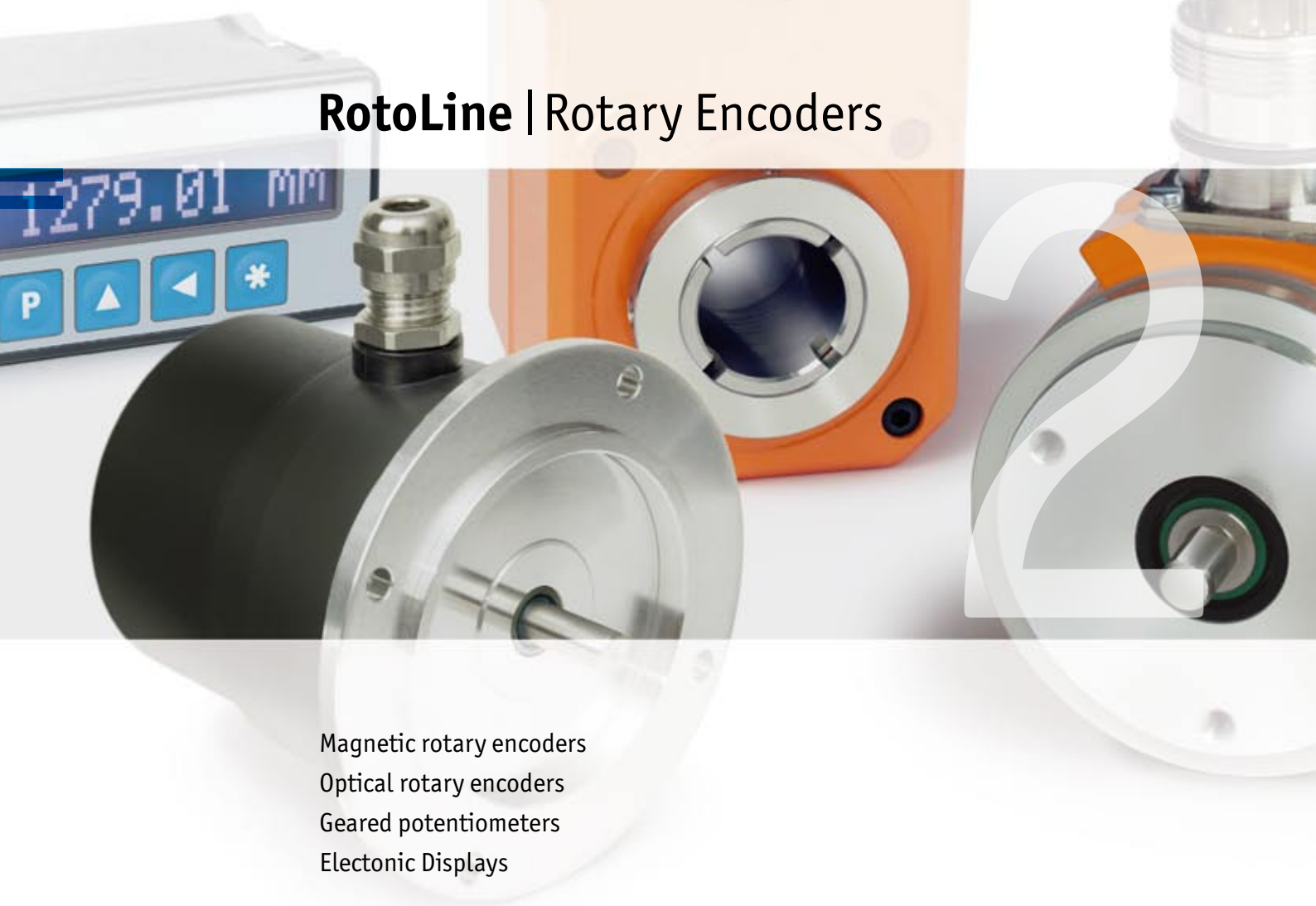


RotoLine | Rotary Encoders



Magnetic rotary encoders
Optical rotary encoders
Geared potentiometers
Electronic Displays

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 process 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.

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 ...



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

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

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



2.0 | Rotoline

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

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

- Magnetic rotary encoders
- Optical rotary encoders
- Geared potentiometers
- Electronic Displays

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.

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

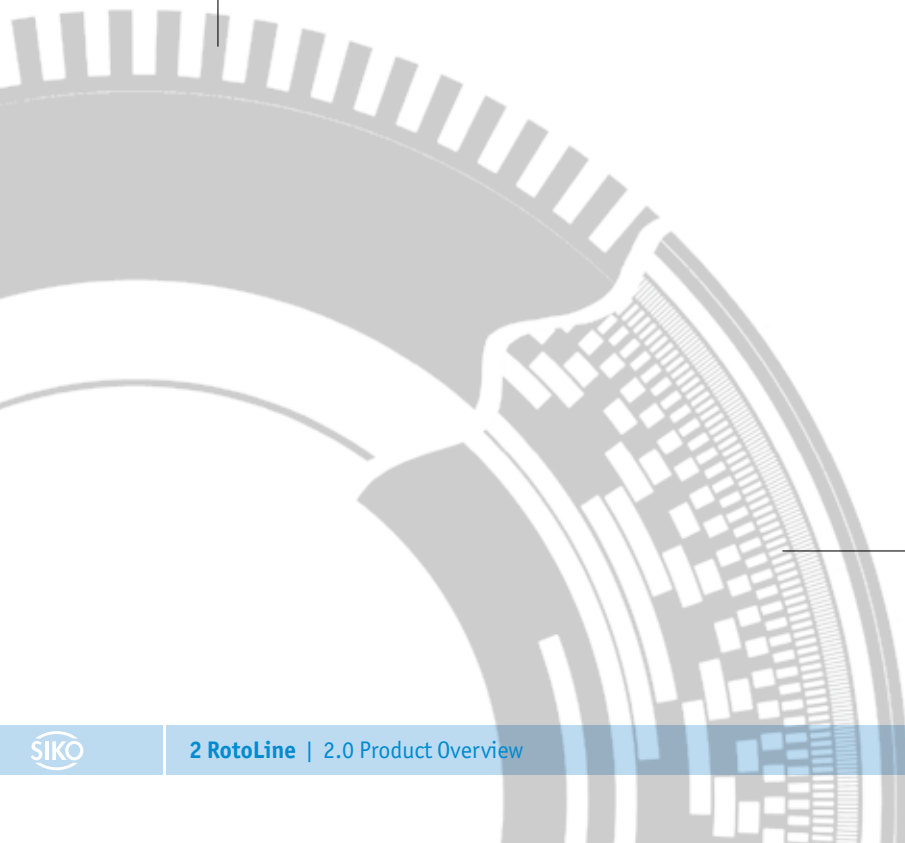
- Hollow shaft diameters 6–22 mm
- Solid shaft diameters 5–10 mm
- Resolutions up to 2560 pulses/revolution
- Output circuit: PP, OP, LD5, LD24
- Protection category up to IP65

Magnetic angle encoders

- Hollow shaft diameters 10–20 mm
- Solid shaft diameters 6–10 mm
- Resolutions up to 4096 pulses/revolutions (12 bit) and up to 8192 revolutions (13 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



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 IP68

Electronic Displays

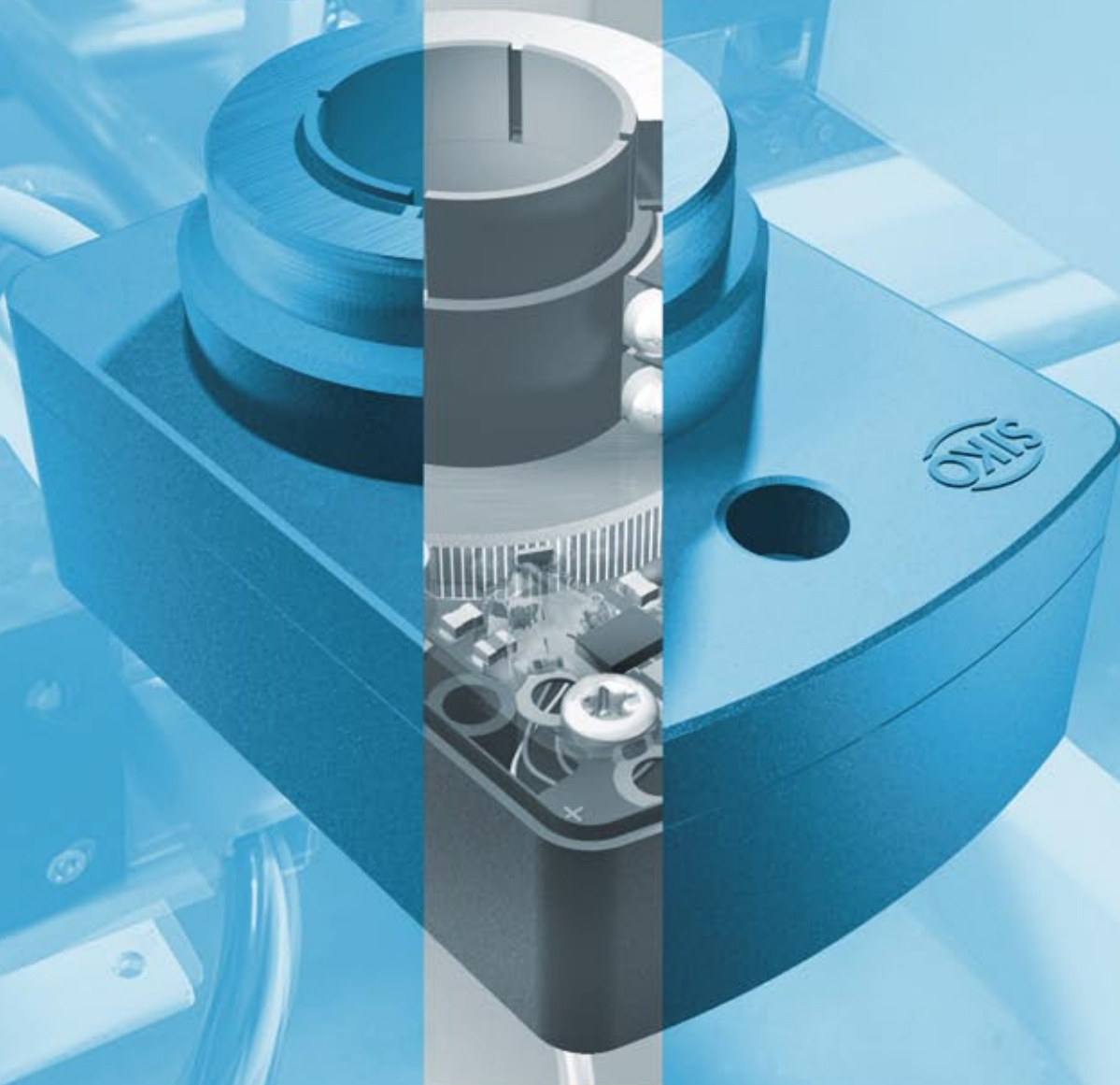
SIKO electronic displays are multifunctional, electronic measurement solutions. They make easy work of realizing the display of distance and angle information, revolutions, speed or number of pieces.

Electronic Displays

7-segment figure LED or LCD-displays
Operating voltage 24 V DC, 24 V AC, 110 V AC, 230 V AC
Encoder inputs: PP 24 V signals, LD 5 V signals, serial SSI, number of pieces, speed and analog 0 ... 10 V, 4 ... 20 mA
External calibration or referencing option
Optional interfaces: RS232/RS485



2.1



2.0 | RotoLine Table of contents 4

2.1 | Magnetic rotary encoders

General information and areas of application		8
Function and application		10
Product matrix		11
Products		
Incremental encoders	IH28M	12
	IV28M/1	15
	IH58M	18
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	IG04M	24
	IG07M	27
	IG09M	30
Absolut encoders	AH36M	33
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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 4096 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.

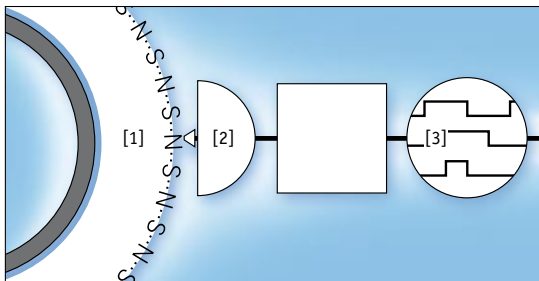
To be “absolutely” on the safe side, application-proven incremental technology is also used in our absolute multiturn encoders. Combined with battery-free multiturn technology, this tried and tested solution enables every rotation to be registered – even in a currentless state. Thus, in magnetic angle coding, a diametral magnet generates the multiturn signal required to record full rotations of

the encoder. Computed together with the high-resolution singleturn signal, this produces an absolute value which provides the correct position value at all times.

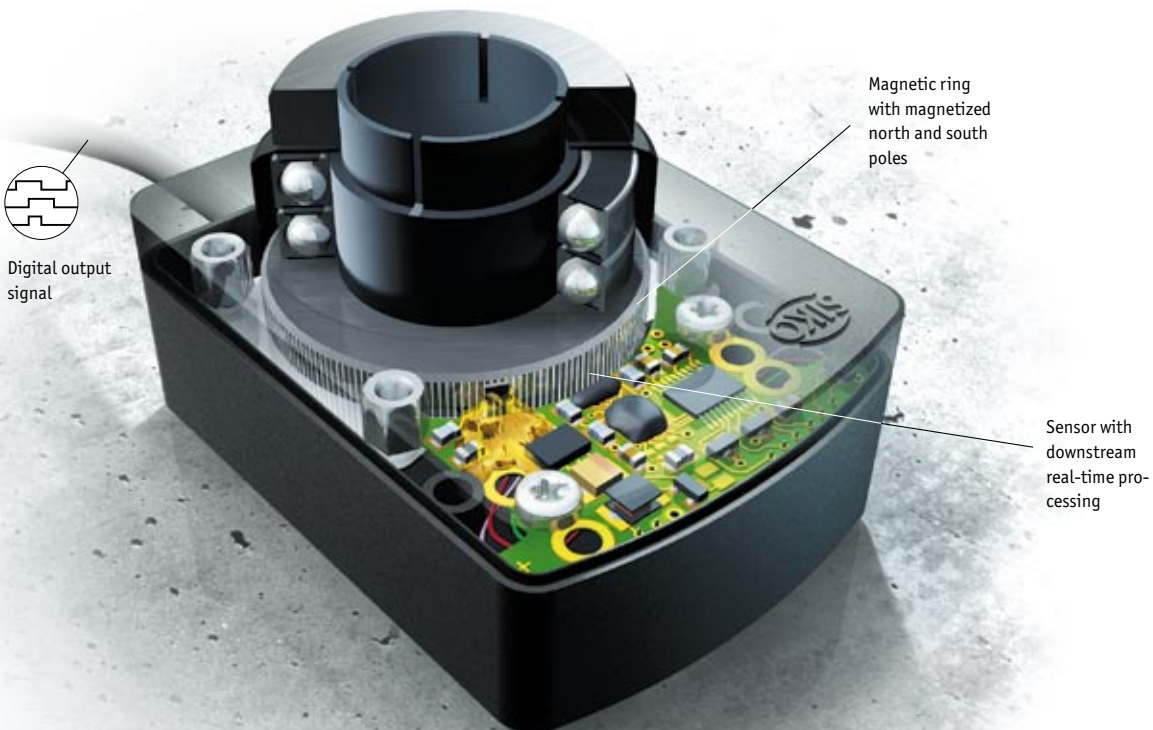
Benefits

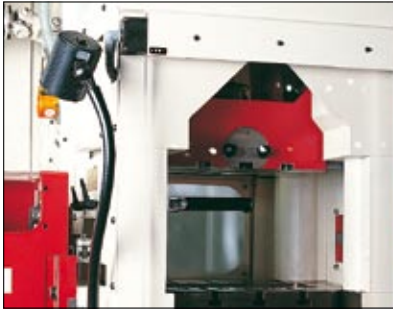
- Very high shock, vibration and temperature resistance
- Fully resistant to oil, lubricants, dirt and water
- Wear and maintenance-free sensor system
- Optional sealing of the electronics also permits use in oil baths etc.
- Very compact designs
- Magnetic encoders are very versatile due to the wide 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
- Packaging and food industries
- Chemical and pharmaceutical industries
- Energy generation
- 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

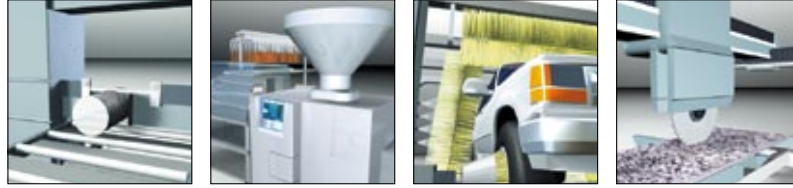
Benefits

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



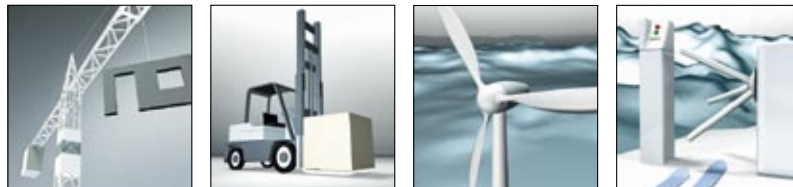
e.g., presses and dies, construction vehicles, elevators, rough wood processing ...

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 ...





2.1

Magnetic rotary encoders, incremental

							
	IH28M	IV28M/1	IH58M	IV58M	IG04M	IG07M	IG09M
Page	12	15	18	21	24	27	30
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
Output circuits							
PP	•	•	•	•	•	•	•
OP	•	•	•	•	•	•	•
LD5	•	•	•	•	•	•	•
LD24	•	•	•	•	•	•	•
Housings							
Plastic	•	•			•		•
Zinc die-cast						•	
Aluminium			•	•			
Resolutions							
Pulses/revolution	≤1000	≤1000	≤2560	≤2560	≤2000	≤2560	≤2560

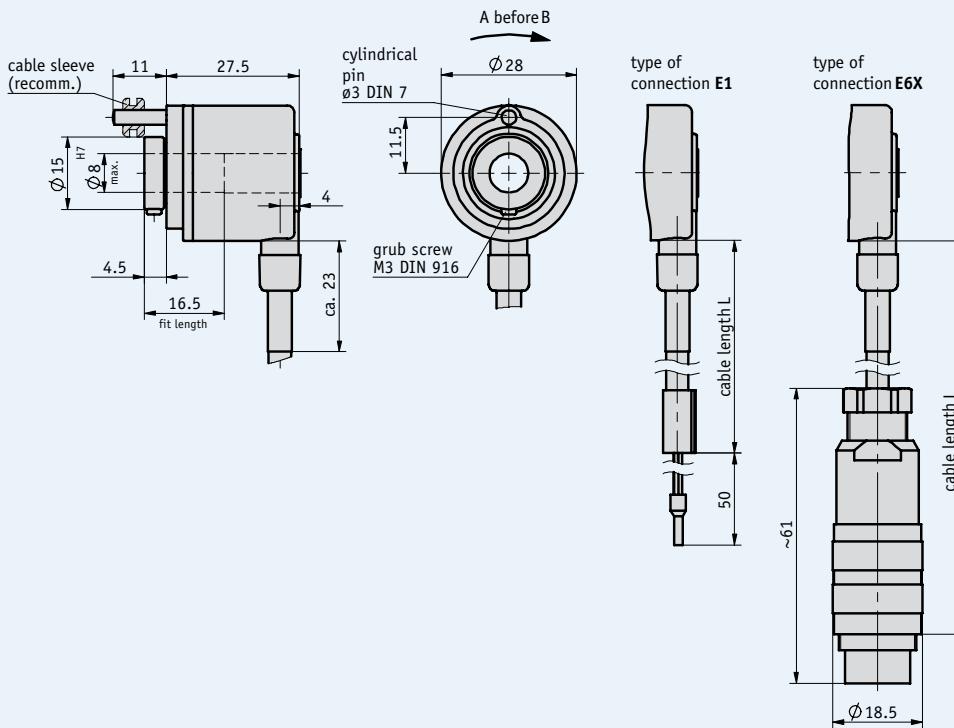
2.1

Magnetic rotary encoders, absolute

				
	AH36M	AV58M	WV36M/CAN	WV36M/SSI
Page	33	35	37	40
Shaft design				
Hollow shaft	•			
Solid shaft		•	•	•
Shaft diameters	6 mm	6 mm	6 mm	6 mm
Output circuits				
MWI (4 ... 20 mA)	•	•		
MWU (0 ... 10 V)	•	•		
SSI				•
CAN-Bus			•	
Housings				
Aluminium and steel	•		•	•
steel		•		
Resolutions				
Pulses/revolution			4096	4096
Revolutions	≤65 536	≤65 536	4096	8192
Pulses above the programmed measuring range	4096	4096		

Profile

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



Mechanical data

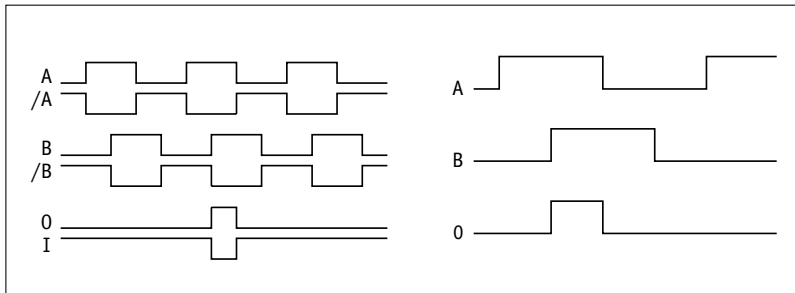
Feature	Technical data	Additional information
Max. speed	3000 rpm	
Shaft moment of inertia	$\sim 0.24 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 0.1 \text{ Ncm}$	at 20 °C
Weight	$\sim 0.1 \text{ kg}$	
Protection category	IP54	
Operating temperature	-20 ... +70 °C	
Storage temperature	-20 ... +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 Ø 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	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

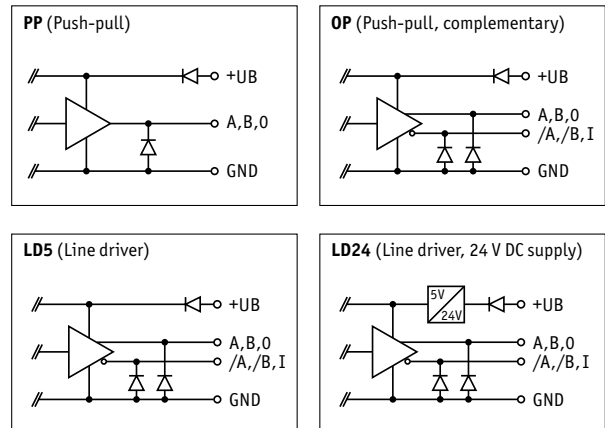
Pin assignment

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, 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:

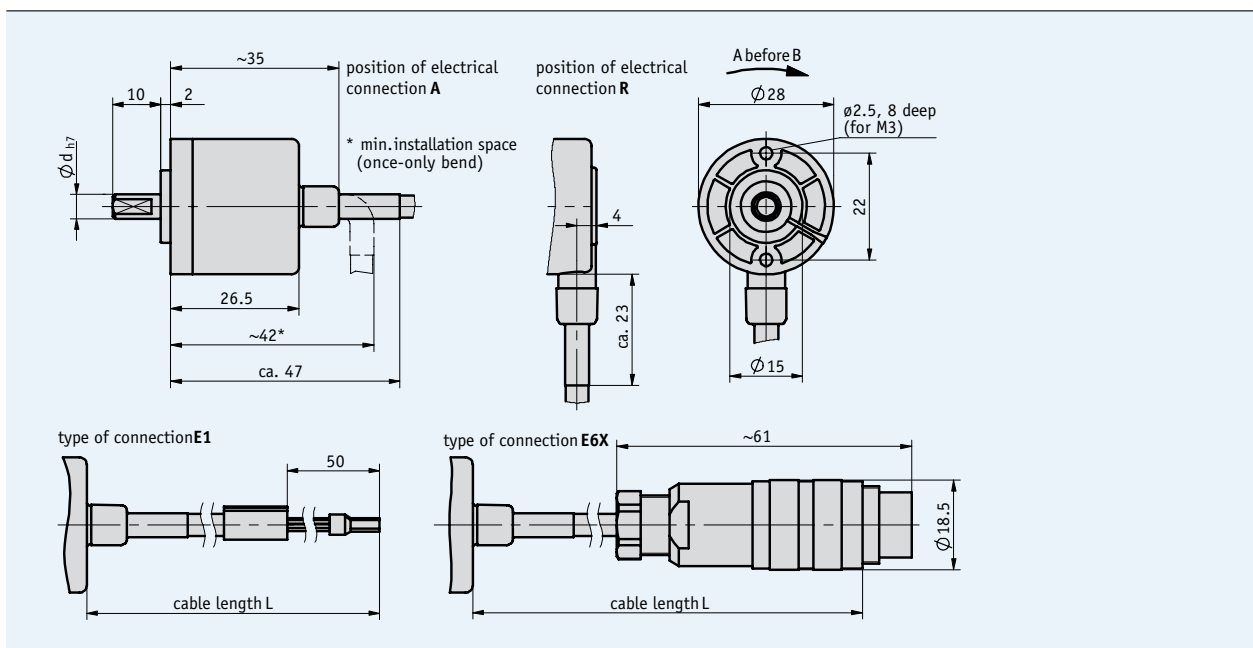
Mating connectors Page 106
 Cable extension Page 108
 Electronic display MA10/4 Page 96
 Electronic display MA55 Page 94

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

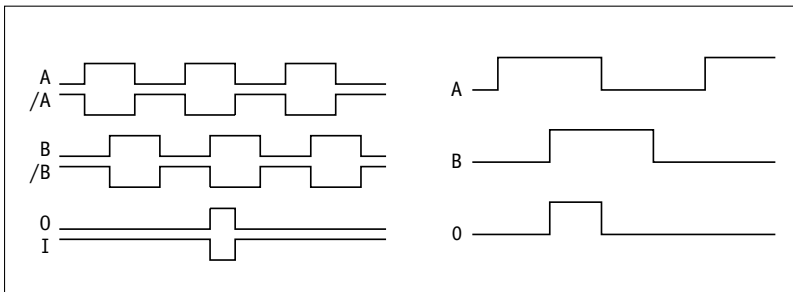
Feature	Technical data	Additional information
Max. speed	3000 rpm	
Shaft moment of inertia	$\sim 0.24 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 0.1 \text{ Ncm}$	at 20 °C
Shaft load rating	radial 30 N axial 8 N	
Weight	$\sim 0.1 \text{ kg}$	
Protection category	IP54	
Operating temperature	-20 ... +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	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 0 is not defined and can deviate from the signal image.

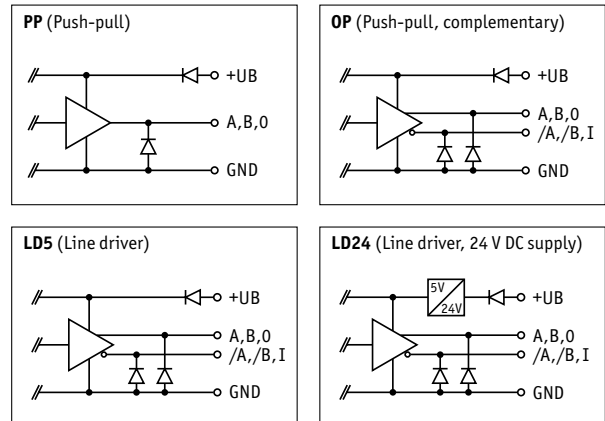
Pin assignment

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	

2.1

Order code

IV28M/1 - - - - - - -

A B C D E F G

Scope of delivery: IV28M/1, User information

Accessories:

Mating connectors Page 106
 Cable extension Page 108
 Electronic display MA10/4 Page 96
 Electronic display MA55 Page 94

Additional information:

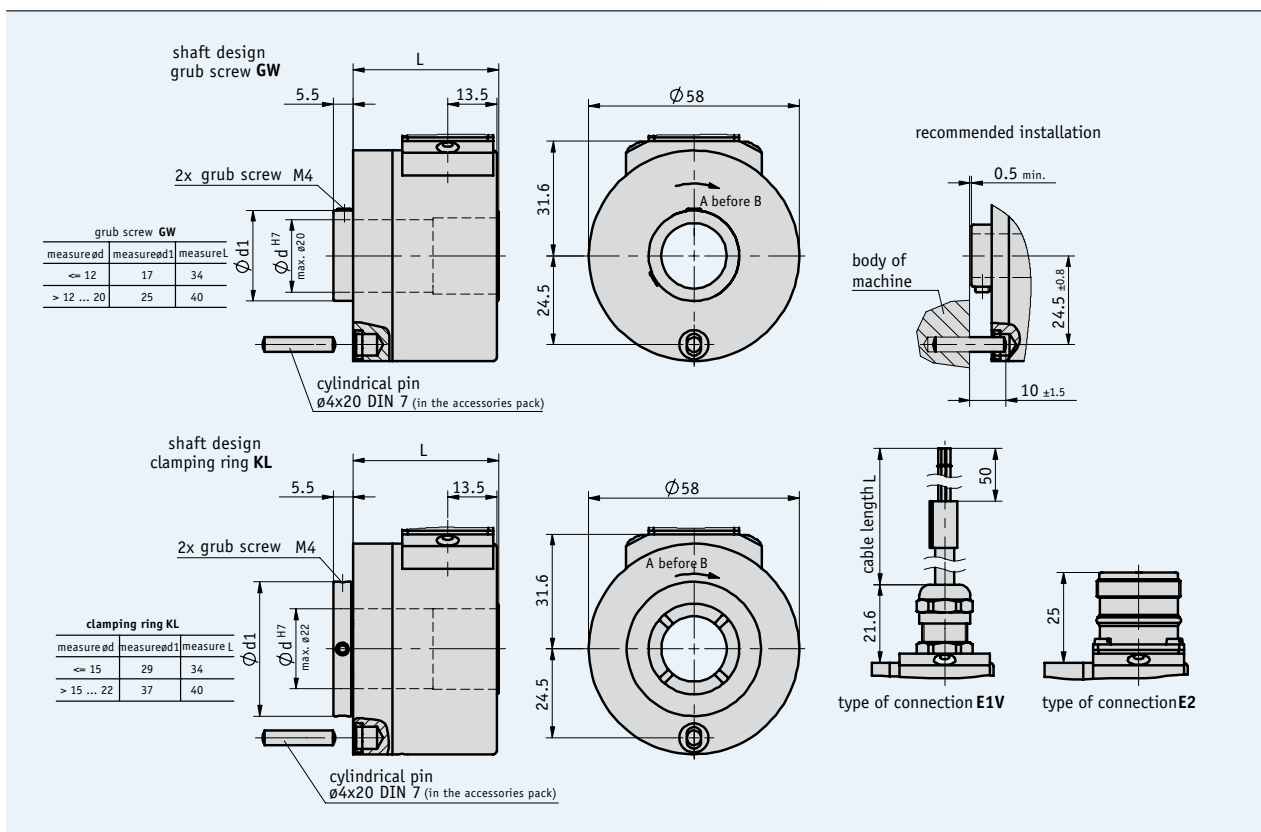
General information and areas of application Page 8 cont.

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



2.1



Mechanical data

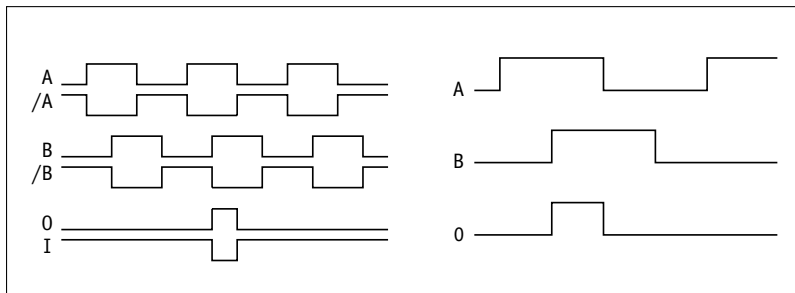
Feature	Technical data	Additional information
Max. speed	6000 rpm	
Shaft moment of inertia	$\sim 0.3 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 4 \text{ Ncm}$	at 20 °C
Weight	$\sim 0.4 \text{ kg}$	
Protection category	IP65	
Operating temperature	-20 ... +100 °C	
Storage temperature	-20 ... +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 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



! 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

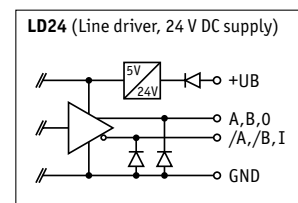
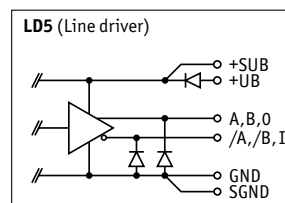
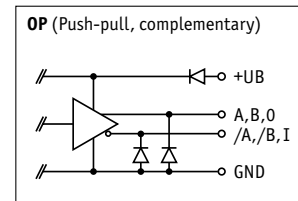
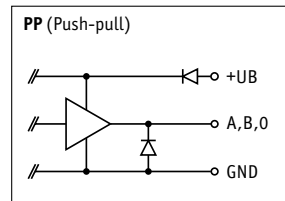
Signal	E1V	E2
N.C.		1
N.C.		2
O/I	green	3
N.C.		4
A	yellow	5
N.C.		6
N.C.		7
B	white	8
N.C.		9
GND	gray	10
N.C.		11
+UB	brown	12

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:

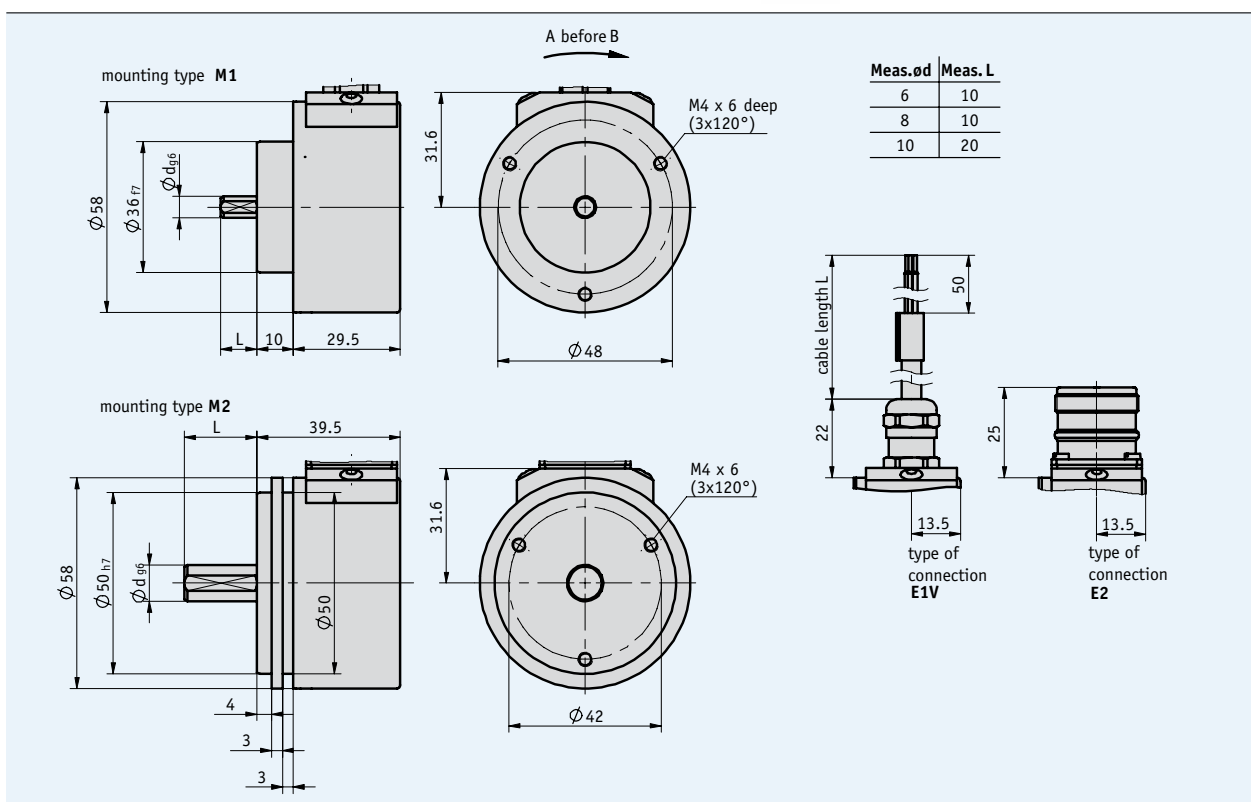
Mating connectors Page 106
 Cable extension Page 108
 Electronic display MA10/4 Page 96
 Electronic display MA55 Page 94

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

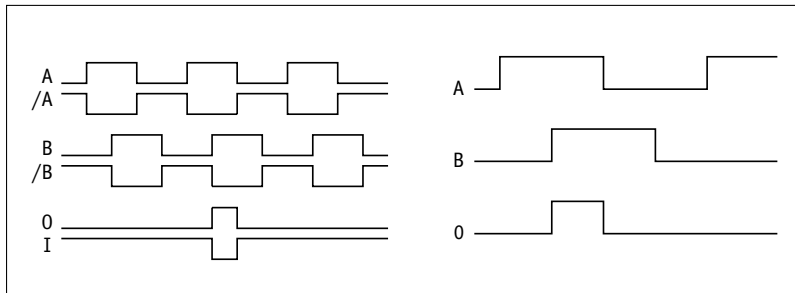
Feature	Technical data	Additional information
Max. speed	6000 rpm	
Shaft moment of inertia	$\sim 0.15 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 1.5 \text{ Ncm}$	at 20 °C
Shaft load rating	radial 80 N axial 40 N	
Weight	$\sim 0.4 \text{ kg}$	
Protection category	IP65	
Operating temperature	-20 ... +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 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



! 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

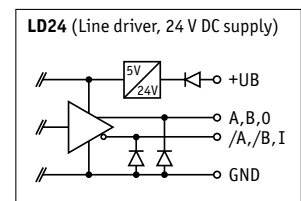
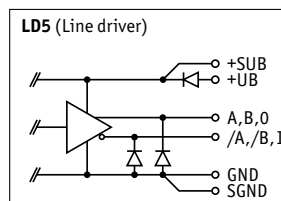
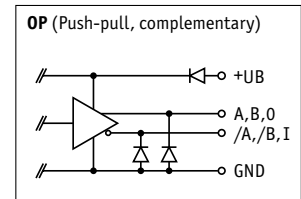
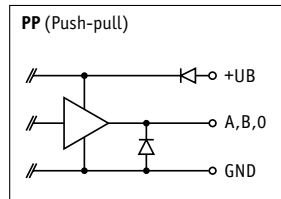
Signal	E1V	E2
N.C.		1
N.C.		2
O/I	green	3
N.C.		4
A	yellow	5
N.C.		6
N.C.		7
B	white	8
N.C.		9
GND	gray	10
N.C.		11
+UB	brown	12

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 106
Cable extension	Page 108
Self-aligning coupling	Page 112
Servo-clamp	Page 113
Electronic display MA10/4	Page 96
Electronic display MA55	Page 94

Additional information:

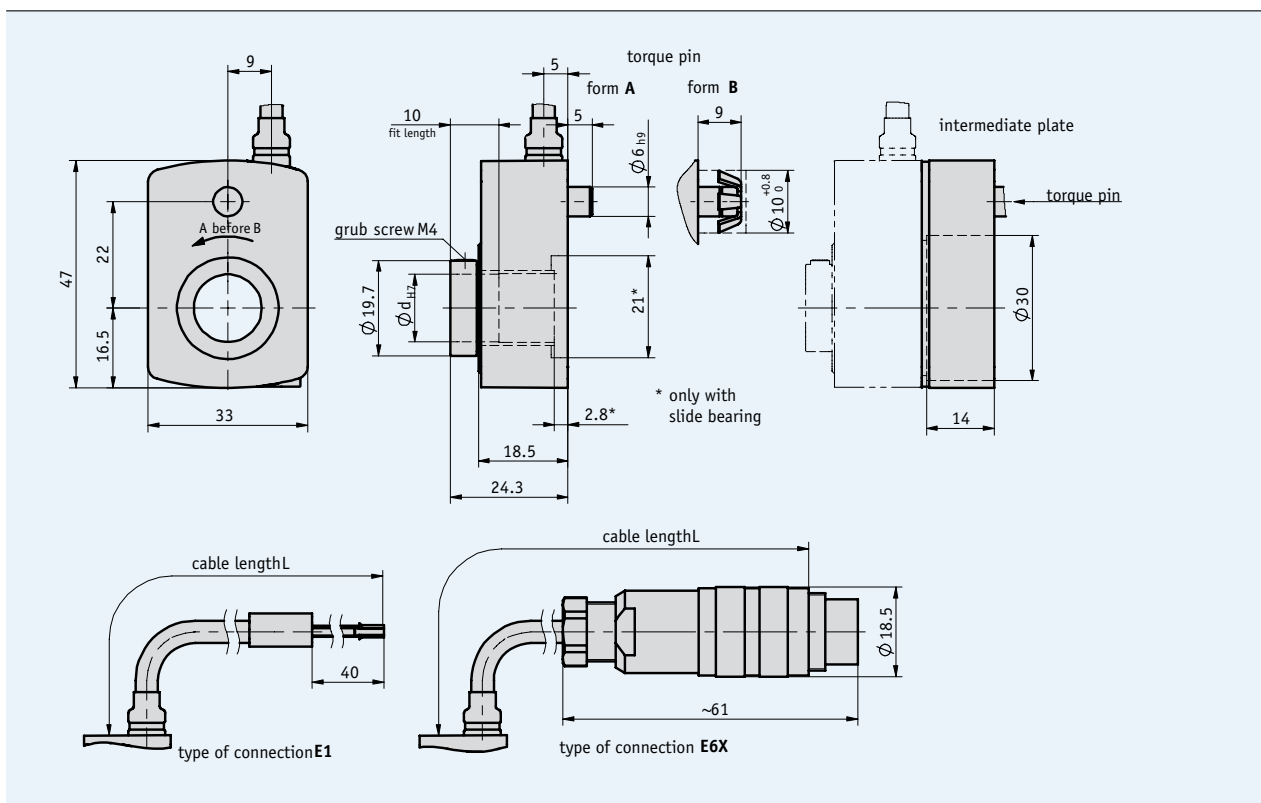
General information and areas of application Page 8 cont.

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

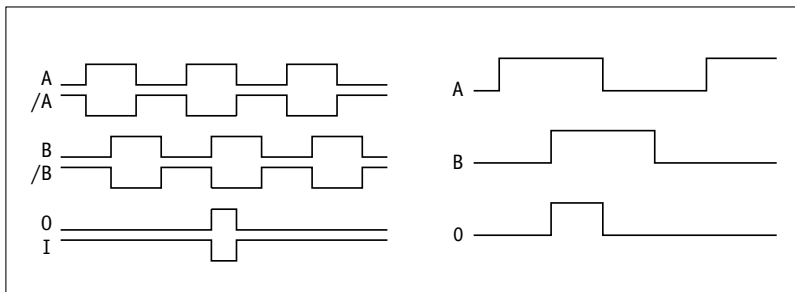
Feature	Technical data	Additional information
Max. speed	plain bearing 600 rpm short-time ball bearing 3000 rpm	
Shaft moment of inertia	$\sim 1.9 \times 10^{-6} \text{ kgm}^2$	
Weight	$\sim 0.1 \text{ kg}$	with 1 m cable
Protection category	IP50 plain bearing IP63 ball bearing	
Operating temperature	$-20 \dots +80 \text{ }^\circ\text{C}$	
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	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

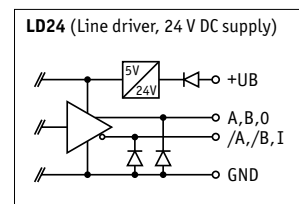
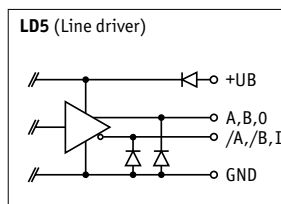
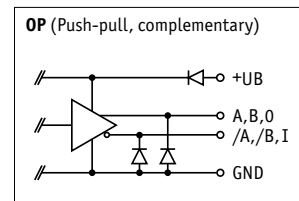
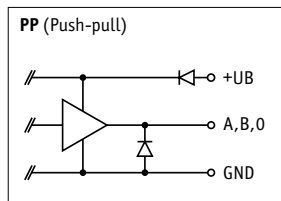
Pin assignment

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, 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

IGO4M - - - - - - - - -

Scope of delivery: IGO4M, User information

Accessories:

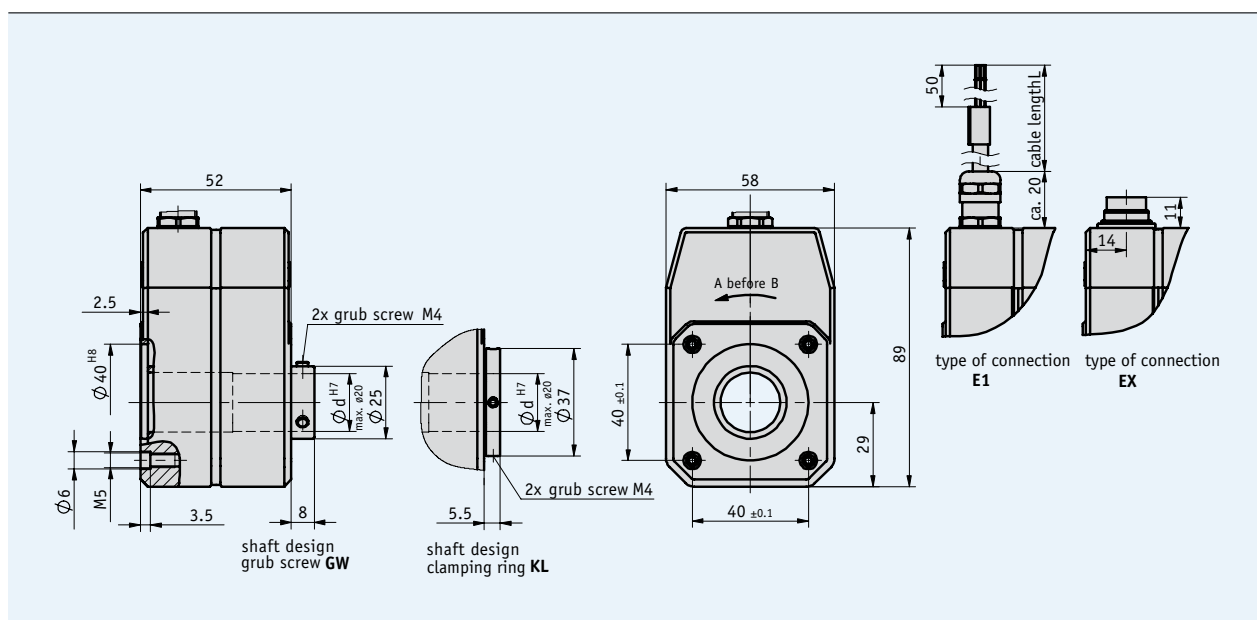
Mating connectors Page 106
 Cable extension Page 108
 Electronic display MA10/4 Page 96
 Electronic display MA55 Page 94

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

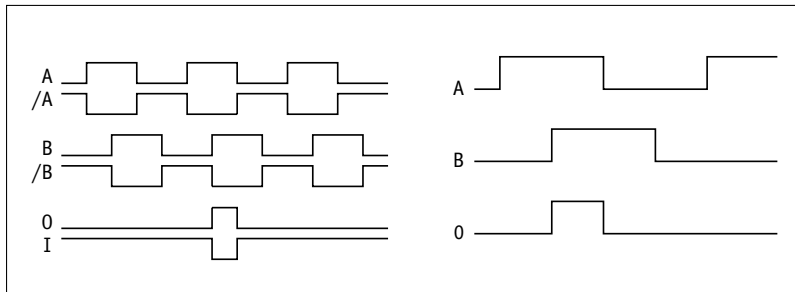
Feature	Technical data	Additional information
Max. speed	6000 rpm, IP64 3000 rpm, IP65	
Shaft moment of inertia	$\sim 0.3 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 6 \text{ Ncm}$, IP64 $\leq 10 \text{ Ncm}$, IP65	at 20 °C
Shaft load rating	radial 5600 N axial 1400 N	
Weight	$\sim 0.75 \text{ kg}$	
Protection category	IP64, high-precision packed sealing gap IP65, enhanced bearing sealing	
Operating temperature	$-20 \dots +100 \text{ °C}$	
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	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 $\pm 5\%$	+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



! 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

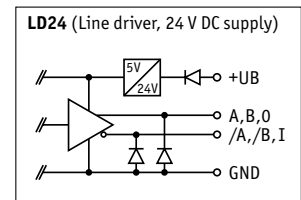
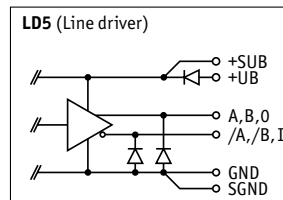
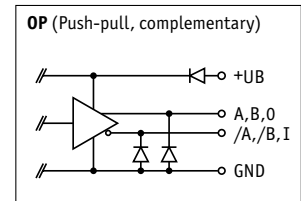
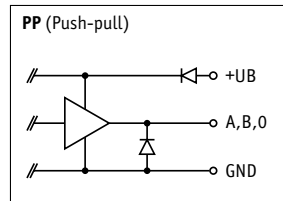
Signal	E1	E6X
N.C.		A
N.C.		B
O/I	green	C
N.C.		D
A	yellow	E
N.C.		F
N.C.		G
B	white	H
N.C.		J
GND	gray	K
N.C.		L
+UB	brown	M

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
Signal image			
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	

Order code

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

A
B
C
D
E
F
G
H

Scope of delivery: IG07M, User information

Accessories:

Mating connectors Page 106
 Cable extension Page 108
 Electronic display MA10/4 Page 96
 Electronic display MA55 Page 94

Additional information:

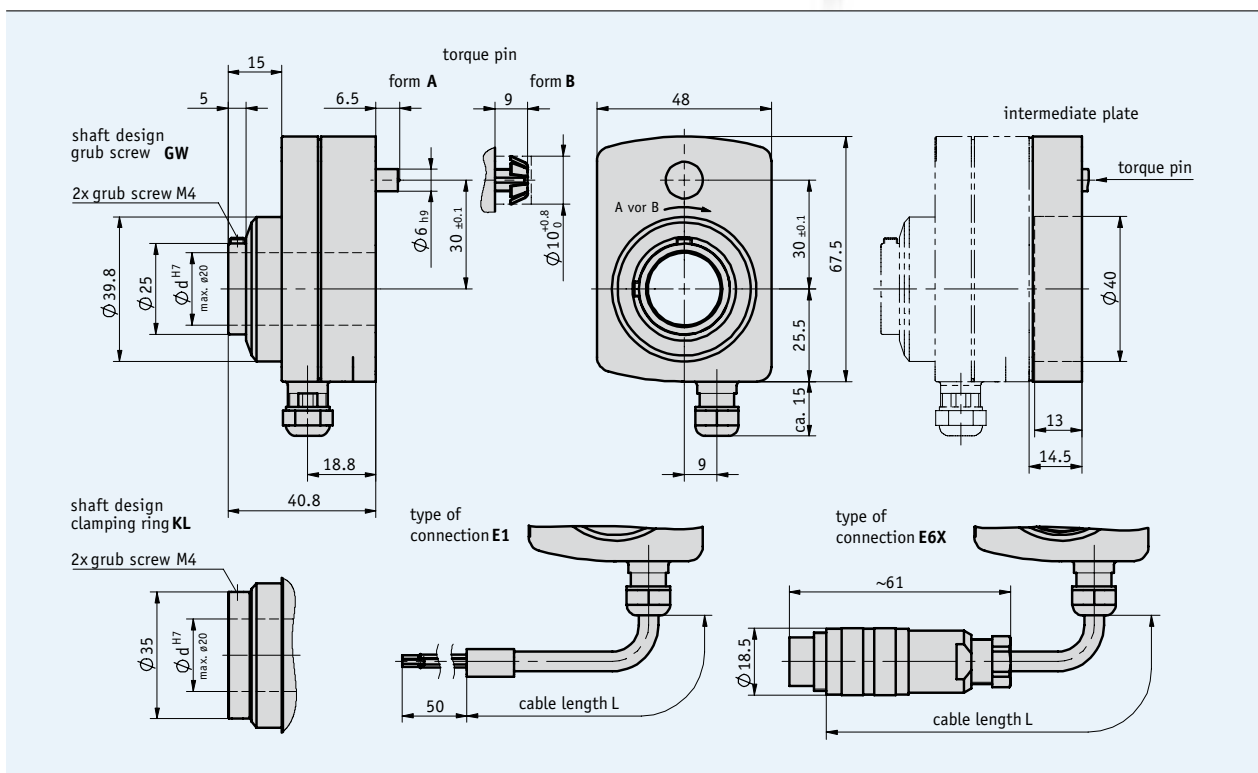
General information and areas of application Page 8 cont.

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

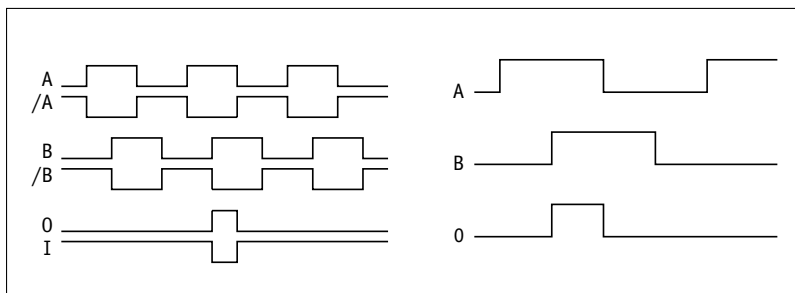
Feature	Technical data	Additional information
Max. speed	6000 rpm 2000 rpm	with IP53 with IP63
Shaft moment of inertia	$\sim 0.15 \times 10^{-6} \text{ kgm}^2$	
Starting torque	$\leq 2 \text{ Ncm}$, IP53 $\leq 3.5 \text{ Ncm}$, IP63	at 20 °C
Weight	$\sim 0.12 \text{ kg}$	
Protection category	IP53 IP63	
Operating temperature	-20 ... +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	browned steel	
Housing	reinforcing 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	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



! 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

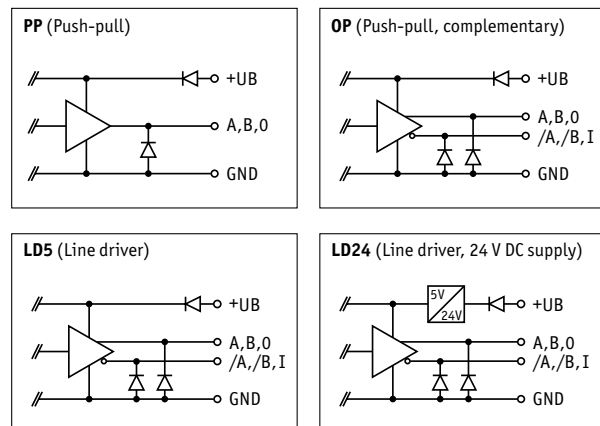
Pin assignment

Output circuit PP

Signal	E1	E6X
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
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, 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:

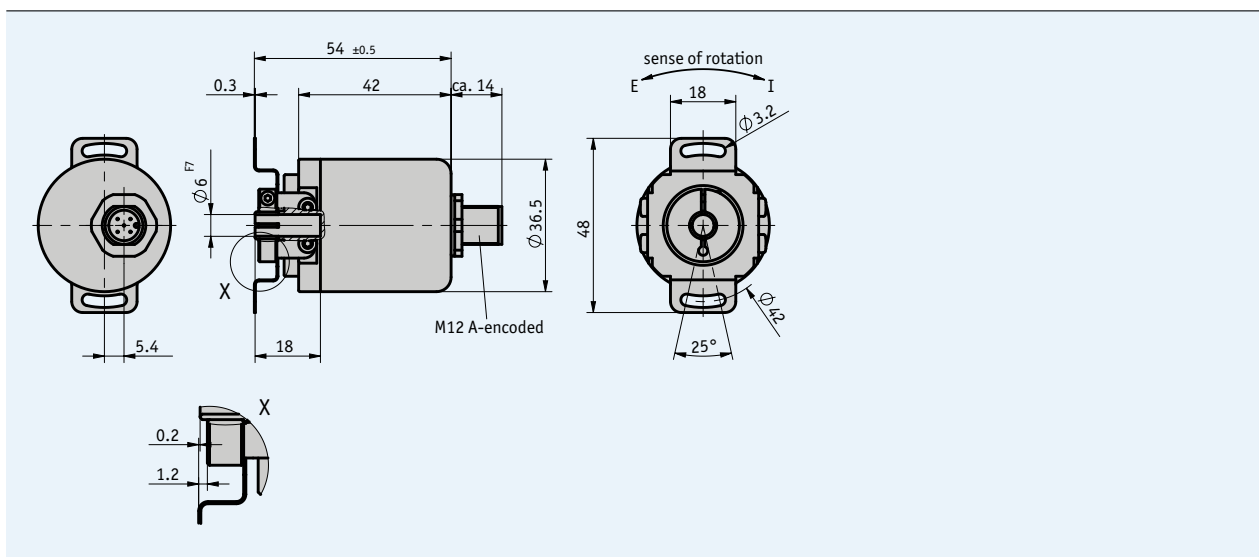
- Mating connectors Page 106
- Cable extension Page 108
- Electronic display MA10/4 Page 96
- Electronic display MA55 Page 94

Additional information:

General information and areas of application Page 8 cont.

Profile

- Absolute analog encoder
- 12 Bit (4096) resolution above the measuring range
- Operating temperature up to -40 °C
- Voltage (0 ... 10 V)/current (4 ... 20 mA) outputs
- Programmable measuring range via teach-in function with external inputs
- Hollow shaft with $\varnothing 6$ mm



2.1

Mechanical data

Feature	Technical data	Additional information
Max. speed	≤12000 rpm	
Shaft moment of inertia	≤20 gcm ²	
Starting torque	≤2 Ncm	at 25 °C
Shaft load rating	radial 80 N axial 20 N	
Weight	~0.15 kg	
Protection category	housing IP65, shaft IP54	
Operating temperature	-40 ... +85 °C	
Storage temperature	-40 ... +85 °C	
Shock resistance	≤100 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	≤10 g (10 ... 1000 Hz)	according to DIN EN 60068-2-6
Humidity	98%	condensation inadmissible
Shaft	stainless steel	
Housing	aluminium and coated steel	

Electrical data

Analog outputs

Feature	4 ... 20 mA (MWI)	0 ... 10 V (MWU)	Additional
Operating voltage	15 ... 30 V DC	12 ... 30 V DC	
Load resistance	<500 Ω, at UB ≥15 V DC	<10 kΩ, at UB ≥12 V DC	
Linearity	0.15 %	0.15 %	
Starting time	<1 s	<1 s	
Settling time	80 ms	80 ms	
Power consumption (typ.)	50 mA	50 mA	

Encoder data

Feature	Technical data	Additional information
Resolution	12 bit	above the programmed measuring range
Smallest measuring range	22.5°	
Accuracy Singleturn	±0.35°	
Resolution singleturn	12 bit	
Largest measuring range	65 536 revolution	16 revolution factory setting, only multiturn

2.1

Pin assignment

Signal	PIN
I _{out} /U _{out}	1
+UB	2
GND	3
Set 1	4
Set 2	5

Order

Order table

Feature	Order text	Specification	Additional information
Analog output	MWI	4 ... 20 mA	
	MWU	0 ... 10 V	
Measuring range	M	multiturn	
	S	singleturn	measuring range max. 360°

Order code

AH36M - - - M12

A B

Scope of delivery: AH36M, User information

Accessories:

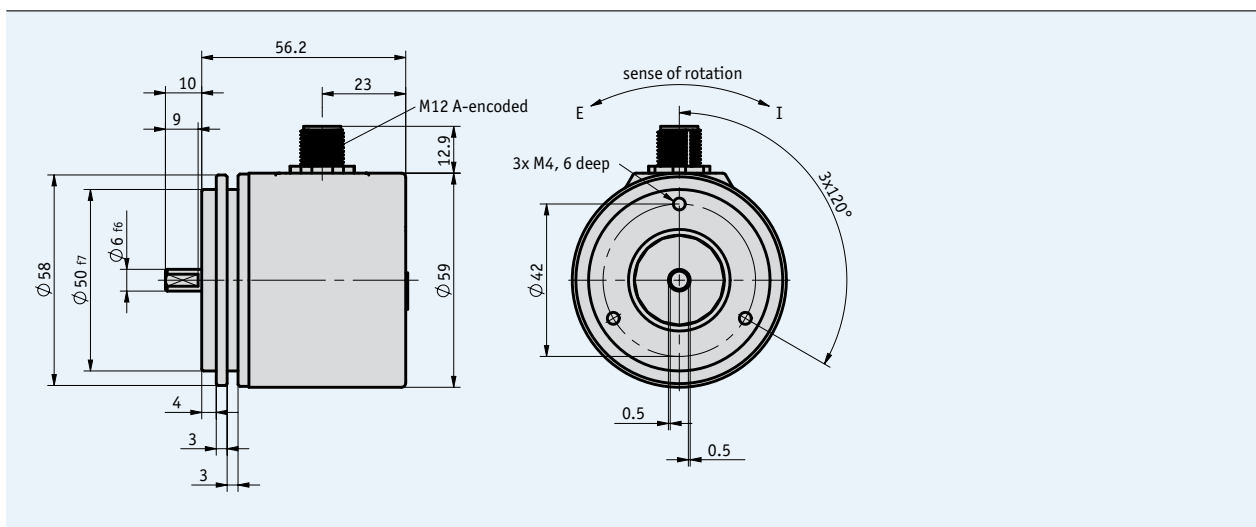
Mating connectors Page 106
 Cable extension Page 108
 Electronic display MA50 Page 92

Additional information:

General information and areas of application Page 8 cont.

Profile

- Absolute analog encoder
- 12 Bit (4096) resolution over the measuring range
- Operating temperature up to -40 °C
- Voltage (0 ... 10 V)/current (4 ... 20 mA) outputs
- Programmable measuring range via teach-in function with key function or external inputs



2.1

Mechanical data

Feature	Technical data	Additional information
Max. speed	≤12000 rpm	
Shaft moment of inertia	≤20 gcm ²	
Starting torque	≤2 Ncm	at 25 °C
Shaft load rating	radial 80 N axial 20 N	
Weight	~0.15 kg	
Protection category	housing IP64, shaft IP65	
Operating temperature	-40 ... +85 °C	
Storage temperature	-40 ... +85 °C	
Shock resistance	≤100 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g (10 ... 1000 Hz)	according to DIN EN 60068-2-6
Humidity	98%	condensation inadmissible
Shaft	stainless steel	
Housing	steel nickelized	

Electrical data

Analog outputs

Feature	4 ... 20 mA (MWI)	0 ... 10 V (MWU)	Additional
Operating voltage	15 ... 30 V DC	12 ... 30 V DC	
Load resistance	<500 Ω, at UB ≥15 V DC	<10 kΩ, at UB ≥12 V DC	
Linearity	0.15 %	0.15 %	
Starting time	<1 s	<1 s	
Settling time	80 ms	80 ms	
Power consumption (typ.)	50 mA	50 mA	

Encoder data

Feature	Technical data	Additional information
Resolution	12 bit	über den programmierten Messbereich
Smallest measuring range	22.5°	
Largest measuring range	65 536 revolution	16 revolution factory setting

Pin assignment

Signal	PIN
I _{out} /U _{out}	1
+UB	2
GND	3
Set 1	4
Set 2	5

Order

Order table

Feature	Order text	Specification	Additional information
Analog output	MWI	4 ... 20 mA	
	MWU	0 ... 10 V	

Order code

AV58M - A - 6 - M12

Scope of delivery: AV58M, User information

Accessories:

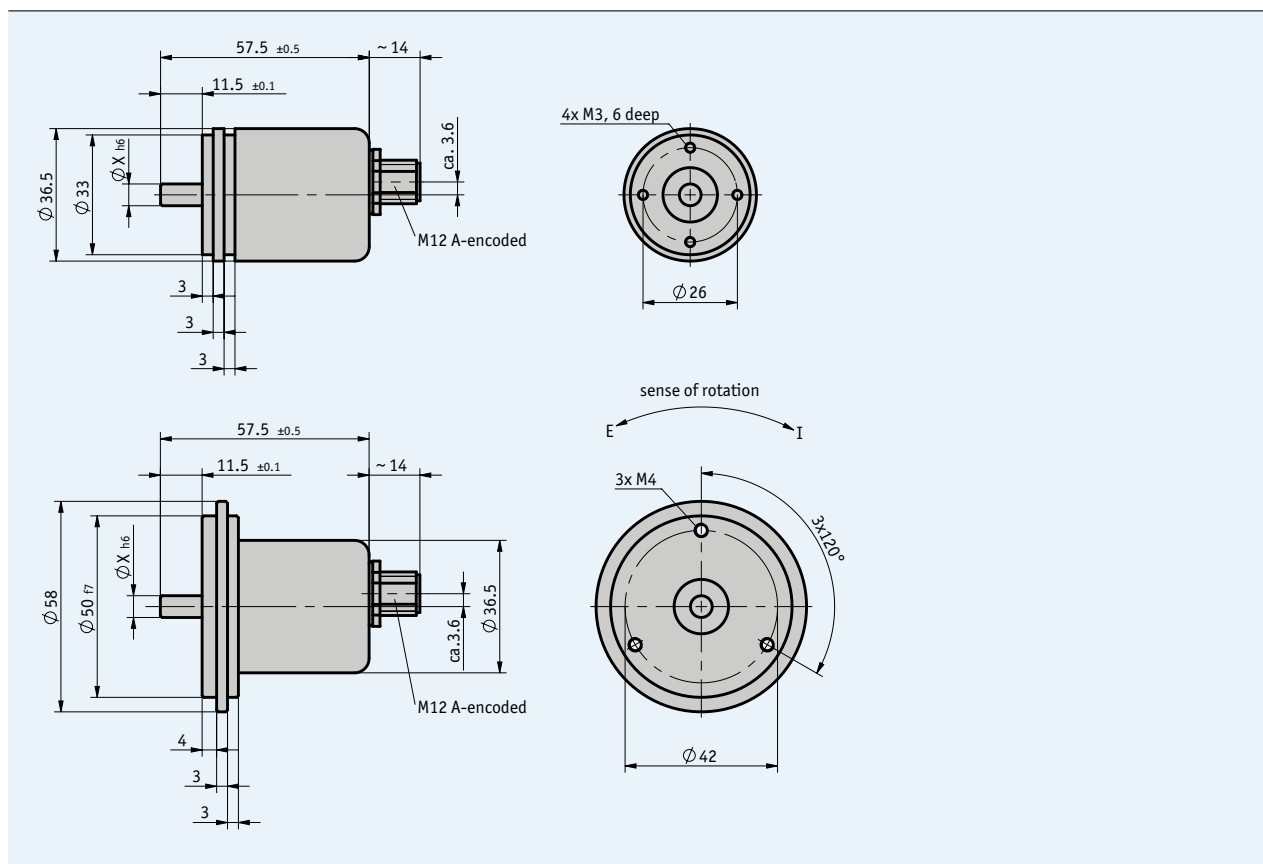
Mating connectors Page 106
 Cable extension Page 108
 Electronic display MA50 Page 92

Additional information:

General information and areas of application Page 8 cont.

Profile

- Compact design (36.5 mm diameter)
- CANopen (DS406) interface
- IP64 type of protection
- Multi-turn without battery
- Double ball bearings
- 13 bit multi-turn (8192 revolutions)
- 12 bit single-turn (4096 steps)



2.1

Mechanical data

Feature	Technical data	Additional information
Max. speed	12000 min ⁻¹	
Shaft moment of inertia	≤30 gcm ²	
Starting torque	≤3 Ncm	at 20 °C
Shaft load rating	radial 80 N axial 20 N	
Weight	~0.15 kg	
Protection category	housing IP65, shaft IP54 IP65	with flange Ø36 mm with flange Ø58 mm
Operating temperature	-30 ... +85 °C	
Storage temperature	-30 ... +85 °C	
Shock resistance	≤100 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g (10 ... 1000 Hz)	according to DIN EN 60068-2-6
Humidity	98%	condensation inadmissible
Shaft	stainless steel	
Housing	aluminum and steel nickelized	

Electrical data

Feature	Technical data	Additional information
Operating voltage	+10 ... +30 V DC	reverse-polarity protection
Steps per revolution	4096	
Number of revolution	4096	
Power consumption	≤1.2 W	
CAN interface	according ISO 11898, galvanically isolated	CANopen (DS406)
Transmission rate	max. 1M Baud	
Device addressing	adjustable	per SDO or Layer Setting Service (LSS)
Cycle time	<600 µs	
EMC	EN 61000-6-4, emitted interference EN 61000-6-2, noise immunity	

Pin assignment

Signal	PIN
CAN_GND	1
+UB	2
GND	3
CAN_H	4
CAN_L	5

Order

Order table

Feature	Order text	Specification	Additional information
Mounting type	6/S36	shaft Ø6 mm, flange Ø36 mm	
	6/S58	shaft Ø6 mm, flange Ø58 mm	

Order code

WV36M/CAN - 4096 - 4096 - A - M12

Scope of delivery: WV36M/CAN, User information

Accessories:

Mating connectors Page 106
 Cable extension Page 108
 Self-aligning coupling Page 112

Additional information:

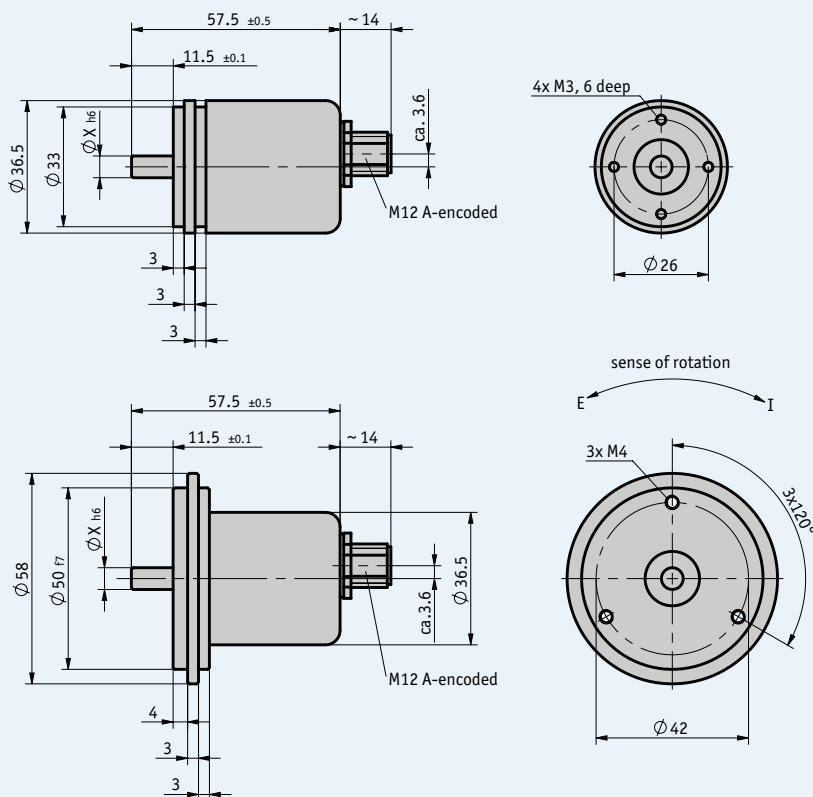
General information and areas of application Page 8 cont.

Angle encoder WV36M/SSI

Metal housing with solid shaft

Profile

- Compact design (36.5mm diameter)
- SSI interface
- IP64 type of protection
- Multi-turn without battery
- Double ball bearings
- 13 bit multi-turn (8192 revolutions)
- 12 bit single-turn (4096 steps)



Mechanical data

Feature	Technical data	Additional information
Max. speed	12000 min ⁻¹	
Shaft moment of inertia	≤30 gcm ²	
Starting torque	≤3 Ncm	at 20 °C
Shaft load rating	radial 80 N axial 20 N	
Weight	~0.15 kg	
Protection category	housing IP65, shaft IP54	with flange Ø36 mm with flange Ø58 mm
Operating temperature	-30 ... +85 °C	
Storage temperature	-30 ... +85 °C	
Shock resistance	≤100 g/6 ms	according to DIN EN 60068-2-27
Vibration resistance	10 g (10 ... 1000 Hz)	according to DIN EN 60068-2-6
Humidity	98%	condensation inadmissible
Shaft	stainless steel	
Housing	aluminum and steel nickelized	

Electrical data

Feature	Technical data	Additional information
Operating voltage	+10 ... +30 V DC	reverse-polarity protection
Steps per revolution	4096	
SSI clock rate	100 kHz ... 2 MHz	max. 120 m; 100 kHz
Power consumption	~0.25 W	
Cycle time (singleturn)	<600 µs	
SSI data output	line-driver according to RS422	
EMC	EN 61000-6-4, emitted interference EN 61000-6-2, noise immunity	

2.1

Pin assignment

Signal	PIN
GND	1
+UB	2
Clock +	3
Clock -	4
Data +	5
Data -	6
Calibration input	7
Direction	8

Order

Order table

Feature	Order text	Specification	Additional information
Output code	B	binary	
	G	gray	
Number of revolution	4096	12 Bit	
	8192	13 Bit	
Mounting type	6/S36	shaft Ø6 mm, flange Ø36 mm	
	6/S58	shaft Ø6 mm, flange Ø58 mm	

Order code

WV36M/SSI - - 4096 - - - M12

Scope of delivery: WV36M/SSI, User information

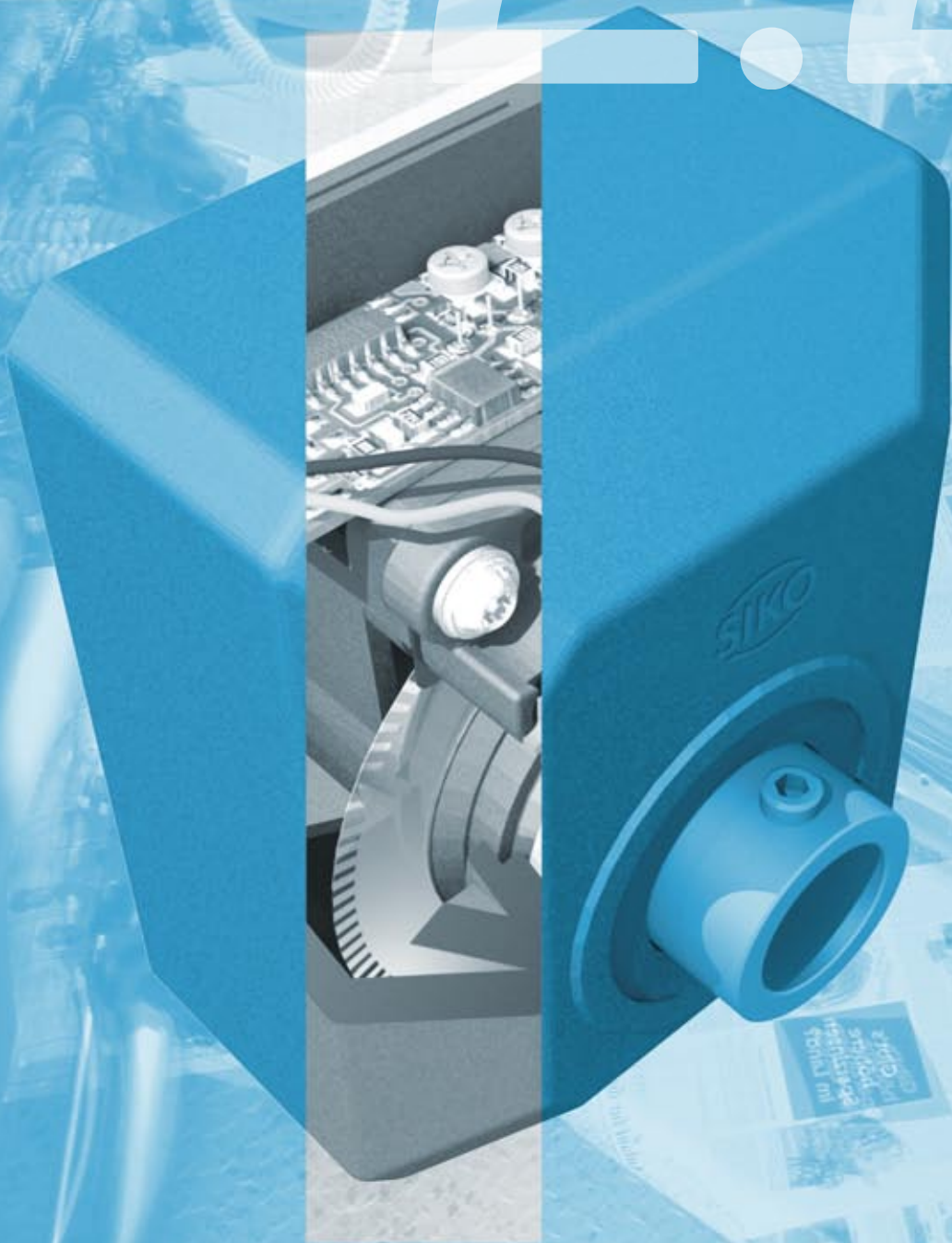
Accessories:

Mating connectors Page 106
 Cable extension Page 108
 Self-aligning coupling Page 112
 Electronic display MA10/4 Page 96

Additional information:

General information and areas of application Page 8 cont.

2.2



2.0 | RotoLine Table of contents 4
2.1 | Magnetic rotary encoders 7

2.2 | Optical rotary encoders

General information and areas of application		46
Function and application		48
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Products		
Incremental encoders	IG06	50
	IG07	53
	IG17	57

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2.4 | Electronic Displays 89
2.5 | Accessories 105
2.6 | Product index, Contact information 115

2.0

2.1

2.2

2.3

2.4

2.5

2.6

Sophisticated technology for high-resolution applications

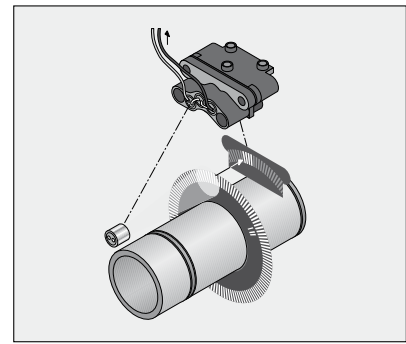
Optical encoders have an excellent cost-benefit ratio. This fully developed technology offers robust and well-sealed housings, permitting reliable measurement with very high resolutions in a large number of industrial applications.

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.

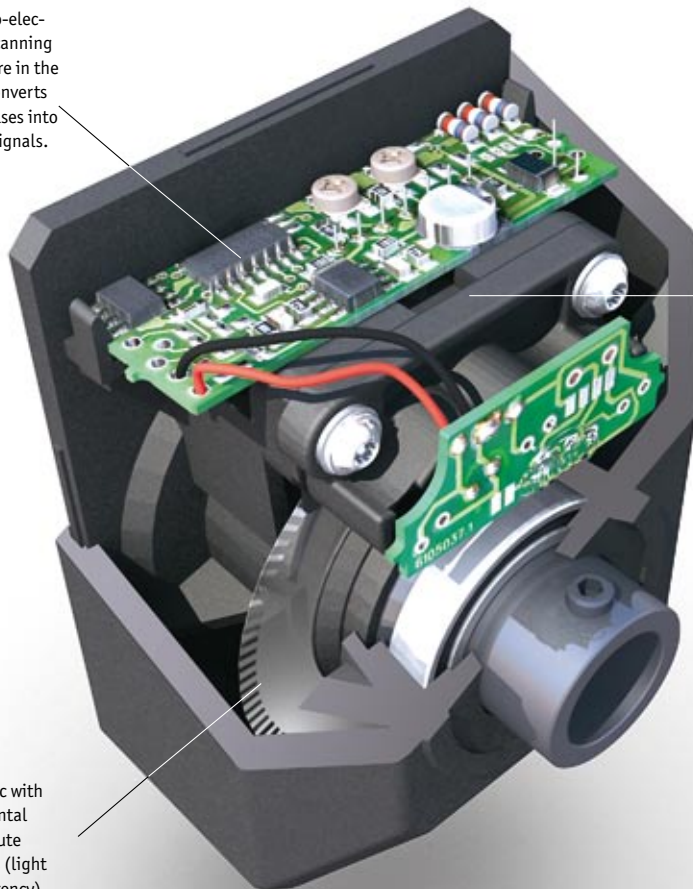


The incremental, opto-electronic scanning principle using an incremental encoder as an example

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

Applications

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



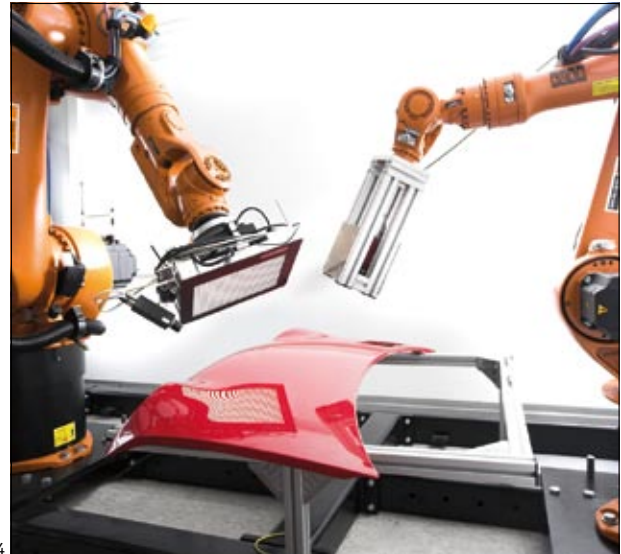
1



2



3

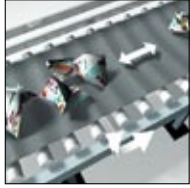


4

[1] High air humidity – food production © Handtmann Maschinenfabrik GmbH & Co. KG, [2] Shavings, high mechanical loads – cutting and surface processing in the wood industry. [3] Paper dust and precision – monitoring printing speed, roller alignment and setting of paper formats. [4] 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).

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.)



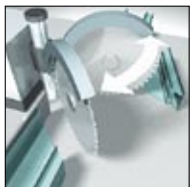
Reliable incremental or absolute path measurement: Robust housings encapsulate the high-resolution encoders, guarantee precise measuring results on a large and small scale.



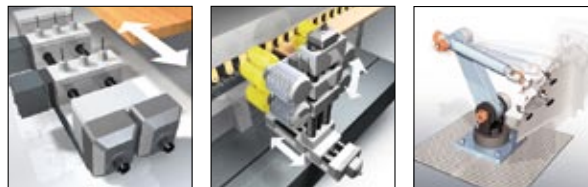
e.g., run length control, storage technology, elevators for material, packing and cutting ...

- 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



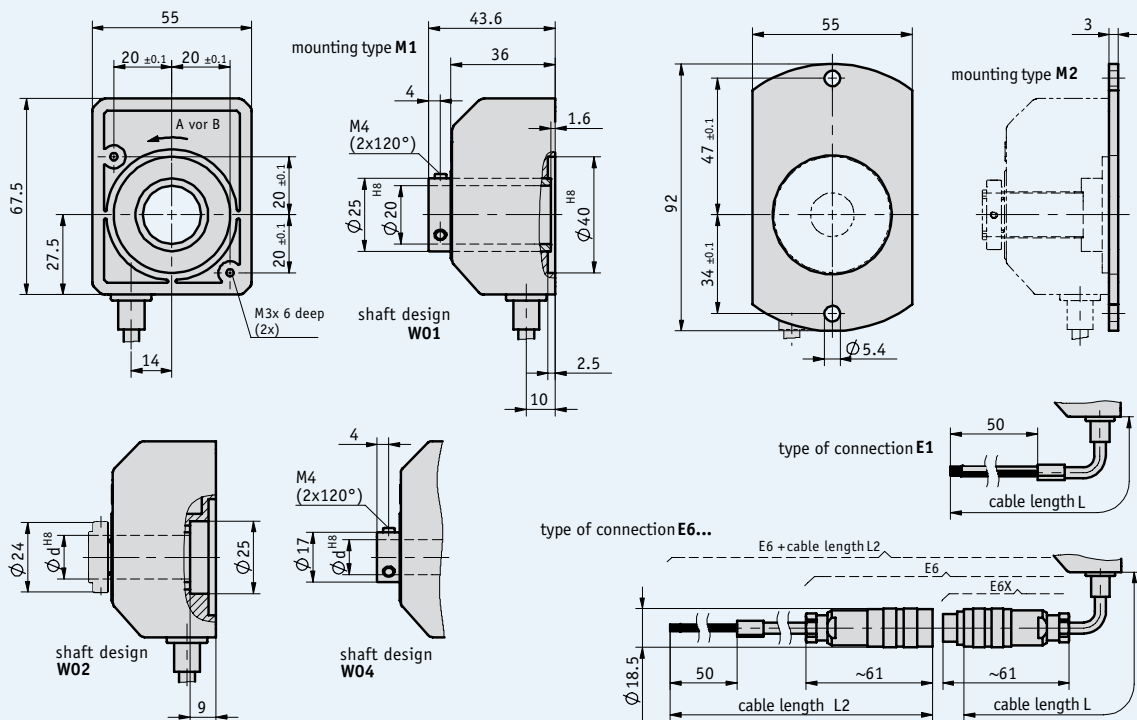
IG17

Page	50	53	57
Measurement type			
Incremental	•	•	•
Shaft design			
Hollow shaft	•	•	
Solid shaft			•
Shaft diameter			
	10 ...20 mm	12 ...20 mm	6 ...16 mm
Output circuit			
PP	•	•	•
OC	•		
OP		•	•
LD5		•	•
LD24		•	•
Housing			
Plastic	•		
Zinc die-cast		•	•
Resolution			
Max. pulses/revolution	1024	1024	1024

2.2

Profile

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



Mechanical data

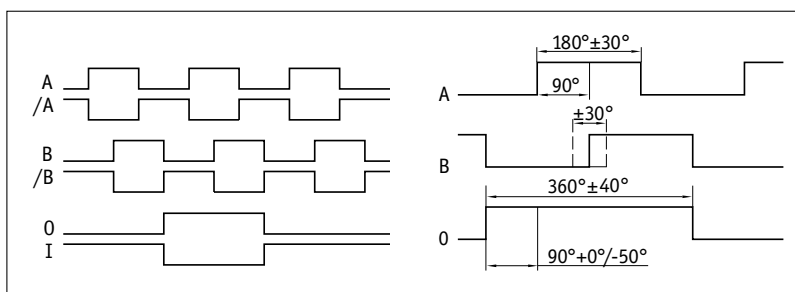
Feature	Technical data	Additional information
Max. speed	6000 rpm 600 rpm	with W02, W04 with W01, W01N
Shaft moment of inertia	$\sim 10.5 \times 10^{-6} \text{ kgm}^2$ $\sim 9.5 \times 10^{-6} \text{ kgm}^2$ $\sim 9 \times 10^{-6} \text{ kgm}^2$	with W01, W01N with W02 with W04
Starting torque at 20 °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 25N	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	

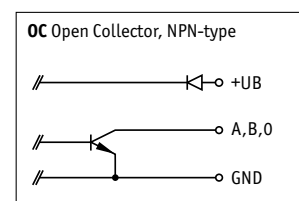
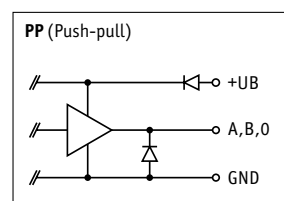
Signal image



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 C	oil-resistant	
Type of connection	E1 D E6 D E6X D	flying leads cable coupler with cable extension cable coupler	
Cable length L	... E ... E	0.3, 2 ... 40 m, in steps of 1 m 0.3, 2, 3	only PVC only PUR
Cable length L2	... F ... F	0.3, 2 ... 15 m, in steps of 1 m 0.3, 2, 3	only PVC only PUR
Mounting type	M1 G M2 G	with blind hole bore with mounting plate	
Output circuit	PP H OC H	push-pull open collector	
Shaft design	W01 I W02 I W04 I	set screw/plain bearing clamp ring/ball bearing set screw/ball bearing	
Hollow shaft/diameter (mm)	20 K ... K ... K	∅ 20 mm 14, 15 mm 10, 12 mm	with W01 with W02 with W04

■ **Order code**



Scope of delivery: IG06, User information

Accessories:
Electronic display MA10/4
Electronic display MA55

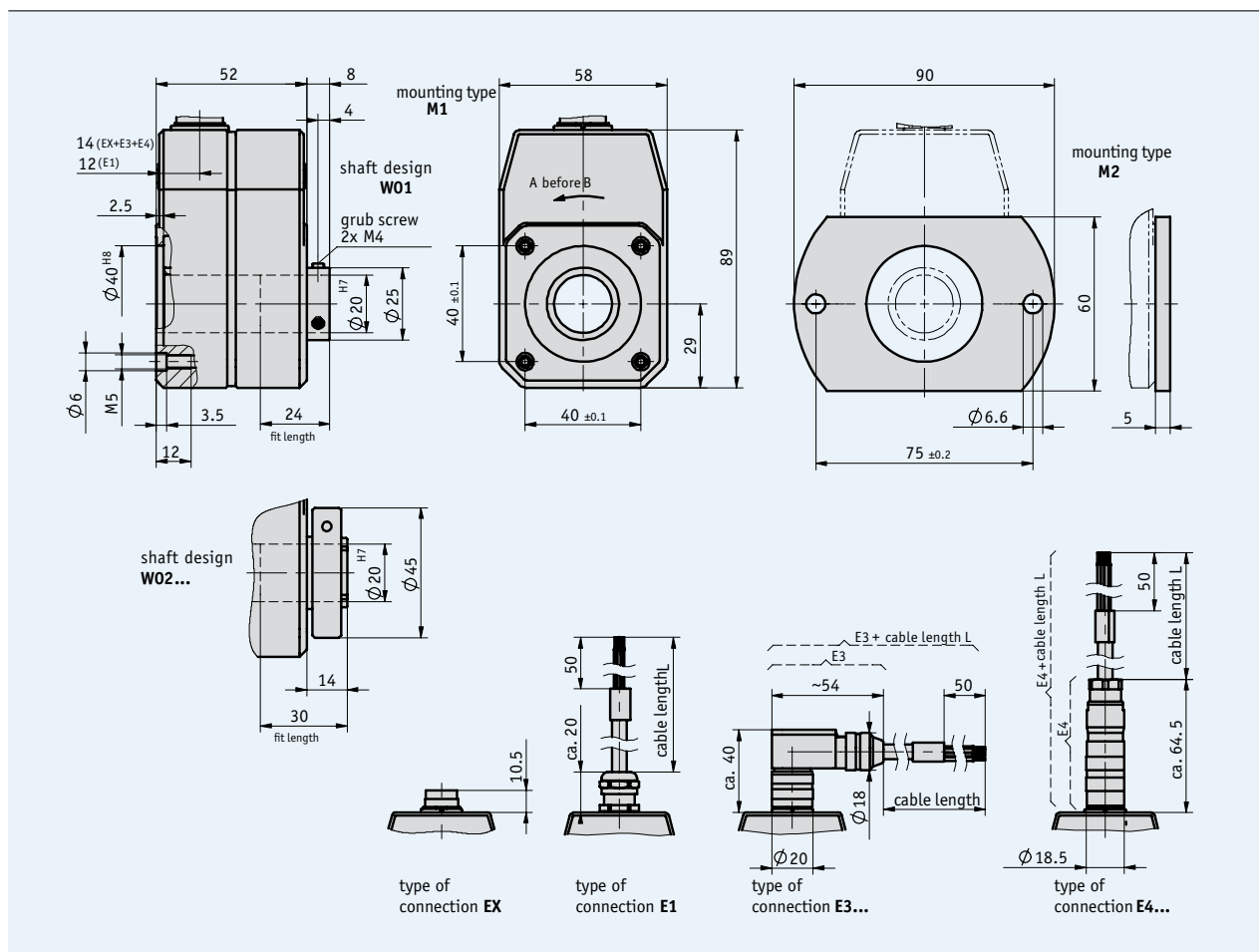
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Page 94

Additional information:
General information and areas of application

Page 46 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

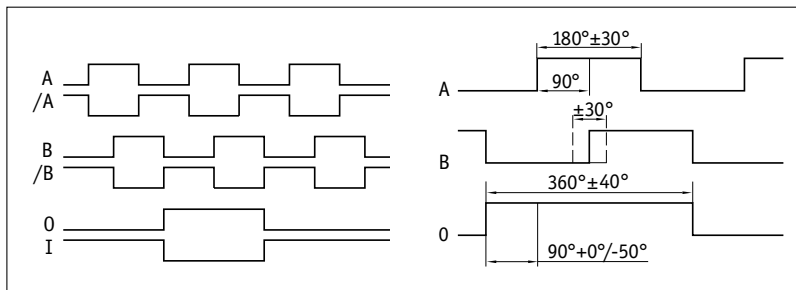
Feature	Technical data	Additional information
Max. speed	6000 rpm 3000 rpm	with IP64 with IP65
Shaft moment of inertia	~28.5 x 10 ⁻⁶ kgm ² ~58.5 x 10 ⁻⁶ kgm ² ~35.5 x 10 ⁻⁶ kgm ²	with W01 with W02 with W03
Starting torque at 20 °C	≤6 Ncm ≤10 Ncm	with IP64 with IP65
Shaft load rating	radial 5600 N axial 1400 N	
Weight	~0.75 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 ±5 %	+10 ... +30 V DC	
Current consumpt. w/o load (typ.)	<40 mA	<40 mA	<40 mA	AB0 variant
Maximum load/channel	±40 mA, short circuit-resist.	±40 mA, short circuit-resist.	±40 mA, short circuit-resist.	
Max. pulse frequency	80 kHz	50 kHz	50 kHz	
Phasing	90° ±30°	90° ±30°	90° ±30°	
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
0/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

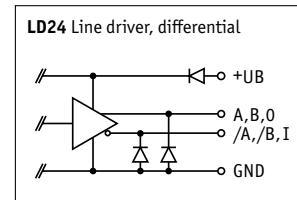
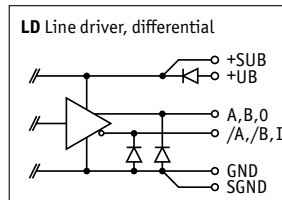
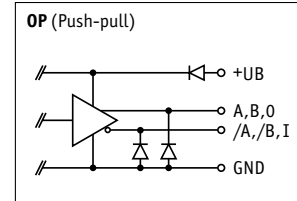
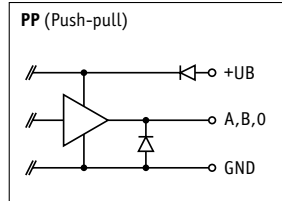
Output signals ABO

Signal	E1	EX, E3, E4
A	yellow	A
B	white	B
0	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 only with LD5	red	G
SGND only with LD5	blue	H
0	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 ... 50 m, in steps of 1 m without cable	
Mounting type	M1 M2 E	with blind hole bore with flange	
Output circuit	PP OP LD LD24 F	push-pull push-pull with inverted signals line driver line driver, 24 V	
Shaft design/diameter	W01 W01/RH12 W01/RH14 W01/RH15 W01/RH16 W02 W02N G	∅ 20 mm with reducing bush ∅ 12 mm with reducing bush ∅ 14 mm with reducing bush ∅ 15 mm with reducing bush ∅ 16 mm ∅ 20 mm ∅ 20 mm, stainless steel	ball bearing and clamping screw ball bearing and clamping screw ball bearing and clamping screw ball bearing and clamping screw ball bearing and clamping screw ball bearing und clamp ring ball bearing und clamp ring
Bearing	MS RS H	high-precision packed sealing gap, IP64 enhanced bearing sealing, IP65	

Order code

IG07 - - - - - - - - - - SV - SG

A B C D E F G H

Scope of delivery: IG07, User information

Accessories:

Electronic display MA10/4

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Electronic display MA55

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Additional information:

General information and areas of application

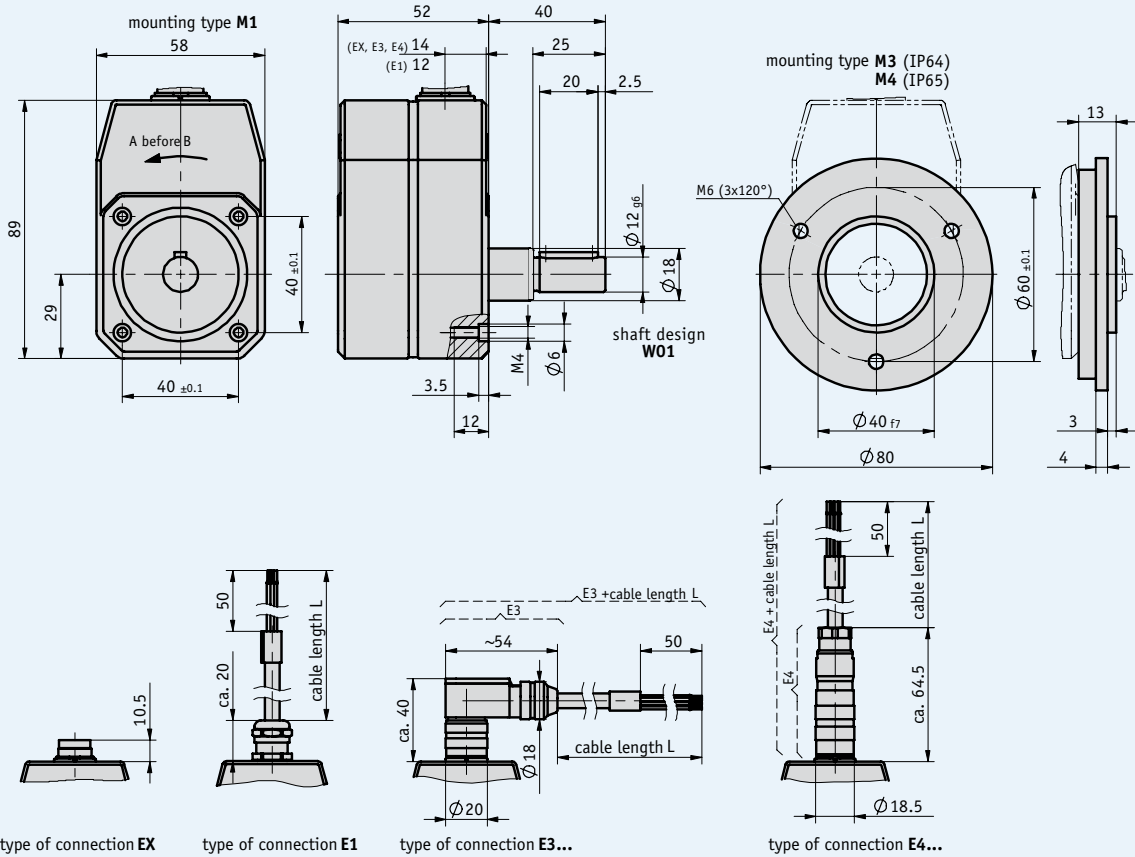
Page 46 cont.

Incremental encoder IG17

Housing made of zinc die-cast with solid shaft

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

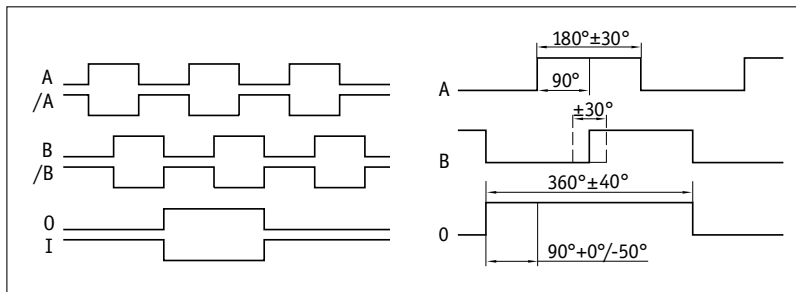
Feature	Technical data	Additional information
Max. speed	6000 rpm 3000 rpm	with IP64 with IP65
Shaft moment of inertia	$\sim 28.5 \times 10^{-6} \text{ kgm}^2$	with W01
Starting torque at 20 °C	$\leq 6 \text{ Ncm}$ $\leq 10 \text{ Ncm}$	with IP64 with IP65
Shaft load rating	radial 5600 N axial 1400 N	
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
0/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

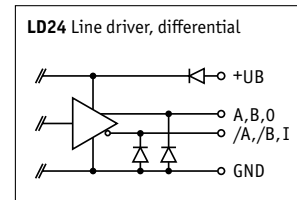
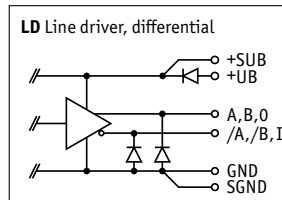
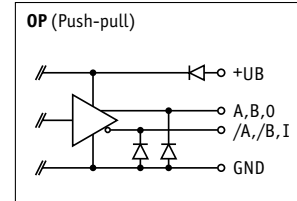
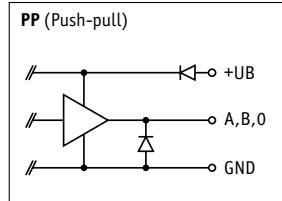
Output signals ABO

Signal	E1	EX, E3, E4
A	yellow	A
B	white	B
0	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		
0	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**



Scope of delivery: IG17, User information

Accessories:

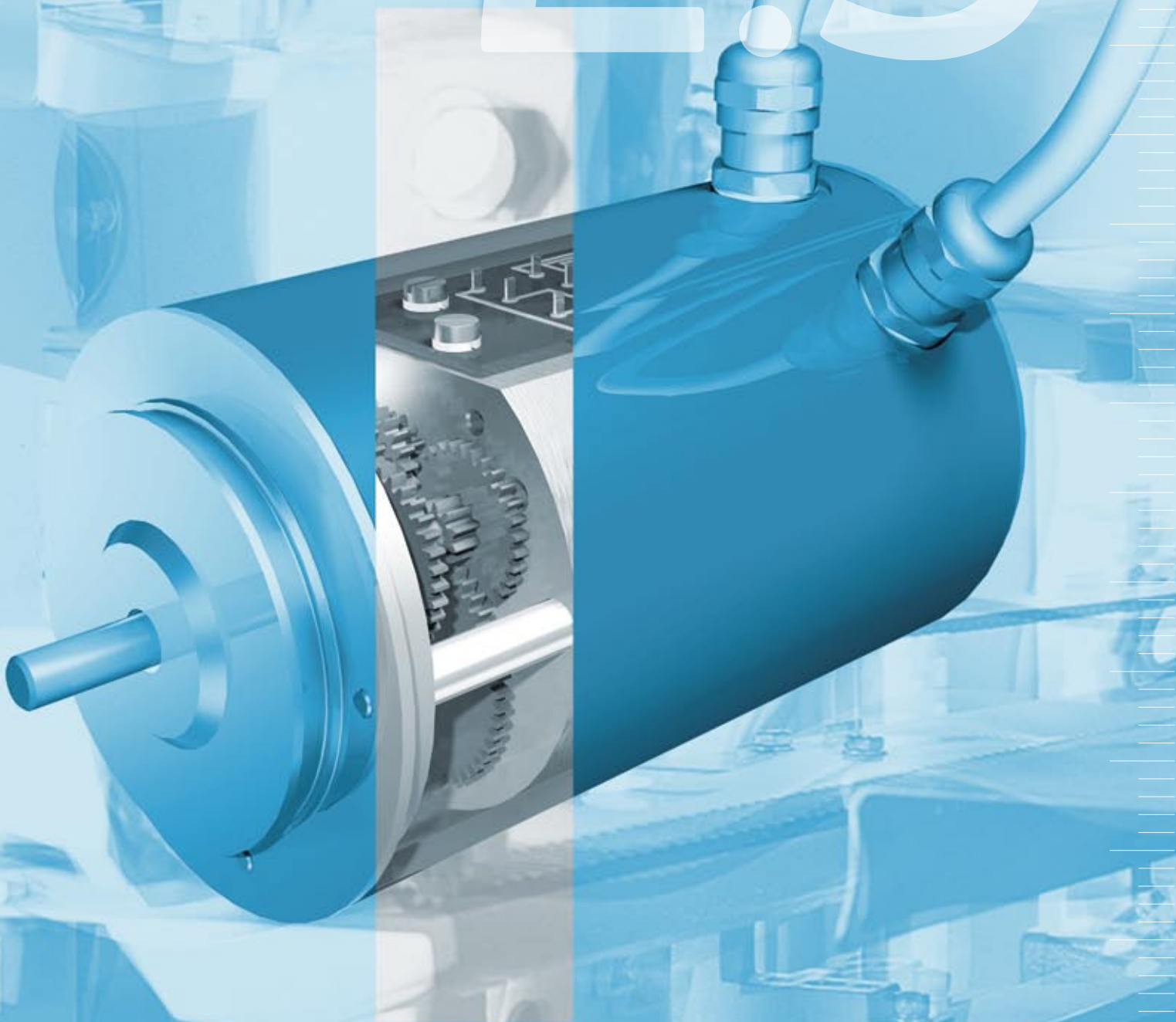
- Servo-clamp Page 113
- Electronic display MA10/4 Page 96
- Electronic display MA55 Page 94

Additional information:

General information and areas of application Page 46 cont.

2.2

23



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2.3 | Geared potentiometers

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2.0

2.1

2.2

2.3

2.4

2.5

2.6

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.

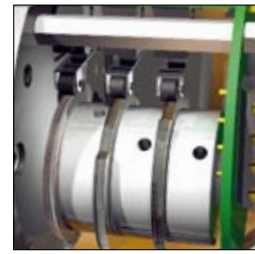
This mature and track-proven geared potentiometer measuring method, also referred to as GP, registers rotation and makes this available for length and angle definition. A combination of gear unit and potentiometer tracks rotation and forwards the information to the follow-up "evaluators" (such as indicators,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



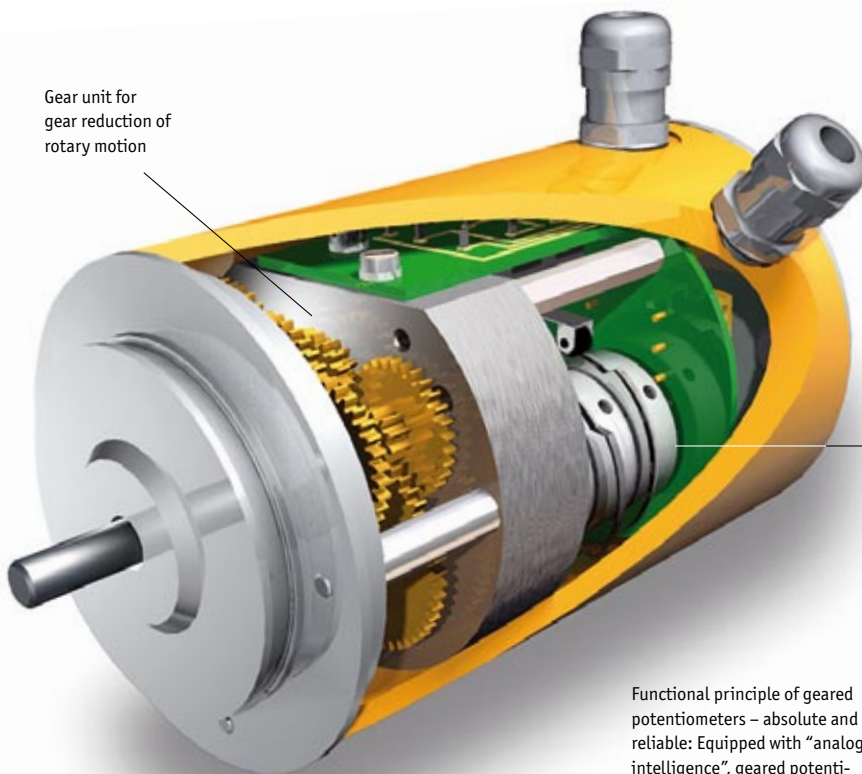
Switch cam with configurable "switching patterns"

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

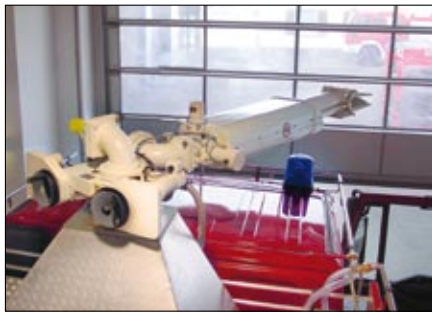
Gear unit for gear reduction of rotary motion



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.

2.3



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



5

[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).

2.3

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).

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

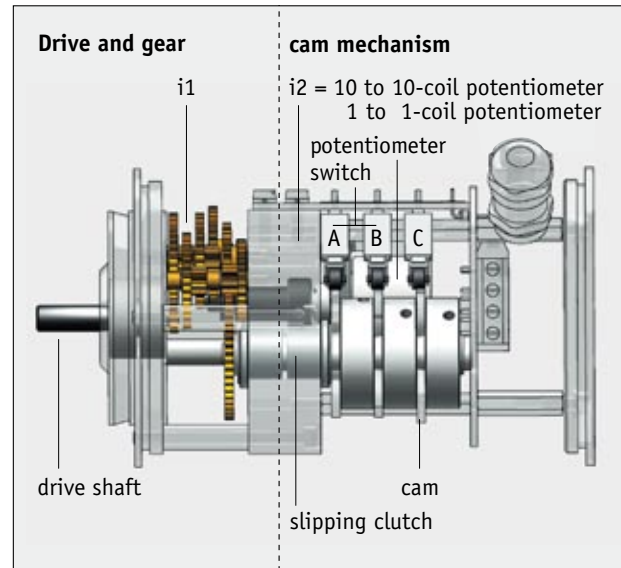
Note

- 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.

2.3



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

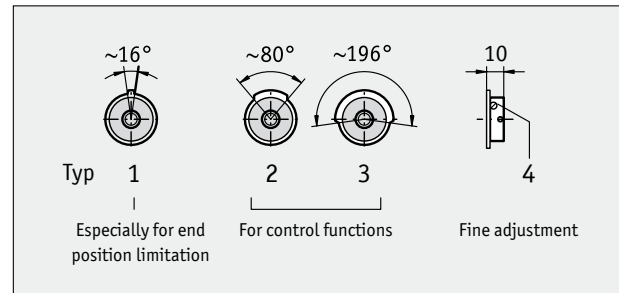
GP43 and GP44 are available with up to three cam switches to control additional switching operations.

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

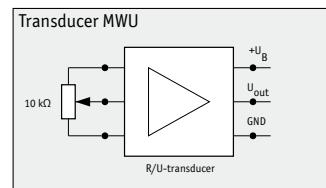
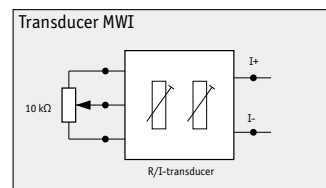
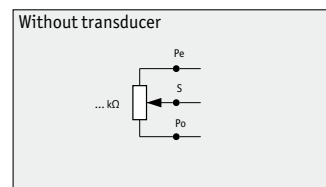
On the potentiometers with transducers the measurement path can be modified with so-called trimming potentiometers.

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.



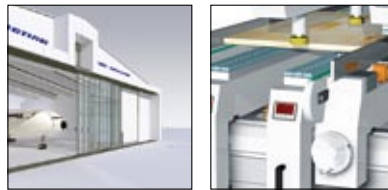
e.g., mobile derrick jibs, warehousing/forklift technologies, level measurement ...

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

Path measurement



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



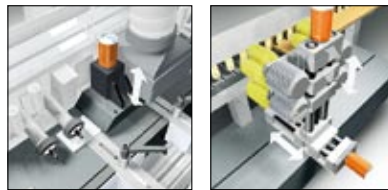
e.g., door locking, dowel drilling machines ...

- 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 ...

2.3

Geared potentiometers

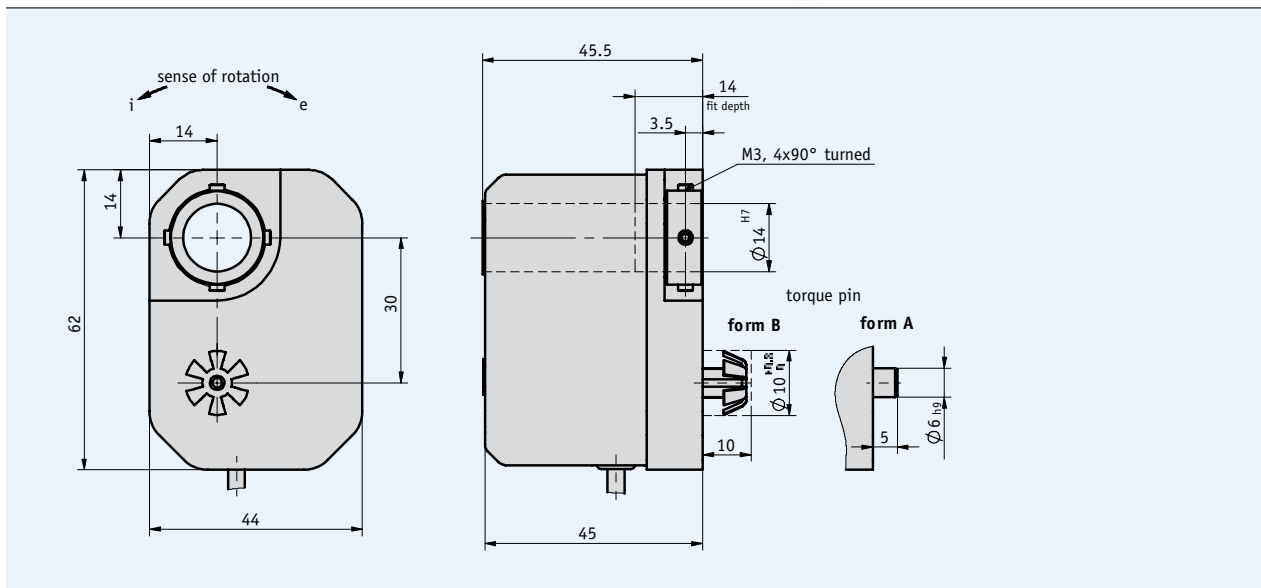
						
	GP02	GP03/1	GP04/1	GP09	GP43	GP44
Page	70	73	76	79	82	85
Shaft design						
Hollow shaft	•		•	•		•
Solid shaft		•	•		•	•
Shaft diameter						
	14 mm	6 mm	16, 20 mm	20 mm	6 mm	16, 20 mm
Analog outputs						
Potentiometer	•	•	•	•	•	•
Power output	•	•	•	•	•	•
Voltage output		•	•	•		
Housing						
Plastic	•					
Plastic reinforced		•				
Aluminum		•	•		•	•
Zinc die-cast				•		
Protection category						
IP52	•		•	•	•	•
IP65		•	•	•	•	•
IP68				•		
Switching cam						
					•	•
Friction clutch						
		•	•	•	•	•

Geared potentiometer GP02

Compact design with through hollow shaft

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	0.2 ... 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	Operating voltage
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

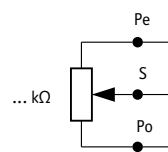
Potentiometric outputs P01, P05, P10

Signal	Cable color
Po	brown
Pe	white
S	green

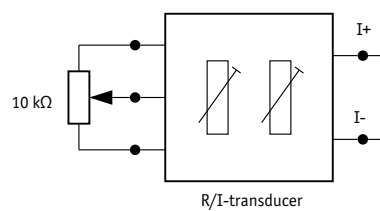
Transducer MWI

Signal	Cable color
I+	brown
I-	white

Potentiometric outputs P01, P05, P10



Transducer MWI



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	0.2, 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 and potentiometer type 02 or 03
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	0.2 ... 15 m in steps of 0.1 m	

■ **Order code**



Scope of delivery: GP02, User information

Accessories:
Electronic display MA50

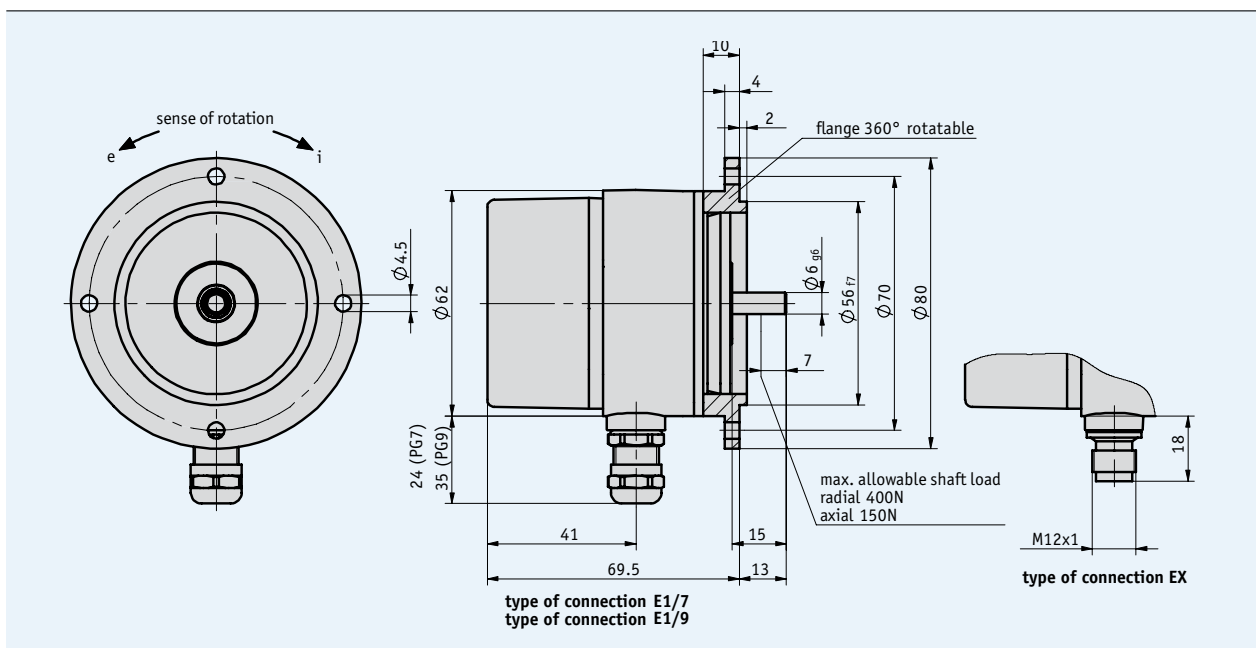
Page 92

Additional information:
General information and areas of application

Page 64 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	Operating voltage
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

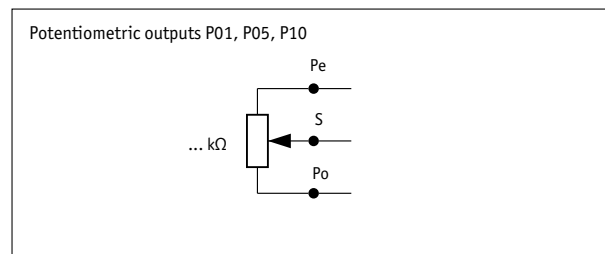
Characteristic/Specification	01	02	03
Design	hybrid	wire	hybrid
Resistance	5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ
Resistance tolerance	±10 %	±5 %	±5 %
Linearity tolerance	±1 %	±0.25 %	±0.25 %
Load rating	1 W at 70 °C	1 W at 70 °C	2 W at 70 °C
Range of rotation	340° ±5° (mechanically straight-through)	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

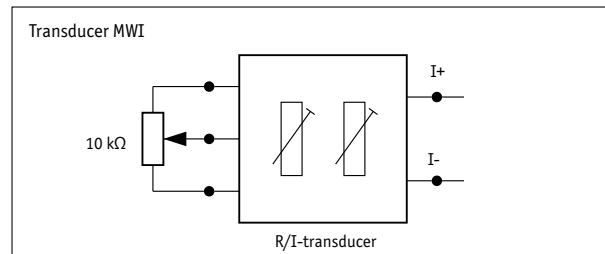
Potentiometric outputs P01, P05, P10

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



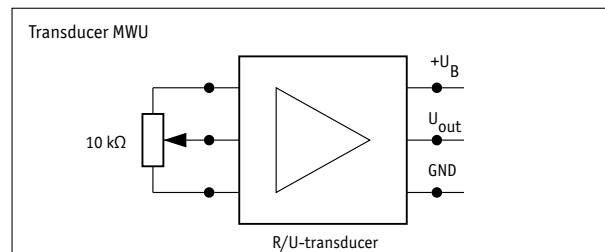
Transducer MWI

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)**

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

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, 0.25, 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 E1/9 EX B	screwed cable gland PG7 screwed cable gland PG9 for M12 connector	
Potentiometer type	01 02 03 C	1 coil, hybrid 10 coils, wire 10 coils, hybrid	
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 potentiometer type 02 or 03 only with potentiometer type 02 or 03 only with potentiometer type 02 or 03
Sense of rotation	ODR E	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

2.3

■ **Order code**



Scope of delivery: GP03/1, User information

Accessories:

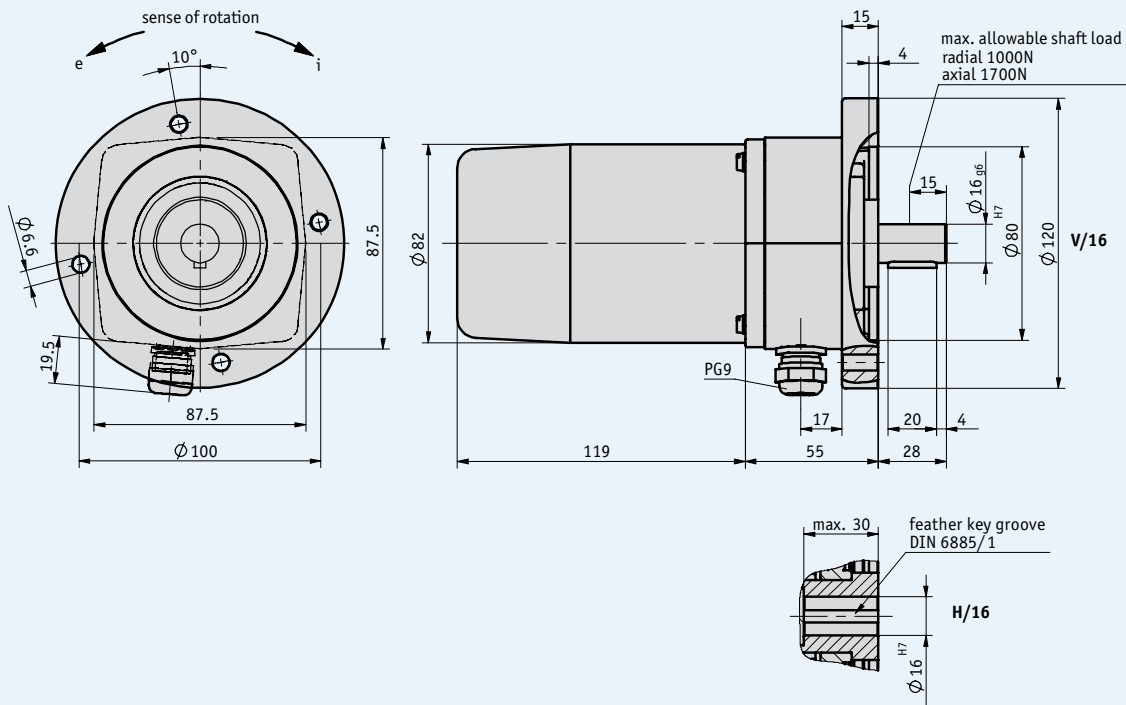
- Mating connectors Page 106
- Self-aligning coupling Page 112
- Electronic display MA50 Page 92

Additional information:

General information and areas of application Page 64 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
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	Operating voltage
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	5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ
Resistance tolerance	±10 %	±5 %	±5 %
Linearity tolerance	±1 %	±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

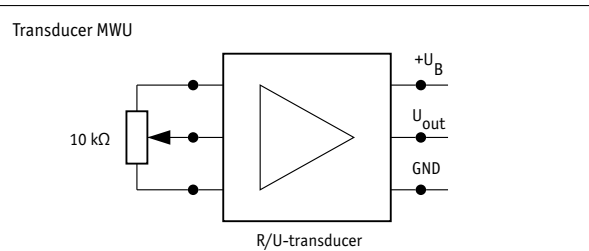
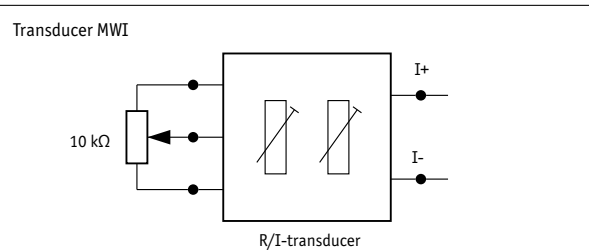
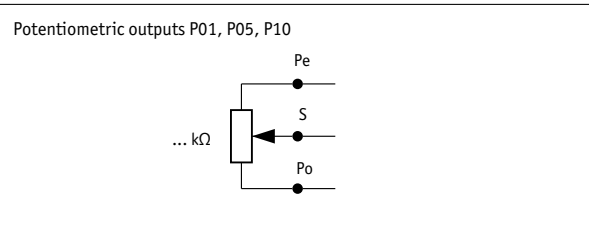
Signal	Terminal
Po	3
Pe	1
S	2

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)**

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

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, 0.166, 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	
	H/16	hollow shaft Ø 16 mm	
	V/20	solid shaft Ø 20 mm	
	V/16	solid shaft Ø 16 mm	
Potentiometer type	01 C	1 coil, hybrid	
	02	10 coils, wire	
	03	10 coils, hybrid	
Analog output	MWI D	transducer 4 ... 20 mA	only with potentiometer type 02 or 03
	MWU	transducer 0 ... 10 V	only with potentiometer type 02 or 03
	P01	potentiometer 1 kΩ	only with potentiometer type 02 or 03
	P05	potentiometer 5 kΩ	
Sense of rotation	ODR E	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
Protection category	IP52 F		
	IP65		

■ **Order code**



Scope of delivery: GP04/1, User information

Accessories:
Electronic display MA50

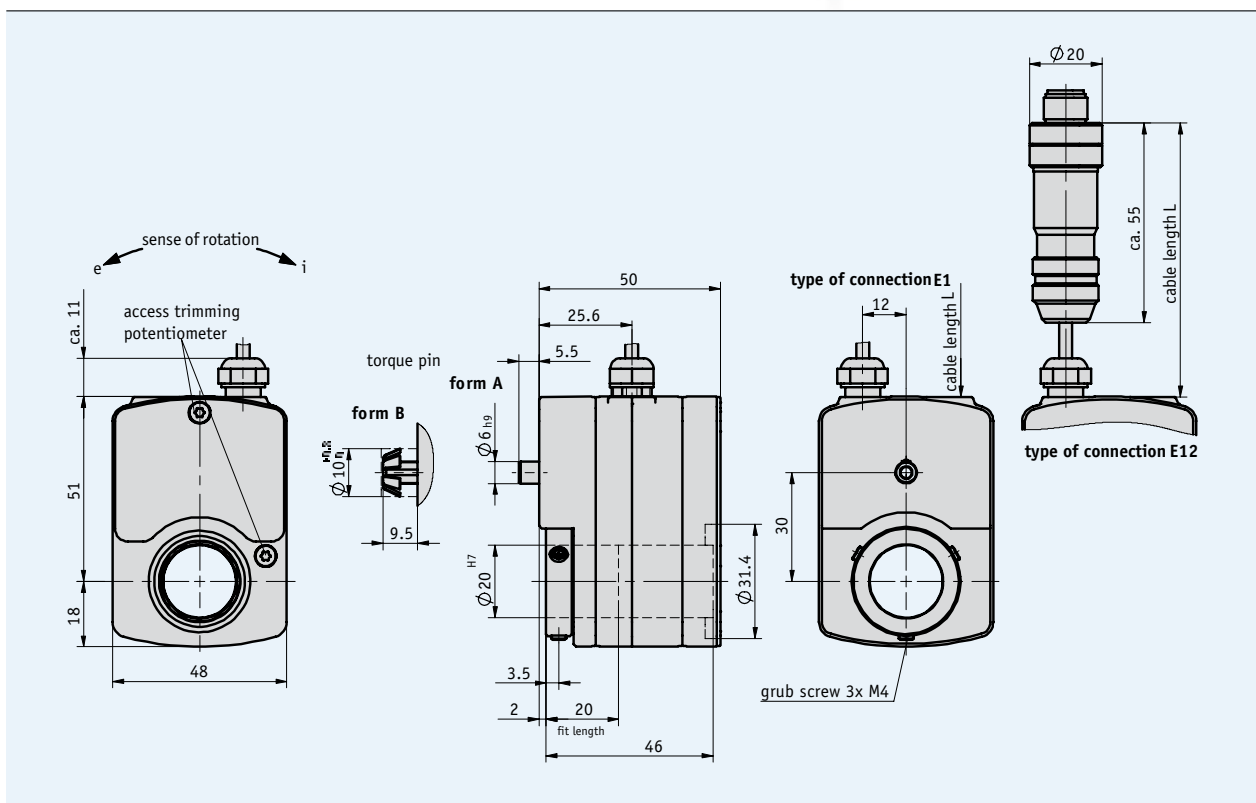
Page 92

Additional information:
General information and areas of application

Page 64 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	Operating voltage
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

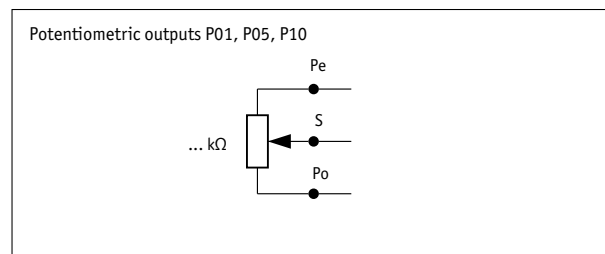
Characteristic/Specification	01	02	03
Design	hybrid	wire	hybrid
Resistance	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ	1 kΩ, 5 kΩ, 10 kΩ
Resistance tolerance	±5 %	±5 %	±5 %
Linearity tolerance	±0.25	±0.25 %	±0.1 %
Load rating	1 W at 70 °C	1 W at 70 °C	2 W at 70 °C
Range of rotation	340° ±5° (mechanically straight-through)	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

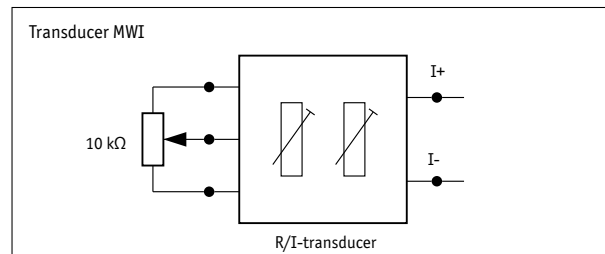
Potentiometric outputs P01, P05, P10

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



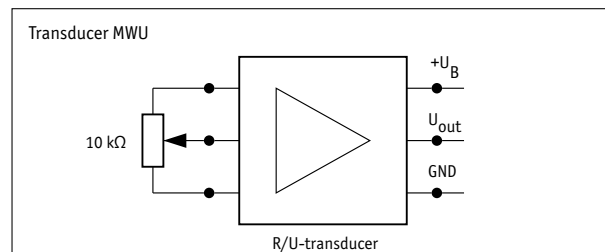
Transducer MWI

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 potentiometer type 02 only with potentiometer type 02
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	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:

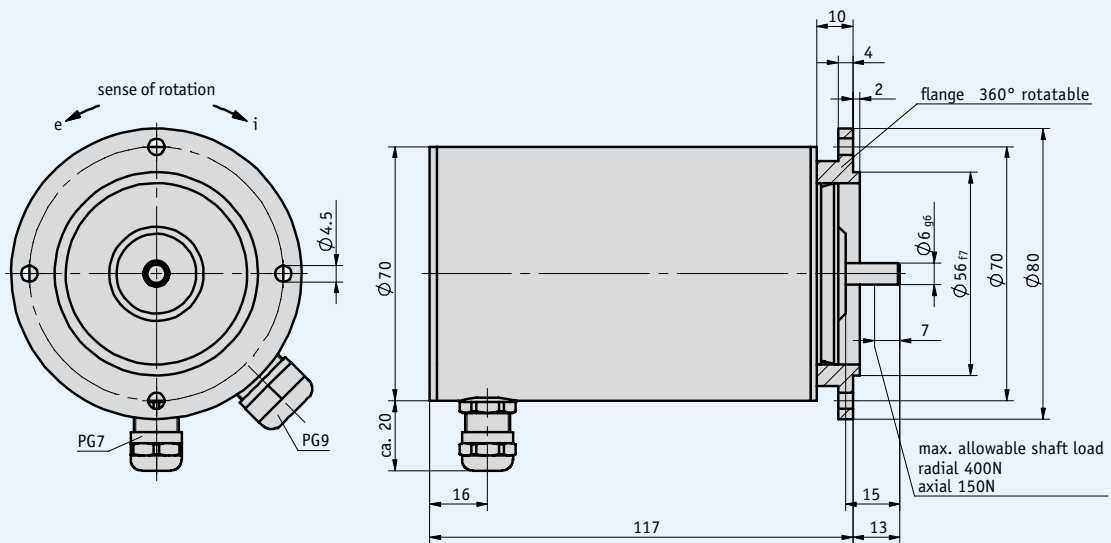
- Mating connectors Page 106
- Self-aligning coupling Page 112
- Electronic display MA50 Page 92

Additional information:

General information and areas of application Page 64 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	Operating voltage
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
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

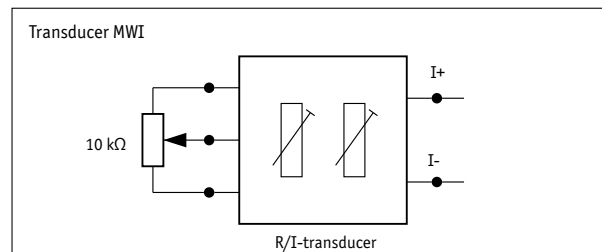
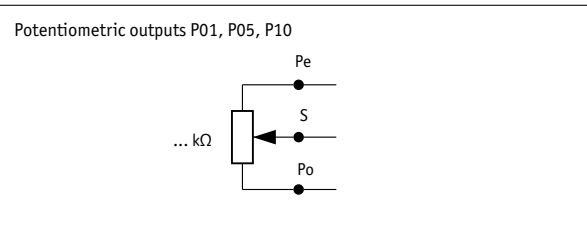
Signal	Terminal
Po	11
Pe	13
S	12

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)**


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

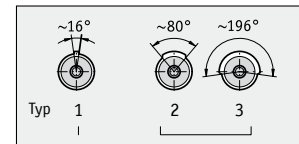
n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i1 = order feature for gear ratio

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.

■ **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 02 03 03/0,1 B	1 coil, hybrid 10 coils, wire 10 coils, hybrid 10 coils, hybrid, linear tolerance ±0,1 %	
Resistance	P01 P05 P10 C	potentiometer 1 kΩ potentiometer 5 kΩ potentiometer 10 kΩ	
Transducer	MWI OMW D	transducer 4 ... 20 mA without	only with P10 and potentiometer type 02 or 03
Sense of rotation	ODR E	without indication of sense of rotation	with P01, P05 or P10
	e	counter-clockwise ascending values	with MWI
	i	clockwise ascending values	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	above 48 V dielectric strength	
	2	up to 48 V dielectric strength	

■ **Order code**



Scope of delivery: GP43, User information

Accessories:

Self-aligning coupling
 Electronic display MA50

Page 112
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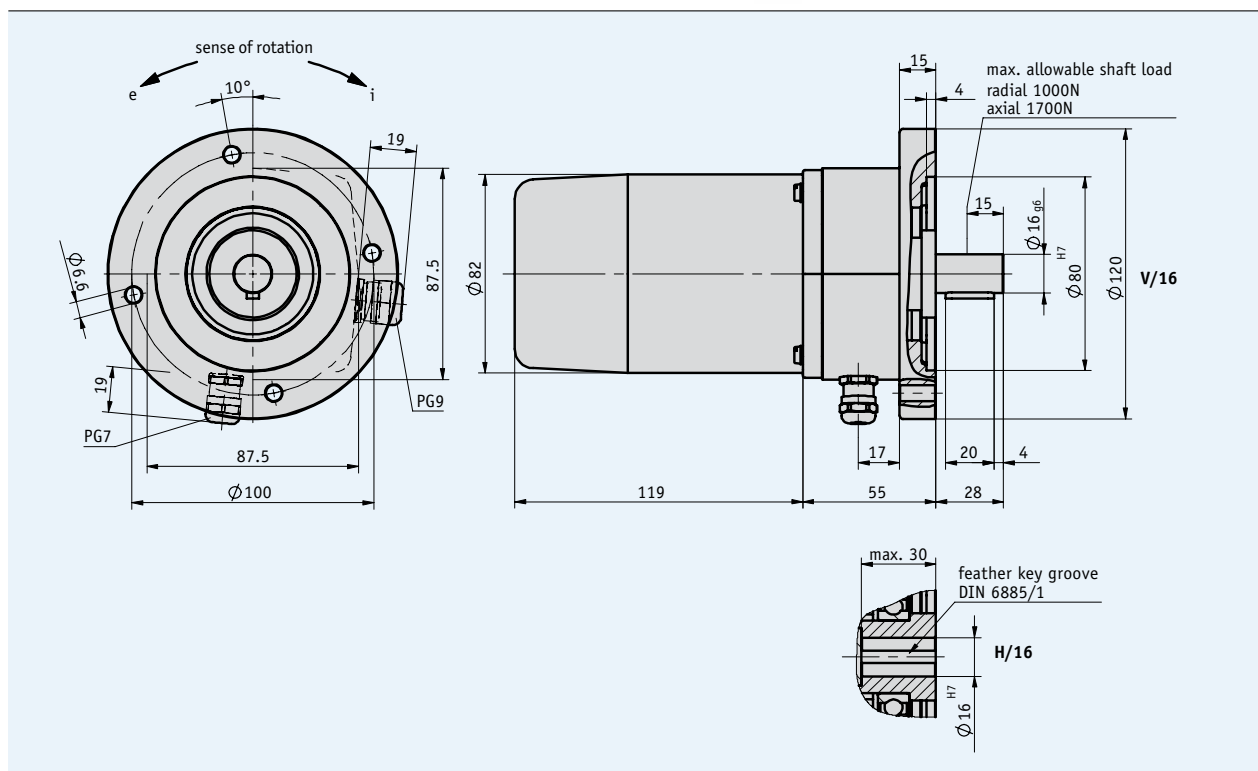
Additional information:

General information and areas of application

Page 64 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	Operating voltage
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

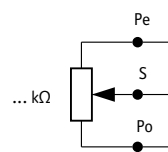
Note: Characters highlighted in orange color are order features.

Pin assignment

Potentiometric outputs P01, P05, P10

Signal	Terminal
Po	11
Pe	13
S	12

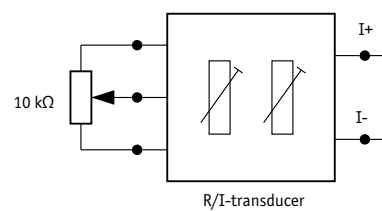
Potentiometric outputs P01, P05, P10



Transducer MWI

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

Transducer MWI



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)

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

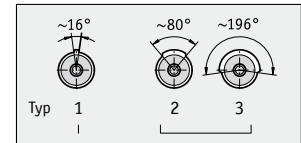
n = number of revolutions on the driving shaft
 α = potentiometer angle of rotation
 340° with 1-coil potentiometer
 3600° with 10-coil potentiometer
 i1 = order feature for gear ratio

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.

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 and potentiometer type 02 or 03
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

Page 92

Additional information:
 General information and areas of application

Page 64 cont.

2.4



2.0 RotoLine Table of contents	4
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2.0

2.1

2.2

2.3

2.4

2.5

2.6

Displays and controls – functionality reduced to the basics

Excellent readability, ergonomic handling and smart use: SIKO's electronic displays are the instruments of choice wherever clear signals from measurement encoders are to be displayed in digital form and combined with logical functions.

All displays are equipped with scaleable intelligence. They allow monitoring of up to three measurement processes at the same time. Information is displayed on a single compact device – regardless of the type and combination of the sensors or encoders connected.

Measurement displays can generally be adapted quickly and effortlessly to various sensor interfaces by exchanging or adding modular components or simply by modifying the software.

In addition to standardized solutions, SIKO's individual solutions are a particularly practical way of fulfilling almost all requirements for customer-specific applications.

Measurement data is transferred to higher level control units via serial interfaces. The free programmability of the electronic displays enables direct input of specific parameters. As an option, some MA types offer signal functions via additional switching outputs. This enables complete single axis positioning control.

SIKO's electronic displays are multifunctional, electronic measurement solutions that allow effortless display of distance and angle information as well as rotation, speed or number of pieces. They also provide data for direct evaluation or further processing.



Clear digits and good readability: All front foils have recesses for sensitive, unambiguous key pressure

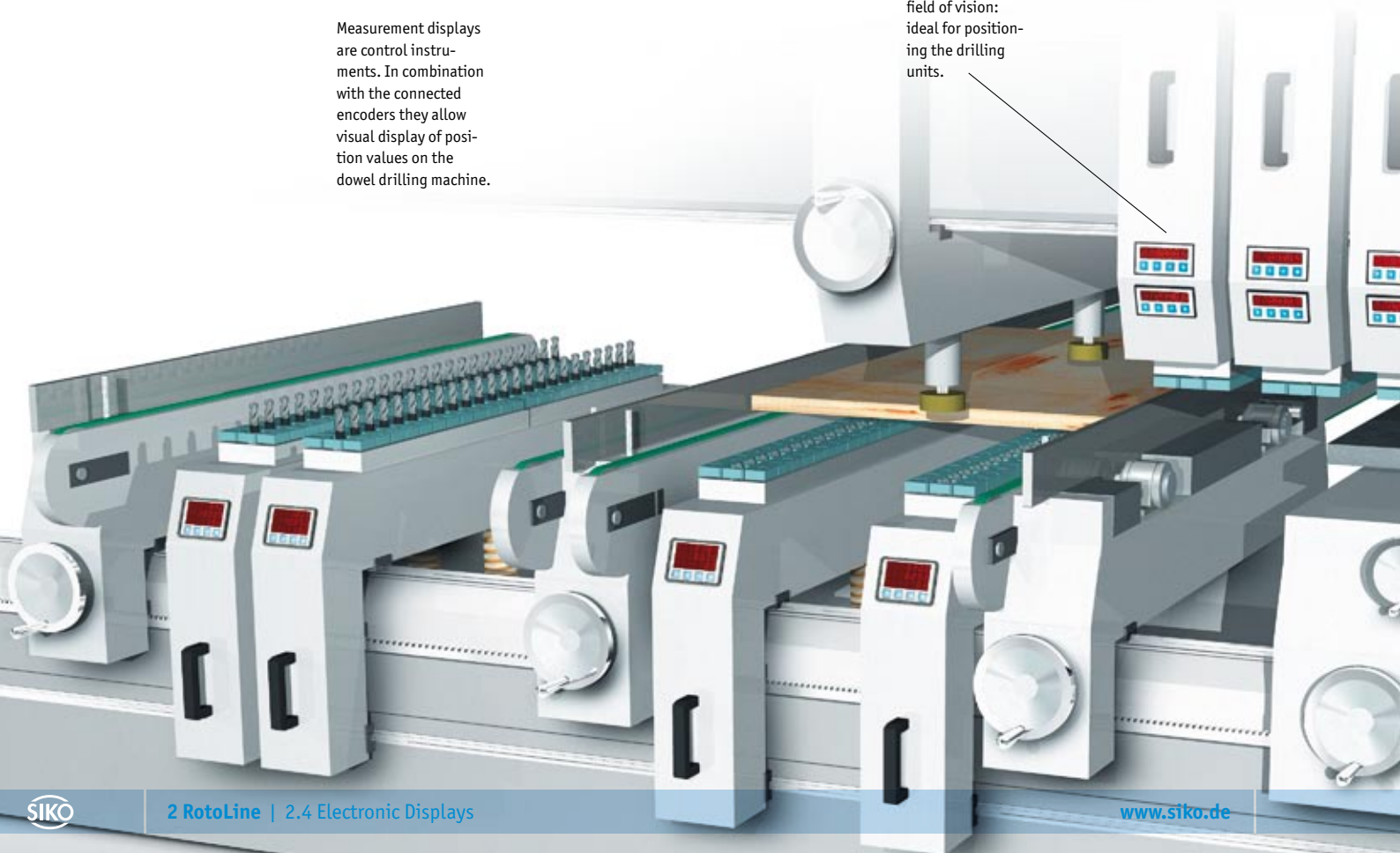
Benefits

- Incremental inputs: PP, OC, LD: PP, OC, LD, rotational speed, number of pieces
- Absolute inputs: SSI, analog
- Operating voltages: 24 V DC, 24 V AC, 110 V AC, 230 V AC
- Freely programmable parameters
- Possibility of external calibration and referencing
- Switching outputs
- RS232/RS485 interfaces








2.4

Measurement displays are control instruments. In combination with the connected encoders they allow visual display of position values on the dowel drilling machine.

Built-in devices within the staff's field of vision: ideal for positioning the drilling units.

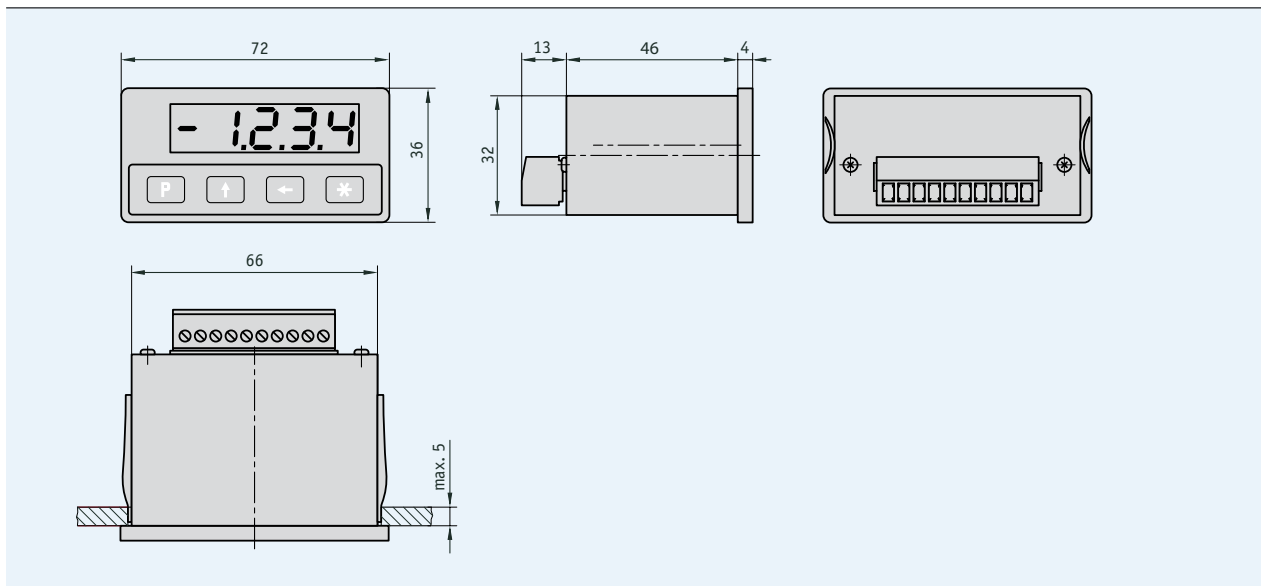


Electronic Displays

							
	MA07/1	MA50	MA55	MA10/4	MA48	MA355	MX04
Page	103	92	94	96	99	103	101
Display							
1-line	LED	LED	LED	LCD	LCD		
2-line							LCD
3-line						LED	
Operating voltage							
230 V AC				•	•		
115 V AC				•	•		
24 V AC				•			
24 V DC	•	•	•	•	•	•	•
Type of measurement							
Length and angle measurement	•	•	•	•	•	•	•
Speed	•			•			
Number of pieces	•			•			
Additional functions							
Limit monitoring		•		•			
Reset key		•	•	•	•	•	
I/O card							•
Interface RS232/ RS485 (option)				•			•
Inputs							
Incremental	•		•	•	•	•	
Absolute (SSI)				•			
Analog (current, voltage, resistance)		•					

Profile

- LED display (1 line of 4 digits)
- Voltage, current and resistor inputs for length and angle measurement
- Free programming via front keyboard
- Non-volatile parameter storage (EEPROM)
- 2 switching outputs (limit-dependent, programmable)
- Compact design



2.4

Mechanical data

Feature	Technical data	Additional information
Operating temperature	0 ... 50 °C	
Storage temperature	-20 ... 80 °C	
Temperature drift	<1 %	
Humidity	max. 95 % rF	
Condensation	inadmissible	
Protection category	IP40 for whole device IP60 front with switchboard mounting	DIN 40050
Connection	10-pin connector strip	
Keyboard	membrane keys with pressure point	
Housing	plastic	switchboard cutout 68 x 33 mm, DIN 43700
Weight	approx. 0.2 kg	

Electrical data

Feature	Technical data	Additional information
Operating voltage	10 ... 30 V DC	
Current consumption	~80 mA	with 24 V, without encoder
Switching outputs	≤30 V/100 mA	
Display	4-digit, LED, red (7-segment)	
Display range	-9 999 ... +9 999	
Signal inputs	0 ... 10 V DC 0 ... 20 mA or 4 ... 20 mA 0 ... 10 kΩ	voltage current resistance
Resolution	max. 10 bit	
Accuracy	max. 0.1 %	
Interference protection class	EN61000-6-2, EN6100-6-4	

Pin assignment

Resistance measurement	Voltage measurement	Current measurement	PIN
N.C.	N.C.	I+ (0 ... 20 mA, 4 ... 20 mA)	1
Potentiometer E (ultimate position)	N.C.	N.C.	2
Potentiometer S (wiper)	N.C.	N.C.	3
N.C.	U+ (0 ... 10 V)	N.C.	4
N.C.	N.C.	I- (0 ... 20 mA, 4 ... 20 mA)	5
Potentiometer A (initial position)	U-	N.C.	6
Switching output O (upper limit)	switching output O (upper limit)	switching output O (upper limit)	7
Switching output U (lower limit)	switching output U (lower limit)	switching output U (lower limit)	8
+ Ub operating voltage	+ Ub operating voltage	+ Ub operating voltage	9
0 V GND	0 V GND	0 V GND	10

Order

Order code

MA50

Scope of delivery: MA50, User information, Mating connectors

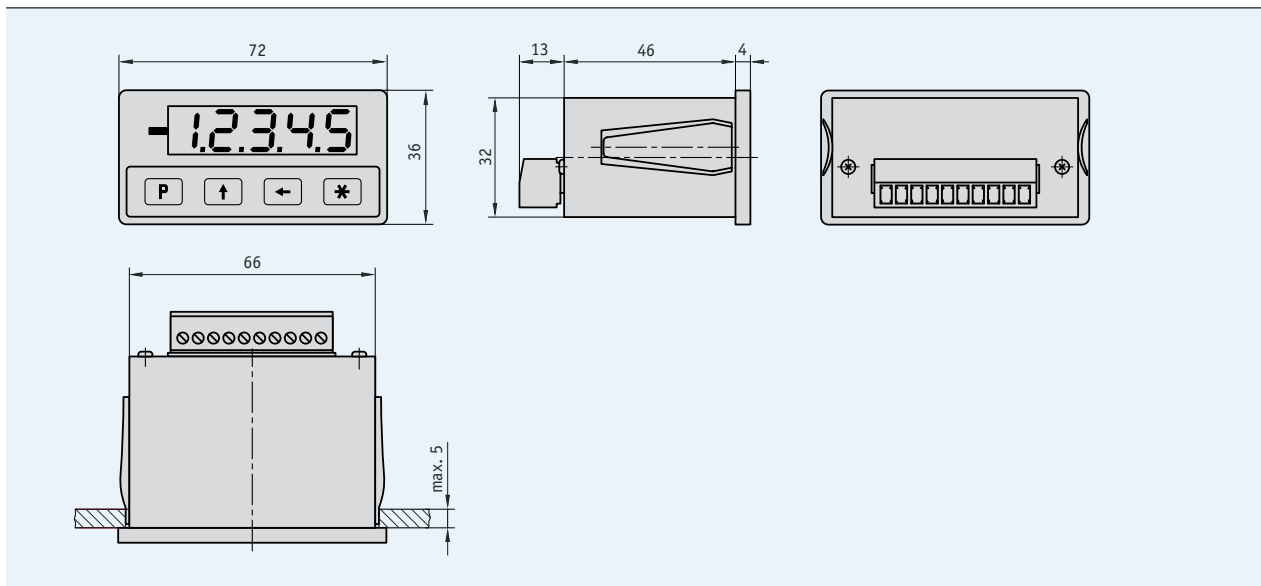
Additional information:

General information and areas of application

Page 90 cont.

Profile

- LED display (1 line of 5 digits)
- Input for incremental encoder recognition of the counting direction for length and angle measurement
- Free programming via front keyboard
- Non-volatile parameter storage (EEPROM)
- With reference connection
- Integrated quadruple evaluation of counting pulses
- Compact design



2.4

Mechanical data

Feature	Technical data	Additional information
Operating temperature	0 ... 50 °C	
Storage temperature	-20 ... 80 °C	
Humidity	max. 95 % rF	
Condensation	inadmissible	
Protection category	IP40 whole device IP60 front with switchboard mounting	DIN 40050
Connection	10-pin connector strip	
Keyboard	membrane keys with pressure point	
Housing	plastic, with clamping clips	switchboard cutout 68 x 33 mm, DIN 43700
Weight	approx. 0.2 kg	

Electrical data

Feature	Technical data	Additional information
Operating voltage	24 V DC \pm 20 %	
Current consumption	~60 mA	with 24 V, without encoder
Display	5-digit, LED, red (7-segment)	
Display range	-99 999 ... +99 999	
Encoder input	square-wave signals 90° phase-shifted PP (push-pull), OE (open emitter)	with reference signal
Encoder input frequency	max. 25 kHz	
Encoder supply	24 V DC (200 mA)	
Pulse analysis	4-fold	
Interference protection class	EN61000-6-2, EN6100-6-4	

Pin assignment

PP, OE	PIN
+ Ub encoder supply	1
A	2
B	3
I (I/O signal)	4
GND, screen encoder supply	5
RFS	6
GND	7
PE	8
0 V GND	9
+24 V operating voltage	10

Order

Order code

MA55

2.4

Scope of delivery: MA55, User information, Mating connectors

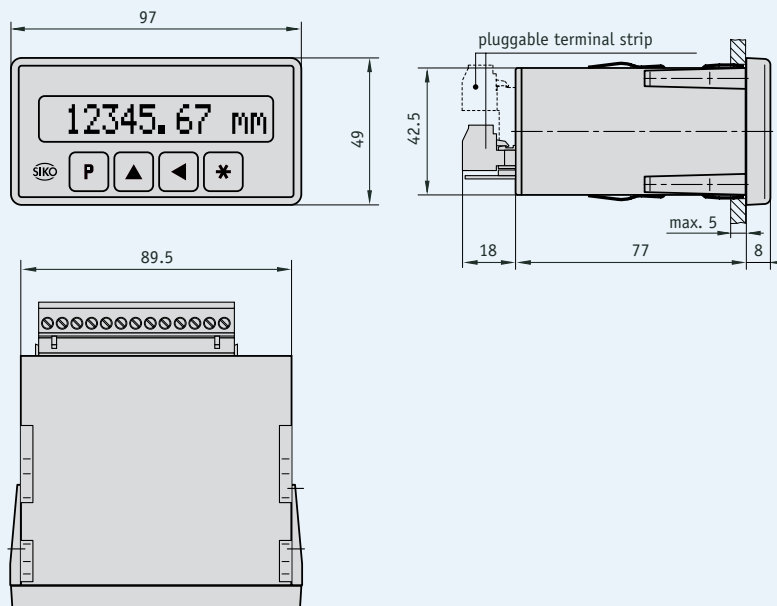
Additional information:

General information and areas of application

Page 90 cont.

Profile

- High contrast LCD readout (1 line of 12 digits)
- Display of units
- Inputs for incremental or absolute encoder (SSI), length and angle measurement, speed or number of pieces
- Free programming via front keyboard
- With reference connection
- Optional: RS232 or RS485 interface
- Optional: Switching outputs



Mechanical data

Feature	Technical data	Additional information
Operating temperature	0 ... +50 °C	
Storage temperature	-20 ... +85 °C	
Condensation	inadmissible	
Protection category	IP40 whole device IP60 front with switchboard mounting	DIN 40050
Connection	13-pin connector strips	
Keyboard	membrane keys with pressure point	
Housing	plastic	switchboard cutout 92 x 45 mm, DIN 43700
Weight	0.4 kg 0.25 kg	with 230 V and 110 V with 24 V

Electrical data

Feature	Technical data	Additional information
Operating voltage	24 V DC $\pm 20\%$ 24 V AC $\pm 10\%$ 115 V AC $\pm 10\%$ 230 V AC $\pm 10\%$	
Current consumption	120 mA	with 24 V, without encoder
Switching outputs	≤ 30 V/100 mA	2 freely programmable outputs
Display	12-digit LCD dot matrix	
Display range	-9 999 999 ... +9 999 999	additionally sign and unit of measurement
Encoder input	PP, OC, OP, LD5, LD24, SSI/5, SSI/24 DREH/PP, DREH/OC, S/PP, S/OC	length and angle measurement speed measurement number of pieces measurement
Encoder input frequency	max. 500 kHz	
Encoder supply	24 V DC (200 mA) 5 V DC (200 mA)	
Counter capacity	$\pm 2^{23}$ increments	
Pulse analysis	quadruple	incremental encoder
Interference protection class	EN61000-6-2, EN6100-6-4	

Pin assignment

Incremental PP, OC, OP, LD5, LD24	Speed/number of pieces speed/PP, speed/OC, S/PP, S/OC	Absolute SSI/5, SSI/24	PIN
+Ub encoder supply	+Ub encoder supply	+Ub encoder supply	1
A	A	clock+	2
B		data+	3
Index signal			4
GND, screen encoder supply	GND, screen encoder supply	GND, screen encoder supply	5
24 V DC out	24 V DC out	24 V DC out	6
RFS	RFS	CAL	7
N.C.	N.C.	N.C.	8
GND	GND	GND	9
N.C.	N.C.	N.C.	10
PE	PE	PE	11
0 V GND	0 V GND	0 V GND	12
+ Ub operating voltage	+ Ub operating voltage	+ Ub operating voltage	13
Encoder supply	encoder supply	encoder supply	14
/A (LD, OP)		clock-	15
/B (LD, OP)	/I (LD, OP)	data-	16
/I (LD, OP)			17
GND	GND	GND	18
N.C.	N.C.	N.C.	19
GND	GND	GND	20
N.C.	N.C.	N.C.	21
DÜA/TXD/A1	DÜA/TXD/A2	DÜA/TXD/A1	22
DÜB/RXD/A2	DÜB/RXD/A3	DÜB/RXD/A2	23
N.C.	N.C.	N.C.	24
N.C.	N.C.	N.C.	25
N.C.	N.C.	N.C.	26

Order

■ **Order table**

Feature	Order data	Specifications	Additional information
Operating voltage	1	230 V AC ±10 %	
	2	115 V AC ±10 %	
	3	24 V AC ±10 %	
	4	24 V DC ±20 %	
Encoder input	PP	push-pull	
	OC	open collector	
	OP	PP invertiert	
	LD/5	line driver/5 V DC encoder supply	
	LD/24	line driver/24 V DC encoder supply	
	SSI/5	SSI/5 V DC encoder supply	
	SSI/24	SSI/24 V DC encoder supply	
	DREH/PP	speed/24 V DC encoder supply	push-pull
	DREH/OC	speed/24 V DC encoder supply	open collector
	S/PP	number of pieces/24 V DC encoder supply	push-pull
S/OC	number of pieces/24 V DC encoder supply	open collector	
Counting frequency (kHz)	25		
	250		
	500		
Switching output	S0	without	
	SM	with	
Interface/protocol	XX/XX	without	
	S1/00	RS232/standard	
	S3/00	RS485/standard	
Front foil	BS	blue	
	BN	blue neutral	without company logo
Software	S	length measurement	
	SW02	angle measurement, 0–360°	

■ **Order code**



Scope of delivery: MA10/4, User information, Mating connectors



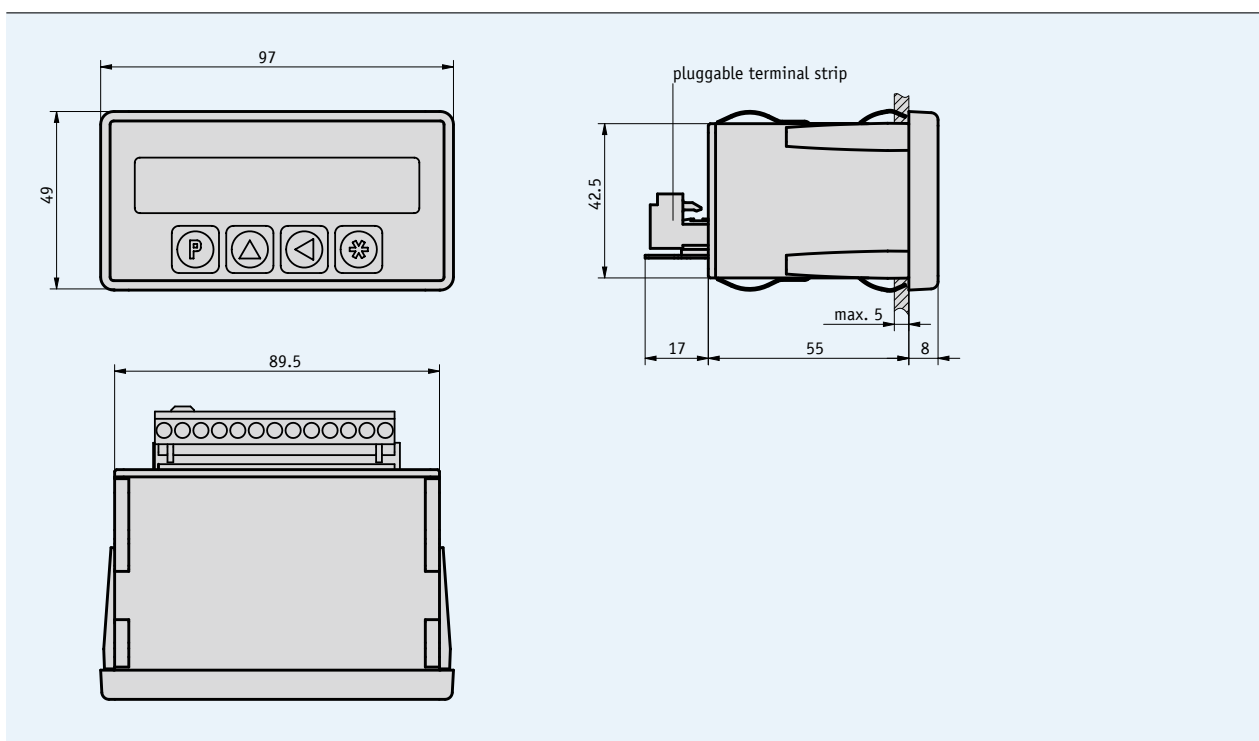
Additional information:

General information and areas of application

Page 90 cont.

Profile

- low-cost electronic display
- LCD with high contrast, 12-digit, dot matrix
- For incremental measuring systems
- Freely programmable via front keyboard



2.4

Mechanical data

Feature	Technical data	Additional information
Operating temperature	0 ... +50 °C	
Storage temperature	-20 ... +85 °C	
Humidity	condensation inadmissible	
Protection category	IP40 whole device IP60 front with switchboard mounting	DIN 40050
Connection	13-pin terminal strip	
Keyboard	Membrane keys with pressure point	
Housing	Plastic	switchboard cutout 45 x 92 mm, DIN 43700
Weight	0.4 kg 0.25 kg	with 230 V and 115 V with 24 V

Electrical data

Feature	Technical data	Additional information
Operating voltage	24 V DC ±10 %	
	115 V AC ±10 %	
	230 V AC ±10 %	
Current consumption	60 mA	at 24 V, without encoder
Display	12-digit LCD dot matrix	
Display range	-9 999 999 ... +9 999 999	
Encoder input	PP/OC, OE, OP, LD5, LD24	
Encoder input frequency	max. 500 kHz	
Encoder supply	24 V DC (200 mA)	
	5 V DC (200 mA)	
Counter capacity	±2 ²³ increments	
Pulse evaluation	4-fold	
Protection class	EN61000-6-2, EN6100-6-4	

Pin assignment

PP/OC, OE	LD, OP	PIN
+Ub encoder supply	+Ub encoder supply	1
A	A	2
N.C.	/A	3
B	B	4
N.C.	/B	5
I	I	6
N.C.	/I	7
GND	GND	8
RFS (ground switching)	RFS (ground switching)	9
GND	GND	10
PE, protective conductor	PE, protective conductor	PE
115 / 230 V AC, GND	115 / 230 V AC, GND	N
115 / 230 V AC, +24 V DC	115 / 230 V AC, +24 V DC	L

2.4

Order

Order table

Feature	Order text	Specification	Additional information
operating voltage	1	230 V AC ±10 %	
	3	24 V AC ±10 %	
	4	24 V DC ±20 %	
Encoder input	PP/OC	Gegentakt/Open Collector	
	OE	Open Emitter	
	OP	PP invertiert	
	LD/5	Linedriver/5 V DC Geberversorgung	
	LD/24	Linedriver/24 V DC Geberversorgung	
Front foil	BS	blau	
	BN	blau neutral	ohne Firmenlogo

Order code

MA48 - EG - A - B - C - S

Scope of delivery: MA48, User information, Mating connectors

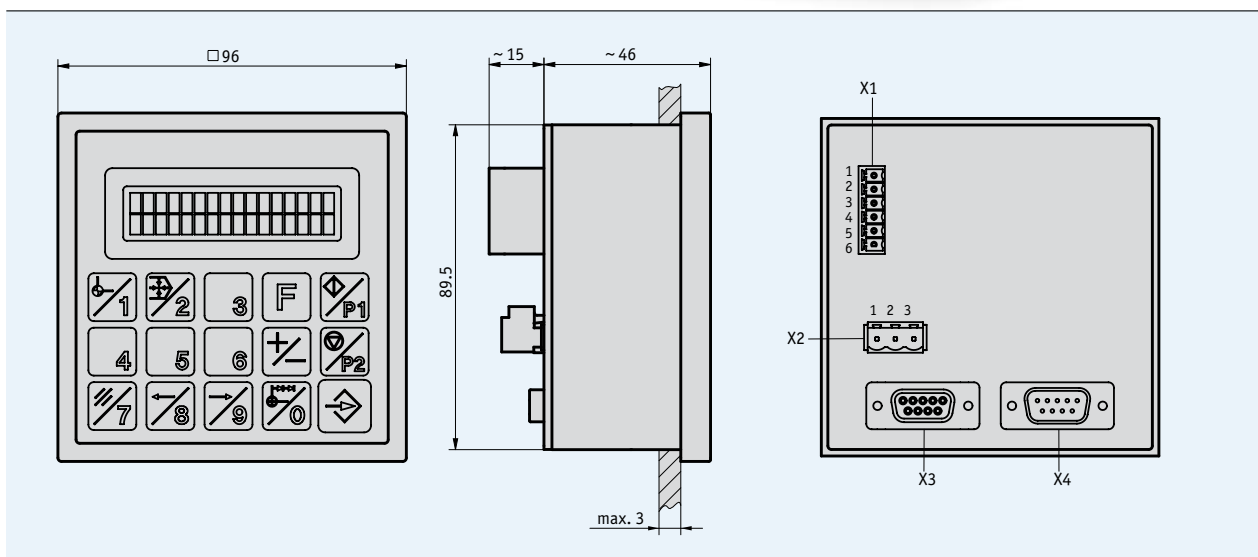
Additional information:

General information and areas of application

Page 90 cont.

Profile

- Central control station for AP04, AP04S, AP24 position indicators and actuators AG05
- Up to 31 devices can be controlled
- Management of up to 99 setpoint value sets
- Individual or block positioning
- Setpoint input via keyboard or teach-in
- Clear text LCD display
- Switching outputs, RS232 interface



2.4

Mechanical data

Feature	Technical data	Additional information
Operating temperature	0 ... +50 °C	
Storage temperature	-20 ... +85 °C	
Humidity	condensation inadmissible	
Protection category	IP20 whole device IP60 front with switchboard mounting	DIN 40050
Connection	terminal strip, D-SUB 9-pins for interfaces	
Keyboard	Membrane keys with pressure point	
Housing	Plastic	switchboard cutout 92 x 92 mm, DIN 43700
Weight	0.25 kg	

Electrical data

Feature	Technical data	Additional information
Operating voltage	24 V DC ±10 %	reverse-polarity protection
Current consumption	100 mA	at 24 V, without encoder
Switching inputs	24 V DC, 10 mA	2 pcs. high aktiv
Switching outputs	24 V DC, 200 mA	open emitter 2 pcs.
Display	LCD dot matrix 2x 16 characters	backlight
Display range	-9 999 999 ... +9 999 999	
Encoder interface	RS485 (SIKONETZ 5)	position indicator connection
Service interface	RS232 (Service Mode)	
Supply encoder	24 V DC, ≤ 900 mA	D-DUB encoder interface X3
Interference protection class	EN61000-6-2, EN6100-6-4	

Pin assignment

In-/outputs X1	PIN
Switching input 1	1
GND	2
Switching output 1	3
Switching input 2	4
GND	5
Switching output 2	6

Operating voltage X2	PIN
PE	1
GND	2
+24 V DC	3

Encoder interface X3	Service interface X4	PIN
+Ub supply encoder	N.C.	1
N.C.	TXD	2
DÜA	RXD	3
N.C.	N.C.	4
GND	GND	5
N.C.	N.C.	6
N.C.	N.C.	7
DÜB	N.C.	8
N.C.	N.C.	9

2.4

Order

■ Order code

MX04 - 4 - I/O, PNP - S3/09 - S1/00 - S

Scope of delivery: MX04, User information

Accessories:

Mating connectors

Page 106

Additional information:

General information and areas of application

Page 90 cont.

Profile Electronic Display MA07/1

- Incremental, length, angle, rotational speed or number of pieces measurement
- LED display (1 line of 5 digits)
- Inputs for incremental sensors, length and angle measurement, rotational speed or number of pieces
- Free programming via front keyboard
- Incremental measurement function (operating mode I), actual value memory (operating modes I and S)
- With reference connection
- Programming enabled via external input (keyswitch)
- Compact design



➔ **Additional information:**

General information and areas of application
Data sheet

Page 90 cont.
www.siko.de

2.4

Profile Three-Channel Display MA355

- Incremental, length and angle measurement
- LED readout for display of 3 measured values (3 lines of 6 digits)
- 3 inputs for incremental sensors, individually programmable, length and angle measurement
- Free programming via front keyboard (scaling factors, offset, reset value, etc.)



➔ **Additional information:**

General information and areas of application
Data sheet

Page 90 cont.
www.siko.de

2.5



2.0 RotoLine Table of contents	4
2.1 Magnetic rotary encoders	7
2.2 Optical rotary encoders	45
2.3 Geared potentiometers	63
2.4 Electronic Displays	89

2.5 | Accessories

Products

Mating connectors		106
Cable extensions	KV...	108
Self-aligning coupling	AK18	112
Servo-clamp	SK	113

2.6 Product index, Contact information	115
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2.0

2.1

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2.3


2.4

2.5

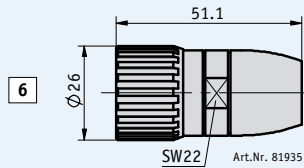
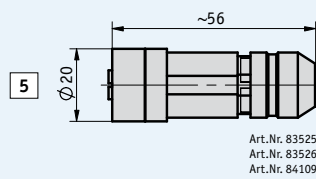
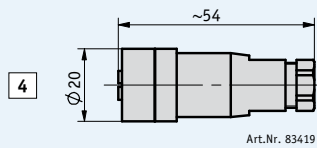
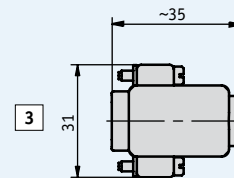
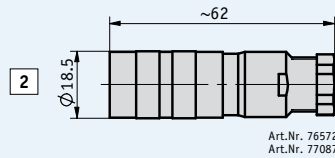
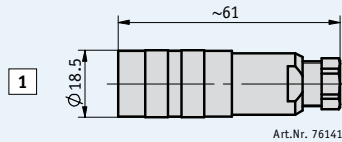
2.6

Profile

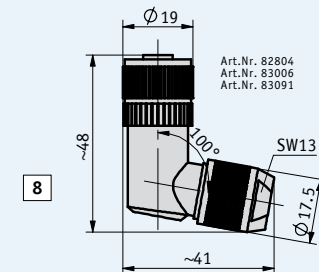
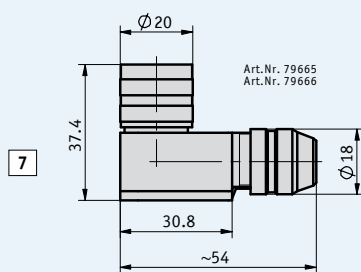
- Mating connectors, straight
- Mating connectors, offset
- Bus terminator, straight

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

Mating connectors, straight



Mating connectors, offset



Order

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).

Order matrix magnetic rotary encoders

Magnetic rotary encoders											
				IH28M IV28M/1	IH58M IV58M	IG04M	IG07M	IG09M	WV36M/ CAN	WV36M/ SSI	AH36M AV58M
Pict.	PINs	cable Ø	Order data								
Mating connectors, straight											
5	4	6 ... 8	83526								
5	5	6 ... 8	84109						•		•
1	7	4 ... 6	76141	▶ PP ⊙ E6X		▶ PP ⊙ E6X					
2	12	6 ... 8	76572	▶ OP, LD5, LD24 ⊙ E6X		▶ OP, LD5, LD24 ⊙ E6X	⊙ EX	⊙ E6X			
6	12	≤ 8,5	81935		⊙ E2						
Mating connectors, offset											
7	12	6 ... 8	79666				⊙ EX				
8	5	4 ... 8	83006						•		•

Order matrix optical rotary encoders, geared potentiometers, electronic displays

Optical rotary encoders										Geared potentiometers		Electronic displays
				IG06	IG07 IG17	GP03/1		GP09	MX04			
Pict.	PINs	cable Ø	Order data									
Mating connectors, straight												
4	4	4 ... 6	83419				⊙ EX					
5	8	6 ... 8	83525					⊙ E12				
1	7	4 ... 6	76141	⊙ E6, E6X								
2	7	6 ... 8	77087		▶ PP (AXX, AXO, AXI, ABX, ABO, ABI), OP (AXX, AXO, AXI , ABX) ⊙ EX, E3, E4							
2	12	6 ... 8	76572		▶ OP (ABO, ABI) OC, LD5, LD24 ⊙ EX, E3, E4							
X3	3	9	71366 + 71365								•	
X4	3	9	71364 + 71365								•	
Mating connectors, offset												
7	7	6 ... 8	79665		▶ PP (AXX, AXO, AXI, ABX, ABO, ABI), OP (AXX, AXO, AXI , ABX) ⊙ EX, E3, E4							
7	12	6 ... 8	79666		▶ OP (ABO, ABI) OC, LD5, LD24 ⊙ EX, E3, E4							

Order code (see order matrix)

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).

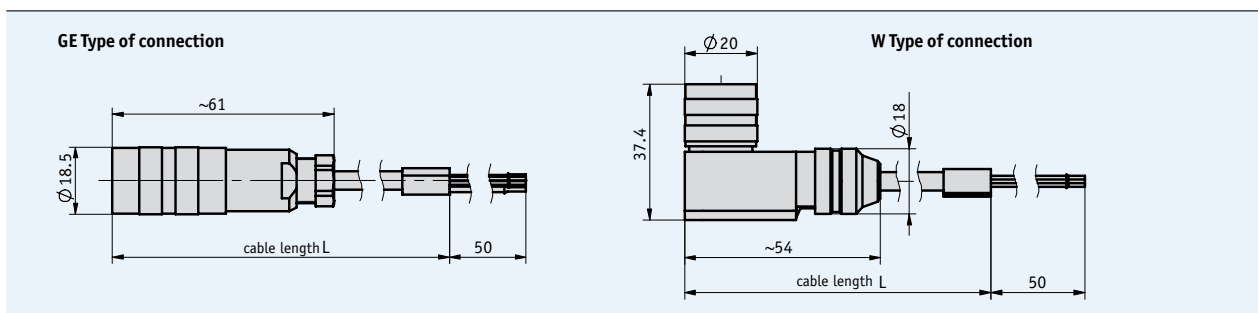
			Magnetic rotary encoders					Optical rotary encoders	
			IH28M IV28M/1	IH58M IV58M	IG04M	IG07M	IG09M	IG06	IG07 IG17
Page	Cable sheath	Product							
Cable extension									
109	PUR	KV07S0	▶ PP ⊙ E6X		▶ PP ⊙ E6X			⊙ E6X, E6	▶ PP (AXX, AX0, AXI, ABX, ABO, ABI), OP (AXX, AX0, AXI, ABX) ⊙ EX, E3, E4
110	PUR	KV12S0	▶ OP, LD5, LD24 ⊙ E6X		▶ OP, LD5, LD24 ⊙ E6X	⊙ EX	⊙ E6X		▶ OP (AB0, ABI) OC, LD5, LD24 ⊙ EX, E3, E4
111	PUR	KV12S1		⊙ E2					

2.5

Profile

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

 Voltage drop should be envisaged with increasing cable length. This should be taken into account for the electrical design.



Mechanical data

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

2.5

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 W	A straight connector angle plug	not with KV12S1
Cable length	...	B 1 ... 20 m, in steps of 1 m	

▪ Order code

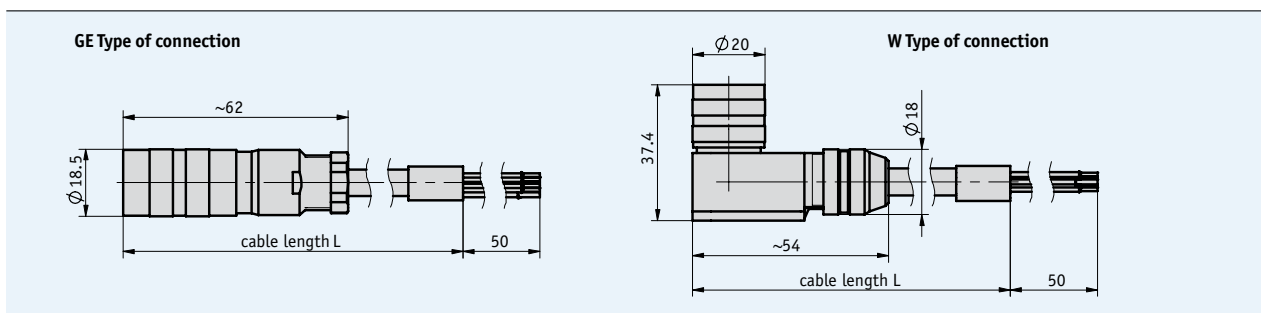
KV07S0 - -
A B

Scope of delivery: KV07S0, User information

Profile

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

! Voltage drop should be envisaged with increasing cable length. This should be taken into account for the electrical design.



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	K
black	L
brown	M

Order

Order table

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


Order code

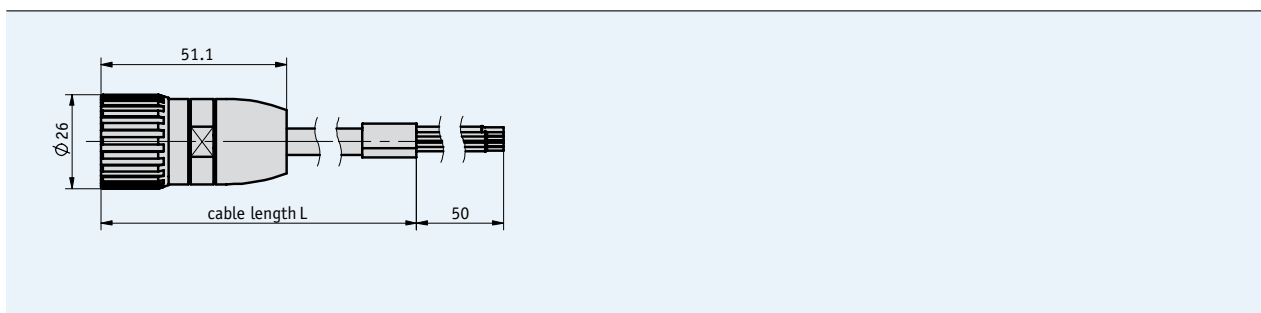
KV12S0 - -

Scope of delivery: KV12S0, User information

Profile

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

 Voltage drop should be envisaged with increasing cable length. This should be taken into account for the electrical design.



Mechanical data

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

2.5

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	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	

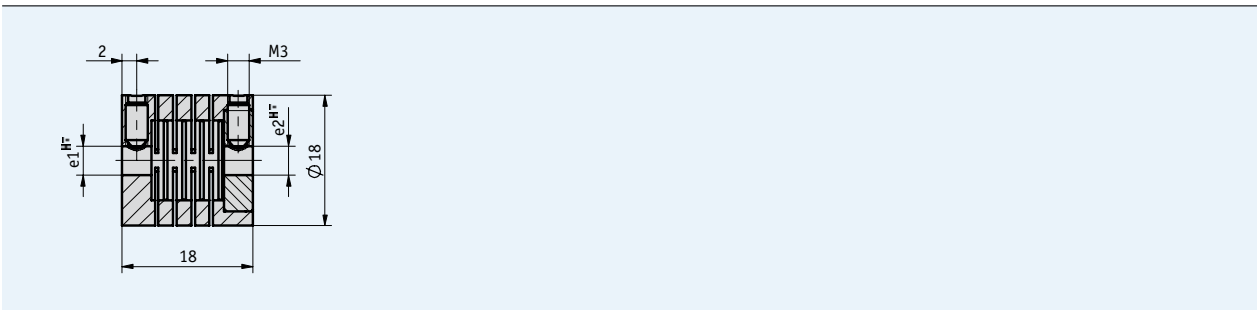
▪ Order code

KV12S1 - GE -

Scope of delivery: KV12S1, User information

Profile

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



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	

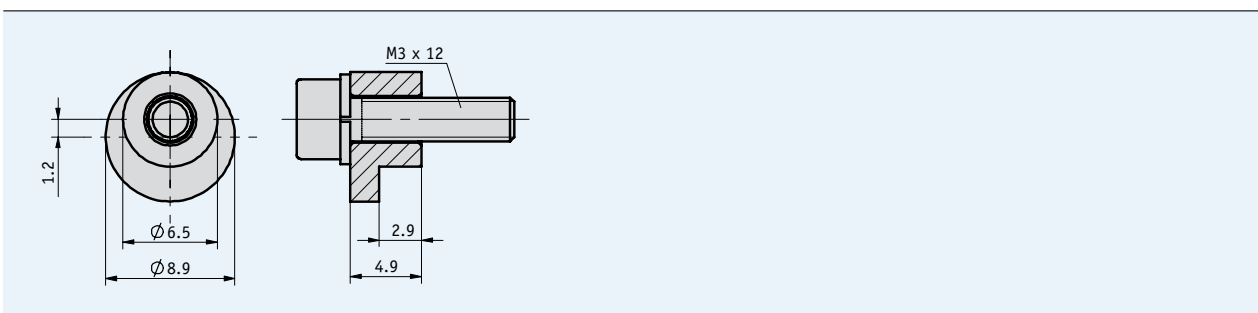
Order code

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	

Order

- Order code

SK

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

2.6



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2.6

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

IV28M/1

GP03/1

IG07

WV36M

Gerät	Type	Page
A		
AH36M	Absolute encoder	33
AK18	Self-aligning coupling	112
AV58M	Absolute encoder	35
G		
GP02	Geared potentiometer	70
GP03/1	Geared potentiometer	73
GP04/1	Geared potentiometer	76
GP09	Geared potentiometer	79
GP43	Geared potentiometer	82
GP44	Geared potentiometer	85
I		
IG04M	Incremental encoder, magnetic	24
IG06	Incremental encoder, optical	50
IG07	Incremental encoder, optical	53
IG07M	Incremental encoder, magnetic	27
IG09M	Incremental encoder, magnetic	30
IG17	Incremental encoder, optical	57
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	109
KV12S0	Cable extension	110
KV12S1	Cable extension	111
M		
	Mating connectors	106
MA07/1	Electronic Display	103
MA10/4	Electronic Display	96
MA48	Electronic Display	99
MA50	Electronic Display	92
MA55	Electronic Display	94
MA355	Three-Channel Display	103
MX04	Multiplex Controller	101
S		
SK	Servo-clamp	113
W		
WV36M/CAN	Angle encoder, magnetic	37
WV36M/SSI	Angle encoder, magnetic	40

2.6

Germany

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SIKO GmbH
Weihermattenweg 2
D-79256 Buchenbach

Telephone
+49 7661 394-0

Telefax
+49 7661 394-388

E-Mail
info@siko.de

Internet
www.siko.de