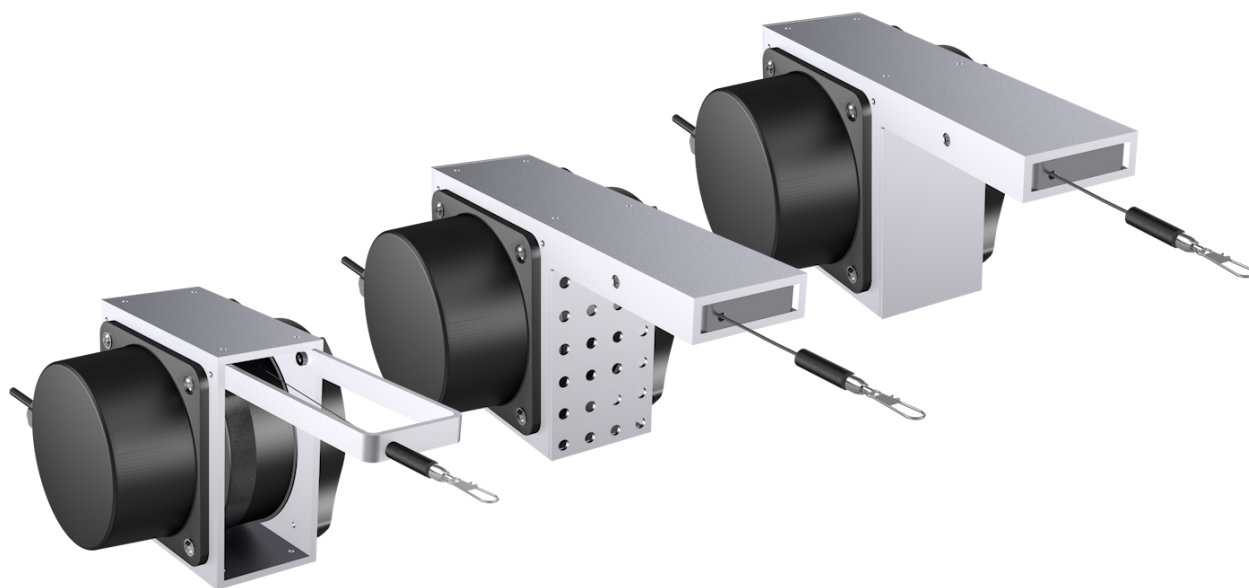


ACH120 - DRAW WIRE SENSOR



ACH120

KEY-FEATURES:

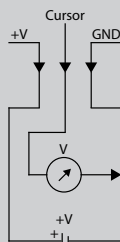
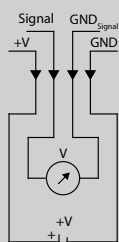
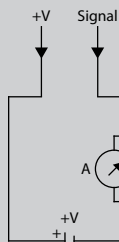
- Cost-effective sensor for construction machinery and mobile hydraulics
- Extreme robust construction
- Five housing variations for different environments
- Measurement ranges from 3 to 10 m
- Linearity up to $\pm 0.1\%$ of full scale
- Output signals: potentiometer, current, voltage or CANopen, optional redundant output
- Protection class up to IP69K (suitable for steam and high pressure cleaning)
- Temperature range -20 to +85 °C (optional -40 °C)
- Optional with TEDS connector

TECHNICAL DATA

Measurement range	[m]	3	4	5	6	7	8	9	10
Draw wire diameter	[mm]	0.5 / 1 / 1.5				0.5 / 1		0.5	
Linearity	[%]					±0.25			
Improved linearity (optional)	[%]					±0.1			
Improved linearity for output 5R and 10R (optional)	[%]					±0.15			
Resolution		see output types below							
Sensor element		potentiometer							
Output signals ¹⁾		potentiometer / 0.5 to 4.5 V / 0 to 5 V / -5 to +5 V / 0 to 10 V / 0 to 5 V (teachable) / 0 to 10 V (teachable) / 4 to 20 mA / CANopen							
Redundant output signals		optional for: potentiometer / 0.5 to 4.5 V / 0 to 5 V / -5 to +5 V / 0 to 10 V / 4 to 20 mA / CANopen							
Connection		connector output M12 radial or cable output radial (TPE cable)							
Protection class		IP67, optional IP69K (only in combination with cable output)							
Humidity		max. 90 % relative, no condensation							
Operating temperature		see output types below							
Rope extraction speed	[m/s]	max. 3							
Acceleration	[m/s²]	max. 50							
Extraction force	[N]	F _{min} = 7 / F _{max} = 13 (depending on the measurement range)							
Housing		aluminum, spring case PA6							
Draw wire		stainless steel V4A							
Weight	[g]	1300 to 1600 (depending on the measurement range)							

¹⁾ other output signals on request

ANALOG OUTPUTS

Output type	Potentiometer			Voltage ¹⁾				Current
Order Code	1R	5R	10R	4,5V	5V	55V	10V	420A
Output	1 kΩ	5 kΩ	10 kΩ	0.5 to 4.5 V	0 to 5 V	-5 to +5 V	0 to 10 V	4 to 20 mA
Supply	max. 30 V			8 to 30 VDC			12 to 30 VDC	12 to 30 VDC ²⁾
Recommended cursor current	<1 μA			-				
Current consumption max.	-			max. 25 mA (no load)				-
Power consumption max.	-							
Output current	-			max. 10 mA, min. load 10 kΩ				max. 50 mA in case of error ³⁾
Dynamics	-			<3 ms from 0 to 100 % and 100 to 0 %				<1 ms from 0 to 100 % and 100 to 0 %
Resolution	theoretically unlimited, limited by the noise							
Noise	depends on the quality of the power supply			0.5 mV _{eff}				1.6 μA _{eff}
Inverse-polarity protection	-			yes				
Short-circuit proof	-			yes				-
Operating temperature	-20 to +85 °C / optional: -40 to +85 °C							
Temperature coefficient	±0.0025 %/K			0.0037 %/K				0.0079 %/K
EMC	-			according to EN 61326-1:2013				
Circuit								

¹⁾ Galvanically isolated
²⁾ Load: 250 Ω (max. 500 Ω)
³⁾ Load max. 0.5 kΩ

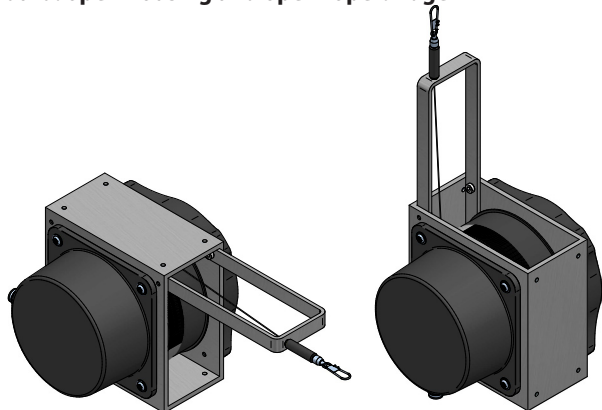
MFL = multi-functional line

DIGITAL OUTPUT CAN_{OPEN} (WCAN)

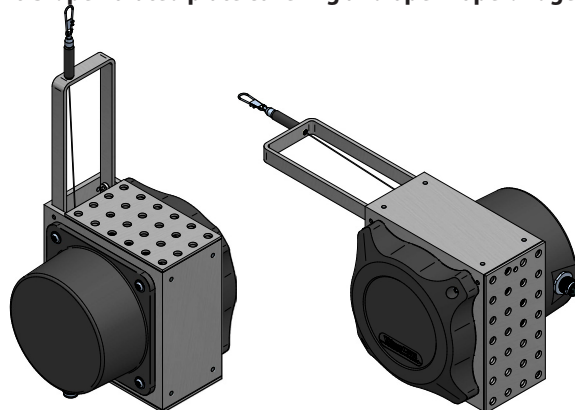
Link to the manual		CANopen (WCAN)
CAN specification		Full CAN 2.0B (ISO11898)
Communication profile		CANopen CiA 301 V 4.2.0
Device profile		Encoder, absolute linear; CIA 406 V 3.2.0
Error control		Producer Heartbeat, Emergency Message, Node Guarding
Node ID		Default: 7, configurable via SDO
PDO		1 x TPDO, static mapping
PDO Modes		Event-triggered, Time-triggered, Sync-cyclic, Sync-acyclic
Transmission rate		1 Mbps, 800, 500, 250, 125, 50, 20 kbps configurable via SDO
Integrated Bus termination resistor		120 Ω , connectible via SDO
Bus, galvanic separation		No
Supply	[VDC]	8...30
Current consumption		10 mA typical at 24 V, 20 mA typical at 12 V
Measurement rate		1 kHz with 16-bit resolution
Repeatability		equal to the linearity
Resolution		0.002 % of measurement range
Electrical protection		inverse polarity protection
Operating temperature	[°C]	-20 to +85 / optional: -40 to +85
Temperature coefficient	[%/K]	0.0014
EMC		DIN EN61326-1:2013, conformity with directive 2014/30/EU

HOUSING VARIANTS

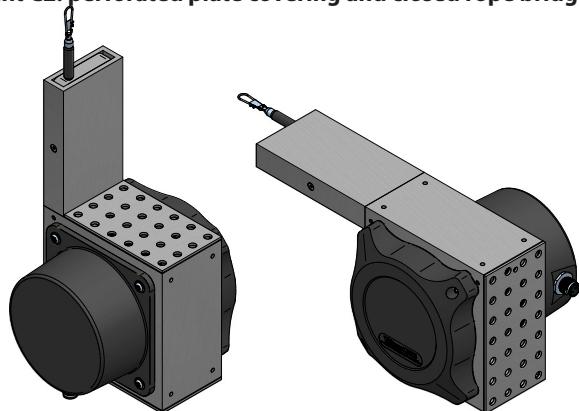
Standard: open housing and open rope bridge



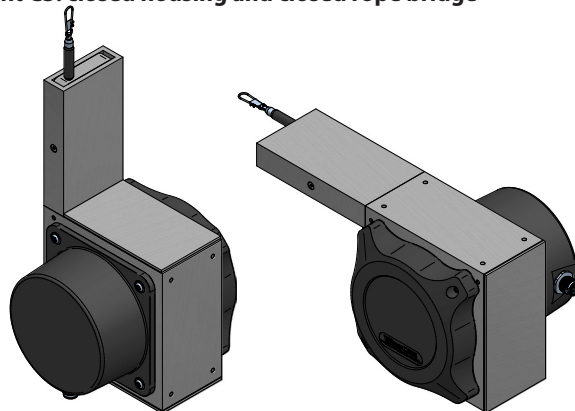
Variant C1: perforated plate covering and open rope bridge



Variant C2: perforated plate covering and closed rope bridge

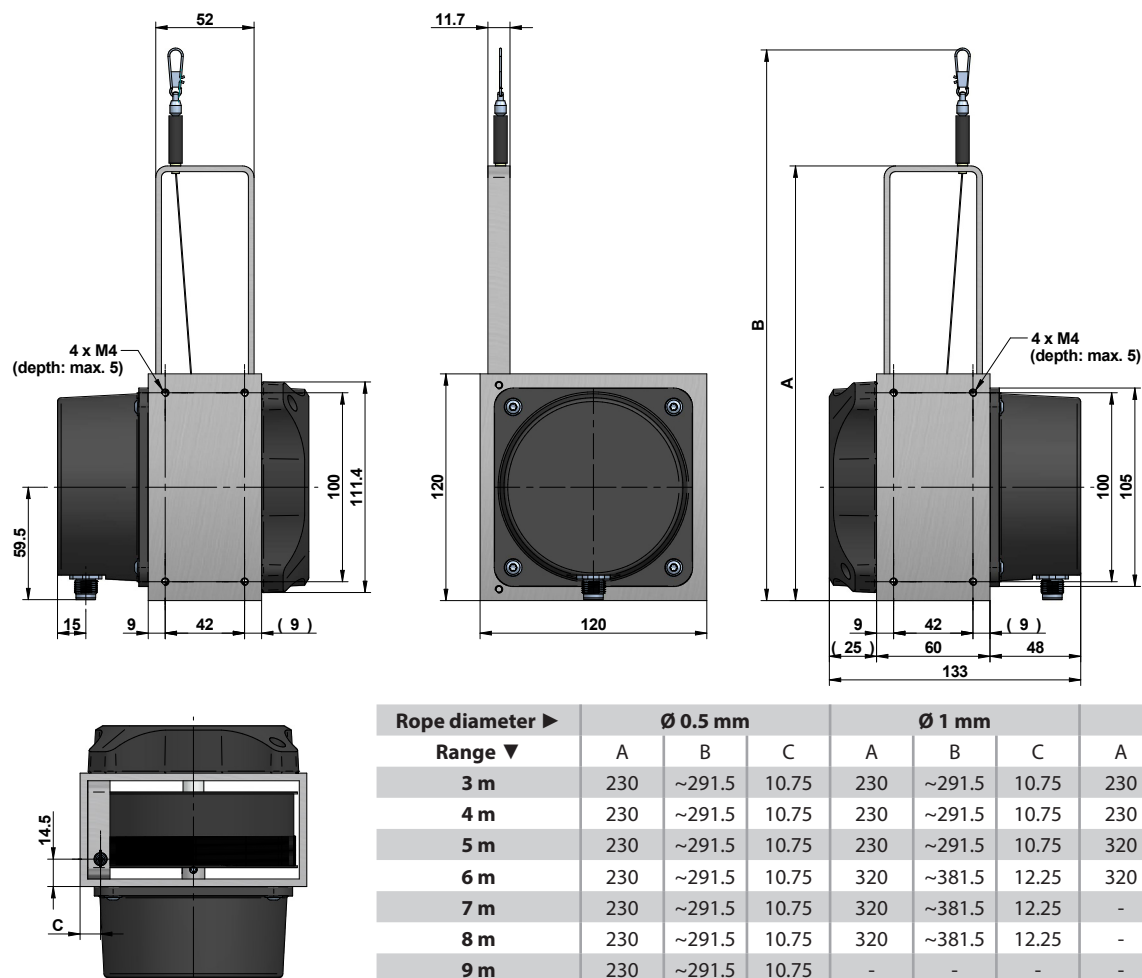


Variant C3: closed housing and closed rope bridge

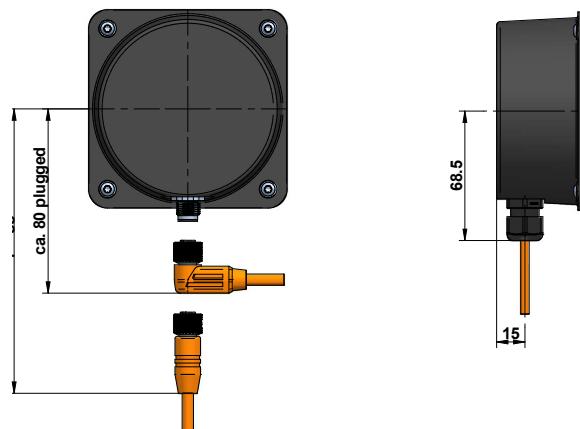


TECHNICAL DRAWING

Standard housing variant: open housing and open rope bridge



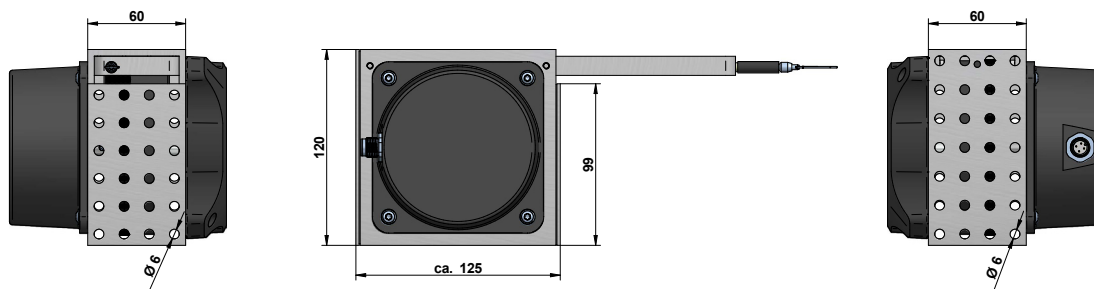
Connector output / cable output all variants



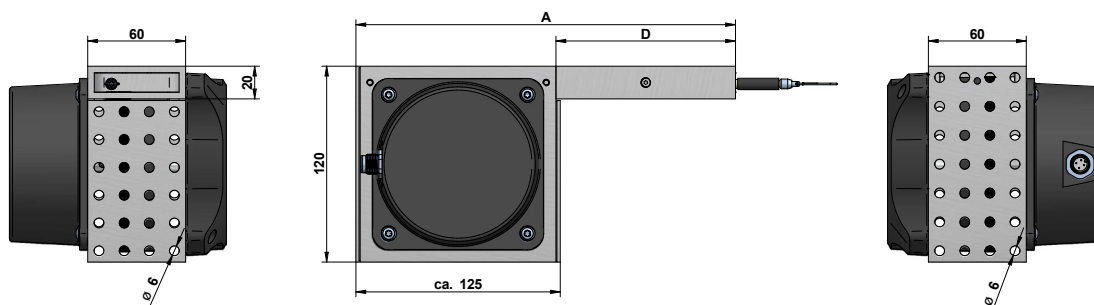
Note: when using close-range high pressure or high temperature spray downs for cleaning purposes the cable must be protected.

TECHNICAL DRAWING - VARIATIONS

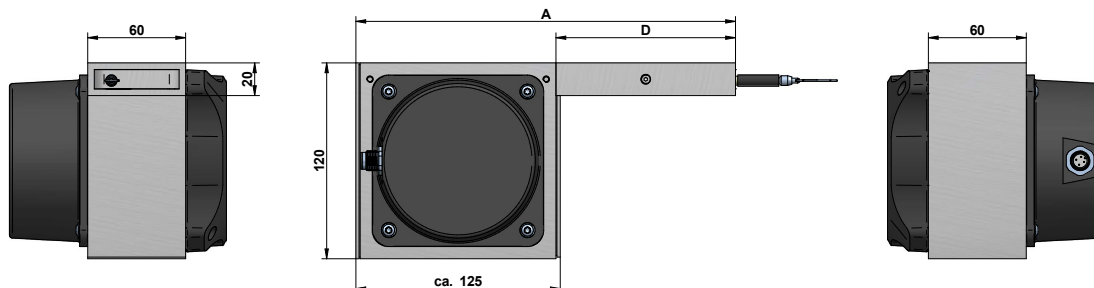
Option C1: perforated plate covering and open rope bridge



Option C2: perforated plate covering and closed rope bridge

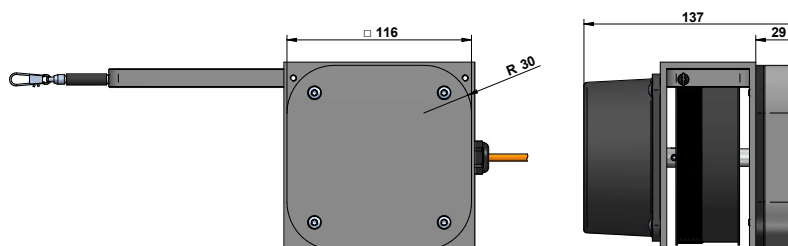


Option C3: closed housing and closed rope bridge

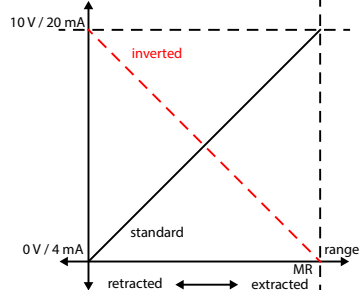
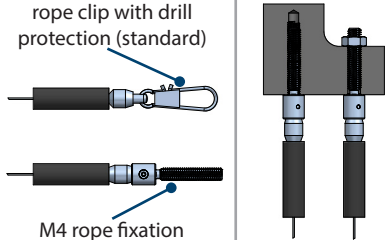
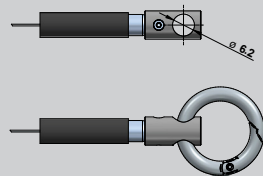


Rope diameter ▼	Range ►	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m
Ø 0.5 mm	A	233							
	D	110							
Ø 1 mm	A	233			323			-	
	D	110			200			-	
Ø 1.5 mm	A	233		323		-			
	D	110		200		-			

Option IAP: seawater protection



OPTIONS

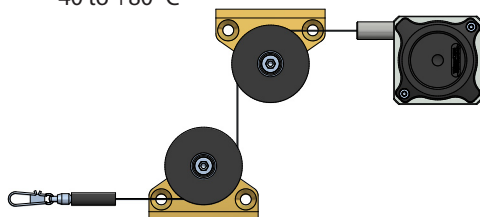
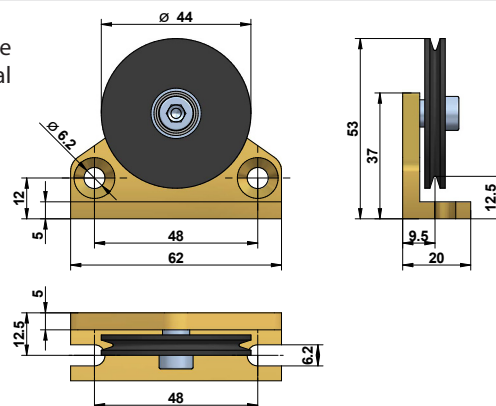
Option	Order code	Description
Cable or connector orientation	-	Standard: cable or connector output shows downwards
Improved linearity	L10, L15	Improved linearity 0.1 % (L10) or 0.15 % (L15). Option L10 is not combinable with outputs 5R and 10R. Option L15 is only combinable with output 5R or 10R.
Inverted output signal (analog output only)	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. 
Redundant output signal	R1, R2, R3, R4	By using a double potentiometer the sensor delivers two independent output signals. R1: 2 x potentiometer output R2: 2 x voltage output R3: 2 x current output R4: 2 x CANopen
Sensor housing (drawing see page 5)	C1, C2, C3	Standard: open housing and open rope bridge (<i>Especially suited for applications under the conditions of fine dust and fluids.</i>) C1: perforated plate covering and open rope bridge (<i>Especially suited for applications under the conditions of dirt, particle size >2 mm and fluids.</i>) C2: perforated plate covering and closed rope bridge (<i>Especially suited for applications under the conditions of dirt, particle size >2 mm and fluids, protection against impact and shock</i>) C3: closed housing and closed rope bridge (<i>Especially suited for applications under the conditions of adhesive dust, cement, concrete, clay, protection against impact and shock.</i>)
Wire rope diameter	D05, D10, D15	The wire rope is made of V4A stainless steel, 1.4401. Please choose the wire rope diameter in part two of the order code. D05: Ø 0.5 mm (standard) D10: Ø 1 mm (not with measurement ranges 9 m and 10 m) D15: Ø 1.5 mm (not with measurement ranges 7 m to 10 m)
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. 
Rope fixation with cylindrical pin and M6 through bore	ZH, ZR	ZH: cylindrical pin with M6 through bore ZR: cylindrical pin with M6 through bore and car-bine ring 
Protection class IP69K (only in combination with cable output)	IP69	All relevant components are completely encapsulated. Suitable for close-range high pressure or high temperature spray downs.
Increased see water protection (drawing see page 5)	IAP	The components consist of hard-anodized aluminum and V4A connecting elements. This ensures an even higher corrosion resistance, which has been especially designed for offshore use. The spring housing is sealed like the electronics housing and includes protection class IP67/IP69. The option reduces the maximal displacement speed to 1.5 m/s.
Increased temperature range Low	T40	The use of special components allow a working temperature down to -40 °C (up to +85°C).
TEDS connector (in combination with analog and cable output only; more information about TEDS)	TD, TDP, TDPS	TD: Assembling TDP: Assembling + programming TDPS: Assembling + programming + 35 measurement points

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. Suitable for standard wire rope diameter 0.5 mm.

Material foot: anodized aluminum
 Material rope wheel: POM-C
 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 to +80 °C



Rope extension - SV

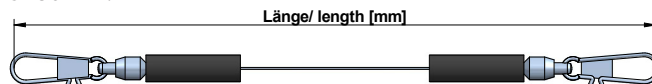
For bridging a greater distance between the measuring target and the sensor a rope extension can be applied. The rope clip must not be guided over the deflection pulley.

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

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

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

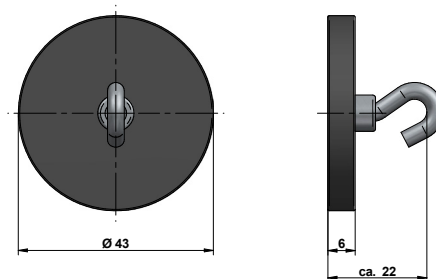
SV3-XXXX: rope extension (20000 to 40000 mm)



Magnetic clamp - MGG2

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 neodymium core for an increased adhesive force of 100 N. The hook makes it easy to attach the rope clip.



APPLICATIONS

The draw wire sensors of the mobile hydraulic series MH were specially developed for the demanding area of construction machines and construction equipment. The sensor can be individually configured depending on the application, in which it is used. Small adhesive and abrasive particles with small grain size can easily be removed when using the open MH versions. Seawater resistant protective grating provide a maximum protection against larger foreign objects like tree branches. In case of applications with high safety requirements, thicker stainless-steel wire ropes are available, as well as redundant, analogue outputs. This mobile hydraulics series offers the possibility to perform accurate and cost-effective distance measurement on construction machinery.

ORDER GUIDE

ACH120 - [] - [] - [] - [] - []

Measurement range MR [m]

3 / 4 / 5 / 6 / 7 / 8 / 9 / 10

Wire rope

Diameter 0,5 mm (Standard)
 Diameter 1 mm (not MR 9 to 10)
 Diameter 1.5 mm (not MR 7 to 10)

D05
 D10
 D15

Output signal

Potentiometer 1 kΩ
 Potentiometer 5 kΩ
 Potentiometer 10 kΩ
 Voltage 0.5 to 4.5 V
 Voltage 0 to 5 V
 Voltage -5 to 5 V
 Voltage 0 to 10 V
 Current 4 to 20 mA
 Digital CANopen

1R
 5R
 10R
 4,5V
 5V
 55V
10V
420A
 WCAN

Connection

Connector output M12, radial ¹⁾
 Cable output, radial, 2 m ¹⁾
 Cable output, radial, 5 m ¹⁾
 Cable output, radial, 10 m ^{1), 2)}

SR12
 KR02
 KR05
 KR10

Version

Standard
 Sensor with options

-
 O

¹⁾ 4 pole in combination with analog outputs
 5 pole in combination with WCAN or option R4
 8 pole in combination with options R1, R2, R3

²⁾ larger lengths on request

³⁾ only available for outputs 5R and 10R

⁴⁾ for more information about TEDS connectors see [here](#)

Bold text: standard with shorter lead time

Option

L10 Improved linearity ±0.1 %
 L15 Improved linearity ±0.15 % ³⁾
 IN Inverted output signal
 R1 Redundant potentiometer output
 R2 Redundant voltage output
 R3 Redundant current output
 R4 Redundant CANopen output
 C1 Perforated plate covering + open rope bridge
 C2 Perforated plate covering + closed rope bridge
 C3 Closed housing + closed rope bridge
 M4 rope fixation M4
 ZH Cylindrical pin
 ZR Cylindrical pin with carbine ring
 IP69 Protection class IP69K
 IAP Increased sea water protection, IP69K
 T40 Temperature range -40 to +85 °C
 TD TEDS: assembling ⁴⁾
 TDP TEDS: assembling + programming ⁴⁾
 TDPS TEDS: assembling + programming + 35 measurement points ⁴⁾

Option

Not combinable with

L10 5R, 10R
 IN WCAN
 M4 D15, ZH, ZR
 ZH M4, ZR
 ZR M4, ZH
 IP69 SR12, IAP
 IAP D10, D15, SR12, IP69, T40
 T40 IAP
 TD 1R, 5R, 10R, WCAN, R1, R2, R3, R4, SR12
 TDP 1R, 5R, 10R, WCAN, R1, R2, R3, R4, SR12
 TDPS 1R, 5R, 10R, WCAN, R1, R2, R3, R4, SR12

GENERAL ACCESSORIES

UR2 deflection pulley (for rope diameter 0.5 mm)

MGG2 magnetic clamp

SV1-XXXX rope extension (150 mm up to 4995 mm)

SV2-XXXX rope extension (5000 mm up to 19995 mm)

SV3-XXXX rope extension (20000 mm up to 40000 mm)

CABLES AND CONNECTORS ACCESSORIES

Cable with connector (female) M12, 4 poles, shielded, IP67

K4P2M-S-M12 2 m, straight connector

K4P5M-S-M12 5 m, straight connector

K4P10M-S-M12 10 m, straight connector

K4P2M-SW-M12 2 m, angular connector

K4P5M-SW-M12 5 m, angular connector

K4P10M-SW-M12 10 m, angular connector

Mating connector (female) M12, 4 poles, for self assembly

D4-G-M12-S straight connector

D4-W-M12-S angular connector

Cable with connector (female) M12, 5 poles, shielded, IP67

K5P2M-S-M12 2 m, straight connector

K5P2M-SW-M12 2 m, angular connector

Cable with connector (female) M12, 8 poles, shielded, IP67

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

Mating connector (female) M12, 8 poles, for self assembly

D8-G-M12-S straight connector

D8-W-M12-S angular connector