

Absolute encoders - SSI

Solid shaft with synchro flange

Optical multiturn encoders up to 14 bit ST / 16 bit MT

GM401



GM401 with connector M23

Technical data - electrical ratings

Voltage supply	10...30 VDC 5 VDC \pm 10 %
Reverse polarity protection	Yes (10...30 VDC) / No (5 VDC)
Consumption w/o load	\leq 50 mA (24 VDC) \leq 80 mA (5 VDC)
Initializing time typ.	20 ms after power on
Interfaces	SSI, Incremental A 90° B (optional)
Function	Multiturn
Steps per revolution	\leq 16384 / 14 bit
Number of revolutions	\leq 65536 / 16 bit
Absolute accuracy	\pm 0.025 °
Sensing method	Optical
Code	Gray or binary
Code sequence	CW/CCW coded by connection
Inputs	SSI clock Control signals UP/DOWN inv. and zero
Output stages	SSI data: Linedriver RS422 Diagnostic outputs push-pull
Incremental output	512, 1024, 2048 pulses + inverted
Interference immunity	DIN EN 61000-6-2
Emitted interference	DIN EN 61000-6-4
Diagnostic functions	Self-diagnosis Multiturn sensing
Approval	UL approval / E63076

Features

- Encoder multiturn / SSI
- Optical sensing method
- Resolution: max. singleturn 14 bit, multiturn 16 bit
- Synchro flange
- Electronic setting of zero point
- Counting direction input
- Available with additional incremental output
- Maximum resistant against magnetic fields

Optional

- Stainless steel design
- Corrosion protection for offshore applications

Technical data - mechanical design

Size (flange)	\varnothing 58 mm
Shaft type	\varnothing 6 mm solid shaft
Flange	Synchro flange
Protection DIN EN 60529	IP 54 (without shaft seal), IP 65 (with shaft seal)
Operating speed	\leq 10000 rpm (mechanical) \leq 6000 rpm (electric)
Starting acceleration	\leq 1000 U/s ²
Starting torque	\leq 0.015 Nm (+25 °C, IP 54) \leq 0.03 Nm (+25 °C, IP 65)
Rotor moment of inertia	20 gcm ²
Admitted shaft load	\leq 20 N axial \leq 40 N radial
Materials	Housing: aluminium Flange: aluminium
Operating temperature	-25...+85 °C -40...+85 °C (optional)
Relative humidity	95 % non-condensing
Resistance	DIN EN 60068-2-6 Vibration \pm 0.75 mm - 10-58 Hz 10 g - 58-2000 Hz DIN EN 60068-2-27 Shock 200 g, 6 ms
Weight approx.	400 g
Connection	Connector M23, 12-pin Connector M12, 8-pin Cable 1 m

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Part number

GM401.

Pulses / Incremental output

- 02 No incremental output
- 04 2048 pulses / push-pull
- 06 2048 pulses / RS422
- 07 2048 periods / SinCos
- 24 1024 pulses / push-pull*
- 26 1024 pulses / RS422*
- 27 1024 periods / SinCos
- 34 512 pulses / push-pull*
- 36 512 pulses / RS422*
- 37 512 periods / SinCos**

Connection

- A0 Connector M23, 12-pin, axial
- A1 Connector M23, 12-pin, radial
- A2 Connector M23, 12-pin, axial, for incremental output 04/06/07/24/26/27/34/36/37
- A3 Connector M23, 12-pin, radial, for incremental output 04/06/07/24/26/27/34/36/37
- 11 Cable 1 m, axial
- 21 Cable 1 m, radial
- 31 Cable 1 m, axial, for incremental output 04/06/07/24/26/27/34/36/37
- 41 Cable 1 m, radial, for incremental output 04/06/07/24/26/27/34/36/37
- M4 Connector M12, 8-pin axial
- M5 Connector M12, 8-pin, radial

Voltage supply / signals

- 10 10...30 VDC / gray code 25 bit (ST 13 + MT 12)
- 11 5 VDC / gray code 25 bit (ST 13 + MT 12)
- 12 10...30 VDC / binary code 25 bit (ST 13 + MT 12)
- 13 5 VDC / binary code 25 bit (ST 13 + MT 12)
- 20 10...30 VDC / gray code 24 bit (ST 12 + MT 12)
- 30 10...30 VDC / gray code 25 bit (ST 13 + MT 12) + parity
- 40 10...30 VDC / gray code 24 bit (ST 12 + MT 12) + DV
- 90 10...30 VDC / gray code 26 bit (ST 14 + MT 12)
- 92 10...30 VDC / binary code 26 bit (ST 14 + MT 12)
- A0 10...30 VDC / gray code 29 bit (ST 13 + MT 16)

Flange / Solid shaft

- 1 Synchro flange / ø6 mm, IP 54
- B Synchro flange / ø6 mm, IP 65

* Version with 5 VDC on request

** Version with 10...30 VDC on request

· Subject to modification in technic and design. Errors and omissions excepted.

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Accessories

Connectors and cables

11034154	Female connector M23, 12-pin, without cable (Z 130.001)
10138559	Female connector M23, 12-pin, 2 m cable (Z 130.003)
11034156	Female connector M23, 12-pin, 3 m cable (Z 130.004)
10126594	Female connector M23, 12-pin, 5 m cable (Z 130.005)
10129757	Female connector M23, 12-pin, 10 m cable (Z 130.007)
11042991	Female connector M23, 12-pin, 15 m cable (Z 130.M15)
11034344	Female connector M23, 12-pin, without cable (incr.) (Z 182.001)
11034345	Female connector M23, 12-pin, 2 m (incr.) (Z 182.003)
11034346	Female connector M23, 12-pin, 5 m (incr.) (Z 182.005)
11076757	Female connector M23, 12-pin, 8 m (incr.) (Z 182.M08)
11034347	Female connector M23, 12-pin, 10 m (incr.) (Z 182.007)
11051323	Female connector M23, 12-pin, 15 m (incr.) (Z 182.M15)
10127844	Connection cable 2 m shielded with female connector M12, 8-pin, straight (ESG 34FH0200G)
10129333	Connection cable 10 m shielded with female connector M12, 8-pin, straight (ESG 34FH1000G)

Mounting accessories

10117669	Eccentric fixing, single (Z 119.006)
10117667	Mounting adaptor for encoders with synchro flange (Z 119.015)
10158124	Bearing flange for encoders with synchro flange (Z 119.035)
10141132	Spring washer coupling D1=6 / D2=10 (Z 121.C01)

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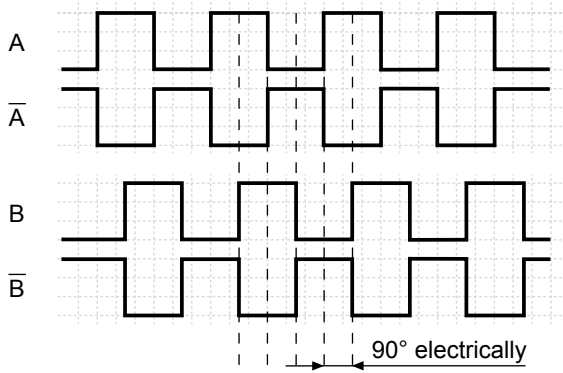
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Output signals

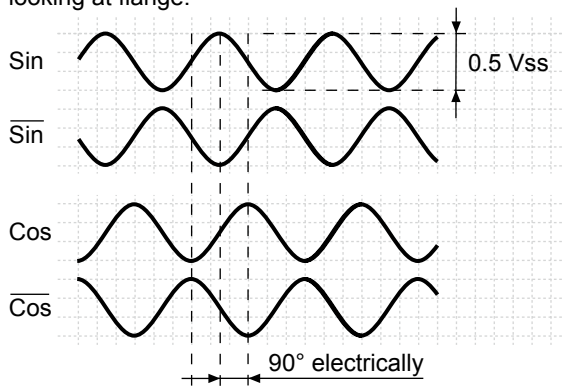
Push-pull and RS422

A leading B when rotating the shaft clockwise and looking at flange.

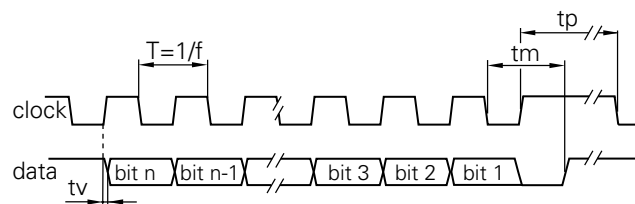


SinCos

Sin leading Cos when rotating the shaft clockwise and looking at flange.



Data transfer



Clock frequency f	62.5...1500 kHz
Duty cycle of T	40...60 %
Delay time tv	150 ns
Monoflop time tm	26 μs + T/2
Clock interval tp	30 μs

Trigger level

SSI	Circuit
SSI-Clock	Optocoupler with switching current approx. 7 mA or RS422 with terminating resistor
SSI-Data	Linedriver RS422 or RS485

Control inputs

Control inputs	Input circuit
Input level High	>0.7 UB
Input level Low	<0.3 UB
Input resistance	10 kΩ

Diagnostic outputs or Incremental outputs

Diagnostic outputs or Incremental outputs	Output circuit Push-pull circuit-proof
Output level High	>UB -3.5 V (I = -20 mA)
Output level Low	<0.5 V (I = 20 mA)
Load High / Low	<20 mA

Incremental outputs

Incremental outputs	Linedriver RS422
Output level High	>2.5 V (I = -20 mA)
Output level Low	<0.5 V (I = 20 mA)
Load High / Low	<20 mA

Outputs

Outputs	SinCos
Output level	0.5 Vpp ±10 % (Output signals before difference formation)
Load	<10 mA

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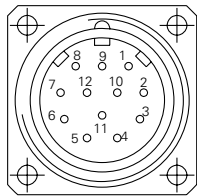
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Terminal assignment

Connector M23

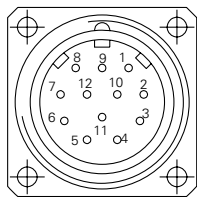
Connector	Core colour	Assignment
1	brown	UB
2	black	GND
3	blue	Clock+
4	beige	Data+
5	green	Zero setting
6	yellow	Data-
7	violet	Clock-
8	brown/yellow	DATAVALID inv.
9	pink	UP/DOWN inv.
10	black/yellow	DATAVALID MT inv.
11-12	–	–



Please use cores twisted in pairs (for example clock+ / clock-) for extension cables of more than 10 m length.

Connector M23 with incremental tracks

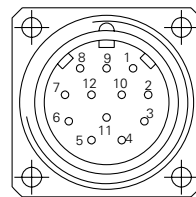
Connector	Core colour	Assignment
1	brown	UB
2	white	GND
3	blue	Clock+
4	green	Data+
5	grey	Zero setting
6	yellow	Data-
7	red	Clock-
8	red/blue	Track B inv.
9	pink	UP/DOWN inv.
10	violet	Track A inv.
11	black	Track A
12	grey/pink	Track B



Please use cores twisted in pairs (for example clock+ / clock-) for extension cables of more than 10 m length.

Connector M23 with SinCos

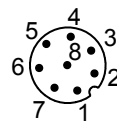
Connector	Core colour	Assignment
1	brown	UB
2	white	GND
3	blue	Clock+
4	green	Data+
5	grey	Zero setting
6	yellow	Data-
7	red	Clock-
8	red/blue	Cosine inv.
9	pink	UP/DOWN inv.
10	violet	Sine inv.
11	black	Sine
12	grey/pink	Cosine



Please use cores twisted in pairs (for example clock+ / clock-) for extension cables of more than 10 m length.

Connector M12

Pin	Assignment
1	GND
2	UB
3	Clock+
4	Clock-
5	Data+
6	Data-
7	Zero setting
8	UP/DOWN inv.



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Terminal significance	
UB	Encoder voltage supply.
GND	Encoder ground connection relating to UB.
Data+/Data-	Differential SSI data output.
Clock+/Clock-	Differential SSI clock input. Optocoupler or RS422 input.
Zero setting	Input for setting a zero point anywhere within the encoder resolution. The zero setting operation is triggered by a High impulse and has to be in line with the selected direction of rotation (UP/DOWN inv.). Connect to GND after setting operation for maximum interference immunity. Impulse duration ≥ 100 ms.
DATAVALID inv.	Diagnostic output. An error warning is given at level Low.
DATAVALID MT inv.	Diagnostic output for monitoring the multiturn sensor voltage supply. Upon dropping below a defined voltage level the DV MT inv. output is switched to Low.
UP/DOWN inv.	UP/DOWN inv. counting direction input. This input is standard on High. UP/DOWN inv. means ascending output data with clockwise shaft rotation when looking at flange. UP/DOWN inv.-Low means ascending values with counterclockwise shaft rotation when looking at flange.
Incremental Outputs	Incremental tracks A 90° B and inverted.

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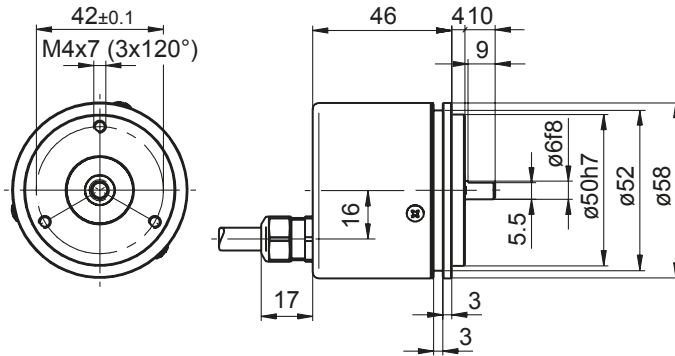
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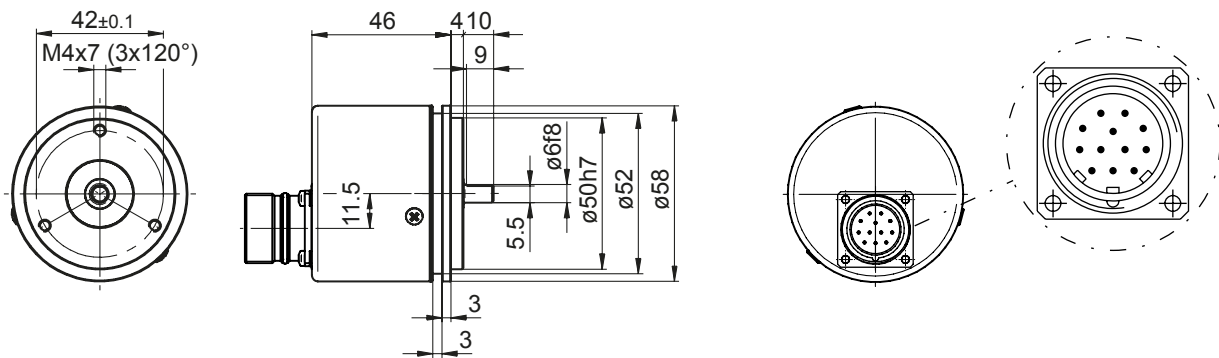
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Dimensions

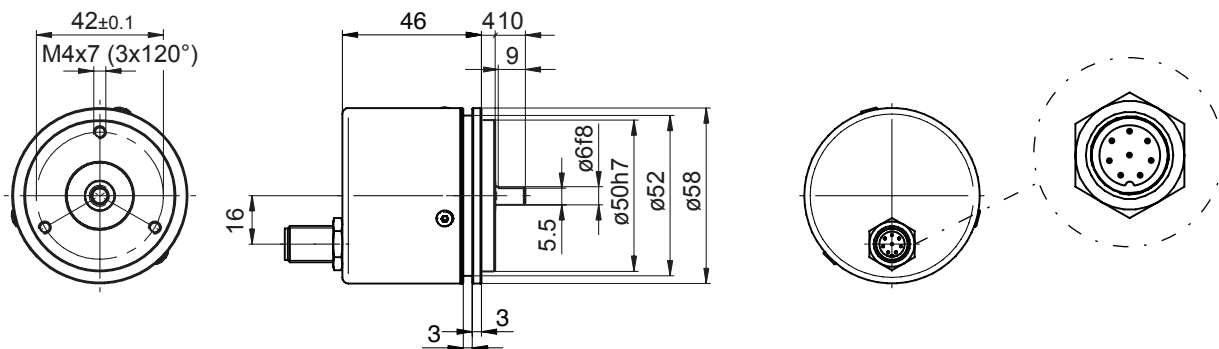
Cable, axial



Connector M23, axial



Connector M12, axial



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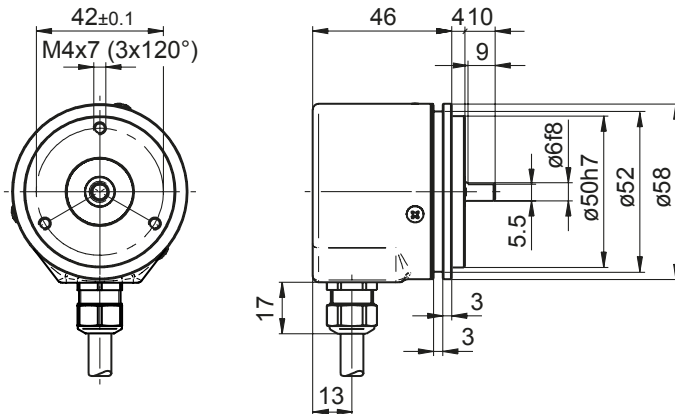
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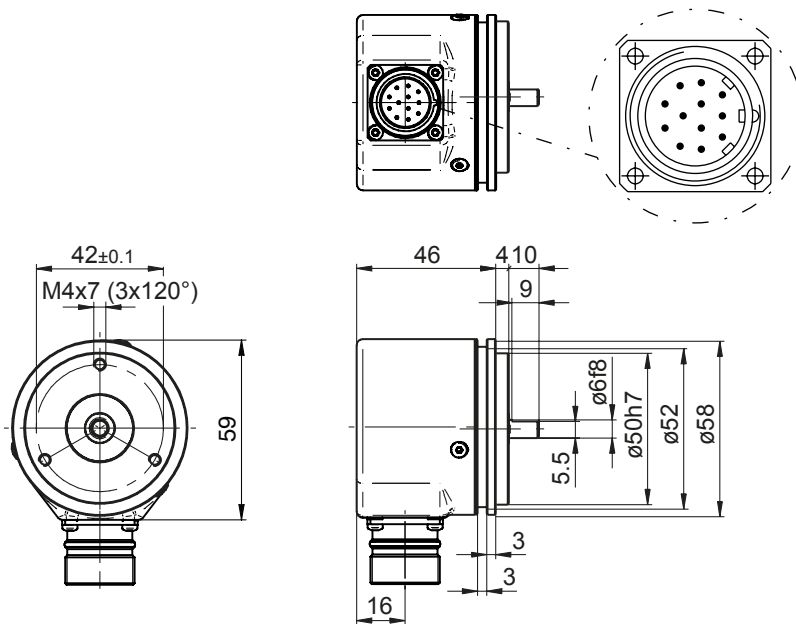
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Dimensions

Cable, radial



Connector M23, radial



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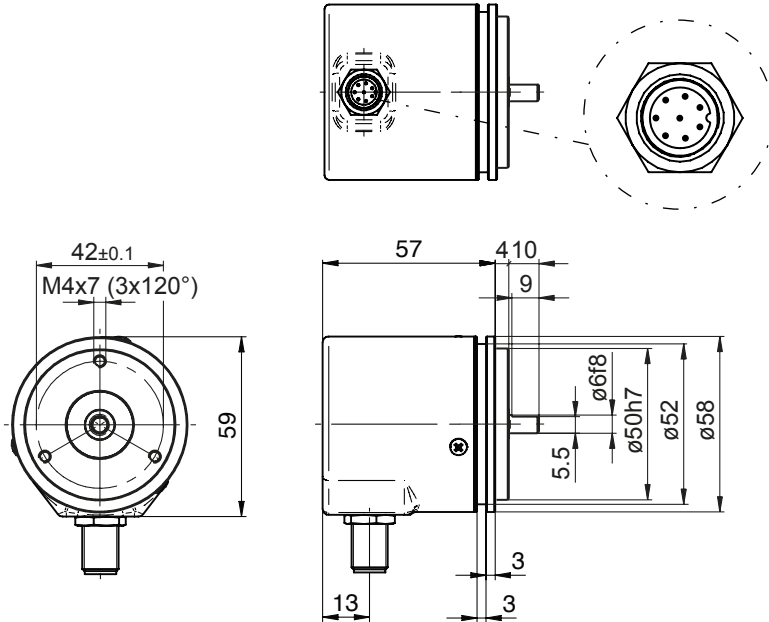
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Dimensions

Connector M12, radial



Connector dimensions M23

