

Макси-энкодеры с полым валом A02H, A020, Sendix H120

Технические характеристики

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Incremental encoders

**Heavy Duty
hollow shaft, optical**

Sendix Heavy Duty H120 (hollow shaft)

Push-pull / RS422



The Sendix Heavy Duty H120 were especially developed for large motors and generators. They are highly accurate and extremely robust thanks to HD-Safety-Lock™ – the Heavy Duty hollow shaft design of the latest generation with sturdy bearing construction and integrated bearing isolation. The dual protection of the shaft, the wide temperature range and the high protection level allow for use even under the harshest conditions.

The very large hollow shaft up to 28 mm plus the wide variety of mounting solutions and connection options offer the very highest degree of flexibility during installation.



Robust

- Integrated bearing isolation up to 2.5 kV for reliable shaft connection. ¹⁾
- Extremely high resilience as a result of dual protection of the shaft (shielding cover disk and radial shaft seal), protection level IP67 as well as a seawater durable housing.
- High shock (200 g) and vibration (15 g) resistance.

Flexible

- 3 fixing solutions: conical central fastening, cylindrical central fastening or through hollow shaft.
- Connection via cable, M12 or M23 connector or terminal box.
- Torque stop on the flange or the cover – allows the device to be rotated as required during mounting.
- Through hollow shaft up to ø 28 mm.

Order code Hollow shaft version

8.H120 . XXXX . XXXX
Type a b c d e

a Flange

- 1 = without mounting aid
- 2 = with fastening arm 70 mm [2.76"] ²⁾
- 3 = with fastening arm 100 mm [3.93"] ²⁾
- 4 = with fastening arm 150 mm [5.91"] ²⁾
- 5 = with stator coupling, ø 119 mm [4.69"]

b Through hollow shaft

- 2 = ø 16 mm [0.63"]
- 3 = ø 20 mm [0.79"]
- 5 = ø 25 mm [0.98"]
- 7 = ø 28 mm [1.10"]
- 6 = ø 1"

*Blind hollow shaft,
with central fastening
insertion depth max. 53 mm [2.09"]*

A = ø 12 mm [0.47"]

B = ø 16 mm [0.63"]

*Blind hollow shaft, cone
with central fastening
insertion depth max. 22.5 mm [0.89"]*

K = ø 17 mm [0.67"], 1 : 10

c Output circuit / supply voltage

- 4 = RS422 (with inverted signal) / 5 V DC
- 1 = RS422 (with inverted signal) / 10 ... 30 V DC
- 5 = push-pull (with inverted signal) / 10 ... 30 V DC
- 6 = push-pull (with inverted signal) / 10 ... 30 V DC, power version up to 350 m

d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC
- A = radial cable, special length PVC *)
- 2 = radial M12 connector, 8-pin, ccw
- 4 = radial M23 connector, 12-pin, ccw
- D = radial M23 connector, 12-pin, cw
- K = terminal box with plug-in spring terminal connectors, rotatable through 180°

*) Available special lengths (connection type A):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.H120.121A.2048.0030 (for cable length 3 m)

e Pulse rate

- 50, 360, 512, 600, 1000, 1024,
1500, 2000, 2048, 2500, 4096,
5000
(e.g. 360 pulses => 0360)

Optional on request

- other pulse rates
- Ex 2/22 ³⁾

1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.

2) Enclosed, not mounted.

3) For the cable connection type, cable material PUR.

Incremental encoders

Heavy Duty hollow shaft, optical	Sendix Heavy Duty H120 (hollow shaft)	Push-pull / RS422
Cables and connectors		Order no.
Preassembled cables	M12 female connector with coupling nut, 8-pin, A coded, straight Single-ended 2 m [6.56'] PVC cable	05.00.6041.8211.002M
	M23 female connector with coupling nut, 12-pin, cw Single-ended 2 m [6.56'] PVC cable	8.0000.6201.0002
Connectors	M12 female connector with coupling nut, 8-pin, A coded, straight (metal)	05.CMB 8181-0
	M23 female connector with coupling nut, 12-pin, cw ¹⁾	8.0000.5012.0000

Technical data

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ at 60 °C [140 °F] 3500 min ⁻¹
Starting torque – at 20 °C [68 °F]	0.05 Nm
Load capacity of shaft	radial 475 N axial 375 N
Weight	1.6 ... 2.0 kg [56.44 ... 70.55 oz] (depending on version)
Protection acc. to EN 60529	IP67
Working temperature range	-40 °C ²⁾ ... +100 °C ³⁾ [-40 °F ³⁾ ... +212 °F ³⁾
Materials	shaft stainless steel, bore tolerance H7 housing, flange seawater durable
Shock resistance acc. to EN 60068-2-27	2000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	150 m/s ² , 10 ... 2000 Hz

Approvals	
CE compliant in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU
ATEX Directive	2014/34/EU (for Ex 2/22 variants)

Electrical characteristics			
Output circuit	RS422 (TTL-compatible))	Push-pull	Push-pull (power version)
Supply voltage	5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC	10 ... 30 V DC
Power consumption (no load)	max. 90 mA	max. 80 mA	max. 90 mA
Permissible load per channel	DC max. +/- 20 mA peak max. +/- 30 mA	max. +/- 30 mA max. +/- 70 mA	max. +/- 150 mA max. +/- 200 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz
Max. cable length	550 m at 100 kHz	150 m at 80 kHz	350 m at 100 kHz
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 3.0 V max. 2.5 V	min. +V - 4.0 V max. 3.0 V
Rising edge time t _r	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t _f	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs ⁴⁾	yes	yes	yes
Reverse polarity protection of the supply voltage	yes	yes	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) Suitable for connection type 4.

2) With connector: -40 °C [-40 °F], with securely installed cable: -30 °C [-22 °F],
with flexibly installed cable: -20 °C [-4 °F].

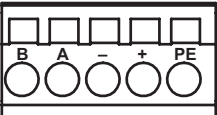
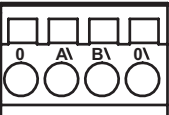
3) Measured at the flange.

4) If supply voltage correctly applied.

Incremental encoders

Heavy Duty hollow shaft, optical	Sendix Heavy Duty H120 (hollow shaft)	Push-pull / RS422
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Terminal assignment

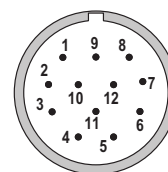
Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)											
1, 4, 5, 6	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Core color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	Shield
Output circuit	Type of connection	M12 connector, 8-pin											
1, 4, 5, 6	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Pin:	1	2	—	—	3	4	5	6	7	8	PH ¹⁾
Output circuit	Type of connection	M23 connector, 12-pin											
1, 4, 5, 6	4, D	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾
Output circuit	Type of connection	Terminal connections											
1, 4, 5, 6	K	Signal:	B	A	0 V	+V	$\perp$	0	$\bar{A}$	$\bar{B}$	$\bar{0}$		
		Pin:	B	A	—	+	PE	0	$\bar{A}$	$\bar{B}$	$\bar{0}$		
													

- +V: Supply voltage encoder +V DC
 0 V: Supply voltage encoder ground GND (0 V)
 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
 A, $\bar{A}$: Incremental output channel A
 B, $\bar{B}$: Incremental output channel B
 0, $\bar{0}$: Reference signal
 PH $\perp$: Plug connector housing (shield)

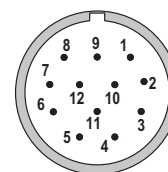
Top view of mating side, male contact base



M12 connector,
8-pin, ccw



M23 connector,
12-pin, ccw



M23 connector,
12-pin, cw

1) PH = shield is attached to connector housing.

Incremental encoders

Heavy Duty hollow shaft, optical

Sendix Heavy Duty H120 (hollow shaft)

Push-pull / RS422

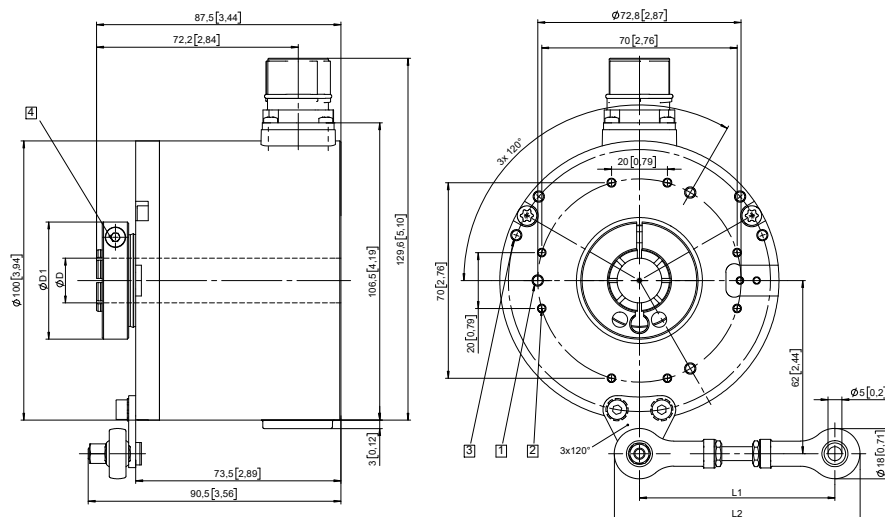
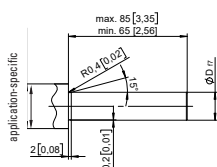
Dimensions

Dimensions in mm [inch]

Flange with fastening arm Through hollow shaft

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm (SW3)

Shaft connection to the application



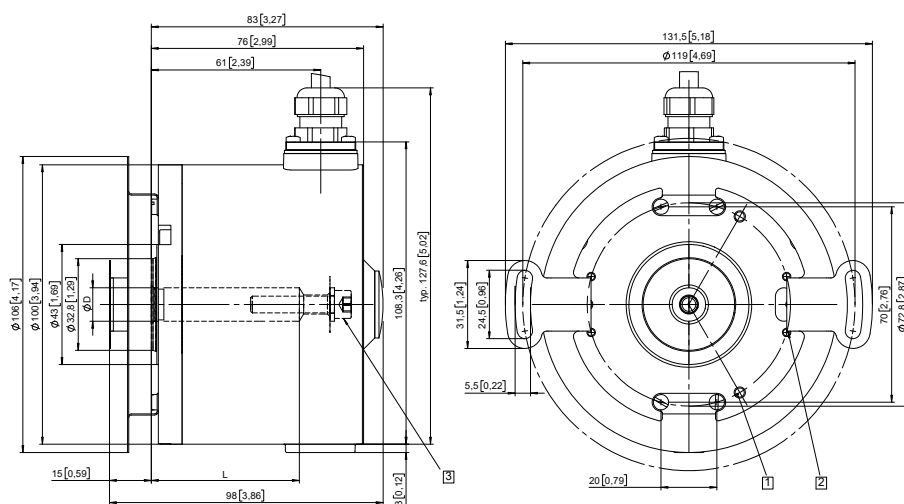
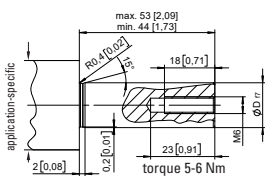
D	Fit	D1
16 [0.63]	H7	42.0 [1.65]
20 [0.79]	H7	42.0 [1.65]
25 [0.98]	H7	47.5 [1.87]
28 [1.10]	H7	52.0 [2.05]
1"	H7	47.5 [1.87]

Fastening arm	L1	L2
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]

Flange with stator coupling, Ø 119 [4.69] Blind hollow shaft with central fastening

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 Recommended torque for M6 (SW5) 5 - 6 Nm

Shaft connection to the application



D	Fit	L
12 [0.47]	H7	53 [2.09]
16 [0.63]	H7	53 [2.09]

L = insertion depth blind hollow shaft

Incremental encoders

Heavy Duty hollow shaft, optical

Sendix Heavy Duty H120 (hollow shaft)

Push-pull / RS422

Dimensions

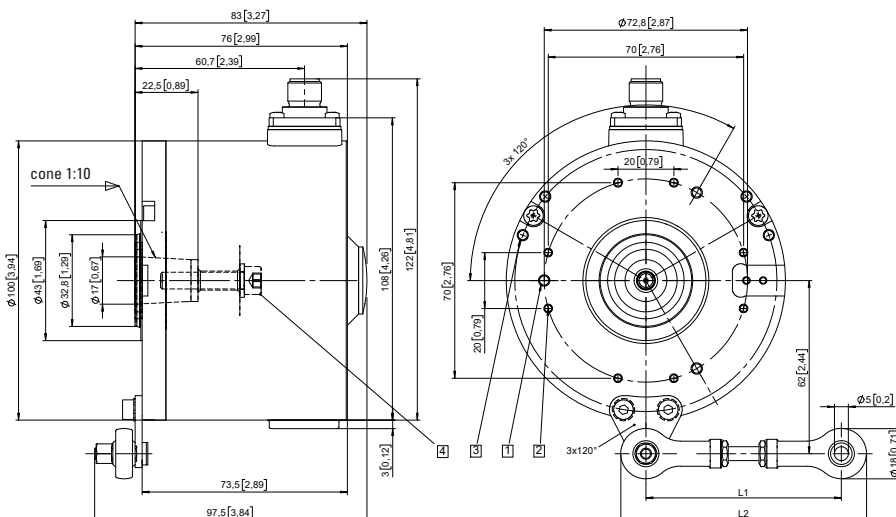
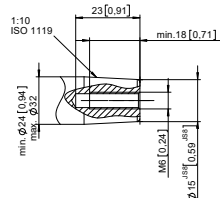
Dimensions in mm [inch]

Flange with fastening arm

Blind hollow shaft with central fastening,
cone, $\varnothing 17$ [0.67], 1 : 10
(blind hollow shaft, cone type K)

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for M6 (SW5) 5 - 6 Nm

Shaft connection to the application

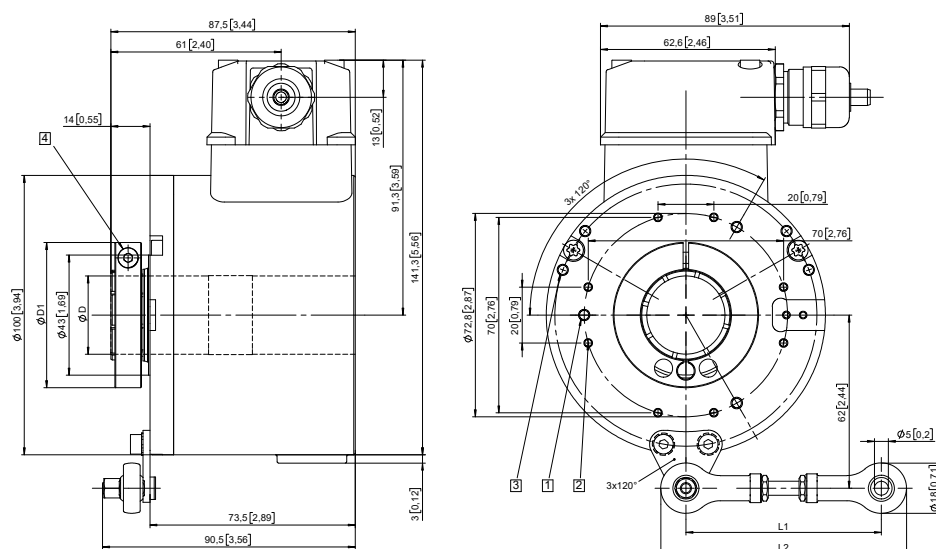
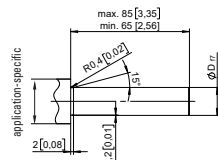


Fastening arm	L1	L2
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]

Flange with fastening arm Through hollow shaft and terminal box

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm (SW3)

Shaft connection to the application



D	Fit	D1
16 [0.63]	H7	42.0 [1.65]
20 [0.79]	H7	42.0 [1.65]
25 [0.98]	H7	47.5 [1.87]
28 [1.10]	H7	52.0 [2.05]
1"	H7	47.5 [1.87]

Fastening arm	L1	L2
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]

Incremental encoders

Large hollow shaft optical

A020 (hollow shaft)

Push-pull / RS422 / SinCos



The incremental encoder type A020 with optical sensor technology is available with a through hollow shaft up to max. 42 mm diameter.

With an installation depth of just 43 mm it is optimally suited for mounting on large shafts, even where space is tight.



High rotational speed



High protection level



Shock / vibration resistant



Magnetic field proof



Optical sensor

Compact

- Minimal installation depth but large hollow shaft.
- Available with compact M12 connector.
- Torque stop can be implemented even with small radius.

Flexible

- With push-pull, RS422 or SinCos interface.
- Hollow shaft from 20 mm up to 42 mm as standard.
- With cable connection, M12 or M23 connectors.

Order code Hollow shaft

8.A020 . XXXX . XXXX
Type a b c d e

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange

- 2 = with spring element, short
3 = with spring element, long
5 = with torque stop, long

b Through hollow shaft

- C = $\varnothing$ 20 mm [0.79"]
6 = $\varnothing$ 24 mm [0.94"]
5 = $\varnothing$ 25 mm [0.98"]
3 = $\varnothing$ 28 mm [1.10"]
A = $\varnothing$ 30 mm [1.18"]
2 = $\varnothing$ 38 mm [1.50"]
B = $\varnothing$ 40 mm [1.57"]
1 = $\varnothing$ 42 mm [1.65"]
4 = $\varnothing$ 1"

c Output circuit / supply voltage

- 1 = RS422 (with inverted signal) / 5 V DC
4 = RS422 (with inverted signal) / 10 ... 30 V DC
2 = Push-pull (without inverted signal) / 10 ... 30 V DC
5 = Push-pull (with inverted signal) / 5 ... 30 V DC
3 = Push-pull (with inverted signal) / 10 ... 30 V DC
A = Push-pull (7272 compatible) / 5 ... 30 V DC
8 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
9 = SinCos, 1 Vpp (with inverted signal) / 10 .. 30 V DC

d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC
A = radial cable, special length PVC *)
2 = radial M23 connector, 12-pin
E = radial M12 connector, 8-pin

*) Available special lengths (connection type A):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.A020.351A.2048.0030 (for cable length 3 m)

e Pulse rate

- 50, 360, 512, 600, 1000, 1024, 1500,
2000, 2048, 2500, 4096, 5000
(e.g. 360 pulses => 0360)

SinCos version only available
with pulses $\geq$ 1024

Optional on request
- other pulse rates

Incremental encoders

Large hollow shaft optical	A020 (hollow shaft)	Push-pull / RS422 / SinCos
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Mounting accessory for hollow shaft encoders		Dimensions in mm [inch]	Order no.
Torque pin, ø 6 mm for flange with spring element (flange type 2 + 3)	with fixing thread		8.0010.4700.0003
Cables and connectors			Order no.
Preassembled cables	M12 female connector with coupling nut, 8-pin, A coded, straight single-ended 2 m [6.56'] PVC cable		05.00.6041.8211.002M
	M23 female connector with coupling nut, 12-pin, cw single-ended 2 m [6.56'] PVC cable		8.0000.6201.0002
Connectors	M12 female connector with coupling nut, 8-pin, A coded, straight (metal)		05.CMB 8181-0
	M23 female connector with coupling nut, 12-pin, cw (metal)		8.0000.5012.0000

Technical data

Mechanical characteristics	
Maximum speed	3000 min ⁻¹ 1)
Mass moment of inertia 2)	< 150 x 10 ⁻⁶ kgm ²
Starting torque with sealing at 20 °C [68 °F]	< 0.2 Nm
Weight	approx. 0.7 kg [24.69 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40 °C 3) ... +70 °C [-40 °F 3) ... +158 °F]
Material shaft	stainless steel H7
Shock resistance acc. to EN 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 2000 Hz

Approvals	
UL compliant in accordance with	File no. E224618
CE compliant in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

Electrical characteristics SinCos output		
Output circuit	SinCos U = 1 Vpp	SinCos U = 1 Vpp
Supply voltage	5 V DC (±5 %)	10 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 65 mA max. 110 mA	typ. 65 mA max. 110 mA
-3 dB frequency	≤180 kHz	≤180 kHz
Signal level channels A/B	1 Vpp (±20 %)	1 Vpp (±20 %)
channel 0	0.1 ... 1.2 V	0.1 ... 1.2 V
Short circuit proof outputs 4)	yes	yes
Reverse polarity protection of the supply voltage	no	yes

1) Short term (app. 15 min. range) up to 3500 min⁻¹.

2) Depending on shaft diameter.

3) With connector: -40 °C [-40 °F], securely installed: -30 °C [-22 °F], flexibly installed: -20 °C [-4 °F].

4) If supply voltage correctly applied.

Incremental encoders

Large hollow shaft optical	A020 (hollow shaft)	Push-pull / RS422 / SinCos
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Electrical characteristics			
Output circuit	RS422 (TTL compatible)	Push-pull	Push-pull (7272 compatible)
Supply voltage	5 V DC ($\pm 5\%$) 10 ... 30 V DC	5 ... 30 V DC 10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)			
without inverted signal	–	typ. 55 mA/max. 125 mA	–
with inverted signal	typ. 40 mA/max. 90 mA	typ. 80 mA/max. 150 mA	typ. 50 mA/max. 100 mA
Permissible load / channel	max. ± 20 mA	max. ± 30 mA	max. ± 20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. $+V - 3.0$ V max. 2.5 V	min. $+V - 2.0$ V max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 1 μ s	max. 1 μ s
Falling edge time t_f	max. 200 ns	max. 1 μ s	max. 1 μ s
Short circuit proof outputs ¹⁾	yes ²⁾	yes	yes
Reverse polarity protection of the supply voltage	no, 10 ... 30 V DC: yes	yes	no

Terminal assignment

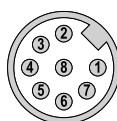
Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)											
1 ... A	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Core color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection	M23 connector, 12-pin											
1 ... A	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Pin:	10	12	11	2	5	6	8	1	3	4	PH ³⁾

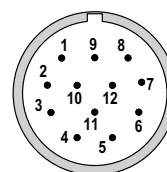
Output circuit	Type of connection	M12 connector, 8-pin											
1 ... A	E	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Pin:	1	2	–	–	3	4	5	6	7	8	PH ³⁾

+V: Supply voltage encoder +V DC
 0 V: Supply voltage encoder ground GND (0 V)
 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
 A, $\bar{A}$: Incremental output channel A
 B, $\bar{B}$: Incremental output channel B
 0, $\bar{0}$: Reference signal
 PH $\perp$: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

1) PH = shield is attached to connector housing.

Incremental encoders

Large hollow shaft optical	A020 (hollow shaft)	Push-pull / RS422 / SinCos
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Dimensions hollow shaft version

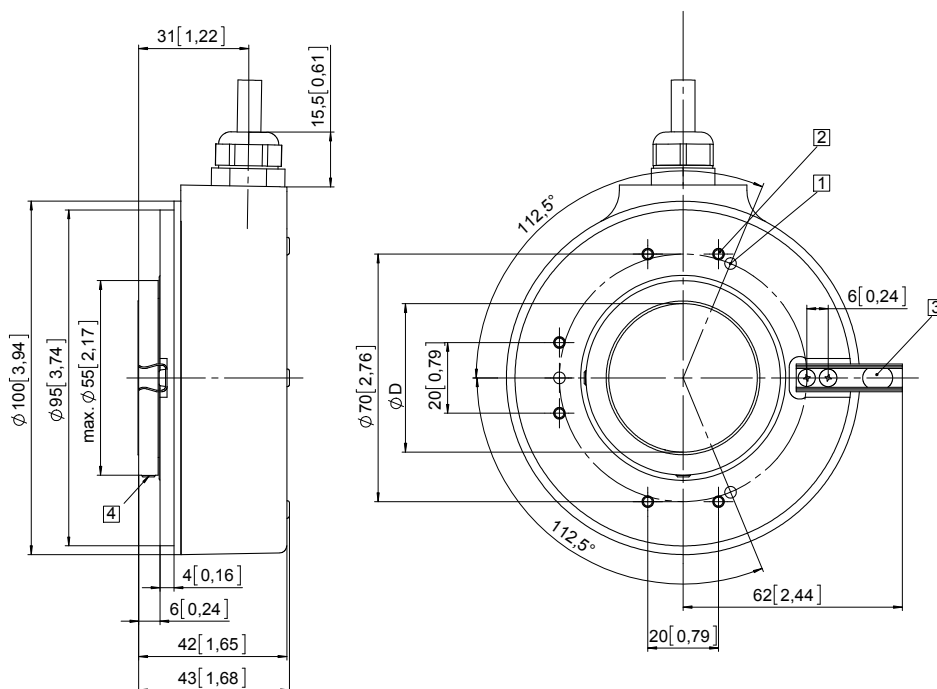
Dimensions in mm [inch]

Flange with spring element, long Flange type 3

- 1 3 x M4, 7 [0.28] deep
- 2 6 x M3, 8 [0.31] deep
- 3 Torque pin DIN 6325, $\varnothing$ 6 [0.24]
- 4 Recommended torque for the clamping ring 1.0 Nm

D	Fit
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
1"	H7

Typ. insertion depth: 1.5 x D
up to L hollow shaft max.

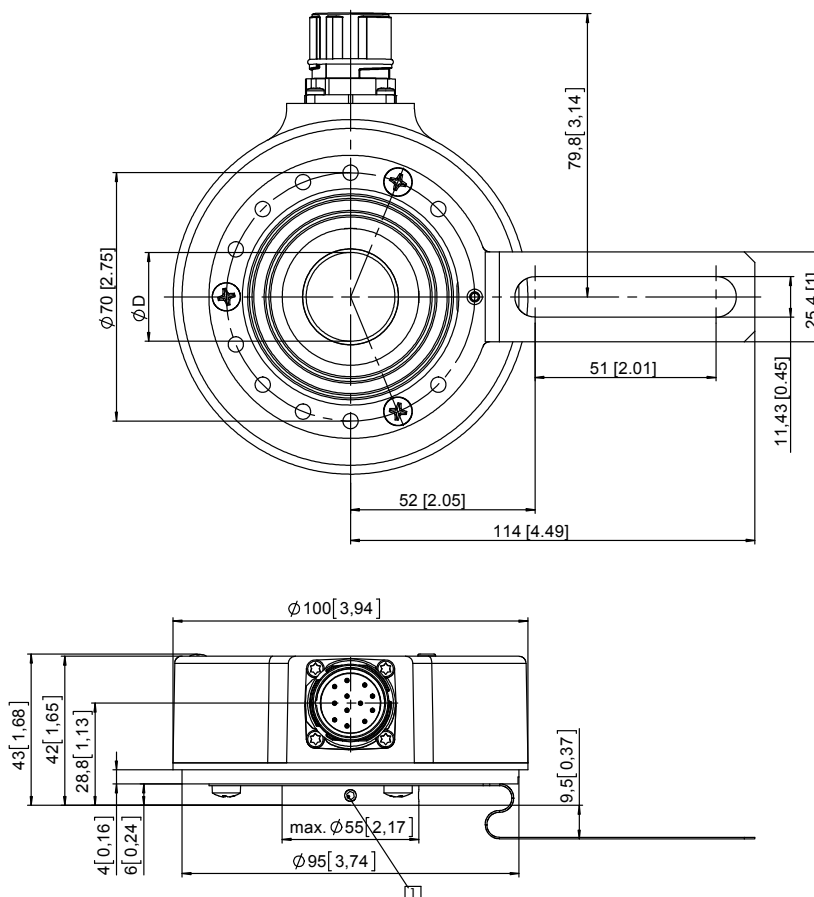


Flange with torque stop, long Flange type 5

- 1 Recommended torque for the clamping ring 1.0 Nm

D	Fit
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
1"	H7

Typ. insertion depth: 1.5 x D
up to L hollow shaft max.



Incremental encoders

**Large hollow shaft
robust, optical**

A02H (hollow shaft)

Push-pull / RS422 / SinCos



The Heavy Duty incremental encoder type A02H boasts a high degree of ruggedness in a very compact design.

Its special construction makes it perfect for all applications in very harsh environments.



High rotational speed



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Optical sensor

Heavy Duty - robust

- Special shaft connection with interlocked bearings.
- Balanced stainless steel clamping ring.
- Optional isolation inserts available to protect against shaft currents.

Compact and versatile

- Only 49 mm installation depth.
- With cable connections, M12, M23, Sub-D or MIL connectors.
- With push-pull, RS422 or SinCos interface.

Order code Hollow shaft

8.A02H.XXXX.XXXX
Type a b c d e

a Flange

- 1 = without mounting aid
- 2 = with spring element, short
- 3 = with spring element, long**
- 5 = with torque stop, long**

- 6 = with torque stop, short ¹⁾

b Through hollow shaft

- C = $\varnothing$ 20 mm [0.79"]
- 6 = $\varnothing$ 24 mm [0.94"]
- 5 = $\varnothing$ 25 mm [0.98"]**
- 3 = $\varnothing$ 28 mm [1.10"]
- A = $\varnothing$ 30 mm [1.18"]**
- H = $\varnothing$ 35 mm [1.38"]
- 2 = $\varnothing$ 38 mm [1.50"]**
- B = $\varnothing$ 40 mm [1.57"]
- 1 = $\varnothing$ 42 mm [1.65"]
- 4 = $\varnothing$ 1"**

- D = $\varnothing$ 1/2" ¹⁾
- E = $\varnothing$ 5/8" ¹⁾
- F = $\varnothing$ 3/4" ¹⁾
- G = $\varnothing$ 1 1/8" ¹⁾
- N = $\varnothing$ 1 1/4" ¹⁾

c Output circuit (with inverted signal) / supply voltage

- 1 = RS422 / 5 V DC**
- 4 = RS422 / 10 ... 30 V DC
- 5 = Push-pull / 5 ... 30 V DC
- 3 = Push-pull / 10 ... 30 V DC**
- 8 = SinCos, 1 Vpp / 5 V DC
- 9 = SinCos, 1 Vpp / 10 ... 30 V DC
- A = Push-pull (7272 compatible) / 5 ... 30 V DC

- D = RS422 / 5 ... 30 V DC ¹⁾

d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC
- A = radial cable, special length PVC *)
- 2 = radial M23 connector, 12-pin**
- E = radial M12 connector, 8-pin**
- G = Sub-D connector, male contact, 9-pin, double-row ²⁾
- R = radial M12 connector, 5-pin ⁴⁾

- K = MIL connector, 7-pin ^{1) 4)}
- D = MIL connector, 10-pin ¹⁾

*) Available special lengths (connection type A):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.A02H.111A.2048.0030 (for cable length 3 m)

e Pulse rate

- 50, 360, 512, 600, **1000, 1024**, 1500,
2000, **2048**, 2500, **4096, 5000**
(e.g. 360 pulses => 0360)

SinCos version only available
with pulses $\geq$ 1024

Optional on request

- other pulse rates on request
- Ex 2/22 ³⁾

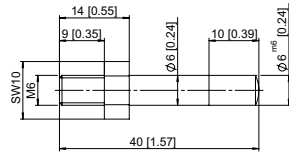
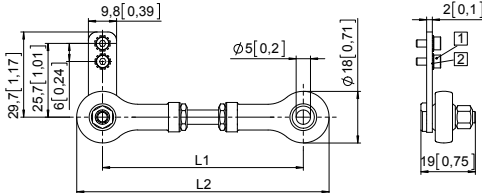
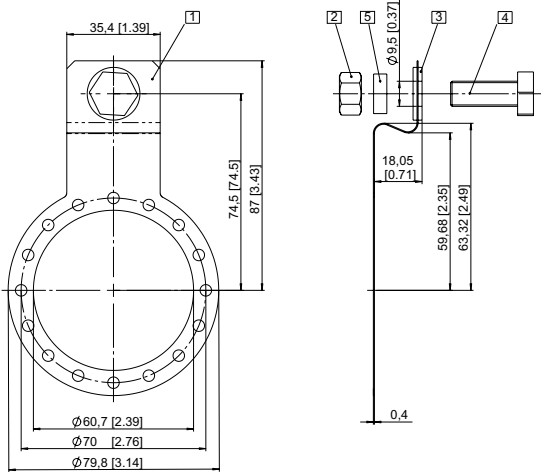
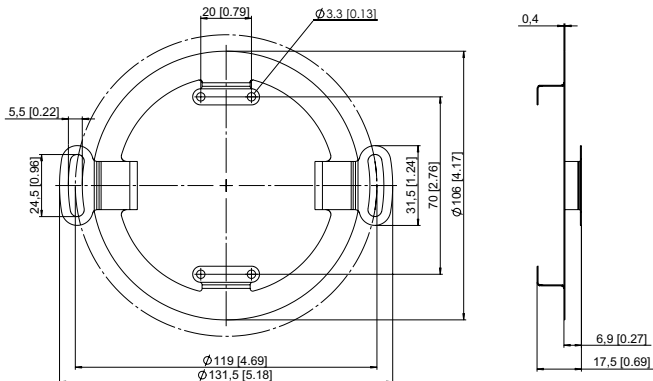
1) US version.

2) Protection level IP40.

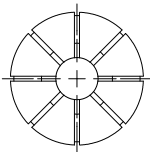
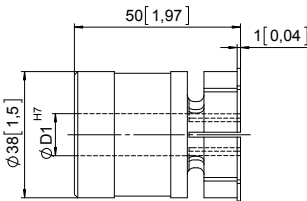
3) For the cable connection type, cable material PUR.

4) Without inversion, cannot be combined with SinCos.

Incremental encoders

Large hollow shaft robust, optical		A02H (hollow shaft)	Push-pull / RS422 / SinCos													
Mounting accessory for hollow shaft encoders		Dimensions in mm [inch]	Order no.													
Torque pin, ø 6 mm for flange with spring element (flange type 2 + 3)		with fixing thread 	8.0010.4700.0003													
Tether arm, flexible 		 <table><tr><th>Tether arm</th><th>L1</th><th>L2</th></tr><tr><td>70 mm [2.76"]</td><td>64 ... 74 [2.51 ... 2.91]</td><td>82 ... 92 [3.23 ... 3.62]</td></tr><tr><td>100 mm [3.94"]</td><td>94 ... 104 [3.70 ... 4.09]</td><td>112 ... 122 [4.41 ... 4.80]</td></tr><tr><td>150 mm [5.91"]</td><td>144 ... 154 [5.67 ... 6.06]</td><td>162 ... 172 [6.38 ... 6.77]</td></tr></table>	Tether arm	L1	L2	70 mm [2.76"]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]	100 mm [3.94"]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]	150 mm [5.91"]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]	70 mm [2.76"] 100 mm [3.94"] 150 mm [5.91"]	8.0010.40S0.0000 8.0010.40T0.0000 8.0010.40U0.0000
Tether arm	L1	L2														
70 mm [2.76"]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]														
100 mm [3.94"]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]														
150 mm [5.91"]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]														
Torque stop, short 			8.0010.4T00.0000													
Stator coupling 			8.0010.40V0.0000													

Incremental encoders

Large hollow shaft robust, optical		A02H (hollow shaft)	Push-pull / RS422 / SinCos
Mounting accessory for hollow shaft encoders			Order no.
Protective cover 		For applications with a very high degree of pollution, Kübler now offers a protective cover for - Improved reliability - Extension of the service life of the encoder Scope of delivery: - Protective cover - Torque stop (8.0010.4T00.0000) 3 screws for fixing to the encoder	8.0010.40Y0.0001
Tapered shaft mounting kit for A02H with hollow shaft, $\varnothing 38$ mm [1.50"] 		For use in upgrading for tapered shaft mounting. Tapered shafts are used for high-precision direct coupling. An isolation insert is also included in the mounting kit; this reliably protects the encoder from shaft currents. Included in the set: - Insert for cone blind hole, cone 1:10, 17 mm [0.67"] length - Isolation insert - Allen screw for central fixing	8.0010.4028.0000
Isolation insert for hollow shaft, $\varnothing 38$ mm [1.50"] Temperature range -40 °C ... +115 °C [-40 °F ... +239 °F]   		$\varnothing D1$: 12 mm 14 mm 15 mm 16 mm 18 mm 20 mm 25 mm 30 mm 32 mm 1/2" 5/8" 3/4" 1" 1 1/4"	8.0010.4091.0000 8.0010.4027.0000 8.0010.4038.0000 8.0010.4019.0000 8.0010.4080.0000 8.0010.4011.0000 8.0010.4012.0000 8.0010.4016.0000 8.0010.4015.0000 8.0010.4013.0000 8.0010.4070.0000 8.0010.4090.0000 8.0010.4050.0000 8.0010.4060.0000
Isolation insert for hollow shaft, $\varnothing 42$ mm [1.65"] external diameter 42 mm [1.65"] / internal diameter 38 mm [1.50"] external diameter 42 mm [1.65"] / internal diameter 12 mm [0.47"]			8.0010.4017.0000 8.0010.4029.0000
Cables and connectors			Order no.
Preassembled cables M12 female connector with coupling nut, 8-pin, A coded, straight single-ended 2 m [6.56'] PVC cable M23 female connector with coupling nut, 12-pin, cw single-ended 2 m [6.56'] PVC cable			05.00.6041.8211.002M 8.0000.6201.0002
Connectors M12 female connector with coupling nut, 8-pin, A coded, straight (metal) M12 female connector with coupling nut, 8-pin, A coded, straight (stainless steel V4A) M23 female connector with coupling nut, 12-pin, cw (metal)			05.CMB 8181-0 8.0000.5136.0000.V4A 8.0000.5012.0000

Incremental encoders

Large hollow shaft robust, optical	A02H (hollow shaft)	Push-pull / RS422 / SinCos
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Technical data

Mechanical characteristics		
Maximum speed		6000 min ⁻¹ 1)
	at 60 °C [140 °F]	2500 min ⁻¹ 1)
Mass moment of inertia		< 220 x 10 ⁻⁶ kgm ² 2)
Starting torque with sealing		< 0.2 Nm
	at 20 °C [68 °F]	
Load capacity of shaft	radial	200 N
	axial	100 N
Weight		approx. 0.8 kg [28.22 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40 °C 3) ... +80 °C [-40 °F 3) ... +176 °F]
Materials	shaft	stainless steel, bore tolerance H7
Shock resistance acc. to EN 60068-2-27		2000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 10 ... 2000 Hz

Approvals		
GL-approval in accordance with		letter of conformity No. 74130
UL compliant in accordance with		File no. E224618
CE compliant in accordance with		
	EMC Directive	2014/30/EU
	RoHS Directive	2011/65/EU
	ATEX Directive	2014/34/EU (for Ex 2/22 variants)

Electrical characteristics SinCos output			
Output circuit	SinCos U = 1 Vpp	SinCos U = 1 Vpp	
Supply voltage	5 V DC (±5 %)	10 ... 30 V DC	
Power consumption (no load)	typ. 65 mA max. 110 mA	typ. 65 mA max. 110 mA	
-3 dB frequency	< 180 kHz	< 180 kHz	
Signal level	channels A/B channel 0	1 Vpp (±20 %) 0.1 ... 1.2 V	1 Vpp (±20 %) 0.1 ... 1.2 V
Short circuit proof outputs 4)	yes	yes	
Reverse polarity protection of the supply voltage	no	yes	

Electrical characteristics RS422 / Push-pull				
Output circuit	RS422 (TTL compatible)	Push-pull	Push-pull (7272 compatible)	
Supply voltage	5 V DC (±5 %) 5 ... 30 V DC 10 ... 30 V DC	5 ... 30 V DC 10 ... 30 V DC	5 ... 30 V DC	
Power consumption (no load)				
without inverted signal	–	typ. 55 mA/max. 125 mA	–	
with inverted signal	typ. 40 mA/max. 90 mA	typ. 80 mA/max. 150 mA	typ. 50 mA/max. 100 mA	
Permissible load / channel	max. +/- 20 mA	max. +/- 30 mA	max. +/- 20 mA	
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz 5)	
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. +V – 3 V max. 2.5 V	min. +V – 2.0 V max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 1 µs	max. 1 µs	
Falling edge time t_f	max. 200 ns	max. 1 µs	max. 1 µs	
Short circuit proof outputs 4)	yes	yes	yes	
Reverse polarity protection of the supply voltage	no, 10 ... 30 V DC: yes	yes	no	

1) During the run-in-phase of approx. 2 hours, reduce the limits for working temperature_{max} or speed max by 1/3.

2) Depending on shaft diameter.

3) With connector: -40 °C [-40 °F], securely installed: -30 °C [-22 °F], flexibly installed: -20 °C [-4 °F].

4) If supply voltage correctly applied.

5) Max. recommended cable length 30 m [98.43'].

Incremental encoders

**Large hollow shaft
robust, optical**

A02H (hollow shaft)

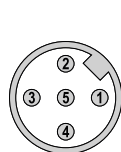
Push-pull / RS422 / SinCos

Terminal assignment

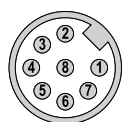
Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)											
1 ... D	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Core color:	WH	BN	GY/PK	RD/BU	GN	YE	GY	PK	BU	RD	shield
Output circuit	Type of connection	M23 connector, 12-pin											
1 ... D	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾
Output circuit	Type of connection	M12 connector, 8-pin											
1 ... D	E	Signal:	0 V	+V	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$		
		Pin:	1	2	3	4	5	6	7	8	PH ¹⁾		
Output circuit	Type of connection	M12 connector, 5-pin											
1 ... D	R	Signal:	0 V	+V	A	B	0	$\perp$					
		Pin:	1	2	3	4	5	PH ¹⁾					
Output circuit	Type of connection	MIL connector, 10-pin											
1 ... D	D	Signal:	0 V	+V	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$		
		Pin:	F	D	A	G	B	H	C	I	J		
Output circuit	Type of connection	MIL connector, 7-pin											
1 ... D	K	Signal:	0 V	+V	+Vsens	A	B	0	$\perp$				
		Pin:	F	D	E	A	B	C	J				
Output circuit	Type of connection	Sub-D connector, 9-pin											
1 ... D	G	Signal:	0 V	+V	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$		
		Pin:	1	2	3	6	4	7	5	8	PH ¹⁾		

+V: Supply voltage encoder +V DC
 0 V: Supply voltage encoder ground GND (0 V)
 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
 A, $\bar{A}$: Incremental output channel A
 B, $\bar{B}$: Incremental output channel B
 0, $\bar{0}$: Reference signal
 PH $\perp$: Plug connector housing (shield)

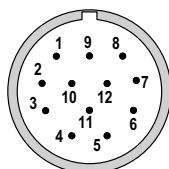
Top view of mating side, male contact base



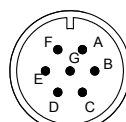
M12 connector, 5-pin



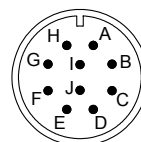
M12 connector, 8-pin



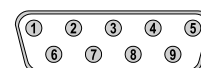
M23 connector, 12-pin



MIL connector, 7-pin



MIL connector, 10-pin



Sub-D connector, 9-pin

1) PH = shield is attached to connector housing.

Incremental encoders

Large hollow shaft robust, optical	A02H (hollow shaft)	Push-pull / RS422 / SinCos
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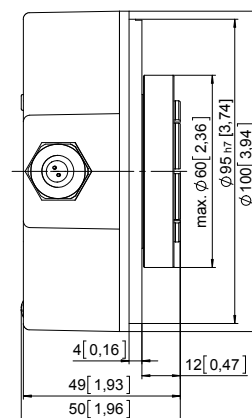
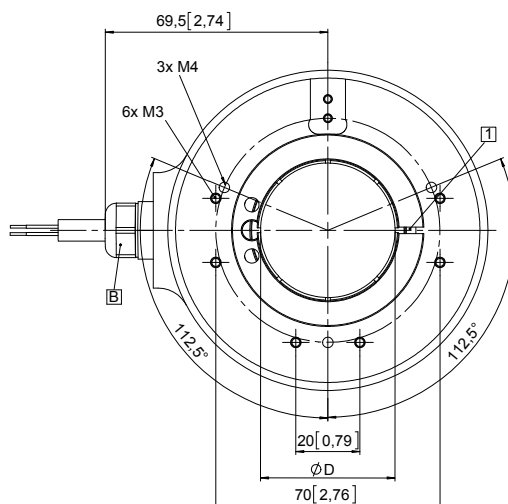
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange without mounting aid Flange type 1

- 1 Recommended torque for the clamping ring 1.0 Nm
- B Cable version

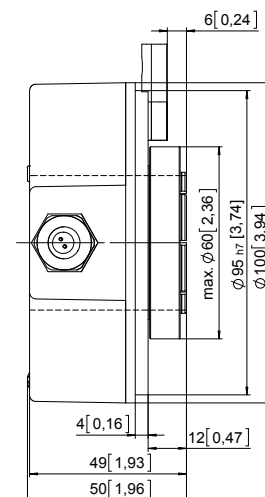
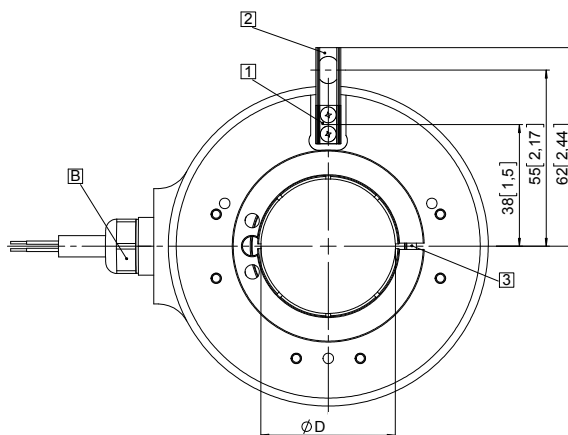
D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7



Flange with spring element Flange type 2 and 3

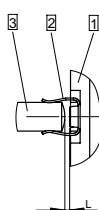
- 1 Spring element, short (flange type 2)
- 2 Spring element, long (flange type 3)
- 3 Recommended torque for the clamping ring
flange type 2: 1.0 Nm
flange type 3: 2.0 Nm
- B Cable version

D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7



Mounting using the spring element, short

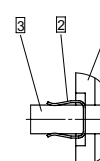
When mounting the encoder, ensure that dimension L is larger than the maximum axial play of the drive in the direction of the arrow.
Danger of mechanical seizure!



- 1 Flange
- 2 Spring element, short
- 3 Torque pin

Mounting using the spring element, long

Torque pin fed through the bore of the spring



- 1 Flange
- 2 Spring element, long
- 3 Torque pin

Incremental encoders

Large hollow shaft robust, optical

A02H (hollow shaft)

Push-pull / RS422 / SinCos

Dimensions hollow shaft version

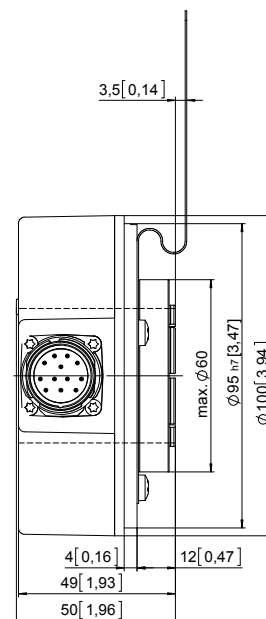
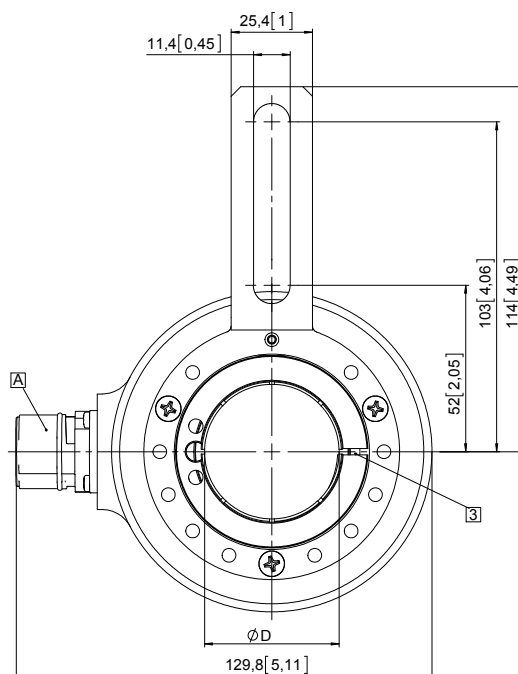
Dimensions in mm [inch]

Flange with torque stop, long Flange type 5

3 Recommended torque for the
clamping ring 2.0 Nm

A Plug version

D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7



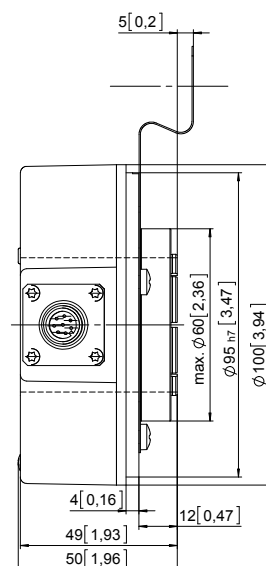
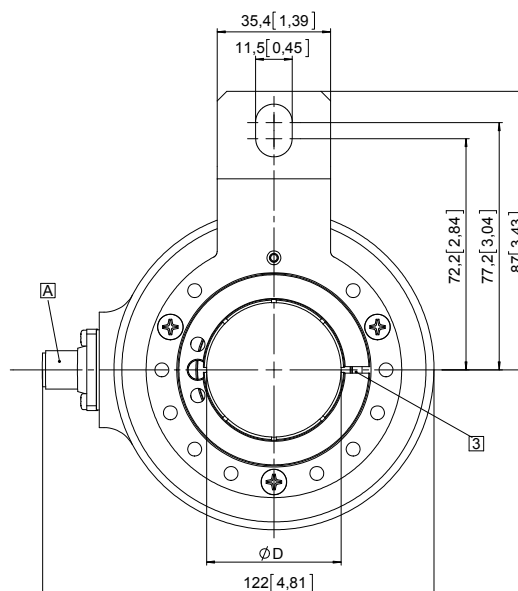
Flange with torque stop, short (Set 8.0010.4T00.0000 enclosed)

Flange type 6

3 Recommended torque for the
clamping ring 2.0 Nm

A Plug version

D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7





По вопросам продаж и поддержки обращайтесь:

Алматы (727)345-47-04
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
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