

# ***DRAW WIRE SENSOR***



## ***Series SX draw wire mechanics for encoder assembly***

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### **Key-Features:**

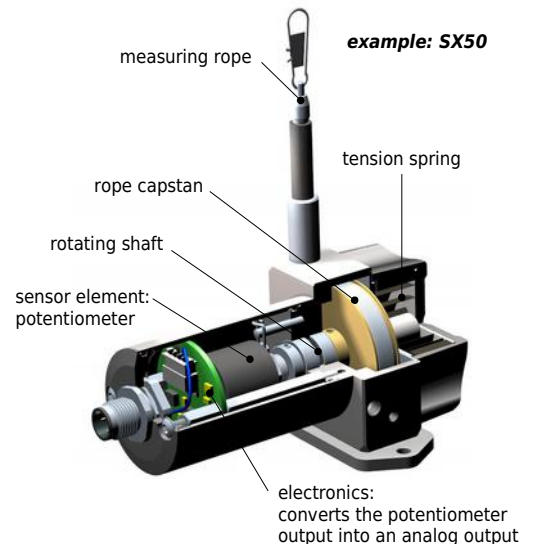
- *Fast and easy encoder mounting*
- *Measurement ranges from 1.0 to 42.5 m*
- *Linearity  $\pm 0.05\%$  of full range (with encoder)*
- *Optional high corrosion protection*
- *Temperature range -20...+85°C (optional -40°C)*
- *High dynamics*
- *Customised versions available*

## INTRODUCTION

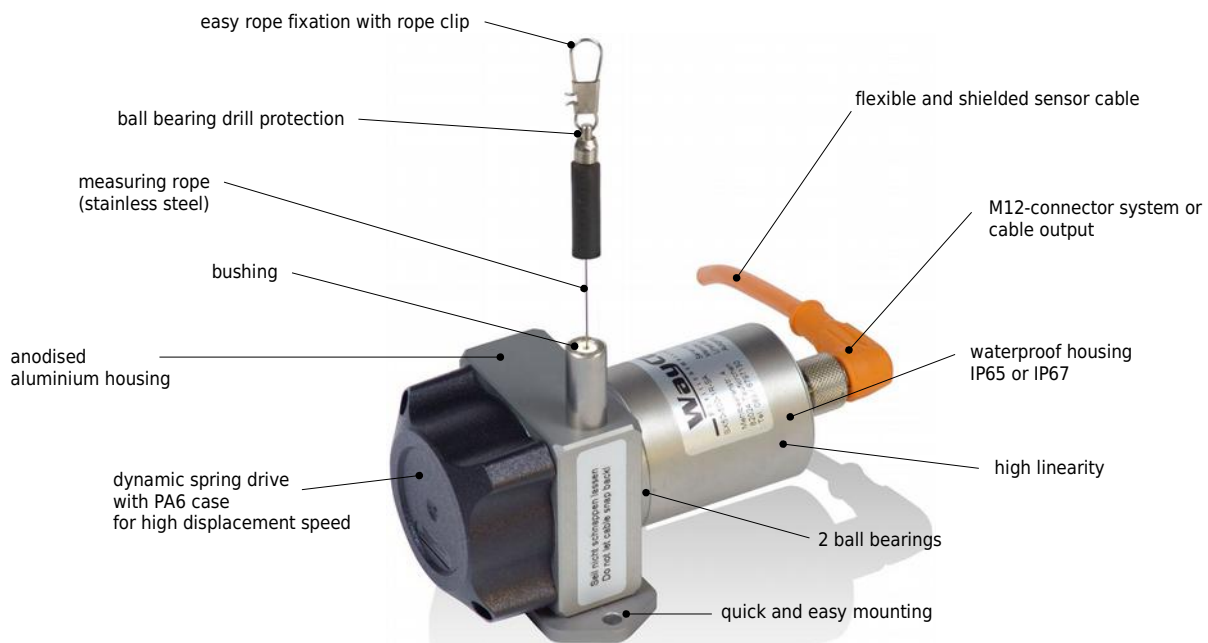
WayCon Positionsmesstechnik GmbH is a manufacturer of high quality draw wire position sensors for industrial use. Due to its small overall size, its short assembly time and its possible customisation, the SX sensor technology is a cost-effective and flexible solution for a wide range of industrial applications. The dynamics of the draw wire transducer allows a high motion speed and acceleration of the measuring target. Its rugged design and high quality makes applications in harsh industrial environments possible. Special instruments are available with mounting service of encoder on site, as well as customised versions of housing.

### Sensor principle:

The key component of a draw wire sensor is a highly flexible steel wire rope, that is wound single-layered on an ultra light capstan. This capstan is connected to the sensor housing by a pre-stressed spring. The end of the steel wire rope, that is equipped with a rope clip gets connected to the target object. As soon as the distance between sensor and target object changes, the steel wire rope gets pulled out of the sensor and is rolled off the capstan (or vice versa). The shaft of the capstan is connected to a potentiometer (for analog output signals), or to an encoder (for digital output signals). If there is a rotation of the capstan due to a change in the distance to the target object, the sensor element will turn proportionally. This way the potentiometer, or the encoder converts a linear movement into a proportional electrical signal. If a standard analog output signal, like 0...10 V or 4...20 mA is needed, the sensor is equipped with an additional electronics.



## SPECIAL FEATURES



## WARNING NOTICES

- Don't let the rope snap back. If the rope is retracted freely, this may lead to injuries (whiplash effect) and the device may be damaged. Caution when unhooking and retracting the rope into the sensor.
- Never exceed the specified measurement range when extracting the rope!
- Do not try to open the device. The stored energy of the spring drive may lead to injuries when being mishandled.
- Do not touch the rope when operating the sensor.
- Avoid guiding the rope over edges or corners. Use a deflection pulley instead.
- Do not operate the sensor if the rope is buckled or damaged. A ripping of the rope may lead to injuries or a damaging of the sensor.



## TECHNICAL DATA SX80

Measurement range	[mm]	1000	1500	2000	2500	3000
Linearity	±[%]	0.05 (with encoder output)				
Disc circumference	[mm]	200				
Temperature	[°C]	standard: -20...+85 / optional: -40...+85 (please pay attention to maximum permitted encoder temperature)				
Weight	[g]	700 to 900, depending on the measurement range				
Housing		aluminium, anodised, spring case PA6				
Encoder requirements		clamping flange (diameter 36 mm), a shaft diameter of 10 mm and a shaft length of 10 - 20 mm				
Accessories		cables, connectors, digital displays, deflection pulley, rope extensions, magnetic clamp (see pages 9 and 10)				

Measurement range [mm]	Extraction Force $F_{min}$ [N]	Extraction Force $F_{max}$ [N]	Speed $V_{max}$ [m/s]	Acceleration $a_{max}$ [m/s <sup>2</sup> ]
1000	4.2	5.4	8	120
1500	4.2	5.4	8	120
2000	5.0	6.4	8	120
2500	5.0	6.4	8	120
3000	5.0	6.4	8	120

## TECHNICAL DATA SX120

Measurement range	[mm]	3125	4000	5000
Linearity	±[%]	0.05 (with encoder output)		
Disc circumference	[mm]	317.68		
Temperature	[°C]	standard: -20...+85 / optional: -40...+85 (please pay attention to maximum permitted encoder temperature)		
Life expectancy		approx. 2 million full strokes (dependent on the displacement speed)		
Weight	[g]	1300 to 1600, depending on the measurement range		
Housing		aluminium, anodised, spring case PA6		
Encoder requirements		clamping flange (diameter 36 mm), a shaft diameter of 10 mm and a shaft length of 10 - 20 mm		
Accessories		cables, connectors, digital displays, deflection pulley, rope extensions, magnetic clamp (see pages 9 and 10)		

Measurement range [mm]	Extraction Force $F_{min}$ [N]	Extraction Force $F_{max}$ [N]	Speed $V_{max}$ [m/s]	Acceleration $a_{max}$ [m/s <sup>2</sup> ]
3125	8.0	10.0	8	120
4000	8.0	11.0	8	120
5000	8.0	11.6	8	120

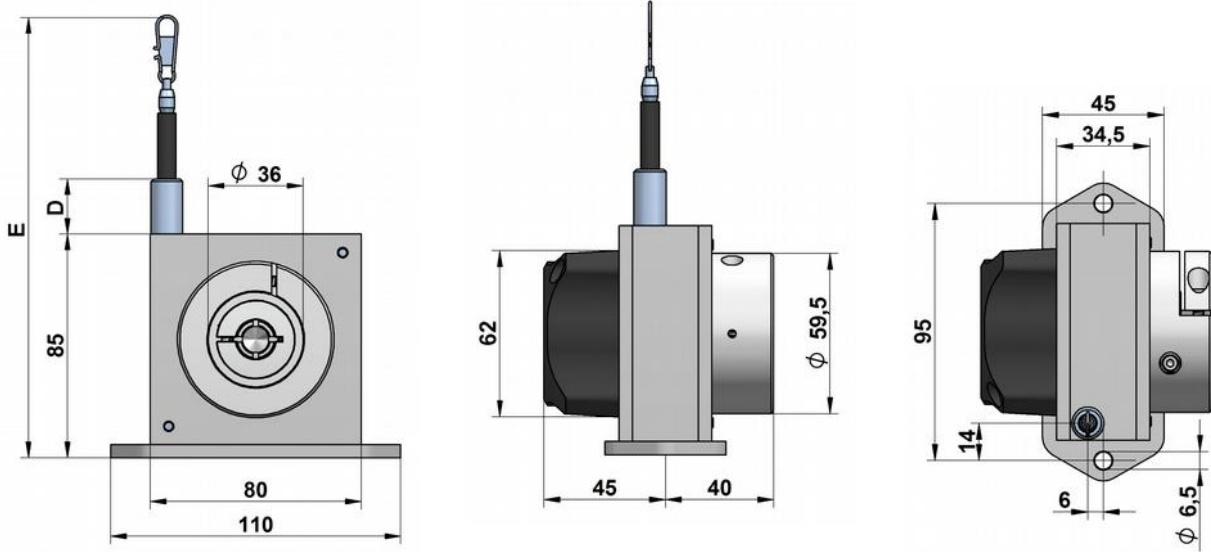
## TECHNICAL DATA SX135

Measurement range	[m]	6.0	7.0	8.0	10.0	12.0	15.0	20.0	25.0	30.0	35.0	40.0	42.5
Linearity	±[%]	0.05 (with encoder output)											
Disc circumference	[mm]	357.14						333.33					
Temperature	[°C]	standard: -20...+85 / optional: -40...+85 (please pay attention to maximum permitted encoder temperature)											
Life expectancy		approx. 2 million full strokes (dependent on the displacement speed)											
Weight	[g]	3200 to 5000, depending on the measurement range											
Housing		aluminium, anodised, spring case PA6											
Encoder requirements		clamping flange (diameter 36 mm), a shaft diameter of 10 mm and a shaft length of 10 - 20 mm											
Accessories		cables, connectors, digital displays, deflection pulley, rope extensions, magnetic clamp (see pages 9 and 10)											

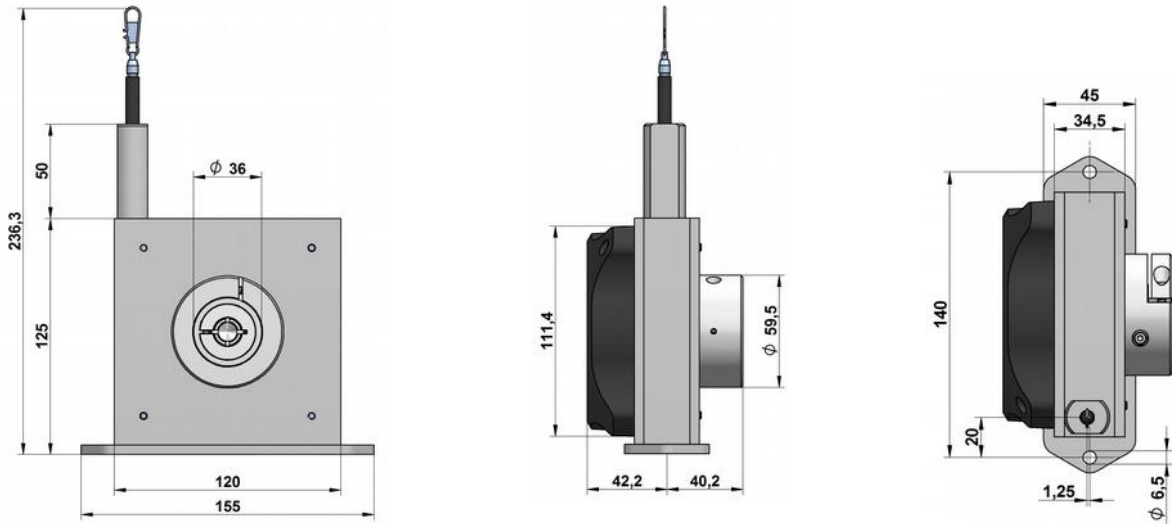
Measurement range [mm]	Extraction Force $F_{min}$ [N]	Extraction Force $F_{max}$ [N]	Speed $V_{max}$ [m/s]	Acceleration $a_{max}$ [m/s <sup>2</sup> ]
6	7.8	13.6	8	120
7	8.2	15.0	8	120
8	8.2	15.2	8	120
10 / 12	4.8	7.2	6	80
15	6.8	11.2	6	80
20	6.4	9.2	5	60
25	7.8	11.4	5	60
30	6.4	9.6	5	60
35	7.4	11.6	5	60
40 / 42,5	5.4	9.0	5	60

# TECHNICAL DRAWING

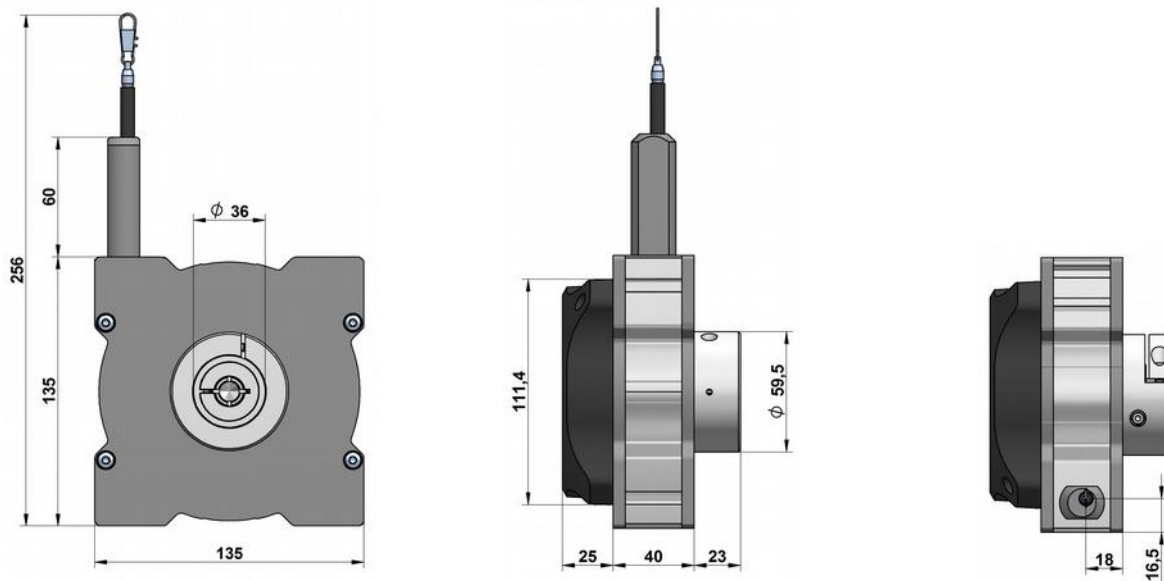
SX80



SX120



SX135



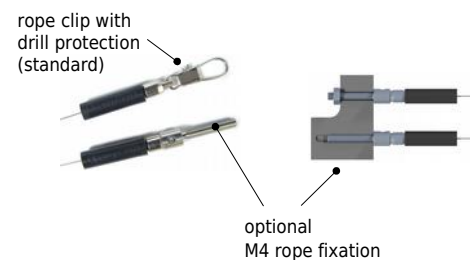
## INSTALLATION

- Mount the sensor at the designated place by using the fixing holes before extracting the rope and before attaching the rope to the measuring target.
- Open the rope clip after the sensor is fully mounted and extract the measuring rope. Hook the rope clip on the measuring object and close the bracket of the clip. For safety reasons put a screw driver trough the clip to extract the rope.
- Check the track of the measuring target on collision with the sensor housing and on exceeding the specified measurement range. When installing the sensor make sure that the rubber stopper does not touch the rope outlet.
- Connect the electronics according to the sensor type. When laying the cables be careful not to under-run the minimal allowed bending radius of the cable (5 x cable diameter).
- **The rope must be extracted from the sensor vertically.** The maximum variation from the vertical is 3°. Avoid carefully extracting the rope at an inclination, since the durability of the instrument would shorten considerably. If it is not possible to keep the limit of 3°, a deflection pulley has to be used.
- The measuring range begins after approximately 2 mm extracted rope (=zero point). The mechanical reserve at the end of the measuring range is about 20 mm.
- When mounting outdoors protect the sensor and the rope from icing at temperatures below 0 °C.
- Guide the rope preferably in corners or guarded in channels to prevent pollution or accidental touch.
- When operating the sensor, take care **not to let the rope snap back** by mistake or extract the rope **over the specified measurement range**, as this might destroy the sensor.
- Maintenance: These instruments are maintenance-free. If however, the rope is soiled due to adverse environmental conditions, it can be cleaned with a cloth drenched in resin-free machine oil.




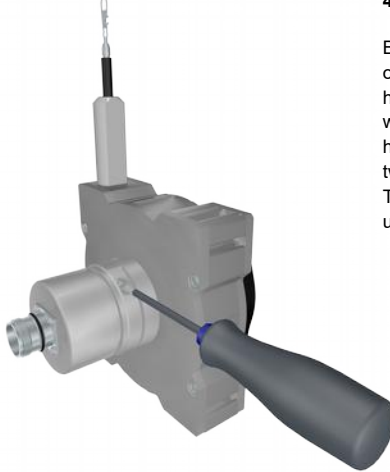


## OPTIONS

Option	Order code	Description
<b>Corrosion protection</b>	CP	Includes a V4A wire rope, stainless steel bearings and option M4. The sensors rope drum gets HARTCOAT® coated. This coating is a hard-anodic oxidation that protects the sensor from corrosion by aggressive media (e. g. sea water) with a hard ceramics-like layer.
<b>Increased temperature range Low</b>	T40	Special components and a low temperature grease make a working temperature down to -40 °C (up to +85°C) possible.
<b>Rope fixation by M4 thread</b>	M4	Optional, pivoted rope fixation with screw thread M4, length 22 mm. Ideal for attachment to through holes or thread holes M4.
<b>Ring eye</b>	RI	The end of the wire rope is equipped with a ring eye instead of a rope clip. Inside diameter 20 mm

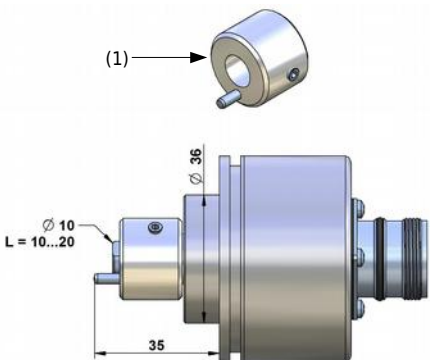
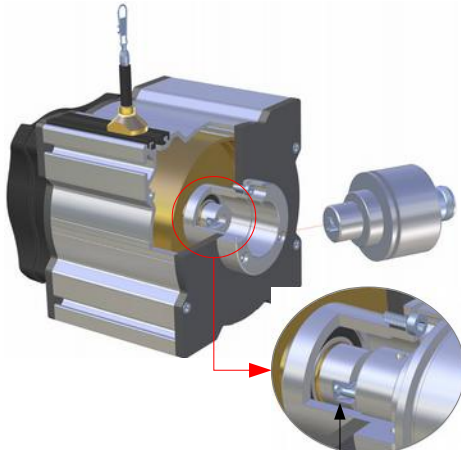
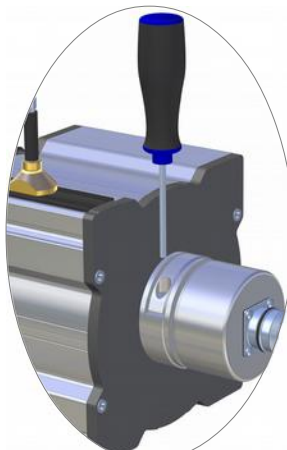


## SX80, SX120, SX135-8 ENCODER ASSEMBLY

	<p><b>1.</b></p> <p>Please insert the encoder into the clamping flange.</p>		<p><b>2.</b></p> <p>The encoder is now connected to the clamping flange.</p>
	<p><b>3.</b></p> <p>By tightening (approx. 2 Nm) the inner radial screw with a 2.5 mm hex wrench the encoder shaft will be clamped to the sensor mechanics and secured from twisting.</p>		<p><b>4.</b></p> <p>By tightening (approx. 2 Nm) the outer radial screw with a 2.5 mm hex wrench the encoder housing will be clamped to the sensor housing and secured from twisting. The system is now ready to be used.</p>

## SX135 ENCODER ASSEMBLY BY EASY-CLAMP-MECHANISM

**IMPORTANT: All incremental and absolute encoders must have a clamping flange (diameter 36 mm), a shaft diameter of 10 mm and a shaft length of 10-20 mm.**

<p><b>1.</b></p> <p>Please mount the included coupling (1) on the shaft of the encoder and fix the set screw (1.0 Nm). Therefore you will need a hexagon screwdriver, size 2. Please pay attention that the dimension between contact surface of the encoder and the end of the cylinder bolt is <u>35 mm</u>.</p> 	<p><b>2.</b></p> <p>Please mount the encoder into the easy-clamp-flange. The cylinder bolt must slip into the spring (2).</p> 	<p><b>3.</b></p> <p>By tightening (1.5 Nm) the radial screw the encoder will be clamped and secured from twisting. Please use a hexagon screwdriver, size 3.</p> 
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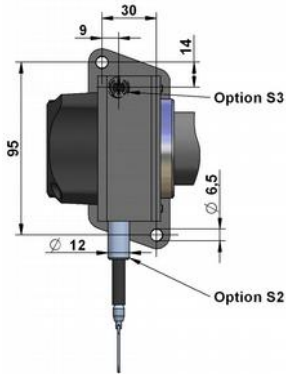
## SX80, SX120 MOUNTING OPTIONS

### SX80, SX120: standard rope outlet, rope outlet sideways top (S1)

The sensor is usually installed by using the regular mounting plate (see technical drawing on page 4).  
By disassembling the mounting plate, there are 4 threads (2 x M3, 2 x M5) in the sensor housing for alternative installation.

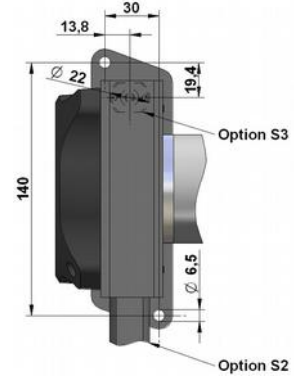
### SX80: rope outlet sideways bottom (S2), rope outlet bottom (S3)

Sensors with option rope outlet S2 and S3 have a modified base plate.



### SX120 rope outlet sideways bottom (S2), rope outlet bottom (S3)

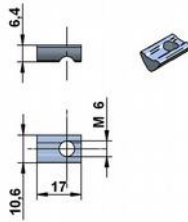
Sensors with option rope outlet S2 and S3 have a modified base plate.



## SX135 MOUNTING OPTIONS

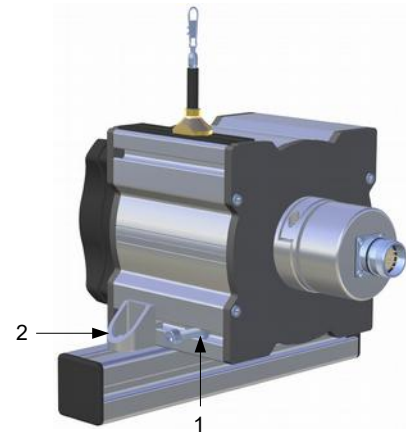
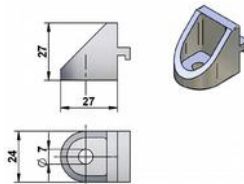
### 1. by using the grooves in the sensor housing

The included T-slot nuts can be easily inserted into the grooves of the sensor housing. The nuts have a metric thread M6.  
Each sensor up to 20 m measurement range comes with 2 nuts, from 20 to 42.5 m four nuts are included.



### 2. by angle clamp brackets

The angle clamp brackets feature a bore for M6 screws to fix it on a plate/ slab or a profile.  
Each sensor up to 20 m measurement range comes with 2 brackets, from 20 to 42.5 m four brackets are included.



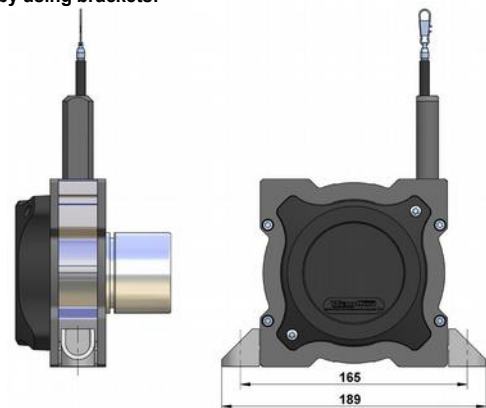
### Important:

The grooves of the sensor housing, the nuts and brackets are compatible to the aluminium building kit system from *item Industrietechnik GmbH* ([www.item.info](http://www.item.info)).

### Position of the grooves:



### Mounting by using brackets:



## ACCESSORIES

### Deflection pulley - UR2

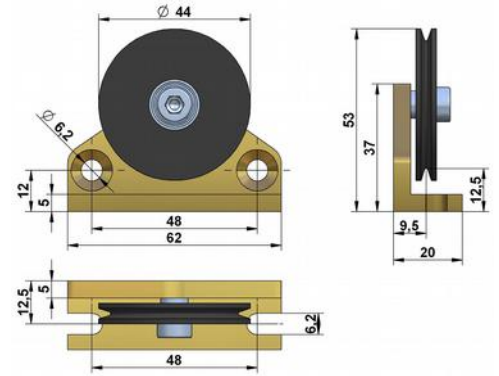
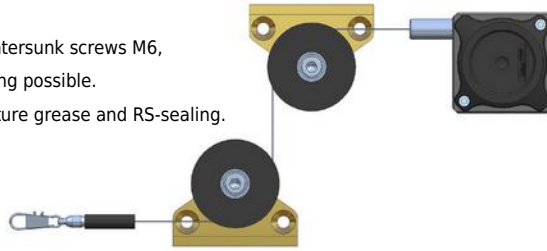
The rope must be extracted from the sensor **vertically**. The maximum variation from the vertical is 3°. A deflection pulley allows a change in the direction of the wire rope. Several pulleys may be used. The rope clip must not be guided over the deflection pulley.

material: anodised aluminium, POM

mounting: by 2 hexagon socket or countersunk screws M6,  
vertical or horizontal mounting possible.

Ball bearings: with special low temperature grease and RS-sealing.

Temperature: -40...+80 °C.



### Rope extension - SV

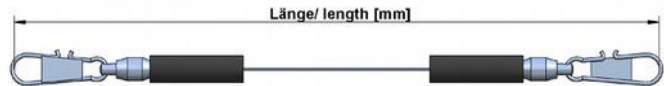
For bridging a greater distance between the measuring target and the sensor a rope extension can be applied. The rope clip must not be guided over the deflection pulley.

Please specify the length needed in your order (XXXX). The minimum length is 150 mm:

SV1-XXXX: rope extension (150...4995 mm)

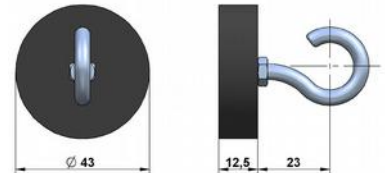
SV2-XXXX: rope extension (5000...19995 mm)

SV3-XXXX: rope extension (20000...40000 mm)



### Magnetic clamp - MGG1

Use the magnetic clamp to quickly attach the rope to metallic objects without any assembly time. A rubber coating provides gentle contact (e. g. on varnished surfaces) and prevents from slipping due to vibration. The magnet consists of a neodym core for an increased adhesive force of 260 N. The hook makes it easy to attach the rope clip.





## ACCESSORIES DIGITAL OUTPUT INCREMENTAL

### Cable with connector M12, 8 poles, shielded

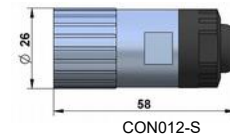
K8P2M-S-M12	2 m, connector straight
K8P5M-S-M12	5 m, connector straight
K8P10M-S-M12	10 m, connector straight
K8P2M-SW-M12	2 m, connector angular
K8P5M-SW-M12	5 m, connector angular
K8P10M-SW-M12	10 m, connector angular

### Mating connector M12, 8 poles, shielded

D8-G-M12-S	mating connector straight
D8-W-M12-S	mating connector angular
	protection class: IP67
	temperature: -25...+90 °C
	cable passage: $\varnothing$ 4...8 mm
	wire diameter: 0.14...0.34 mm <sup>2</sup>

### Mating connector M23, 12 poles

CON012-S	straight, metal housing
	wire diameter: AWG 16...26 mm <sup>2</sup>
	cable diameter: $\varnothing$ 5.5...10 mm



### Digital distance and speed display - WAY-D for incremental output signals

Use the WAY-D display to visualise the measured distance or the speed (tachometer) of the position transducer. A transfer of data to a PC or PLC can be done with the RS232 interface of the WAY-DR.

Protection class:	IP65 (front panel)
Display:	6 digits
Supply:	115 / 250 VAC

#### Output Linedriver L (TTL, RS422):

WAY-DS-5VH:	display only, input level TTL
WAY-DG-5VH:	display with two presets and switching outputs, input level TTL
WAY-DR-5VH:	display with serial interface RS232 / RS485, input level TTL

#### Output Push-Pull G:

WAY-DS:	display only, input level HTL
WAY-DG:	display with two presets and switching outputs, input level HTL
WAY-DR:	display with serial interface RS232 / RS485, input level HTL

For further information please see the WAY-D data sheet.



## ACCESSORIES DIGITAL OUTPUT ABSOLUTE

### SSI output:

K12P02M-S-M23-SSI	2 m cable, shielded, M23 connector straight
K12P05M-S-M23-SSI	5 m cable, shielded, M23 connector straight
K12P10M-S-M23-SSI	10 m cable, shielded, M23 connector straight
K12P15M-S-M23-SSI	15 m cable, shielded, M23 connector straight
CON012-S	Mating connector M23 shielded, straight, 12 poles

### Profibus DP:

K5P2M-B-M12-PROF	2 m cable, plug female M12, 5 poles, open ends
K5P2M-SB-M12-PROF	2 m cable, connector male M12, 5 poles, plug female M12
K5P2M-S-M12-PROF	2 m cable, connector male, M12, 5 poles, open ends
M12-PROF-AW	terminator

### CANopen output:

K5P2M-B-M12-CAN	2 m cable, plug female M12, 5 poles, open ends
K5P2M-SB-M12-CAN	2 m cable, connector male M12, 5 poles, plug female M12
K5P2M-S-M12-CAN	2 m cable, connector male, M12, 5 poles, open ends

### EtherCAT / Profinet:

K4P2M-S-M12-CAT	2 m cable, connector male M12, 4 poles, open ends
K4P5M-S-M12-CAT	5 m cable, connector male M12, 4 poles, open ends
K4P10M-S-M12-CAT	10 m cable, connector male M12, 4 poles, open ends
K4P2M-SS-M12-CAT	2 m cable, connector male M12 on both ends, 4 poles
K4P5M-SS-M12-CAT	5 m cable, connector male M12 on both ends, 4 poles
K4P10M-SS-M12-CAT	10 m cable, connector male M12 on both ends, 4 poles

### Digital distance and speed display - WAY-SSI for SSI output signals

Use the WAY-SSI display to visualise the measured distance or the speed (tachometer) of the position transducer. A transfer of data to a PC or PLC can be done with the RS232 interface of the WAY-SSI-R.

Protection class:	IP65 (front panel)
Display:	6 digits
Supply:	115 / 250 VAC
WAY-SSI-S:	display only
WAY-SSI-A:	display with analog output
WAY-SSI-G:	display with two presets and switching outputs
WAY-SSI-R:	display with serial interface RS232 / RS485

For further information please see the WAY-SSI data sheet.



## SX80 ORDER CODE DRAW WIRE MECHANICS

SX80 — [ ] — F58NK — [ ]

<b>Measurement range [mm]</b>	
1000 / 1500 / 2000 / 2500 / 3000	

<b>Version</b>	
Standard	-
Sensor with options	O

Option	Description
M4	rope fixation be M4 thread
COR	synthetic wire rope, made out of Coramid
RI	ring eye (instead of rope clip)
S1	rope outlet sideways top
S2	rope outlet sideways bottom
S3	rope outlet bottom
T40	increased temperature range low -40...+85°C
CP(80)	corrosion protection SX80

Option	not combinable with
M4	CP(80)
COR	ranges 2500/3000 mm
RI	CP(80)
CP(80)	M4, RI

## SX120 ORDER CODE DRAW WIRE MECHANICS

SX120 — [ ] — F58NK — [ ]

<b>Measurement range [mm]</b>	
3125 / 4000 / 5000	

<b>Version</b>	
Standard	-
Sensor with options	O

Option	Description
M4	rope fixation be M4 thread
COR	synthetic wire rope, made out of Coramid
RI	ring eye (instead of rope clip)
S1	rope outlet sideways top
S2	rope outlet sideways bottom
S3	rope outlet bottom
T40	increased temperature range low -40...+85°C
CP(120)	corrosion protection SX120

Option	not combinable with
M4	CP(120)
RI	CP(120)
CP(120)	M4, RI

## SX135 UP TO 8.0 M ORDER CODE DRAW WIRE MECHANICS

SX135 — [ ] — F58NK — [ ]

<b>Measurement range [m]</b>	
6 / 7 / 8	

<b>Version</b>	
Standard	-
Sensor with options	O

Option	Description
M4	rope fixation be M4 thread
COR	synthetic wire rope, made out of Coramid
RI	ring eye (instead of rope clip)
T40	increased temperature range low -40...+85°C
CP(135-8)	corrosion protection SX135-6/7/8

Option	not combinable with
M4	CP(135-8)
COR	ranges 7 / 8 m
RI	CP(135-8)
CP(135-8)	M4, RI

## SX80 ORDER CODE DRAW WIRE MECHANICS

SX80 — [ ] — F58NK — [ ]

<b>Measurement range [mm]</b>	[ ]
1000 / 1500 / 2000 / 2500 / 3000	

<b>Version</b>	[ ]
Standard	-
Sensor with options	O

Option	Description
M4	rope fixation be M4 thread
COR	synthetic wire rope, made out of Coramid
RI	ring eye (instead of rope clip)
S1	rope outlet sideways top
S2	rope outlet sideways bottom
S3	rope outlet bottom
T40	increased temperature range low -40...+85°C
CP(80)	corrosion protection SX80

Option	not combinable with
M4	CP(80)
COR	ranges 2500/3000 mm
RI	CP(80)
CP(80)	M4, RI

## SX120 ORDER CODE DRAW WIRE MECHANICS

SX120 — [ ] — F58NK — [ ]

<b>Measurement range [mm]</b>	[ ]
3125 / 4000 / 5000	

<b>Version</b>	[ ]
Standard	-
Sensor with options	O

Option	Description
M4	rope fixation be M4 thread
COR	synthetic wire rope, made out of Coramid
RI	ring eye (instead of rope clip)
S1	rope outlet sideways top
S2	rope outlet sideways bottom
S3	rope outlet bottom
T40	increased temperature range low -40...+85°C
CP(120)	corrosion protection SX120

Option	not combinable with
M4	CP(120)
RI	CP(120)
CP(120)	M4, RI

## SX135 UP TO 8.0 M ORDER CODE DRAW WIRE MECHANICS

SX135 — [ ] — F58NK — [ ]

<b>Measurement range [m]</b>	[ ]
6 / 7 / 8	

<b>Version</b>	[ ]
Standard	-
Sensor with options	O

Option	Description
M4	rope fixation be M4 thread
COR	synthetic wire rope, made out of Coramid
RI	ring eye (instead of rope clip)
T40	increased temperature range low -40...+85°C
CP(135-8)	corrosion protection SX135-6/7/8

Option	not combinable with
M4	CP(135-8)
COR	ranges 7 / 8 m
RI	CP(135-8)
CP(135-8)	M4, RI

## SX135 10.0 M AND GREATER ORDER CODE DRAW WIRE MECHANICS

SX135 —  — F58K —

<b>Measurement range [m]</b>	
10 / 12 / 15 / 20 / 25 / 30 / 35 / 40 / 42.5	

<b>Version</b>	
Standard	-
Sensor with options	0

Option	Description
M4	rope fixation be M4 thread
RI	ring eye (instead of rope clip)
T40	increased temperature range low -40...+85°C
CP(135)	corrosion protection SX135

Option	not combinable with
M4	CP(135)
RI	CP(135)
CP(135)	M4, RI

## GENERAL ACCESSORIES

UR2	Deflection pulley
MGG1	Magnetic clamp

SV1-XXXX	rope extension (150...4995 mm)
SV2-XXXX	rope extension (5000...19995 mm)
SV3-XXXX	rope extension (20000...40000 mm)

Subject to change without prior notice.

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