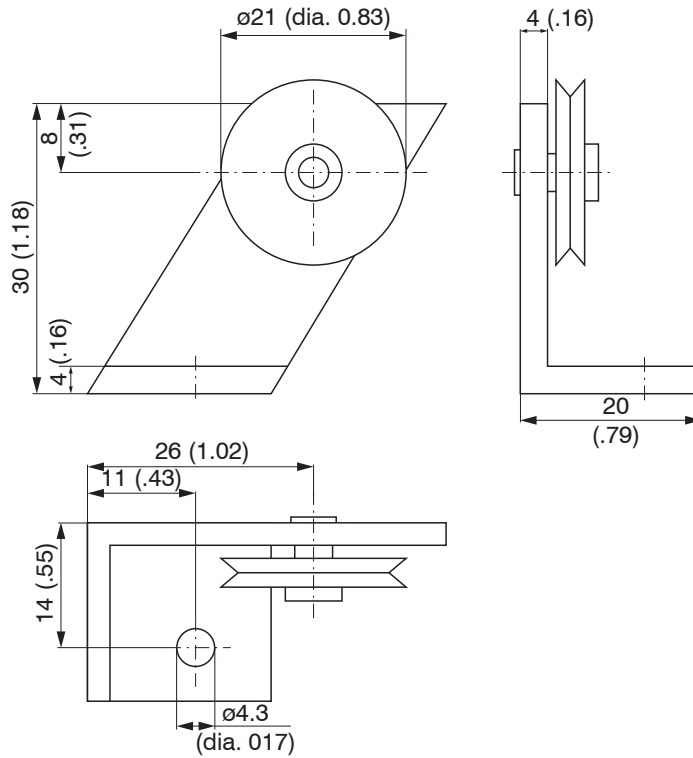


Fig. 29 Guide pulley TR3-WDS fix with mounting socket, dimensions in mm (inches)



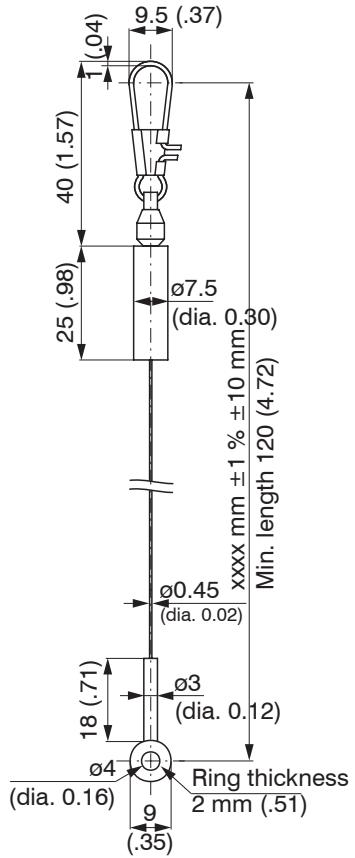


Fig. 30 Wire extension WE-xxxx-CLIP, dimensions in mm (inches)



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