

RotoLine | Rotary Encoders

Magnetic rotary encoders
Optical rotary encoders
Geared potentiometers



Success is the result of a commitment to precision, innovation and customer benefit

“Precision is SIKO’s top priority and standard!” True to this philosophy, SIKO has been developing and producing innovative solutions in distance and angle measurement technology for more than 45 years now. Based in Buchenbach in the foothills of the Black Forest, the company produces its own measurement technologies, which are a global success in all areas of mechanical engineering. Even today, SIKO’s core concept is still manifest in its innovative power, product development and company spirit. Since taking over the business in 1990, industrial engineer Horst Wandres, son of its founder, has continued to develop this philosophy with impressive results.



Intelligent solutions

Attentive ears will always find the right solution. Automation and process optimization are the cornerstones of SIKO’s ambitious new technologies and goal-oriented measurement solutions. The company pursues a clear, consistent line of development, ranging from digital position indicators and handwheels through incremental encoders, absolute encoders and measurement displays to future-oriented technologies with electronically programmable or magnetic measurement systems (MagLine).



Consistent teamwork

The secret of SIKO’s development prowess lies in the motivation and team spirit of its workers. SIKO has a conscious policy of integrating the experiences of its 170 employees, which has a dynamic effect on all areas of company life. Outstanding individual performances blend together to enhance the efficiency of the whole organization.

SIKO again follows the road to success with its compact, ultra-resilient actuators (DriveLine), which enable automated adjustment of machine axles.

Not one for all but all together – this motto typifies SIKO’s synergetic development process, delivering solutions which dominate the market in all aspects of “measurement technology in mechanical engineering”.

This is SIKO today. Precision in motion, dynamic and open for the future ...



6 distinctive product lines

PositionLine	Mechanical and electronic position indicators, handwheels with analog indicators, control knobs
RotoLine	Magnetic and optical encoders, geared potentiometers
LinearLine	Wire-actuated encoders
DriveLine	Actuators
MagLine	Magnetic length and angle measurement systems
DisplayLine	Measurement displays

We speak the same language: At SIKO, a willingness to participate in open dialog enhances engineering performance. Our production site advantages are not interchangeable.



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**Rotary encoders:
Precise measuring technology
with defined values**

SIKO has united the rotary encoder range under the name of RotoLine. There are the following three product categories, depending on the measuring principle employed in their typical applications:

- Magnetic rotary encoders
- Optical rotary encoders
- Geared potentiometers

The comprehensive SIKO product know-how permits a wide selection of types ranging from inexpensive rotary encoders in miniature format with simpler mechanical designs to sophisticated, high resolution products – in housings made of plastic or tough die-cast aluminum.

SIKO rotary encoders are essential for tracking lengths, angles and speed in machines and systems. With a host of different designs and customized application specifications, rotary encoders serve as the basis for robust measuring processes for a wide range of different mechanical engineering applications.

Mounted on a shaft or spindle, they track measured values as incremental or absolute signals. The measuring principle can either be optical, magnetic or based on an electrical resistance (geared potentiometer). The information obtained is then available for higher-level controllers or direct display on indicators (refer to catalog 6 DisplayLine).

Magnetic rotary encoders

Magnetic or optical measurement? Under extreme industrial conditions the magnetic SIKO rotary encoders ensure particularly error-safe measurement.

The reason: On magnetic rotary encoders, a sensor tracks the number of north-south poles of a magnetic ring mounted directly on the hollow or solid shaft. As the measurement principle is based on the alternating pole forces of magnetism and is therefore not dependent on an unobstructed line of vision or system cleanliness, these rotary encoders are particularly suitable for applications in which optical length, angle and speed measurement can produce faulty results.



Reliability and precision are redefined, because this SIKO development makes use of the fascinating advantages of a technology with its resolution, scanning reliability and robustness that opens up completely new applications for these compact measuring systems reaching far beyond those of optical rotary encoders.

Magnetic incremental encoders

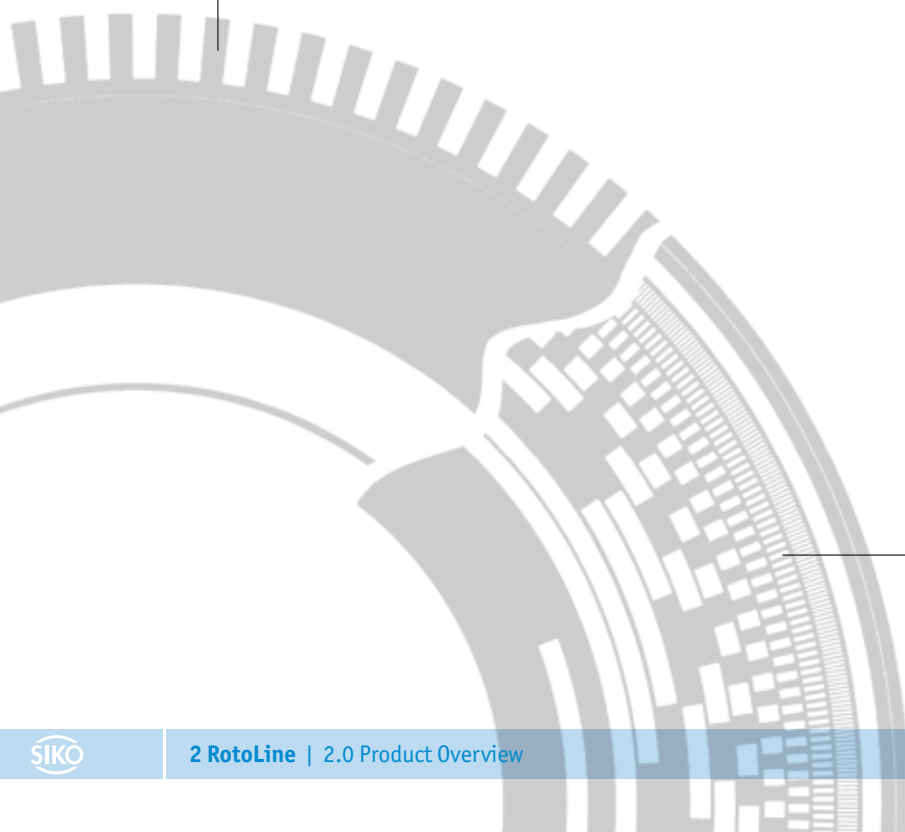
Hollow shaft diameters 6–22 mm
Solid shaft diameters 5–10 mm
Resolutions up to 2560 pulses/revolution
Output circuit: PP, OP, LD5, LD24
Protection category up to IP65

Magnetic angle encoders

Hollow shaft diameters 10–20 mm
Solid shaft diameters 6–10 mm
Resolutions up to 4096 pulses/revolutions (12 bit)
Output circuits: SSI, CAN bus, Profibus
Protection category up to IP65

Incremental marking

Absolute marking



Optical rotary encoders

Optical rotary encoders use light as a medium in a similar manner to a light barrier. A code disk with a pattern of opaque and transparent segments rotates in a gap between the light source and sensor. Depending on their transmissivity, this disk either prevents or enables the passage of the light beam to the sensor on the opposite side. The sensor itself is part of the electronic evaluation system, which derives electrical pulses from the opto-electronic scanning system on the basis of which the length, angle or speed information can be calculated.

Both optical incremental and absolute value encoders are available in both hollow or solid shaft versions. Standard interfaces or individual field bus links with freely programmable parameters are included in the basic standard product features. The standard versions of the optical rotary encoders can be exchanged one to one with the magnetic rotary encoders.



Optical incremental encoders

Hollow shaft diameters 10–20 mm
Solid shaft diameters 6–16 mm
Resolutions up to 1024 pulses/revolution
Output circuit: PP, OC, OP, LD5, LD24
Protection category up to IP65

Optical angle encoders

Hollow shaft diameters 16–20 mm
Resolutions up to 8192 pulses/revolutions (13 bit) and up to 4096 revolutions (12 bit)
Output circuits: SSI, Profibus, Inter-Bus, RS485
Protection category up to IP65



Geared potentiometers

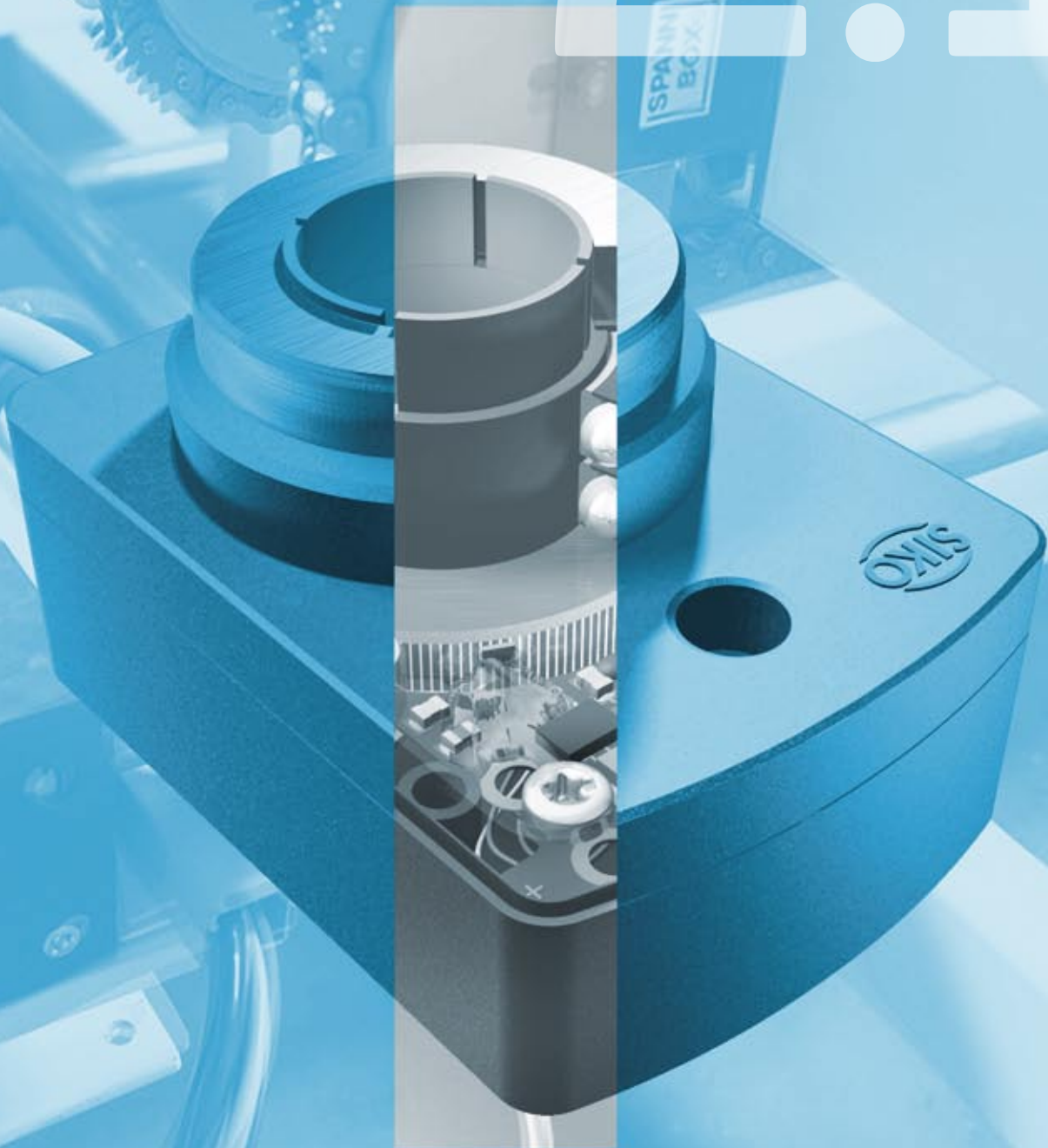
With this absolute measuring method, angles or lengths are tracked by a combination of single or multiple coil potentiometers via a gear unit. The position of the potentiometer provides analog signals for follow-up controllers or electronic displays when motion occurs.

Transducers ensure loss-free signal transmission and prevent line losses. An optional cam controller is available for controlling switching operations.

Geared potentiometers

Hollow shaft diameters 14–20 mm
Solid shaft diameters 6–20 mm
Output: Potentiometer, current 4 ... 20 mA, voltage 0 ... 10 V
Protection category up to IP65

2.1



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2.1 | Magnetic rotary encoders

General information and areas of application		8
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Products		
Incremental encoders	IH28M	12
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Time for a new generation – time for new standards

This SIKO development with its indestructible, magnetic scanning technology is suitable for completely new mechanical engineering concepts. Both resolution and scanning reliability as well as the robustness of the compact measuring systems cover application areas which by far exceed those of optical rotary encoders.

How it works

With a *magnetic ring* [1] mounted on a hollow or solid shaft, the rotation of machine shafts or spindles can be “transmitted” to special *electronic sensors* [2]. The

magnetized pole length of the magnetic ring is converted by a customized evaluation electronic system into up to 2,560 pulses per rotation. These incremental counting pulses are available as *square wave signals* [3] and can therefore be evaluated by any electronic counting system. Sealing of the electronic components also permits safe operation, even with fluid media.

The magnetic absolute measurement requires an even more cunning use of the technology, as the possible shaft adjustment is also logged when the system is not supplied with power. Therefore on a

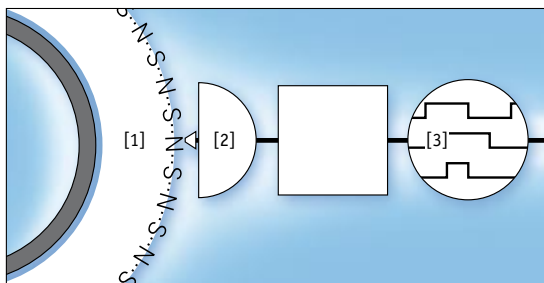
magnetic angle encoder, an initial dimetral magnet installed upstream from the functional logic system described above generates a complete sinus signal per rotation.

This already absolute single turn signal is also digitized and offset with the sequence signal.

Benefits

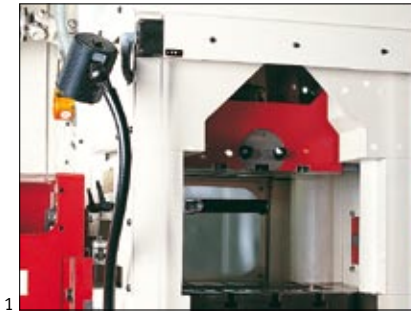
- Very high shock, vibration and temperature resistance
- Fully resistant to oil, lubricants, dirt and water
- Wear and maintenance-free sensor system
- Optional sealing of the electronics also permits use in oil baths etc.
- Very compact designs
- Magnetic encoders are very versatile due to the wide range of versions for hollow shaft and solid shaft installation

2.1



The signal path: A sensor [2] tracks the north-south poles [1] of the specially magnetized ferrite ring and generates pulses [3] which are processed in real time and made available as digital signals.





1

Application areas

Magnetic encoders were developed for wet or humid and heavily soiled operating conditions and where machine vibrations make precise operation difficult.

These non-contacting measuring encoders almost always feel at home even if they are in contact with corrosive solutions such as saline water or in heated, oily environments. In the food, packaging, energy generation and wood processing sectors or for passenger transport and general mechanical engineering applications, optical measuring systems increasingly reach insurmountable limits due to their basic functional design.

For this reason magnetic encoders are predestined for a large number of different applications ...

- Sheet metal processing with punching and forming equipment
- Lifting and elevator equipment
- In offshore plants
- Packaging and food industries
- Chemical and pharmaceutical industries
- Energy generation (e. g., wind generators)
- As well as in all applications where precision measurement is required under extremely difficult conditions



2



3



5



4

[1] Die for metal processing [2] Cutting in the wood, metal and stone processing industry. [3] Tire balancing system. [4] Elevator equipment. [5] Rough wood processing: SIKO magnetic encoders are not affected by pronounced vibration or shocks, a greasy environment or coarse or fine dust, either wet or dry, and they also withstand extreme temperature fluctuations.

Ambient conditions

Examples of use

Benefits

Moisture



Insensitive to moisture, as the scanning process does not require direct visibility.

- No mounting arrangements or moisture protection necessary



e.g., metal saws, food production, portal-type car wash facilities, stoneworking ...

Knocks and vibration



Unshakeable: The components employed are indestructible, the glass required in optical encoders is not necessary, all components are safely integrated.

- High level of reliability
- High level of operational reliability



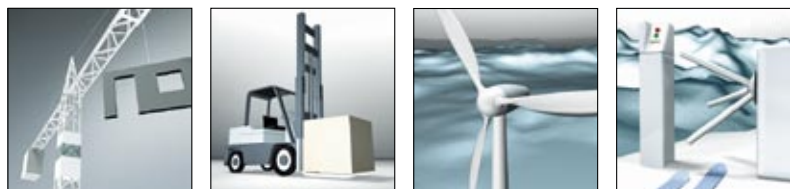
e.g., presses and dies, construction vehicles, elevators, rough wood processing ...

Climatic fluctuations



Absolutely safe function if condensation forms due to fast changes in temperature or icing of components in free-standing installations.

- High level of operational safety
- Maintenance-free



e.g., cranes, forklifts, wind power plants, ski-lifts...

Soiling












Encapsulated housing and scanning without contact or visibility protects the units against penetrating particles.

- High level of operational safety
- No additional protection measures necessary



e.g., wood processing, construction machines, tunnel advance, filling systems ...

Magnetic rotary encoders

									
	IH28M	IV28M	IH58M	IV58M	IG04M	IG07M	IG09M	WH58M	WV58M
Page	12	15	18	21	24	27	30	33	36
Measurement type									
Incremental	•	•	•	•	•	•	•		
Absolute single-turn								•	•
Shaft design									
Hollow shaft	•		•		•	•	•	•	
Solid shaft		•		•					•
Shaft diameters									
	8 mm	5, 6 mm	6–22 mm	6, 8, 10 mm	10, 14 mm	20 mm	12–20 mm	10–20 mm	6, 10 mm
Output circuits									
PP	•	•	•	•	•	•	•		
OP	•	•	•	•	•	•	•		
LD5	•	•	•	•	•	•	•		
LD24	•	•	•	•	•	•	•		
SSI								•	•
CAN bus								•	•
Profibus								•	•
Housings									
Plastic	•	•			•		•		
Zinc die-cast						•			
Aluminum			•	•					
Steel								•	•
Resolutions									
Max. pulses/revolution	1000	1000	2560	2560	2000	2560	2560	4096	4096

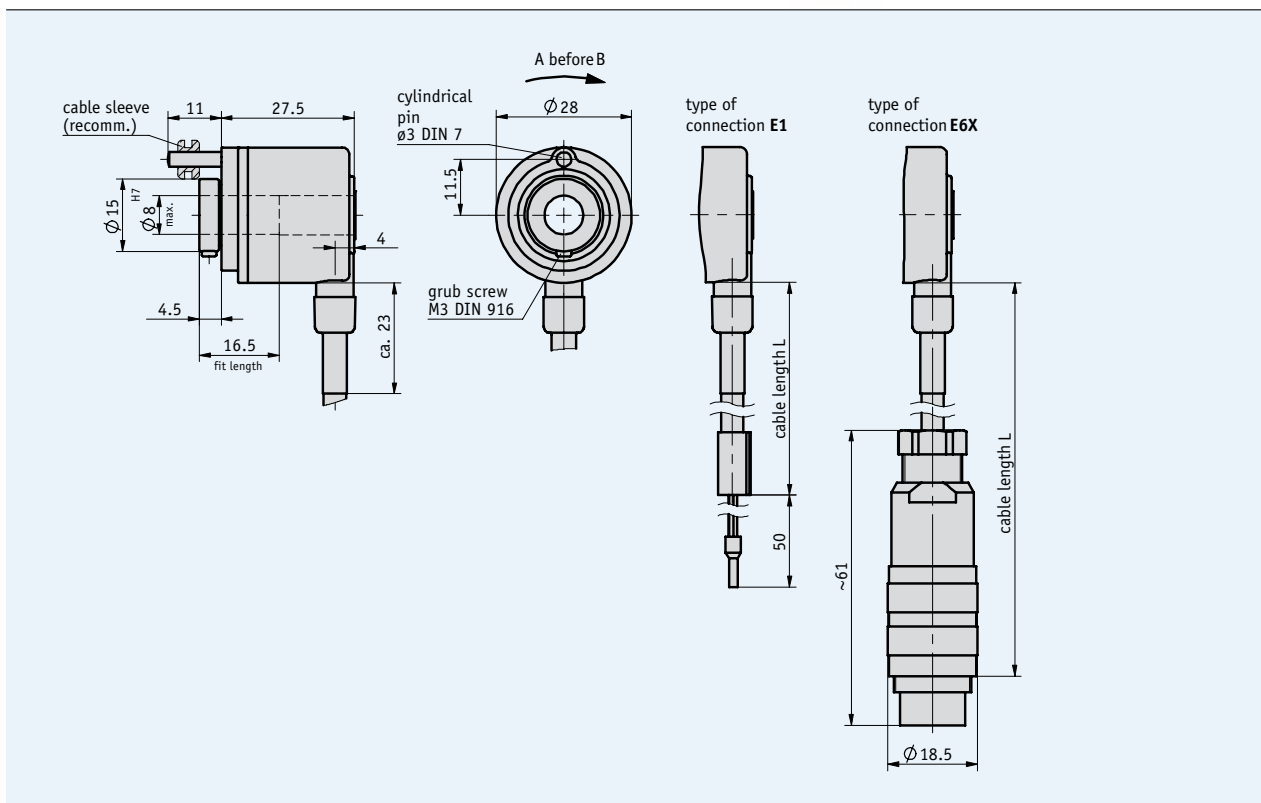
2.1

Profile

- Small design, \varnothing 28 mm
- Resolutions of max. 1000 pulses/revolution
- Hollow shafts up to \varnothing 8 mm, stainless steel
- IP54 protection category
- Housing made of aluminum and plastic



2.1



Mechanical data

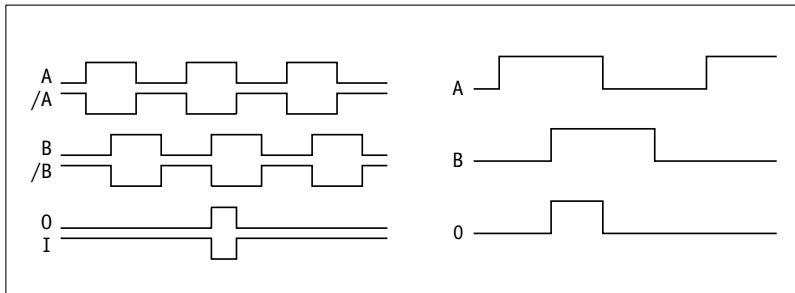
Feature	Technical data	Additional information
Max. speed	3000 rpm	
Shaft moment of inertia	$\sim 0.24 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 0.1 \text{ Ncm}$	at 20 °C
Weight	$\sim 0.1 \text{ kg}$	
Protection category	IP54	
Operating temperature	-20 ... +70 °C	
Storage temperature	-20 ... +80 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	stainless steel, 8 mm	
Housing	aluminum and plastic	
Cable sheath	PUR \varnothing 4.8 mm	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD5 Line driver	LD24 Line driver	Additional information
Operating voltage	+10 ... +30 V DC	+5 V DC $\pm 5\%$	+10 ... +30 V DC	
Power consumpt. w/o load (typ.)	<25 mA	<25 mA	<25 mA	ABO variant
Maximum load/channel	± 30 mA	± 30 mA	± 30 mA	
Max. pulse frequency	100 kHz	100 kHz	100 kHz	
Phasing	90°	90°	90°	
Signal level high (min.)	29.2 V DC			UB = 30 V, IOH = -30 mA
Signal level low (max.)	0.5 V DC			UB = 30 V, IOL = 30 mA
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	yes	

Signal image



! The state of the signals A and B with regard to the reference signal 0 is not defined and can deviate from the signal image.

2.1

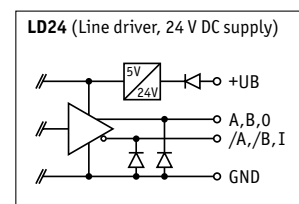
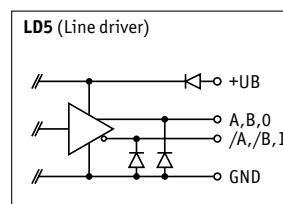
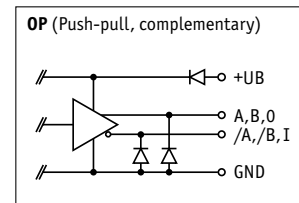
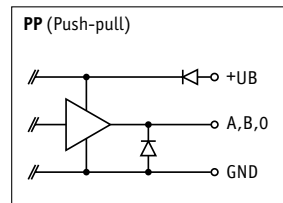
Pin assignment

Output circuit PP

Signal	E1	E6X
B	white	1
+UB	brown	2
O/I	green	3
A	yellow	4
GND	gray	5
N.C.		6-7

Output circuit OP, LD5, LD24

Signal	E1	E6X
/B	blue	A
N.C.		B
O	green	C
/O	red	D
A	yellow	E
/A	pink	F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
N.C.		L
+UB	brown	M



Order

Order table

Feature	Order data	Specification	Additional information
Output signals	... A	ABO, ABI, ABX	
Pulses/revolution	... B	50, 200, 250, 300, 400, 500, 800, 1000 others on request	
Type of connection	E1 E6X C	flying leads connector	
Cable length L (m)	... D	0.3, 1, 2, 2.5, 3, 4, 5, 8, 10	
Output circuit	PP OP LD5 LD24 E	push-pull push-pull with inverted signals line driver line driver	

Order code

IH28M - - - - - - - 8

A B C D E

Scope of delivery: IH28M, User information

Accessories:

Mating connectors

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Cable extension

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Electronic displays MA55, MA10/4

Catalog 6 DisplayLine

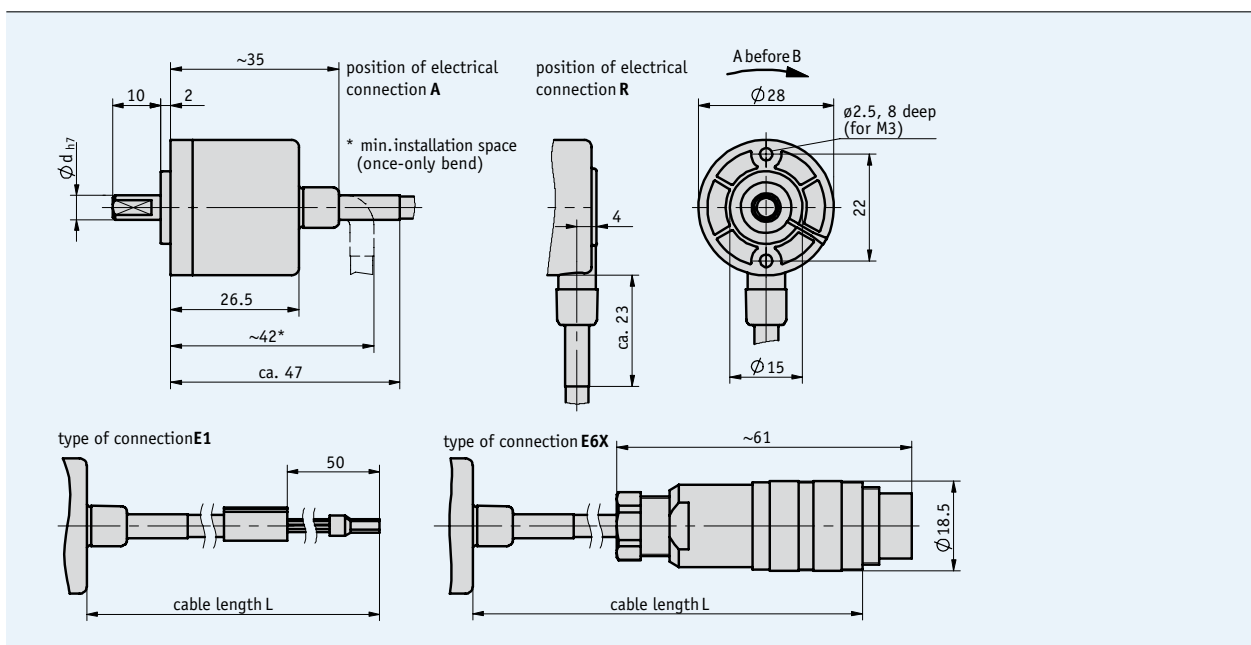
Additional information:

General information and areas of application

Page 8 cont.

Profile

- Small design, \varnothing 28 mm
- Resolutions of max. 1000 pulses/revolution
- Solid shafts up to \varnothing 6 mm, stainless steel
- IP54 protection category
- Plastic housing



2.1

Mechanical data

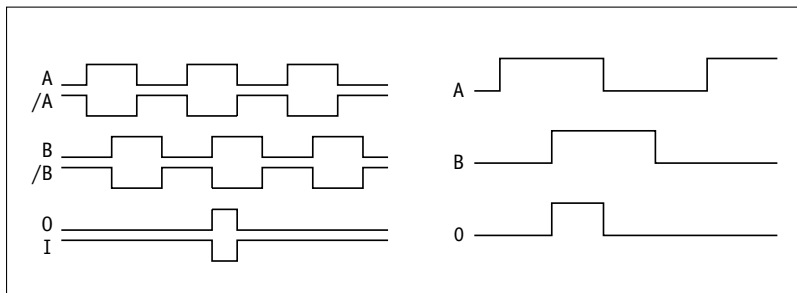
Feature	Technical data	Additional information
Max. speed	3000 rpm	
Shaft moment of inertia	$\sim 0.24 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 0.1 \text{ Ncm}$	at 20 °C
Shaft load rating	radial 30 N axial 8 N	
Weight	$\sim 0.1 \text{ kg}$	
Protection category	IP54	
Operating temperature	-20 ... +70 °C	
Storage temperature	-20 ... +80 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	stainless steel	
Housing	plastic	
Cable sheath	PUR \varnothing 4.8 mm	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD5 Line driver	LD24 Line driver	Additional information
Operating voltage	+10 ... +30 V DC	+5 V DC $\pm 5\%$	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<25 mA	<25 mA	<25 mA	ABO variant
Maximum load/channel	± 30 mA	± 30 mA	± 30 mA	
Max. pulse frequency	100 kHz	100 kHz	100 kHz	
Phasing	90°	90°	90°	
Signal level high (min.)	29.2 V DC			UB = 30 V, IOH = -30 mA
Signal level low (max.)	0.5 V DC			UB = 30 V, IOL = 30 mA
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	yes	

Signal image



! The state of the signals A and B with regard to the reference signal 0 is not defined and can deviate from the signal image.

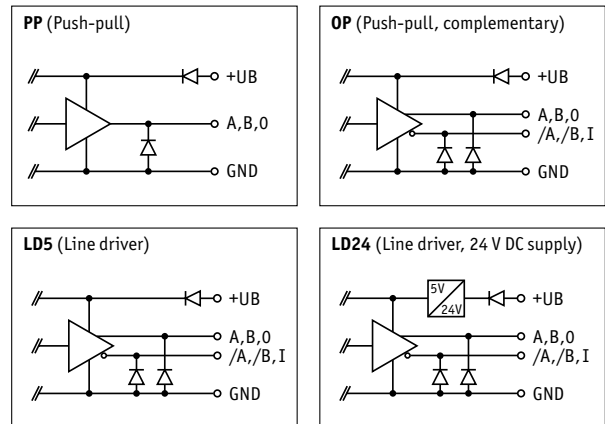
Pin assignment

Output circuit PP

Signal	E1	E6X
B	white	1
+UB	brown	2
O/I	green	3
A	yellow	4
GND	gray	5
N.C.		6-7

Output circuit OP, LD5, LD24

Signal	E1	E6X
/B	blue	A
N.C.		B
O	green	C
/O	red	D
A	yellow	E
/A	pink	F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
N.C.		L
+UB	brown	M



Order

Order table

Feature	Order data	Specification	Additional information
Output signals	... A	ABO, ABI, ABX	
Pulses/revolution	... B	36, 50, 200, 250, 400, 500, 800, 1000 others on request	
Type of connection	E1 E6X C	flying leads connector	
Position of the electrical connection	A R D	axial radial	
Cable length L (m)	... E	0.07, 0.3, 0.35, 1, 2, 2.5, 3, 4, 5, 8, 10	
Output circuit	PP OP LD5 LD24 F	push-pull push-pull with inverted signals line driver line driver	
Shaft diameter	5x10 6x10 G	∅ 5 mm, length 10 mm ∅ 6 mm, length 10 mm, bush glued on	

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Order code

IV28M/1- - - - - - -

A B C D E F G

Scope of delivery: IV28/1, User information

Accessories:

Mating connectors

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Cable extension

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Electronic displays MA55, MA10/4

Catalog 6 DisplayLine

Additional information:

General information and areas of application

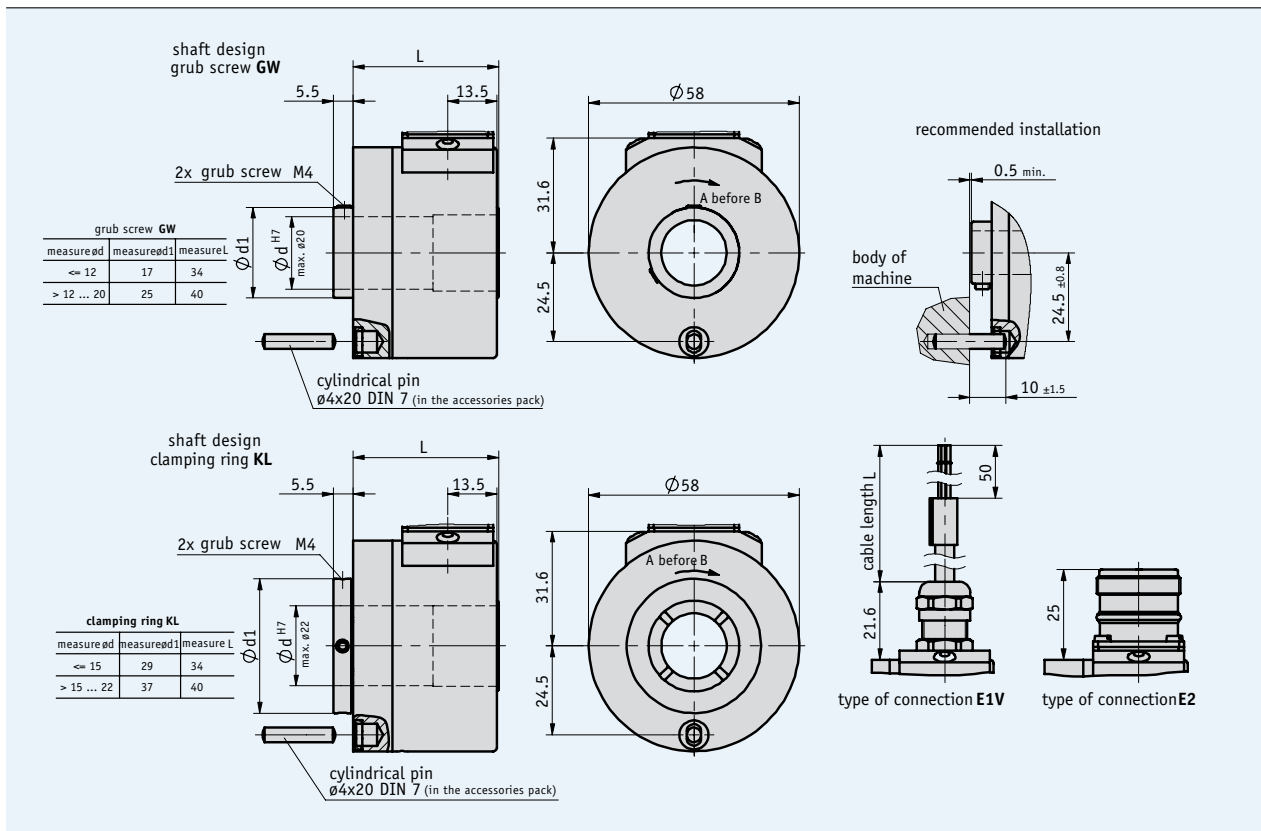
Page 8 cont.

Profile

- Resolutions of max. 2560 pulses/revolution
- Hollow shafts up to $\varnothing 22$ mm, stainless steel
- Protection category IP65
- Aluminum housing
- Condensation permitted with sealed electronics unit



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Mechanical data

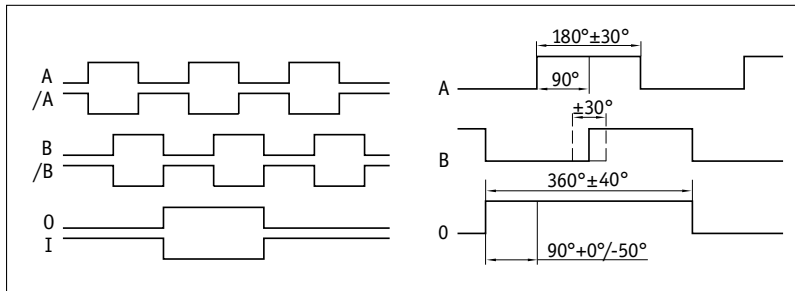
Feature	Technical data	Additional information
Max. speed	6000 rpm	
Shaft moment of inertia	$\sim 0.3 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 4 \text{ Ncm}$	at 20 °C
Weight	$\sim 0.4 \text{ kg}$	
Protection category	IP65	
Operating temperature	-20 ... +100 °C	
Storage temperature	-20 ... +100 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	stainless steel	
Housing	aluminum	
Cable sheath	PUR $\varnothing 4.8 \text{ mm}$	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD5 Line driver	LD24 Line driver	Additional information
Operating voltage	+10 ... +30 V DC	+5 V DC $\pm 5\%$	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<25 mA	<25 mA	<25 mA	AB0 variant
Maximum load/channel	± 30 mA	± 30 mA	± 30 mA	
Max. pulse frequency	100 kHz	100 kHz	100 kHz	
Phasing	$90^\circ \pm 15^\circ$	$90^\circ \pm 15^\circ$	$90^\circ \pm 15^\circ$	
Signal level high (min.)	29.2 V DC			UB = 30 V, IOH = -30 mA
Signal level low (max.)	0.5 V DC			UB = 30 V, IOL = 30 mA
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	yes	

Signal image



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Pin assignment

Output circuit PP

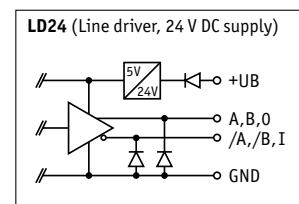
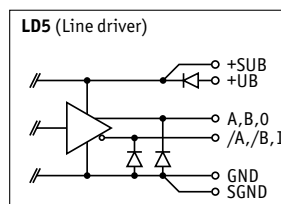
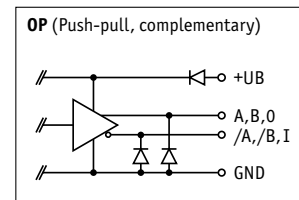
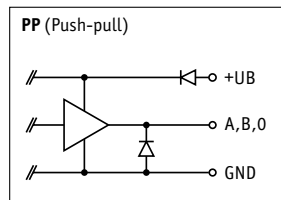
Signal	E1V	E2
N.C.		1
N.C.		2
O/I	green	3
N.C.		4
A	yellow	5
N.C.		6
N.C.		7
B	white	8
N.C.		9
GND	gray	10
N.C.		11
+UB	brown	12

Output circuit LD5

Signal	E1V	E2
/B	blue	1
+SUB	violet	2
0	green	3
/0	red	4
A	yellow	5
/A	pink	6
N.C.		7
B	white	8
N.C.		9
GND	gray	10
SGND	black	11
+UB	brown	12

Output circuit OP, LD24

Signal	E1V	E2
/B	blue	1
N.C.		2
0	green	3
/0	red	4
A	yellow	5
/A	pink	6
N.C.		7
B	white	8
N.C.		9
GND	gray	10
N.C.		11
+UB	brown	12



Order

Order table

Feature	Order data	Specification	Additional information
Output signals	... A	ABO, ABI, ABX	
Pulses/revolution	... B	50, 64, 100, 128, 200, 250, 256, 320, 400, 500, 512, 640, 800, 1000, 1024, 1280, 1600, 2000, 2048, 2560 others on request	
Type of connection	E1V E2 C	PG screwing connector	
Cable length L (m)	... OK D	0.2, 0.3, 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 10, 20 without cable	only with E2
Output circuit	PP OP LD5 LD24 E	push-pull push-pull with inverted signals line driver line driver	
Shaft design	GW KL F	set screw clamp ring	
Shaft diameter	... G	6, 7, 8, 9.525, 10, 12, 14, 15, 15.875, 16, 18, 19, 19.05, 20, 22	
Ambient condition	S E H	condensation not permitted condensation permitted	

Order code

IH58M - - - - - - - -

A B C D E F G H

Scope of delivery: IH58M, User information

Accessories:

Mating connectors

Page 88

Cable extension

Page 90

Electronic displays MA55, MA10/4

Catalog 6 DisplayLine

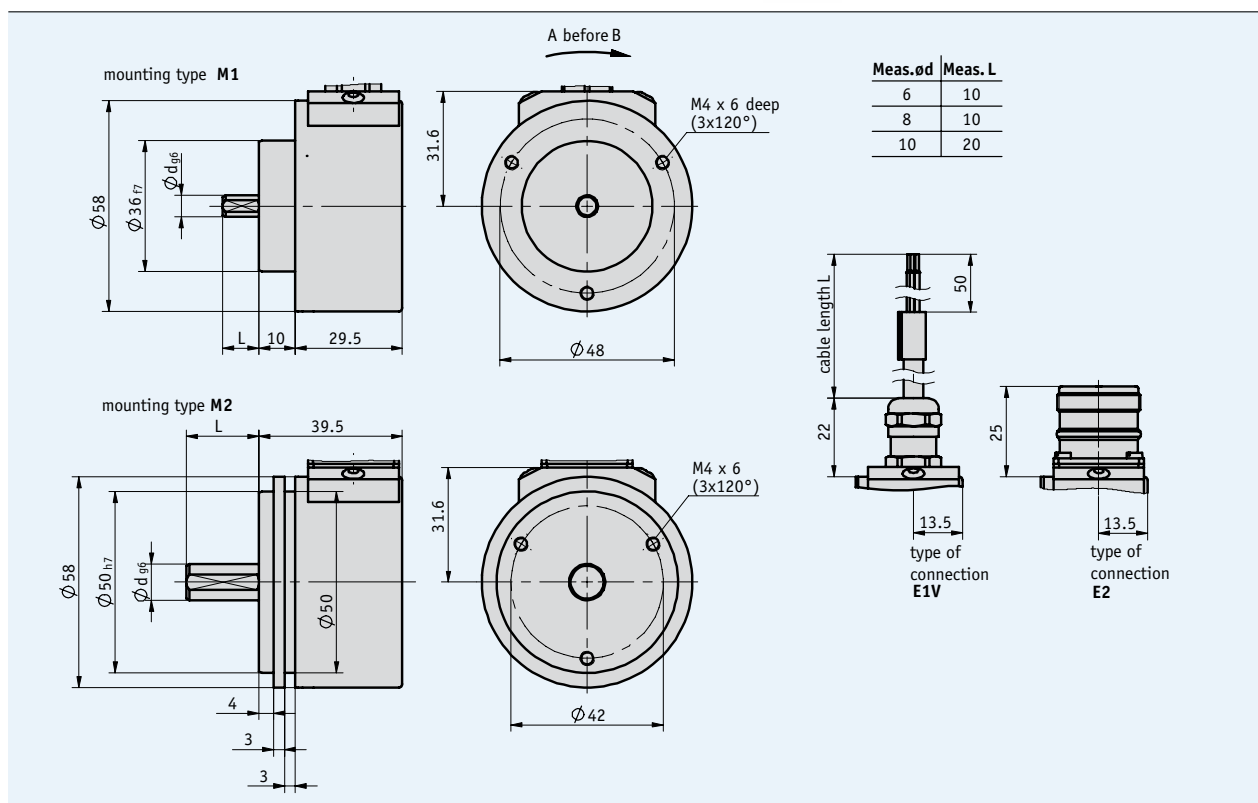
Additional information:

General information and areas of application

Page 8 cont.

Profile

- Resolutions of max. 2560 pulses/revolution
- Solid shafts up to $\varnothing 10$ mm, stainless steel
- IP65 protection category
- Aluminum housing
- Condensation permitted with sealed electronics unit



2.1

Mechanical data

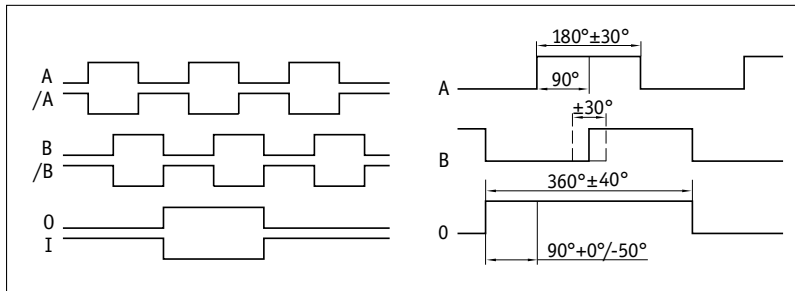
Feature	Technical data	Additional information
Max. speed	6000 rpm	
Shaft moment of inertia	$\sim 0.15 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 1.5 \text{ Ncm}$	at 20 °C
Shaft load rating	radial 80 N axial 40 N	
Weight	$\sim 0.4 \text{ kg}$	
Protection category	IP65	
Operating temperature	$-20 \dots +100 \text{ }^\circ\text{C}$	
Storage temperature	$-20 \dots +100 \text{ }^\circ\text{C}$	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	stainless steel	
Housing	aluminum	
Cable sheath	PUR $\varnothing 4.8 \text{ mm}$	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD5 Line driver	LD24 Line driver	Additional information
Operating voltage	+10 ... +30 V DC	+5 V DC $\pm 5\%$	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<25 mA	<25 mA	<25 mA	ABO variant
Maximum load/channel	± 30 mA	± 30 mA	± 30 mA	
Max. pulse frequency	100 kHz	100 kHz	100 kHz	
Phasing	$90^\circ \pm 15^\circ$	$90^\circ \pm 15^\circ$	$90^\circ \pm 15^\circ$	
Signal level high (min.)	29.2 V DC			UB = 30 V, IOH = -30 mA
Signal level low (max.)	0.5 V DC			UB = 30 V, IOL = 30 mA
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	yes	

Signal image



Pin assignment

Output circuit PP

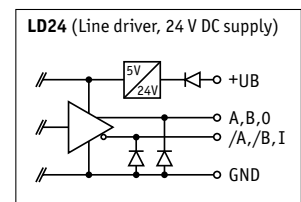
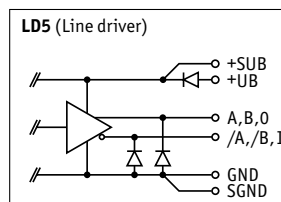
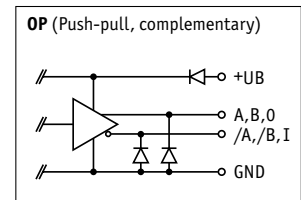
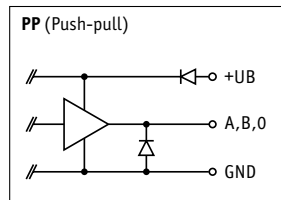
Signal	E1V	E2
N.C.		1
N.C.		2
O/I	green	3
N.C.		4
A	yellow	5
N.C.		6
N.C.		7
B	white	8
N.C.		9
GND	gray	10
N.C.		11
+UB	brown	12

Output circuit LD5

Signal	E1V	E2
/B	blue	1
+SUB	violet	2
0	green	3
/0	red	4
A	yellow	5
/A	pink	6
N.C.		7
B	white	8
N.C.		9
GND	gray	10
SGND	black	11
+UB	brown	12

Output circuit OP, LD24

Signal	E1V	E2
/B	blue	1
N.C.		2
0	green	3
/0	red	4
A	yellow	5
/A	pink	6
N.C.		7
B	white	8
N.C.		9
GND	gray	10
N.C.		11
+UB	brown	12



Order

Order table

Feature	Order data	Specification	Additional information
Output signals	... A	ABO, ABI, ABX	
Pulses/revolution	... B	50, 64, 100, 128, 200, 250, 256, 320, 400, 500, 512, 640, 800, 1000, 1024, 1280, 1600, 2000, 2048, 2560 others on request	
Type of connection	E1V E2 C	PG screwing connector	
Cable length L (m)	... OK D	1, 2, 3, 4, 5, 7, 8, 10, 15, 20 without cable	only with E2
Mounting type	M1 M2 E	clamping flange servo-flange	
Output circuit	PP OP LD5 LD24 F	push-pull push-pull with inverted signals line driver line driver	
Shaft diameter	6x10 8x10 10x20 G	∅ 6 mm, length 10 mm ∅ 8 mm, length 10 mm ∅ 10 mm, length 20 mm	
Ambient condition	S E H	condensation not permitted condensation permitted	

Order code

IV58M - - - - - - - -

A B C D E F G H

Scope of delivery: IV58M, User information

Accessories:

Mating connectors Page 88
 Cable extension Page 90
 Self-aligning coupling Page 94
 Servo-clamp Page 95
 Electronic displays MA55, MA10/4 Catalog 6 DisplayLine

Additional information:

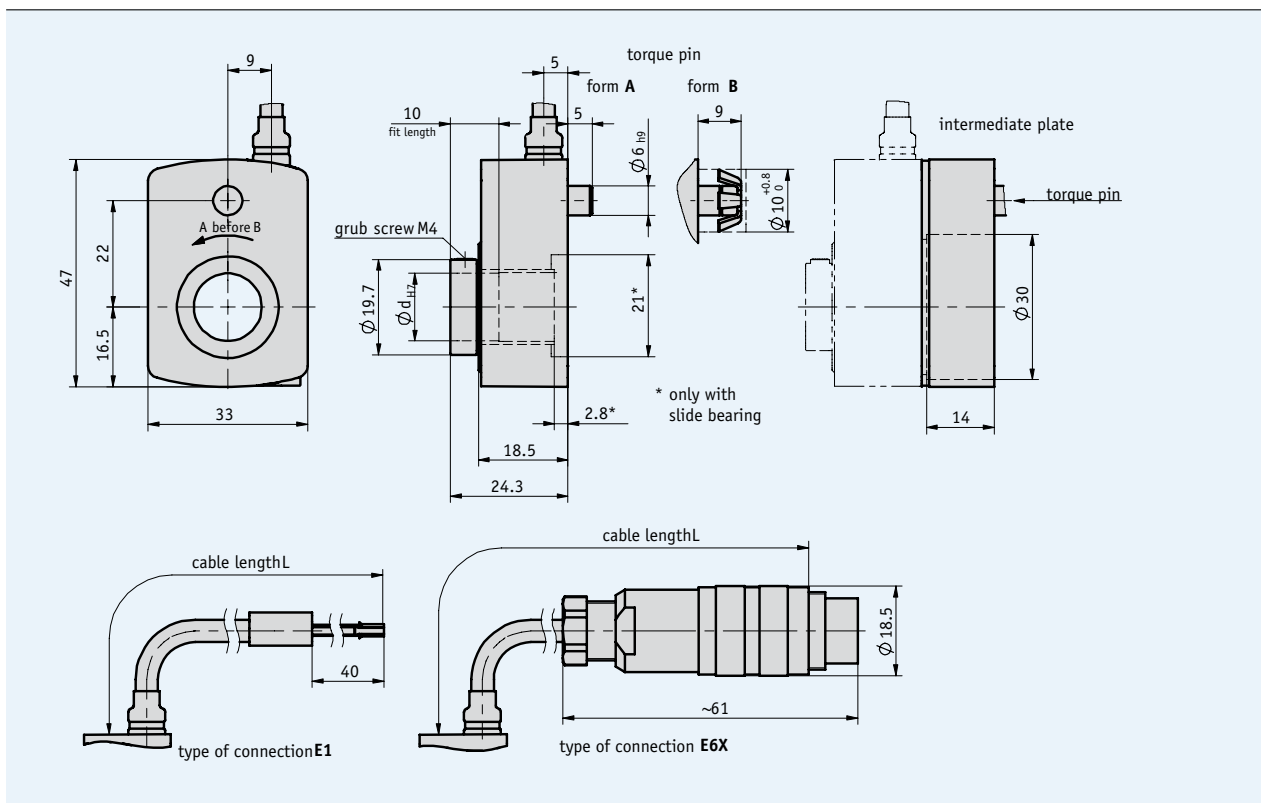
General information and areas of application Page 8 cont.

Profile

- Installation depth 25 mm
- Resolutions of max. 2000 pulses/revolution
- Through hollow shafts up to max. \varnothing 14 mm with plain or ball bearing
- IP50 protection category (plain bearing), IP63 (ball bearing)
- Housing made of reinforced plastic



2.1



Mechanical data

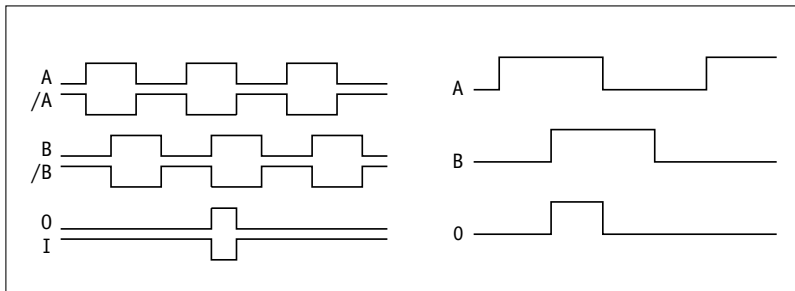
Feature	Technical data	Additional information
Max. speed	plain bearing 600 rpm short-time ball bearing 3000 rpm	
Shaft moment of inertia	$\sim 1.9 \times 10^{-6} \text{ kgm}^2$	
Weight	$\sim 0.1 \text{ kg}$	with 1 m cable
Protection category	IP50 plain bearing IP63 ball bearing	
Operating temperature	$-20 \dots +80 \text{ }^\circ\text{C}$	
Storage temperature	$-20 \dots +80 \text{ }^\circ\text{C}$	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	browned steel	
Housing	reinforced plastic	
Cable sheath	PUR \varnothing 4.8 mm	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD5 Line driver	LD24 Line driver	Additional information
Output circuit	PP, OP push-pull	LD5 line driver	LD24 line driver	
Operating voltage	+10 ... +30 V DC	+5 V DC $\pm 5\%$	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<25 mA	<25 mA	<25 mA	AB0 variant
Maximum load/channel	± 30 mA	± 30 mA	± 30 mA	
Max. pulse frequency	100 kHz	100 kHz	100 kHz	
Phasing	90°	90°	90°	
Signal level high (min.)	29.2 V DC			UB = 30 V, IOH = -30 mA
Signal level low (max.)	0.5 V DC			UB = 30 V, IOL = 30 mA
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	yes	

Signal image



! The state of the signals A and B with regard to the reference signal O is not defined and can deviate from the signal image.

2.1

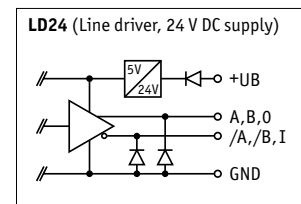
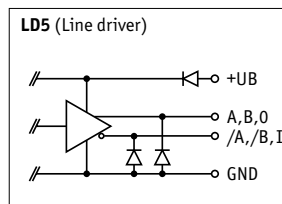
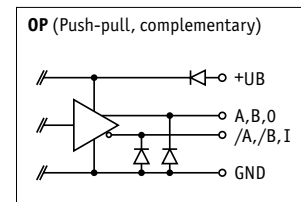
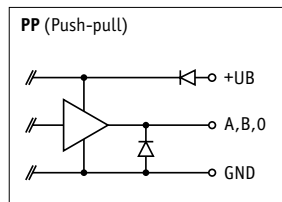
Pin assignment

Output circuit PP

Signal	E1	E6X
B	white	1
+UB	brown	2
O/I	green	3
A	yellow	4
GND	gray	5
N.C.		6-7

Output circuit OP, LD5, LD24

Signal	E1	E6X
/B	blue	A
N.C.		B
O	green	C
/O	red	D
A	yellow	E
/A	pink	F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
N.C.		L
+UB	brown	M



Order

Order table

Feature	Order data	Specification	Additional information
Output signals	... A	ABO, ABI, ABX	
Pulses/revolution	... B	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000 others on request	
Type of connection	E1 E6X C	flying leads connector	
Cable length L (m)	... D	0.5, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0	
Output circuit	PP OP LD5 LD24 E	push-pull push-pull with inverted signals line driver line driver	
Shaft diameter	G14 K10 F	plain bearing Ø 14 mm ball bearing Ø 10 mm	
Torque support	A B G	form A, cylindric pin form B, for tolerance compensation	
Intermediate plate	OZP ZP H	without intermediate plate with intermediate plate	

Order code



Scope of delivery: IG04M, User information

Accessories:

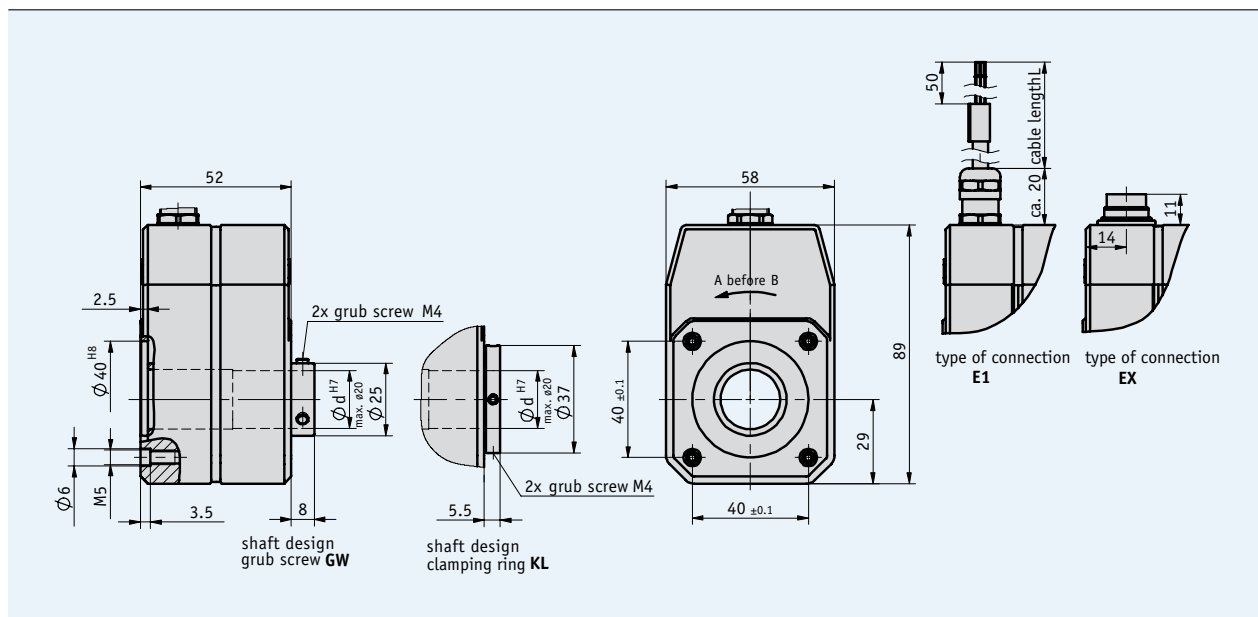
- Mating connectors Page 88
- Cable extension Page 90
- Electronic displays MA55, MA10/4 Catalog 6 DisplayLine

Additional information:

General information and areas of application Page 8 cont.

Profile

- Resolutions of max. 2560 pulses/revolution
- High shaft load rating, axial 1400 N; radial 5600 N
- Through hollow shafts up to \varnothing 20 mm, stainless steel
- IP64 protection category
- Housing made of zinc die-cast
- Condensation permitted with sealed electronics unit



2.1

Mechanical data

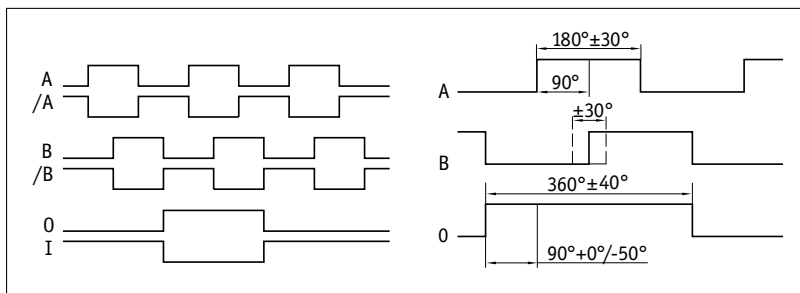
Feature	Technical data	Additional information
Max. speed	6000 rpm, IP64 3000 rpm, IP65	
Shaft moment of inertia	$\sim 0.3 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 6 \text{ Ncm}$, IP64 $\leq 10 \text{ Ncm}$, IP65	at 20 °C
Shaft load rating	radial 5600 N axial 1400 N	
Weight	$\sim 0.75 \text{ kg}$	
Protection category	IP64, high-precision packed sealing gap IP65, enhanced bearing sealing	
Operating temperature	-20 ... +100 °C	
Storage temperature	-20 ... +100 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	stainless steel, \varnothing 20 mm	
Housing	zinc die-cast	
Cable sheath	PUR \varnothing 4.8 mm	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD5 Line driver	LD24 Line driver	Additional information
Operating voltage	+10 ... +30 V DC	+5 V DC ±5 %	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<25 mA	<25 mA	<25 mA	AB0 variant
Maximum load/channel	±30 mA	±30 mA	±30 mA	
Max. pulse frequency	100 kHz	100 kHz	100 kHz	
Phasing	90° ±15°	90° ±15°	90° ±15°	
Signal level high (min.)	29.2 V DC			UB = 30 V, IOH = -30 mA
Signal level low (max.)	0.5 V DC			UB = 30 V, IOL = 30 mA
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	yes	

Signal image



Pin assignment

Output circuit PP

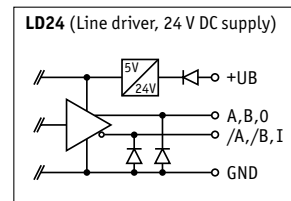
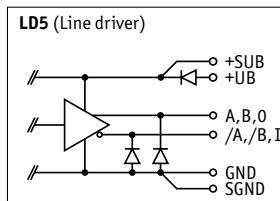
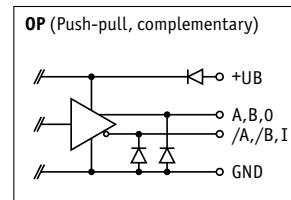
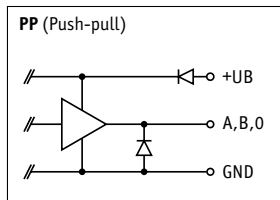
Signal	E1	E6X
N.C.		A
N.C.		B
O/I	green	C
N.C.		D
A	yellow	E
N.C.		F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
N.C.		L
+UB	brown	M

Output circuit LD5

Signal	E1	E6X
/B	blue	A
+SUB	violet	B
0	green	C
/0	red	D
A	yellow	E
/A	pink	F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
SGND	black	L
+UB	brown	M

Output circuit OP, LD24

Signal	E1	E6X
/B	blue	A
N.C.		B
0	green	C
/0	red	D
A	yellow	E
/A	pink	F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
N.C.		L
+UB	brown	M



Order

Order table

Feature	Order data	Specification	Additional information
Output signals	... A	ABO, ABI, ABX	
Pulses/revolution	... B	50, 64, 100, 200, 250, 256, 320, 400, 512, 640, 800, 900, 1000, 1024, 1280, 1600, 2000, 2048, 2560 others on request	
Type of connection	E1 EX C	flying leads connector	
Cable length L (m)	... OK D	01.0, 02.0, 03.0, 04.0, 05.0, 08.0, 10 without cable	only with EX
Output circuit	PP OP LD5 LD24 E	push-pull push-pull with inverted signals line driver line driver	
Shaft design	GW KL F	set screw clamp ring	
Bearing	MS RS G	IP64, high-precision packed sealing gap IP65, enhanced bearing sealing	
Ambient condition	S E H	condensation not permitted condensation permitted	

2.1

Order code

IG07M - - - - - - - 20 - M1 - -

A
B
C
D
E
F
G
H

Scope of delivery: IG07M, User information

Accessories:

Mating connectors

Page 88

Cable extension

Page 90

Electronic displays MA55, MA10/4

Catalog 6 DisplayLine

Additional information:

General information and areas of application

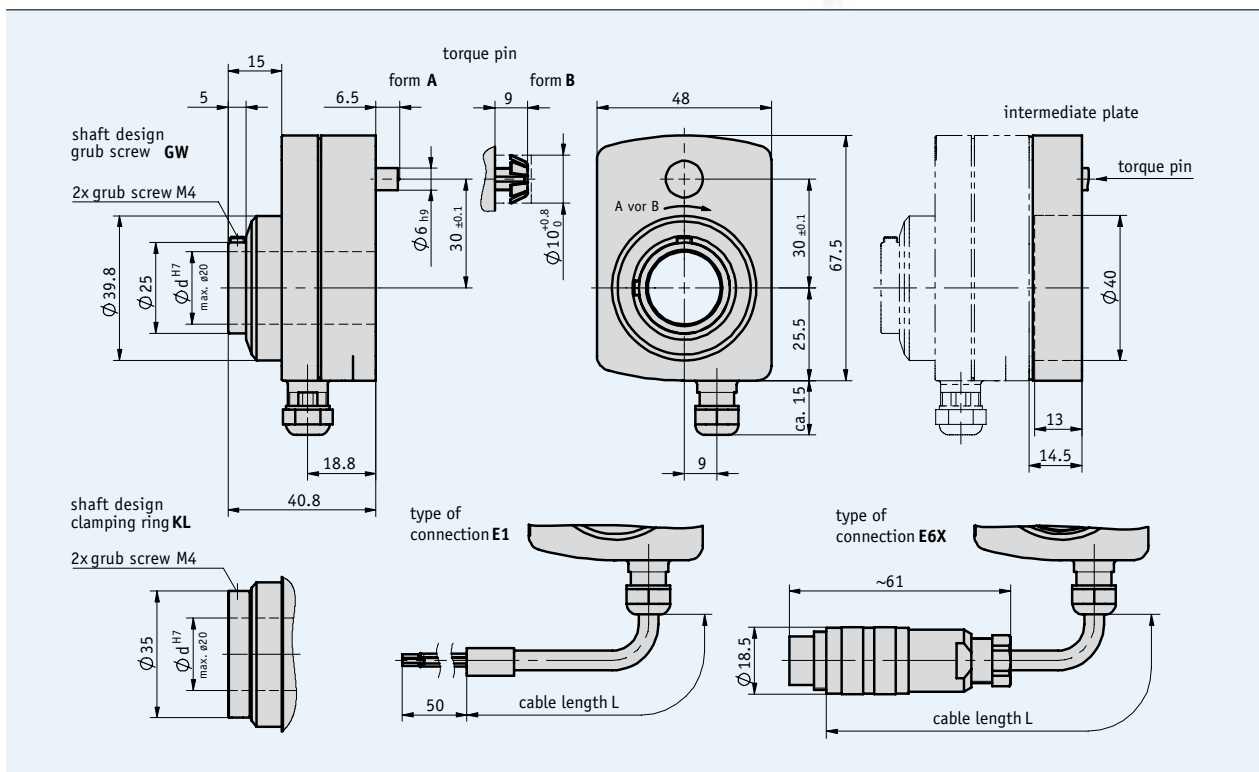
Page 8 cont.

Profile

- Resolutions of max. 2560 pulses/revolution
- Through hollow shafts up to $\varnothing 20$ mm
- IP53 and IP63 protection categories
- Housing made of reinforced plastic
- Condensation permitted with sealed electronics unit
- Can be combined with the DA09S position indicator



2.1



Mechanical data

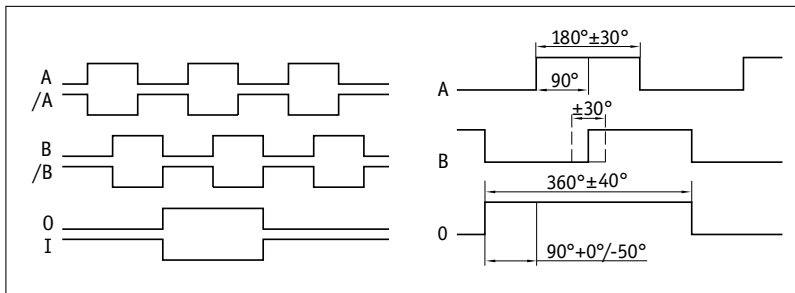
Feature	Technical data	Additional information
Max. speed	plain bearing 6000 rpm	
Shaft moment of inertia	$\sim 0.15 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 2 \text{ Ncm}$, IP53 $\leq 3.5 \text{ Ncm}$, IP63	at 20 °C
Weight	$\sim 0.12 \text{ kg}$	
Protection category	IP53 IP63	
Operating temperature	$-20 \dots +100 \text{ °C}$	
Storage temperature	$-20 \dots +100 \text{ °C}$	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	browned steel	
Housing	reinforced plastic	
Cable sheath	PUR $\varnothing 4.8 \text{ mm}$	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD5 Line driver	LD24 Line driver	Additional information
Operating voltage	+10 ... +30 V DC	+5 V DC $\pm 5\%$	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<25 mA	<25 mA	<25 mA	ABO variant
Maximum load/channel	± 30 mA	± 30 mA	± 30 mA	
Max. pulse frequency	100 kHz	100 kHz	100 kHz	
Phasing	$90^\circ \pm 15^\circ$	$90^\circ \pm 15^\circ$	$90^\circ \pm 15^\circ$	
Signal level high (min.)	29.2 V DC			UB = 30 V, IOH = -30 mA
Signal level low (max.)	0.5 V DC			UB = 30 V, IOL = 30 mA
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	yes	

Signal image



2.1

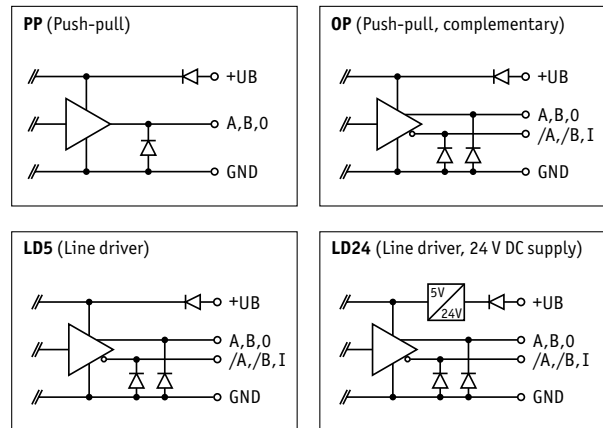
Pin assignment

Output circuit PP

Signal	E1	E6X
N.C.		A
N.C.		B
O/I	green	C
N.C.		D
A	yellow	E
N.C.		F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
N.C.		L
+UB	brown	M

Output circuit OP, LD5, LD24

Signal	E1	E6X
/B	blue	A
N.C.		B
O	green	C
/O	red	D
A	yellow	E
/A	pink	F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
N.C.		L
+UB	brown	M



Order

Order table

Feature	Order data	Specification	Additional information
Output signals	... A	ABO, ABI, ABX	
Pulses/revolution	... B	50, 64, 100, 128, 200, 250, 256, 320, 400, 512, 640, 800, 1000, 1024, 1280, 1600, 2000, 2048, 2560 others on request	
Type of connection	E1 E6X C	flying leads connector	
Cable length L (m)	... D	0.3, 0.4, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 15, 20	
Output circuit	PP OP LD5 LD24 E	push-pull push-pull with inverted signals line driver line driver	
Shaft design	GW KL F	set screw clamp ring	
Shaft diameter	... G	12, 14, 15, 16, 20	
Ambient condition	S E H	condensation not permitted condensation permitted	
Torque support	A B I	form A, cylindric pin form B, for tolerance compensation	
Protection category	IP53 IP63 K		
Intermediate plate	OZP ZP L	without intermediate plate with intermediate plate	

Order code

IG09M - - - - - - - - - - - -

A B C D E F G H I K L

Scope of delivery: IG09M, User information

Accessories:

Mating connectors

Page 88

Cable extension

Page 90

Electronic displays MA55, MA10/4

Catalog 6 DisplayLine

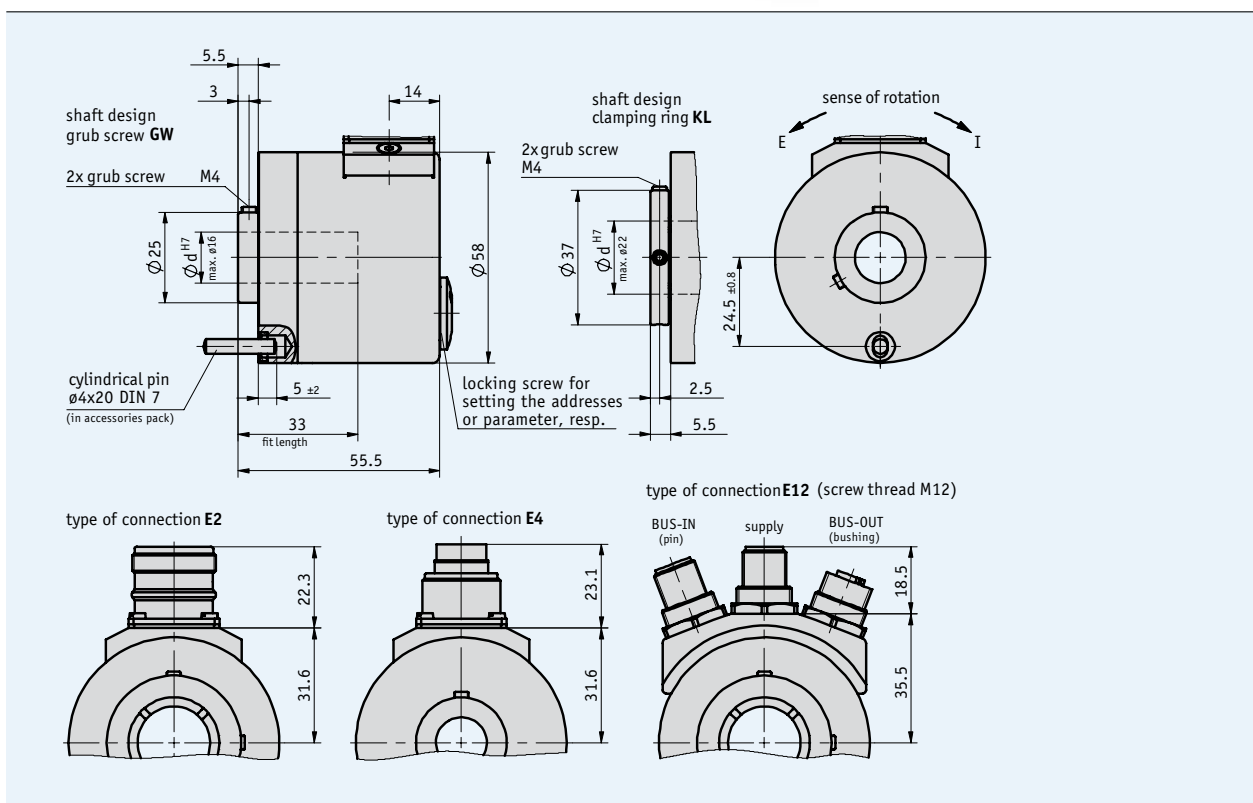
Additional information:

General information and areas of application

Page 8 cont.

Profile

- Very compact design
- Hollow shafts up to max. \varnothing 22 mm
- Robust contactless scanning 12 bit, single-turn
- Standard: SSI output; RS485 and fieldbus as options
- Hood made of sheet steel



2.1

Mechanical data

Feature	Technical data	Additional information
Max. speed	6000 rpm	
Shaft moment of inertia	$\sim 17 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 0.03 \text{ Nm}$	at 20 °C
Weight	$\sim 0.4 \text{ kg}$	
Protection category	IP65	
Operating temperature	-20 ... +100 °C	
Storage temperature	-30 ... +100 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/5 ... 150 Hz	according to DIN EN 60068-2-6
Shaft	stainless steel	
Housing	aluminum and steel	

Electrical data

Feature					Additional information
Protocol	SIKONETZ-3	SSI	CAN bus CANopen	Profibus PB	
Operating voltage	+10 ... +30 V DC	+10 ... +30 V DC	+10 ... +30 V DC	+10 ... +30 V DC	
Output driver interface	RS485	RS422	CAN high-speed acc. to ISO/DIS 11898	RS485	
Current consumption without load (typical)	~0.4 W	~0.9 W	<1.1 W	<1.1 W	
SSI clock rate		min. 65 kHz (<400 m cable length) max. 1 MHz (<25 m cable length)			
Baud rate (kbit/s)	19.2		125, 250, 500, 1000	9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000, 12000	
Short-circuit resistant outputs	yes	yes	yes	yes	output against output or output against GND in case of short circuit
Inverse-polarity protection on UB	yes	yes	yes	yes	
External calibration input	no	yes	no	no	

2.1

Pin configuration

■ Connector pin assignment E2; SSI interface

Signal	PIN
GND	1
+UB	2
Clock +	3
Clock -	4
Data +	5
Data -	6
RS485 DÜA	10
RS485 DÜB	12
N.C.	7-9, 11

■ Connector pin assignment E2; SSI interface with external calibration input

Signal	PIN
GND	1
+UB	2
Clock +	3
Clock -	4
Data +	5
Data -	6
External calibration input	8
RS485 DÜA	10
RS485 DÜB	12
N.C.	7, 9, 11

■ Connector pin assignment E4; SIKONETZ-3 interface

Signal	PIN
DÜA	1
DÜB	2
GND	3
N.C.	4
+UB	5
N.C.	6-7

■ Connector pin assignment E12; Profibus interface

Signal	Signal	PIN
Profibus-IN	Profibus-OUT	
N.C.	VP (2P5)	1
BUS-A	BUS-A	2
N.C.	DGND (2M)	3
BUS-B	BUS-B	4
N.C.	screen	5

■ Connector pin assignment E12; interface CAN bus

Signal	Signal	PIN
CANopen-IN	CANopen-OUT	
N.C.	N.C.	1
N.C.	N.C.	2
CAN_GND	CAN_GND	3
CAN_H	CAN_H	4
CAN_L	CAN_L	5

■ Connector pin assignment E12; power supply

Power supply	PIN
+UB	1
N.C.	2
GND	3
N.C.	4

Order

Order table

Feature	Order text	Specification	Additional information
Interface/protocol	CAN	CAN bus	CANopen
	PB	Profibus DP	
	S3/06	SIKONETZ-3	RS485
	S6/04	SSI	RS422
	S6/04-K	SSI with external calibration input	RS422
Type of connection	E2	connector	for SSI
	E4	connector	for SIKONETZ-3
	E12	connector	for CAN bus or Profibus
Steps per revolution	1024	10 bit	
	4096	12 bit	
Shaft design	GW	set screw	only with hollow shaft Ø 14 mm
	KL	clamp ring	only with hollow shaft Ø 20 mm
Hollow shaft/diameter	...	14, 20	
	E	others on request	
Ambient condition	S	condensation not permitted	
	E	condensation permitted	

2.1

Order code

WH58M - - - - 1 - - -
A B C D E F

Scope of delivery: WH58M, User information

Accessories:

Mating connectors

Page 88

Cable extension

Page 90

Electronic displays MA55, MA10/4

Catalog 6 DisplayLine

Additional information:

General information and areas of application

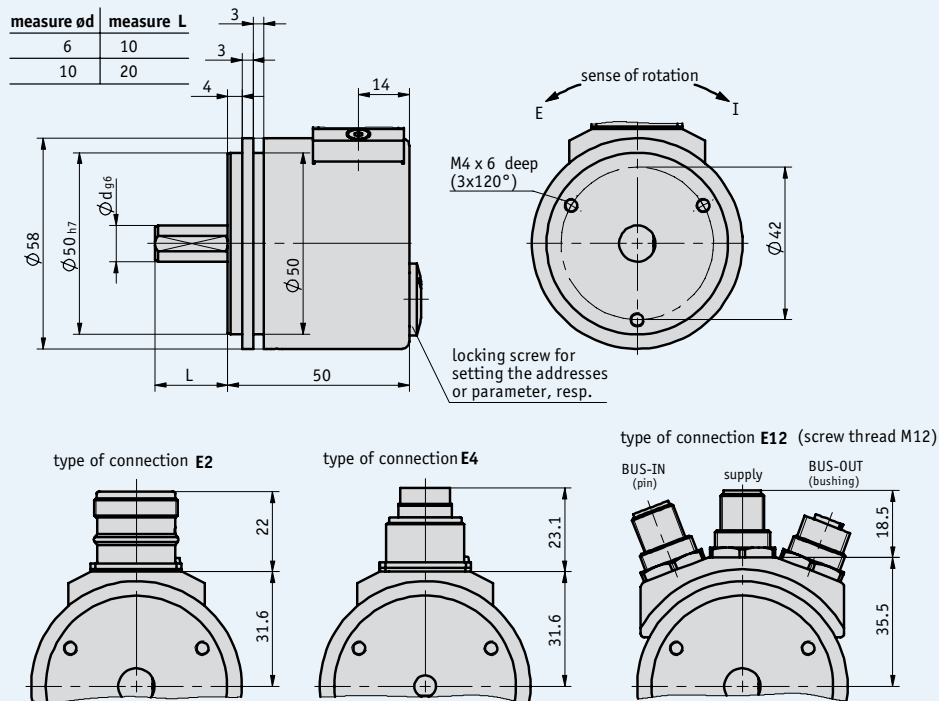
Page 8 cont.

Profile

- Very compact design
- Robust contactless scanning 12 bit, single-turn
- Standard: SSI output; RS485 and fieldbus as options
- Hood made of sheet steel



2.1



Mechanical data

Feature	Technical data	Additional information
Max. speed	6000 rpm	
Shaft moment of inertia	$\sim 5 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 0.01 \text{ Nm}$	at 20 °C
Shaft load rating	radial 80 N axial 40 N	
Weight	$\sim 0.4 \text{ kg}$	
Protection category	IP65	
Operating temperature	-20 ... +100 °C	
Storage temperature	-30 ... +100 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/5 ... 150 Hz	according to DIN EN 60068-2-6
Shaft	stainless steel	
Housing	aluminum and steel	

Electrical data

Feature					Additional information
Protocol	SIKONETZ-3	SSI	CAN bus CANopen	Profibus PB	
Operating voltage	+10 ... +30 V DC	+10 ... +30 V DC	+10 ... +30 V DC	+10 ... +30 V DC	
Output driver interface	RS485	RS422	CAN high-speed acc. to ISO/DIS 11898	RS485	
Current consumption without load (typical)	~0.4 W	~0.9 W	<1.1 W	<1.1 W	
SSI clock rate		min. 65 kHz (<400 m cable length) max. 1 MHz (<25 m cable length)			
Baud rate (kbit/s)	19.2		125, 250, 500, 1000	9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000, 12000	
Short-circuit resistant outputs	yes	yes	yes	yes	output against output or output against GND in case of short circuit
Inverse-polarity protection on UB	yes	yes	yes	yes	
External calibration input	no	yes	no	no	

2.1

Pin assignment

■ Connector pin assignment E2; SSI interface

Signal	PIN
GND	1
+UB	2
Clock +	3
Clock -	4
Data +	5
Data -	6
RS485 DÜA	10
RS485 DÜB	12
N.C.	7-9, 11

■ Connector pin assignment E2; SSI interface with external calibration input

Signal	PIN
GND	1
+UB	2
Clock +	3
Clock -	4
Data +	5
Data -	6
External calibration input	8
RS485 DÜA	10
RS485 DÜB	12
N.C.	7, 9, 11

■ Connector pin assignment E4; SIKONETZ-3 interface

Signal	PIN
DÜA	1
DÜB	2
GND	3
N.C.	4
+UB	5
N.C.	6-7

■ Connector pin assignment E12; Profibus interface

Signal	Signal	PIN
Profibus-IN	Profibus-OUT	
N.C.	VP (2P5)	1
BUS-A	BUS-A	2
N.C.	DGND (2M)	3
BUS-B	BUS-B	4
N.C.	screen	5

■ Connector pin assignment E12; Can bus interface

Signal	Signal	PIN
CANopen-IN	CANopen-OUT	
N.C.	N.C.	1
N.C.	N.C.	2
CAN_GND	CAN_GND	3
CAN_H	CAN_H	4
CAN_L	CAN_L	5

■ Connector pin assignment E12; Power supply

Power supply	PIN
+UB	1
N.C.	2
GND	3
N.C.	4

Order

Order table

Feature	Order text	Specification	Additional information
Interface/protocol	CAN	CAN bus	CANopen
	PB		
	S3/06	SIKONETZ-3	RS485
	S6/04	SSI	RS422
	S6/04-K	SSI with external calibration input	RS422
Type of connection	E2	connector	for SSI
	E4	connector	for SIKONETZ-3
	E12	connector	for CAN bus or Profibus
Steps per revolution	1024	10 bit	
	4096	12 bit	
Shaft/diameter x length	6x10	∅ 6 mm, length 10 mm	
	10x20	∅ 10 mm, length 20 mm	
Ambient condition	S	condensation not permitted	
	E	condensation permitted	

Order code

WV58M - - - - 1 - -

A B C D E

Scope of delivery: WV58M, User information

Accessories:

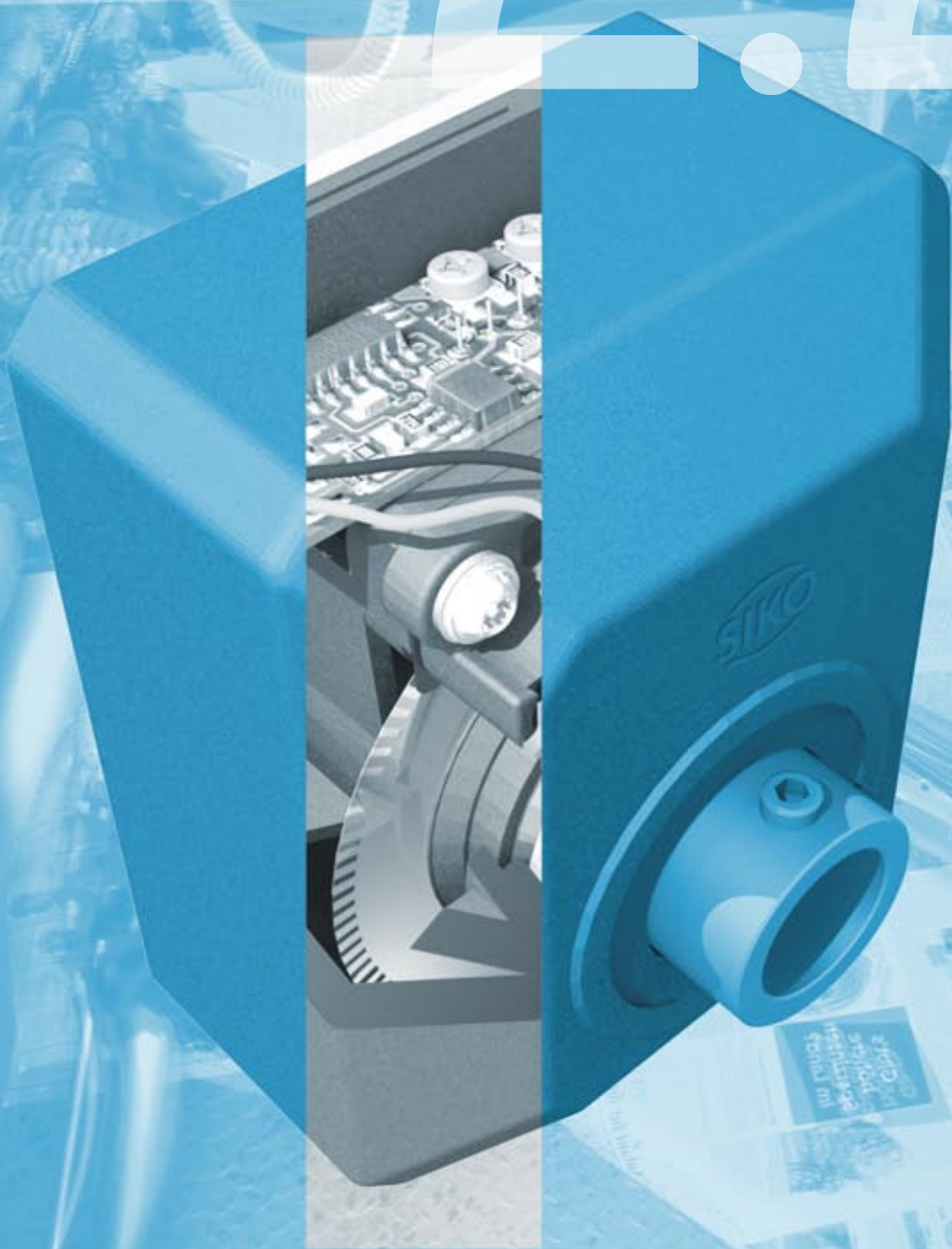
Mating connectors Page 88
 Cable extension Page 90
 Self-aligning coupling Page 94
 Servo-clamp Page 95
 Electronic displays MA55, MA10/4 Catalog 6 DisplayLine

Additional information:

General information and areas of application Page 8 cont.

2.1

2.2



2.0 | RotoLine Product Overview 3
2.1 | Magnetic rotary encoders 6

2.2 | Optical rotary encoders

General information and areas of application	42
Function and application	44
Product matrix	45
Products	
Incremental encoders	IG06 46
	IG07 49
	IG17 53
Angle encoders	WK50/1 57

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2.5 | Product index, Contact information 96

2.0

2.1

2.2

2.3

2.4

2.5

Sophisticated technology for high-resolution applications

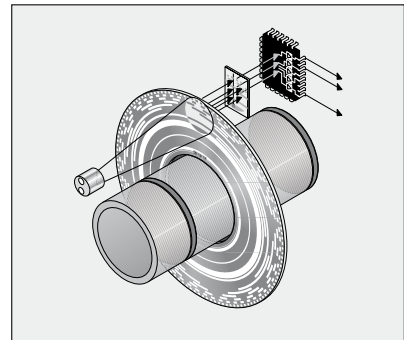
Optical encoders have an excellent cost-benefit ratio. This fully developed technology offers robust and well-sealed housings, permitting reliable measurement with very high resolutions in a large number of industrial applications.

The core of optical encoder technology is precisely segmented code discs with patterns in a circular arrangement. Well protected against external influences, the transparent and opaque sections alternate at defined intervals, dividing a beam of light directed onto a sensor into "digital" yes and no counting units.

Signal sequences are generated, which form the basis for calculating the respective rotation angle. Combined with an intelligent follow-up electronic system, reliable calculation of angles, lengths and even speeds is possible.

As two signal sequences A and B, offset by 90°, are scanned with each rotation, the electronic system also detects the "clockwise/counter-clockwise" direction of rotation due to the phase offset, with the advantage of enhancing the mechanical and electrical safety and reliability of the system.

The hollow shaft incremental encoders are simply slipped onto the shaft or spindle. Solid shaft encoders are mounted with a flange and a connecting coupling.

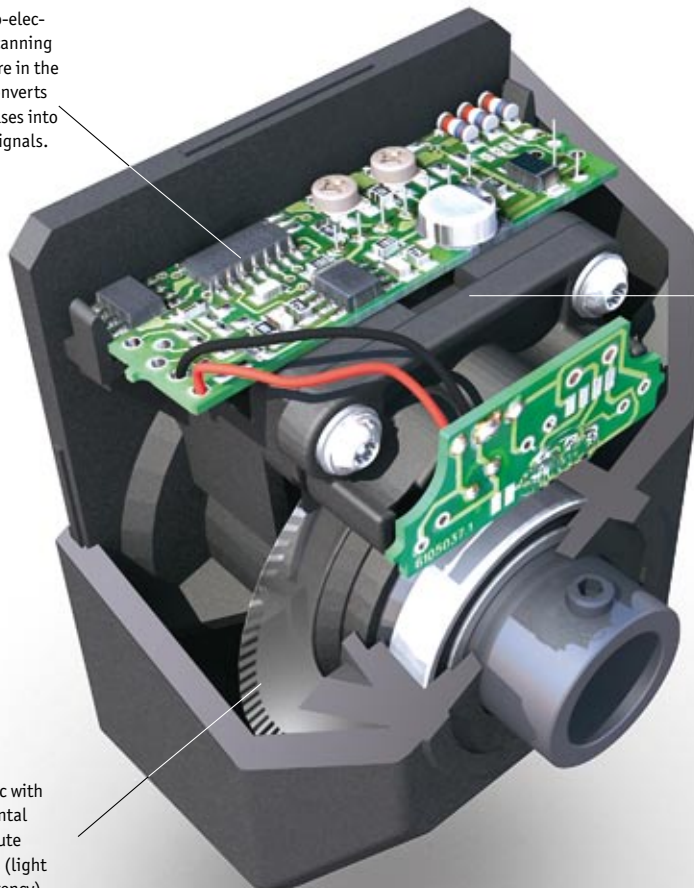


The absolute, opto-electronic scanning principle using an angle encoder as an example

Incremental encoders

During incremental processes, an opto-electronic scanning unit tracks the uniform-incremental dividing pattern of the code disc and converts these into a number of electronic pulses that is proportional to the rotation. In the event of a voltage drop, however, the measured value is lost – the incremental encoder requires a reference operation.

The opto-electronic scanning unit (here in the IG06) converts light pulses into digital signals.



Light module

Code disc with incremental or absolute patterns (light transparency)

High resolutions, a clever housing concept, functional overall design with simple slip-on mounting and locking: The optical SIKO encoders are excellently equipped for demanding measuring assignments

Angle encoders

Absolute encoders or angle encoders measure angles absolutely and directly. Linear motion can also be tracked if this is converted to a rotating motion by toothed belts, drive wheels or cables.

The absolute encoding disc has transparent or opaque encoding on several tracks. As a result the measured values can be tracked absolutely and are also still available after power interruptions without a reference operation.

Applications

Optical encoders are the right choice when it comes to applications with very high resolution requirements. Angle encoders are, for example, particularly suitable for applications in the wood, metal, printing and packaging industries. The devices tirelessly track the complex and highly dynamic motion of robot arms and do not require maintenance. They perform excellently on

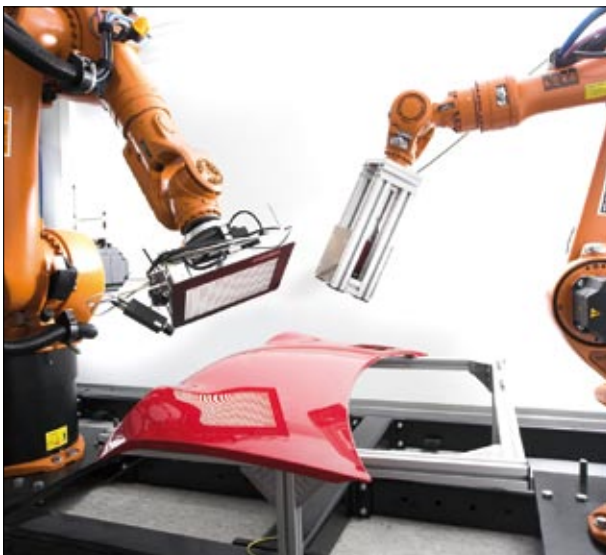
The range includes "single turn" versions for repeated single rotations and "multi-turn" versions for absolute multiple rotation ...

- "Single turn" permits up to 8192 measuring steps/rotation (13 bits). Encoding starts again at the initial value after each full rotation.
- "Multi-turn" is performed in the same manner as "single turn", but permits 4096 rotations with an encoded reduction gear (12 bits). Due to the very high number of measuring steps (> 33 million, 12 bits plus 13 bits = 25 bits), it is also possible to track very long linear paths with a fine resolution.

linear shafts, during angle adjustment operations and monitoring synchronized operations. These encoders are reliable and offer a quick return on investment due to their track-proven specifications. Even "load limits" determined by the measuring principle can be almost completely eliminated by effective installation on the machine.



1



2



3

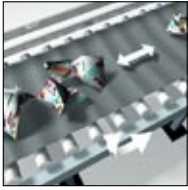


4

[1] Paper dust and precision – monitoring printing speed, roller alignment and setting of paper formats. [2] Dynamics and resolution – cooperating robots during the deflectometric inspection of a bodywork section (photo: indigo werbefotografie © Fraunhofer Institute for Information and Data Processing IITB 2008, Chair for interactive real-time systems at the University of Karlsruhe, TH). [3] High air humidity – food production © Handtmann Maschinenfabrik GmbH & Co. KG, [4] Shavings, high mechanical loads – cutting and surface processing in the wood industry.

Ambient conditions	Examples of use	Benefits
--------------------	-----------------	----------

Tracking the number of revolutions or speed



The high mechanical load capacity permits applications which require a constantly reliable long-term function.



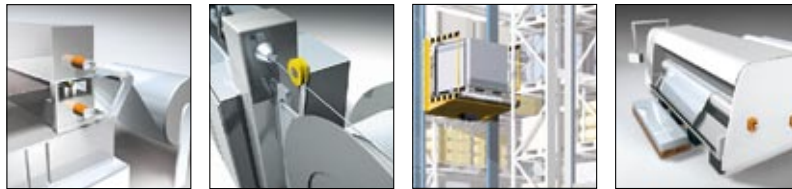
e.g., turning techniques (lathes), drilling systems, foil production ...

- Variable diameter
- Can be installed in any position
- High mechanical load capacity

Tracking paths (running and extension length, distance, stops, etc.)



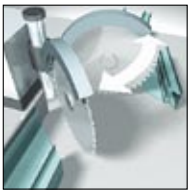
Reliable incremental or absolute path measurement: Robust housings encapsulate the high-resolution encoders, guarantee precise measuring results on a large and small scale.



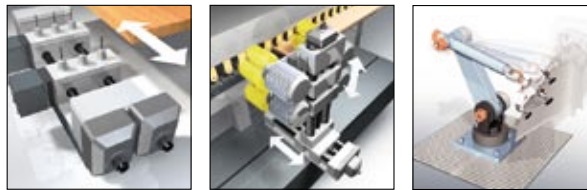
e.g., run length control, storage technology, elevators for material, packing and cutting ...

- Simple installation
- Robust components

Tracking of spindle adjustment (angle and positioning measurement)



High repeat accuracy with exact positioning – the optical SIKO encoders are designed for demanding operations.



e.g., dowel drilling units and surface refinement in the furniture industry, industrial robotics ...

- Very high resolution
- Precise positioning



Application with compound and rotary tables, material testing, forming technology or ...



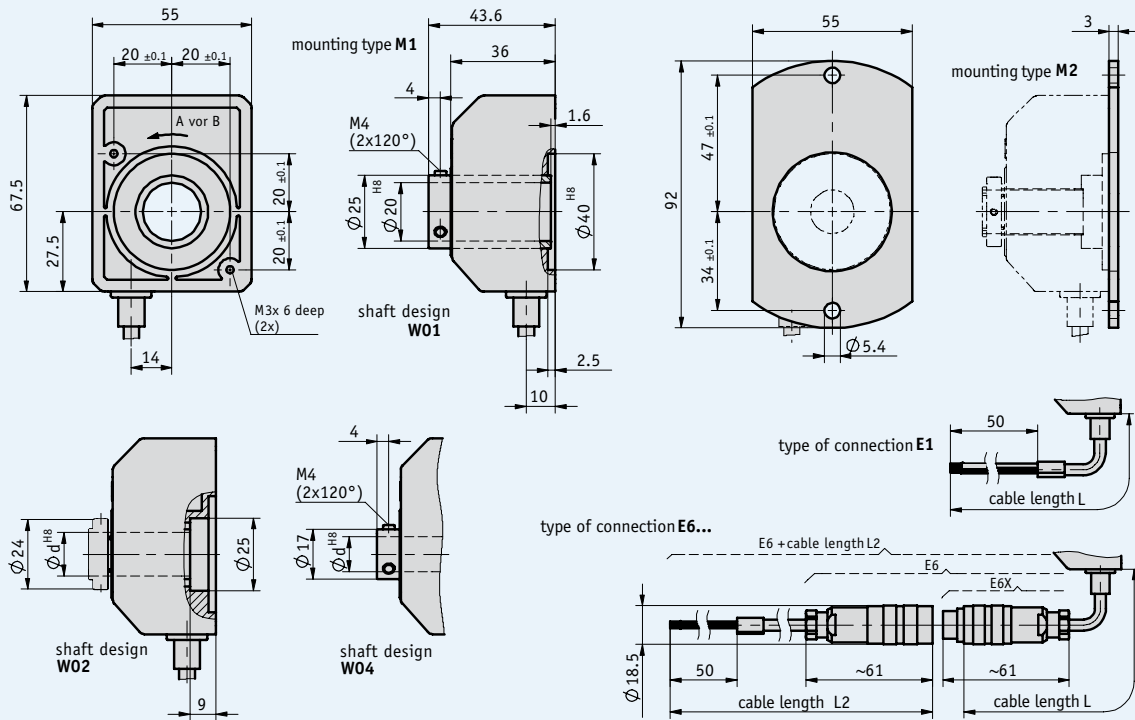
Access control ...

Optical rotary encoders

				
	IG06	IG07	IG17	WK50/1
Page	46	49	53	57
Measurement type				
Incremental	•	•	•	
Absolute multi-turn				•
Shaft design				
Hollow shaft	•	•		•
Solid shaft			•	
Shaft diameter	10–20 mm	12–20 mm	6–16 mm	16, 20 mm
Output circuit				
PP	•	•	•	
OC	•			
OP		•	•	
LD5		•	•	
LD24		•	•	
SSI				•
Housing				
Plastic	•			
Zinc die-cast		•	•	
Aluminum				•
Resolution				
Max. pulses/revolution	1024	1024	1024	8192
Max. number of revolutions				4096

Profile

- Resolutions of max. 1024 pulses/revolution
- Through hollow shafts up to $\varnothing 20$ mm
- Housing made of impact-resistant plastic
- Low-cost version



2.2

Mechanical data

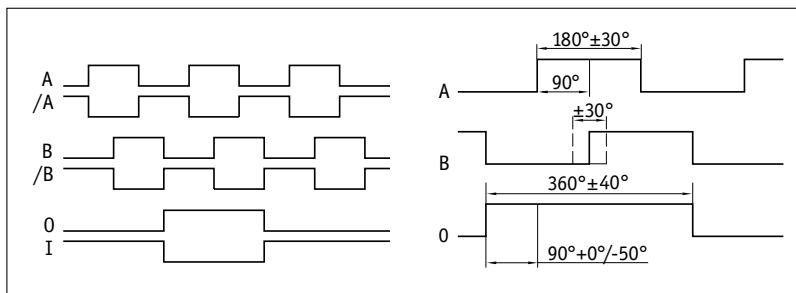
Feature	Technical data	Additional information
Max. speed	6000 rpm 600 rpm	with W02, W04 with W01, W01N
Shaft moment of inertia	$\sim 10.5 \times 10^{-6} \text{ kgm}^2$ $\sim 9.5 \times 10^{-6} \text{ kgm}^2$ $\sim 9 \times 10^{-6} \text{ kgm}^2$	with W01, W01N with W02 with W04
Starting torque at 20 °C	$\leq 15 \text{ Ncm}$, with W01 $\leq 1.5 \text{ Ncm}$, with W02 and W04	
Shaft load rating	radial 20 N axial 10 N radial 50 N axial 25 N	with W01 with W01 with W02, W04 with W02, W04
Weight	$\sim 0.14 \text{ kg}$	
Protection category	IP54	
Operating temperature	0 ... +60 °C	
Storage temperature	-20 ... +80 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	browned steel	
Housing	reinforced plastic	
Cable sheath	PVC or PUR	

Electrical data

Output circuit

Feature	PP Push-pull	OC (NPN) Open collector	Additional information
Operating voltage	+10 ... +30 V DC	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<50 mA	<50 mA	AB0 variant
Maximum load/channel	$\pm 40 \text{ mA}$, short circuit-resistant	$\pm 50 \text{ mA}$	
Max. pulse frequency	25 kHz	25 kHz	
Phasing	$90^\circ \pm 30^\circ$	$90^\circ \pm 30^\circ$	
Signal level high (min.)	UB -2 V, at 20 mA	wiring-dependent	
Signal level low (max.)	1 V, at 20 mA	0.1 V DC	
Inverse-polarity protection on UB	yes	yes	

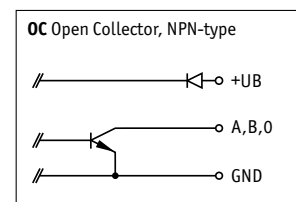
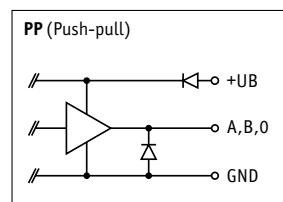
Signal image



Pin assignment

Output circuit PP, OC


Signal	E1	E6X, E6
GND	gray	1
A	yellow	2
B	white	3
O/I	green	4
+UB	brown	5
N.C.		6, 7



Order

Maximum pulses with output signals

Output signal	Plain bearing W01	Ball bearing, W02, W04
AXX	500	1024
ABX	250	500
ABO	220	250
ABI	220	250

 The max. permissible pulses/ revs. must not be exceeded by the output signals.

Order table

Feature	Order text	Specification	Additional information
Output signals	... A	AXX, ABX, ABO, ABI	
Pulses/revolution	... B	1, 2, 5, 10, 20, 25, 36, 40, 50, 60, 70, 80, 90, 100, 125, 140, 150, 180, 200, 220, 240, 250, 280, 300, 360, 400, 500, 600, 1000, 1024 others on request	
Cable sheath	PUR C PVC	oil-resistant	
Type of connection	E1 D E6 E6X	flying leads cable coupler with cable extension cable coupler	
Cable length L	... E	0.3, 2 ... 40 m, in steps of 1 m 0.3, 2, 3	only PVC only PUR
Cable length L2	... F	0.3, 2 ... 15 m, in steps of 1 m 0.3, 2, 3	only PVC only PUR
Mounting type	M1 G M2	with blind hole bore with mounting plate	
Output circuit	PP H OC	push-pull open collector	
Shaft design	W01 I W02 W04	set screw/plain bearing clamp ring/ball bearing set screw/ball bearing	
Hollow shaft/diameter (mm)	20 K	∅ 20 mm 14, 15 mm 10, 12 mm	with W01 with W02 with W04

Order code

IG06 - - - - - - - - - - -

A B C D E F G H I K

Scope of delivery: IG06, User information

 **Accessories:**

Electronic displays MA55, MA10/4

Catalog 6 DisplayLine

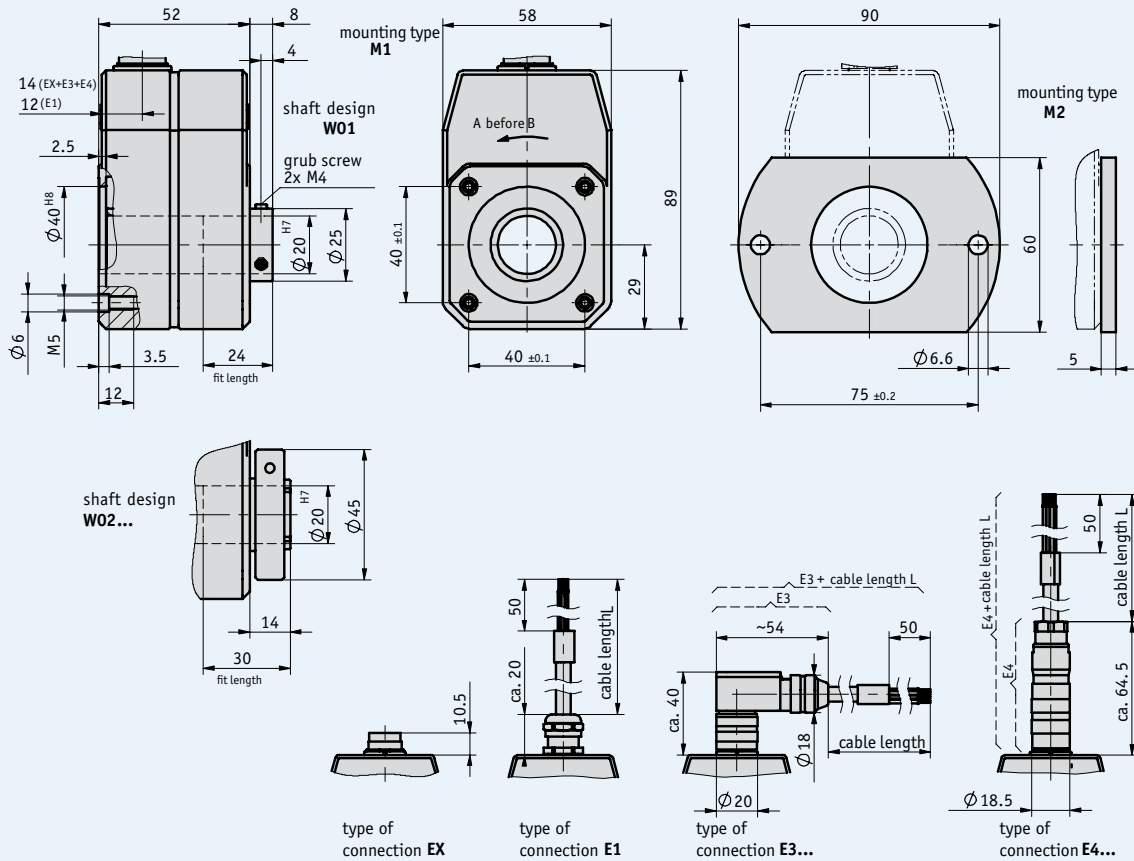
Additional information:

General information and areas of application

Page 42 cont.

Profile

- Resolutions of max. 1024 pulses/revolution
- Through hollow shafts up to $\varnothing 20$ mm
- Housing made of zinc die-cast
- High shaft load rating: radial 5600 N, axial 1400 N



Mechanical data

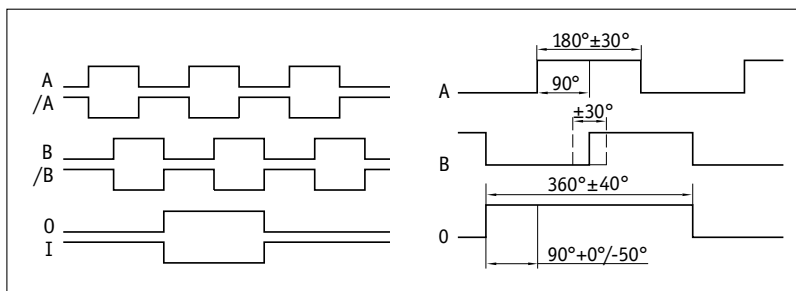
Feature	Technical data	Additional information
Max. speed	6000 rpm 3000 rpm	with IP64 with IP65
Shaft moment of inertia	$\sim 28.5 \times 10^{-6} \text{ kgm}^2$ $\sim 58.5 \times 10^{-6} \text{ kgm}^2$ $\sim 35.5 \times 10^{-6} \text{ kgm}^2$	with W01 with W02 with W03
Starting torque at 20 °C	$\leq 6 \text{ Ncm}$ $\leq 10 \text{ Ncm}$	with IP64 with IP65
Shaft load rating	radial 5600 N axial 1400 N	
Weight	$\sim 0.75 \text{ kg}$	
Protection category	IP64, IP65	
Operating temperature	0 ... +60 °C	
Storage temperature	-20 ... +85 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/50 Hz	according to DIN EN 60068-2-6
Shaft	browned steel	
Housing	zinc, die-cast	
Cable sheath	PVC	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD Line driver	LD24 Line driver	Additional information
Operating voltage	+10 ... +30 V DC	+5 V DC $\pm 5\%$	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<40 mA	<40 mA	<40 mA	AB0 variant
Maximum load/channel	$\pm 40 \text{ mA}$, short circuit-resist.	$\pm 40 \text{ mA}$, short circuit-resist.	$\pm 40 \text{ mA}$, short circuit-resist.	
Max. pulse frequency	80 kHz	50 kHz	50 kHz	
Phasing	$90^\circ \pm 30^\circ$	$90^\circ \pm 30^\circ$	$90^\circ \pm 30^\circ$	
Signal level high (min.)	UB -2 V			
Signal level low (max.)	1 V, at 40 mA			
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	no	

Signal image



Pin assignment

■ Output circuit PP

Output signals AXX, AX0, ABX, ABO

Signal	E1	EX, E3, E4
GND	gray	1
A	yellow	2
B	white	3
O/I	green	4
+UB	brown	5
N.C.		6, 7

■ Output circuit OP

Output signals AXX, AX0, ABX

Signal	E1	EX, E3, E4
GND	gray	1
A	yellow	2
B	white	3
N.C.		4
+UB	brown	5
/A	pink	6
/B	blue	7

■ Output circuit OP

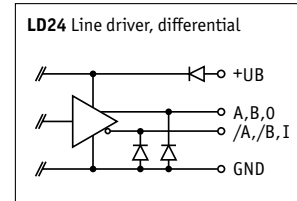
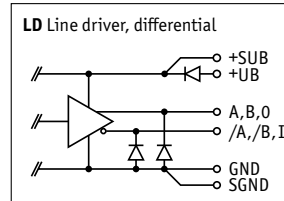
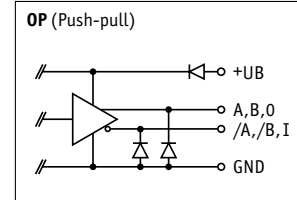
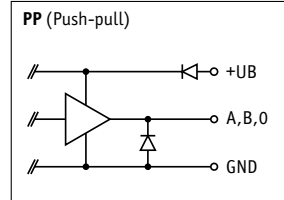
Output signals ABO

Signal	E1	EX, E3, E4
A	yellow	A
B	white	B
O	green	C
/A	pink	D
/B	blue	E
I	violet	F
GND	gray	G
GND	black	H
+UB	brown	J
+UB	red	K
N.C.		L, M

■ Output circuit LD, LD24

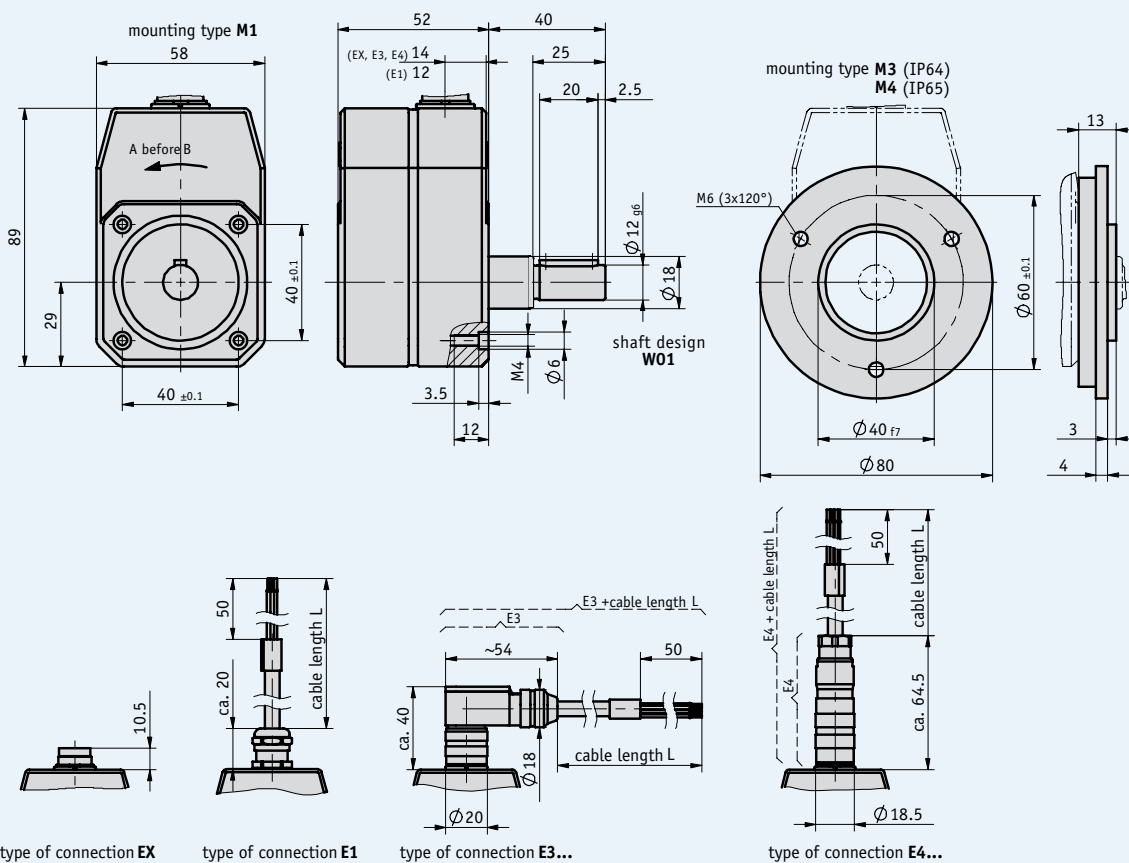
Output signals AXX, AX0, ABX, ABO

Signal	E1	EX, E3, E4
A	yellow	A
/A	green	B
GND	gray	C
+UB	pink	D
B	white	E
/B	brown	F
+SUB	red	G
only with LD5		
SGND	blue	H
only with LD5		
O	red-blue	J
I	gray-pink	K
GND	black	L
+UB	violet	M



Profile

- Resolutions of max. 1024 pulses/revolution
- Solid shafts up to $\varnothing 16$ mm
- Housing made of zinc die-cast
- High shaft load rating, radial 5600 N, axial 1400 N



Mechanical data

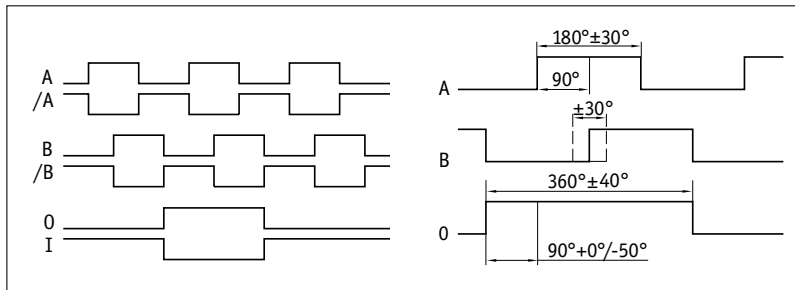
Feature	Technical data	Additional information
Max. speed	6000 rpm 3000 rpm	with IP64 with IP65
Shaft moment of inertia	$\sim 28.5 \times 10^{-6} \text{ kgm}^2$	with W01
Starting torque at 20 °C	$\leq 6 \text{ Ncm}$ $\leq 10 \text{ Ncm}$	with IP64 with IP65
Shaft load rating	radial 5600 N axial 1400 N	
Weight	$\sim 0.75 \text{ kg}$	
Protection category	IP64, IP65	
Operating temperature	0 ... +60 °C	
Storage temperature	-20 ... +85 °C	
Shock resistance	200 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	20 g/5 ... 2000 Hz	according to DIN EN 60068-2-6
Shaft	browned steel	
Housing	zinc, die-cast	
Cable sheath	PVC	

Electrical data

Output circuit

Feature	PP, OP Push-pull	LD Line driver	LD24 Line driver	Additional information
Operating voltage	+10 ... +30 V DC	+5 V DC $\pm 5\%$	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<40 mA	<40 mA	<40 mA	AB0 variant
Maximum load/channel	$\pm 40 \text{ mA}$, short circuit-resist.	$\pm 40 \text{ mA}$, short circuit-resist.	$\pm 40 \text{ mA}$, short circuit-resist.	
Max. pulse frequency	80 kHz	50 kHz	50 kHz	
Phasing	$90^\circ \pm 30^\circ$	$90^\circ \pm 30^\circ$	$90^\circ \pm 30^\circ$	
Signal level high (min.)	UB -2 V			
Signal level low (max.)	1 V, at 40 mA			
Signal level		RS422 A spec.	RS422 A spec.	
Inverse-polarity protection on UB	yes	no	no	

Signal image



Pin assignment

Output circuit PP

Output signals AXX, AX0, ABX, ABO

Signal	E1	EX, E3, E4
GND	gray	1
A	yellow	2
B	white	3
O/I	green	4
+UB	brown	5
N.C.		6, 7

Output circuit OP

Output signals AXX, AX0, ABX

Signal	E1	EX, E3, E4
GND	gray	1
A	yellow	2
B	white	3
N.C.		4
+UB	brown	5
/A	pink	6
/B	blue	7

Output circuit OP

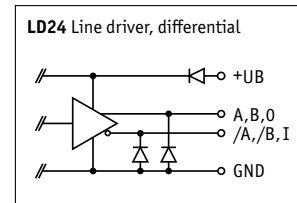
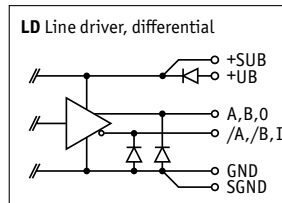
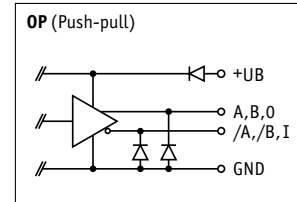
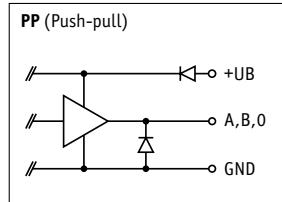
Output signals ABO

Signal	E1	EX, E3, E4
A	yellow	A
B	white	B
O	green	C
/A	pink	D
/B	blue	E
I	violet	F
GND	gray	G
GND	black	H
+UB	brown	J
+UB	red	K
N.C.		L, M

Output circuit LD, LD24

Output signals AXX, AX0, ABX, ABO

Signal	E1	EX, E3, E4
A	yellow	A
/A	green	B
GND	gray	C
+UB	pink	D
B	white	E
/B	brown	F
+SUB	red	G
only with LD5		
SGND	blue	H
only with LD5		
O	red-blue	J
I	gray-pink	K
GND	black	L
+UB	violet	M



Order

Order table

Feature	Order text	Specification	Additional information
Output signals	... A	AXX, ABX, ABO, ABI, AXO, AXI	
Pulses/revolution	... B	1, 2, 5, 10, 20, 25, 30, 36, 40, 50, 60, 70, 80, 90, 100, 125, 140, 150, 160, 180, 200, 220, 250, 280, 300, 350, 360, 400, 450, 500, 512, 585, 600, 750, 800, 900, 1000, 1024 others on request	
Type of connection	EX E1 E3 E4 C	without cable flying leads angle plug connector	
Cable length L	... OK D	0.5, 2 ... 60 m, in steps of 1 m without cable	
Mounting type M ...	1 3 4 E	with blind hole bore with flange, IP64 with flange, IP65	only with MS only with RS
Output circuit	PP OP LD LD24 F	push-pull push-pull with inverted signals line driver line driver, 24 V	
Shaft diameter	12 G	Ø 12 mm others on request	
Bearing	MS RS H	high-precision packed sealing gap, IP64 enhanced bearing sealing, IP65	

Order code

IG17 - - - - - - - - - **W01** - - **SG**

A B C D E F G H

Scope of delivery: IG17, User information

Accessories:

Servo-clamp
Electronic displays MA55, MA10/4

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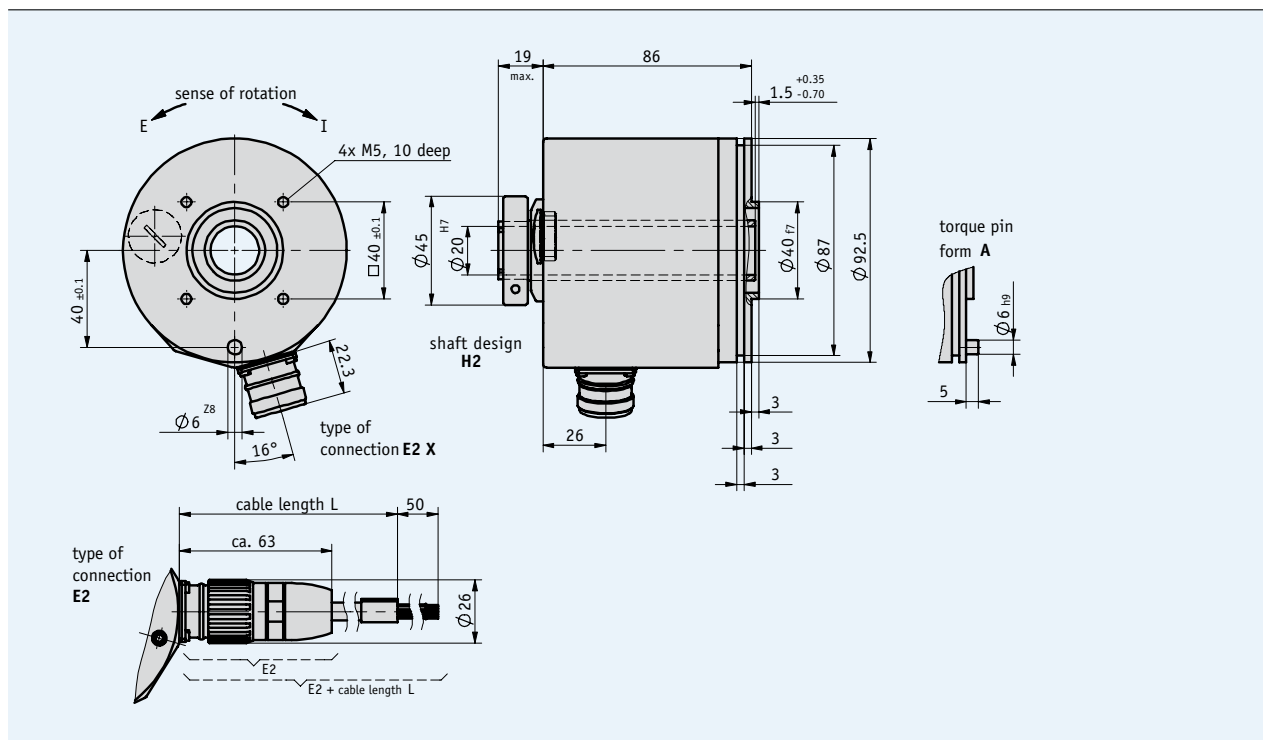
Additional information:

General information and areas of application

Page 42 cont.

Profile

- Up to 8192 steps per revolution and 4096 revolutions
- SSI interface
- Gray or binary output code
- Programmable
- Through hollow shaft



Mechanical data

Feature	Technical data	Additional information
Accuracy	±1 LSB	
Max. speed	3000 rpm 2000 rpm	with IP54 with IP65
Shaft moment of inertia	~1 x 10 ⁻⁴ kgm ²	
Angular acceleration	2 x 10 ⁵ rad/s ²	
Starting torque at 20 °C	~5 Ncm ~15 Ncm	with IP54 with IP65
Shaft load rating	radial 1200 N axial 400 N	
Weight	~1.2 kg	
Protection category	IP64, IP65	
Operating temperature	0 ... +60 °C	
Storage temperature	-20 ... +85 °C	
Bearing life	min. 400 x 10 ⁶ revolutions	109 with 20 N shaft load
Shock resistance	30 g/13 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g/5 ... 150 Hz, 20 g/100 ... 2000 Hz	according to DIN EN 60068-2-6
Shaft	browned steel, on double ball bearing	
Housing	aluminum	
Cable sheath	PVC	

Electrical data

Electrical data	SSI	Additional information
Operating voltage	24 V DC ±20 %	
Output driver	RS 485	
Power consumption	<1.3 W	
Permissible load/channel	max. 1 MHz	
SSI clock rate min./max.	100 kHz/500 kHz	
Signal level high	typ. 3.8 V	
Signal level low	typ. 1.3 V (20 mA)	
Ramp up time tr	max. 100 ns	without cable
Ramp down time tf	max. 100 ns	without cable
Short-circuit resistant outputs	yes, short-circuit to GND permissible	
Inverse-polarity protection on UB	yes	

Pin assignment

■ Type of connection E2, E2X

Interface S6/04, SSI

Signal	Cable color	PIN
Data-	pink	1
Data+	blue	2
Clock-	red	3
Clock+	black	4
+UB (Power supply)	brown	5
GND (Interface)	white	6
DÜA (Interface)	yellow	7
DÜB (Interface)	green	8
GND (Power supply)	gray	9

Order

Order table

Feature	Order text	Specification	Additional information
Interface/protocol	S6/04 A	RS422/SSI Inter-Bus-S and Profibus on request	clock rate depending on cable length 100 kHz ... 1 MHz
Type of connection	E2 E2X B	with mating connectors without mating connectors	for SSI for SSI
Cable length L	... OK C	0.5, 2 ... 20 m, in steps of 1 m without cable	only with E1, E2, E6
Steps per revolution	... D	256, 360, 512, 720, 1024, 2048, 4096, 8192	max. 13 bit
Number of revolutions	... E	128, 256, 512, 1024, 2048, 4096	max. 12 bit
Output code	B G F	binary code Gray code	
Sense of rotation	E I G	counter-clockwise ascending values clockwise ascending values	
Protection category IP	54 65 H	IP54 IP65	
Torque support/form	A O I	form A, cylindric pin without torque support	
Shaft diameter	16 20 K	∅ 16 mm ∅ 20 mm	

2.2

Order code

WK50/1 - - - - - - - - - - - M1 - H2 - -

A B C D E F G H I K

Scope of delivery: WK50/1, User information

Accessories:

Servo-clamp
Electronic displays MA55, MA10/4

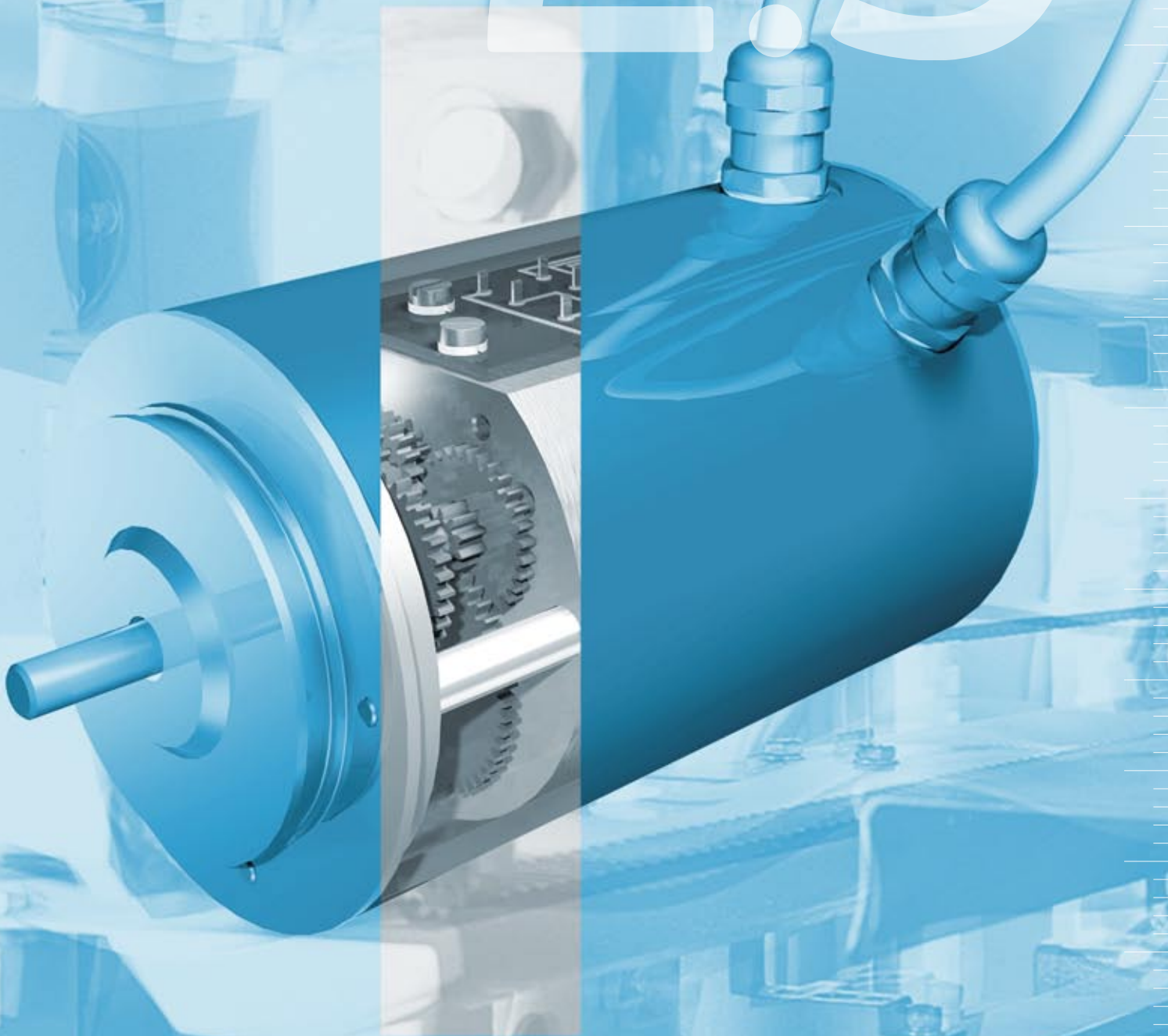
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Additional information:

General information and areas of application

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2.3 | Geared potentiometers

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2.0

2.1

2.2

2.3

2.4

2.5

Robust analog units for absolute length and angle measurement

Geared potentiometers are used for absolute measurement of angles and lengths. Adjustment motions which are performed without operating voltage are automatically tracked by the position of the wiper and forwarded to the measurement indicator or controller when the power supply is restored. Referencing for determining the position is not necessary.

This mature and track-proven geared potentiometer measuring method, also referred to as GP, registers rotation and makes this available for length and angle definition. A combination of gear unit and potentiometer tracks rotation and forwards the information to the follow-up "evaluators" (such as indicators, controllers) as analog signals (potentiometers, current, voltage).

A large number of ratios and analog outputs are available and enable optimum adaptation to the required measuring ranges.

Optional integrated converters permit loss-free signal transmission, even over long line lengths. A useful additional effect: Cable breaks can be automatically displayed as status information, which enables simple programming of emergency stop operations.

An integrated cam controller is available for the models GP43 and GP44, which can also control switching operations at the same time as absolute measurement when equipped with up to three switches.

Geared potentiometers are also suitable for rough environments. For example, the GP09 is also available as an oil-filled version and permits absolute measurement in applications with protection category IP68.



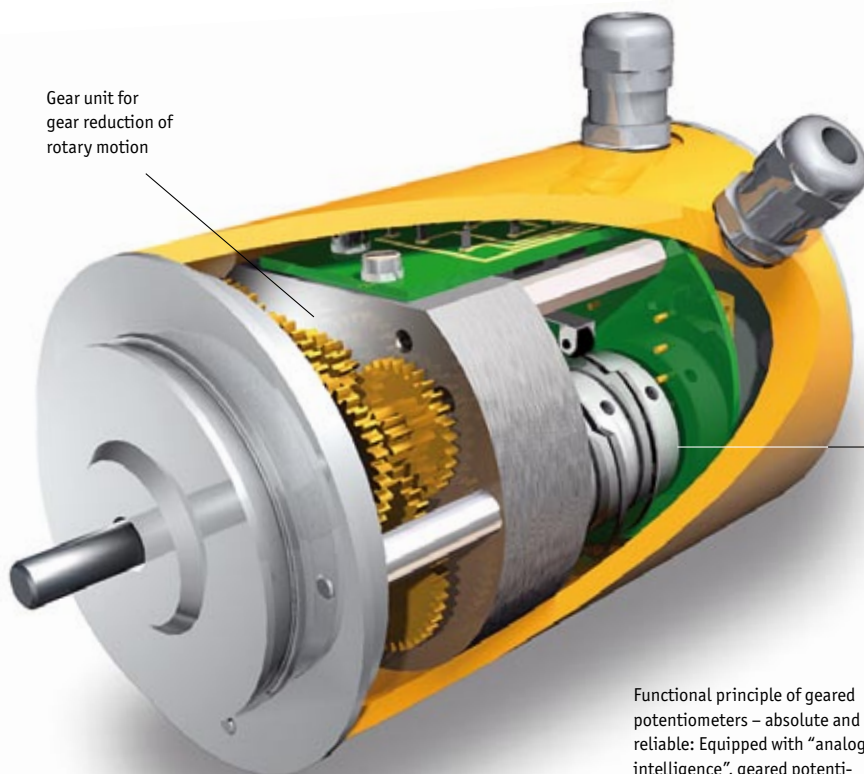
Switch cam with configurable "switching patterns"

The devices can be inconspicuously integrated into the machine configuration. The compact and dust-tight housings are connected to the machine shaft with hollow shaft or solid shaft installation. A friction clutch (all types except GP02) prevents mechanical damage of the GP unit when the end stops are exceeded.

Benefits

- Long service life resulting from consistent further development
- Optimized dimensions: High performance in a compact housing
- Absolute tracking directly on the machine shaft rotation
- Versatile analog signal on the encoder output
- Robust housing versions
- Easy integration due to hollow and solid shaft design
- Numerous gear ratios for optimum adaptation to the customer's measuring range

Gear unit for gear reduction of rotary motion



Unit with switch cam and potentiometer

Functional principle of geared potentiometers – absolute and reliable: Equipped with "analog intelligence", geared potentiometers work with an electromagnetic memory.



1



2



3

Areas of application

A large number of designs and variable technical features open up a wide range of applications for the robust geared potentiometers. The simple installation of the hollow shaft versions also ensures short setup times and simple retrofitting.

SIKO encoders are used during the initial stage of cutting tree trunks in the wood industry, because they can withstand the high mechanical stresses in this environment. Accuracy and reliability are also advantages of the SIKO encoders in the conveying technology and automation sectors. Together with geared potentiometers, they are also indispensable in the paper and printing industry. Here they are used in multi-color printing presses for register adjustment to ensure exact alignment of the rollers.



4

[1] Temperature fluctuations and a high humidity – horizontal/vertical position control of water cannons for firefighting. [2] Moisture, shavings and vibration – rough wood cutting in sawmills. [3] Changing weather conditions – passenger boarding bridge at Dresden airport, (photo: Weimer © Flughafen Dresden GmbH). [4] Fine dust, precision – roller alignment, contact pressure/speed control and fine adjustment for paper infeed for newspaper and magazine printing, © Badischer Verlag & Co. KG, Freiburg. [5] Direct installation – motor feedback on a roller unit (paper industry).



5

Gear ratio calculation

Due to the variety of different gear ratios and the use of 1-coil or 10-coil potentiometers, all measuring ranges can be covered individually. The minimum ratio is calculated with the following formula.

The selection of the gear ratio depends on the maximum measurement path, i.e., the total number of rotations. A friction clutch between the gear unit and potentiometer (on all except GP02) prevents the mechanical destruction of the potentiometer.

Example

A measuring path of $n = 500$ rotations is achieved by the use of a 10-coil potentiometer and a gear ratio of $i = 50$ (refer to formula).

$$\text{Formula: } i = \frac{n \times 360^\circ}{\alpha}$$

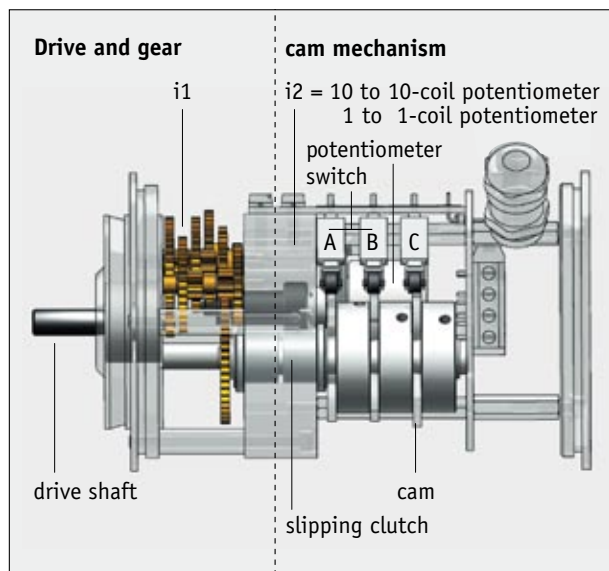
n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i = order feature for gear ratios

Note

- 1-coil potentiometers have a measuring range of 340° and do not have a mechanical stop (type 01).
- 10-coil potentiometers cover a measuring range of 3600° and are equipped with a mechanical stop (type 02/03).
- 10-coil potentiometers are protected against mechanical destruction by a friction clutch (type 02/03).

Available ratios

The available ratios are shown for the individual products in the ordering table. Other ratios, also intermediate values, are available upon request.



Fine adjustment of the cam discs is performed with the screw gear. The time for a switching pulse can therefore be determined individually and precisely.

Switching cam function diagram

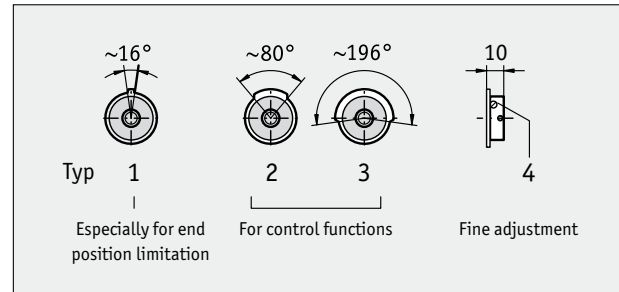
GP43 and GP44 are available with up to three cam switches to control additional switching operations.

Switching angle

Cam switches are available in three different switching angle versions (refer to table). Types 1, 2 and 3 are standard products for various control functions. Individual switching angles are possible upon request.

Cam form/switching angle

Type	Actuating angle	Special technical features
1	~16°	end position limitation
2	~80°	control functions
3	~196°	control functions



Switching angle of the three switching cams

Interfaces

With a transducer the SIKO geared potentiometers are available with various analog outputs:

Potentiometer output

0 ... 1 kΩ, 0 ... 5 kΩ and 0 ... 10 kΩ

Current output

All GPs are also optionally available with a 4 ... 20 mA transducer. When ordering always state the direction of rotation code, either "i" or "e". Advantage: Long line lengths are possible and cable breaks are detected immediately.

Voltage output

A stable voltage of 0 ... 10 V is output via an external power supply depending on the potentiometer setting.

Transducer adjustment

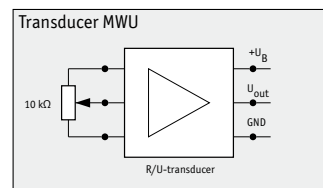
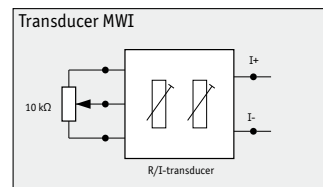
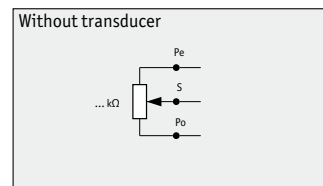
On the potentiometers with transducers the measurement path can be modified with so-called trimming potentiometers.

Transducer MWI

The potentiometer resistance is converted into a current of 4 ... 20 mA (standard value). These values can be adapted to the actual beginning and end settings of the application with two trimming potentiometers Po and Pe.

Transducer MWU

The potentiometer resistance is converted into a voltage of 0 ... 10 V DC. With a trimming potentiometer Pe the end value can be adapted to the actual end position of the application.



Ambient conditions

Examples of use

Benefits

Level and distance measurement



Acts directly via the shaft or spindle. The principle of operation corresponds to that of a wire-actuated encoder.



e.g., mobile derrick jibs, warehousing/forklift technologies, level measurement ...

- Easy mounting
- Delay-free reaction time
- Absolute measurement

Path measurement



Acts indirectly (offset) on toothed racks via cogwheel or worm gear.



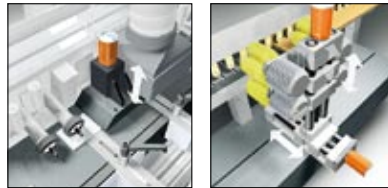
e.g., door locking, dowel drilling machines ...

- Various shaft diameters
- Variable mounting positions

Position measurement



Acts directly via the shaft or spindle. Suitable gear reductions or ratios enable very high fine resolution.



e.g., edge glueing or grinding technologies ...

- Precise position monitoring
- Variable attachment diameters (hollow/solid shaft)

Angle measurement

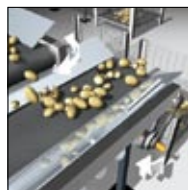


Acts directly (offset). Safe absolute measurement since currentless adjustment is recorded.









e.g., textile-/foil production, building crane technology, fire-fighting cannons ...

- Exact angle indication
- Variable mounting positions
- Solid electromechanical design and construction for tough industrial environments



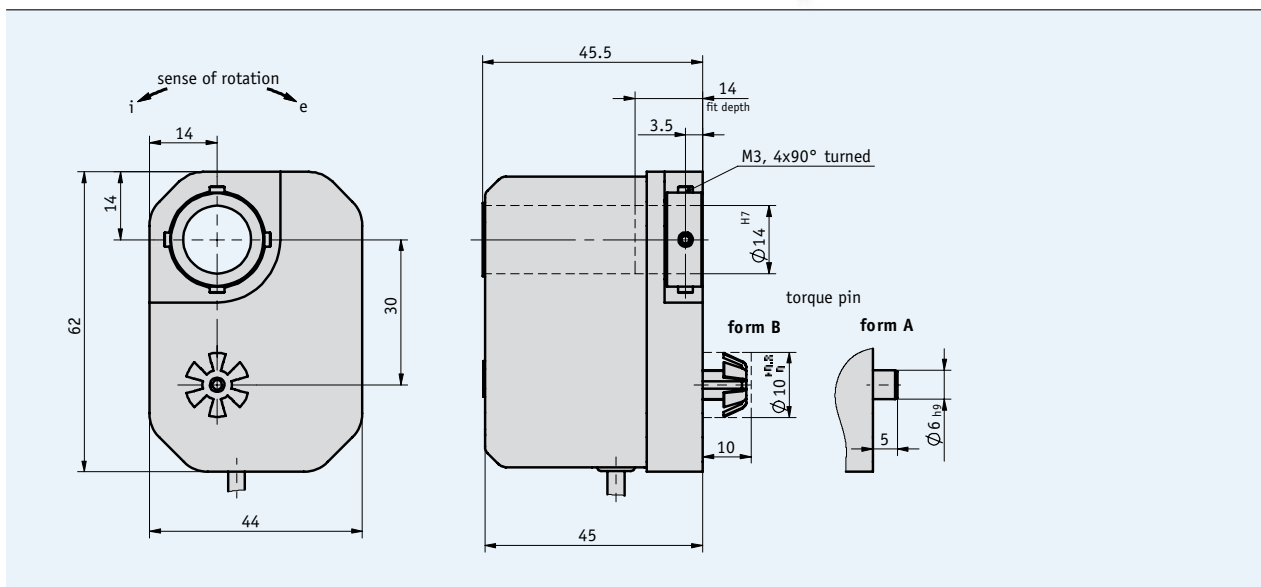
Or hoisting and conveying ...

Geared potentiometers

						
	GP02	GP03/1	GP04/1	GP09	GP43	GP44
Page	68	71	74	77	80	83
Shaft design						
Hollow shaft	•		•	•		•
Solid shaft		•	•		•	•
Shaft diameter	14 mm	6 mm	16, 20 mm	20 mm	6 mm	16, 20 mm
Analog outputs						
Potentiometer	•	•	•	•	•	•
Power output	•	•	•	•	•	•
Voltage output		•	•	•		
Housing						
Plastic	•					
Plastic reinforced		•				
Aluminum		•	•		•	•
Zinc die-cast				•		
Protection category						
IP52	•		•	•	•	•
IP65		•	•	•	•	•
IP68				•		
Switching cam					•	•
Friction clutch		•	•	•	•	•

Profile

- Through hollow shaft \varnothing 14 mm
- Adaptation to various measurement paths owing to a wide range of gear ratios
- Compact, low-cost design
- Potentiometer or power output
- Easy mounting



Mechanical data

Feature	Technical data	Additional information
Gear ratio	0.125 ... 128	
Speed	max. 500 rpm	depending on gear ratio
Operating temperature	0 ... +80 °C	
Condensation	inadmissible	
Service life of axial movement	1 x 10 ⁶ 2 x 10 ⁶	with P01, P02 with P03
Protection category	IP52	according to DIN VDE 0470
Shaft	browned steel, \varnothing 14 mm	
Housing	plastic	

Electrical data

Feature	Technical data	Additional information
Interference protection class	3	according to IEC 801

■ Analog outputs

Feature	Technical data	Voltage supply
Potentiometer output	0 ... 1 kΩ, 0 ... 5 kΩ, 0 ... 10 kΩ depending on the potentiometer type used	
Power output	4 ... 20 mA	24 V DC ±20 %, with load ≤ 500 Ω

■ Potentiometer type

Feature	01	02	03/0.1
Design	hybrid	wire	hybrid
Resistance	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ
Resistance tolerance	±5 %	±5 %	±5 %
Linearity tolerance	±0.25 %	±0.25 %	±0.1 %
Load rating	1 W at 70 °C	1 W at 70 °C	2 W at 70 °C
Range of rotation	340° ±5° (mechanically straight-through)	3600° ±10°	3600° ±10°
Standard terminal resistor (the higher value is always valid)	0.5 % or 1 Ω	0.5 % or 1 Ω	0.5 % or 1 Ω

Note: Characters highlighted in orange color are order features.

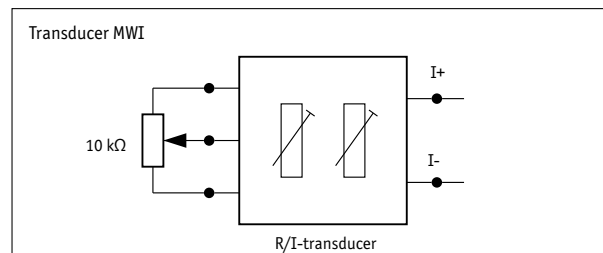
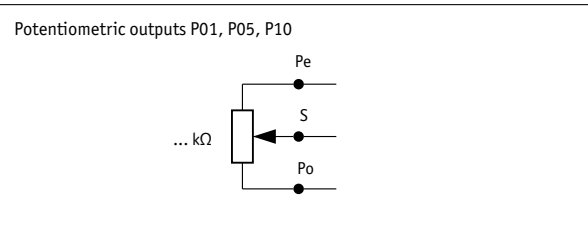
Pin assignment

■ Potentiometric outputs P01, P05, P10

Signal	Cable color
Po	brown
Pe	white
S	green

■ Transducer MWI

Signal	Cable color
I+	brown
I-	white



Order

■ **Ratio calculation** (order table, feature A)

$$\text{Formula: } i_1 = \frac{n \times 360^\circ}{\alpha}$$

n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i1 = order feature for gear ratio

If the calculated ratio "i1" is the same as a value in the ordering table for the "ratio" feature, but this is not available, select the next highest ratio.

■ **Order table**

Feature	Order data	Specifications	Additional information
Gear ratio	... A	0.125, 0.2, 0.25, 0.333, 0.5, 1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 15, 16, 20, 203.636, 24, 28, 30, 36, 36.571, 48, 55, 68, 80, 112, 128 others on request	
Torque support	A B	B form A, cylindric pin form B for tolerance compensation	
Potentiometer type	01 02 03 03/0,1	C 1 coil, hybrid 10 coils, wire 10 coils, hybrid 10 coils, hybrid, linear tolerance 0.1	
Resistance	P01 P05 P10	D resistance 1 kΩ resistance 5 kΩ resistance 10 kΩ	
Transducer	MWI 0MW	E transducer 4 ... 20 mA without	only with P10
Sense of rotation	ODR e i	F without indication of sense of rotation counter-clockwise ascending values clockwise ascending values	with P01, P05 or P10 with MWI with MWI
Cable length	... G	G 0.2 ... 15 m in steps of 0.1 m	

■ **Order code**



Scope of delivery: GP02, User information

➔ **Accessories:**

Electronic display MA50

Catalog 6 DisplayLine

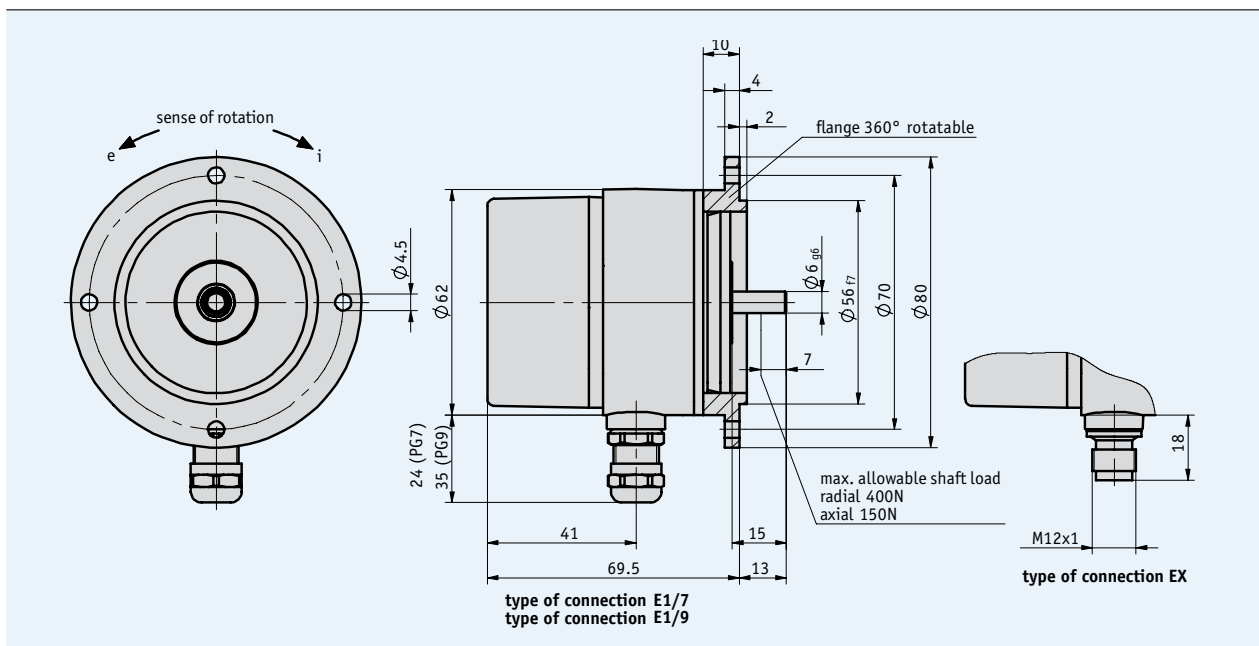
Additional information:

General information and areas of application

Page 62 cont.

Profile

- Solid shaft \varnothing 4 mm or \varnothing 6 mm
- Adaptation to various measurement paths owing to a wide range of gear ratios
- Integrated friction clutch to protect the potentiometer
- Compact design
- Potentiometer, power or voltage output
- IP65 protection category



2.3

Mechanical data

Feature	Technical data	Additional information
Gear ratio	0.1 ... 55	
Speed	max. 500 rpm	depending on gear ratio
Operating temperature	-20 ... +80 °C	
Condensation	inadmissible	
Service life of axial movement	1 x 10 ⁶ 2 x 10 ⁶	with P01, P02 with P03
Protection category	IP65	according to DIN VDE 0470
Maximum shaft load	radial 400 N axial 150 N	
Shaft	stainless steel, \varnothing 6 mm	
Housing	reinforced plastic and aluminum	

Electrical data

Feature	Technical data	Additional information
Interference protection class	3	according to IEC 801

Analog outputs

Feature	Technical data	Voltage supply
Potentiometer output	0 ... 1 kΩ, 0 ... 5 kΩ, 0 ... 10 kΩ depending on the potentiometer type used	
Power output	4 ... 20 mA	24 V DC ±20 %, with load ≤500 Ω
Voltage output	0 ... 10 V	24 V DC ±20 %

Potentiometer type

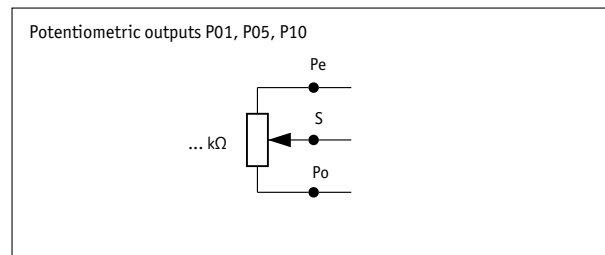
Characteristic/Specification	01	02	03
Design	hybrid	wire	hybrid
Resistance	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ
Resistance tolerance	±5 %	±5 %	±5 %
Linearity tolerance	±0.25 %	±0.25 %	±0.25 %
Load rating	1 W at 70 °C	1 W at 70 °C	2 W at 70 °C
Range of rotation	340° ±5° (mechanically straight-through)	3600° ±10°	3600° ±10°
Standard terminal resistor (the higher value is always valid)	0.5 % or 1 Ω	0.5 % or 1 Ω	0.5 % or 1 Ω

Note: Characters highlighted in orange color are order features.

Pin assignment

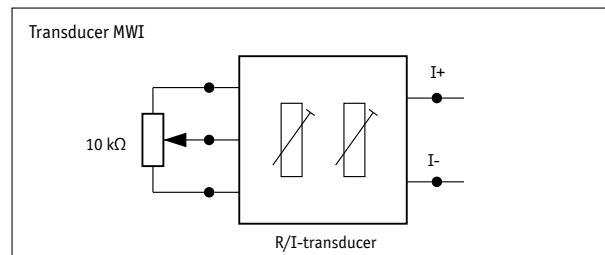
Potentiometric outputs P01, P05, P10

Signal	E1 (Terminal)	EX (Connector pin)
Po	3	1
Pe	1	2
S	2	3
N.C.		4



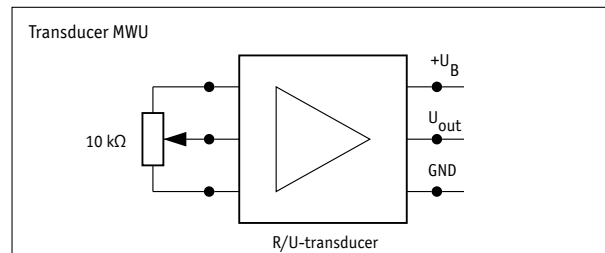
Transducer MWI

Signal	E1 (Terminal)	EX (Connector pin)
I+	1	1
I-	2	2
N.C.	3	3
N.C.		4



Transducer MWU

Signal	E1 (Terminal)	EX (Connector pin)
+24 V DC	1	1
GND	2	2
U _{out}	3	3
N.C.		4



Order

Ratio calculation (order table, feature A)

$$\text{Formula: } i1 = \frac{n \times 360^\circ}{\alpha}$$

n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i1 = order feature for gear ratio

If the calculated ratio "i1" is the same as a value in the ordering table for the "ratio" feature, but this is not available, select the next highest ratio.

Order table

Feature	Order data	Specifications	Additional information
Gear ratio	... A	0.1, 0.166, 0.25, 0.333, 0.5, 1, 2, 3, 4, 5, 6, 7, 10, 12, 15, 20, 24, 30, 40, 55 others on request	
Type of connection	E1/7	screwed cable gland PG7	
	E1/9	screwed cable gland PG9	
	EX	for M12 connector	
Potentiometer type	01	1 coil, hybrid	
	02	10 coils, wire	
	03	10 coils, hybrid	
Analog output	MWI	transducer 4 ... 20 mA	only with P10
	MWU	transducer 0 ... 10 V	only with P10
	P01	potentiometer 1 kΩ	
	P05	potentiometer 5 kΩ	
Sense of rotation	ODR	without indication of sense of rotation	with P01, P05 or P10
	e	counter-clockwise ascending values	with MWI or MWU
	i	clockwise ascending values	with MWI or MWU

Order code



2.3

Scope of delivery: GP03/1, User information

Accessories:

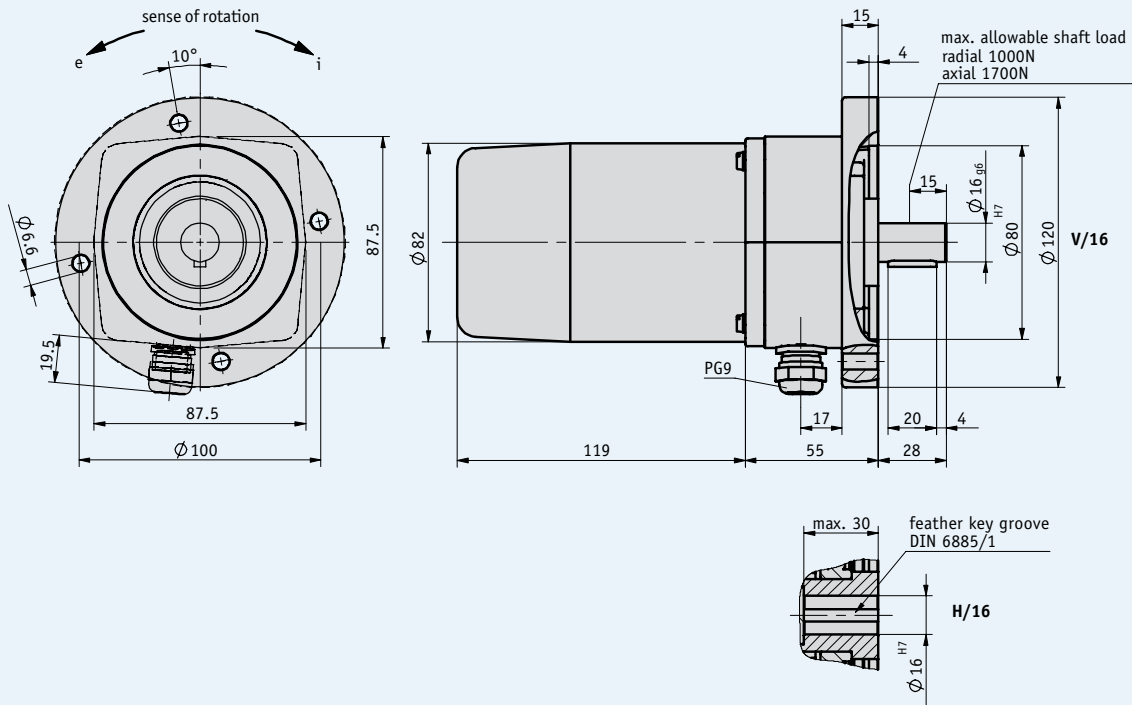
Mating connectors Page 88
 Self-aligning coupling Page 94
 Electronic display MA50 Catalog 6 DisplayLine

Additional information:

General information and areas of application Page 62 cont.

Profile

- Extremely resistant to external influence
- Solid or blind-hole shaft, max. \varnothing 20 mm
- Adaptation to various measurement paths owing to a wide range of gear ratios
- Integrated friction clutch to protect the potentiometer
- Potentiometer, power or voltage output
- IP65 protection category possible



Mechanical data

Feature	Technical data	Additional information
Gear ratio	0.2 ... 55	
Speed	max. 500 rpm	depending on gear ratio
Voltage supply	24 VDC \pm 20 % transducer MWI (with load \leq 500 Ω)	
Operating temperature	-20 ... +80 °C	
Condensation	inadmissible	
Service life of axial movement	1 x 10 ⁶ 2 x 10 ⁶	with P01, P02 with P03
Protection category	IP52, IP65	according to DIN VDE 0470
Maximum shaft load	radial 1000 N, axial 1700 N	
Shaft	aluminum (IP52) browned steel (IP65)	
Housing	aluminum	

Electrical data

Feature	Technical data	Additional information
Interference protection class	3	according to IEC 801

Analog outputs

Feature	Technical data	Voltage supply
Potentiometer output	0 ... 1 kΩ, 0 ... 5 kΩ, 0 ... 10 kΩ depending on the potentiometer type used	
Power output	4 ... 20 mA	24 V DC ±20 %, with load ≤500 Ω
Voltage output	0 ... 10 V	24 V DC ±20 %

Potentiometer type

Characteristic/Specification	01	02	03
Design	hybrid	wire	hybrid
Resistance	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ
Resistance tolerance	±5 %	±5 %	±5 %
Linearity tolerance	±0.25 %	±0.25 %	±0.25 %
Load rating	1 W at 70 °C	1 W at 70 °C	2 W at 70 °C
Range of rotation	340° ±5° (mechanically straight-through)	3600° ±10°	3600° ±10°
Standard terminal resistor (the higher value is always valid)	0.5 % or 1 Ω	0.5 % or 1 Ω	0.5 % or 1 Ω

Note: Characters highlighted in orange color are order features.

Pin assignment

Potentiometric outputs P01, P05, P10

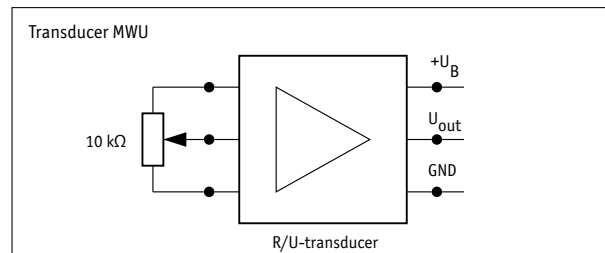
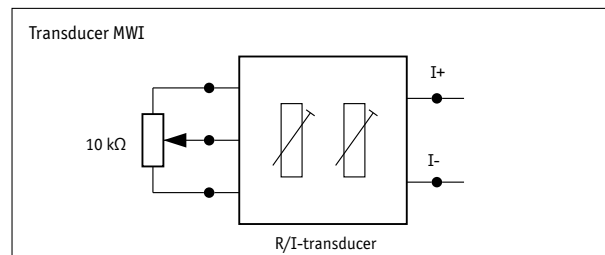
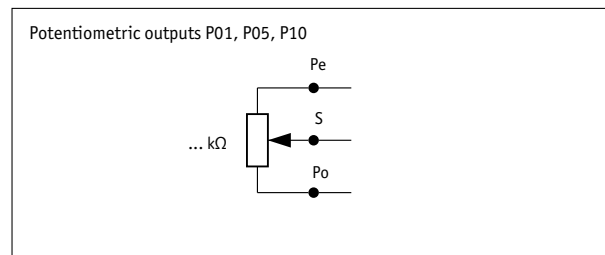
Signal	Terminal
Po	3
Pe	1
S	2

Transducer MWI

Signal	Terminal
I+	1
I-	2

Transducer MWU

Signal	Terminal
+24 V DC	1
GND	2
U _{out}	3



Order

Ratio calculation (order table, feature A)

$$\text{Formula: } i_1 = \frac{n \times 360^\circ}{\alpha}$$

n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i1 = order feature for gear ratio

If the calculated ratio "i1" is the same as a value in the ordering table for the "ratio" feature, but this is not available, select the next highest ratio.

Order table

Feature	Order data	Specifications	Additional information
Gear ratio	...	A 0.1, 0.166, 0.166, 0.25, 0.333, 0.5, 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 24, 30, 40, 55 others on request	
Driving shaft	H/20	B hollow shaft Ø 20 mm hollow shaft Ø 16 mm solid shaft Ø 20 mm solid shaft Ø 16 mm	
	H/16		
	V/20		
	V/16		
Potentiometer type	01	C 1 coil, hybrid 10 coils, wire 10 coils, hybrid	
	02		
	03		
Analog output	MWI	D transducer 4 ... 20 mA transducer 0 ... 10 V potentiometer 1 kΩ potentiometer 5 kΩ potentiometer 10 kΩ	only with P10
	MWU		only with P10
	P01		
	P05		
	P10		
Sense of rotation	ODR	E without indication of sense of rotation counter-clockwise ascending values clockwise ascending values	with P01, P05 or P10
	e		with MWI or MWU
	i		with MWI or MWU
Protection category	IP52	F	
	IP65		

Order code

GP04/1 - - - - - -

A B C D E F

Scope of delivery: GP04/1, User information

Accessories:

Electronic display MA50

Catalog 6 DisplayLine

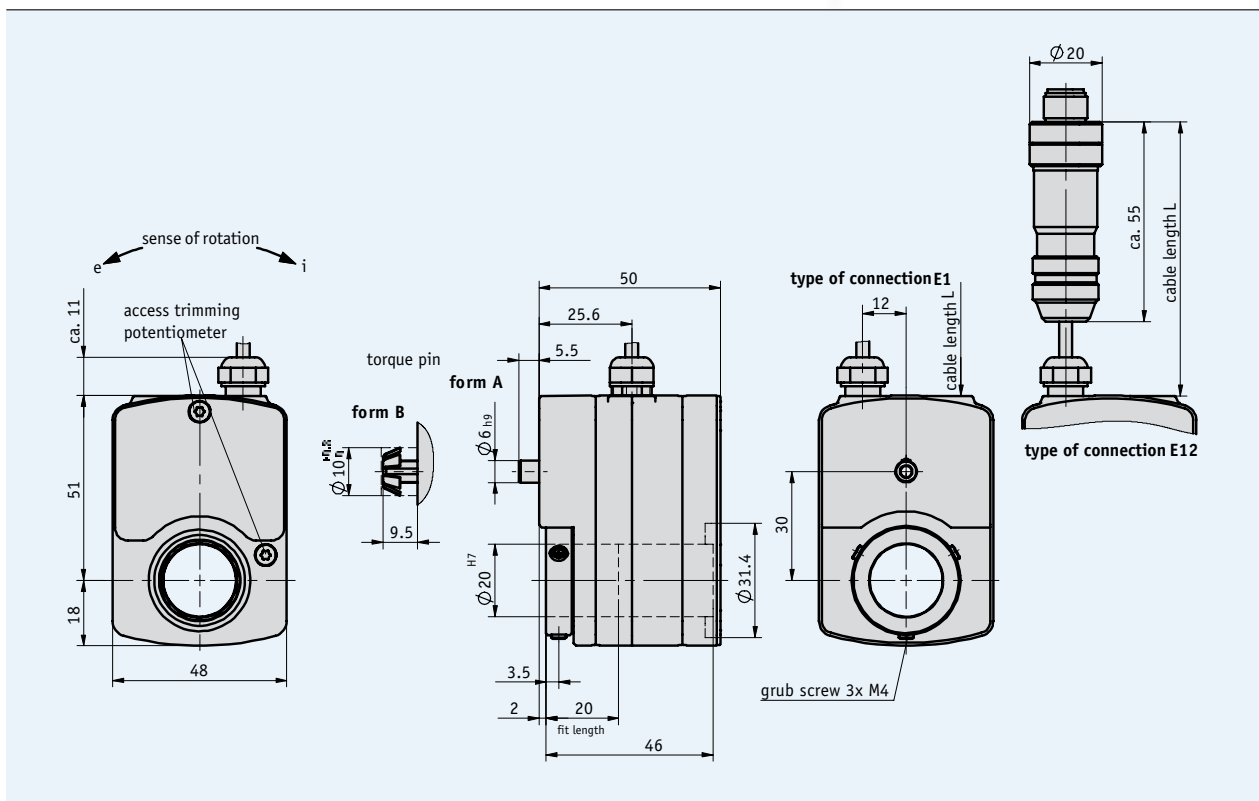
Additional information:

General information and areas of application

Page 62 cont.

Profile

- Resistant to external influences
- Through hollow shaft \varnothing 20 mm
- Adaptation to various measurement paths owing to a wide range of gear ratios
- Integrated friction clutch to protect the potentiometer
- Compact design
- Potentiometer, power or voltage output
- IP68 protection category with oil filling possible
- Easy mounting



2.3

Mechanical data

Feature	Technical data	Additional information
Gear ratio	0.184 ... 150.036	
Speed	max. 500 rpm	depending on gear ratio
Operating temperature	-20 ... +80 °C	
Condensation	inadmissible	
Service life of axial movement	1 x 10 ⁶ 2 x 10 ⁶	with P01, P02 with P03
Protection category	IP52, IP65, IP68	according to DIN VDE 0470
Maximum shaft load	radial 400 N axial 150 N	
Shaft	stainless steel, \varnothing 20 mm	
Housing	zinc die-cast	

Electrical data

Feature	Technical data	Additional information
Interference protection class	3	according to IEC 801

Analog outputs

Feature	Technical data	Voltage supply
Potentiometer output	0 ... 1 k Ω , 0 ... 5 k Ω , 0 ... 10 k Ω depending on the potentiometer type used	
Power output	4 ... 20 mA	24 V DC \pm 20 %, with load \leq 500 Ω
Voltage output	0 ... 10 V	24 V DC \pm 20 %

Potentiometer type

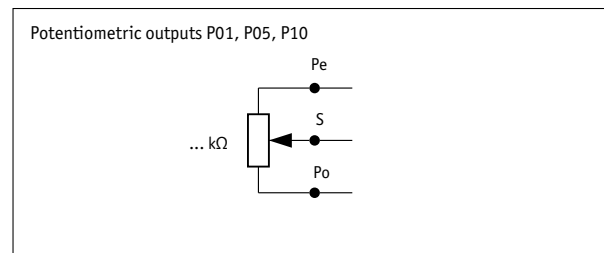
Characteristic/Specification	01	02	03
Design	hybrid	wire	hybrid
Resistance	1 k Ω , 5 k Ω , 10 k Ω	1 k Ω , 5 k Ω , 10 k Ω	1 k Ω , 5 k Ω , 10 k Ω
Resistance tolerance	\pm 5 %	\pm 5 %	\pm 5 %
Linearity tolerance	\pm 0.25	\pm 0.25 %	\pm 0.1 %
Load rating	1 W at 70 °C	1 W at 70 °C	2 W at 70 °C
Range of rotation	340° \pm 5° (mechanically straight-through)	3600° \pm 10°	3600° \pm 10°
Standard terminal resistor (the higher value is always valid)	0.5 % or 1 Ω	0.5 % or 1 Ω	0.5 % or 1 Ω

Note: Characters highlighted in orange color are order features.

Pin assignment

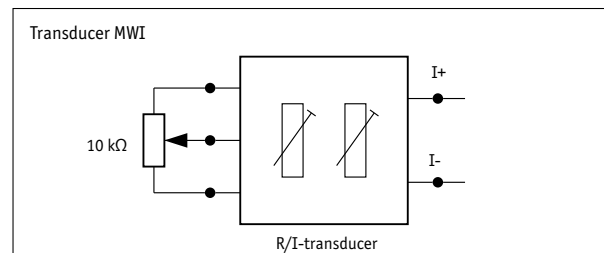
Potentiometric outputs P01, P05, P10

Signal	E1 (Cable color)	E12 (Connector pin)
Po	brown	3
Pe	white	1
S	green	2
N.C.		4



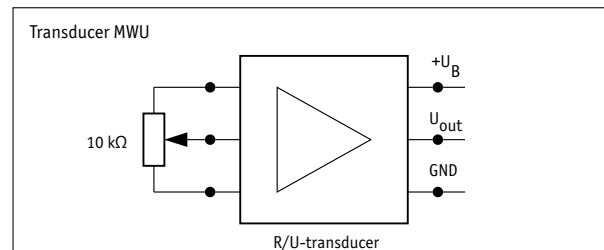
Transducer MWI

Signal	E1 (Cable color)	E12 (Connector pin)
I+	brown	3
I-	white	1
N.C.		2
N.C.		4



Transducer MWU

Signal	E1 (Cable color)	E12 (Connector pin)
+24 V DC	brown	3
GND	white	1
U _{out}	green	2
N.C.		4



Order

Ratio calculation (order table, feature A)

$$\text{Formula: } i_1 = \frac{n \times 360^\circ}{\alpha}$$

n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i1 = order feature for gear ratio

If the calculated ratio "i1" is the same as a value in the ordering table for the "ratio" feature, but this is not available, select the next highest ratio.

Order table

Feature	Order data	Specifications	Additional information
Gear ratio	... A	0.184, 0.27, 0.361, 0.740, 1, 2, 2.503, 3.048, 4, 5.213, 6, 8.003, 10, 12, 15.238, 20, 24.167, 40.034, 45.494, 53.333, 58.333, 76.190, 100.392, 150.036 others on request	
Torque support	A B	B form A, cylindric pin form B for tolerance compensation	
Potentiometer type	01 02 03/0,1	C 1 coil, hybrid 10 coils, wire 10 coils, hybrid, linear tolerance 0.1	
Analog output	MWI MWU P01 P05 P10	D transducer 4 ... 20 mA transducer 0 ... 10 V potentiometer 1 kΩ potentiometer 5 kΩ potentiometer 10 kΩ	only with P10 only with P10
Sense of rotation	ODR e i	E without indication of sense of rotation counter-clockwise ascending values clockwise ascending values	with P01, P05 or P10 with MWI or MWU with MWI or MWU
Type of connection	E1 E12	F flying leads connector, M12	
Cable length L (m)	... G	G 0.2 ... 20 m, in steps of 0.1 m	
Protection category	IP52 IP65 IP68	H with oil filling, against condensation	
Max. number of revolutions*	OAU ... I	I customer-adjustable 0.17, 0.25, 0.333, 0.6, 1, 2.5, 4, 5, 10, 12, 20, 24, 40, 60, 75, 100 others on request	except with IP68 only with IP68 prot. categ. and analog output MWI, MWU only with IP68 prot. categ. and analog output MWI, MWU

*The max. number of revolutions must be ≤ the measuring range.

Order code



Scope of delivery: GP09, User information

Accessories:

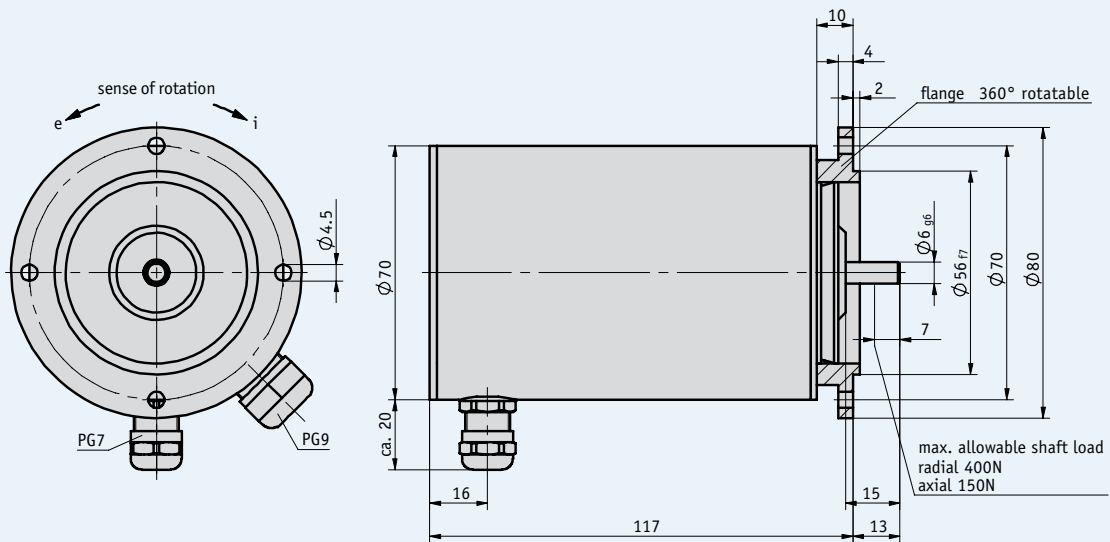
Mating connectors Page 88
 Self-aligning coupling Page 94
 Electronic display MA50 Catalog 6 DisplayLine

Additional information:

General information and areas of application Page 62 cont.

Profile

- Solid shaft \varnothing 6 mm
- Adaptation to various measurement paths owing to a wide range of gear ratios
- Integrated friction clutch to protect the potentiometer
- Compact design
- Potentiometer or power output
- IP65 protection category possible
- Up to 3 switching cam outputs, freely adjustable



Mechanical data

Feature	Technical data	Additional information
Gear ratio	0.1 ... 512	
Speed	max. 500 rpm	depending on gear ratio
Operating temperature	-20 ... +80 °C	
Condensation	inadmissible	
Service life of axial movement	1 x 10 ⁶ 2 x 10 ⁶	with P01, P02 with P03
Protection category	IP52, IP65	according to DIN VDE 0470
Maximum shaft load	radial 400 N axial 150 N	
Shaft	browned steel, \varnothing 6 mm	
Housing	aluminum	

Electrical data

Feature	Technical data	Additional information
Interference protection class	3	according to IEC 801

Analog outputs

Feature	Technical data	Voltage supply
Potentiometer output	0 ... 1 k Ω , 0 ... 5 k Ω , 0 ... 10 k Ω depending on the potentiometer type used	
Power output	4 ... 20 mA	24 V DC \pm 20 %, with load \leq 500 Ω

Potentiometer type

Feature	01	02	03
Design	hybrid	wire	hybrid
Resistance	1 k Ω , 5 k Ω , 10 k Ω	1 k Ω , 5 k Ω , 10 k Ω	1 k Ω , 5 k Ω , 10 k Ω
Resistance tolerance	\pm 5 %	\pm 5 %	\pm 5 %
Linearity tolerance	\pm 0.25 %	\pm 0.25 %	\pm 0.25 %
Load rating	1 W at 70 °C	1 W at 70 °C	2 W at 70 °C
Range of rotation	340° \pm 5° (mechanically straight-through)	3600° \pm 10°	3600° \pm 10°
Standard terminal resistor (the higher value is always valid)	0.5 % or 1 Ω	0.5 % or 1 Ω	0.5 % or 1 Ω

Note: Characters highlighted in orange color are order features.

Pin assignment




Potentiometric outputs P01, P05, P10

Signal	Terminal
Po	11
Pe	13
S	12

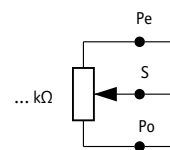
Transducer MWI

Signal	Terminal
I+	12
I-	11
N.C.	13

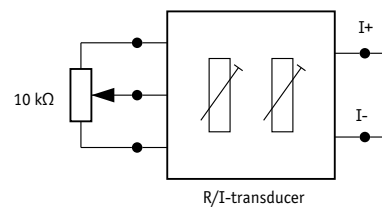
Switching cam

Assignment	Switching cam 1 Terminal	Switching cam 2 Terminal	Switching cam 3 Terminal
	1	4	7
	2	5	8
	3	6	9

Potentiometric outputs P01, P05, P10



Transducer MWI



Order

Ratio calculation (order table, feature A)

$$\text{Formula: } i1 = \frac{n \times 360^\circ}{\alpha}$$

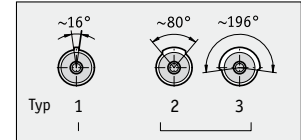
n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i1 = order feature for gear ratio

If the calculated ratio "i1" is the same as a value in the ordering table for the "ratio" feature, but this is not available, select the next highest ratio.

Switching cam order (example of order table, feature F)

Digit 1	Digit 2	Digit 3	Order data
cam form 2			2
cam form 1	cam form 3		13
cam form 1	cam form 2	cam form 3	123

! Order switching cams!
 1-3 switching cams can be ordered. Therefore, the order element can have 1 to 3 digits.



Switching angle of the 3 switching cams: specifically for end position limiter (1), for control functions (2, 3).

Order table

Feature	Order data	Specifications	Additional information
Gear ratio	... A	0.1/10, 0.1666/10, 0.2/10, 0.25/10, 0.333/10, 0.5/10, 0.5/2.5, 0.8/10, 1, 1.400, 1/3.0357, 2, 2.14, 2.5, 3, 3.333, 4, 5, 5.385, 6, 6.5, 7, 8, 10, 12, 12.25, 14, 15, 20, 21, 24, 25, 30, 33, 35, 40, 48, 55, 60.5, 64, 65.154, 70, 80, 96, 101.5, 121, 134.75, 150, 256, 348.8, 384, 463.830, 512 others on request	
Potentiometer type	01 B 02 03 03/0,1	1 coil, hybrid 10 coils, wire 10 coils, hybrid 10 coils, hybrid, linear tolerance ±0,1 %	
Resistance	P01 C P05 P10	potentiometer 1 kΩ potentiometer 5 kΩ potentiometer 10 kΩ	
Transducer	MWI D OMW	transducer 4 ... 20 mA without	only with P10
Sense of rotation	ODR E e i	without indication of sense of rotation counter-clockwise ascending values clockwise ascending values	with P01, P05 or P10 with MWI with MWI or MWU
Switching cam/form	... F	1, 2, 3, 11, 12, 13, 22, 23, 33, 111, 112, 113, 122, 123, 221, 222, 223, 233, 331, 333 others on request	
Operating voltage of switching cam	1 G 2	above 48 V dielectric strength up to 48 V dielectric strength	

Order code



Scope of delivery: GP43, User information

Accessories:

Self-aligning coupling
 Electronic display MA50

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 Catalog 6 DisplayLine

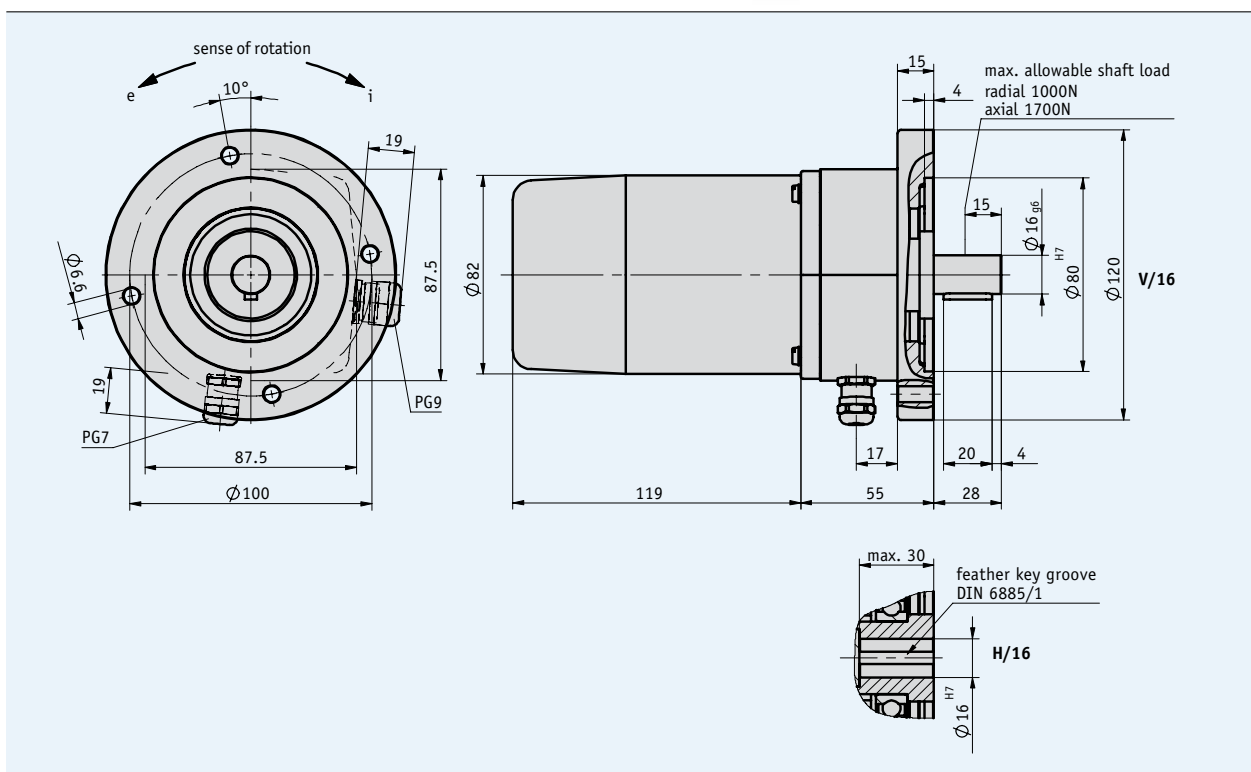
Additional information:

General information and areas of application

Page 62 cont.

Profile

- Extremely resistant to external influences
- Solid or blind-hole hollow shaft, max. \varnothing 20 mm
- Adaptation to various measurement paths owing to a wide range of gear ratios
- Integrated friction clutch to protect the potentiometer
- Potentiometer or power output
- IP65 protection category possible
- Up to 3 switching cam outputs, freely adjustable



2.3

Mechanical data

Feature	Technical data	Additional information
Gear ratio	0.2 ... 512	
Speed	max. 500 rpm	depending on gear ratio
Operating temperature	-20 ... +80 °C	
Condensation	inadmissible	
Service life of axial movement	1 x 10 ⁶ 2 x 10 ⁶	with P01, P02 with P03
Protection category	IP52, IP65	according to DIN VDE 0470
Maximum shaft load	radial 1000 N axial 1700 N	with solid shaft
Shaft	aluminum (IP52) browned steel (IP65)	
Housing	aluminum	

Electrical data

Feature	Technical data	Additional information
Interference protection class	3	according to IEC 801

Analog outputs

Feature	Technical data	Voltage supply
Potentiometer output	0 ... 1 kΩ, 0 ... 5 kΩ, 0 ... 10 kΩ depending on the potentiometer type used	
Power output	4 ... 20 mA	24 V DC ±20 %, with load ≤500 Ω

Potentiometer type

Characteristic/Specification	01	02	03/0,1
Design	hybrid	wire	hybrid
Resistance	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ
Resistance tolerance	±5 %	±5 %	±5 %
Linearity tolerance	±0.25 %	±0.25 %	±0.1 %
Load rating	1 W at 70 °C	1 W at 70 °C	2 W at 70 °C
Range of rotation	340° ±5° (mechanically straight-through)	3600° ±10°	3600° ±10°
Standard terminal resistor (the higher value is always valid)	0.5 % or 1 Ω	0.5 % or 1 Ω	0.5 % or 1 Ω

Note: Characters highlighted in orange color are order features.

Pin assignment


Potentiometric outputs P01, P05, P10

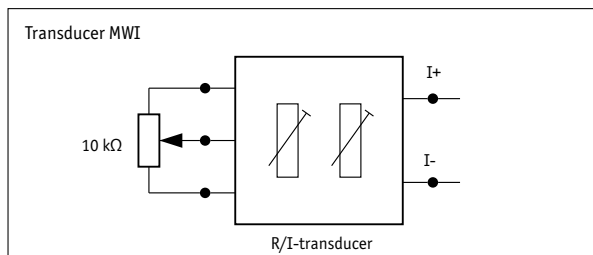
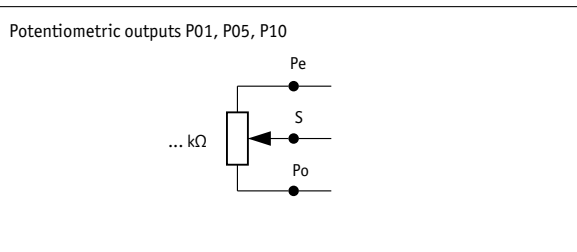
Signal	Terminal
Po	11
Pe	13
S	12

Transducer MWI

Signal	Terminal
I+	12
I-	11
N.C.	13

Switching cam

Assignment	Switching cam 1 Terminal	Switching cam 2 Terminal	Switching cam 3 Terminal
	1	4	7
	2	5	8
	3	6	9



Order

Ratio calculation (order table, feature A)

$$\text{Formula: } i1 = \frac{n \times 360^\circ}{\alpha}$$

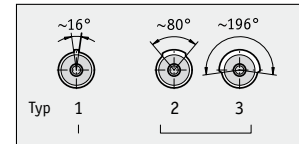
n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i1 = order feature for gear ratio

If the calculated ratio "i1" is the same as a value in the ordering table for the "ratio" feature, but this is not available, select the next highest ratio.

Switching cam order (example of order table, feature F)

Digit 1	Digit 2	Digit 3	Order data
cam form 2			2
cam form 1	cam form 3		13
cam form 1	cam form 2	cam form 3	123

! Order switching cams!
 1-3 switching cams can be ordered. Therefore, the order element can have 1 to 3 digits.



Actuating angle of the 3 switching cams: specifically for end position limiter (1), for control functions (2, 3).

Order table

Feature	Order data	Specifications	Additional information
Gear ratio	... A	0.1/10, 0.134/10, 0.15/10, 0.1666/10, 0.2/10, 0.25/10, 0.333/10, 0.5/10, 0.5/2.5, 1, 1.125, 1/3.0357, 2, 2.14, 2.5, 3, 4, 5, 6.5, 7, 8, 10, 12, 12.25, 14, 15, 20, 24, 25, 30, 33, 35, 40, 48, 55, 64, 70, 80, 101.5, 121, 150, 176, 256, 291.156, 348.8, 360, 384, 3.830, 512 others on request	
Driving shaft	H/16 H/20 V/16 V/20	B hollow shaft Ø 16 mm hollow shaft Ø 20 mm solid shaft Ø 16 mm solid shaft Ø 20 mm	
Potentiometer type	01 02 03 03/0.1	C 1 coil, hybrid 10 coils, wire 10 coils, hybrid 10 coils, hybrid, linear tolerance ±0.1 %	
Resistance	P01 P05 P10	D potentiometer 1 kΩ potentiometer 5 kΩ potentiometer 10 kΩ	
Transducer	MWI OMW	E transducer 4 ... 20 mA without	only with P10
Sense of rotation	ODR e i	F without indication of sense of rotation counter-clockwise ascending values clockwise ascending values	with P01, P05 or P10 with MWI with MWI
Switching cam/form	... G	1, 2, 3, 11, 12, 13, 22, 23, 33, 111, 112, 113, 122, 123, 221, 222, 223, 233, 331, 333 others on request	
Operating voltage of switching cam	1 2	H above 48 V dielectric strength up to 48 V dielectric strength	

Order code

GP44 - - - - - - - - -

A B C D E F G H

Scope of delivery: GP44, User information

Accessories:

Electronic display MA50

Catalog 6 DisplayLine

Additional information:

General information and areas of application

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2.4



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2.2 Optical rotary encoders	40
2.3 Geared potentiometers	60

2.4 | Accessories

Products

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Servo-clamp	SK	95

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2.0

2.1

2.2

2.3

2.4

2.5

Accessories RotoLine

Matrix for mating connectors

Mating connectors are available for a number of RotoLine encoders. The suitable connectors depend on the combination of the interface or output circuits (▶) and the connection type (⊙) of the encoder. Corresponding connection assignments are shown on the product pages (refer to matrix).


				Magnetic rotary encoders					Geared potentiometers		
				IH28M IV28M/1	IH58M IV58M	IG04M	IG07M	IG09M	WH58M WV58M	GP03/1	GP09
Pict.	PINs	cableØ	Order data								
Mating connectors, straight											
9	4	4 ... 6	83419							⊙ EX	
10	4	4 ... 8	83526								⊙ E12
1	7	4 ... 6	76141	▶ PP ⊙ E6X		▶ PP ⊙ E6X					
2	7	6 ... 8	77087						▶ S3/06 ⊙ E4		
2	12	6 ... 8	76572	▶ OP, LD5, LD24 ⊙ E6X		▶ OP, LD5, LD24 ⊙ E6X	⊙ EX	⊙ E6X			
4	12	max 8.5	81935		⊙ E2				▶ S6/04, S6/04-K ⊙ E2		
Mating connectors, offset											
3	7	6 ... 8	79666				⊙ EX				
3	12	6 ... 8	79665						▶ S3/06 ⊙ E4		
Profibus IN	5	5	82804						▶ PB ⊙ E12		
Profibus OUT	6	5	82805						▶ PB ⊙ E12		
CAN bus IN	5	5	83006						▶ CAN ⊙ E12		
CAN bus OUT	6	5	83007						▶ CAN ⊙ E12		
Bus supply	5	4	83091						▶ PB CAN ⊙ E12		
Bus terminator, straight											
Profibus	7	5	82816						▶ PB ⊙ E12		
CAN bus	8	5	82815						▶ CAN ⊙ E12		

Order

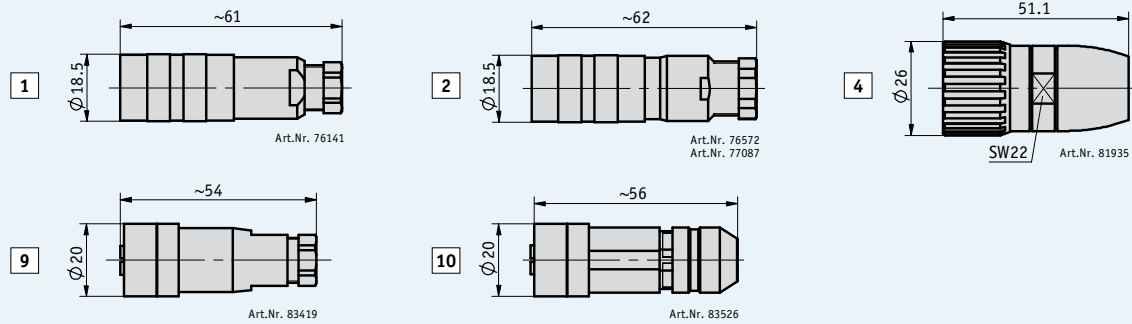
Order code (see Product matrix)

Profile

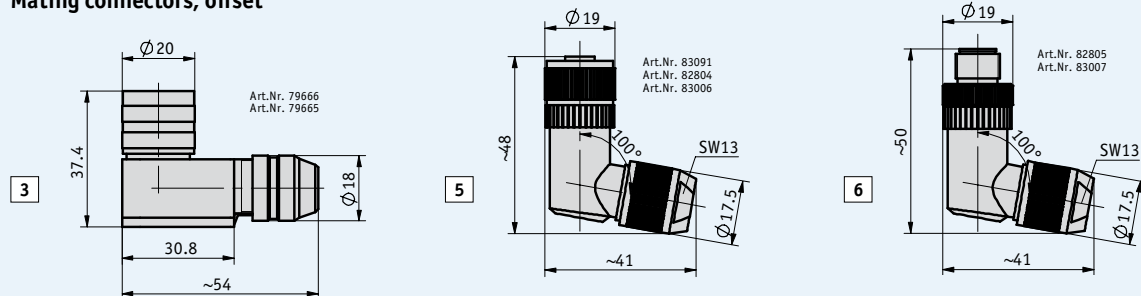
- Mating connectors, straight
- Mating connectors, offset
- Bus terminator, straight

 When screwed on, the distance to the device will increase by approx. 3 mm.

Mating connectors, straight



Mating connectors, offset



Bus terminator, straight



Accessories RotoLine

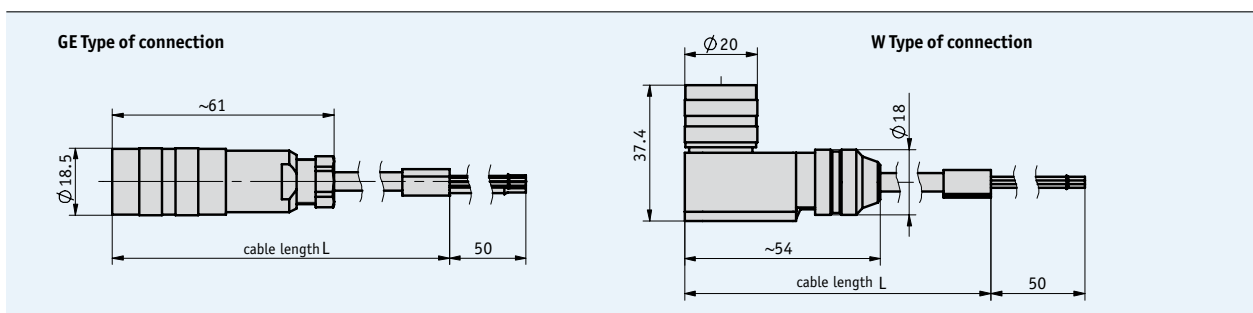
■ **Matrix for cable extension**

Cable extensions are available for a range of RotoLine encoders. The corresponding cable extensions depend on the combination of the interface or output circuits (▶) and the connection type (⊙) of the encoder. Corresponding connection assignments are shown on the data sheets of the cable extensions (refer to matrix).

		Magnetic rotary encoders					
		IH28M IV28M/1	IH58M IV58M	IG04M	IG07M	IG09M	WH58M WV58M
Page	Cable sheath	Product					
Cable extension							
91	PUR	KV07S0	▶ PP ⊙ E6X		▶ PP ⊙ E6X		▶ S3/06 ⊙ E4
92	PUR	KV12S0	▶ OP, LD5, LD24 ⊙ E6X		▶ OP, LD5, LD24 ⊙ E6X	⊙ EX	⊙ E6X
93	PUR	KV12S1		⊙ E2			▶ S6/04, S6/04-K ⊙ E2

Profile

- Ready-to-use cable connection
- Cable lengths up to 20 m



Mechanical data

Feature	Technical data	Additional information
Cable sheath	PUR	
Temperature range	-30 ... +100 °C	

2.4

Pin assignment

KV07S0

Cable color	PIN
white	1
brown	2
green	3
yellow	4

Cable color	PIN
gray	5
pink	6
blue	7

Order

Order table

Feature	Order text	Specification	Additional information
Type of connection	GE	straight connector	
	W	angle plug	not with KV12S1
Cable length	...	1 ... 20 m, in steps of 1 m	

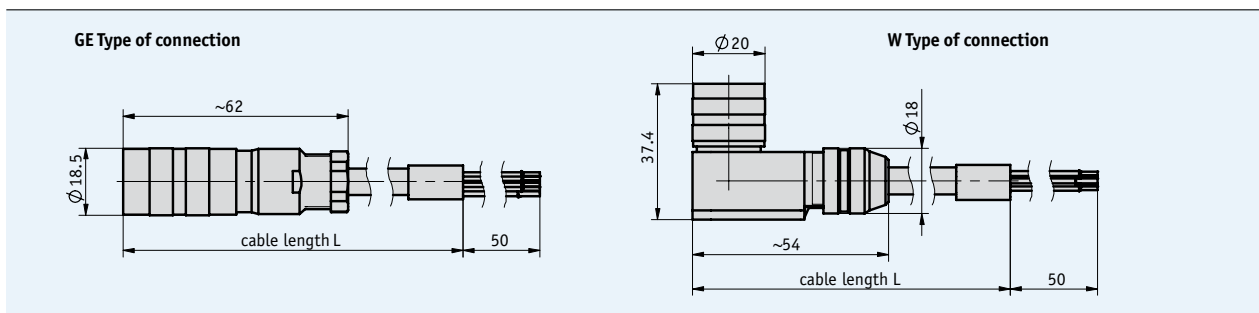
Order code

KV07S0 - -

Scope of delivery: KV07S0, User information

Profile

- Ready-to-use cable connection
- Cable lengths up to 20 m



2.4

Mechanical data

Feature	Technical data	Additional information
Cable sheath	PUR	
Temperature range	-30 ... +100 °C	

Pin assignment

KV12S0

Cable color	PIN
blue	A
violet	B
green	C
red	D
yellow	E
pink	F

Cable color	PIN
red-blue	G
white	H
gray-pink	J
gray-pink	K
black	L
brown	M

Order

Order table

Feature	Order text	Specification	Additional information
Type of connection	GE W	straight connector angle plug	
Cable length	... B	1 ... 20 m, in steps of 1 m	

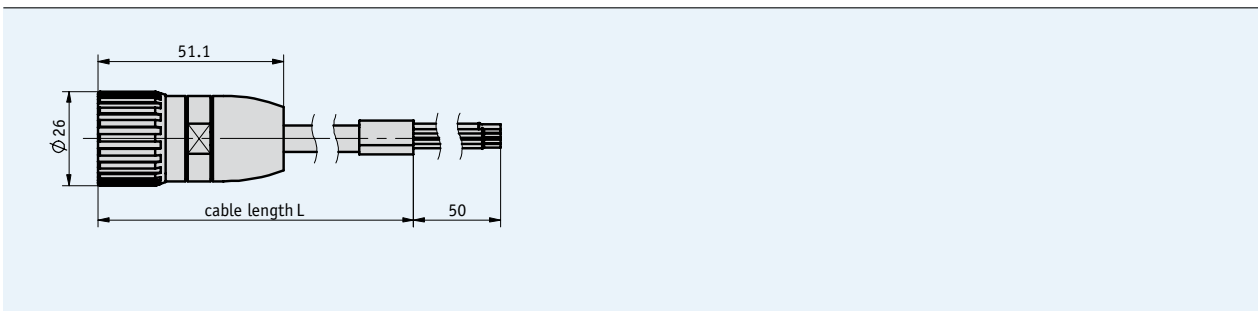
Order code

KV12S0 - -

Scope of delivery: KV12S0, User information

Profile

- Ready-to-use cable connection
- Cable lengths up to 20 m



Mechanical data

Feature	Technical data	Additional information
Cable sheath	PUR	
Temperature range	-30 ... +100 °C	

2.4

Pin assignment

KV12S1

Cable color	PIN
blue	1
violet	2
green	3
red	4
yellow	5
pink	6

Cable color	PIN
red-blue	7
white	8
gray-pink	9
gray-pink	10
black	11
brown	12

Order

Order table

Feature	Order text	Specification	Additional information
Cable length	...	A 1 ... 20 m, in steps of 1 m	

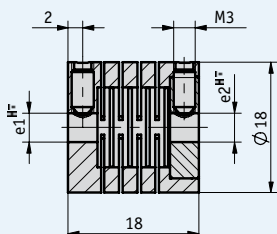
Order code

KV12S1 - GE -

Scope of delivery: KV12S1, User information

Profile

- Backlash-free compensation of mechanical manufacturing tolerances
- Various diameters of 4 ... 10 mm



2.4

Mechanical data

Feature	Technical data	Additional information
Speed	max. 25000 rpm	
Admissible offset	max. 0.1 mm	radial and axial
Bore diameter	4 ... 10 mm	
Material	aluminum	

Order

Order table

Feature	Order text	Specification	Additional information
Bore diameter e1	... A	4, 5, 6, 8, 10 mm	
Bore diameter e2	... B	4, 5, 6, 8, 10 mm	

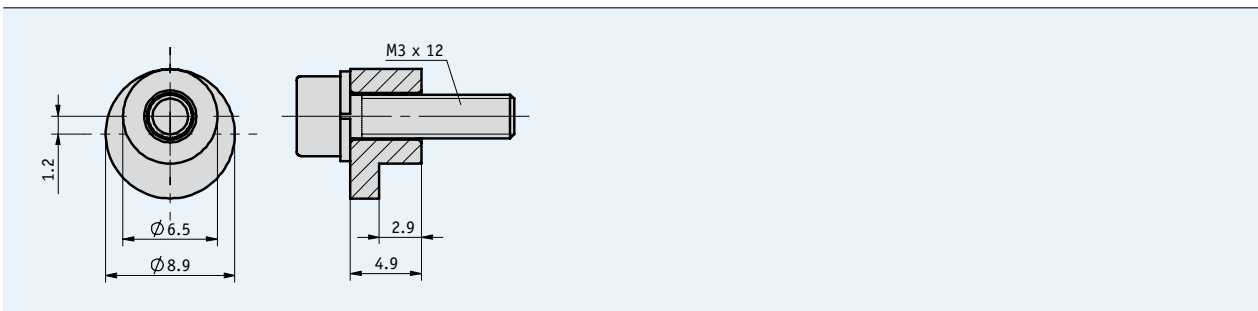
Order code

AK18 - -

Scope of delivery: AK18

Profile

- For easy and secure fastening of rotary encoders with servo-flange



Mechanical data

Feature	Technical data	Additional information
Material	steel	

2.4

Order

- Order code

SK

Scope of delivery: 1x eccentric fastening device, 1x spring lock washer,
1x cylinder head bolt

2.5



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2.0

2.1

2.2

2.3

2.4

2.5

**Magnetic and optical rotary encoders,
 geared potentiometers**

IV28M/1

GP03/1

IG07

WH58M

Gerät	Type	Page
A		
AK18	Self-aligning coupling	94
G		
GP02	Geared potentiometer	68
GP03/1	Geared potentiometer	71
GP04/1	Geared potentiometer	74
GP09	Geared potentiometer	77
GP43	Geared potentiometer	80
GP44	Geared potentiometer	83
I		
IG04M	Incremental encoder, magnetic	24
IG06	Incremental encoder, optical	46
IG07	Incremental encoder, optical	49
IG07M	Incremental encoder, magnetic	27
IG09M	Incremental encoder, magnetic	30
IG17	Incremental encoder, optical	53
IH28M	Incremental encoder, magnetic	12
IH58M	Incremental encoder, magnetic	18
IV28M/1	Incremental encoder, magnetic	15
IV58M	Incremental encoder, magnetic	21
K		
KV07S0	Cable extension	91
KV12S0	Cable extension	92
KV12S1	Cable extension	93
M		
	Mating connectors	88
S		
SK	Servo-clamp	95
W		
WH58M	Angle encoder, magnetic	33
WK50/1	Angle encoder, optical	57
WV58M	Angle encoder, magnetic	36

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