DRAW WIRE SENSOR

Series SX80

Key-Features:

- Measurement ranges from 1000 to 3000 mm
- Analog Output: Potentiometer, 0...10 V, 4...20 mA
- Digital Output Incremental: RS422 (TTL), push-pull
- Digital Output Absolute: CANopen, SSI, Profibus, EtherCAT, Profinet
- Linearity up to ±0.02% of full scale
- Protection class up to IP67
- Temperature range -20...+85 °C (optional -40 °C or +120 °C)
- High dynamics
- High interference immunity factor
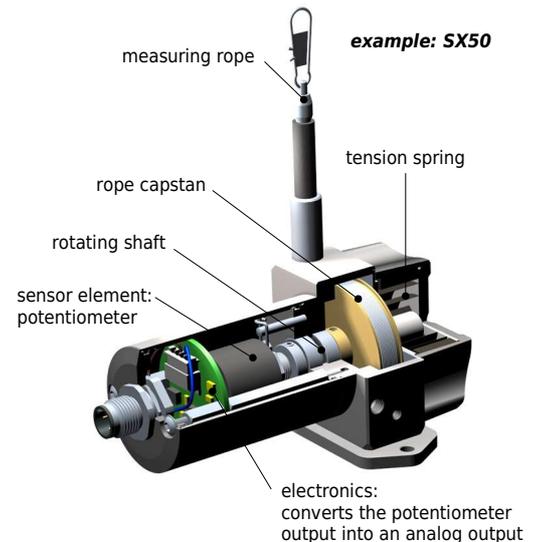- Customised versions available

Content:

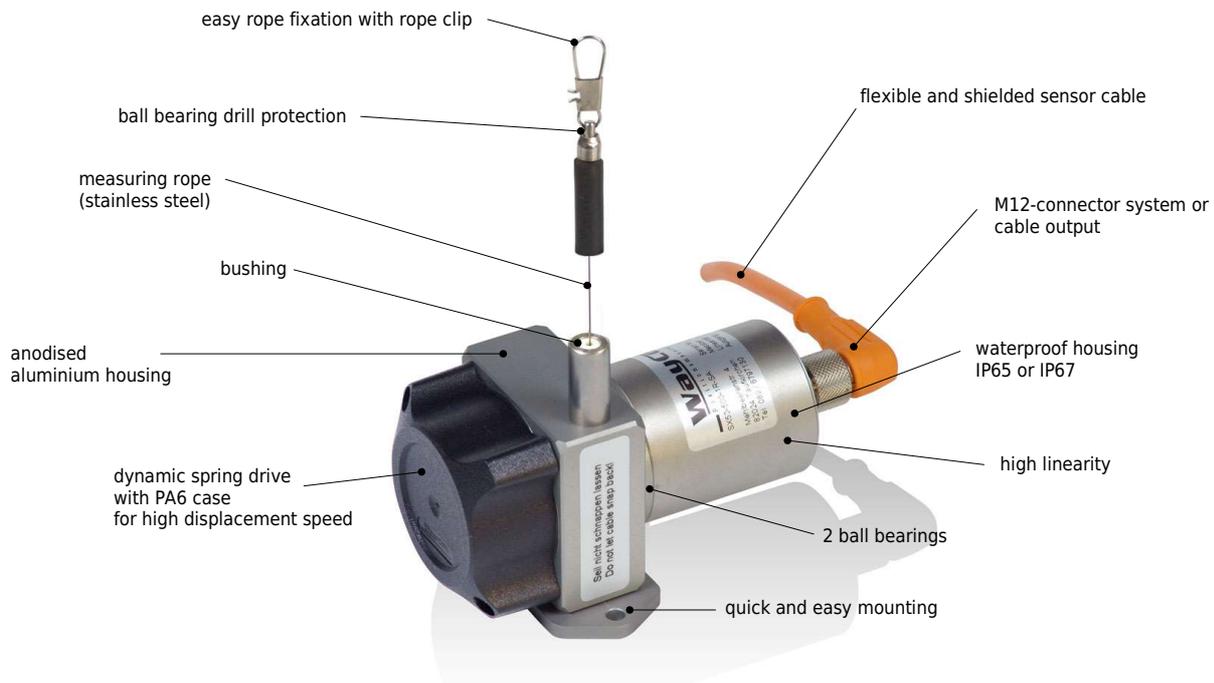29.07.14

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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 winded 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.

example: SX50

measuring rope
tension spring
rope capstan
rotating shaft
sensor element: potentiometer
electronics: converts the potentiometer output into an analog output

SPECIAL FEATURES

easy rope fixation with rope clip
flexible and shielded sensor cable
ball bearing drill protection
measuring rope (stainless steel)
M12-connector system or cable output
bushing
anodised aluminium housing
waterproof housing IP65 or IP67
high linearity
dynamic spring drive with PA6 case for high displacement speed
2 ball bearings
quick and easy mounting

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.

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TECHNICAL DATA ANALOG OUTPUT

Measurement range *	[mm]	1000	1500	2000	2500	3000
Linearity	[%]	0.15	0.15	0.10	0.10	0.10
Improved linearity (optional)	[%]	0.10	0.10	0.05	0.05	0.05
Resolution		see types of output table below				
Sensor element		Hybrid Potentiometer				
Connection		connector output M12 axial or cable output axial 2 m (TPE cable)				
Protection class		IP65, optional IP67				
Humidity		maximum 90 % relative, no condensation				
Temperature	[°C]	standard: -20…+85 / optional: -40…+85 / optional: -20…+120 °C (only with Potentiometer (1R) and cable output (KA))				
Mechanical data		extraction force, maximum velocity and maximum acceleration see table page 13				
Life expectancy		approx. 2 million full strokes				
Weight	[g]	300 to 500, depending on the measurement range				
Housing		aluminium, titanium-grey anodised, spring case PA6				
Accessories		cables, connectors, digital displays, deflection pulley, rope extensions, magnetic clamp (see pages 11 and 12)				

*   other ranges on request

TYPES OF ANALOG OUTPUT

Output: Potentiometer (voltage divider)

Output	1 kΩ
Supply	max. 30 V
Recommended cursor current	< 1 µA
Resolution	theoretically unlimited, limited by the noise
Noise	dependent on the quality ot the power supply
Working temperature	-20…+85 °C , optional: -40…+85 °C / -20…+120 °C
Temperature coefficient	± 0.0025 %/K
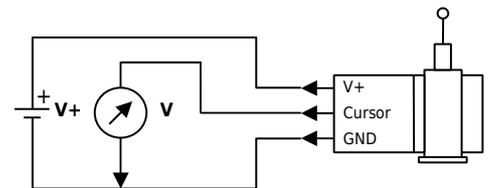
**Output: Voltage 0…10 V**

Output	0…10 V, galvanically isolated, 4 conductors
Supply	12…30 VDC
Current consumption	max. 22.5 mA (unloaded)
Output current	max. 10 mA, min. load 10 kOhm
Dynamics	< 3 ms from 0…100 % and 100…0 %
Resolution	limited by the noise
Noise	3 mV$_{ss}$ typical, max. 37 mV$_{ss}$
Inverse-polarity protection	yes, infinite
Short-circuit proof	yes, permanent
Working temperature	-20…+85 °C , optional: -40…+85 °C
Temperature coefficient	0.0037 %/K
Electromagnetic compatibility (EMC)	according to EN 61326-1:2006
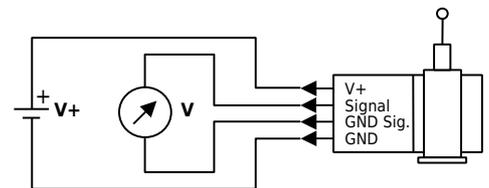
Note: GND Sig. and GND may be connected in a 3-wire system.

Output: Current 4…20 mA

|	
Output	4…20 mA, 2 conductors
Supply	12…30 VDC
Output current	max. 50 mA in case of error
Dynamics	< 1 ms from 0…100 % and 100…0 %
Resolution	limited by the noise
Noise	0.03 mA$_{ss}$ = 6 mV$_{ss}$ an 200 Ohm
Inverse-polarity protection	yes, infinite
Working temperature	-20…+85 °C , optional: -40…+85 °C
Temperature coefficient	0.0079 %/K
Electromagnetic compatibility (EMC)	according to EN 61326-1:2006

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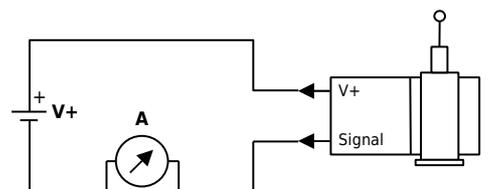
TECHNICAL DRAWING ANALOG OUTPUT
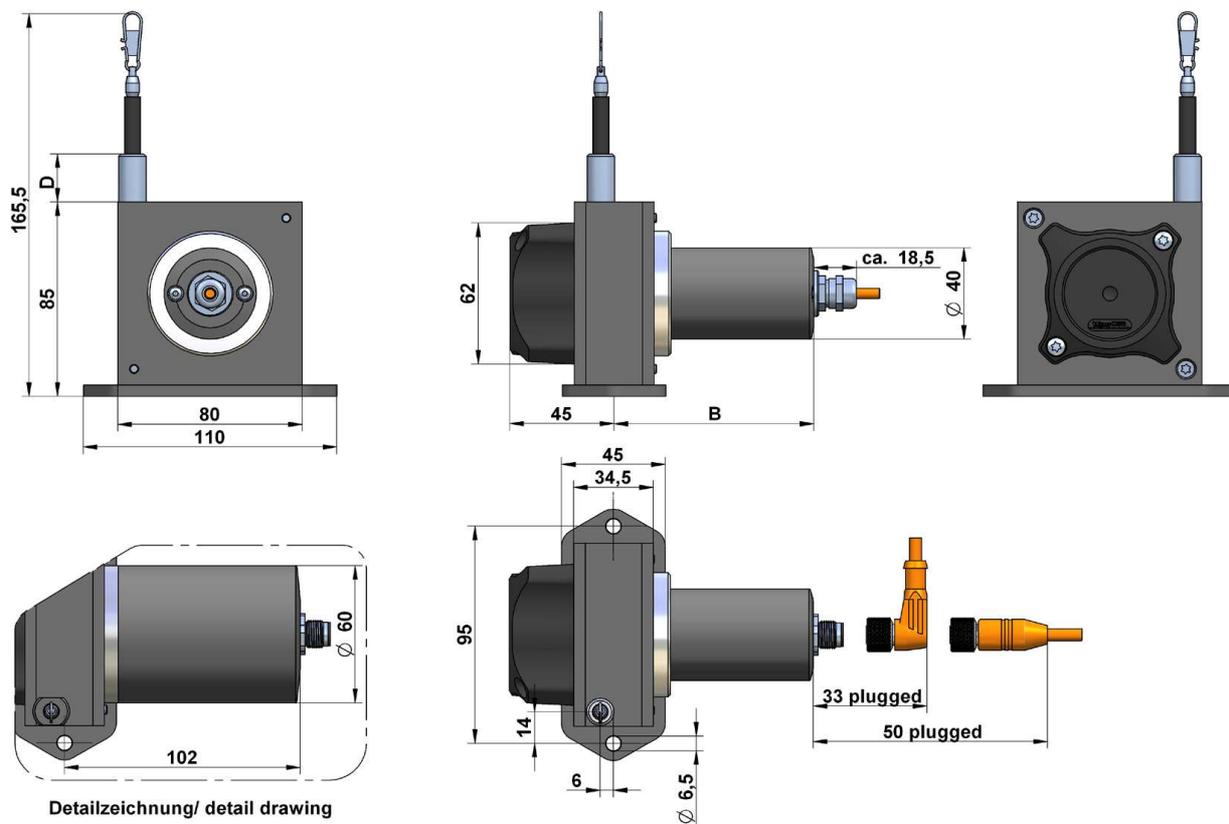
Detailzeichnung/ detail drawing

Range	Output	B	D
1000/2000 mm	Poti	73	21
1000/2000 mm	10V/420A	87	21
1500 mm	see detail drawing		21
2500/3000 mm	see detail drawing		35

ELECTRICAL CONNECTION ANALOG OUTPUT

Cable output

Cable type	TPE, flexible		
Cable direction	axial		
Length	standard: 2 m, (others on request)		
Diameter	4.5 mm		
Wire	0.25 mm²		
Temperature	fixed installation -30…+85 °C		
	flexible installation -20…+85 °C		

Cable colour	0…10 V	4…20 mA	1 kOhm
brown	V +	V +	V +
white	Signal	n. c.	Cursor
blue	GND	Signal	GND
black	GND Signal	n. c.	n. c.

Connector output, M12, 4 poles
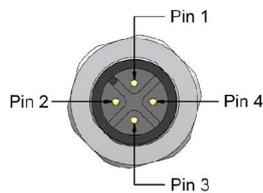
Pin	0…10 V	4…20 mA	1 kOhm
1	V +	V +	V +
2	Signal	n. c.	Cursor
3	GND	Signal	GND
4	GND Signal	n. c.	n. c.

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TECHNICAL DATA DIGITAL OUTPUT INCREMENTAL

Measurement range *	[mm]	1000 / 1500 / 2000 / 2500 / 3000
Linearity	[%]	0.05, independent of the measurement range
Improved linearity (optional)	[%]	0.02, independent of the measurement range
Selectable resolution	[Pulses/mm]	0.5 / 1.25 / 2.5 / 5 / 10 / 25 (this resolution can be raised by the factor 4 using quadruple edge detection)
Z-Pulse distance	[mm]	200
Sensor element		Incremental-Encoder (with optical code disk)
Output signal		A/B-Pulses (90° phase-delayed), Z-Pulse (plus inverted pulses A_{not}, B_{not}, Z_{not})
Connection		M12 connector output or cable output with 2.0 m cable (PVC), open ends
Protection class		IP65, optional IP67
Humidity		maximum 90 % relative, no condensation
Temperature range	[°C]	-20...+85
Mechanical data		extraction force, maximum velocity and maximum acceleration see table page 13
Life expectancy		approx. 2 million full strokes
Weight	[g]	approx. 750
Housing		aluminium, titanium-grey anodised, spring case PA6
Accessories		digital displays, deflection pulley, rope extensions, magnetic clamp (see pages 12 and 13)

* other ranges on request

| Electrical Data		Linedriver L RS422 (TTL-compatible)	Push-Pull G
Power supply +V	[VDC]	5, ±5 %	8...30
Current consumption (no load)	[mA]	typical 40, max. 90	typical 40, max. 100
Load/ Channel	[mA]	max. ±20	max. ±40
Pulse frequency	[kHz]	max. 300	max. 200
Signal level high	[V]	min. 2.5	min. +V – 3
Signal level low	[V]	max. 0.5	max. 0.5
Recommended circuit			
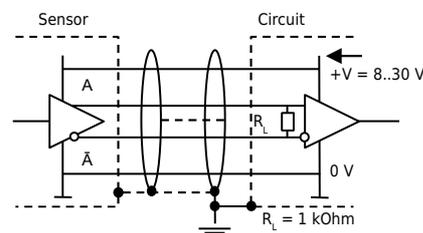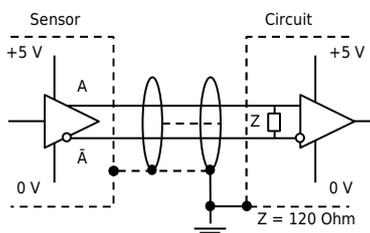
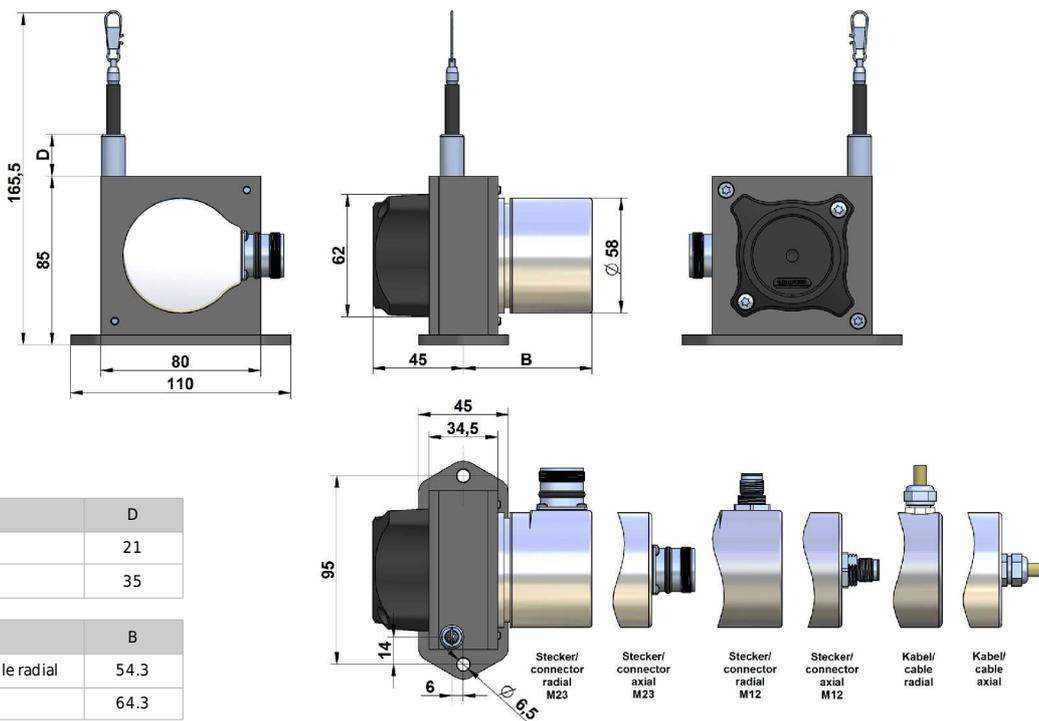# OUTPUT SIGNAL DIGITAL OUTPUT INCREMENTAL

Output signal

Pulses A and B are 90° phase-delayed (detection of direction). The Z-Pulse is emitted once per turn. The Z-Pulse distance is 125 mm (= circumference of the rope drum) and can be used as a reference mark.

Th diagram shows the signal without inverted signals; time line for return of rope.
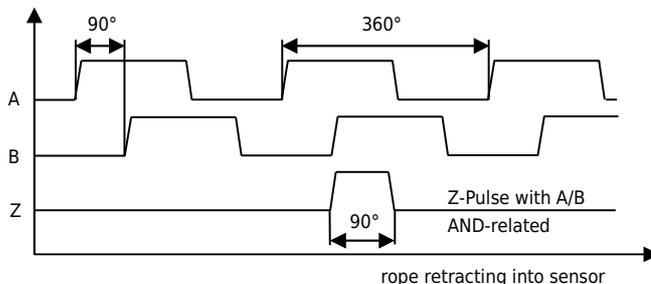
TECHNICAL DRAWING DIGITAL OUTPUT INCREMENTAL

Digital Output Incremental

Range	D
1000/1500/2000 mm	21
2500/3000 mm	35

Output	B
cable/connector axial, cable radial	54.3
connector radial	64.3

CONNECTION DIGITAL OUTPUT INCREMENTAL

Signal	0 V	+V	0 V$_{sens}$ *	+V$_{sens}$ *	A	A$_{Not}$	B	B$_{Not}$	Z	Z$_{Not}$	screen
Connector M23, 12-pole	10	12	11	2	5	6	8	1	3	4	housing
Connector M12, 8-pole	1	2	-	-	3	4	5	6	7	8	housing
Cable output	white	brown	black	violet	green	yellow	grey	pink	blue	red	housing

* For Linedriver L only. For long cable lengths it may occur that the operating voltage at the sensor does not suffice due to the output resistance. With the sensor lines 0 V$_{sens}$ and +V$_{sens}$ the operating voltage can be checked and, if necessary, be readjusted at the input connection.

+V:	Encoder power supply +VDC
0 V:	Encoder power supply ground GND (0 V)
0 V$_{sens}$ / +V$_{sens}$:	Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly

A, A$_{Not}$:	Incremental output channel A
B, B$_{Not}$:	Incremental output channel B
Z, Z$_{Not}$:	Reference signal

Connector output, M23, 12 poles
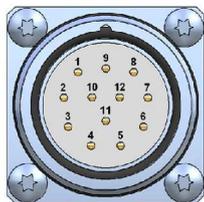
Connector output, M12, 8 poles
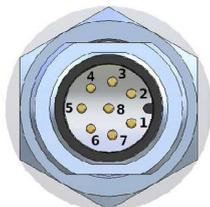
Cable output

Cable type	PVC, flexible
Cable direction	radial or axial
Length	2.0 m
Diameter	ø 4.5 mm
Wires	8 (push-pull) and 10 (linedriver) x 0.14 mm²
Temperature	fixed installation -30...+85 °C
	flexible installation -20...+85 °C
Assignment	see table above

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TECHNICAL DATA DIGITAL OUTPUT ABSOLUTE

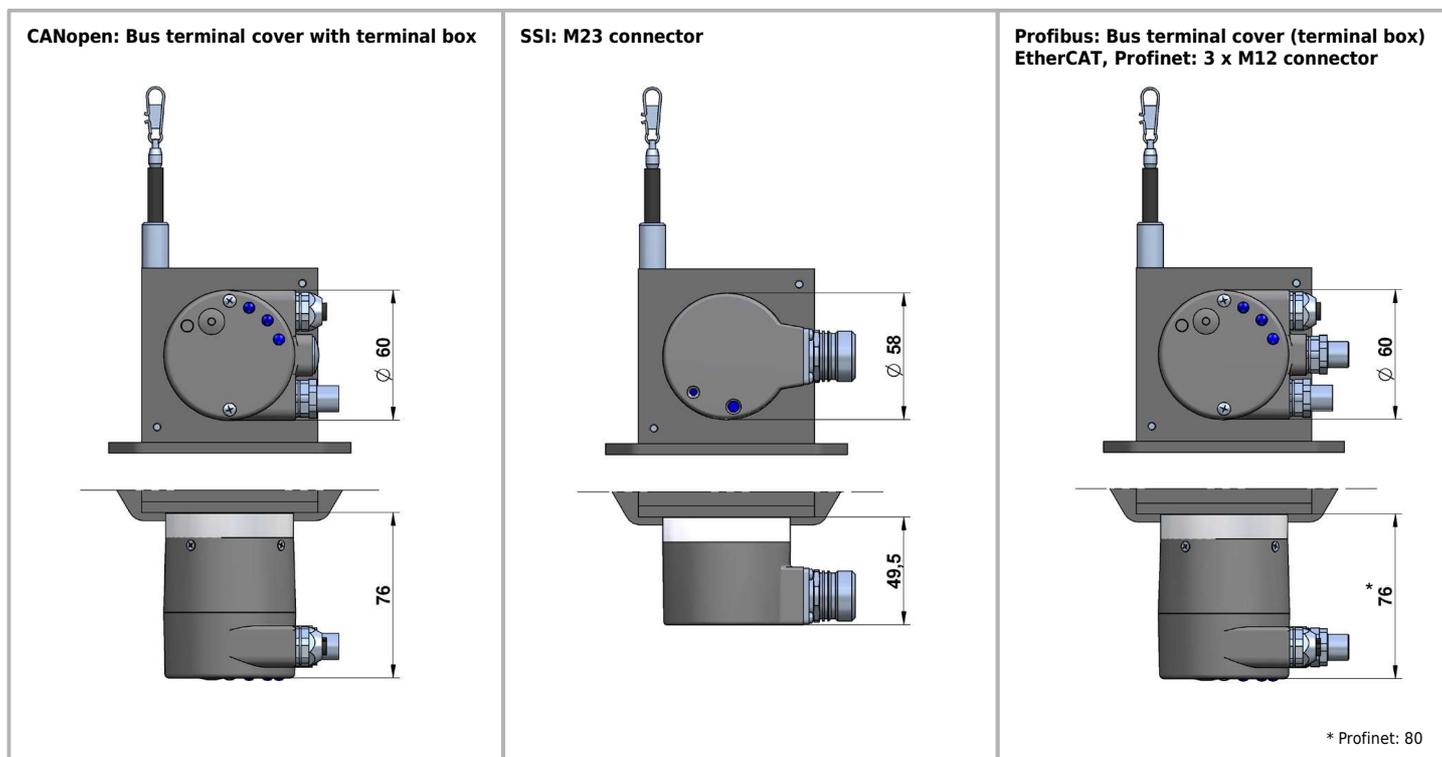|		CANopen	SSI	Profibus-DP	EtherCAT	Profinet
Measurement range	[mm]	1000 / 1500 / 2000 / 2500 / 3000				
Linearity	[%]	0.05, independent of the measurement range				
Improved linearity (optional)	[%]	0.02, independent of the measurement range				
Resolution scalable (with Software)		yes	no	yes	yes	yes
Standard resolution	[Pulses/mm]	40.96	20.48	40.96	40.96	40.96
	[Bit]	13	12	13	13	13
Maximum resolution	[Pulses/mm]	327.68	-	327.68	327.68	327.68
	[Bit]	16	-	16	16	16
Sensor element		Multiturn-Absolute-Encoder (with optical code disk)				
Connection		cable gland radial	1 x connector M23	cable gland radial	3 x connector M12	3 x connector M12
		2 x	radial, 12 poles	3 x	4 pole, radial	4 pole, radial
Power supply	[VDC]	10…30 (reverse polarity protection of the power supply)				
Current consumption (no load, 24 V)	[mA]	max. 100	max. 50	max. 120	max. 120	max. 200
Protection class		IP65, optional IP67				
Humidity		max. 90 % relative, no condensation				
Temperature	[°C]	-20…+80				
Mechanical data		extraction force, maximum velocity and maximum acceleration see table page 14				
Life expectancy		approx. 2 million full strokes				
Weight	[g]	approx. 1100				
Housing		aluminium, titanium-grey anodised, spring case PA6				
Special cables needed		yes	yes	yes	yes	yes
Accessories		cable, connector, digital display,deflection pulley, rope extensions, magnetic clamp (see pages 12 and 13)				

Other encoder types are available on request

TECHNICAL DRAWING DIGITAL OUTPUT ABSOLUTE

Note: for dimensions of the sensor housing please see page 4.

CANopen: Bus terminal cover with terminal box

SSI: M23 connector

Profibus: Bus terminal cover (terminal box)
EtherCAT, Profinet: 3 x M12 connector

* Profinet: 80

DESCRIPTION CANopen

Parameters of the CANopen Interface

Code	Binary
Interface	CAN High-Speed acc. to ISO 11898, Basic- and Full-CAN, CAN Specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 … 1000 kbit/s (can be set via DIP switches/ Software configurable)
Node address	1…127 (can be set via rotary switches/ Software configurable)
Termination switchable	can be set via DIP switches/ Software configurable
SET Button (Option)	Zero or defined value option
LED	LED is ON with the following fault conditions: Sensor error (internal code or LED error) too low voltage, over-temperature

Electrical connection CANopen

	Bus out					Bus in				
Signal	CAN_GND	CAN_L	CAN_H	0 V	+V	0 V	+V	CAN_L	CAN_H	CAN_GND
Abbreviation	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG

DESCRIPTION SSI

Parameters of the SSI interface

Output driver	RS485 Transceiver-type
Permissible load/channel	max. ±20 mA
Signal level	HIGH: typ 3.8 V LOW: with I_{Load} = 20 mA typ 1.3 V
Resolution	12 bit
Code	Gray
SSI clock rate	ST-resolution: 50 kHz…2 MHz
Monoflop time	≤ 15 µs
Data refresh rate	≤ 1 µs
Status and Parity bit	on request

SET Input (optional)

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS-C. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

SET Input

Input	active HIGH
Input type	comparator
Signal level (+V = power supply)	HIGH: min 60% of +V, max. +V LOW: max. 25% of +V
Input current	<0.5 mA
Min. pulse duration (SET)	10 ms
Input delay	1 ms
New position data readable after	1 ms
Internal processing time	200 ms

Electrical connection SSI

	Cable (Isolate unused wires individually before initial start-up)											
Signal	0V	+V	C+	C-	D+	D-	SET	DIR	Status	n.c.	n.c.	n.c.	H
PIN	1	2	3	4	5	6	7	8	9	10	11	12	shield

+ V:	Encoder power supply +VDC	SET:	SET Input
0 V:	Encoder power supply GND (0 V)	DIR:	Direction input: If this input is active, output values are counted
C+, C-:	Clock signal		backwards (decrease) when the shaft is turning clockwise.
D+, D-:	Data signal	H:	Plug connector housing (Shield)

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DESCRIPTION PROFIBUS DP

Parameters of the Profibus DP interface	
Code	Binary
Interface	Profibus DP 2.0 Standard (DIN 19245 Part 3), RS485 Driver galvanically isolated
Protocol	Profibus Encoder Profile V1.1 Class1 and Class2 with manufacturer-specific add-ons
Baud rate	maximum 12 Mbit/s
Device address	1...127 (set by rotary switches)
Termination switchable	set by DIP switches
SET Button (Option)	Zero or defined value option
LED	LED is ON with the following fault conditions: Sensor error, Profibus error

Electrical connection Profibus

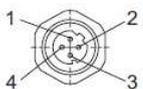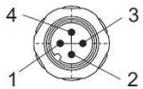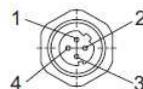|	Bus IN				Bus OUT			
Signal	B	A	0 V	+V	0 V	+V	B	A
Terminal	1	2	3	4	5	6	7	8

The shield of the connection cable must be connected over a large area via the cable gland.

DESCRIPTION EtherCAT

Parameters of the Ether CAT Interface	
Code	Binary
Protocol	EtherNet / EtherCAT
Modes	Freerun, Distributed Clock
Diagnostic LED red	LED is ON with the following fault conditions: Sensor error (internal code or LED error), low voltage, over-temperature
Run LED green	LED is ON with the following conditions: Preop-, Safeop and Op-State (EtherCAT Status machine)
2 x Link LEDs yellow	LED is ON with the following conditions (Port IN and Port OUT): Link detected

Electrical connection EtherCAT

	Signal	Transmit data +	Receive data +	Transmit data -	Receive data -	
Bus Port in	Abbreviation	TxD+	RxD+	TxD-	RxD-	D coded
	PIN	1	2	3	4	
Power supply	Signal	Voltage +	-	Voltage -	-	
	Abbreviation	+V	-	0 V	-	
	PIN	1	2	3	4	
Bus Port out	Signal	Transmit data +	Receive data +	Transmit data -	Receive data -	
	Abbreviation	TxD+	RxD+	TxD-	RxD-	D coded
	PIN	1	2	3	4	

DESCRIPTION PROFINET

Parameters of the Profinet interface	
Code	Binary
Protocol	PROFINET 10
LED Link1/Link2	two coloured: green = active link
	yellow = data transfer

Ezturn Software for Profinet (supplied with the encoder)

- Monitoring of cyclic data (e.g. position, speed)
- Monitoring of acyclic data (e.g. IMO, electronic name plate, encoder parameters, warnings and error messages, preset)
- Setting of preset values
- Firmware updates via the bus

Electrical connection Profinet

	Signal	Transmit data +	Receive data +	Transmit data -	Receive data -	
Bus Port 1	Abbreviation	TxD+	RxD+	TxD-	RxD-	D coded
	PIN	1	2	3	4	
Power supply	Signal	Voltage +	-	Voltage -	-	
	Abbreviation	+V	-	0 V	-	
	PIN	1	2	3	4	
Bus Port 2	Signal	Transmit data +	Receive data +	Transmit data -	Receive data -	D coded
	Abbreviation	TxD+	RxD+	TxD-	RxD-	
	PIN	1	2	3	4	
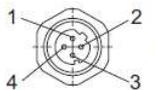
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OPTIONS

Option	Order code	Description
Protection class IP67 (instead of IP65)	IP67	Use option IP67, if sensor will operate in a humid environment. The regular ball bearings are replaced by stainless steel ball bearings. Note that with this option there may occur a light hysteresis in the output signal due to the special sealing The max. acceleration is reduced to 60 % of the specified value.
Corrosion protection by HARTCOAT®	CO	All components of the housing and the inner mechanics get 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 The regular ball bearings are replaced by stainless steel ball bearings.
Best corrosion protection	ICP	This option combines the options CO (HARTCOAT®-coating) and IP67 (protection class IP67). In addition, a increased corrosive protection is achieved by the use of special components.
Increased temperature range Low only in combination with analog output	TEMP-40-SX-ST	Spezial components and a low temperature grease make a working temperature down to -40 °C (up to +85°C) possible.
Increased temperature range High only in combination with potentiometer 1R	TEMP120	Sensors with potentiometer output (1R) can be operated from -20 to +120 °C when this option is used. (NOT in combination with analog or digital output signals)
Changed rope outlet	S1, S2, S3	S1: rope outlet sideways at the top S2*: rope outlet sideways at the bottom S3*: rope outlet on the bottom * with modified mounting plate see page 13
Changed cable or **connector orientation** only for digital incremental output and digital incremental output	K1, K2, K3	Standard: sideways, opposite to the rope outlet K1: at the top K2: sideways, same side as the rope outlet K3: at the bottom
Ring eye	RI20	The end of the wire rope is equipped with a ring eye instead of a rope clip. Inside diameter 20 mm
Rope fixation by M4 thread	M4	Optional, pivoted rope fixation with screw thread M4, length 22 mm. Ideal for attachment to through holes or thread holes M4.
Inverted output signal only in combination with analog output	IN	The analog signal of the sensor is increasing by extracting the rope (standard). Option IN inverts the signal, i. e. the signal of the sensor declines by extracting the rope.

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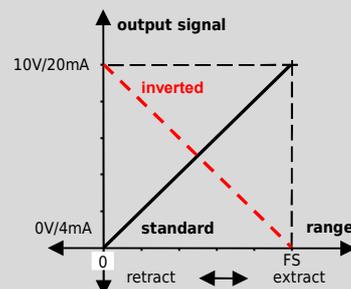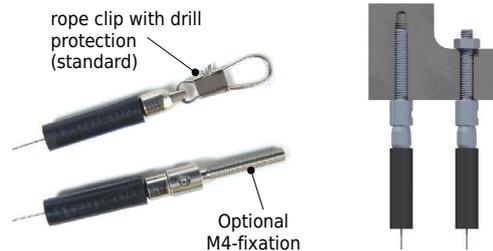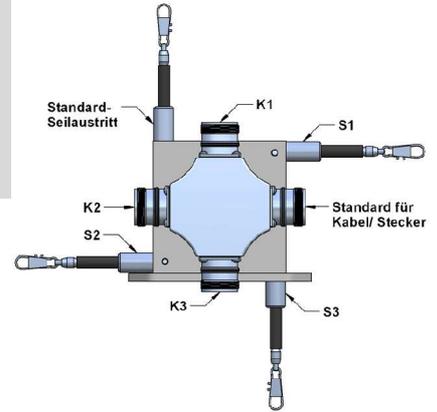
ACCESSORIES

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.
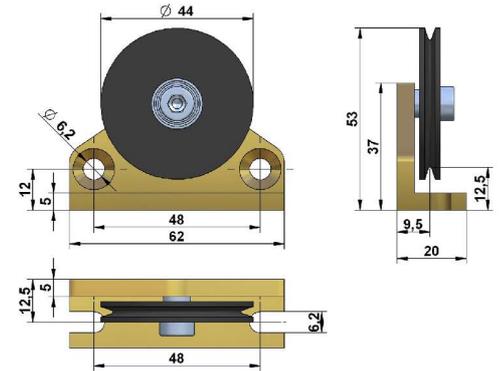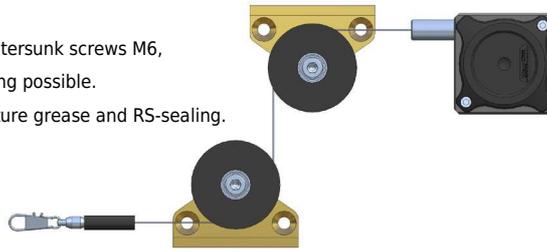
Rope extension - SV

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...19.995 mm)

SV3-XXXX: rope extension (20.000...40.000 mm)
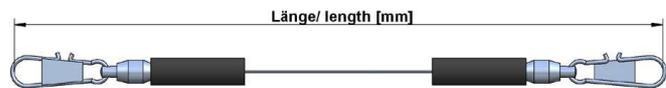
Magnetic clamp - MGG1

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.
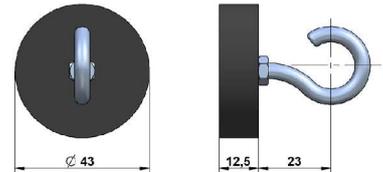
ACCESSORIES ANALOG Output

Cable with connector M12, 4 poles, shielded	
K4P2M-S-M12	2 m, connector straight
K4P5M-S-M12	5 m, connector straight
K4P10M-S-M12	10 m, connector straight
K4P2M-SW-M12	2 m, connector angular
K4P5M-SW-M12	5 m, connector angular
K4P10M-SW-M12	10 m, connector angular

Mating Connector M12, 4 poles, shielded	
D4-G-M12-S	straight, M12 for self assembly
D4-W-M12-S	angular, M12 for self assembly
	protection class: IP67
	temperature: -25...+90 °C
	cable passage: ø 4...8 mm
	wire cross-section: 0.14...0.34 mm²
	mode of connection: spring cage

Digital display - PAXD (for Potentiometer)

Use the PAXD display to visualise the measured distance of the position transducer with a potentiometer as sensor element. A transmission of the measurement data to a computer or PLC can be done with interface plug-in cards.

Inputs:	Potentiometer signal
Analog output (plug-in cards):	0...20 mA, 4...20 mA, 0...10 V
Serial interfaces (plug-in cards):	RS485, RS232, DeviceNet, USB, Profibus, Relay output, Transistor output
Protection class:	IP65 (Front panel)
Display:	5 digits
PAXD000B:	1 channel, power supply: 85 to 250 VAC
PAXD001B:	1 channel, power supply:: 11 to 36 VDC/24 VAC

For further information please see the data sheet of the PAXD display series

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ACCESSORIES ANALOG OUTPUT

Digital displays PAXP (1 channel) and PAXDP (2 channels) for sensors with analog output signals 0..10V or 4..20 mA

Use the PAXD or PAXDP display to visualise the measured distance of transducers with an analog output signal.
A transmission of the measurement data to a computer or PLC can be done with interface plug-in cards.

Inputs:	0...10 V or 4...20 mA, 2 independent counters (for PAXDP)
Analog output (plug-in cards):	0...20 mA, 4...20 mA, 0...10 V
Serial interfaces (plug-in cards):	RS485, RS232, DeviceNet, USB, Profibus, Relay output, Transistor output
Protection class:	IP65 (front panel)
Display:	5 digits
PAXP000B:	1 channel, power supply: 85 to 250 VAC
PAXP001B:	1 channel, power supply: 11 to 36 VDC/24 VAC
PAXDP000B:	2 channels, power supply: 85 to 250 VAC
PAXDP001B:	2 channels, power supply: 11 to 36 VDC/24 VACC

For further information please see the PAXD and PAXDP data sheet.

ACCESSORIES DIGITAL OUTPUT INCREMENTAL
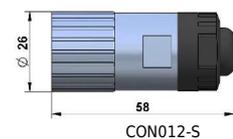
Cable with connector M12, 8 poles, shielded		Mating connector M12, 8 poles, shielded		Mating connector M23, 12 poles	
K8P2M-S-M12	2 m, connector straight	D8-G-M12-S	mating connector straight	CON012-S	straight, metal housing
K8P5M-S-M12	5 m, connector straight	D8-W-M12-S	mating connector angular		wire diameter: AWG 16...26 mm²
K8P10M-S-M12	10 m, connector straight		protection class: IP67		cable diameter: ø 5.5...10 mm
K8P2M-SW-M12	2 m, connector angular		temperature: -25...+90 °C		
K8P5M-SW-M12	5 m, connector angular		cable passage: ø 4...8 mm		
K8P10M-SW-M12	10 m, connector angular		wire diameter: 0.14...0.34 mm²		

CON012-S

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

<u>Output Linedriver L (TTL, RS422):</u>

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

<u>Output Push-Pull G:</u>

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

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.

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MECHANICAL DATA

Measurement Range [mm]	Extraction Force		Speed V$_{max}$ [m/s]	Acceleration a$_{max}$ [m/s²]
	F$_{min}$ [N]	F$_{max}$ [N]		
1000	4.2	5.4	10	140
1500	4.2	5.4	10	140
2000	5.0	6.4	10	140
2500	5.0	6.4	10	140
3000	5.0	6.4	10	140

* reduced to 60 % when option IP67 is used

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.

Mounting: standard rope outlet, rope outlet sideways top (S1)

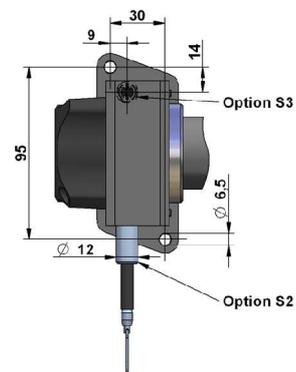The sensor is usually installed by using the regular mounting plate (see technical drawing on page 4).
By disassembling the mounting plate, there are 4 threads (2 x M3, 2 x M5) in the sensor housing for alternative installation.
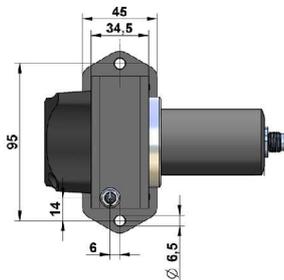
Mounting: rope outlet sideways bottom (S2), rope outlet bottom (S3)

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

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ORDER CODE ANALOG OUTPUT

SX80 – ☐ – ☐ – ☐ – ☐

Measurement Range [mm]	
1000 / 1500 / 2000 / 2500 / 3000	

Analog Output		
Potentiometer	1 kOhm	1R
Voltage output	0...10 V	10V
Current output	4...20 mA	420A

Connection	
Connector output M12 axial	SA
Connector output M12 radial	SR
Cable output axial	KA

Version	
Standard	-
Sensor with options	O

	Selectable Options
M4	rope fixation be M4 thread
RI20	ring eye (instead of rope clip)
S1	rope outlet sideways top
S2	rope outlet sideways bottom
S3	rope outlet bottom
IN	inverted output signal
L05	improved linearity 0.05 %
L10	improved linearity 0.10 %
SSB8	stainless steel bearings
TEMP-40-SX-ST	increased temperature range low -40...+85°C
TEMP120*	increased temperature range high -20...+120 °C
IP67	protection class IP67
CO(80)	HARTCOAT coating SX80
ICP(80)	increased corrosion protection SX80

* only for 1R in combination with KA

ORDER CODE DIGITAL OUTPUT INCREMENTAL

SX80 – ☐ – ☐ – ☐ – ☐ – ☐

Measurement Range [mm]	
1000 / 1500 / 2000 / 2500 / 3000	

Resolution [Pulses/mm]	
0.5 / 1.25 / 2.5 / 5 / 10 / 25	

Output type	
Linedriver according to RS422 (TTL)	L
Push-Pull	G

Connection	
Connector output M23 radial (optional M12)	SR
Connector output M23 axial (optional M12)	SA
Cable output radial (2.0 m length)	KR *
Cable output axial (2.0 m length)	KA *

	Version
-	Standard
O	Sensor with options

	Selectable Options
M4	rope fixation M4 thread
RI20	ring eye (instead of rope clip)
M12	Connector output M12 (instead of M23)
S1	rope outlet sideways top
S2	rope outlet sideways bottom
S3	rope outlet bottom
K1	cable/connector orientation top
K2	cable/connector orientation left
K3	cable/connector orientation bottom
L02	improved linearity 0.02 %
IP67	protection class IP67
CO(80)	HARTCOAT coating SX80

* for linedriver: 10 wires (with additional sensor lines)
  for push-pull: 8 wires (without additional sensor lines)

ORDER CODE DIGITAL OUTPUT ABSOLUTE

SX80 – ☐ – ☐ – ☐

Measurement Range [mm]	
1000 / 1500 / 2000 / 2500 / 3000	

Interfaces / Bus systems	
SSI	SSI
CANopen	CAN
Profibus DP	PRO
EtherCAT	CAT
Profinet	NET

Version	
Standard	-
Sensor with options	O

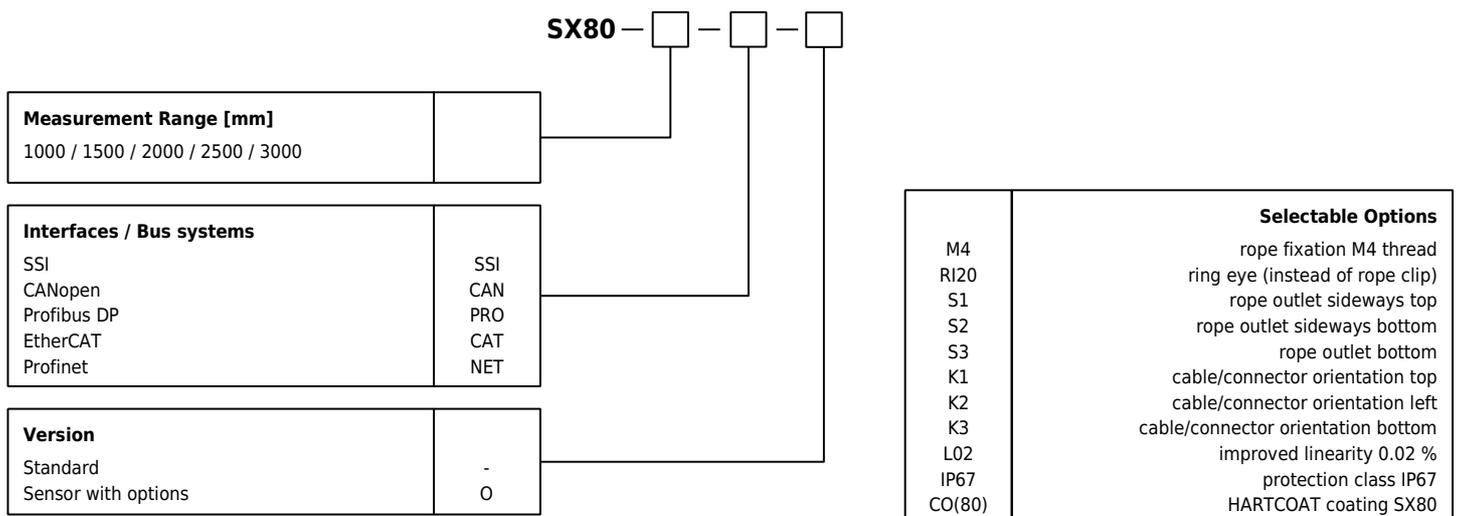|	Selectable Options
M4	rope fixation M4 thread
RI20	ring eye (instead of rope clip)
S1	rope outlet sideways top
S2	rope outlet sideways bottom
S3	rope outlet bottom
K1	cable/connector orientation top
K2	cable/connector orientation left
K3	cable/connector orientation bottom
L02	improved linearity 0.02 %
IP67	protection class IP67
CO(80)	HARTCOAT coating SX80

GENERAL ACCESSORIES

UR2	Deflection pulley		SV1-XXXX	rope extension (150…4995 mm)
MGG1	Magnetic clamp		SV2-XXXX	rope extension (5000…19.995 mm)
			SV3-XXXX	rope extension (20.000…40.000 mm)

ACCESSORIES ANALOG OUTPUT

Cable with mating connector M12, 4 poles, shielded			Digital display 1 channel, 0…10V/4…20 mA	
K4P2M-S-M12	2 m, straight connector		PAXP000B	1 channel, supply: 85 to 250 VAC
K4P5M-S-M12	5 m, straight connector		PAXP001B	1 channel, supply: 11…36 VDC/24 VAC
K4P10M-S-M12	10 m, straight connector			
K4P2M-SW-M12	2 m, angular connector		Digital display 2 channels, 0…10V/4…20 mA	
K4P5M-SW-M12	5 m, angular connector		PAXDP00B	2 channels, supply: 85 to 250 VAC
K4P10M-SW-M12	10 m, angular connector		PAXDP01B	2 channels, supply: 11…36 VDC/24 VAC

Mating Connector M12, 4 poles, shielded			Digital display 1 channel, Potentiometer	
D4-G-M12-S	straight, M12 for self assembly		PAXD000B	1 channel, supply: 85 to 250 VAC
D4-W-M12-S	angular, M12 for self assembly		PAXD001B	1 channel, supply: 11…36 VDC/24 VAC

Additional cable for cable output KA (2 m length is standard)	
Kabel-TPE	order code for 1 m of additional TPE cable

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ACCESSORIES DIGITAL OUTPUT INCREMENTAL

Cable with mating connector M12, 8 poles, shielded	
K8P2M-S-M12	2 m, straight connector
K8P5M-S-M12	5 m, straight connector
K8P10M-S-M12	10 m, straight connector
K8P2M-SW-M12	2 m, angular connector
K8P5M-SW-M12	5 m, angular connector
K8P10M-SW-M12	10 m, angular connector

Cable with mating connector M23, 8 poles, shielded	
K8P2M-S-M23	2 m, straight connector
K8P5M-S-M23	5 m, straight connector
K8P10M-S-M23	10 m, straight connector

Mating Connector M23, 12 poles, shielded	
CON012-S	straight, M23 for self assembly, metal housing

Mating Connector M12, 8 poles, shielded	
D8-G-M12-S	straight, M12 for self assembly
D8-W-M12-S	angular, M12 for self assembly

Digital display 1 channel, Linedriver L (input level TTL, RS422)	
WAY-DS-5VH	display only
WAY-DG-5VH	display with two presets and switching outputs
WAY-DR-5VH	display with serial interface RS232 / RS485

Digital display 1 channel, Push-Pull G	
WAY-DS	display only
WAY-DG	display with two presets and switching outputs
WAY-DR	display with serial interface RS232 / RS485

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

Digital display 1 channel, for sensors with SSI signal	
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

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-B-M12-CAT	2 m cable, plug female M12, 4 poles, open ends
K4P5M-B-M12-CAT	5 m cable, plug female M12, 4 poles, open ends
K4P10M-B-M12-CAT	10 m cable, plug female M12, 4 poles, open ends

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