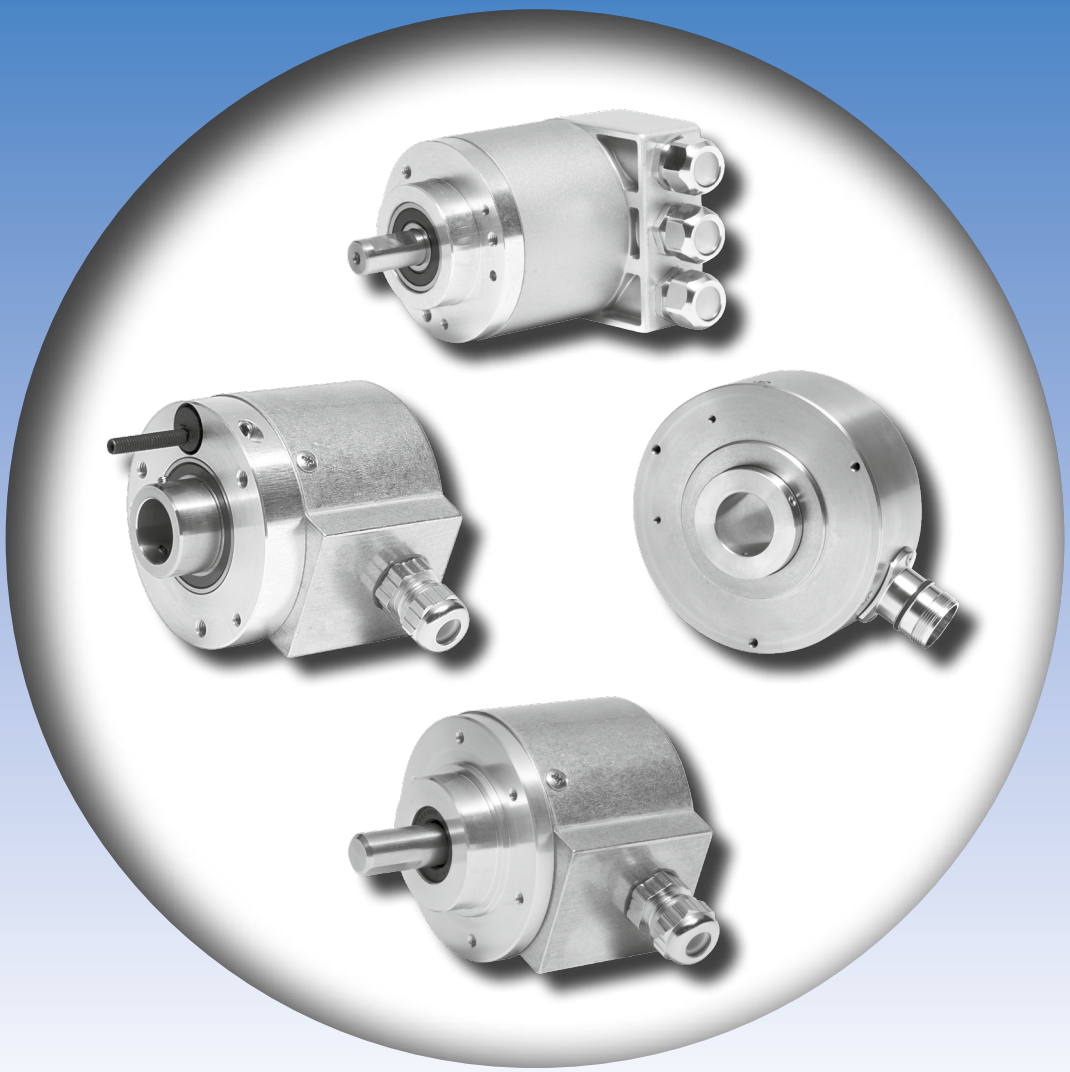
hohner

Elektrotechnik Werne

Hohner Rotary Encoders



Absolute, Single- and Multi-turn · Incremental · Linear · SSI
InterBus-S · CAN · CANopen · Profibus-DP and DeviceNet
Profinet · Ethernet

Your partner for standard and special designs
– accurate, reliable and quick –

About us

Hohner Elektrotechnik GmbH was founded in 1980 in Werne an der Lippe, a beautiful small town on the edge of the Münsterland.

Hohner has been a specialist in the design and manufacture of pulse encoders and its associated application possibilities. Therefore, to this day, the main task of the company still consists of producing high-quality products and, above all, putting reliable Hohner products on the market.

In order to meet the ever increasing market requirements, optimum logistics ensure short delivery times.

Product overview

Incremental encoders

Absolute encoders

Absolute/Multi-turn with bus connection

Ex encoders of the type EX d IIC T4 Gb

(PTB 09 ATEX 1106X) absolute/incremental

Special variations

Customised complete solutions

Pulse encoders - Function and benefits

Incremental and absolute rotary encoders are used to measure angles, distances and speeds. They serve thus as an interface between the mechanically and electrically measured variable in a control loop, and are mainly used in automation technology. The electrically measured variable generated is prepared in such a way that it can be evaluated directly by the PLC (Programmable Logic Controller), a control computer or even a simple counter card.

A contactless optical scanning of a measuring body (pulse disc) in transmitted light procedure applies to all Hohner encoders.

An LED emits infrared light through a sampling grid. By moving the measurement body, the light is interrupted rhythmically and measured via receiver elements. The downstream electronics shapes and amplifies the signals thus generated. Dividing the measuring body into a certain number of equal parts (increments) enables optimum evaluation.

Hohner uses as measuring body high-grade plastic pulse discs with extremely high temperature resistance and high shock resistance.

The scale is attached onto the plastic carrier with a special photo-technical procedure designed by Hohner. This technology allows the production of any number of pulses or division to the maximum value of the respective series.

Incremental rotary encoders

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Solid shaft encoder	Series 20	8
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Plug-in shaft encoder	SWI 58	22
Hollow shaft encoder	HWI 40	24
	HWI 80	26
	HWI 103	28
	MIG Nova	30
Ex encoder of the type EEx d IIC T6	AWI 70 Ex/HWI 70 Ex	34

Absolute rotary encoders

General description		36
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Multi-turn solid and plug-in encoder	Series 72	46
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Single-turn hollow shaft	HWA 58	62
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Ex encoder of the type EEx d IIC T6	AWA 70 Ex/HWA 70 Ex	66

Linear measuring system

	Draw wire EM	68

Accessories

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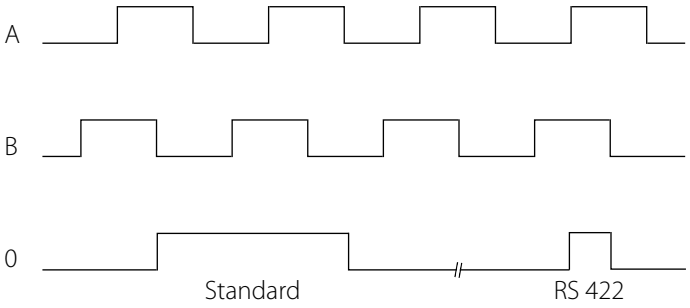
Incremental Rotary Encoders

General description

Incremental rotary encoders are sensors for detecting rotary movements. An optoelectronic scanning unit con-verts the division (circular disc with light and dark fields, also referred to as increments) supplied by a measuring body into a proportional number of electronic pulses. The number of output pulses is a measure for the angle of the encoder. The subsequent electronics used by the user enable the measuring of angles, distances or speeds. Different signal outputs and output circuits are available for adapting to the controls used.

Signal outputs



Two square pulse trains offset by 90° el, with channel A lagging in clockwise rotation.

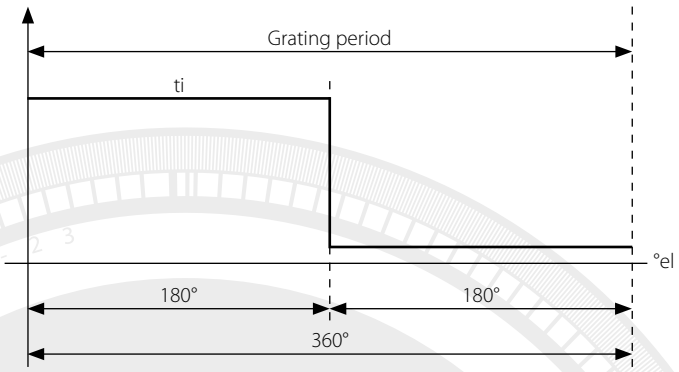
Reference pulse 0 once per revolution, position and length optional, linked for RS 422.

All output signals measured against GND!

All channels can also be executed inversely.

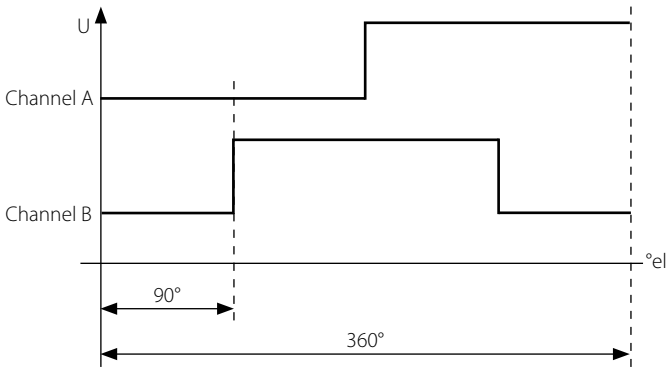
Pulse and Phase tolerance

Puls tolerance



ti : tp 180° el: 180° el ± 10%

Phase tolerance



90° el ± 10%

Calculation of permissible speed

$$n \left(\frac{u}{min} = \frac{f_{max}\,(Hz)}{\text{No. of pulses}} \right) \times 60$$

Attention: Observe permissible mechanical speed

Power supply

U_B = 5V DC ± 5%

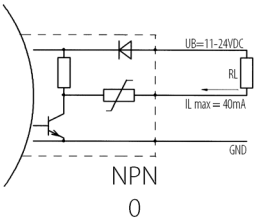
U_B = 10V...30V DC

The limits of supply voltage, including the residual ripple, may not be exceeded as this could cause malfunctions, or damage the device.

Output circuits

0

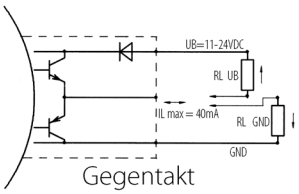
Darlington Driver
ULN 2003 o.ä.
max. 40mA per channel
short-circuit-proof



NPN
0

1

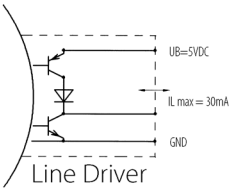
Push-pull –
Power driver
max. 30mA/or 100mA
per channel
short-circuit-proof



Gegentakt
1

2

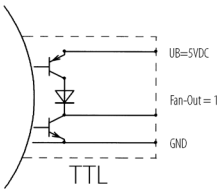
TTL Line Driver
75114 or sim.



Line Driver
2

3

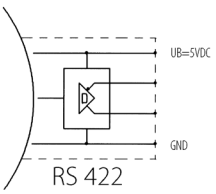
TTL
max. 1.6mA per channel
(1 TTL load)



TTL
3

6

Driver according to E/A standard
RS 422
AM 26 LS 31 C
DS 26 C 31 C or sim.

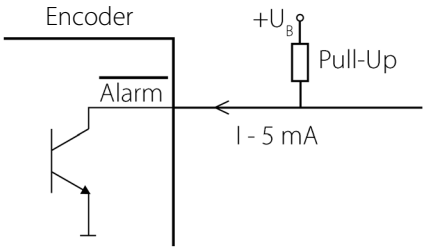


RS 422

Incremental Rotary Encoders

Alarm output

Output circuit



Technical data

Output	NPN - Open collector
Output load max.	5 mA/24 V at UB = 5 VDC 5 mA/32 V at UB = 10...30 VDC
Level	Output active (fault): L 0.7 VDC Output inactive: high impedance (H level, possibly via external pull-up resistor)
Error reporting period	• 20 ms

Function

The rotary encoders with alarm outputs are equipped with monitoring electronics reporting essential operating errors via a separate output. The alarm output can be used for selecting an optical control (LED; for circuit, see above) or the control system (PLC or similar). The alarm outputs of several encoders can also be interconnected by parallel connection to a common "System alarm".

The following errors are reported:

Category I	**Category II**	**Category III**
- Glass breakage	- Overtemperature 1 VDC < U < 4 VDC	Voltage range
- Defective LED	- Overload e.g. due to short circuit	- Voltage drop on the supply lines
- Contamination		

Category I errors cannot be remedied; replacing the encoder is necessary.

Category II errors are detected by means of a thermal monitoring unit in the electronics. The error mes-sage expires after removing the cause for the temperature increase.

Category III errors indicate an insufficient power supply. This category also reports short-term disturbances of the power supply, e.g. due to electrostatic discharges, which may distort the output signals. Remedial action en-sues by intercepting the interfering effects, e.g. by carefully selecting the cable routin

Cable lengths (AWI 58 H)

Output RS 422 (R)	depending on output voltage and frequency (at 25°C)	
	lenght	RS 422
	10 m	5 VDC, 300 kHz
	50 m	5 VDC, 300 kHz
	100 m	5 VDC, 300 kHz

Output Push-pull (K)	depending on output voltage and frequency (at 25°C)		
	lenght	Push-pull (K)	Push-pull (K)
		5 VDC, 10 mA	10...30 VDC, 30 mA
	10 m	300 kHz	12 VDC, 200 kHz 24 VDC, 200 kHz 30 VDC, 200 kHz
	50 m		12 VDC, 200 kHz 24 VDC, 200 kHz 30 VDC, 100 kHz
	100 m		12 VDC, 200 kHz 24 VDC, 100 kHz 30 VDC, 50 kHz

Output Push-pull antivalent (I)	depending on output voltage and frequency (at 25°C)	
	lenght	Push-pull antivalent
	10 m	12 VDC, 200 kHz 24 VDC, 200 kHz 30 VDC, 200 kHz
	50 m	12 VDC, 200 kHz 24 VDC, 50 kHz 30 VDC, 25 kHz
	100 m	12 VDC, 150 kHz 24 VDC, 25 kHz 30 VDC, 12 kHz

Series 20

- Incremental rotary encoder with shaft
- For simple industrial applications
- Accessories from page 70

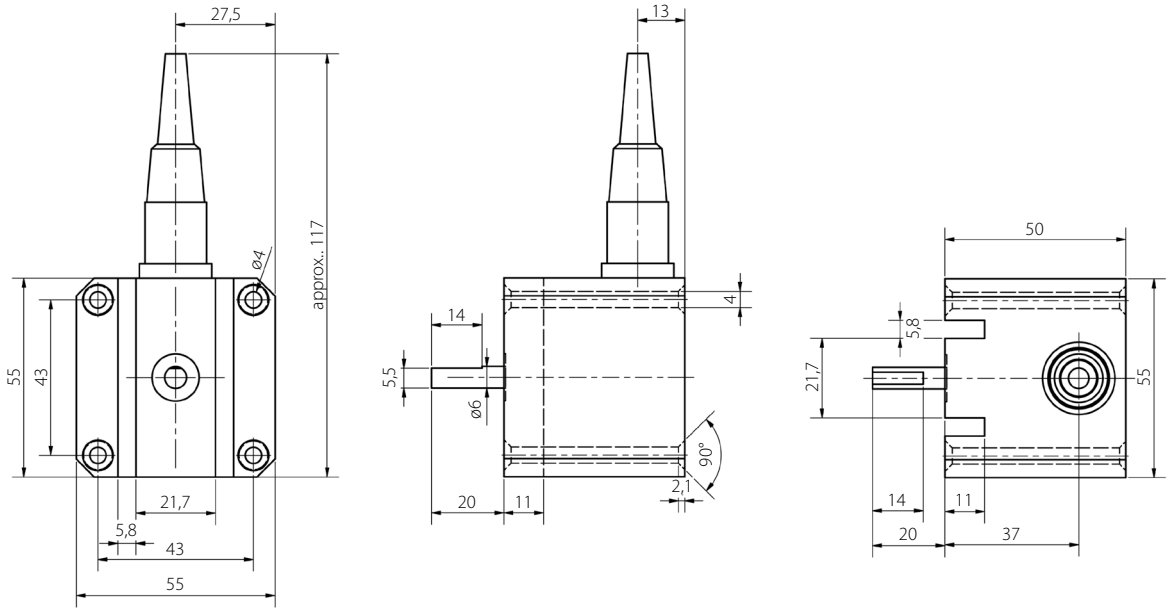
Electrical specifications

max. pulse frequency:	25 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V . . . 30V DC
Max. current consumption:	80 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	80 mA

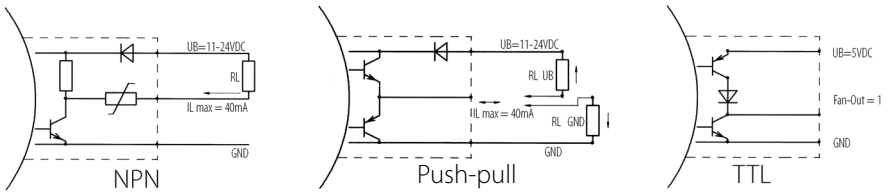
Mechanical specifications

Housing/Flange:	Zinc die-casting - cadmium-plated
Shaft:	stainless steel
Bearing:	Deep groove ball bearing
Weight:	approx. 0.5 kg
Protection type:	IP 41 according to DIN 40050
Max. speed:	3000 U/min
Moment of inertia:	10 gcm2
Torque:	approx. 0.4 Ncm
Max. shaft load:	axial 5 N
	radial 3 N

Mechanical dimensions

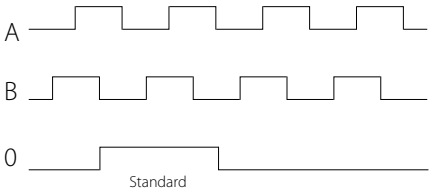


Output circuits



Order ref.:.: 0 1 3

Signal outputs



Two square pulse trains offset by 90° el,
with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution,,
position and length optional.

All channels can also be executed inversely.

Pin configuration

	- Volts	+ Volts	A	B	0
Connection type 5-core cable	black	blue	brown	beige	yellow
Connection type 9414/08 connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
Connection type 9412/05 connector	Pin 1	Pin 2	Pin 3	Pin 4	–

Order reference

Series 20 2 □ □ □ – □ Number of pulses 1 . . . 500

Shaft

2 = 6 mm

Signal output

5 = A
7 = A, B
9 = A, B, 0
6 = A, 0

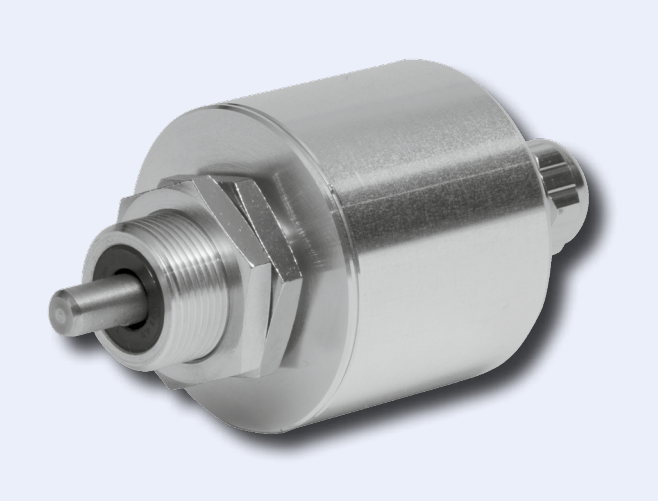
Connection type
(see page 70)

6 = Cable connection
5 = Connector 9414 / 08
8 = Connector 9412 / 05

Output circuit

0 = NPN
1 = Push-pull
U_B = 10 . . . 30 V DC / max. 30 mA
3 = TTL
5 = PNP

AWI 40



AWI 40

- Incremental rotary encoder with shaft
- For simple industrial requirements
- Small design and high degree of protection
- Also available in stainless steel
  for aggressive environmental conditions
- Accessories from page 70

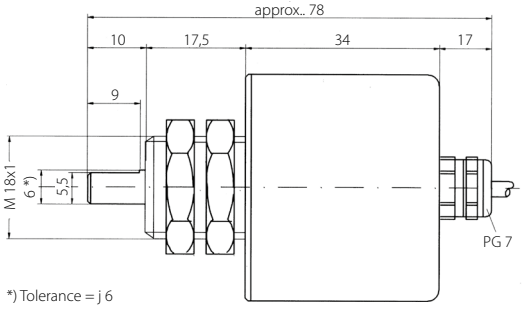
Electrical specifications

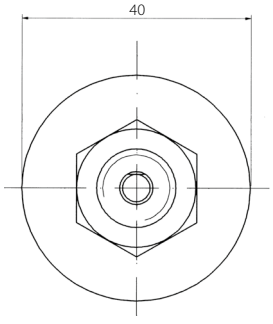
max. pulse frequency:	25 kHz
Perm. temperature range:	-30°. . . +70°C
Power supply:	10V . . . 30V DC
Max. current consumption:	80mA (without load)
Max. output load:	30mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	40mA
Max. output load:	30mA (per channel)

Mechanical specifications

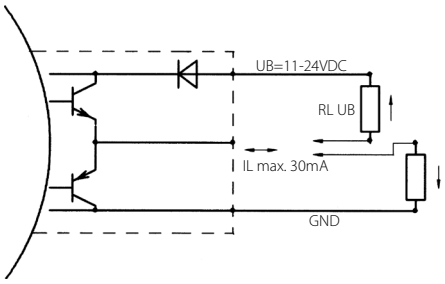
Flange/Housing:	Aluminium
Shaft:	stainless steel
Shaft seal:	Oil/Salt-water resistant
Bearing:	Deep groove ball bearing
Weight:	approx. 0.3 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	approx. 3 Ncm
Max. shaft load:	axial 5 N radial 5 N

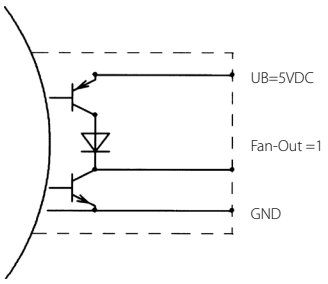
Mechanical dimensions



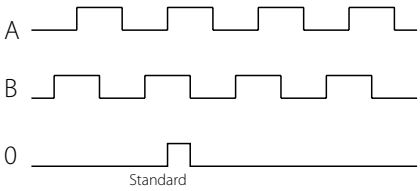


Output circuits





Signal outputs



Two square pulse trains offset by 90° el,
with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution,,
position and length optional.

C design 0 pulse optional

All channels can also be executed inversely.

Tolerances (at 25 kHz)

Phasenversatz: 90° ± 20° el

Tastverhältnis: 180° : 180° ± 18° el

Pin configuration

	GND	+ U_B	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow			grey	
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow	grey	pink	blue	red
Connection type 01	black	blau	brown	beige			yellow	
Connection type 01	black	blau	brown	beige	yellow	green	pink	purple
Connection type 08, 09	1	2	3	4	(5)		5	
Connection type 10, 11	1	2	3	4	(5)	(6)	5	6

Order reference

AWI 40 [ ] – [0 6] [ ] [ ] [ ] – [ ] [C] with declaration of conformity (higher pulse numbers upon request)

Impulszahl 1... 500

Housing

S = Standard
E = Stainless steel

Shaft

06 = 6 mm

Signal output

1 = A
2 = A, B
3 = A, B, 0
4 = A, $\bar{A}$
5 = A, B / $\bar{A}$, $\bar{B}$
6 = A, B, 0 / $\bar{A}$, $\bar{B}$, $\bar{0}$
7 = A, 0
8 = A, 0 / $\bar{A}$, $\bar{0}$
9 = A, B, 0, $\bar{0}$

Connection position/Connection type (see page 70)

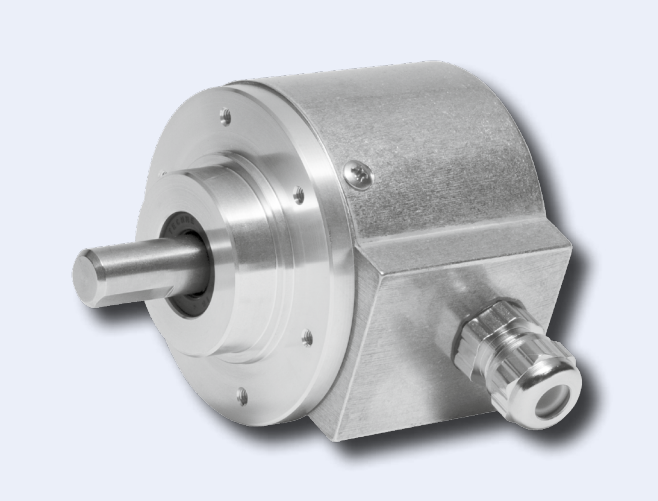
Standard
A = axial: 00, 01, 08, 09, 10, 11
R = radial: 00, 01

Edelstahl
A = axial: 00, 01,08, 09, 10, 11
R = radial: 00, 01

Output circuit

1 = Push-pull 30mA
3 = TTL

AWI 58



AWI 58

- Incremental rotary encoder with shaft and high degree of protection
- Compact design for highest industrial requirements
- International standard
- Also available in stainless steel for aggressive environmental conditions
- Accessories from page 70

Electrical specifications

max. pulse frequency:	100 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V. . . 30V DC
Max. current consumption:	80 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% UB
Power supply:	5V DC ± 5%
Max. current consumption:	80 mA
Max. output load:	30 mA (per channel)

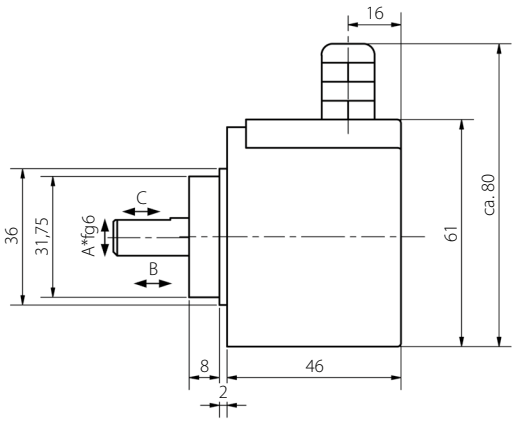
Mechanical specifications

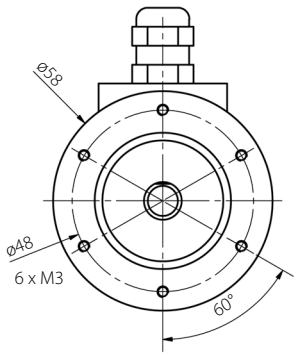
Flange:	Aluminium
Housing:	Zinc die-casting
Shaft:	stainless steel
Shaft seal:	
Oil/Salt-water resistant	
Bearing:	Deep groove ball bearing
Weight:	approx. 0.4 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	approx. 3 Ncm
Max. shaft load:	axial 15 N/radial 30 N

Mechanical dimensions

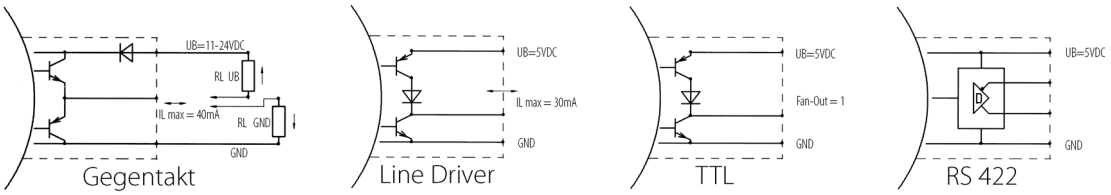
A	B	C
6 mm	10 mm	9.5 mm
6.35 mm	10 mm	9.5 mm
8 mm	20 mm	15 mm
9.52 mm	20 mm	15 mm
10 mm	20 mm	15 mm
12 mm	25 mm	20 mm

* Tolerance = fg 6



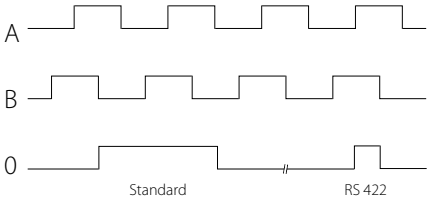


Output circuits



Order ref.: 1 2 3 6

Signal outputs



Two square pulse trains offset by 90° el,
with channel A lagging in clockwise rotation.
Reference pulse 0 once per revolution,
position and length optional, linked for RS 422.

All channels can also be executed inversely.

Pin configuration

	GND	+ U_B	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow			grey	
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow	grey	pink	blue	red
Connection type 01	black	blue	brown	beige			yellow	
Connection type 01	black	blue	brown	beige	yellow	green	pink	purple
Connection type 05	1	2	3	4				
Connection type 08, 09	1	2	3	4	(5)		5	
Connection type 10, 11	1	2	3	4	(5)	(6)	5	6
Connection type 12	1	2	3	4	5	6	7	8
Connection type 52	A	B	C	D	E	F	G	

Order reference

AWI 58 [ ] – [ ][ ][ ][ ][ ] – [ ] (higher pulse numbers on request)

Number of pulses 1 ... 5000

Housing
S = Standard
E = Stainless steel

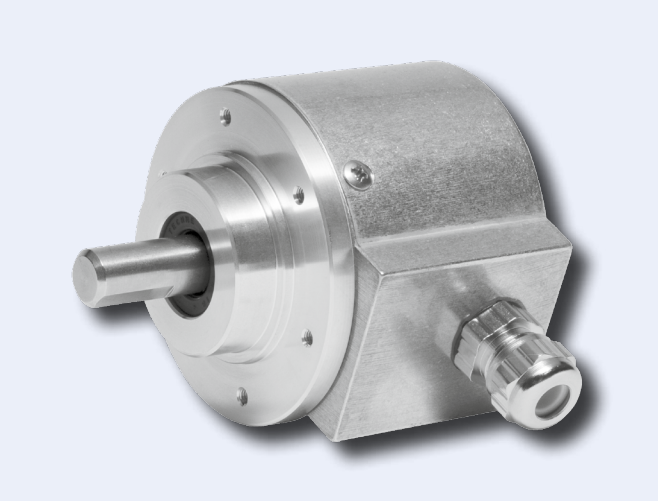
Shaft
06 = 6 mm
08 = 8 mm
10 = 10 mm
12 = 12 mm (IP 54)
56 = 6,35 mm
59 = 9,52 mm

Signal output (see page 70)
1 = A
2 = A, B
3 = A, B, 0
4 = A, $\bar{A}$
5 = A, B / $\bar{A}$, $\bar{B}$
6 = A, B, 0 / $\bar{A}$, $\bar{B}$, $\bar{0}$
7 = A, 0
8 = A, 0 / $\bar{A}$, $\bar{0}$
9 = A, B, 0, $\bar{0}$

Connection position/Connection type
Standard
R = radial: 00, 01, 05, 08, 09, 10, 11, 12, 52
A = axial: 00, 01, 05, 08, 09, 10, 11
Stainless steel
R = radial: 00, 01, 12
A = axial: 00, 01, 12

Output circuit
1 = Push-pull 30mA
2 = TTL Line Driver 75114 o.Ä.
3 = TTL
6 = RS 422
7 = U_B 24V DC-Ausg. 5V TTL
8 = Push-pull 100mA
9 = U_B 24V DC-out. RS 422

AWI 58 H



AWI 58 H

- Incremental industrial rotary encoder with shaft
- Protection class IP 65
- Resolutions up to 10 000 pulses
- Application for, e.g. machine tools, CNC axles, packaging machines, motors/drives, injection moulding machines, sawing machines, textile machines
- Accessories from page 70

Electrical specifications

General design	according to DIN VDE 0160, protection class III, degree of contamination 2, overvoltage category II
max. pulse frequency:	200 kHz (Push-pull) 300 kHz (RS 422)
Perm. temperature range:	-30° ... +70° C
Power supply:	10 ... 30 V DC* (Push-pull (K, I)) 5 V ± 10% or 10 ... 30 V DC* (RS 422 + alarm (R))
Current consumption:	40 mA (5 V DC) 60 mA (10 V DC) 30 mA (24 V DC)

* Reverse polarity protection for supply voltage 10 ... 30 V DC

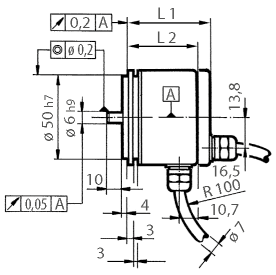
Mechanical specifications

Flange:	S = Synchro flange, K = Clam ping flange
Housing:	Aluminium Ø 58 mm
Shaft:	stainless steel
Shaft diameter:	6 mm/10 mm
Weight:	approx. 0.36 kg
Protection class (EN60529):	IP 65
Max. speed:	10 000 U/min
Torque:	- 0.5 Ncm (IP 65)
Max. shaft load:	Ø 10 mm radial 60 N/axial 40 N Ø 6 mm radial 40 N/axial 20 N
Moment of inertia:	S = Synchro flange approx. 14 g/cm2 K = Clamping flange approx. 20 g/cm2
Vibration resistance:	100 m/s2 (10 ... 2000 Hz) (IEC 68-2-6)
Shock resistance:	1000 m/s2 (6 ms) (IEC 68-2-27)
Connection type:	1.5 m cable or flange receptacle

Mechanical dimensions

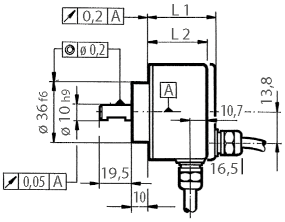
Synchro flange, 58 mm
Connection cable, axial/radial

L1 max. = 57.5 mm
L2 max. = 56 mm

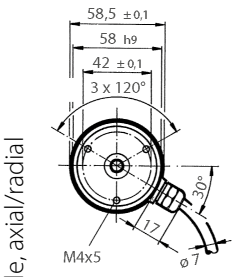


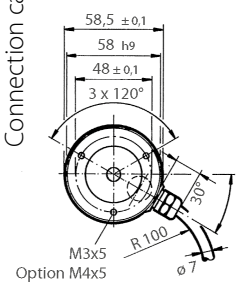
Clamping flange, 58 mm
Connection cable, axial/radial

L1 max. = 57.5 mm
L2 max. = 56 mm

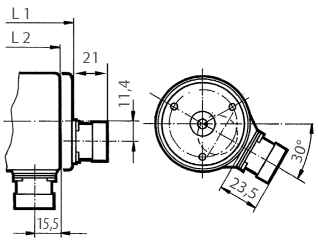


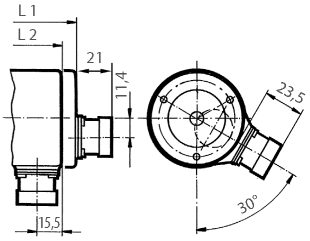
Connection cable, axial/radial





Flange receptacle, 12-pole, axial/radial





Pin configuration TPE cable

TPE cable (F) colour	Output RS 422 (R)	Push-pull (K)	Push-pull antivalent (I)
brown/green	5/10. . . 30 V DC =	10. . . 30 V DC =	10. . . 30 V DC =
blue	Sense VCC		Sense VCC
brown	Channel A	Channel A	Channel A
green	Channel A-		Channel A-
grey	Channel B	Channel B	Channel B
pink	Channel B-		Channel B-
red	Channel N	Channel N	Channel N
black	Channel N-		Channel N-
white/green	GND	GND	GND
purple	Alarm––––––––	Alarm––––––––	Alarm––––––––
Shield*	Shield*	Shield*	Shield*

* Connected with the encoder housing

Flange receptacle 12-pole (clockwise)

PIN	RS 422 + Alarm (R)	Push-pull (K)	Push-pull antivalent (I)
1	Channel B–	N.C.	Channel B–
2	Sense V_{CC}	N.C.	Sense V_{CC}
3	Channel N	Channel N	Channel N
4	Channel N–	N.C.	Channel N–
5	Channel A	Channel A	Channel A
6	Channel A–	N.C.	Channel A–
7	Alarm––––––	Alarm––––––	Alarm––––––
8	Channel B	Channel B	Channel B
9	N.C.*	N.C.*	N.C.*
10	GND	GND	GND
11	N.C.	N.C.	N.C.
12	5/10 . . . 30 V DC =	10 . . . 30 V DC =	10 . . . 30 V DC =

* Shield for cable design with connector

Pulse numbers AWI 58 H

2500 / 3000 / 3400 / 3480 / 3600 / 3750 / 3925 / 3958 / 3968 / 4000 / 4096 / 4445 / 4800 / 5000 / 5400 / 6000 / 6875 / 7200 / 7680 / 7854 / 8000 / 8192 / 9000 / 10000

Standard-output variants

RS 422 (R):
A, B, N, A–, B–, N–, Alarm––––

Push-pull (K): A, B, N, Alarm––––

Push-pull antivalent(I):
A, B, N, A–, B–, N–, Alarm––––

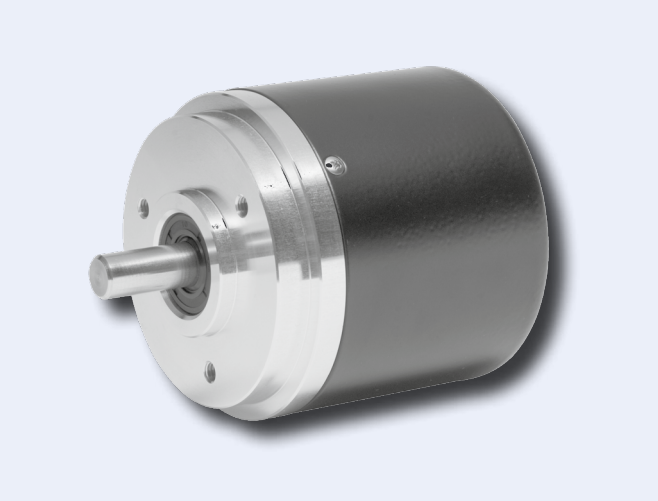
Order reference

AWI 58 H – 0 / ☐☐☐☐☐ · 4 ☐☐☐

Design	Resolution	Supply	Type of flange	Protection class	Shaft	Signal output	Connection
0 = Standard	up to 10 000	A = 5 V DC E = 10 . . . 30 V DC	S = Synchro flange K = Clamping flange	4 = IP 65	1 = 6 mm (S) 2 = 10 mm (K)	K = Push-pull Short-circuit-proof [1] I = Push-pull, antivalent [1] R = RS 422+Alarm [2]	D= Flange receptacle 12-pol. radial clockwise F = TPE-cable, radial

[1] Supply 10 . . . 30 V DC [2] Supply 5 V DC

AWI 90



AWI 90

- Incremental rotary encoder with shaft
- Due to its design for highest mechanical requirements
- For applications with high mechanical loads
- Also available in stainless steel for aggressive environmental conditions
- Accessories from page 70

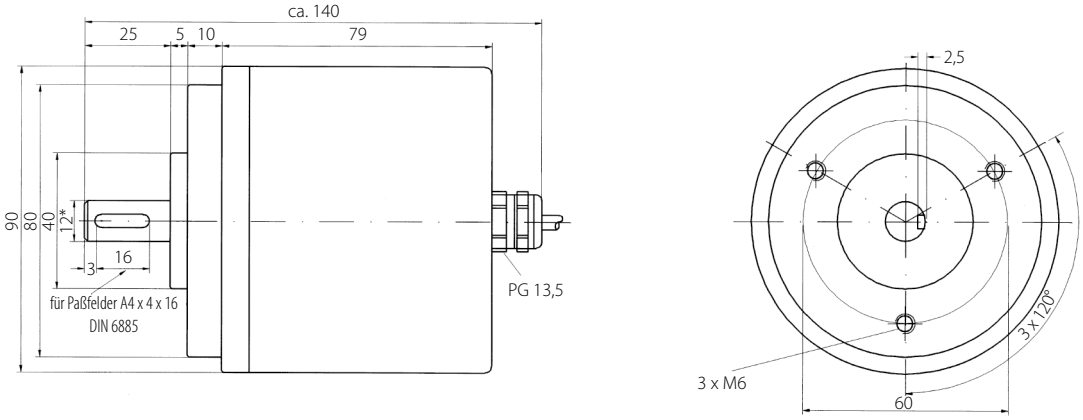
Electrical specifications

Max. step frequency:	100 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10 V. . . 30 V DC
Max. current consumption:	80 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% UB
Power supply:	5 V DC ± 5%
Max. current consumption:	80 mA
	150 mA for Line Driver 75114 or sim.

Mechanical specifications

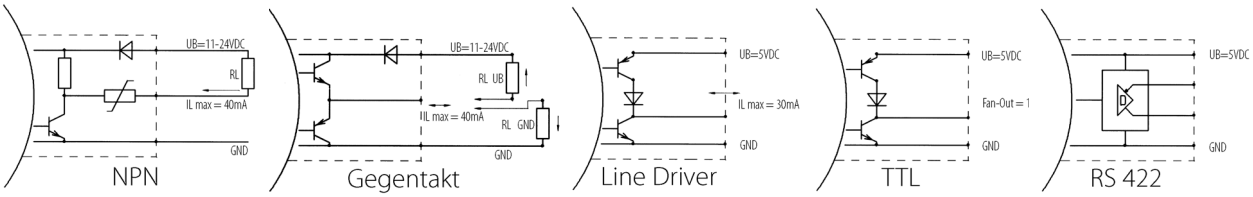
Flange:	Aluminium
Housing:	Powder-coated sheet steel
Shaft:	stainless steel
Shaft seal:	Oil/Salt-water resistant
Bearing:	Deep groove ball bearing
Weight:	approx. 1.2 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	approx. 5 Ncm
Max. shaft load:	axial 30 N/radial 50 N

Mechanical dimensions



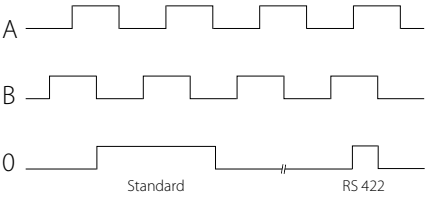
* Tolerance = h 6

Output circuits



Order ref.:: 0 1 2 3 6

Signal outputs



Two square pulse trains offset by 90° el,

with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution,
RS 422 position and length optional, linked for RS 422.

All channels can also be executed inversely.

Pin configuration

	GND	+ U_B	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow			grey	
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow	grey	pink	blue	red
Connection type 01	black	blue	brown	beige			yellow	
Connection type 01	black	blue	brown	beige	yellow	green	pink	purple
Connection type 02, 03	1	2	3	4	5	6	7	
Connection type 05	1	2	3	4				
Connection type 08, 09	1	2	3	4			5	
Connection type 10, 11	1	2	3	4	(5)	(6)	5	6
Connection type 12	1	2	3	4	5	6	7	8

Order reference

AWI 90 □ – □□□□□ – □□□ Impulszahl 1... 5000

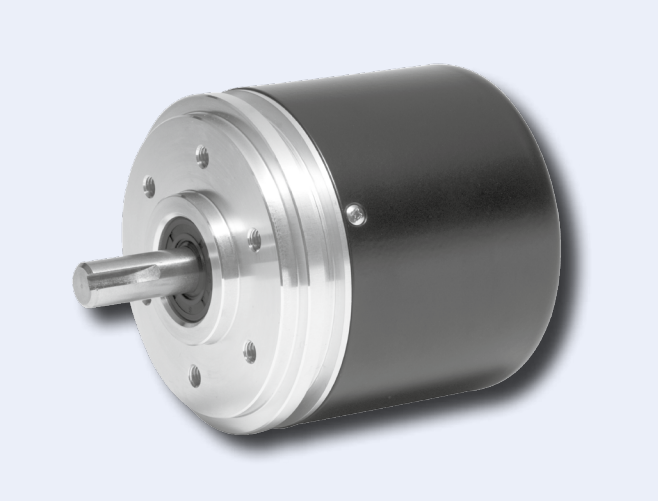
Housing
S = Standard
E = Stainless steel

Shaft
12 = 12 mm

Signal output
1 = A
2 = A, B
3 = A, B, 0
4 = A, $\bar{A}$
5 = A, B / $\bar{A}$, $\bar{B}$
6 = A, B, 0 / $\bar{A}$, $\bar{B}$, $\bar{0}$
7 = A, 0
8 = A, 0/$\bar{A}$, $\bar{0}$
9 = A, B, 0, $\bar{0}$

Connection position/Connection type (see page 70)
Standard
R = radial: 00, 01, 05, 08, 09, 10, 11, 12
A = axial: 00, 01, 02, 03, 05, 08, 09, 10, 11, 12
Stainless steel
R = radial: 00, 01, 12
A = axial: 00, 01, 12

Output circuit
0 = NPN
1 = Push-pull 30mA
2 = TTL Line Driver 75114 or sim.
3 = TTL
6 = RS 422
7 = UB 24V DC out. 5V TTL
8 = Push-pull 100mA
9 = UB 24V DC out. RS 422



PH 05

- Incremental rotary encoder with shaft
- Very robust design
  for highest mechanical requirements
- Accessories from page 70

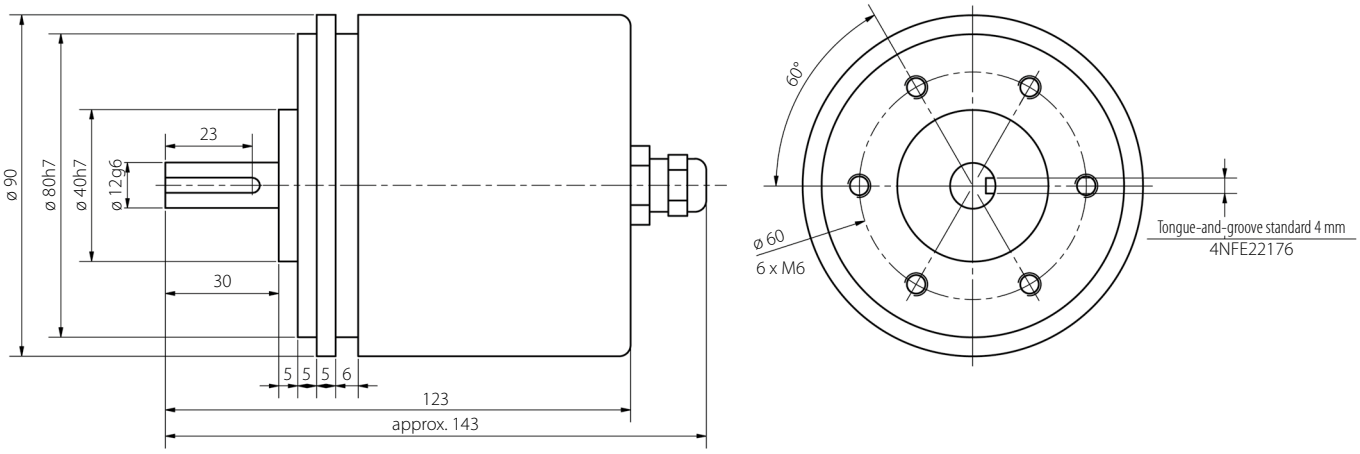
Electrical specifications

max. pulse frequency:	100 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V. . . 30V DC
Max. current consumption:	80 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	80 mA
	150 mA for Line Driver

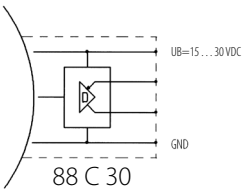
Mechanical specifications

Housing:	Powder-coated sheet steel
Flange:	Aluminium
Shaft:	stainless steel
Shaft seal:	Oil/Salt-water resistant
Bearing:	Deep groove ball bearing
Weight:	approx. 1.2 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	5 Ncm
Max. shaft load:	axial 30 N
	radial 50 N

Mechanical dimensions

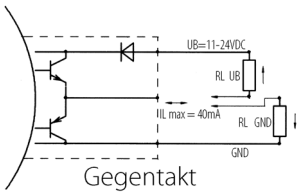


Output circuits



88 C 30

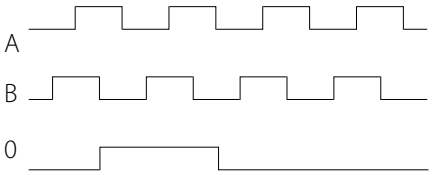
Order ref.: 3



Gegentakt

5

Signal outputs



Standard

Two square pulse trains offset by 90° el,
with channel A lagging in clockwise rotation.
Reference pulse 0 once per revolution,
position and length optional.

All channels can also be executed inversely.

Pin configuration

Connection	GND	+ U_B	A	B	0	AN	BN	0N
3R / 3A	white	brown	green	yellow	blue	grey	pink	ret
6R / 6A	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8

Order reference

PH 05 □□□□ – □□□□ Number of pulses 1 ... 5000

Output circuit

3 = 88 C 30
5 = Push-pull

Signal output

5 = A, AN
6 = A, AN, 0, 0N
7 = A, AN, B, BN
9 = A, AN, B, BN, 0, 0N

Resolution class

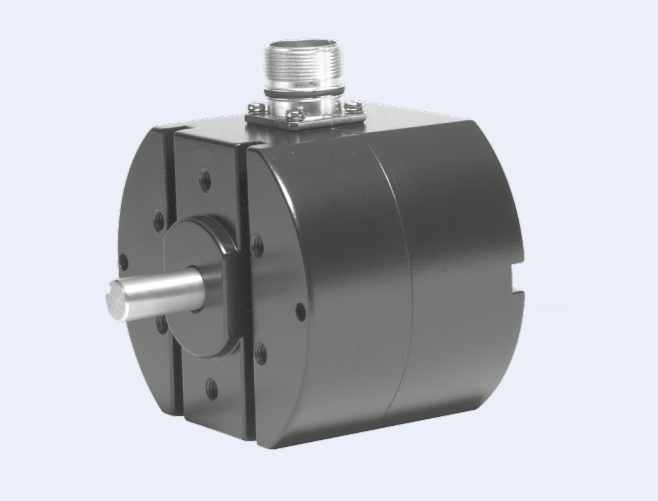
9 = 1 ... 1000 Pulses
0 = 1001 ... 2500 Pulses
3 = 2501 ... 3600 Pulses

Connection type/Connection position

(see page 70)

3R = Cable outlet radial (length 2 m)
3A = Cable outlet axial (length 2 m)
6R = Connector 12 radial
6A = Connector 12 axial

PA 02



PA 02

- Incremental rotary encoder with shaft
- Very robust design
- Low torque
- Accessories from page 70

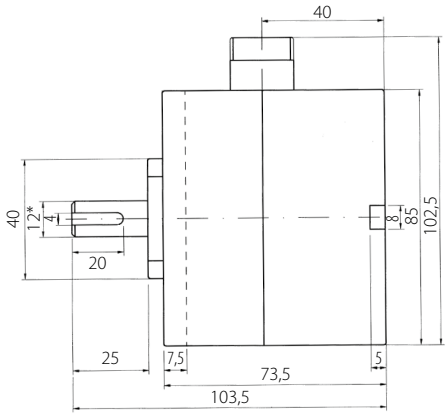
Electrical specifications

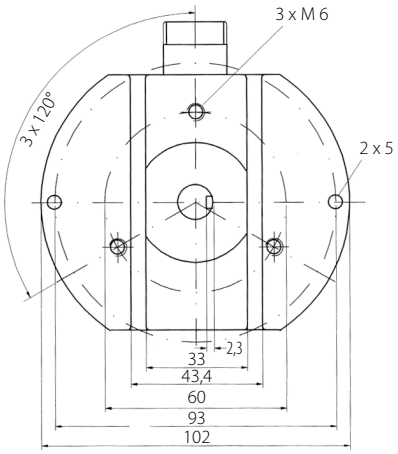
max. pulse frequency:	100 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V. . . 30V DC
Max. current consumption:	80 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	80 mA

Mechanical specifications

Housing:	Zinc die-casting
Shaft:	stainless steel
Bearing:	Deep groove ball bearing
Weight:	approx. 1.2 kg
Protection type:	IP 54
Max. speed:	6000 U/min
Torque:	approx. 3 Ncm
Max. shaft load:	axial 30 N
	radial 50 N

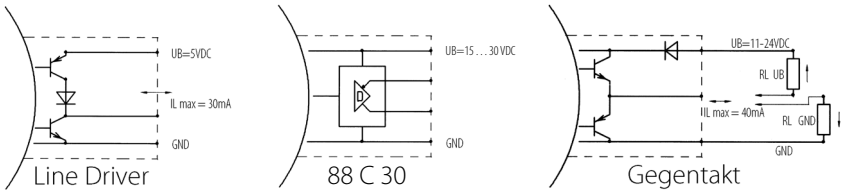
Mechanical dimensions





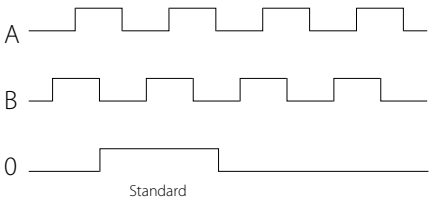
* Tolerance = H 6

Output circuits



Order ref.: 2 3 5

Signalausgänge



Two square pulse trains offset by 90° el,

with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution,

position and length optional.

All channels can also be executed inversely.

Pin configuration

	GND	+ U_B	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$	⏚
Connection type K (01)	black	blue	brown	beige			yellow		yl/gr
Connection type K (01)	black	blue	brown	beige	yellow	green	pink	purple	yl/gr
Connection type 0 (connector 12)	1	2	3	4	5	6	7	8	11

Order reference

PA 02 □□□ – □□□□ Number of pulses 1 ... 3600

Output circuit

2 = Line Driver 75183
2 = U_B = 5V DC/max. 40mA

3 = 88 C 30 Driver
2 = U_B = 15...30V DC/max. 100mA/Output 12 V

5 = Push-pull driver
5 = U_B = 11...24V DC/max. 30mA

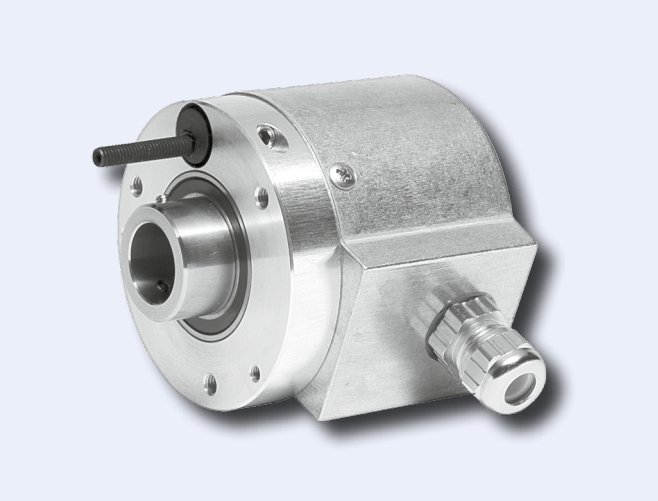
Signal output

5 = A, $\bar{A}$
7 = A, B / $\bar{A}$, $\bar{B}$
9 = A, B, 0 / $\bar{A}$, $\bar{B}$, $\bar{0}$

Connection type
(see page 70)

K = Cable 01
0 = Connector 12

SWI 58



SWI 58

- Incremental rotary encoder with plug-in shaft
- Direct assembly onto existing shafts
- Compact design
  for highest industrial requirements
- Accessories from page 70

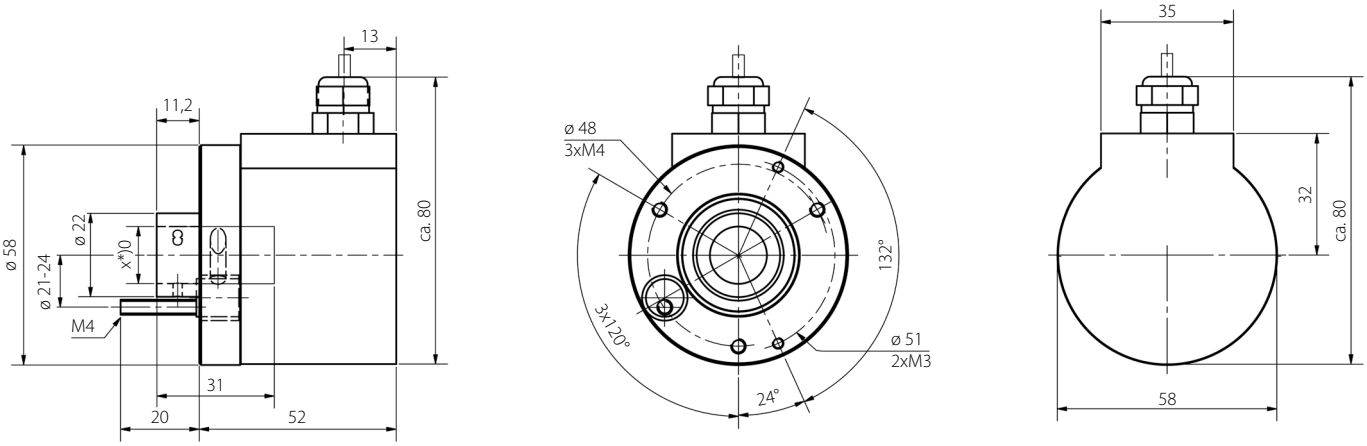
Electrical specifications

max. pulse frequency:	100 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V. . . 30V DC
Max. current consumption:	80 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	80 mA (150 mA for Line Driver 75114 or similar)

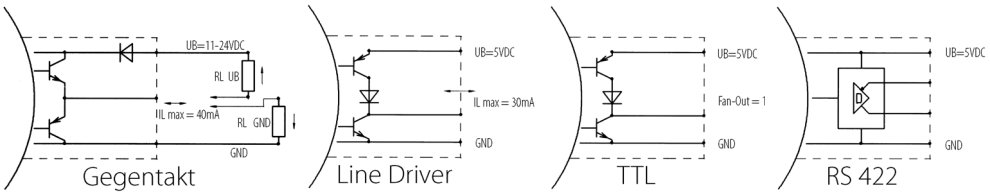
Mechanical specifications

Flange:	Aluminium
Housing:	Zinc die-casting
Shaft:	stainless steel
Bearing:	Deep groove ball bearing
Weight:	approx. 0.4 kg
Protection type:	IP 54
Max. speed:	6000 U/min
Torque:	approx. 5 Ncm
Max. shaft load:	axial 100 N/radial 100 N

Mechanical dimensions

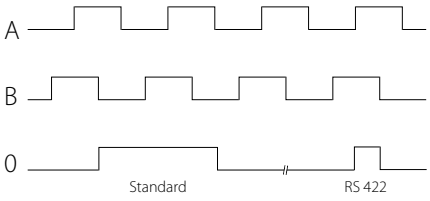


Output circuits



Order ref.: 1 2 3 6

Signal outputs



Two square pulse trains offset by 90° el,
with channel A lagging in clockwise rotation.

with channel A lagging in clockwise rotation.
position and length optional, linked for RS 422.

All channels can also be executed inversely.

Pin configuration

	GND	+ U_B	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow			grey	
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow	grey	pink	blue	red
Connection type 01	black	blue	brown	beige			yellow	
Connection type 01	black	blue	brown	beige	yellow	green	pink	purple
Connection type 05	1	2	3	4				
Connection type 08, 09	1	2	3	4	(5)		5	
Connection type 10,11	1	2	3	4	(5)	(6)	5	6
Connection type 12	1	2	3	4	5	6	7	8
Connection type 52	A	B	C	D	E	F	G	

Order reference

SWI 58 S – [ ][ ][ ][ ][ ] – [ ] (higher pulse numbers on request)

Number of pulses 1 ... 5000

Housing
S = Standard

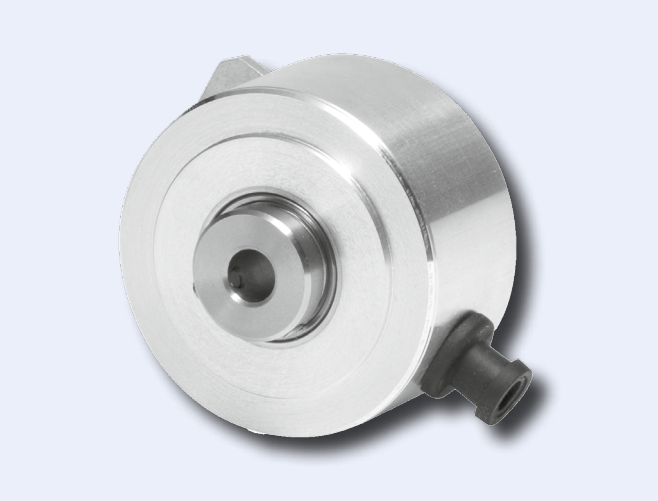
Shaft
08 = 8 mm
10 = 10 mm
12 = 12 mm
15 = 15 mm

Signal output
1 = A
2 = A, B
3 = A, B, 0
4 = A, $\bar{A}$
5 = A, B / $\bar{A}$, $\bar{B}$
6 = A, B, 0/ $\bar{A}$, $\bar{B}$, $\bar{0}$
7 = A, 0
8 = A, 0/ $\bar{A}$, $\bar{0}$
9 = A, B, 0, $\bar{0}$

Connection position/Connection type
(see page 70)
Standard
R = radial: 00, 01, 05, 08
09, 10, 11, 12
A = axial: 00, 01, 05, 08,
09, 10, 11, 12

Output circuit
1 = Push-pull 30mA
2 = TTL Line Driver 75114 or sim.
3 = TTL
6 = RS 422
7 = U_B 24V DC out. 5V TTL
8 = Push-pull 100mA
9 = U_B 24V DC out. RS 422

HWI 40



HWI 40

- Incremental rotary encoder with hollow shaft
- Direct assembly onto existing shafts
- Small design
  for simple industrial requirements
- Accessories from page 70

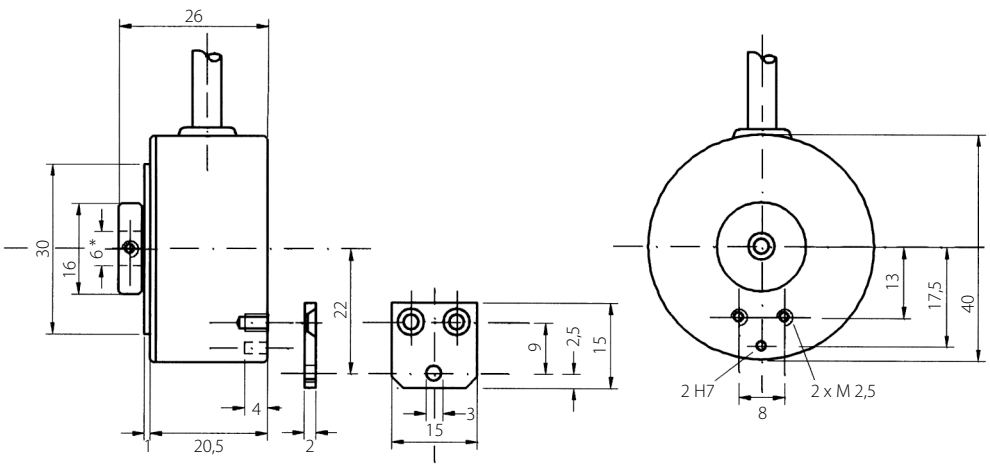
Electrical specifications

max. pulse frequency:	25 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V. . . 30V DC
Max. current consumption:	40 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	40 mA
Max. output load:	30 mA (per channel)

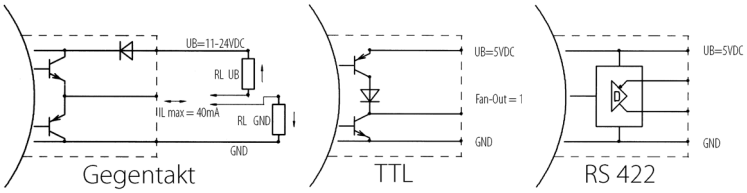
Mechanical specifications

Flange:	Aluminium
Housing:	Aluminium
Shaft:	stainless steel
Bearing:	Deep groove ball bearing
Weight:	approx. 0.1 kg
Protection type:	IP 54
Max. speed:	6000 U/min
Torque:	approx. 1 Ncm

Mechanical dimensions

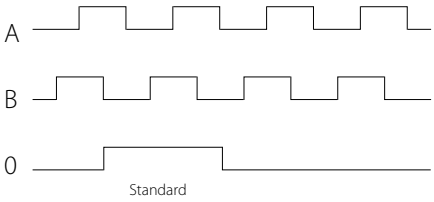


Output circuits



Order ref.: 1 3 6

Signal outputs



Two square pulse trains offset by 90° el, with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution, position and length optional.

All channels can also be executed inversely.

Pin configuration

	GND	+ U_B	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow			grey	
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow	gray	pink	blue	red
Connection type 01	black	blue	brown	beige			yellow	
Connection type 01	black	blue	brown	beige	yellow	green	pink	purple

Order reference

HWI 40 | S | 0 6 | | 1 | R | | | – | | (higher pulse numbers on request)

Number of pulses 1 ... 100

Housing	Shaft	Signal output	Drive	Connection position/Connection type (see page 70)		Output circuit
S = Standard	06 = 6 mm	1 = A 2 = A, B 3 = A, B, 0 4 = A, $\bar{A}$ 5 = A, B / $\bar{A}$, $\bar{B}$ 6 = A, B, 0 / $\bar{A}$, $\bar{B}$, $\bar{0}$ 7 = A, 0 8 = A, 0 /$\bar{A}$, $\bar{0}$ 9 = A, B, 0, $\bar{0}$	1 = Studs	Standard R = radial:	 00, 01	1 = Push-pull 30mA 3 = TTL 6 = RS 422

HWI 80

HWI 80

- Incremental rotary encoder with hollow shaft
- Constructionally great scope due to flat design
- Also available in stainless steel for aggressive environmental conditions
- Accessories from page 70

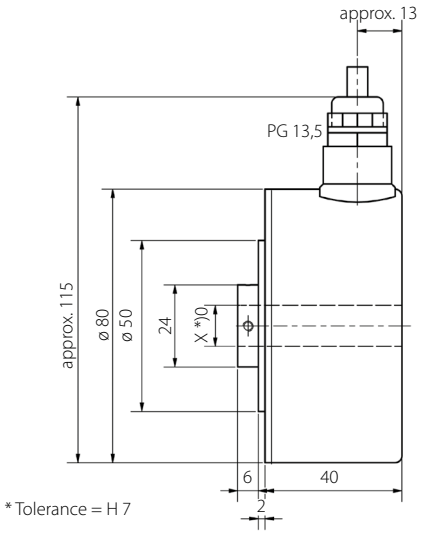
Electrical specifications

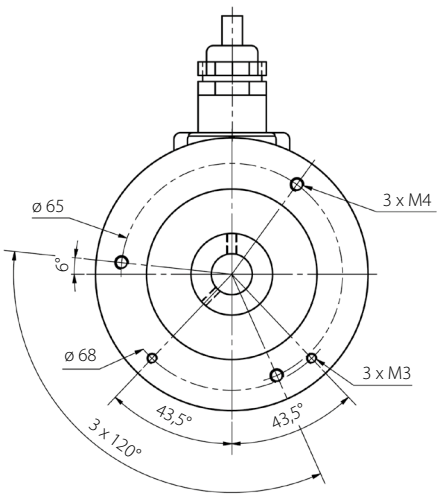
max. pulse frequency:	100 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V. . . 30V DC
Max. current consumption:	80 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	80 mA

Mechanical specifications

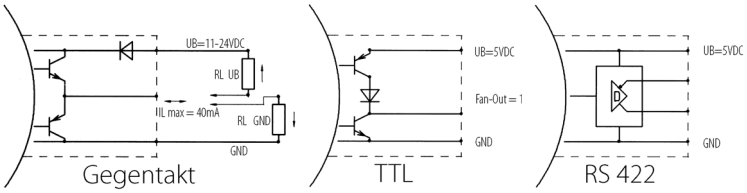
Flange:	Aluminium
Housing:	Aluminium
Hollow shaft:	stainless steel
Shaft seal:	Oil/Salt-water resistant
Bearing:	Deep groove ball bearing
Weight:	approx. 0.5 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	approx. 10 Ncm

Mechanical dimensions



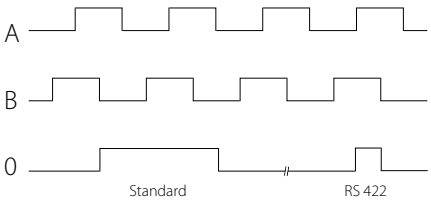


Output circuits



Order ref.: 1 3 6

Signal outputs



Two square pulse trains offset by 90° el, with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution, position and length optional, linked for RS 422.

All channels can also be executed inversely.

Pin configuration

	GND	+ U_B	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
Connection type 00 (Colour code according to DIN 47100	white	brown	green	yellow			grey	
Connection type 00 (Colour code according to DIN 47100	white	brown	green	yellow	grey	pink	blue	red
Connection type 01	black	blue	brown	beige			yellow	
Connection type 01	black	blue	brown	beige	yellow	green	pink	purple
Connection type 07, 08, 09, 10, 11	1	2	3	4	(5)	(6)	5	6
Connection type 12, 54	1	2	3	4	5	6	7	8

Order reference

HWI 80 ☐ ☐☐☐R☐☐ – ☐☐☐☐ (higher pulse numbers on request)

Number of pulses 1 ... 2500

Housing
S = Standard
E = Stainless steel

Shaft
06 = 6 mm
07 = 7 mm
08 = 8 mm
10 = 10 mm
11 = 11 mm
12 = 12 mm
59 = 9.52 mm

Signal output
1 = A
2 = A, B
3 = A, B, 0
4 = A, $\bar{A}$
5 = A, B / $\bar{A}$, $\bar{B}$
6 = A, B, 0 / $\bar{A}$, $\bar{B}$, $\bar{0}$
7 = A, 0
8 = A, 0 /$\bar{A}$, $\bar{0}$
9 = A, B, 0, $\bar{0}$

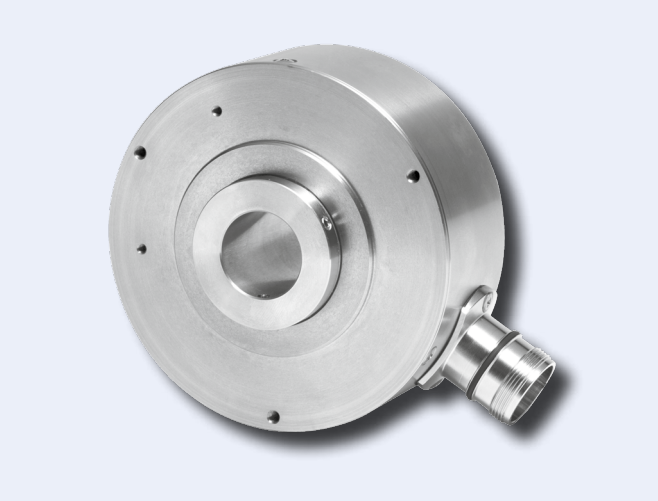
Drive
1 = Studs
2 = Coupling

Connection position/Connection type (see page 70)

Standard	
R = radial:	00, 01, 07, 08, 09, 10, 11, 12, 54
Stainless steel	
R = radial	00, 01, 12

Output circuit
1 = Push-pull 30mA
3 = TTL
6 = RS 422
7 = U_B 24V DC out. 5V TTL
8 = Push-pull 100mA
9 = U_B 24V DC out. RS 422

HWI 103



HWI 103

- Incremental rotary encoder with hollow shaft
- Constructionally great scopedue to flat design
- Very robust design
- Also available in stainless steel for aggressive environmental conditions
- Accessories from page 70

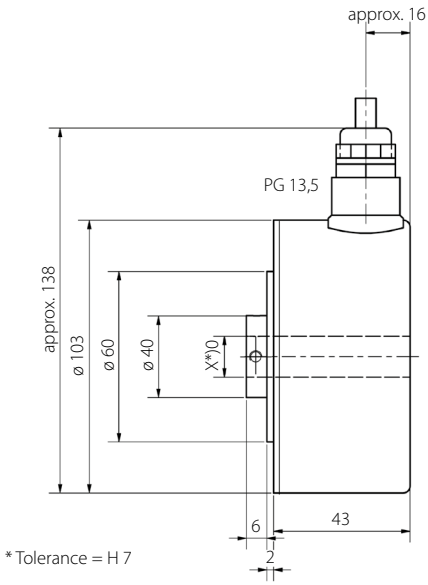
Electrical specifications

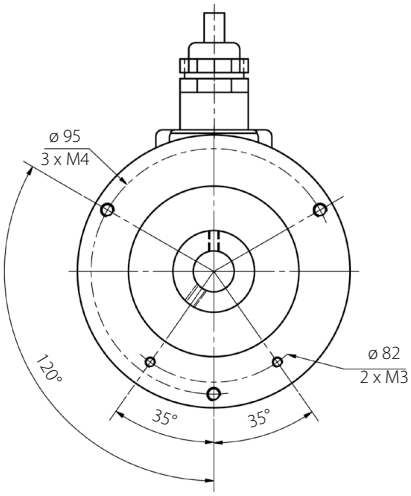
max. pulse frequency:	100 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V. . . 30V DC
Max. current consumption:	80 mA (without load)
Max. output load:	30 mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	80 mA

Mechanical specifications

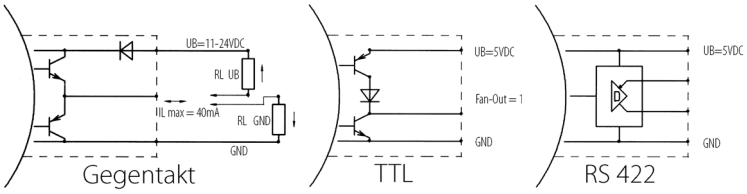
Flange:	Aluminium
Housing:	Aluminium
Hollow shaft:	stainless steel
Shaft seal:	Oil/Salt-water resistant
Bearing:	Deep groove ball bearing
Weight:	approx. 0.8 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	approx. 15 Ncm at 25° C approx. 50 Ncm at 20° C

Mechanical dimensions



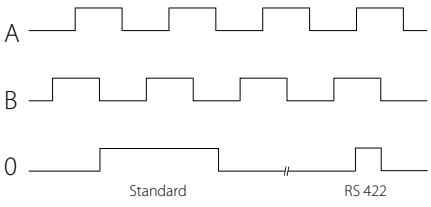


Output circuits



Order ref.: 1 3 6

Signal outputs



Two square pulse trains offset by 90° el, with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution, position and length optional, linked for RS 422.

All channels can also be executed inversely.

Pin configuration

	GND	+ U_B	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow			grey	
Connection type 00 (Colour code according to DIN 47100)	white	brown	green	yellow	grey	pink	blue	red
Connection type 01	black	blue	brown	beige			yellow	
Connection type 01	black	blue	brown	beige	yellow	green	pink	purple
Connection type 07, 08, 09, 10, 11	1	2	3	4	(5)	(6)	5	6
Connection type 12, 54	1	2	3	4	5	6	7	8

Order reference

HWI 103 [ ] [ ] [ ] 1 R [ ] [ ] – [ ]

Number of pulses 1 ... 5000

Housing
S = Standard
E = Stainless steel

Shaft
10 = 10 mm
12 = 12 mm
14 = 14 mm
15 = 15 mm
16 = 16 mm
18 = 18 mm
19 = 19 mm
20 = 20 mm
22 = 22 mm
24 = 24 mm
25 = 25 mm
75 = 25.4 mm

Signal output
1 = A
2 = A, B
3 = A, B, 0
4 = A, $\bar{A}$
5 = A, B / $\bar{A}$, $\bar{B}$
6 = A, B, 0 / $\bar{A}$, $\bar{B}$, $\bar{0}$
7 = A, 0
8 = A, 0/$\bar{A}$, $\bar{0}$
9 = A, B, 0, $\bar{0}$

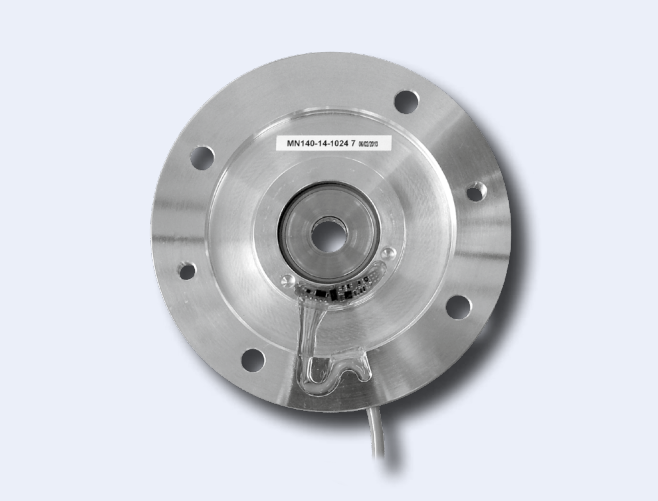
Drive
1 = Studs

Connection position/Connection type
see page 70
Standard
R = radial: 00, 01, 07, 08, 09, 10, 11, 12, 54,

Stainless steel
R = radial: 00, 01, 12

Output circuit
1 = Push-pull 30mA
3 = TTL
6 = RS 422
7 = UB 24V DC out. 5V TTL
8 = Push-pull 100mA
9 = UB 24V DC out. RS 422

MIG Nova



MIG Nova

- Rotary encoders available in aluminium and stainless steel
- 16*, 32, 48, 64, 80, 96, 112, ... 512, 1024 and 2048* pulses
- Electronics integrated and protected in flange
- No open electronic components
- Protection class standard IP 55 (depending on sealing up to IP 66)
- Securely and space-savingly mounted between motor and machine flange, or gear flange
- Flange width available as of 7 mm
- Operating speed up to 6,000 min-1
- Increased signal quality
- Elastomer-bound magnetic ring

MIG Nova

The **MIG *Nova*** is the consistent development of the MIG 1024 distinguished by its thin height, the extremely high signal quality and, as with all Hohner products, its quality workmanship.

The **MIG *Nova*** is, like all our rotary encoders, manufactured in-house and tested with the latest measuring methods for its functional reliability and accuracy prior to delivery. The consistent development enables us to offer flange widths as of 7 mm.

The practical and hundred thousand-fold proven, patented intermediate flange design remains. This will save you also considerable assembly costs and allows for an easy exchange between MIG 1024 and MIG Nova. The board remains as usual fully encapsulated and protected in the flange, in addition to protecting the electronics against almost any mechanical damage by the ingenious assembly type and special rotary encoder construction.

Conventional rotary encoder often have the problem of getting dirty and damaged by external forces affecting a safe and stable operation. The place-saving, easy assembly type between motor and gear eliminates these disruptive factors from the very beginning. Depending on the diameter of the flange, this MIG only requires 7 to 12 mm thus preventing any components of the rotary encoder from protruding into the unprotected area.

Another new feature of the **MIG *Nova*** is to dispense completely with conventional magnets and only use elastomer-bound magnetic rings. The magnets have excellent protection against rust as they are only applied to a stainless steel hub. The **MIG *Nova*** expands the application range of rotary encoders enormously due to its optimised microelectronics; the number of pulses from 1,024 so far has increased by up to 2,048 pulses.

The **MIG *Nova*** opens additional applications in the exact rotational speed control, position and dose controls, torque control and digital synchronisation control for intermediate flange rotary pulse encoders. The signals of the MIG are outputted as universal HTL or TTL compatible signals.

This makes it compatible with virtually all controls and is ideally suited for retrofitting existing drives. The speed-up from 2,500 min-1 so far by up to 6,000 min-1 until now, depending on the application, also enables an even more versatile use of the **MIG *Nova*** in your applications. Upon request, it is possible to increase the pulse numbers even further, depending on the application. The standard cable lengths are 2 m, 5 m and 10 m; other lengths are also available upon request. The **MIG *Nova*** is available in diameters of 80 to 350 mm for all IEC flange motors; all other special sizes are available upon request. The flange versions are available in aluminium and stainless steel.

With the new MIG *Nova*, we succeeded to close the gap roughly between magnetic and optical encoders.

*Depending on speed and shaft diameter

Mechanical values

Max. speed	6,000 min-1 (1,024 pulses) or 3,000 min-1 (2,048 pulses)
Temperature range	-30°C to +85°C
Flange/Hub material	Aluminium/Stainless steel (others on request)
Connection cable	PUR jacket 6 x 0.14 shielded (A+B , A+B inv.)
Cable length	Standard 2 m or on request max. 100 m at 5V DC max. 20 m at 24 V DC max. 50 m at 24 V DC and pulse frequency max. 50 kHz
Protection class	Standard IP 55 depending on the sealing between motor and machine flange max IP 66

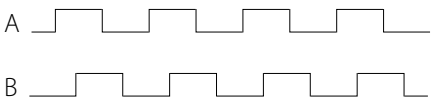
Electrical values

Power supply U_B	5 to 24 V DC
max. pulse frequency	≤ 100 kHz
Output signals	Rectangular pulse, A 90° B and A 90° B inverted
Pulses/Revolution	32 …. 512 , 1.024 , 2.048
Signal level	UHIGH ≥ UB – 0,7 V at ILoad ≤ 10mA / ULOW ≤ 0,7 V at ILoad ≤ 10mA
Loading capacity of the outputs	≤ 30mA at UB= 10 V DC / ≤ 20mA at UB= 24 V DC
Output circuit	Line driver push-pull (Push-Pull)
External evaluations	NPN, PNP, RS 422
Protection against polarity	Yes
Protection against short circuit at the output	Yes
Motor shaft play	0,2 mm axial / 0,05 mm radial

Pin configuration

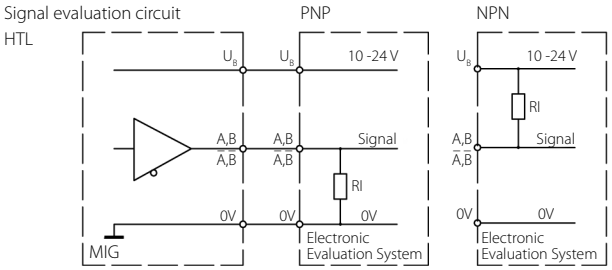
Connection	U_B	0 V	A	B	A'	B'
Cable	brown	white	yellow	green	pink	grey

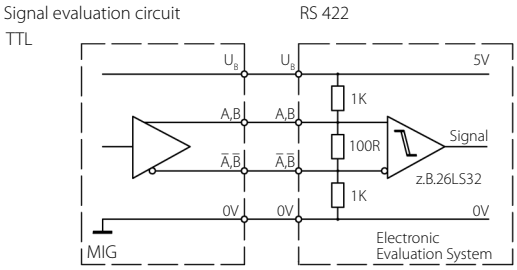
Signal outputs

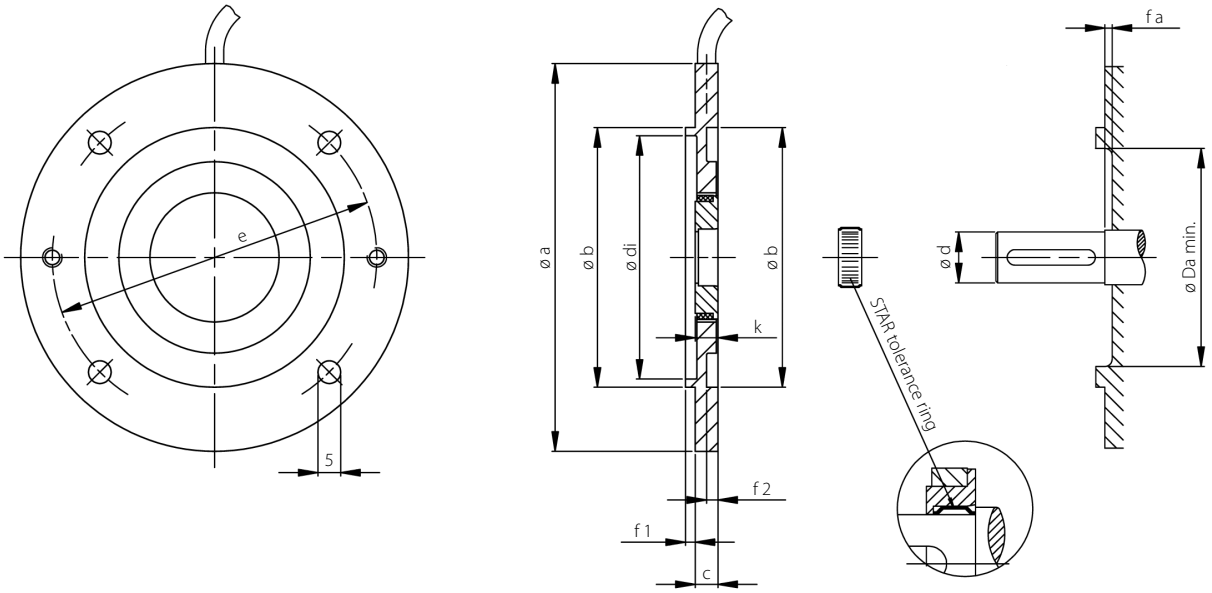


DThe two square-wave signals A and B are displaced by 90° for detecting the direction of rotation. All channels can also be executed inversely. (Pulse ratio:Pause ratio = 1:1)

Output circuits







Dimension table

Dimensions									Standard motor sizes (BG) allocation according to IEC			
Ø a	Ø b	c	Ø di	Ø e	f1	f2	k	s	BG	Ø d x length	ta	Ø Da
80	50	7	44	65	2,5	3	7	5,8	56	Ø 9 x 20	2	43
90	60	7	54	75	2,5	3	7	5,8	63	Ø11 x 23	2	43
105	70	7	64	85	2,5	3	7	7	56	Ø 9 x 20	2	60
									71	Ø 14 x 30	2	60
120	80	7	74	100	3	3,5	7	7	56	Ø 9 x 20	2	60
									63	Ø11 x 23	2	60
									80	Ø19 x 40	2	60
140	95	7	85	115	3,5	4	7	9	63	Ø11 x 23	2	60
									71	Ø14 x 30	2	60
140	95	9	85	115	3,5	4	9	9	90	Ø 24 x 50	3	60
160	110	7	100	130	3,5	4	7	9	71	Ø 14 x 30	2	60
									80	Ø 19 x 40	2	60
160	110	9	100	130	3,5	4	9	9	90	Ø 24 x 50	3	60
									100	Ø 28 x 60	3	105
									112	Ø 28 x 60	3	105
200	130	9	120	165	3,5	4	9	11	80	Ø 19 x 40	2	60
									90	Ø 24 x 50	3	60
									100	Ø 28 x 60	3	60
									112	Ø 28 x 60	3	60
200	130	12	120	165	3,5	4	12	11	132	Ø 38 x 80	3	105
250	180	12	170	215	4	5	12	13,5	100	Ø 28 x 60	3	60
									112	Ø 28 x 60	3	60
									132	Ø 38 x 80	3	105
300	230	12	218	265	4	5	12	13,5	132	Ø 38 x 80	3	105
350	250	12	238	300	5	6	12	17	160	Ø 42 x 110	3	105
									180	Ø 48 x 110	3	105

Selection table

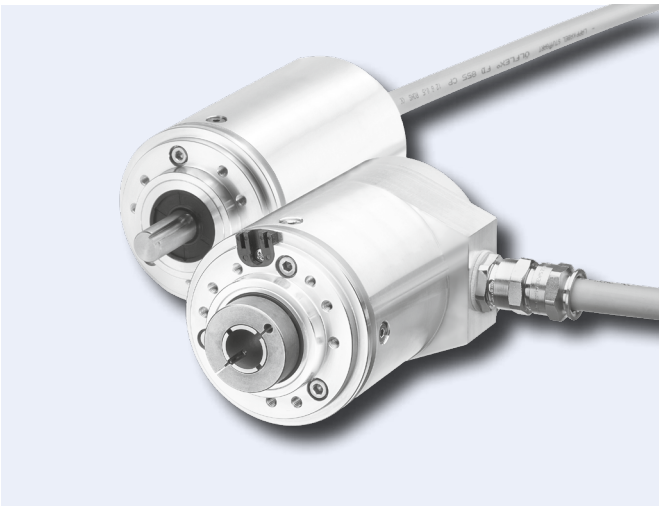
MIG *Nova*	Flange width	Magnet Ø	IEC comp.	Shaft Ø d x l	Pulse numbers							
					16	32	48	64	80	Multiplication 16** ... bis 512	1024*	2048*
80	7	Ø 19,7	56	Ø 9 x 20	X	X	X	X	X	X	X	
90	7		63	Ø 11 x 23	X	X	X	X	X	X	X	
105	7	Ø 39,1	56	Ø 9 x 20	X	X	X	X	X	X	X	X
			71	Ø 14 x 30	X	X	X	X	X	X	X	X
120	7	Ø 39,1	56	Ø 9 x 20	X	X	X	X	X	X	X	X
			63	Ø 11 x 23	X	X	X	X	X	X	X	X
			80	Ø 19 x 40	X	X	X	X	X	X	X	X
140	7	Ø 39,1	63	Ø 11 x 23	X	X	X	X	X	X	X	X
			71	Ø 14 x 30	X	X	X	X	X	X	X	X
140	9	Ø 39,1	90	Ø 24 x 50	X	X	X	X	X	X	X	X
160	7	Ø 39,1	71	Ø 14 x 30	X	X	X	X	X	X	X	X
			80	Ø 19 x 40	X	X	X	X	X	X	X	X
160	9	Ø 39,1	90	Ø 24 x 50	X	X	X	X	X	X	X	X
			100	Ø 28 x 60	X	X	X	X	X	X	X	X
			112	Ø 28 x 60	X	X	X	X	X	X	X	X
200	9	Ø 39,1	80	Ø 19 x 40	X	X	X	X	X	X	X	X
			90	Ø 24 x 50	X	X	X	X	X	X	X	X
			100	Ø 28 x 60	X	X	X	X	X	X	X	X
			112	Ø 28 x 60	X	X	X	X	X	X	X	X
200	12	Ø 79,9**	132	Ø 38 x 80		X		X		X	X	X
250	12	Ø 39,1	100	Ø 28 x 60	X	X	X	X	X	X	X	X
			112	Ø 28 x 60	X	X	X	X	X	X	X	X
250	12	Ø 79,9**	132	Ø 38 x 80		X		X		X	X	X
300	12	Ø 79,9**	132	Ø 38 x 80		X		X		X	X	X
350	12	Ø 79,9**	160	Ø 42 x 110		X		X		X	X	X
			180	Ø 48 x 110		X		X		X	X	X

* at 1024 pulses, max. speed 6000 min-1, at 2048 pulses, max. speed 3000 min-1

** Multiplication in increments of 32 with Ø 79.9 magnet

Available pulse numbers: 16 ; 32 ; 48 ; 64 ; 80 ; 96 ; 112 ; 128 ; 144 ; 160 ; 176 ; 192 ; 208 ; 224 ; 240 ; 256 ; 272 ; 280 ; 304 ; 320 ; 336 ; 352 ; 368 ; 384 ; 400 ; 416 ; 432 ; 464 ; 480 ; 496 ; 512 ; 1024 ; 2048

AWI 70 Ex / HWI 70 Ex



AWI 70 Ex / HWI 70 Ex

- Compact design
- Diameter 70 mm of the type "Pressurised encapsulation" with Ex d IIC T4 (PTB 09 ATEX1106 X)
- Electronic temperature and aging compensation
- Short-circuit-proof outputs
- Overvoltage and reverse polarity protection on the operating voltage input (at UB = 10 - 30 V DC)
- Resolutions up to 5000 pulses
- Accessories from page 70

Mechanical specifications

Speed:	max. 6000 U/min.*	Working temperature range:	-30° C . . . + 70° C
Moment of inertia of the rotor:	approx. 8 x 10-6 kgm2	Shaft:	Stainless steel
perm. shaft load radial:	20 N (at shaft end)1	Shock resistance according to	
perm. shaft load axial:	10 N	DIN - IEC 68-2-27:	1000 m/s2, 6 ms
Starting torque (25° C):	< 0.05 Nm	Vibration resistance according to	
Weight:	approx. 0.9 kg	DIN - IEC 68-2-6:	100 m/s$_2$, 10. . . 2000 Hz
Protection class according to EN 60 529:	IP 64		

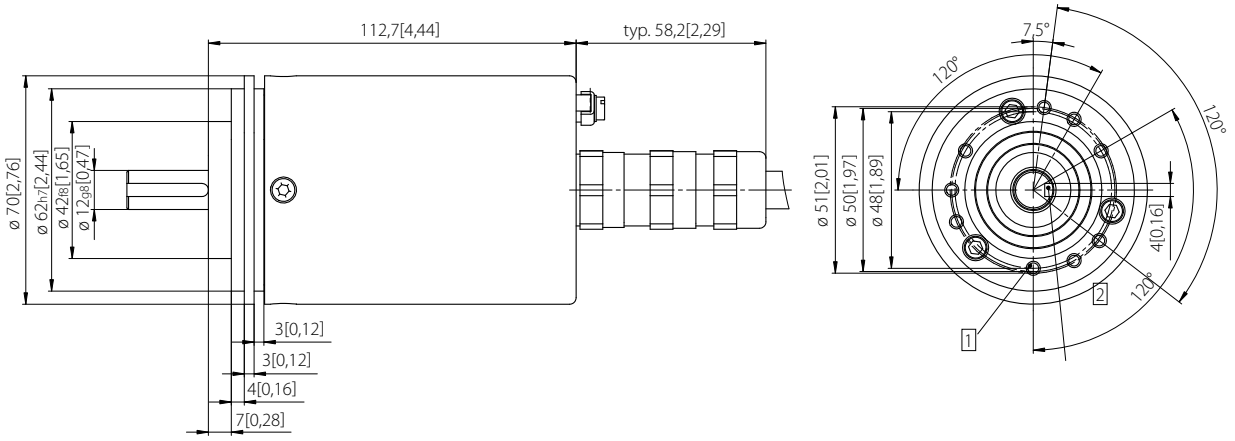
* in continuous operation max. 1500 U/min [1] for shaft design

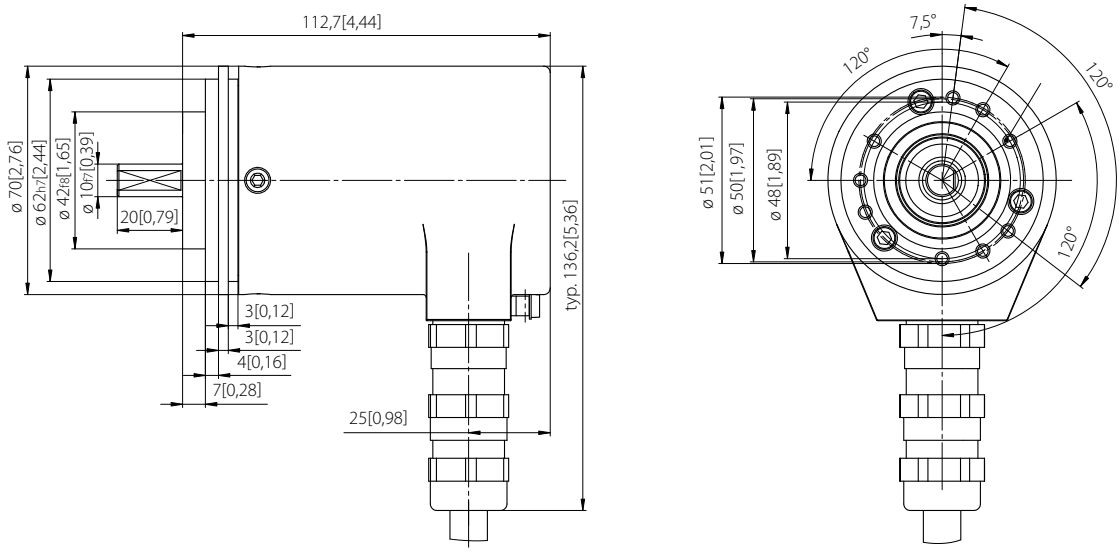
Electrical specifications

Output circuit	RS 422 (TTL compatible)	Push-pull circuit
Supply voltage	5 V DC (+/- 5%) or 10-30 V DC	10 - 30 VDC
Current consumption without inversions (without load)	–	type 46 mA/max. 78 mA
Current consumption with inversions (without load)	type 20 mA/max. 33 mA	type 77 mA/max. 126 mA
max. perm. load/channel	+/- 20mA	+/- 30 mA
max. pulse frequency	200 Hz	200 Hz
Signal level high	min. 2.5 V	min. U_B -3 V
Signal level low	max. 0.5 V	max. 2.5 V
Rise time tr	max. 200 ns	max. 1 µs
Fall time tr	max. 200 ns	max. 1 µs
Short-circuit proof[1)]	yes[2)]	yes
Reverse polarity protection on UB	no	yes

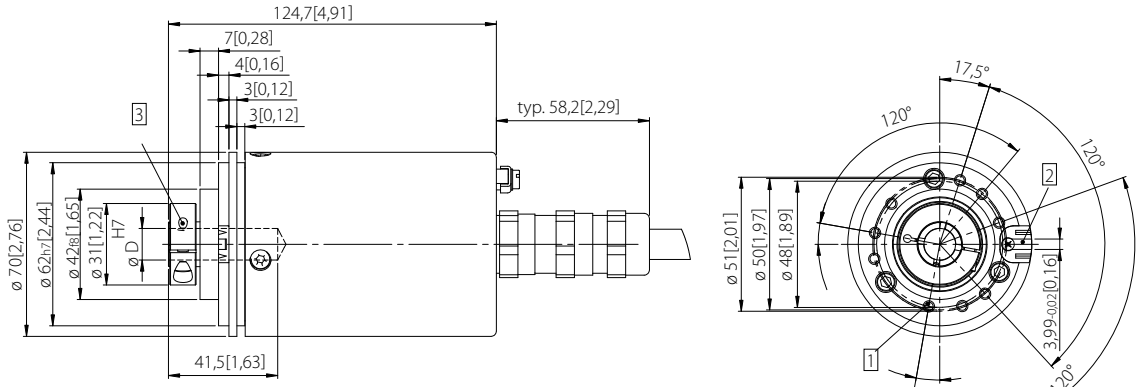
[1)] With correctly applied supply voltage U_B
[2)] Only one channel at the same time: with U_B = 5 V short circuit to channel and 0 V and + UB is permissible
with U_B = 10 - 30 V short circuit to channel and 0 V is permissible

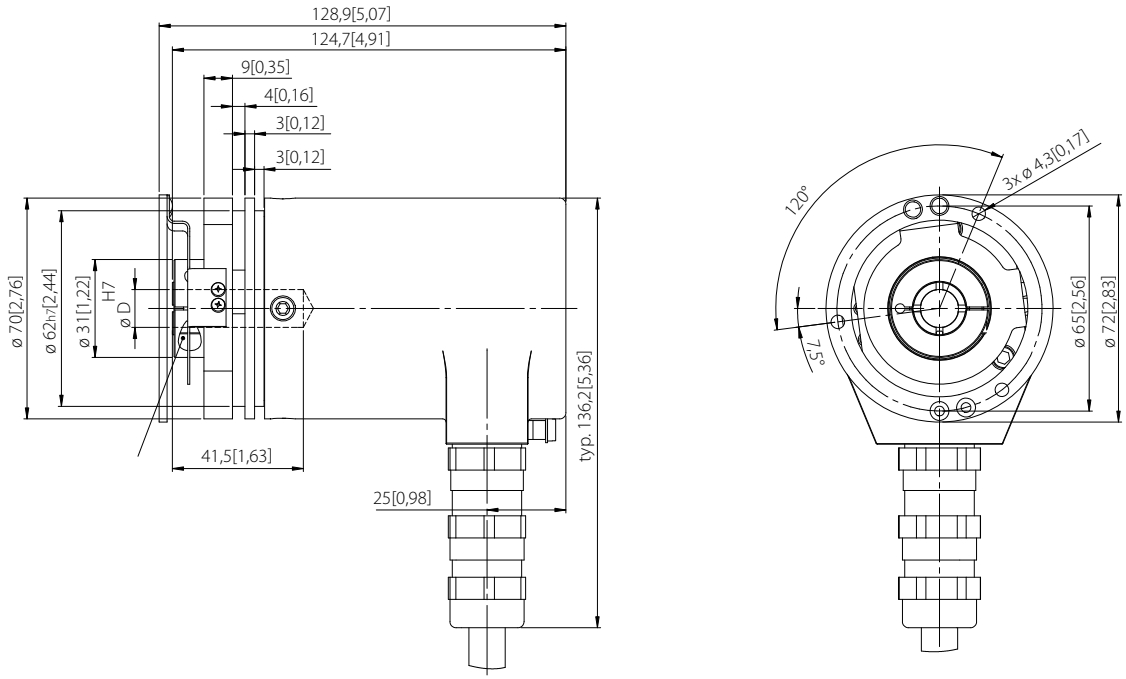
Mechanical dimensions





Mechanical dimensions





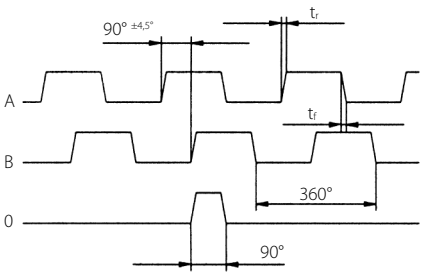
Installation instructions

Flange and shaft of encoder and drive may not be rigidly coupled at the same time!

Please observe

All current standards for installing electrical systems in potentially explosive atmospheres must be observed during installation! Manipulations of the encoder (opening, mechanical processing) will lead to the loss of ex approval and guarantees! The installer assumes the consequential liability!

Pulse image



Direction of rotation (relative to pulse image)
Shaft rotating clockwise, facing the shaft

Recommended encoders according to RS 422 - specification
e.g. DS 3486 or AM 26LS32

All channels can also be executed inversely.

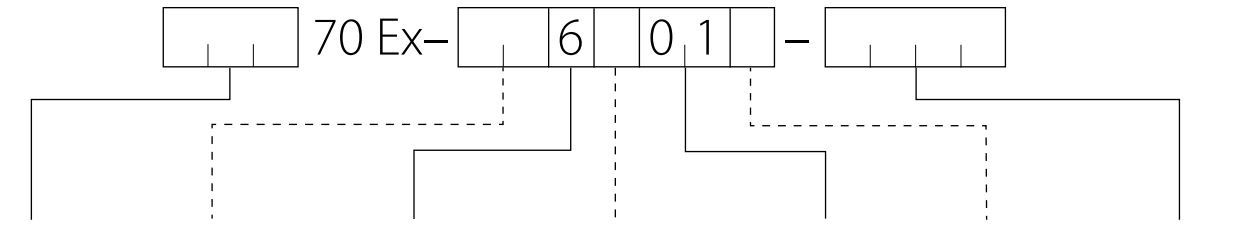
Pulse numbers available at short notice:
10, 20, 30, 50, 60, 100, 120, 125, 127, 150, 180, 200, 216, 240, 250, 254, 256, 300, 340, 360, 400, 500, 512, 600, 625, 720, 750, 800, 900, 1000, 1024, 1250, 1270, 1400, 1500, 1800, 2000, 2048, 2400, 2500, 3000, 3600, 4000, 4096, 5000
Other pulse numbers upon request

Pin configuration

Cabel 01	Sig.	0 V	0 V Sensor	$+U_B$	$+U_B$ Sensor	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
	Colour	white	grey/pink	brown	red/brown	green	yellow	grey	pink	blue	red
	Control line	1	9	2	10	3	4	5	6	7	8

SG = Shield located on housing of the cable gland. The sensor cables are connected internally with the power supply.
Unused outputs must be insulated prior to commissioning.

Order reference



Design	Shaft	Signal output	Connection position	Connection type (see page 70)	Output circuit	Pulse numbers
AWI = Axle shaft	10 = 10 x 20 mm with flat 12 = 12 x 25 mm with keyway	6 = A, B, 0 / $\overline{A}$, $\overline{B}$, $\overline{0}$	R = radial A = axial	01 = Cable (length 2 m) (other lenght on request)	1 = Push-pull 6 = RS 422 7 = RS 422 with U_B = 10 - 30 V	
HWI = Blind hollow shaft	12 = 12 mm 14 = 14 mm					

Absolute rotary encoders

General descriptions

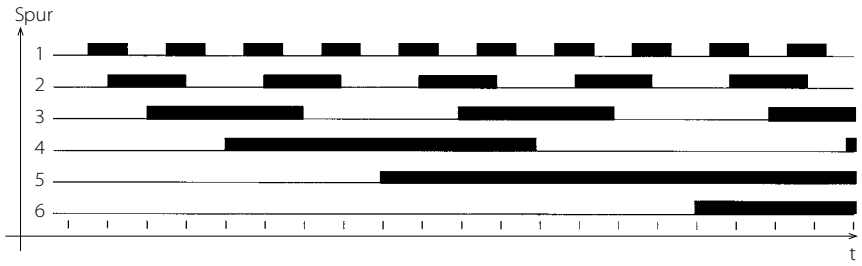
Absolute rotary encoders are optoelectronic sensors collecting and encoding angles or distances. A digitally coded value is assigned to each measuring step defined by the division on a measuring body (code disk). This absolute measured value can be read as often as desired, is reproducible and not corrupted by power failures.

The one-step grey code is basically used with the code disk (measuring body). The one-step coding has the advantage of avoiding intermediate values while measuring step changes.

Output codes

Grey code

This is a one-step format code whose individual positions have no significance. Only 1-bit changes during measure value change thus avoiding intermediate values that can occur in multi-step output codes. The number of positions to represent a position value corresponds to those of the binary codes.

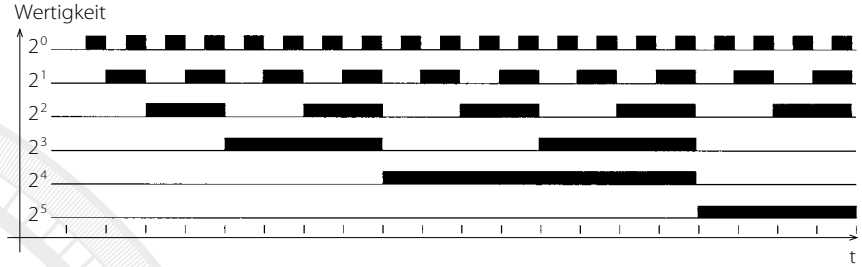


Grey excess codes

The one-step coding of the grey code applies to resolutions that can be represented as potency (x) to the base 2 (2x). A central part is taken from the grey code for other resolutions, which guarantees that the one-step coding is maintained. This output code is known as grey express code.
It should be observed that the representation range no longer begins at "0", but shifts by a certain value (e.g. resolution 360 steps/revolution corresponds to 76 - 435 range).

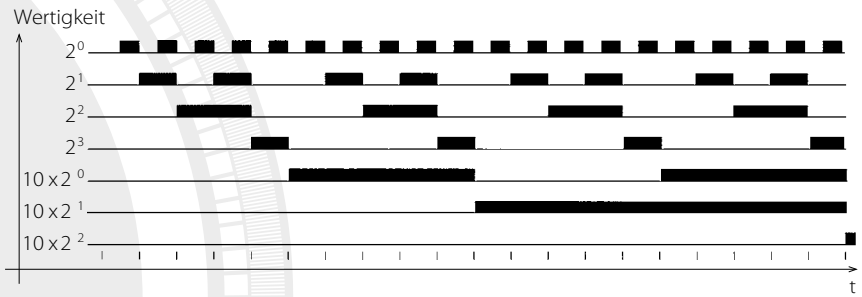
Binary code

With this assessable output code, a precise valence with the potency (x) to the base 2 (2x) is assigned to each position value.



BCD code (8-4-2-1 code)

This is an assessable decades code. Each decade of the decimal system is represented by a 4-bit binary number. The 6 redundant combinations (10-15) of the binary code are not used. They are also referred to as pseudo-tetrades.



Input

Counting direction switchover - The output of the position value facing the shaft clockwise is ascending with absolute rotary encoders. The counting direction is reversible via this output.
Latch - The output data of the absolute rotary encoder can be "frozen" via this input. This enables an error-free takeover of the position values to a control.

Calculation of permissible speed

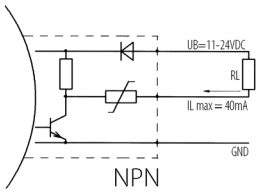
Depending on the max. step frequency of 10 kHz, the permissible speed is roughly calculated according to the following Formula:

$$n \left(\frac{u}{min} = \frac{f_{max}\,(Hz)}{Resolutions} \right) \times 60$$

Attention: This calculation does not take into account the influence of the cable length; in addition, the permissible mechanical speed should be observed!!

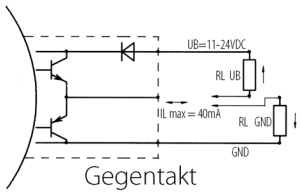
Output circuits

0 Darlington Driver
ULN 2003 o.ä.
max. 40mA per channel
short-circuit-proof



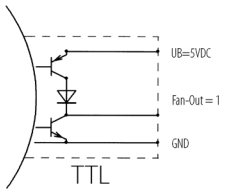
NPN
0

1 Push-pull
max. ±10mA



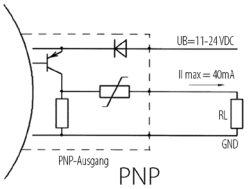
Gegentakt
1

3 TTL
max. 1,6mA per channel
(1 TTL-Load)



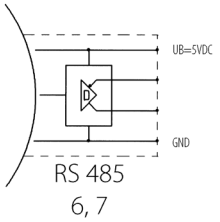
TTL
3

5 High Current Source
Driver UDN 2982 or.sim



PNP
5

6, 7 serial output SSI



RS 485
6, 7

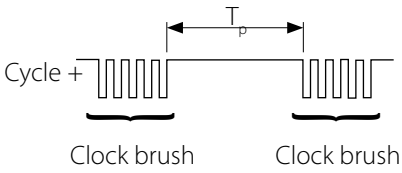
Absolute rotary encoders

Synchronous serial transmission (SSI) for absolute rotary encoders

Absolute rotary encoders are, in many cases, subject to severe mechanical stresses, electrical and magnetic fields contaminating the operating site. Special constructive measures are, therefore, required to combat dirt, dust and liquids in the industrial environment. Our absolute rotary encoders have a mechanically robust design according to the latest technologies, and the electronics are designed as compact as possible.

The main focus in the interference resistance applies to the data transmission from the rotary encoder to the control. The measuring data of the rotary encoder must be read error-free from the control. Under no circumstances should undefined data be transmitted, e.g. at the changeover point. The concept described here for synchronous serial data transfer for absolute rotary encoders differs essentially from the parallel and asynchronous serial transmission types by:

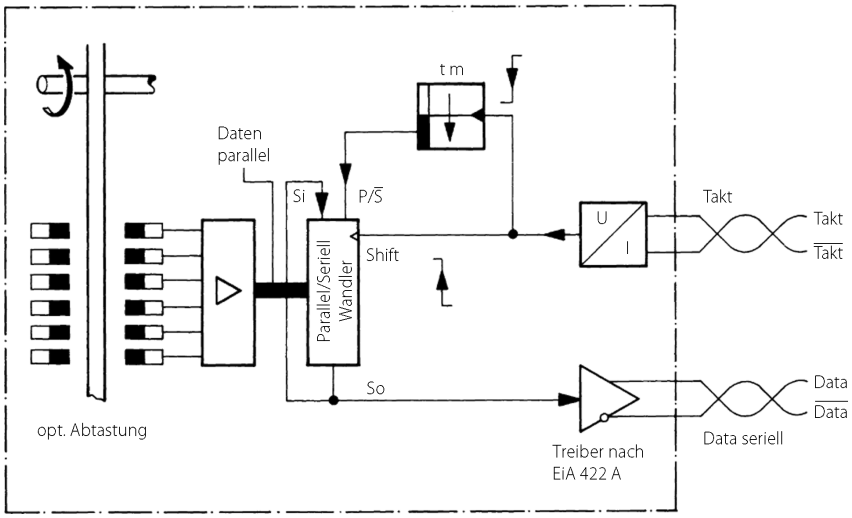
- fewer electronic components
- fewer cables for data transfer
- the same interface hardware, regardless of the resolution (word lengths) of the absolute rotary encoder
- galvanic isolation of the rotary encoder of the control by octocoupler
- line breakage monitoring by constant current
- data transfer rates up to 1.5 Mbit/s (depending on the cable length)
- Ring register operation possible



Transfer procedure

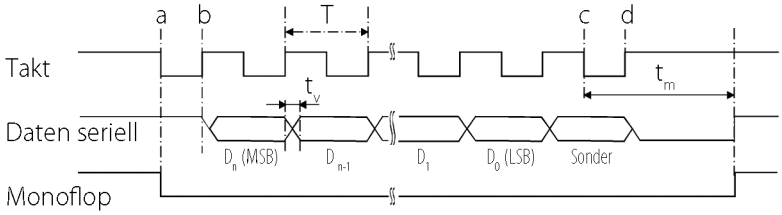
For correct data transfer, it is necessary to apply a defined number of pulses (clock brushes) at the input of the absolute rotary encoder. A TP pause must be observed thereupon. As long as no clock signal is applied to the rotary encoder, the encoder's internal parallel/serial shift register is switched to parallel. The data are free-running and correspond respectively to the position of the rotary encoder shaft. As soon as a clock brush is reapplied, the current angle information is stored.
The first change of the clock signal from high to low actuates the rotary encoder's internal retriggerable monoflop, whose tm monoflop timeout must be greater than the period duration T of the clock signal.
The output of the monoflop controls the parallel/serial register via the P/S (parallel/serial) port.

Block diagram of an absolute rotary encoder



Synchronous serial transfer

The number of clocks required for data transfer is independent of the resolution of the absolute rotary encoder. The cycle can be interrupted at any point, or continued for multiple queries in the ring register operation.



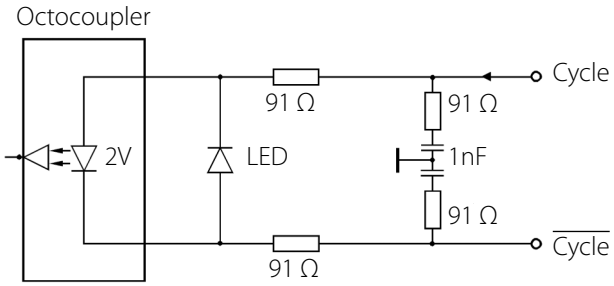
T = Period duration of clock signal
t_m = Monoflop time
t_m between 10 µs and 30 µs
tv = 100ns

The first change of the clock signal from low to high b applies the most significant bit (MSB) of the angle information to the serial data output of the rotary encoder.

Each succeeding rising edge shifts the next least-significant bit to the data output. After transfer of the next least-significant bit (LSB), the alarm bit or other special bits are transferred, depending on the configuration. Then the data line switches from low c until the tm time has elapsed.

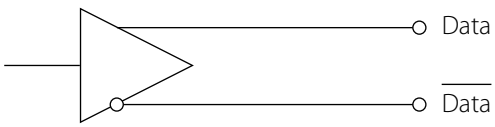
Another data transfer can only be started when the data line is switched to high d again. If the clock change is not interrupted at the point c, the ring register operation is activated automatically. That is, the information stored during the first clock change is returned via the S0 port onto the serial input S1. As long as the cycle is not interrupted at c, the data can be read out as often as desired.

Input circuit



Output circuit

Driver according to EIA 422 A

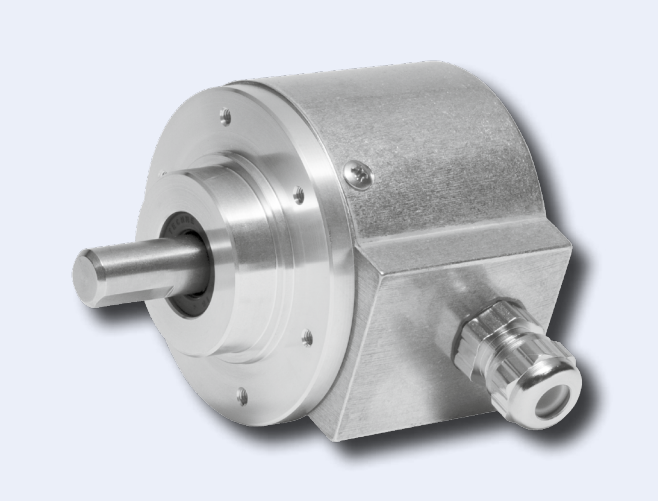


Recommended data transfer rate

The maximum data transfer rate depends on the cable length.

Cable length	Baud rate
< 50 m	< 400 kHz
< 100	< 300 kHz
< 200 m	< 200 kHz
< 400 m	< 100 kHz

AWA 58



AWA 58

- Absolute rotary encoder with shaft and high degree of protection
- Compact design for highest industrial requirements
- International standard
- Also available in stainless steel for aggressive environmental conditions
- Accessories from page 70

Electrical specifications

max. pulse frequency:	25 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10V. . . 30V DC
Max. current consumption:	170 mA (without load)
Max. output load:	40 mA (per channel)
Residual ripple:	max. ± 5% U_B
Power supply:	5V DC ± 5%
Max. current consumption:	80 mA
Max. output load:	30 mA (per channel)

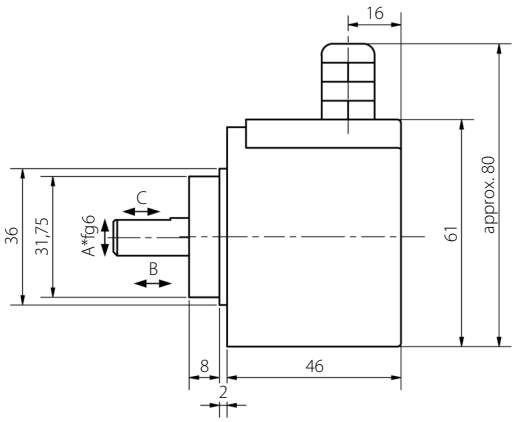
Mechanical specifications

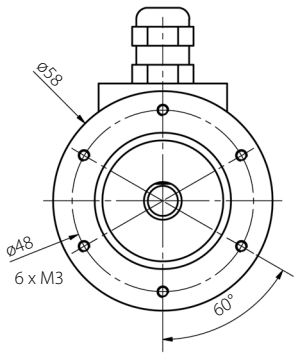
Flange:	Aluminium
Housing:	Zinc die-casting
Shaft:	stainless steel
Shaft seal:	
Oil/Salt-water resistant	
Bearing:	Deep groove ball bearing
Weight:	approx. 0.4 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	approx. 3 Ncm
Max. shaft load:	axial 15 N/radial 30 N

Mechanical dimensions

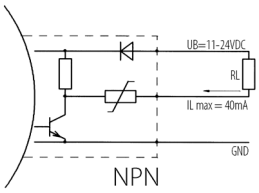
A	B	C
6 mm	10 mm	9,5 mm
6,35 mm	10 mm	9,5 mm
8 mm	20 mm	15 mm
9,52 mm	20 mm	15 mm
10 mm	20 mm	15 mm
12 mm	25 mm	20 mm

* Tolerance = fg 6

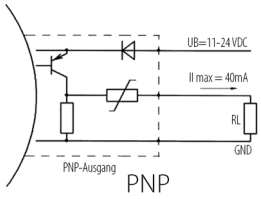




Output circuits



NPN



PNP

Order ref.: 0 5

Output code	Resolution	Inputs	Option
Grey (beginning with 0)	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024	Counting direction switchover with GND	none
Grey excess (beginning with ≠ 0)	45, 90, 180, 360		

Pin configuration

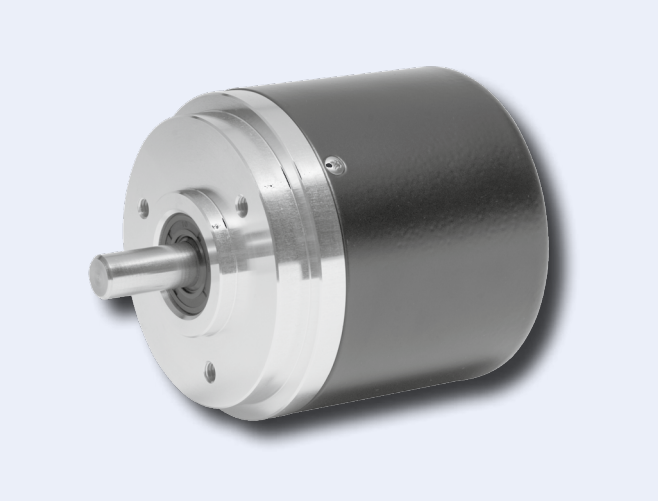
Connection type	GND	+ U_B	2_0	2_1	2_2	2_3	2_4	2_5	2_6	2_7	2_8	2_9	↔
00	white	brown	green	yellow	grey	pink	blue	red	black	purple	gr/pin	bl/re	ye/br
12	1	2	3	4	5	6	7	8	9	10	11	12	
16	1	2	3	4	5	6	7	8	9	10	11	12	16

Order reference

AWA 58 – [ ] – [ ][ ][ ][ ][ ] 0 – [ ] (max. resolution 1024)

Housing	Shaft	Counting direction	Connection position/ Connection type	Output circuit (see page 70	Output code	Option
S = Standard E = Stainless steel	06 = 6 mm 08 = 8 mm 10 = 10 mm 12 = 12 mm (IP 54) 56 = 6.35 mm 59 = 9.52 mm	1 = right 2 = left 3 = reversible	Standard: A = axial: 00, 12, 16 R = radial: 00, 12, 16 Stainless steel A = axial: 00, 12, 16 R = radial: 00, 12, 16	0 = NPN 5 = PNP	E = Grey excess G = Grey	0 = none

AWA 90



AWA 90

- Absolute rotary encoder with shaft
- Due to its design
  for highest mechanical requirements
- For applications
  with high mechanical loads
- Also available in stainless steel for aggressive
  environmental conditions
- Accessories from page 70

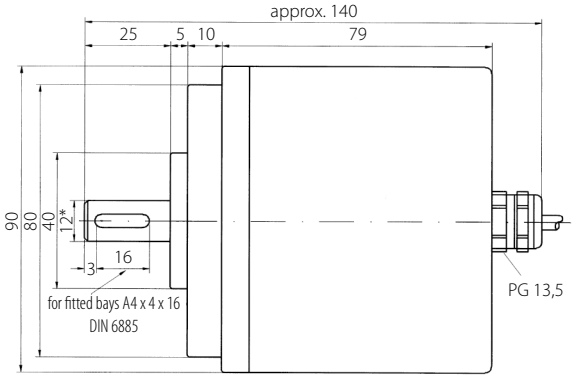
Electrical specifications

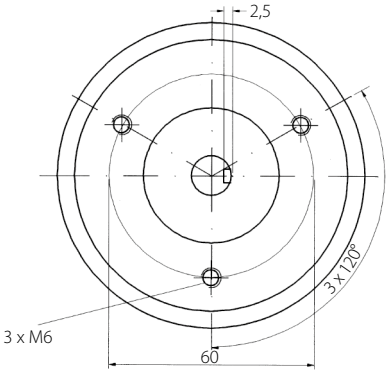
Max. step frequency:	25 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10 V. . . 30 V DC
Max. current consumption:	160 mA (without load)
Max. output load:	40 mA (per channel)
Residual ripple:	max. ± 5% U_B

Mechanical specifications

Flange:	Aluminium
Housing:	Powder-coated sheet steel
Shaft:	stainless steel
Shaft seal:	
Oil/Salt-water resistant	
Bearing:	Deep groove ball bearing
Weight:	approx. 1.2 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	approx. 5 Ncm
Max. shaft load:	axial 30 N/radial 50 N

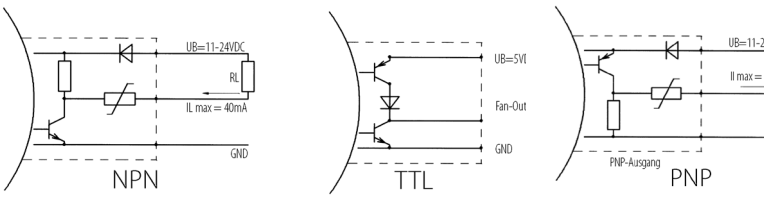
Mechanical dimensions





* Tolerance =

Output circuits



Order ref.: 0 3 5

Output code

Output code	Resolution	Inputs	Option
Binary, BCD	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 3600, 4096	(Octocoupler) Counting direction switchover with + U_B	Latch (Octocoupler input, control with + U_B)
Grey (beginning with 0)	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096		
Grey excess (beginning ≠ 0)	45, 90, 180, 360, 720, 1440, 2880, 3600		

Pin configuration

	BCD*		10_0				10_1				10_2				10_3				
			1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	Option	↔
Connection type	GND	+ U_B	2_0	2_1	2_2	2_3	2_4	2_5	2_6	2_7	2_8	2_9	2_{10}	2_{11}	Option	↔	-	-	-
12	1	2	3	4	5	6	7	8	9	10	11	12	-	-	-		-	-	-
16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	-	-
00	white	brown	green	yellow	grey	pink	blue	red	black	puple	gr/pin	bl/re	wh/gre	br/gre	wh/ye	ye/br	wh/gr	gr/br	wh/pin

* as of resolution 2048 BCD, only cable output!

Order reference

AWA 90 [ ] – [1 2] [ ] [ ] [ ] [ ] [ ] – [ ] (max. resolution 4096)

Housing
S = Standard
E = Stainless steel

Shaft
12 = 12 mm

Counting direction
1 = right
2 = left
3 = reversible

Connection position/ Connection type
Standard
A = axial: 00, 12, 16
R = radial: 00, 12, 16

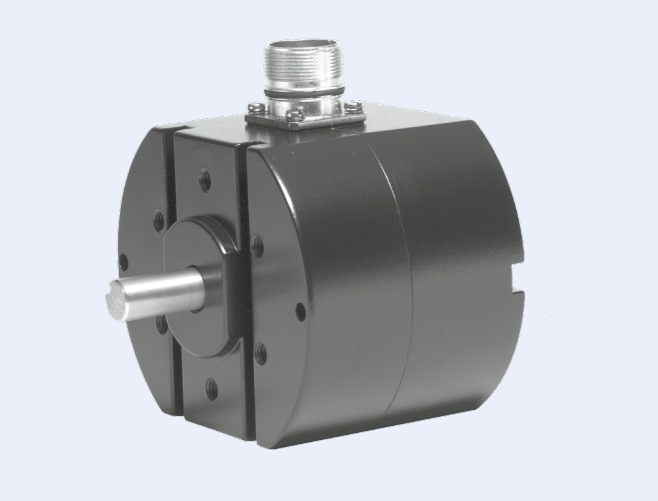
Stainless steel
A = axial: 00, 12, 16
R = radial: 00, 12, 16

Output circuit
(see page 70)
0 = NPN
3 = TTL (upon request)
5 = PNP
6 = SSI (only grey/grey excess)

Output code
B = Binary
C = BCD
E = Grey excess
G = Grey

Option
0 = none
L = Latch

70 – 140



70 – 140

- Absolute rotary encoder with shaft
- Very robust design
- Low torque
- Accessories from page 70

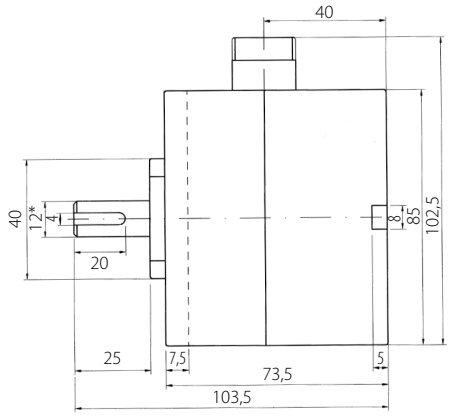
Electrical specifications

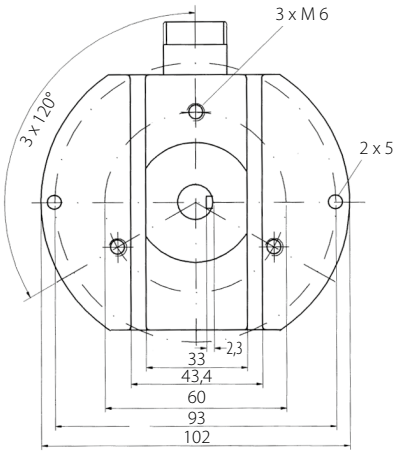
max. pulse frequency:	25 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10 V. . . 30 V DC
Max. current consumption:	100 mA (without load)
Max. output load:	40 mA (per channel)
Residual ripple:	max. ± 5% U_B

Mechanical specifications

Housing:	Zinc die-casting
Shaft:	stainless steel
Bearing:	Deep groove ball bearing
Weight:	approx. 1.2 kg
Protection type:	IP 54
Max. speed:	6000 U/min
Torque:	approx. 3 Ncm
Max. shaft load:	axial 30 N
	radial 50 N

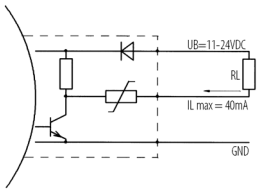
Mechanical dimensions

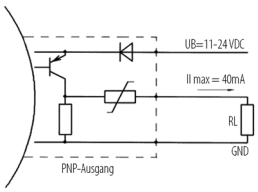




* Tolerance = H 6

Output circuits





Order ref.: NPN PNP

Output code

Output code	Resolution	Inputs
Binary, BCD	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024	Counting direction switchover (looking at the shaft) Input open = right Input + U_B = left
Grey (beginning with 0)	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024	
Grey excess (beginning ≠ 0)	45, 90, 180, 360, 720	

Pin configuration

	BCD*		10_0				10_1				10_2				10_3	
			1	2	4	8	1	2	4	8	1	2	4	8	1	2
Connection type	GND	+ U_B	2_0	2_1	2_2	2_3	2_4	2_5	2_6	2_7	2_8	2_9	2_{10}	2_{11}	Option	↔
F (12 pol.)	1	2	3	4	5	6	7	8	9	10	11	12	-	-	-	
F (16 pol.)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
K (00)	white	brown	green	yellow	grey	pink	blue	red	black	purple	gr/pin	bl/re	ws/gre	br/gre	ws/yel	yel/br

* Binary, BCD, only 1024

Order reference

70 – 140 □□ – □□□□ (max. resolution 1024)

Coding + Count direction + Output

A = Gray → NPN	E = Bin → NPN	I = BCD → NPN
B = Gray ← NPN	F = Bin ← NPN	L = BCD ← NPN
C = Gray → PNP	G = Bin → PNP	K = BCD → PNP
D = Gray ← PNP	H = Bin ← PNP	M = BCD ← PNP
N = Gray ↔ NPN	P = Bin ↔ NPN	S = BCD ↔ NPN
O = Gray ↔ PNP	R = Bin ↔ PNP	T = BCD ↔ PNP

Modification

A = without
B = Parity (uneven)
C = Parity (even)
F = Connector axial (⇄ 12 pol., ↔ 16 pol.)
K = Cable output (00)

Series 72

- Multi-turn rotary encoder with shaft
- Measuring range greater than 360°
- Multi-plate technology
- 18-bit wider C'Mos counter
- Integrated accumulator
- Additional filter circuits

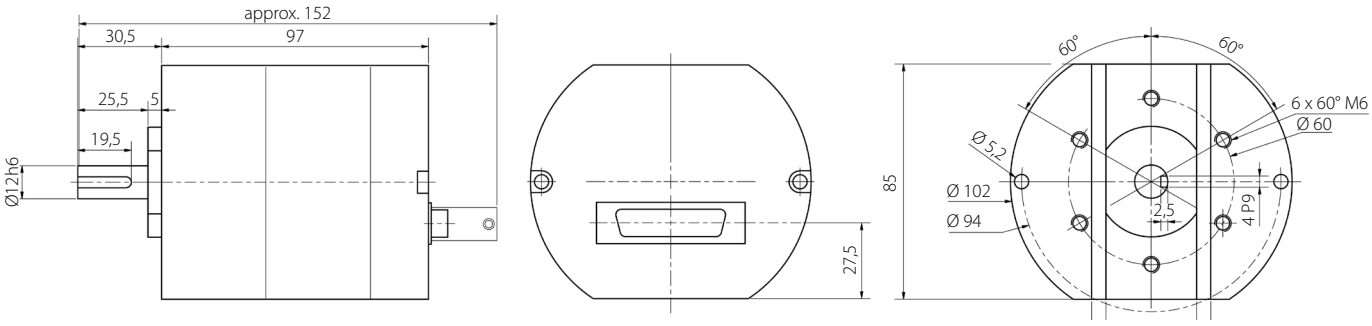
Electrical specifications

Max. step frequency:	25 kHz
Perm. temperature range:	-30°. . . +70° C
Power supply:	10 V. . . 30 V DC
Max. current consumption:	120 mA
Power failure safety:	max. 48 hrs.

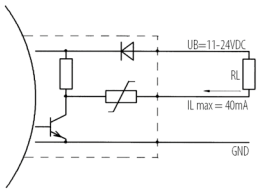
Mechanical specifications

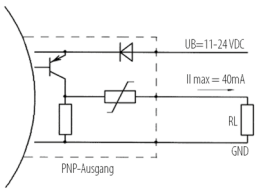
Housing:	Zinc die-casting
Flange:	Zinc die-casting
Shaft:	stainless steel 12 mm
Bearing:	Deep groove ball bearing
Weight:	approx. 1.2 kg
Protection type:	IP 54 according to DIN 40050
Max. speed:	6000 U/min
Moment of inertia:	270 gcm²
Torque:	3 Ncm
Max. shaft load:	axial 10 N radial 10 N

Mechanical dimensions



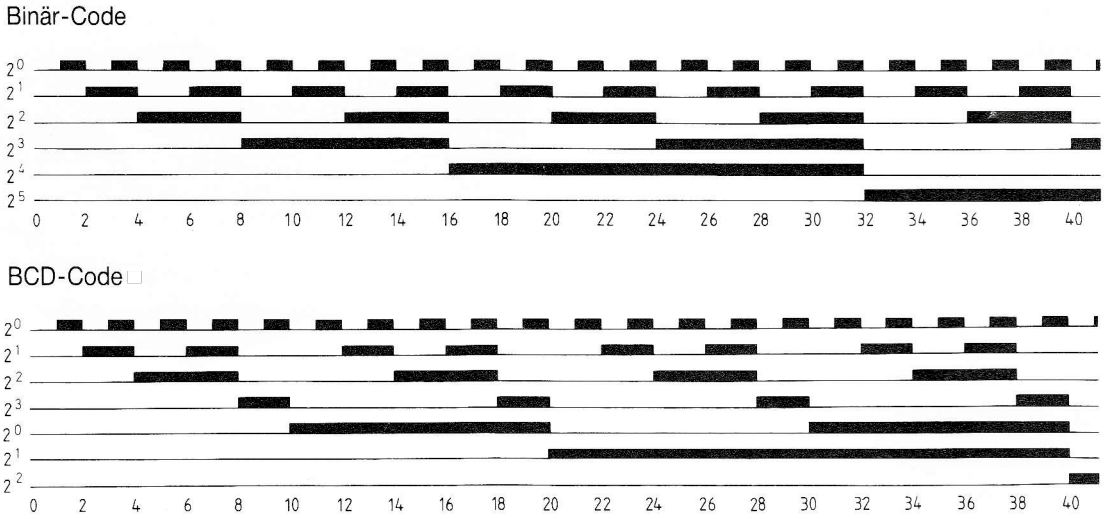
Output circuits





Order ref.: NPN PNP

Output signals



Order reference

Serie 72 | 1 | 4 | 0 | U | | | – | | Division up to max. 2600 (as of 2, each division available by 2)

Mech. Design
140 = Standard

Coding + Count direction
U* = Bin ↔ 18-bit = 262 144
or
BCD ↔ 18-bit = 39 999

* reversible

Output circuit
N = NPN (current sink)
P = PNP (current source)

Modification
B = without buffer
C = Standard
D = Reset pulse
K = Cable output

Special versions (upon request)

- External buffering
- Without buffering
- Cable output
- Flange-triggered reset pulse

Functional description of the control inputs

Pin	Desc.	Explanation
25 *	Reset Acknowledgement Alarm	A signal (+ Ub) resets the internal counter. The alarm output is acknowledged at the same time.
24 *	Code Selection of output code	A signal (+ Ub) switches the code type from binary to BCD code
23 *	Change of counting direction	A signal (+ Ub) changes the counting direction. Looking at the shaft: Sequence of numbers increasing for an anticlockwise shaft)
22	Alarm/Relay output Unilateral mass of switching	When the internal battery no longer has sufficient voltage and counting errors could arise, this is indicated by resetting the output. Furthermore, the internal power supply is monitored during operation.

* All control inputs are switched via octocoupler

Functional description of alarm output: (after applying the operating voltage)

The counter is reset and the alarm output is acknowledged by resetting.

The alarm output is only set when the battery voltage has exceeded a certain value during actuation of the reset.

This depends on the battery discharge and can take a few minutes.

If the reset is controlled with a static signal of + Ub, the release of the count is signalled by setting the alarm output.

Options:

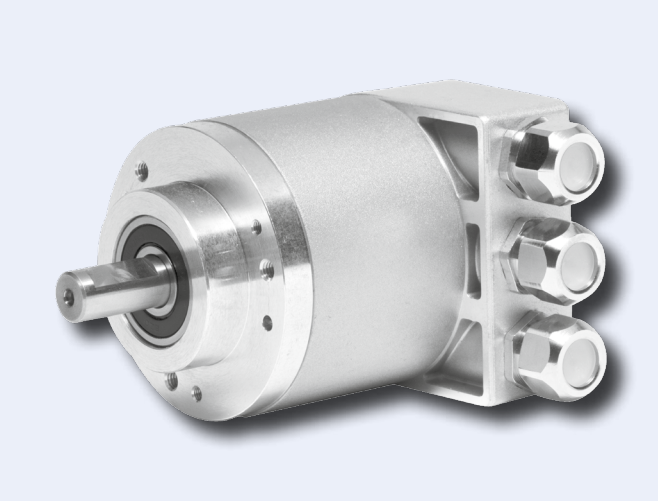
Option1/Pin 21: Acknowledgement input for alarm signal independent of reset

Option2/Pin 21.22: Potential-free relay contact for alarm signal

Pin configuration type 72-140 U. . .

Pin	25-pole connector			Wire colour at cable output (DIN 47 100)
	Valence for binary code	Valence for BCD code		
1 2	– +	– +		white brown
3 4 5 6	2^0 2^1 2^2 2^3	1 2 4 8	x 10^0	green yellow grey pink
7 8 9 10	2^4 2^5 2^6 2^7	1 2 4 8	x 10^1	blue red black purple
11 12 13 14	2^8 2^9 2^{10} 2^{11}	1 2 4 8	x 10^2	grey-pink blue-red white-green brown-green
15 16 17 18	2^{12} 2^{13} 2^{14} 2^{15}	1 2 4 8	x 10^3	white-yellow yellow-brown white-grey grey-brown
19 20	2^{16} 2^{17}	1 2	x 10^3	white-pink pink-brown
21 22 23 24 25	Option Alarm ↔ Binary / BCD Reset	Option Alarm ↔ Binary / BCD Reset		white-blue brown-blue white-red brown-red white-black

BC 58



BC 58

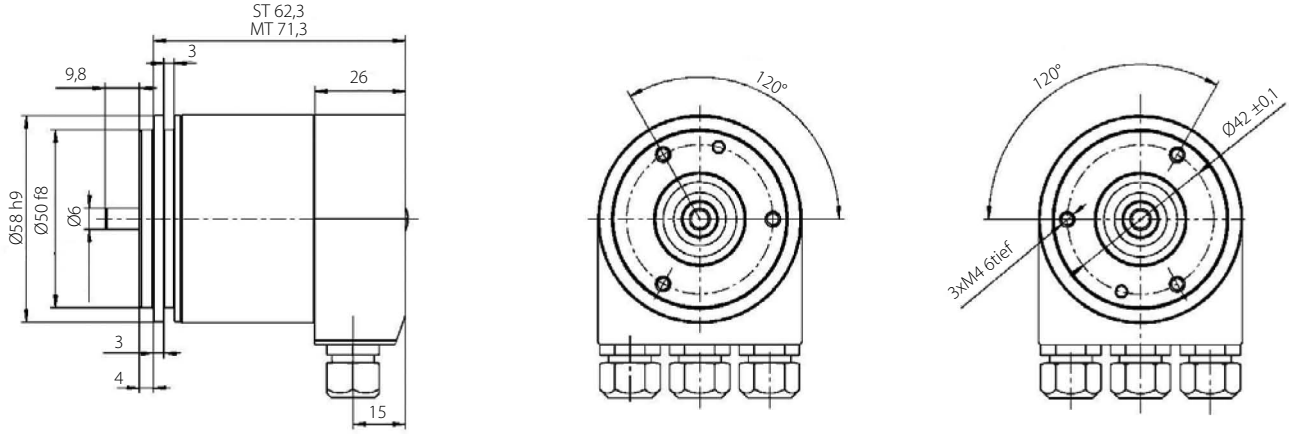
- Absolute rotary encoder with shaft
- Available in single-turn and multi-turn
- Short-circuit-proof
- Parallel, SSI, Profibus DP,
  InterBus (K2) (K3) DeviceNet, CAN, CANopen
- Accessories from page 70

Mechanical specifications

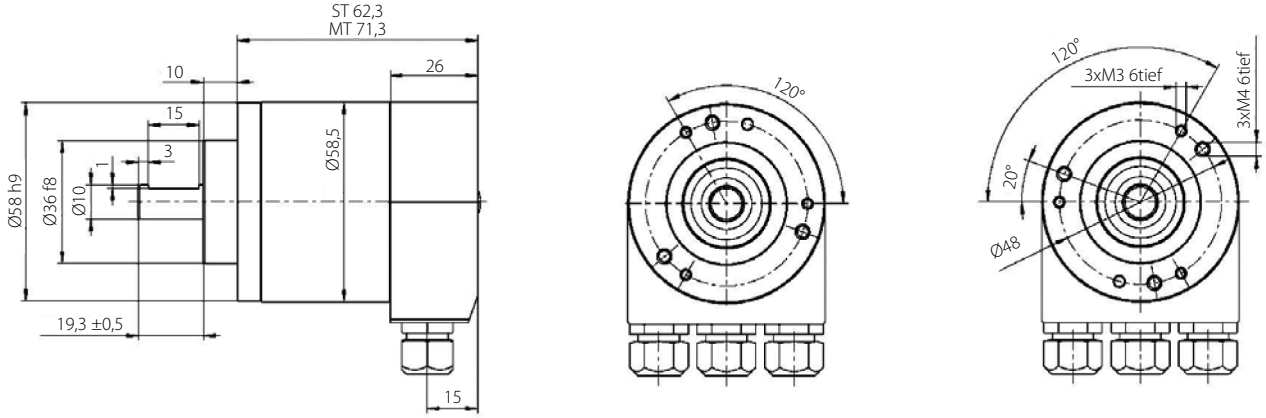
Shaft diameter	6 mm (synchro flange) 10 mm (clamping flange) 10/12 mm (blind hollow shaft)
Shaft load	axial 20 N, radial 40 N (6 mm shaft) axial 40 N, radial 60 N (10, 12 mm shaft)
Speed	Continuous operation 10 000 min -1
Torque	< 0.5 Ncm
Moment of inertia	Synchro flange: 14 gcm^2 Clamping flange: 20 gcm^2 Blind hollow shaft: 20 gcm^2
Protection class	Shaft input IP 64 or IP 67, housing IP 67
General design	according to DIN EN 61010, protection class III, degree of contamination 2, overvoltage category II
Operating temperature	- 40 ... 100 ° C
Storage temperature	- 40 ... 85 ° C
Vibration resistance	DIN EN 60068-2-6, 100 m/s^2 (10 ... 2000 Hz)
Shock resistance	DIN EN 60068-2-27, 1000 m/s^2 (6 ms)
Connection	axial or radial
Housing	S = Synchro flange K= Clamping flange F = Blind hollow shaft
Starting torque	< 0.01 Nm
Mass	Single-turn approx. 260 g, Multi-turn approx. 310 g

Mechanical dimensions

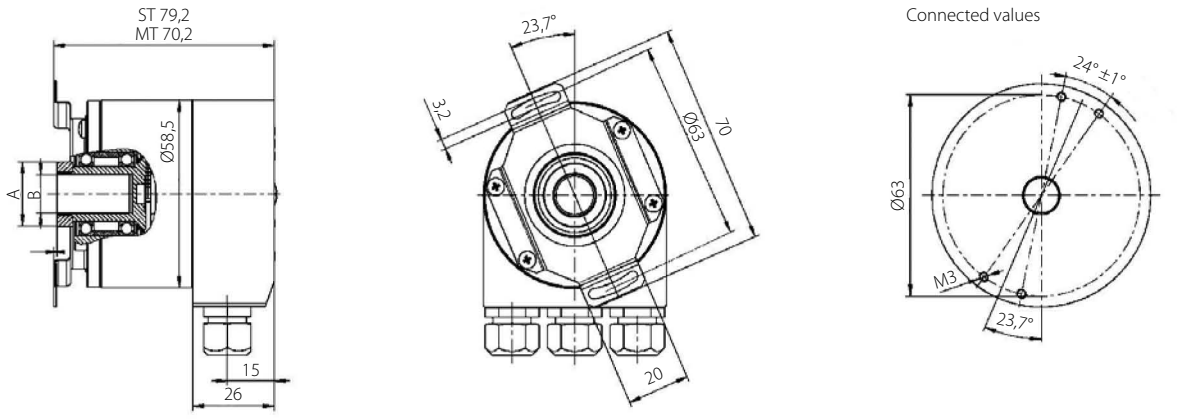
Synchro flange („S“)



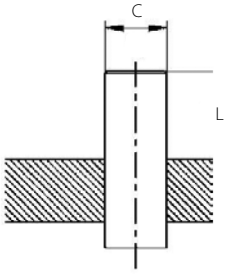
Clamping flange („K“)



Blind hollow shaft („F“)



Hollow shafts Ø A	$10^{+0,012}$ mm	$12^{+0,012}$ mm
Connecting shafts Ø C	10_{g7} mm	12_{g7} mm
Clamping ring Ø B	18 mm	20 mm
L min.	15 mm	18 mm
L max.	20 mm	20 mm
Shaft code	„2“	„7“



BC 58 with parallel interface - Single-turn with cable

Colour (PVC)	10 Bit	12 Bit	13 Bit	14 Bit
grey/pink	N.C.	N.C.	N.C.	S0 (LSB)
brown/yellow	N.C.	N.C.	S0 (LSB)	S1
brown/grey	N.C.	S0 (LSB)	S1	S2
red/blue	N.C.	S1	S2	S3
purple	S0 (LSB)	S2	S3	S4
white/brown	S1	S3	S4	S5
white/green	S2	S4	S5	S6
white/yellow	S3	S5	S6	S7
white/grey	S4	S6	S7	S8
white/pink	S5	S7	S8	S9
white/blue	S6	S8	S9	S10
white/red	S7	S9	S10	S11
white/black	S8	S10	S11	S12
brown/green	S9 (MSB)	S11 (MSB) Tristate	S12 (MSB)	S13 (MSB)
yellow	Tristate S0…S9	S0… S11 Latch	Tristate S0…S1	Tristate S0…S13
pink	Latch (only binary)	Latch (only binary)	Latch (only binary)	Latch (only binary)
green	Direction	Direction	Direction	Direction
black	0 V	0 V	0 V	0 V
red	5V/10..30VDC	5V/10..30VDC	5V/10..30VDC	5V/10..30VDC
brown	Alarm	Alarm	Alarm	Alarm

BC 58 with parallel interface - Single-turn with flange receptacle, 17-pole

Pin	10 Bit	12 Bit	13 Bit	14 Bit
1	S0 (LSB)	S0	S12 (MSB	S13 (MSB)
2	S1	S1	S11	S12
3	S2	S2	S10	S11
4	S3	S3	S9	S10
5	S4	S4	S8	S9
6	S5	S5	S7	S8
7	S6	S6	S6	S7
8	S7	S7	S5	S6
9	S8	S8	S4	S5
10	S9 (MSB)	S9	S3	S4
11	N.C.	S10	S2	S3
12	Tristate S0..S9	S11 (MSB) Latsch	S1	S2
13	Latsch (nur binär	Latsch (nur binär)	S0 (LSB)	S1
14	Direction	Direction	Direction	S0 (LSB)
15	0 V	0 V	0 V	0 V
16	5V/10..30VDC	5 V/10..30VDC	5V/10..30VDC	5V/10..30VDC)
17	Alarm	Alarm	Alarm	Alarm

BC 58 with parallel interface - Multi-turn (PVC cable)

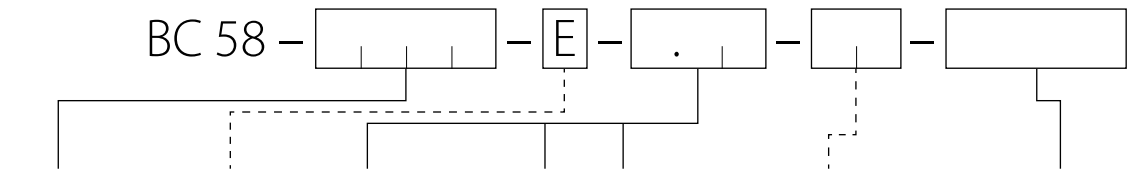
Colour	Configuration	Colour	Configuration	Colour	Configuration
brown	S 0	yellow/brown	S 11	grey/green	M 10 2)
green	S 1	white/grey	M 0	yellow/grey	M 11 2)
yellow	S 2	grey/brown	M 1	pink/green	Alarm
grey	S 3	white/pink	M 2	yellow/pink	Direction
pink	S 4	pink/brown	M 3	green/blue	Latch
purple	S 5	white/blue	M 4 1)	yellow/blue	Tristate
grey/pink	S 6	brown/blue	M 5 1)	red (0.5 mm^2)	10 ... 30 V DC
red/blue	S 7	white/red	M 6 1)	white (0.5 mm^2)	10 ... 30 V DC
white/green	S 8	brown/red	M 7 1)	blue (0.5 mm^2)	0 V
brown/green	S 9	white/black	M 8 2)	black (0.5 mm^2)	0 V
white/yellow	S 10	brown/black	M 9 2)		

1) N.C. with resolution 16-bit
2) N.C. with resolution 16- or 20-bit

Electrical specifications

Supply voltage	10-30 V
Intrinsic current consumption	ST 200 mA/MT 300 mA
Interface	Parallel
Output code	Binary, Grey, Grey excess
Resolution single-turn	10-14-bit, depending on variant, 12-bit in MT design Grey excess: 360, 720 steps
Resolution multi-turn	12-bit
Linearity	+/- ½ LSB
Output current	30 mA per bit Short-circuit-proof
Control inputs	$\overline{\text{Latch}}$, $\overline{\text{Direction}}$, $\overline{\text{Tristate}}$ by ST; Tristate by MT
Connection	Cable or flange receptacle, Conin 17-pole. Axial or radial, Sub D 37-pole

Order reference



Resolution	Supply	Flange	Protection class	Shaft	Interface	Connection
0010 = 10-bit ST	E = 10-30 V	S.41 = Synchro	IP 64	6 mm	PB = Parallel	A = Cable axial
0012 = 12-bit ST		S.71 = Synchro	IP 67	6 mm	Binary	B = Cable radial
0013 = 13-bit ST		K.42 = Clamp	IP 64	10 mm	PG = Parallel grey	W = Connector 17-pole axial
0014 = 14-bit ST		K.47 = Clamp	IP 67	10 mm		Y = Connector 17-pole radial
0360 = 360 ST		F.42 = Spring sheet	IP 64	10 mm hollow sh.		A-A1-F = 0.1 m Cable/axial
0720 = 720 ST		F.47 = Spring sheet	IP 67	12 mm hollow sh.		A-A1-F = + 37-pole connector
1212 = 12 MT+12 S						B-A1-F = 0.1 m Cable/radial
						B-A1-F = + 37-pole connector

BC 58 with SSI interface

Synchronous serial transmission (SSI) for absolute rotary encoders

The SSI interface can be used for multi-turn encoders with grey code or binary code. Furthermore, special bits (alarm signal, parity) can be attached to the data bits of the 24-bit encoder.

The SSI interface supports single and multiple transfers. For multiple transfer (the stored value is read out several times in succession), a fixed number of cycles per revolution must be observed (25 to 26 cycles for multi-turn).

For multiple transfer, the distance between the clock brush must be below 10 µs and for single transfer, it must be greater than 30 µs. After the output of the last bit (alarm or parity), the data output for approx. 20 µs is set to logic „0", then to logic „1". Then current encoder data can be read out again.

Recommended data transfer rate for SSI

The maximum data transfer rate depends on the cable length.

Cable length	Baud rate
< 50 m	< 400 KHz
< 100 m	< 300 KHz
< 200 m	< 200 KHz
< 400 m	< 100 Khz

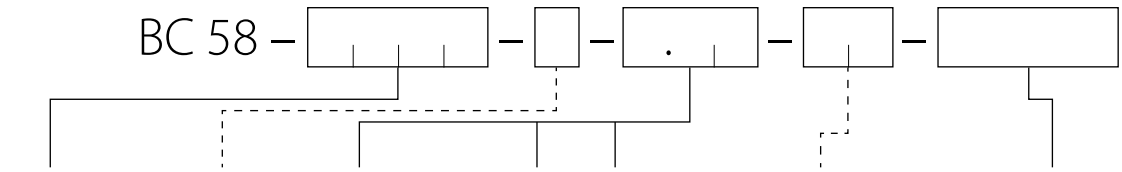
Pin configuration SSI interface

Cable	Flange receptacle	Signal
brown (0.5 mm^2)	1	0 V (supply voltage)
pink	2	Data
yellow	3	Cycle
	4	N.C.
blue	5	$\overline{\text{Direction}}$
	6	N.C.
	7	N.C.
white (0.5 mm^2)	8	10 ... 30 V DC
	9	N.C.
grey	10	$\overline{\text{Data}}$
green	11	$\overline{\text{Cycle}}$
black	12	0 V- Signal output

BC 58 with SSI interface

Electrical	
Supply voltage	5V or 10-30 V
Intrinsic current consumption	Single-turn 50 mA/Multi-turn 100 mA
Interface	Standard SSI
Output code	Binary or grey
Resolution single-turn	10-17-bit, depending on variant, max. 13-bit in MT Grey excess: 360, 720 steps
Absolute accuracy	+/- 35 ´´
Repeat accuracy	+/- 7 ´´
Status LED	Green = ok; Red = Alarm
Control inputs	Direction
Parametrisable	Resolution, code type, direction of rotation, warning, alarm
Reset button	Lockable per parametrisation
Connection	Cable or flange receptacle Conin axial or radial

Order reference



Resolution	Supply	Flange	Protection class	Shaft	Interface	Connection
0010 = 10-bit ST	A = 5 V	S.41 = Synchro	IP 64	6 mm	SB = SSI	A = Cable axial
0012 = 12-bit ST	E = 10-30 V	S.71 = Synchro	IP 67	6 mm	Binary	B = Cable radial
0013 = 13-bit ST		K.42 = Clamp	IP 64	10 mm	SG = SSI	C = Connector 12-pole axial
0014 = 14-bit ST		K.72 = Clamp	IP 67	10 mm	Grey	D = Connector 12-pole radial
0017 = 17-bit ST		F.42 = Spring sheet	IP 64	10 mm hollow sh.		
1212 = 12 MT+12 S		F.47 = Spring sheet	IP 64	12 mm hollow sh.		
1213 = 12 MT+13 S						

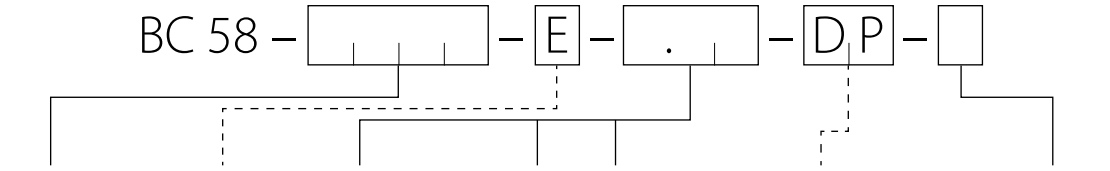
BC 58

BC 58 with Profibus DP interface

Electrical	
Supply voltage	11-30 V DC
Intrinsic current consumption	Single-turn 220 mA/Multi-turn 250 mA
Interface	Profibus-DP, Encoder Profile
Certified	PNO
Programmable	According to class 2: Resolution, Preset*, Direction
Output code	Binary
Baud rate	9.6 K Baud - 12 M Baud
Resolution single-turn	10 - 14-bit, depending on variant
Resolution multi-turn	12-bit
Integrated special function	Speed, acceleration, operating time
Connection	Bus cover with 2 connectors, bus cover with 3-fold PG gland
Mechanical	
perating temperature	- 40° C to + 85° C
Mass, approx.	Single-turn 350 g/Multi-turn 400 g

* Preset only via bus, no button

Order reference



Resolution	Supply	Flange	Protection class	Shaft	Interface	Connection
0010 = 10-bit ST	E = 10-30 V	S.41 = Synchro	IP 64	6 mm	DP = Profibus DP	I = 2 x 2-pole connector
0012 = 12-bit ST		S.71 = Synchro	IP 67	6 mm		Z = Cover 3-fold PG
0013 = 13-bit ST		K.42 = Clamp	IP 64	10 mm		
0014 = 14-bit ST		K.72 = Clamp	IP 67	10 mm		
1212 = 12 MT+12 S		F.42 = Spring sheet	IP 64	10 mm hollow sh.		
1213 = 12 MT+13 S		F.47 = Spring sheet	IP 64	12 mm hollow sh.		
1214 = 12 MT+14 S						

BC 58 with Interbus interface

Electrical	
Supply voltage	11-30 V DC
Intrinsic current consumption	Single-turn 220 mA/Multi-turn 250 mA
Interface	Interbus, ENCOM Profile K 3 (parametrisable), K 2
DÜ Format	Supi address 0123, Byte no. 3210
Programmable	Direction, scaling factor, preset, offset
Output code	32-bit binary
Baud rate	500 KBaud according to ENCOM
Resolution single-turn	Single-turn 10 - 17-bit, depending on variant, 12-bit in MT design
Resolution multi-turn	12-bit
ID code k 3	37H (055 decimal)
Connection	Bus cover with 2 connectors, bus cover with 3-fold PG gland
Mechanical	
Operating temperature	- 40° C to + 85° C
Mass, approx.	Single-turn 350 g/Multi-turn 400 g

Order reference

BC 58 – ☐☐☐ – E – ☐.☐ – ☐☐ – ☐

Resolution	Supply	Flange	Protection class	Shaft	Interface	Connection
0010 = 10-bit ST	E = 10-30 V	S.41 = Synchro	IP 64	6 mm	I2 = Interbus K 2	I = 2 x 2-pole connector
0012 = 12-bit ST		S.71 = Synchro	IP 67	6 mm	I3 = Interbus K 3	Z = Cover 3-fold PG
0013 = 13-bit ST		K.42 = Clamp	IP 64	10 mm		
0014 = 14-bit ST		K.72 = Clamp	IP 67	10 mm		
0017 = 17-bit ST		F.42 = Spring sheet	IP 64	10 mm hollow sh.		
1212 = 12 MT+12 S		F.47 = Spring sheet	IP 64	12 mm hollow sh.		

BC 58 with DeviceNet interface

Electrical	
Supply voltage	11-30 V DC
Intrinsic current consumption	Single-turn 220 mA/Multi-turn 250 mA
Interface	CAN-Highspeed according to ISO/DIS 11898, CAN specifications 2.0 B
Certified	PNO
Programmable	According to class 2: Resolution, Preset*, Direction
Output code	Binary
Baud rate	Adjustable 125, 250, 500 KBaud
Resolution single-turn	10 - 14-bit, depending on variant, 12-bit in MT design
Resolution multi-turn	12-bit
Transfer mode	Polling mode (only upon request), Change of State (automatic with value change), Cyclical with adjustable cycle timer
Connection	Bus cover with 2 connectors, bus cover with 3-fold PG gland
Mechanical	
Operating temperature	- 40° C to + 85° C
Mass, approx.	Single-turn 350 g/Multi-turn 400 g

* Preset only via bus, no button

Order reference

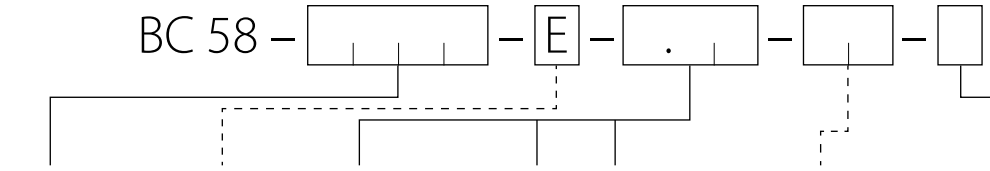
BC 58 – [ ][ ][ ][ ] – [E] – [ ][.][ ][ ] – [V][D] – [ ]

Resolution	Supply	Flange	Protection class	Shaft	Interface	Connection
0010 = 10-bit ST	E = 10-30 V	S.41 = Synchro	IP 64	6 mm	VD = DeviceNet	I = 2 x 12-pole connector
0012 = 12-bit ST		S.71 = Synchro	IP 67	6 mm		Z = Cover 3-fold PG
0013 = 13-bit ST		K.42 = Clamp	IP 64	10 mm		
0014 = 14-bit ST		K.72 = Clamp	IP 67	10 mm		
1212 = 12 MT+12 S		F.42 = Spring sheet	IP 64	10 mm hollow sh.		
1213 = 12 MT+13 S		F.47 = Spring sheet	IP 64	12 mm hollow sh.		
1214 = 12 MT+14 S						

BC 58 with CANopen/CAN Layer 2 interface

Electrical	
Supply voltage	11-30 V DC
Intrinsic current consumption	Single-turn 220 mA/Multi-turn 250 mA
Interface	CAN-Highspeed according to ISO/DIS 11898, Basic and Full CAN CAN specifications 2.0 B (11 and 29-bit identifier)
Profile	Profile CANopen according to Profile DSP 406, with additional functions
Programmable	CANopen: Direction, resolution, preset, offset, Limit values: CAN L2: Direction, limit values, binary
Output code	32-bit binary
Baud rate	Adjustable 10 to 1,000 KBaud
Base identifier	Adjustable via DIP switch
Integrated special function	Speed, acceleration/rotary axle, limit values only CANopen
Resolution single-turn	Single-turn 10 - 14-bit, depending on variant, 12-bit in MT design
Resolution multi-turn	12-bit
Transfer mode	Polling mode (only upon request), Change of State (automatically with value change), cyclical with adjustable cycle timer
Connection	Bus cover with 2 connectors, bus cover with 3-fold PG gland
Mechanical	
Operating temperature	- 40° C to + 85° C
Mass, approx.	Single-turn 350 g/Multi-turn 400 g

Order reference



Resolution	Supply	Flange	Protection class	Shaft	Interface	Connection
0010 = 10-bit ST	E = 10-30 V	S.41 = Synchro	IP 64	6 mm	OL = CANopen	D = 1 x 12-pole connector
0012 = 12-bit ST		S.71 = Synchro	IP 67	6 mm	CL = CAN L2	I = 2 x 12-pole connector
0013 = 13-bit ST		K.42 = Clamp	IP 64	10 mm		Z = Cover 3-fold PG
0014 = 14-bit ST		K.72 = Clamp	IP 67	10 mm		
0017 = 17-bit ST		F.42 = Spring sheet	IP 64	10 mm hollow sh.		
1212 = 12 MT+12 S		F.47 = Spring sheet	IP 64	12 mm hollow sh.		
1213 = 12 MT+13 S	1214 = 12 MT+14 S					

Series NS-NSM

Series NS-NSM

- Absolute rotary encoder with shaft
- Available in single-turn and multi-turn
- Profinet
- Accessories from page 70

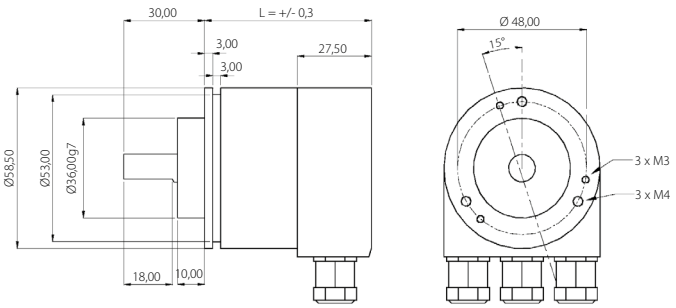
Electrical specifications

Supply voltage:	10-30 V +/- 5%
Power:	max. 4 watt
Interface:	Ethernet
Protocol:	ProfiNet (NRT, RT, IRT)
Transfer rate:	100 MBit/s
Cycle time	<= 1 ms (IRT); <= 10 ms (RT)
Resolution:	Single-turn 16-bit Multi-turn 30-bit (16-bit single-turn - 14-bit multi-turn)
Linearity	+/- 2 LSB x 16-bit, 1 LSB x 14-bit +/- 1/2 LSB 12-bit
Output code:	Binary
Programmability:	Resolution turn Resolution total Preset
Terminating resistor:	adjustable with DIP switches
Operating temperature:	Standard -10°C. . . +60°C Option R -40°C . . . +85°C

Mechanical specifications

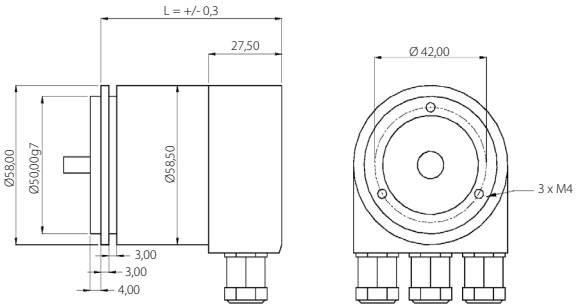
Housing:	Aluminium
Flange:	Aluminium
Shaft:	stainless steel
Bearing:	2 ball bearings
Weight:	400 g
Protection type:	IP 67
Max. speed:	6000 U/min
Torque:	< 0.5 Ncm
Moment of inertia:	20 g/cm^2
Max. shaft load:	axial 20 N - Rad 40 N axial 40 N - Rad 60 N

Mechanical dimensions



Flange H

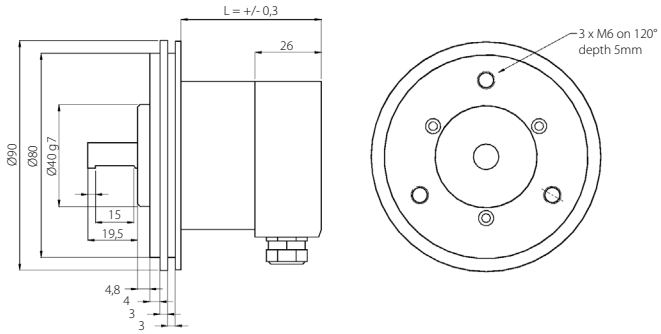
Single-turn *L = 69.00
Multi-turn *L = 80.00



Flange 3

Single-turn *L = 69.00
Multi-turn *L = 80.00

Mechanical dimensions



Flange T

Single-turn *L = 69.00

Multi-turn *L = 80.00

Order reference

NS [ ] – [ ][ ] 2 M [ ] / [ ][ ] / [ ][ ]

Design	Shaft	Flange	Output	Connection	Option	Bit Single-turn	Bit Multi-turn
S = Single-turn M = Multi-turn	3 = Ø 6 mm L 10 mm 1 = Ø 10 mm L 20 mm	H = Flange H 3 = Flange 3 T = Flange T	2 = Standard	M = M12 (bus cover with 3 Connector M12 4 Pin)	P = None (Standard version type P) R = Type P with extended temperature range	12 = 12-bit 13 = 13-bit 16 = 16-bit	12 = 12-bit 14 = 14-bit

HWA 58

HWA 58

- Absolute rotary encoder with hollow shaft
- 10-, 12- or 13-bit resolution - Single-turn
- Housing 58 mm
- Protection class IP 66
- Parallel interface
- Electronic temperature and aging compensation
- Short-circuit-proof outputs
- For accessories, see page 70

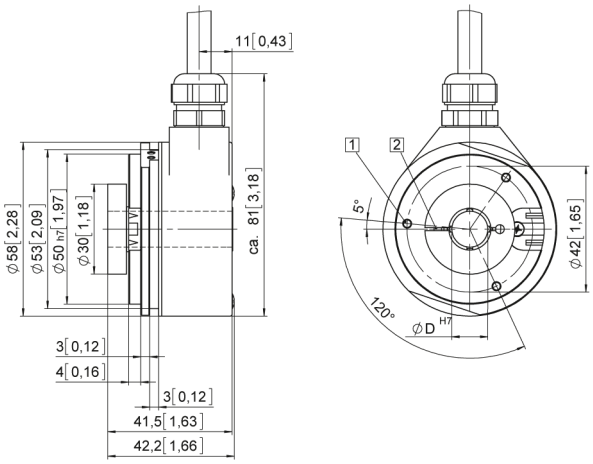
Mechanical specifications

Speed:	max. 6000 U/min.*	Shock resistance	
Moment of inertia of the rotor:	approx. 6 x 10-6 kgm^2	according to DIN - IEC 68-2-27	200 g, 6 ms
Starting torque (25° C):	< 0.05 Nm		
Weight:	approx. 0.4 kg	Vibration resistance	
Protection class according to EN 60 529:	IP 66	according to DIN - IEC 68-2-6	10 g, 10 ... 2000 Hz
Working temperature range:	-30° C . . . + 70° C		
Shaft:	Stainless steel		

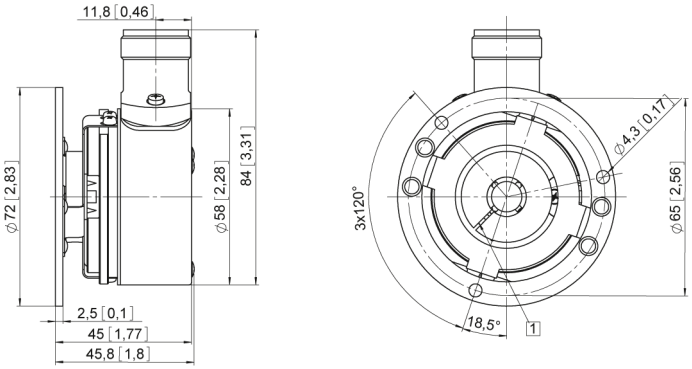
* in continuous operation max. 1500 U/min

Mechanical dimensions

Flange type 1



Flange STN 1 with stator coupling



Installation instructions:

Flange and shaft of encoder and drive
may not be rigidly coupled at the same time!

In this case, the max. permissible resolution is 4096 divisions (12-bit) with a measurement error of approx. +/- 0.5-bit and an assembly radius of the torque support of 22.5 mm.

When using the stator coupling, the radial deviation of the drive shaft must be max. 10µ at 13-bit, 20µ at 12-bit and 80µ at 10-bit to prevent the measurement error from exceeding +/- 1/2-bit.

Electrical specifications

Interface type	Parallel	Parallel
Supply voltage (U_B)	5 VDC (+/- 5%)	10 - 30 VDC
Output driver	Push-pull	Push-pull
Current consumption type	109 mA	109 mA
Current consumption max.	169 mA	169 mA
Perm. load/Channel	max. +/-10 mA	max. +/- 10 mA
Data switching rate	40.000/s	40.000/s
Short-circuit-proof outputs[1)]	yes	yes[2)]
Reverse polarity protection on UB	no	yes

CE conformity according to EN 50081-2 and EN 55011 class B

[1)] With correctly applied supply voltage UB
[2)] Only one channel at the same time: with UB = 5 V short circuit to channel and 0 V and + UB is permissible
with UB = 10 - 30 V short circuit to channel and 0 V is permissible

Counting direction

Ascending code values during clockwise rotation of shaft. (facing the shaft)

Pin configuration

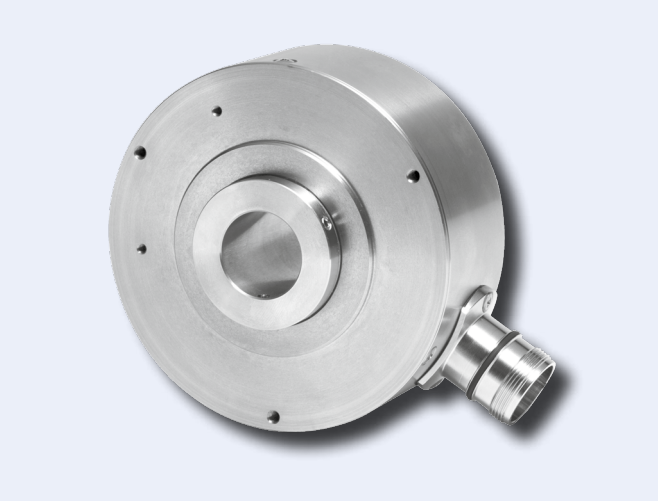
	PIN																	
Connection type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Housing
17	GND	$+U_B$	2_0	2_1	2_2	2_3	2_4	2_5	2_6	2_7	2_8	2_9	2_{10}	2_{11}	2_{12}	–	v/R	⏚
Cable 00	white	brown	green	yellow	grey	pink	blue	red	black	purple	grey pink	red blue	white green	brown green	white yellow	–	white grey	⏚

Order reference

HWA 58 S – [ ][ ] R [ ][ ] G 0 – [ ][ ][ ][ ] (Resolutions: 10-, 12- und 13 Bit)

Housing	Hollow shaft	Flange	Connection position	Connection type (see page 70)	Output circuit	Output code	Option
S = Standard	10 = 10 mm 12 = 12 mm	1 = Flange type 1 4 = STN 1	R = radial	00 = Cable 17 = Connector 17	1 = Parallel 10 V - 30 V VDC 3 = Parallel 5 V	G = Gray	0 = none

HWA 103



HWA 103

- Absolute rotary encoder with hollow shaft
- Constructionally great scope due to flat design
- Very robust design
- Also available in stainless steel for aggressive environmental conditions
- Accessories from page 70

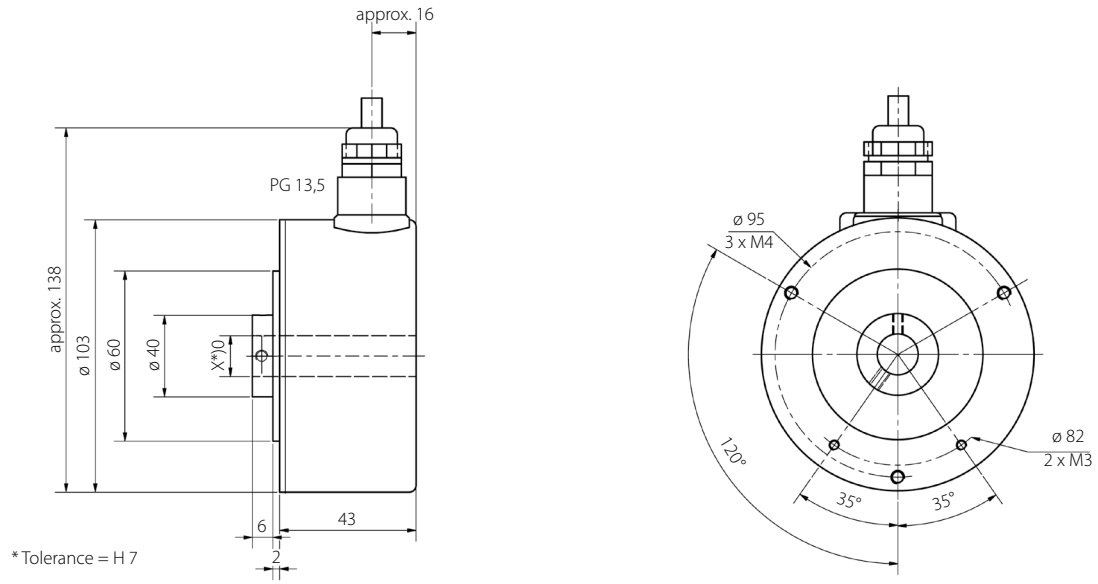
Electrical specifications

max. pulse frequency:	25 kHz
Perm. temperature range:	-30° . . . +70° C
Power supply:	10 V. . . 30 V DC
Max. current consumption:	160 mA (without load)
Max. output load:	40 mA (per channel)
Residual ripple:	max. ± 5% U_B

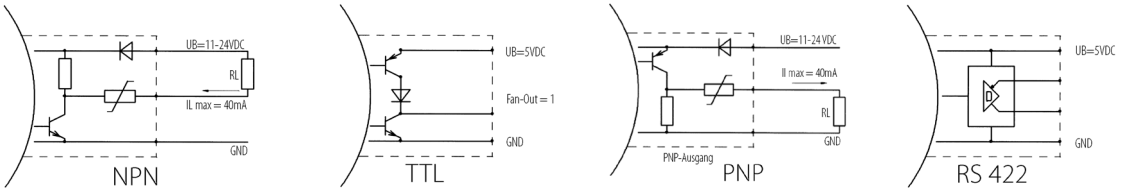
Mechanical specifications

Flange:	Aluminium
Housing:	Aluminium
Hollow shaft:	stainless steel
Shaft seal:	Oil/Salt-water resistant
Bearing:	Deep groove ball bearing
Weight:	approx. 0.8 kg
Protection type:	IP 65
Max. speed:	6000 U/min
Torque:	approx. 15 Ncm

Mechanical dimensions



Output circuits



Order ref.: 0 | 3 | 5 | 6

Output code

Output code	Resolution	Inputs	Option
Binary, BCD	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 3600, 4096	(Octocoupler) Counting direction switchover with + U_B	Latch (Octocoupler input, control with + U_B)
Grey (beginning with 0)	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096		
Grey excess (beginning ≠ 0))	45, 90, 180, 360, 720, 1440, 2880, 3600		

Pin configuration

	BCD*		10_0				10_1				10_2				10_3				
			1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	Option	↔
Connection type	GND	+ U_B	2_0	2_1	2_2	2_3	2_4	2_5	2_6	2_7	2_8	2_9	2_{10}	2_{11}	Option	↔	-	-	-
12	1	2	3	4	5	6	7	8	9	10	11	12	-	-	-		-	-	-
16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	-	-
00	white	brown	green	yellow	grey	pink	blue	red	black	purple	gr/pin	bl/re	ws/gre	br/gre	wh/ye	ye/br	wh/gr	gr/br	wh/pin

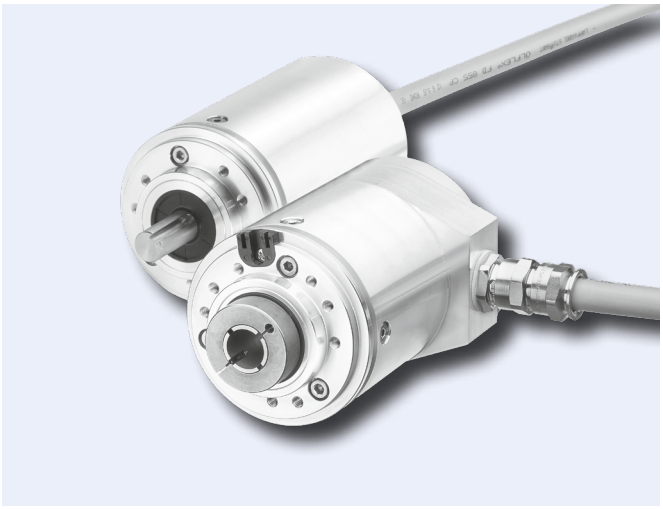
* as of resolution 2048 BCD, only cable output!

Order reference

HWA 103 S – [ ][ ]1[ ]R[ ][ ][ ] – [ ] (max. resolution 4096)

Housing	Shaft	Drive	Counting direction	Connection position /Connection type (see page 70)	Output circuit	Output code	Option
S = Standard	10 = 10 mm 12 = 12 mm 14 = 14 mm 15 = 15 mm 16 = 16 mm 18 = 18 mm 19 = 19 mm 20 = 20 mm 22 = 22 mm 24 = 24 mm 25 = 25 mm 75 = 25.4 mm	1 = Stud 2 = left 3 = reversible	1 = right	R = radial: 00, 12, 16	0 = NPN 3 = TTL (upon request) 5 = PNP 6 = SSI (only grey/ Grey excess)	B = Binary C = BCD E = Grey excess G = Grey	0 = none L = Latch

AWA 70 Ex / HWA 70 Ex



AWA 70 Ex / HWA 70 Ex

- Compact design
- Diameter 70 mm of the type "Pressurised encapsulation" with Ex d IIC T4 (PTB 09 ATEX1106 X)
- Electronic temperature and aging compensation
- Short-circuit-proof outputs
- Overvoltage and reverse polarity protection on the operating voltage input (at UB = 10 - 30 V DC)
- Resolutions up to 13-bit
- SSI interface

Mechanical specifications

Speed:	max. 6000 U/min.*
Moment of inertia of the rotor:	approx. 8 x 10-6 kgm2
perm. shaft load radial:	20 N (at shaft end)1
perm. shaft load axial:	10 N
Starting torque (25° C):	< 0.05 Nm
Weight:	approx. 0.9 kg
Protection class according to EN 60 529:	IP 64
Working temperature range:	-30° C . . . +70° C
Shaft:	Stainless steel

Working temperature range:	-30° C . . . +70° C
Shaft:	Stainless steel
Shock resistance according to DIN - IEC 68-2-27:	1000 m/s2, 6 ms
Vibration resistance according to DIN - IEC 68-2-6:	100 m/s2, 10 ... 2000 Hz

* in continuous operation max. 1500 U/min

1 for shaft design

* in continuous operation max. 1500 U/min

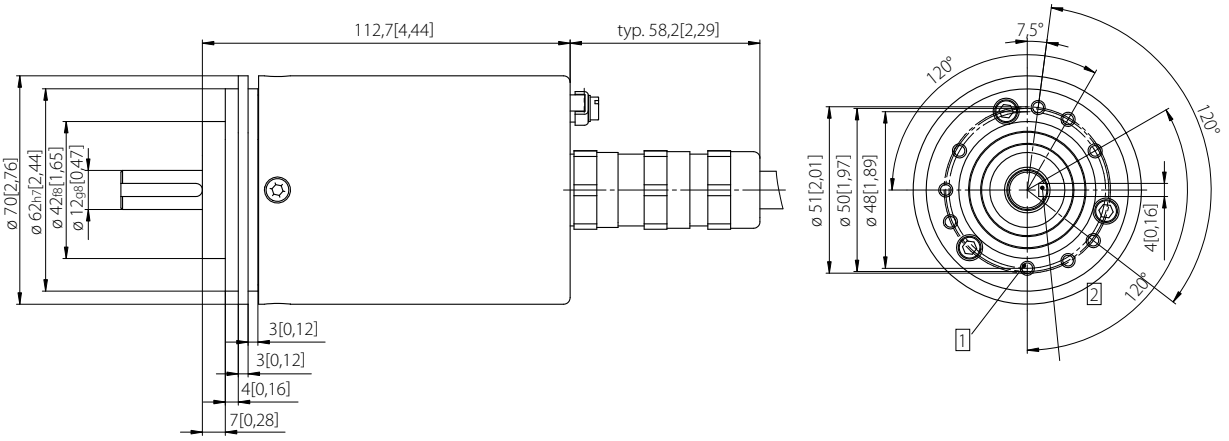
Electrical specifications

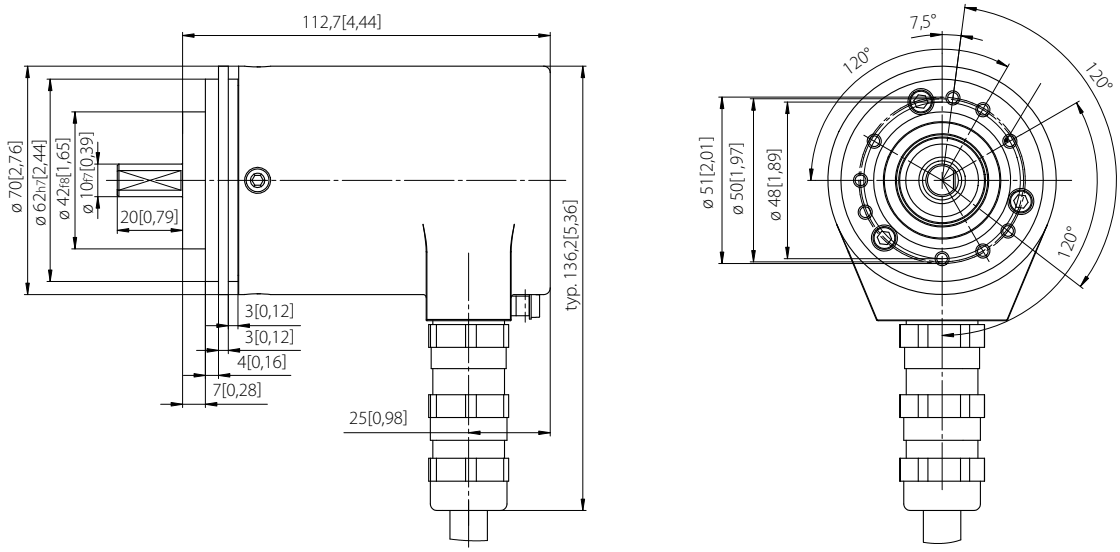
Interface type	Synchronous - Serial (SSI)	Synchronous - Serial (SSI)
Supply voltage (U_B)	5 VDC (+/- 5%)	10 - 30 VDC
Output driver	RS 485	RS 485
Current consumption type	89 mA	89 mA
Current consumption max.	138 mA	138 mA
Perm. load/channel	max. +/- 20mA	max. +/- 20 mA
Data switching rate	max. 15.000/s	max. 15.000/s
Cycle rate min./max.	100 kHz / 500 kHz	100 kHz/500 kHz
Short-circuit-proof outputs[1)]	yes	yes[2)]
Reverse polarity protection on UB	no	yes

[1)] With correctly applied supply voltage UB

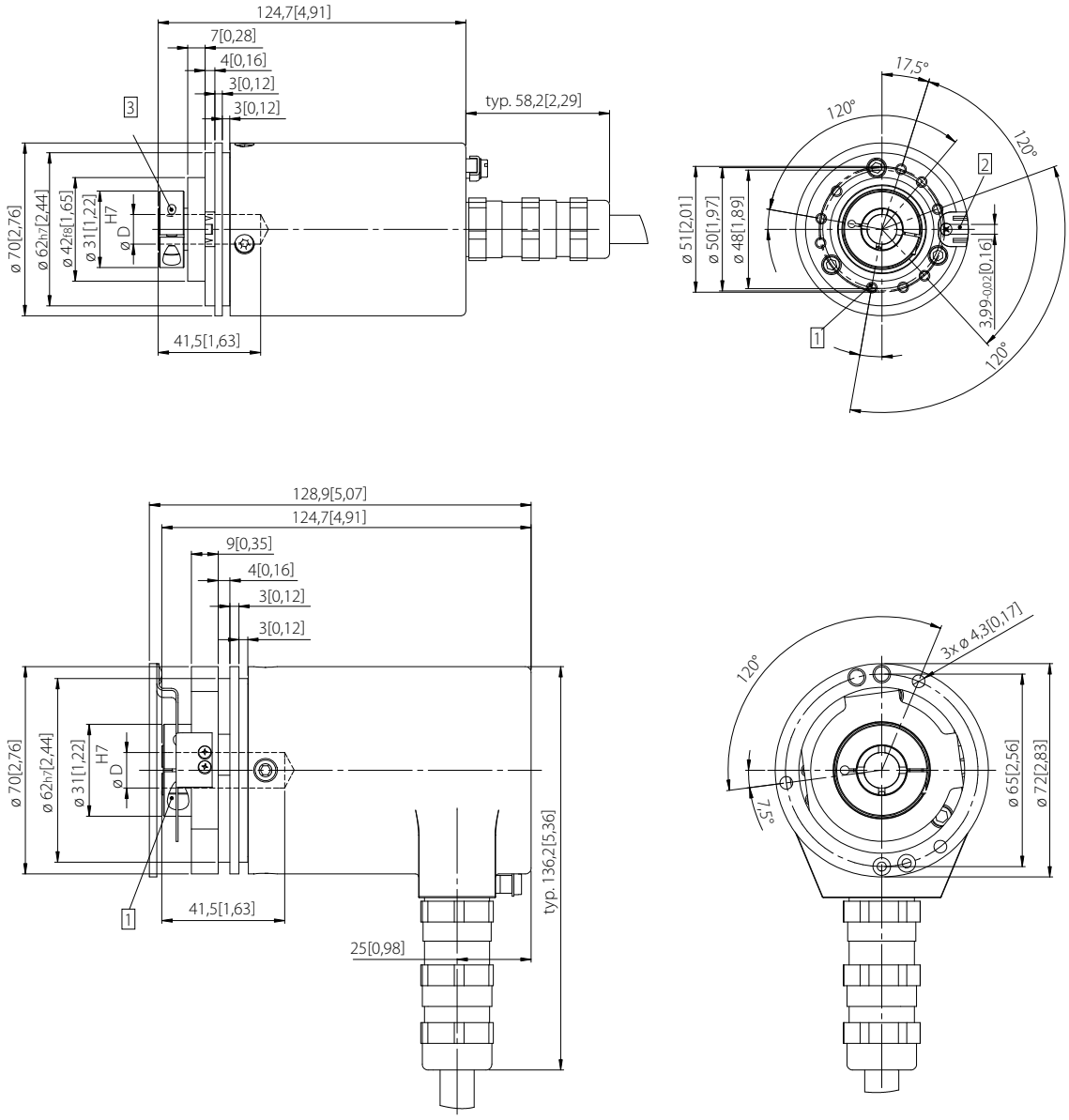
[2)] Only one channel at the same time: with U_B = 5 V short circuit to channel and 0 V and + UB is permissible
with U_B = 10 - 30 V short circuit to channel and 0 V is permissible

Mechanical dimensions





Mechanical dimensions



Installation instructions

Flange and shaft of encoder and drive may not be rigidly coupled at the same time!

Please observe

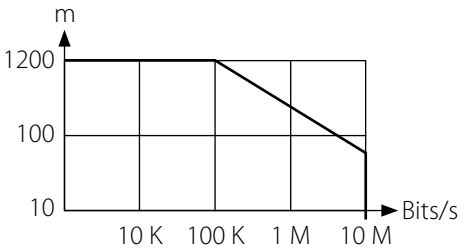
All current standards for installing electrical systems in potentially explosive atmospheres must be observed during installation!
Manipulations of the encoder (opening, mechanical processing) will lead to the loss of ex approval and guarantees!
The installer assumes the consequential liability!

Counting direction

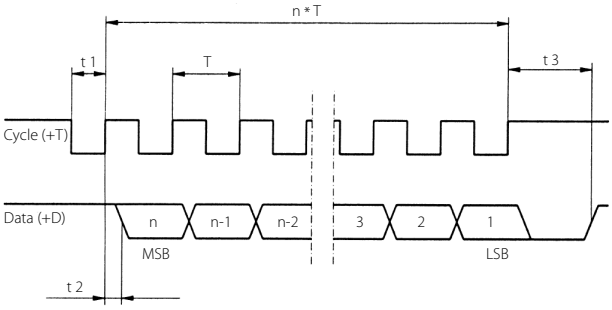
Ascending code values during clockwise rotation of shaft. (facing the shaft)

Max. permissible transfer rate for SSI

depending on the cable length



SSI interface



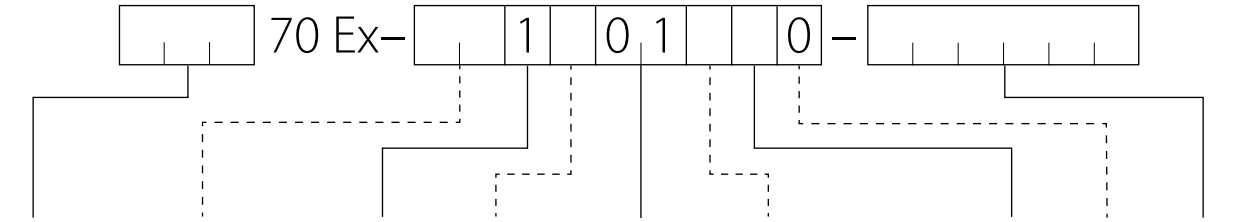
Functional description of the SSI interface
The cycle and data lines are at high level when in idle state. The first decreasing clock pulse edge signals the start of data transfer. The clock pulse edges increasing thereafter, transfer the data bit by bit, starting with MSB. The transfer of a complete data word requires n+1 increasing clock pulse edges (n=resolution in bit). The data line remains on low after the last positive clock pulse edge, until the encoder is ready again for a new data word. The cycle line must remain at least as long on high, and can subsequently start once again a new read-out sequence of the encoder with a decreasing edge.

Please observe! The data update is carried out synchronously with the read-out cycle. The data are thus as current as the time lag between two read-outs; a periodic read-out of the encoder is, therefore, recommended. After a longer read-out interval and simultaneous shaft rotation of the encoder, the data content of the first read-out can be "outdated" and should be ignored.

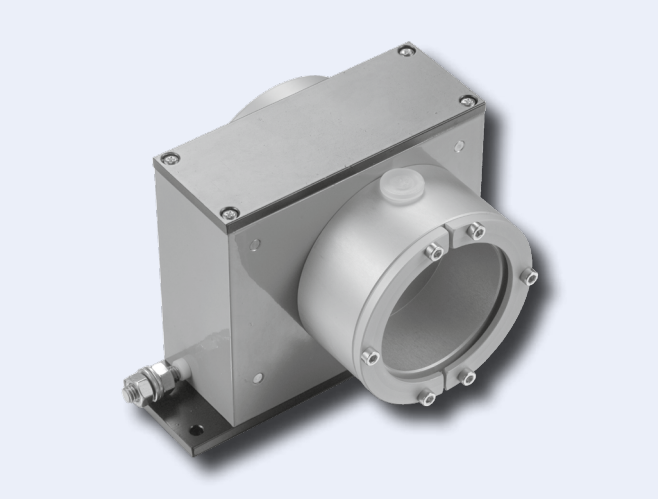
Pin configuration

Signal	0V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚	⏚
Cable labelling	1	2	3	4	5	6	7	8	9	YE/GN	Shield

Order reference



Design	Shaft	Counting direction	Connection position	Connection type (see page 70)	Output circuit	Output code	Option	Resolution
AWA = Axle shaft	10 = 10x20 mm with flat 12 = 12x25 mm with keyway	1 = right	R = radial A = axial	01 = Cable (length 2 m) (other length on request)	6 = SSI with UB 10 V - 30 V 7 = SSI with UB 5 V	G = Grey B = Binary	0 = none	1024 2048 4096 8192 16384 131072
HWA = Blind hollow shaft	12 = 12 mm 14 = 14 mm							



Draw wire EM

System for linear measurement with retractable cable

The ENCO-METER enables simple, quick and cost-effective adaptation of the rational signal recorders (encoder, potentiometer ...) to measure linear distances of up to 10 metres on slow moving machines without abrupt accelerations and with an average number of switching operations.

It consists of a stainless steel micro-cable with which its free end must be connected to the moveable component of the machine.

The other end of the cable is rolled up in a precision drum inside the device while a leaf spring always keeps it tensioned. The drum shaft can actuate any type of rotary/signal recorders.

By default, we have potentiometers with
R = 10 kΩ and
n = 10 rotations in stock. It should be noted that the mechanical route of the potentiometer may restrict the measuring range of the ENCO-METER.

Output devices

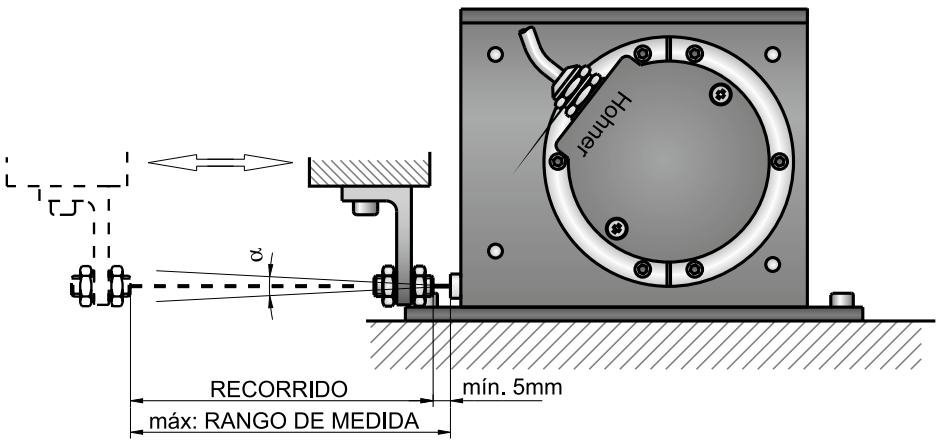
Upon request, we can deliver the ENCO-METER already mounted to an electronic output device, such as an incremental encoder, absolute encoder or potentiometer. If a specific resolution r (mm per pulse) is wanted in case of an absolute or incremental encoder, the number of pulses of the encoder (n) is calculated as follows:

$$n = \frac{D}{r}$$ (D is the unrolling of the ENCO-METER in mm)

Installation

The ENCO-METERS are mounted on a flat surface of the machine by means of 3 or 4 screws M4. Any mounting position may be used. The cable must be properly aligned ($\alpha < 2^{o}$) and may, under no circumstances, exceed the measuring range. Using a potentiometer results in an output ratio r (in Ω per mm) according to:

$$r = \frac{R}{D \times n}$$ (R is the nominal resistance and n the number of rotations)



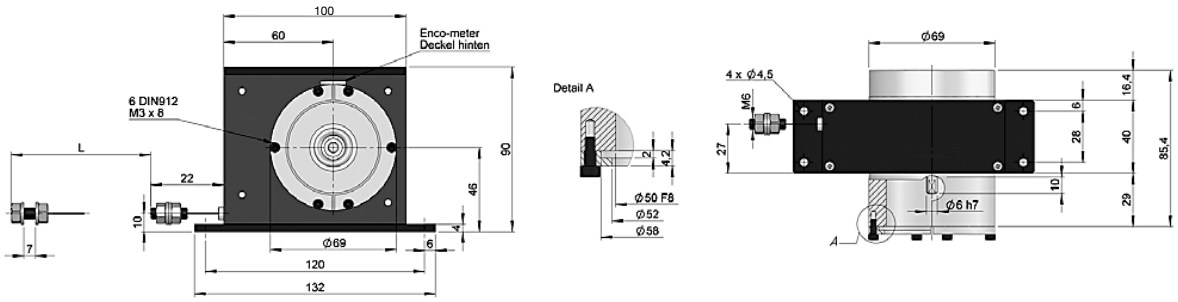
Technical data

Modell	EM4	EM8	EM10
Unrolling	200 mm [1]	250 mm [1]	300 mm [1]
Reference	90.1404	90.1808	90.1810
Cable [2]	Ø 0,61 made of stainless steel AISI316 (structure 19 x 7 + 0)		
Measuring range	up to 4000 mm	up to 8000 mm	up to 10000 mm
Maximum extent of the cable	4010 mm	8010 mm	10010 mm
Static minimum tension of the cable	3 N	6 N	6 N
Static maximum tension of the cable	8.9 N	13N	13 N
Max. extension acceleration	35 m/s²	30 m/s²	25 m/s²
Max. recovery acceleration [3]	10 m/s²	12 m/s²	12 m/s²
Max. speed	1 m/s	0.75 m/s	0.75 m/s
Dust and splash protection	IP51 according to DIN 40050		

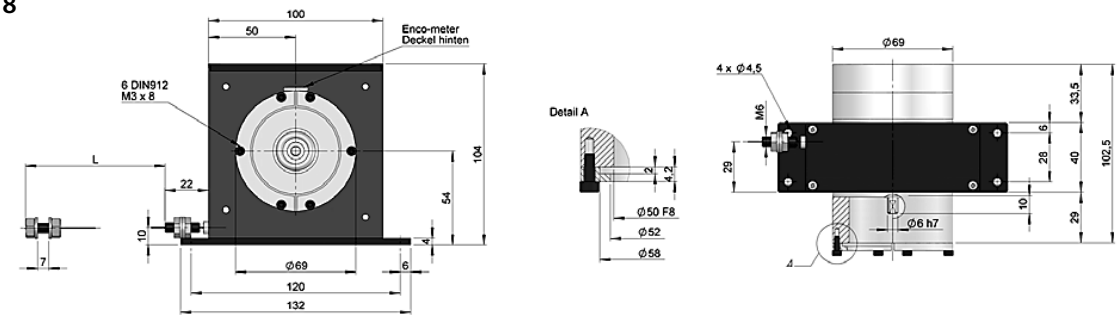
[1] ±0.06 mm per revolution
[2] Other types of cables are available upon request.
[3] We can deliver EM4s with dual drive torque allowing a doubling of the recovery accelerations.

Mechanical dimensions

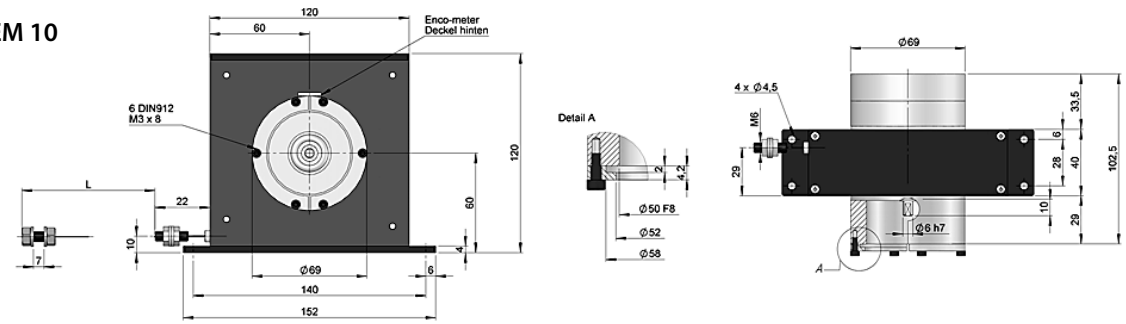
EM 4



EM 8

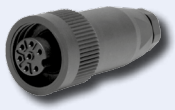
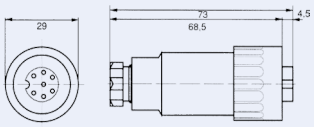
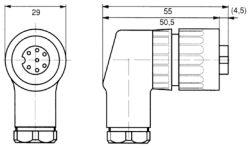
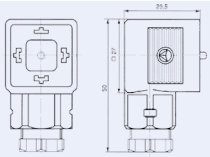
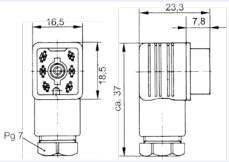
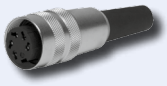
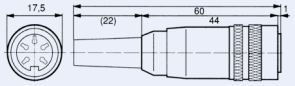
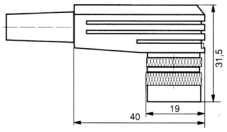
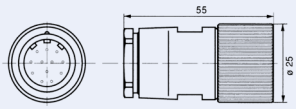
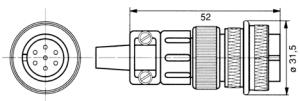
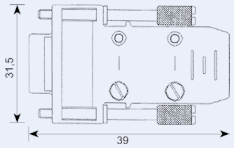


EM 10



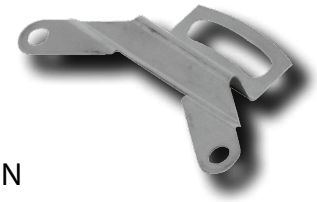
Accessories

Connection types

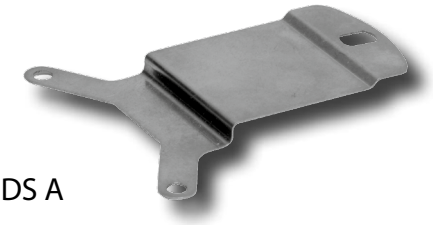
No.	Illustration	Dimensions				
00	Cable connection (IP 65)	Standard:	2 m	AWI 40:	3 m	Colour code according to DIN 47100
01	Cable connection (IP 65)	Standard:	2 m	AWI 40:	3 m	
B, F	Cable connection (IP 65)	Standard:	1,5 m			
02	 IP 65	Material: Pole number: Total length:	Plastic 6 + E 77 mm			
03	 IP 65	Material: Pole number: Total length:	Plastic 6 + E 60 mm			
05	 IP 65	Material: Pole number: Total length:	Plastic 3 + E 40 mm			
07	 IP 65	Material: Pole number: Total length:	Plastic 6 33 mm			
08, 10	 IP 40	Material: Pole number: Total length:	Brass 5 / 6 62 mm		Please observe! When selecting this connection type, the degree of protection reduces to IP 40.	
09, 11	 IP 40	Material: Pole number: Total length:	Brass 5 / 6 34 mm		Please observe! When selecting this connection type, the degree of protection reduces to IP 40.	
12, 16, 17, D, H, I, Y	 IP 65	Material: Pole number: Total length:	Brass 12/16/17 60 mm		D = 12-pole clockwise H = 12-pole anticlockwise I = 9-pole clockwise Y = 17-pole clockwise	
52	 IP 65	Material: Pole number: Total length:	Aluminium 7 / 10 52 mm			
54	 IP 40	Material: Pole number: Total length:	Plastic 9 / 25 ca. 50 mm		Please observe! When selecting this connection type, the degree of protection reduces to IP 40.	

Torque supports

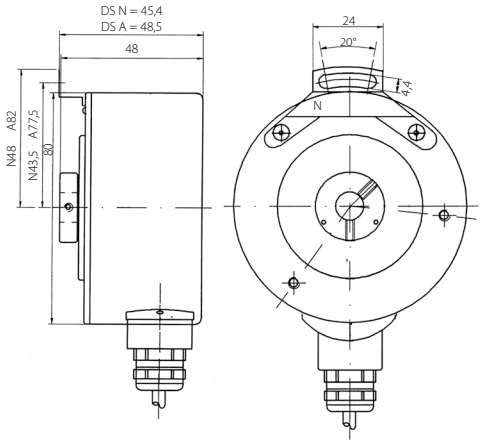
DS N

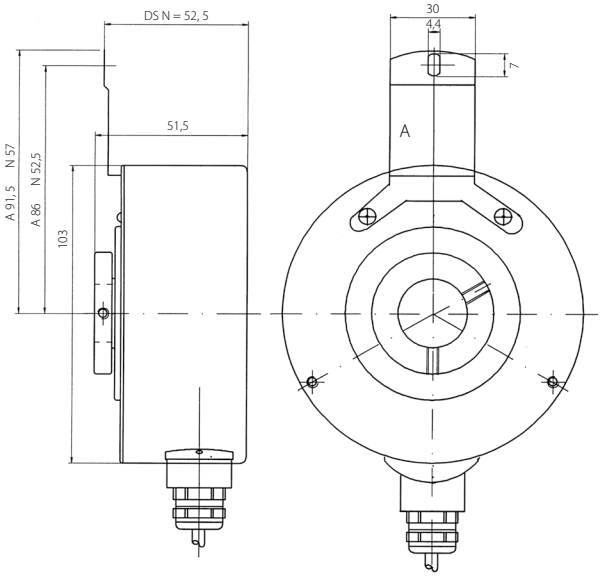


DS A



Mechanical dimensions





Installation instructions

In order to compensate axial and radial shaft run-out, as well as any angle set, the rotary encoder flange may not be rigidly secured. Fix the flange above a stator coupling (e.g. spring sheet) as torque support.

The following flexible fixing plates are available:

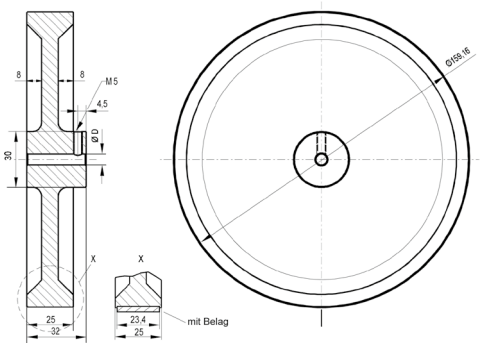
DS A	suitable for encoder type HWI 103	Shaft offset max: +/- 2.0 mm axial, +/- 0.15 mm radial
DS N	suitable for encoder type HWI 80	Shaft offset max: +/- 0.5 mm axial, +/- 0.3 mm radial

Accessories

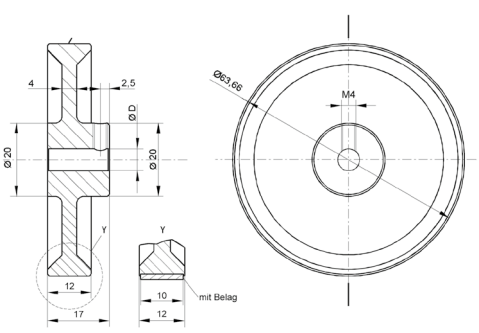
Measuring wheels	Type	Circumfe-rence	Material	D	B	Coating	Profile
	M 101	500	Plastic or Aluminium	10 / 12	25	Smooth plastic	
	M 102	500	Plastic or Aluminium	10 / 12	25	Ribbed plastic	
	M 120	500	Plastic or Aluminium	10 / 12	25	Napped rubber	
	M 130	500	Plastic or Aluminium	10 / 12	25	Knurled aluminium	
	M 140	500	Plastic or Aluminium	10 / 12	25	Vulkollan plastic	
	M 108	200	Plastic or Aluminium	6/10	12	Smooth plastic	
	M 110	200	Plastic or Aluminium	6/10	12	Knurled aluminium	
	M 190	200	Plastic or Aluminium	6/10	12	Napped rubber	
	M 109	200	Plastic or Aluminium	6/10	12	Ribbed plastic	

Mechanical dimensions

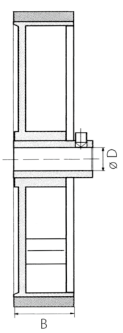
Measuring wheel 500 mm circumference

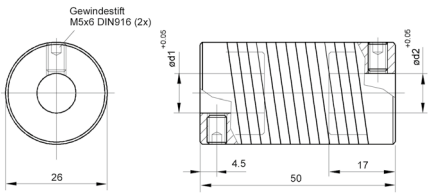
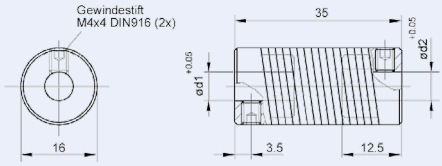
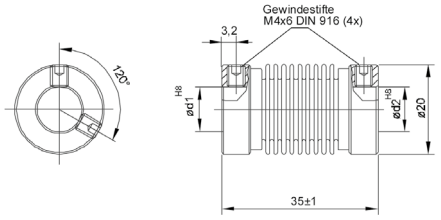
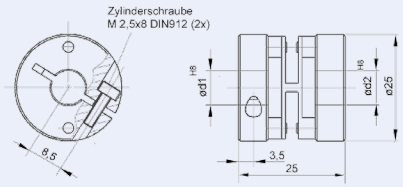


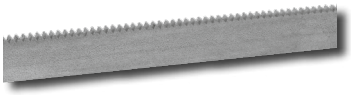
Measuring wheel 200 mm circumference

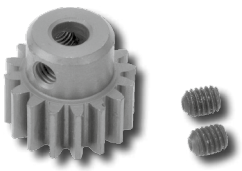


Tolerance
0.2 % – 0.5 %



Couplings	Type	A	B	d^1	d^2	Mechanical dimensions
	Spring coupling K 401	50	26	6 6 6 8 8 10 10 12	6 8 10 8 10 10 12 12	
	Spring coupling K 402	35	16	4 5 5 6 6 8	5 5 6 6 8 8	
	Bellow coupling K 409	35	20	4 4 6 6 8 10 10	4 6 6 10 8 10 12	
	Spring washer coupling K 410	25	25	6 6 8 10 10 12	6 10 8 10 12 12	

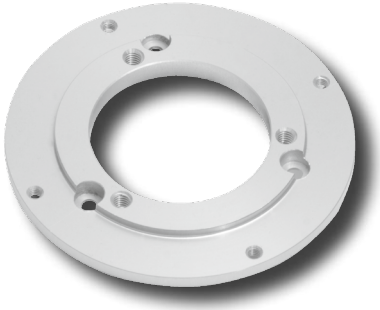
Rack	Type	Width	Height	Length
	Z 214	5	20	1000

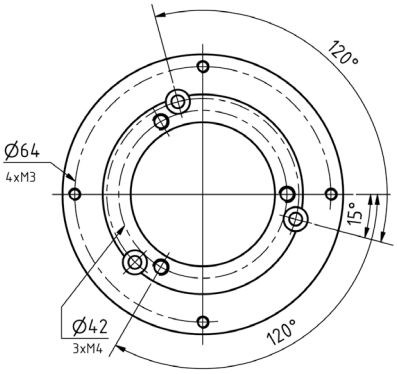
Sprocket	Type	Teeth	Circumference
	R 218	16	50,26

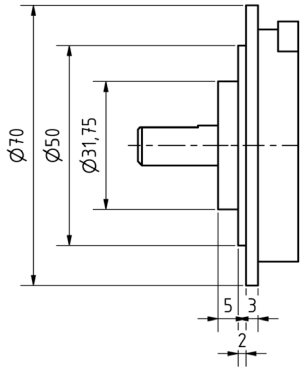
Accessories

Round flange

F 2 for AWI 58 S, AWI 58 H, BC 58

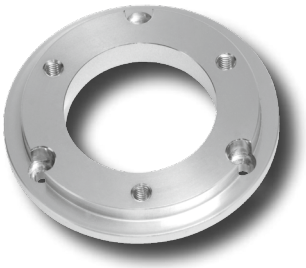


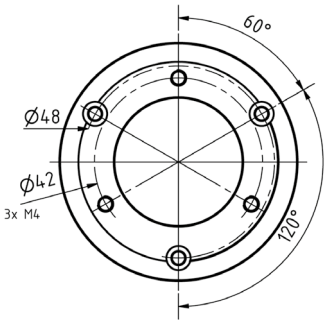


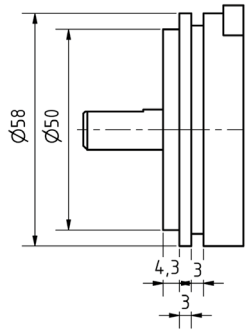


Round flange

F 3 for AWI 58 S, AWI 58 H, BC 58

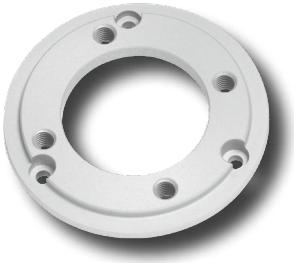


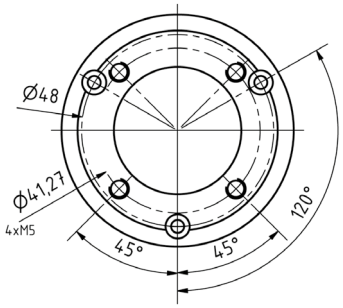


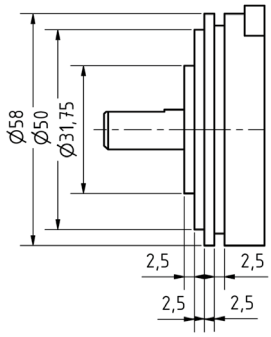


Round flange

F 4 for AWI 58 S, AWI 58 H, BC 58

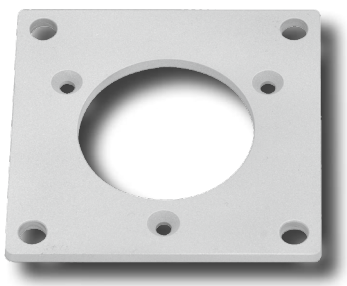


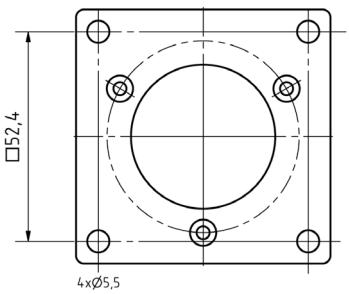


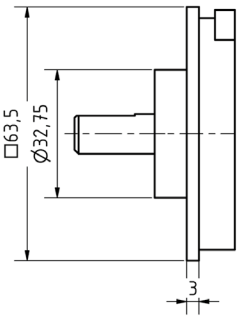


Square flange

F 5 for AWI 58 S, AWI 58 H, BC 58

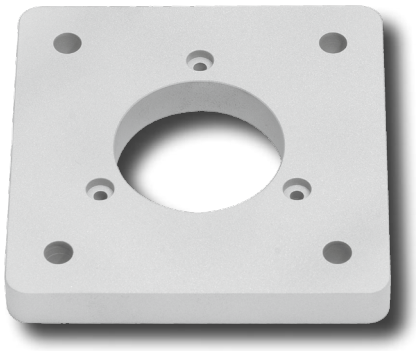


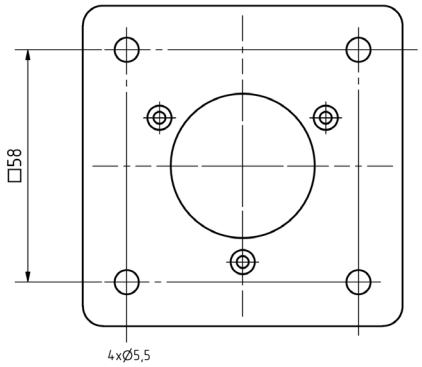


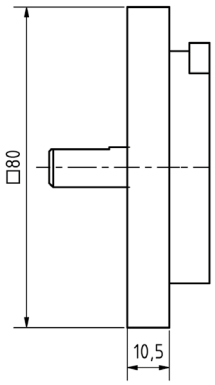


Square flange

F 6 for AWI 58 S, AWI 58 H, BC 58

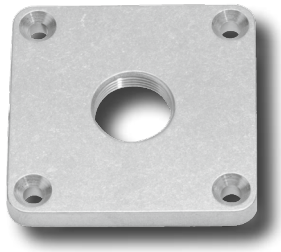


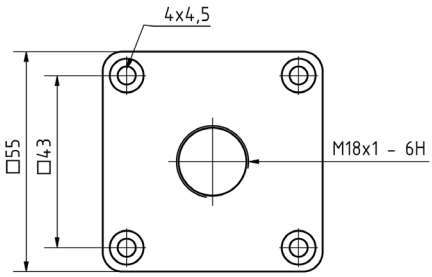


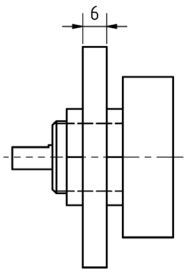


Square flange

F 7 S for AWI 40 S

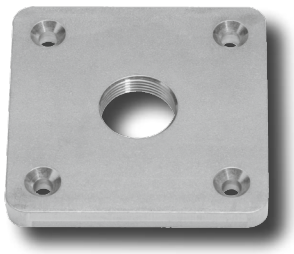


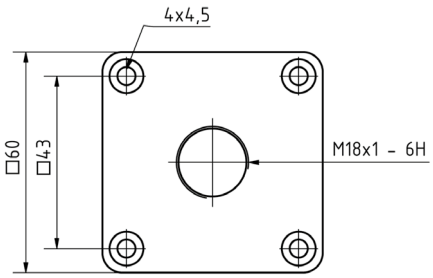


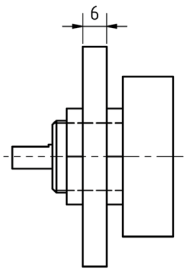


Square flange

F 7 E for AWI 40 E



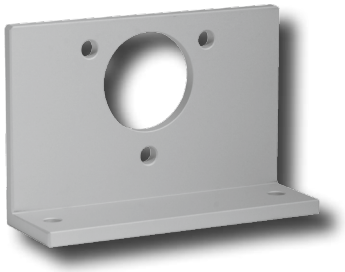


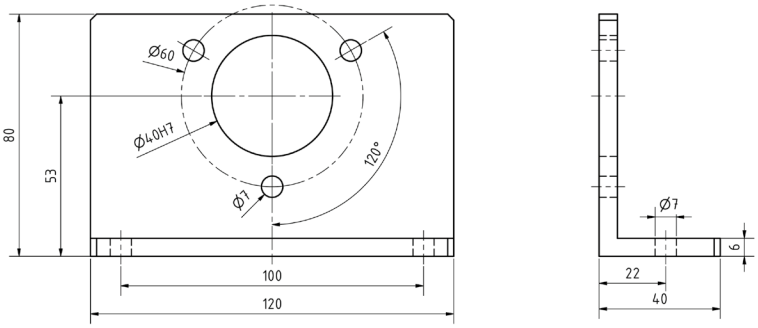


Accessories

Angle flange

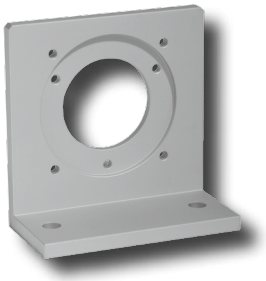
WF 1 for AWI 90 S, PA 02, 70 - 140

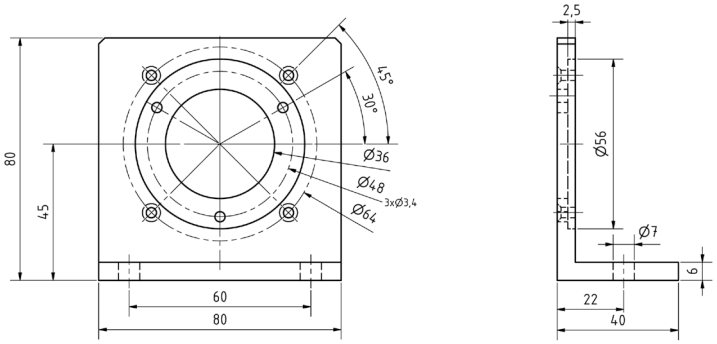




Angle flange

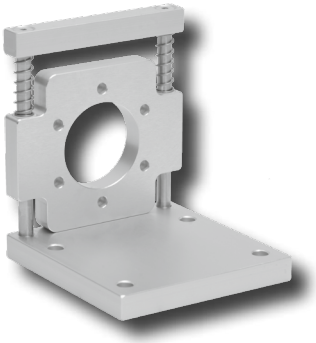
WF 2 for AWI 58, AWI 58 H, BC 58

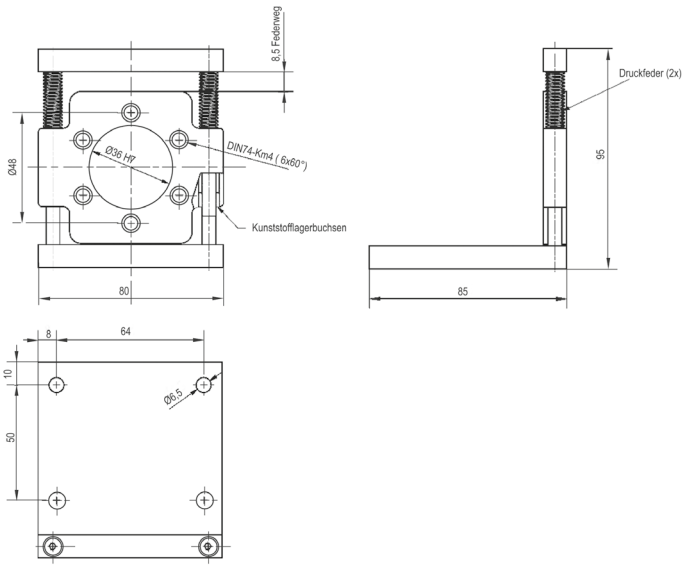




Angle flange

WF 3 for AWI 58, AWI 58 H, BC 58





Mounting bell

For AWI 58, AWI 58 H, BC 58

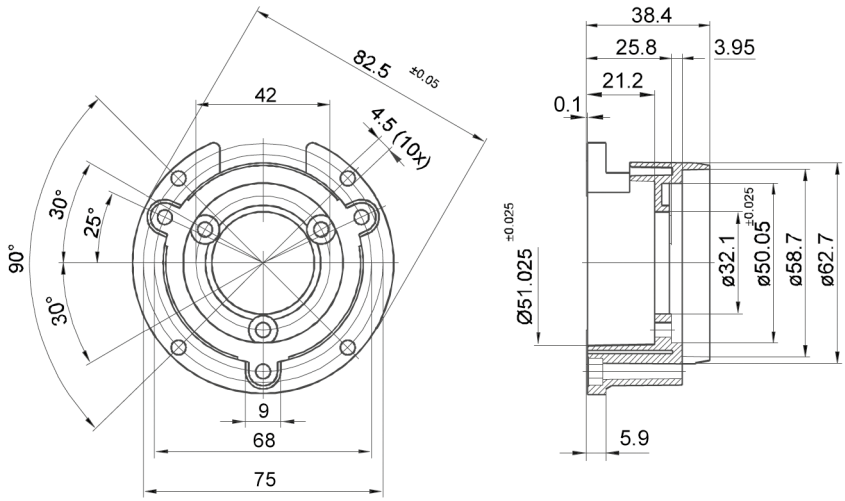
The mounting bell MOGL 5038 provides a very simple and inexpensive installation for all encoders with a synchro flange. The mounting bell made of fibreglass-reinforced plastic in injection moulding technology has a thermally and electrically insulating effect.

The encoder is mounted optionally onto the bell with 3 screws M4 x 10 DIN 912 or 3 mounting eccentrics

Technical data

Model	**MOGL 5038**
Material	Fortron (PPS) 40% fibreglass-reinforced, black
Temperature range	-40° C ... +270°C
Weight	54 g
Net distance (encoder drive)	25.8 mm
Net outlet (for coupling)	Ø 32.1 mm

Mechanical dimensions



Mounting kit DMSA 2000 for mounting bell

consisting of:
4 x screw M4 x 12 DIN 912
3 x mounting eccentric BEMN 1242 49
3 x screw M4 x 10 DIN 912
3 x cylinder screw M4 x 35 DIN 84 A2
7 x disc 4.3 DIN 433
3 x hexagon nut M4 DIN 934 A2

Assembly and installation instructions

Assembly and installation instructions

Hohner rotary encoders can be used both in simple industrial applications, as well as toughest environmental conditions, depending on the type and design.
The precision and optoelectronic components used in an incremental or absolute encoder today no longer present a problem regarding the above-mentioned applications. However, in order to ensure proper functioning of your rotary encoder, the following assembly and installation instructions should be observed:

Electrical:

- When wiring or pulling the plug, it is essential to ensure absence of voltage.
- Static discharges at the connections may cause damage.
- The shielded cable must be connected to the PE in the control cabinet (the shield is not connected in the device, i.e. unilateral shielding).
- Unused cables should be connected on a floating basis isolated from each other.
- Do not lay the encoder cable parallel or near the load lines.
- The tests carried out according to the certificate of conformity were performed in the standard version with 2 m cable.

Mechanical:

- It is imperative to avoid blows to the shaft.
- The maximum shaft load may not be exceeded.
- An axial or radial shaft misalignment must be compensated through suitable measures, such as through the use of couplings, torque supports, belt drive, or similar.
- The device may not be mechanically modified.
- When using hollow shaft encoders, a distortion-free installation should be ensured.

These are just some instructions for which observance thereof can avoid problems during the application of encoders. Should any questions arise during the assembly or installation of Hohner rotary encoders, our expert staff will be at your disposal with advice and practical support.

Declaration of conformity

EC declaration of conformity

Manufacturer and Distributor:	Hohner Elektrotechnik GmbH Gewerbehof 1 59368 Werne

declares that

Product:	Incremental/absolute rotary encoder
Type:	AWI 40k, AWk 58, AWk 70k, AWk 90k, HWI 40 S, HWI 80 S, HWk 103 S, SWA 90, PA02, 70-140, series 10, series 30
Options:	All AWI 40k only ending with C

comply with the following product specifications:
EN 50082 part 2, EN 55011, IEC 1000-4-2, IEC 1000-4-4

Type: HWA 58 E

this product complies with the following European directive.
(89/336/EEC)
"Council Directive on the approximation of the laws of the
Member States relating to electromagnetic compatibility"

The conformity of the described product with the regulations of the directive
is proven by complete compliance with the following standards.
European standard: EN 50082 - 2, EN 50081 - 2, EN 55011 class B

Type: AWI 70 Ex, HWI 70 Ex, AWA 70 Ex, HWA 70 Ex

The described products comply with the following harmonised European standards:
EN 50 014: 1977 + A1., A5 (VDE 0170/0171 part 1/1.87) General provisions
EN 50 018: 1977 + A1., A3 (VDE 0170/0171 part 5/1.87) Pressurised encapsulation „d"

Type: AWI 58 H, BC58

The described products comply with the regulations of the following guidelines.

Number: 89/336/EEC amended by 91/263/EEC and 92/31/EEC and 93/68 EWG
(Text: Council Directive on the approximation of the laws of the Member States
relating to electromagnetic compatibility)

The conformity of the described products with the regulations of the directive is proven
by complete compliance with the following standards:
EN 50082 - 2, EN 50081 - 2, ENV 50140, EN 61000 - 4 - 2, ENV 50141, EN 55011

Werne, 01. 06. 1998

Hohner Elektrotechnik GmbH
Peter Scherer, Managing director

General sales conditions

General sales conditions no. 4

General
The following general sales conditions apply exclusively to all transactions between us and our business partners, even if different conditions are stipulated or prescribed to us. All orders placed by travelling staff or representatives require our written consent to be valid.

Prices
The prices are deemed ex works, strictly net, without packaging costs and the like; they are always subject to change.

Delivery time
Any agreed dates and periods are always considered as estimates. We reserve the right to withdraw from the contract should circumstances arise changing the conditions existing at the time of the offer, order or order confirmation. For such cases, we have, at our own discretion, the right to adhere to the contract and charge the current price for the goods valid at the time of delivery.

Shipment
Shipment always takes place, even with post-paid deliveries, at the expense and risk of the buyer. Insurance for damages in transit is made at the request and expense of the buyer. However, we reserve the right to insure the shipment in whole or part at the expense of the buyer, without obligation to do so. For reports of damage to shipments insured through us, the terms and deadlines of the respective carrier and insurance companies apply.

Packaging
The packaging of the goods is, unless otherwise agreed, determined at our discretion. We reserve the right to charge, besides the value calculation, a deposit for special packaging. Packaging is charged at cost price and will not be taken back.

Payment
Place of performance for deliveries and payment is for all current and future orders Werne. Payments shall be made, unless otherwise agreed, net 30 days after the invoice date, without any deduction free of charge to Werne. The date of settlement is the date upon which the amount is at our disposal. For payments within 8 days after the invoice date, we grant a 2% cash discount. In the case of delayed payment, a 3% default interest will be charged above the legal bank discount, while reserving the right to assert claims for higher compensation.
Upon deterioration of the buyer's ability to pay or after receiving unfavourable information about him, we have the right to demand advance payment of sufficient security of the invoice amounts, even if other conditions are provided or agreed upon. in these cases, unpaid bills are payable immediately. The same applies if the buyer mortgages stocks, accounts receivables, etc. or
purchases goods as security for other creditors, or fails to pay despite repeated reminders. Retention or offset with any claims by the buyer against our payment entitlement is excluded.

Reservation of title
The delivered goods remain our property until the purchase price is paid in full and until payment of all previous and future deliveries within the business relations, including all secondary claims (if payment is made by a bill of exchange, until the discharge of the check or bill). The buyer is hitherto not entitled to pledge the goods to third parties or transfer them by way of security. The ruling rights of sale during the ordinary course of business remains unaffected. In the event of resale, it is agreed that the reservation of title to the resold goods are forwarded from the buyer to the new buyer or new
seller. The proceeds from the resale should be kept separately in our behalf. The buyer herewith assigns all claims against a third party resulting from the resale or any other legal reason to us for our security. The buyer is authorised to collect these claims on our account as long as the buyer meets his payment obligations to us in due course. We are, however, entitled to inform the buyer (third party), to be identified upon request, of the transferral of the claim, and issue instructions. The buyer must inform us immediately of any access by third parties to the goods supplied under reservation of title or assigned claims. The right of title is also valid against the carrier to whom the goods are handed over at the request of the buyer or on our commission.

Custom-made products
For custom-made products, we have the right to demand total or partial advance payment . For mas-produced articles we are entitled to carry out excess or short deliveries of 20% and partial deliveries.

Tools always remain our property, even if the buyer has paid them in whole or part.
It is exclusively up to the buyer to ensure that the goods commissioned do not violate the property right of third parties. The buyer thereby assumes full responsibility for any claim towards us.

Complaints
Complaints must be reported to us in writing immediately after discovery. Should we not receive a specified notice of defects by the buyer within 4 weeks after
receipt of the goods at the address location, namely at the postal, or railway station, or receiving forwarded, or air freight, sea port agency, etc. of the address location, quality and quantity, etc. are deemed to be approved under relinquishment of any right to complaint relating to apparent or allegedly concealed defects. For any goods delivered by us proving to be defective, after unchanged receipt of goods free of charge, provided timely and formally correct submission of the complaint, we may, at our discretion, provide either free replacement, or repair, or refund the value of the goods at the current price at the time of receipt by us. Any further claims of the buyer or third party are expressly excluded in any case.
Tolerance ranges shall be deemed as accepted according to the respective state of the art technology, unless special agreements have been explicitly agreed.

Warranty terms
Regarding deficiencies of the delivery, including the absence of expressly warranted characteristics, we shall be liable in such a way that we will repair or replace at our discretion all parts which prove useless or considerably impaired in their usefulness, within 6 months (3 months for shift operations) since the delivery date (day we dispatched). We shall only be liable for material defects where reasonable care should have led us to recognise the defects. Any further claims of any kind of the buyer or third party are expressly excluded in any case. The buyer shall bear any costs incurred by us arising from unjustified notices of defect.
We must be notified in writing of any complaints immediately after discovery and concerned parts should be submitted upon request. The complaint period ends at the latest upon expiry of the 7th month since the day of delivery (day we dispatched).
The buyer shall afford us the necessary time and opportunity to undertake all the changes deemed
necessary to supply spare parts. Replaced delivery items shall become our property.
No liability shall be assumed: a) for damage resulting from normal wear; b) as long as the buyer has not fulfilled his obligations towards us, especially the agreed conditions of payment; c) when the buyer carries out modifications and repairs without our authorisation.
Tolerance ranges shall be deemed as accepted according to the respective state of the art technology, unless special agreements have been explicitly agreed.
We have carefully checked all the information in this catalogue (technical data, illustrations, dimensions, etc.) and they are based on our knowledge and production status at the time of printing. They do not, however, represent binding assurance.

Place of jurisdiction
The relationship between us and our clients is governed by German law. Place of jurisdiction for everything arising from the delivery contract

Status
January 2000

Hohner-Elektrotechnik GmbH,
59368 Werne

Notes

hohner

Elektrotechnik Werne

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