

Datasheet

Features at a glance

Our SGA series **of draw-wire encoders** are a compact and cost-effective position measuring system that is particularly quick and easy to install. Our displacement measuring system is potentiometric, optionally available with a current, voltage or resistance output. They are used in all areas of research and industry due to their high reliability, durability and accuracy.

- Measuring ranges from 1,000 to 3,000 mm
- Analog Output: Potentiometer, Voltage, Current
- Linearity up to $\pm 0.02\%$ of the measuring range
- Protection class up to IP67
- Temperature range: $-20...+85\text{ }^{\circ}\text{C}$
(optional $-40\text{ }^{\circ}\text{C}$ or $+120\text{ }^{\circ}\text{C}$)
- High dynamics and immunity to interference
- Customer-specific designs



Please read carefully before commissioning!

Unpacking and checking:

Lift the device out of the packaging by grasping the case. **DO NOT pull on the rope.**

After unpacking, check the device and accessories for completeness and any transport damage. If necessary, please contact the freight forwarder or Willtec Messtechnik directly so that a damage report can be drawn up.

Maintenance



The devices are maintenance-free. However, if the rope becomes dirty due to adverse environmental conditions, this must be cleaned with a slightly oil-soaked cloth as required.

To do this, use resin-free machine oil.

Technical features

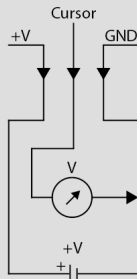
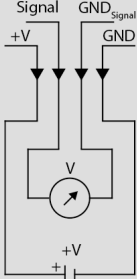
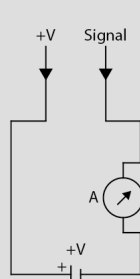
Measurement range MR ¹⁾	[mm]	1000	1500	2000	2500	3000
Linearity	[%]	±0.15			±0.1 ²⁾	
Improved linearity (optional) ²⁾	[%]	±0.1			±0.05	
Resolution		see output types below				
Sensor element		Hybrid Potentiometer				
Connection		connector output M12 or cable output axial (TPE cable)				
Protection class		IP65, optional IP67				
Humidity		max. 90 % relative, no condensation				
Temperature		see output types below				
Mechanical data		extraction force, max. velocity and max. acceleration see „ Mechanical Data “				
Housing		aluminium, anodised, spring case PA6				
Draw wire		stainless steel V2A Ø 0.5 mm				
Weight	[g]	700 to 900, depending on the measurement range				

¹⁾ others on request

²⁾ linearity max. $\pm 0.15\%$ in combination with outputs 5R and 10R

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Technical features

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...4.5 V	0...5 V	-5...+5 V	0...10 V	4...20 mA
Supply	max. 30 V			8...30 VDC			12...30 VDC	12...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...100 % and 100...0 %				<1 ms from 0...100 % and 100...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...+85 °C / optional: -40...+85 °C or -20...+120 °C			-20...+85 °C / optional: -40...+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 k Ω

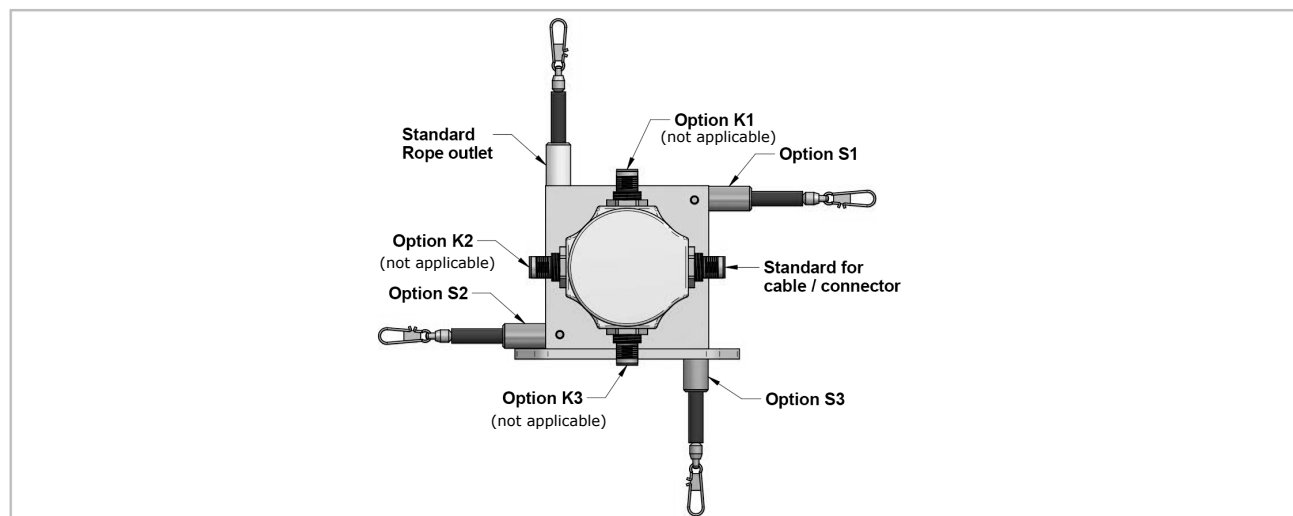
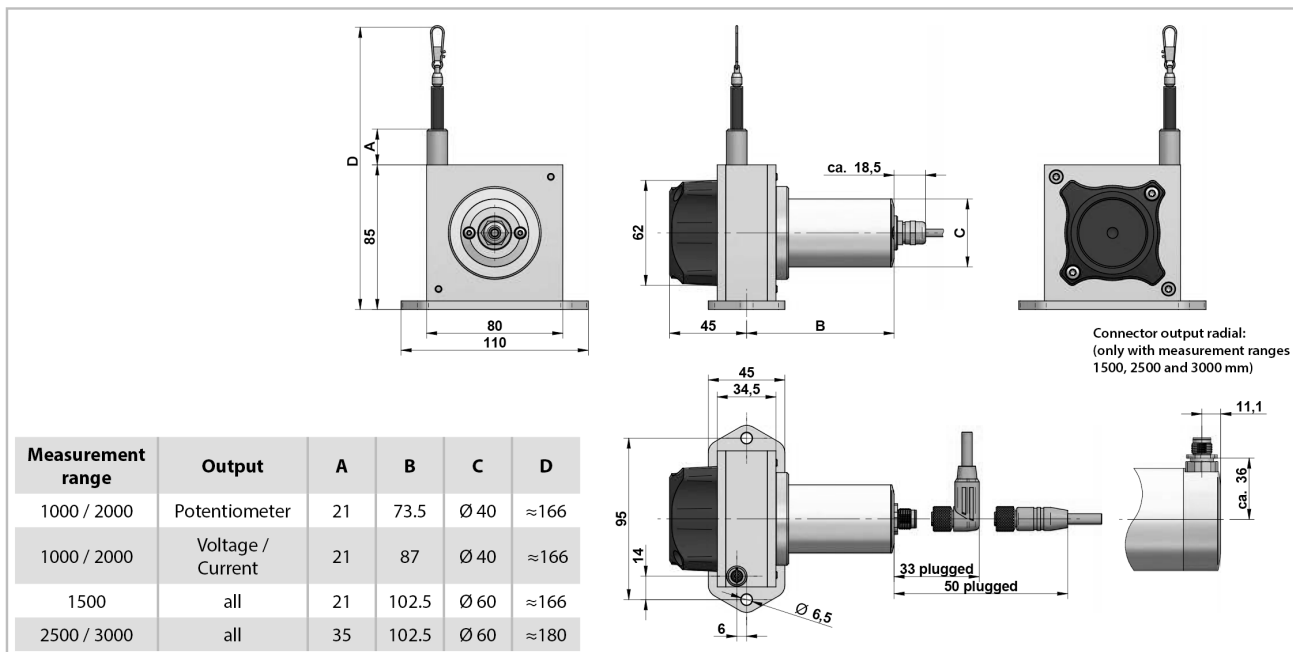
Mechanical characteristics

Measurement range [mm]	Extraction force F _{min} [N]	Extraction force F _{max} [N]	Velocity V _{max} [m/s] ¹⁾	Acceleration a _{max} [m/s ²] ¹⁾
1000	4.2	5.4	10	140
1500	4.2	5.4	10	140
2000	5	6.4	10	140
2500	5	6.4	10	140
3000	5	6.4	10	140

¹⁾ reduced to 80 % with option IP67

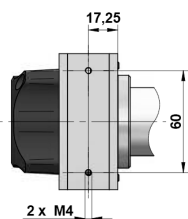
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Technical Drawing



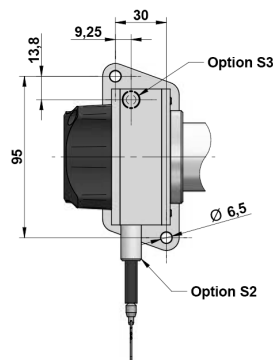
Mounting: standard rope outlet, rope outlet sideways top (S1)

The sensor is usually installed by using the regular mounting plate (see technical drawing above). By disassembling the mounting plate, there are 2 x M4 threads in the sensor housing for alternative installation. Please note that the fastening screws must not be threaded deeper than 5 mm into the sensor housing.



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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Mounting the Sensors



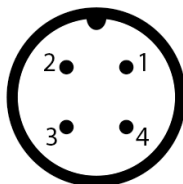
Attach the sensor to the mounting holes in the designated location before pulling out the rope or before attaching the rope to the target.

- The sensor can be mounted using the mounting plate. By unscrewing the mounting plate, threaded holes are alternatively available for assembly. For rope exit S2 and S3, the sensor has a modified mounting plate.
- Open the rope clip (not with M4 threaded screw) after the sensor has been securely mounted and pull out the measuring rope. Hook the rope clip onto the object and close the bracket of the rope clip. To be on the safe side, use a thin screwdriver and guide it through the rope clip to pull out the rope.

Electrical connection

M12 flange connector, 4-pin

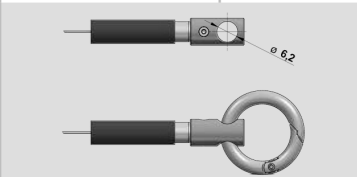
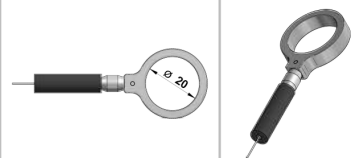
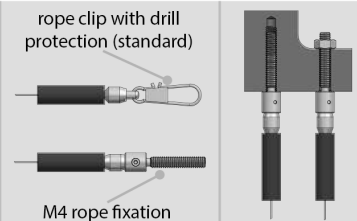
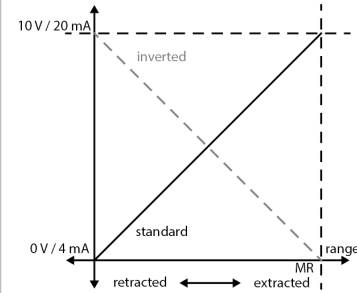
Cable output cable colours	Connector output M12, male	Potentiometer output	Voltage output	Current output
BN	Pin 1	+V	+V	+V
WH	Pin 2	Cursor	Signal	n. c.
BU	Pin 3	GND	GND	Signal
BK	Pin 4	n. c.	GND _{Signal}	n. c.



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Options

Option	Order code	Description
Improved linearity	L05, L10	Improved linearity 0.05 % (L05) or 0.1 % (L10)
Inverted output signal	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.
Changed rope outlet	S1, S2, S3	Standard: rope outlet at the top S1: rope outlet sideways at the top S2: rope outlet sideways at the bottom (modified mounting plate) S3: rope outlet on the bottom (modified mounting plate)
Synthetic wire rope	COR	Synthetic wire rope, made out of abrasion resistant and enhanced Coramid. We recommend COR at stable temperatures due to the coefficient of expansion.
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 by eyelet	RI	The end of the wire rope is equipped with a eyelet instead of a rope clip. Inside diameter 20 mm
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 carbine ring
Protection class IP67	IP67	Use option IP67, if the sensor will operate in a humid environment. Note that with this option there may occur a light hysteresis in the output signal due to the special sealing. The max. acceleration and displacement speed are reduced to 80 % of the specified value.
Corrosion protection	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.
Increased corrosion protection	ICP	Components of the housing and the rope drum get HARTCOAT® coated. Includes the options CP, IP67 and M4.
Increased temperature range High (potentiometer output only)	H120	Sensors with potentiometer output and cable output can be operated from -20 to +120 °C when this option is used.
Increased temperature range Low	T40	Special components and a low temperature grease make a working temperature down to -40 °C (up to +85 °C) possible.



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When handling the sensor, make sure that you do not accidentally snap the rope or pull the rope out over the specified measurement range. This can destroy the sensor.

- The rope must be pulled vertically out of the sensor during operation. The maximum deviation from the vertical is 3°. Avoid pulling out the measuring rope at an angle at all costs. The service life of the device would be shortened as a result. If the tolerance limit of 3° cannot be maintained, a pulley must be used.
- Preferably lay the rope in corners or protected under guides to avoid dirt or accidental contact.
- Avoid running the rope over edges or corners. Use the pulley if necessary.
- Do not operate the sensor if there are kinks or damage in the measuring rope.

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Ordering example

Type **SGA-80** - **1000** - **420A** - **SA12** - **IP67**
SGA-80 = Draw-wire sensor

Measuring range MR (mm)

1000 = 1.000 mm
1500 = 1.500 mm
2000 = 2.000 mm
2500 = 2.500 mm
3000 = 3.000 mm

Output signal

420A = Current 4 ... 20 mA
1R = Potentiometer 1 k Ω
5R = Potentiometer 5 k Ω
10R = Potentiometer 10 k Ω
4,5 V = Voltage 0.5 ... 4.5 V
5 V = Voltage 0 ... 5 V
55 V = Voltage -5 ... +5 V
10 V = Voltage 0 ... 10 V

Connection

SA12 = M12 connector output, axial, 4-pin
SR12 ¹⁾ = M12 connector output, radial, 4-pin ¹⁾
KA02 = Cable output, axial, 2 m, 4-pole
KA05 = Cable output, axial, 5 m, 4-pin
KA10 ²⁾ = Cable output, axial, 10 m, 4-pole ²⁾

Version

- = Standard
S1 = Rope exit side top
S2 = Rope exit side bottom
S3 = Rope exit side floor
IN = Inverted output signal
COR = Plastic measuring rope made of coramide
CP = Corrosion protection
ICP = Increased corrosion protection
H120 = Temperature range -20...+120 °C
M4 = Rope attachment with M4 thread
RI = Rope attachment with ring eye
ZH = Cylindrical Pin Rope Attachment
ZR = Cylindrical pin rope attachment with carabiner ring
IP67 = IP67 degree of protection
L05 = Improved linearity $\pm 0,05$ %
L10 = Improved linearity $\pm 0,1$ %
T40 = Temperature range -40...+85 °C

¹⁾ Only for measuring ranges 1500, 2500 and 3000 mm

²⁾ Longer lengths on request



Versions that cannot be generated from the order key may be available as a special version on request.

The manufacturer reserves the right, without prior notice, to make any changes to the products that he deems necessary for their improvement.

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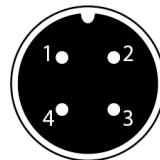
Accessories

Cable with M12 connector

Analog output

Cable with mating connector M12 (female), 4 poles

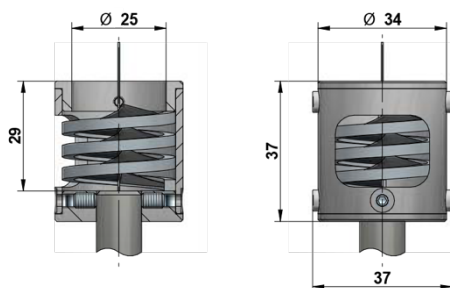
C04-2M-S-M12	2 m, straight connector, IP67, shielded
C04-5M-S-M12	5 m, straight connector, IP67, shielded
C04-10M-S-M12	10 m, straight connector, IP67, shielded
C04-2M-SW-M12	2 m, angular connector, IP67, shielded
C04-5M-SW-M12	5 m, angular connector, IP67, shielded
C04-10M-SW-M12	10 m, angular connector, IP67, shielded



Pin	Cable colour
1	BN
2	WH
3	BU
4	BK

Rope scraper CM-SGA-80

Use the CM-SGA-80 rope scraper to remove dirt from the measuring rope of the sensor. Please note that the maximum measuring range of the sensor is reduced by 29 mm and the CM-SGA-80 is not compatible with Option RI.



Warning



Do not attempt to open the device. The high stored energy of the drive spring can lead to injuries if handled incorrectly.

- Do not touch the moving rope during operation.
- Protect the sensor and rope from ice build-up when mounting outdoors in sub-zero temperatures. The use of a pulley leads to de-icing of the measuring rope.
- In a humid environment, install a sensor with a rope outlet facing downwards, otherwise water will collect inside the sensor.