

GM401

Solid shaft with synchro flange

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

Overview

- 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



Technical data

Technical data - electrical ratings

Voltage supply	10...30 VDC 5 VDC ±10 %
Reverse polarity protection	Yes (10...30 VDC) / No (5 VDC)
Consumption w/o load	≤50 mA (24 VDC) ≤80 mA (5 VDC)
Initializing time typ.	20 ms after power on
Interface	SSI Incremental A 90° B (optional)
Function	Multiturn
Steps per revolution	≤16384 / 14 bit
Number of revolutions	≤65536 / 16 bit
Absolute accuracy	±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	EN 61000-6-2
Emitted interference	EN 61000-6-4
Diagnostic function	Self-diagnosis Multiturn sensing
Approval	UL approval / E63076

Technical data - mechanical design

Size (flange)	ø58 mm
Shaft type	ø6 mm solid shaft
Flange	Synchro flange
Protection EN 60529	IP 54 (without shaft seal) IP 65 (with shaft seal)
Operating speed	≤10000 rpm (mechanical) ≤6000 rpm (electric)
Starting acceleration	≤1000 U/s ²
Starting torque	≤0.015 Nm (+25 °C, IP 54) ≤0.03 Nm (+25 °C, IP 65)
Rotor moment of inertia	20 gcm ²
Admitted shaft load	≤20 N axial ≤40 N radial
Material	Housing: aluminium Flange: aluminium
Operating temperature	-25...+85 °C -40...+85 °C (optional)
Relative humidity	95 % non-condensing
Resistance	EN 60068-2-6 Vibration ±0.75 mm - 10-58 Hz 10 g - 58-2000 Hz 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

Optional

- Stainless steel design
- Corrosion protection for offshore applications

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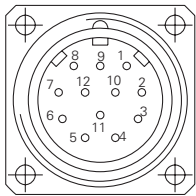
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Terminal assignment

Cable or connector M23

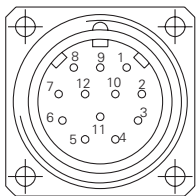
Pin	Core colour	Assignment
1	brown	UB
2	black	GND
3	blue	Clock+
4	beige	Data+
5	green	Zero setting
6	yellow	Data-
7	violet	Clock-
8	brown/yellow	DATAVALID inv.
9	pink	UP/DOWN inv.
10	black/yellow	DATAVALID MT inv.
11-12	–	–



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

Cable or connector M23 with incremental tracks

Pin	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

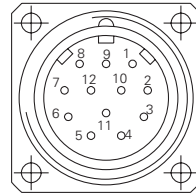


Please use cores twisted in pairs (for example clock+ / clock-) for extension cables of more than 10 m length.

Terminal assignment

Cable or connector M23 with SinCos

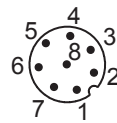
Pin	Core colour	Assignment
1	brown	UB
2	white	GND
3	blue	Clock+
4	green	Data+
5	grey	Zero setting
6	yellow	Data-
7	red	Clock-
8	red/blue	Cosine inv.
9	pink	UP/DOWN inv.
10	violet	Sine inv.
11	black	Sine
12	grey/pink	Cosine



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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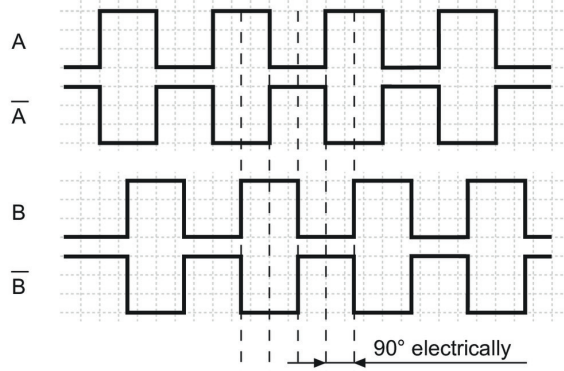
Terminal significance

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.

Output signals

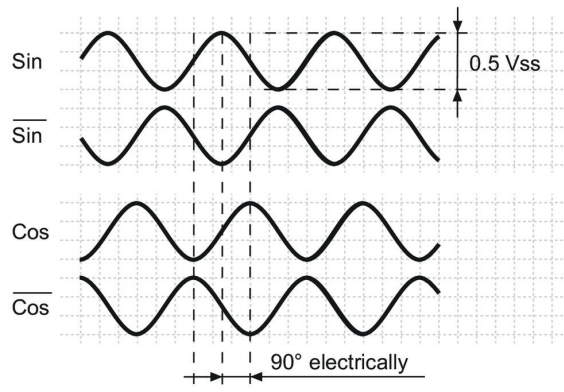
Push-pull and RS422

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.



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Trigger level

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

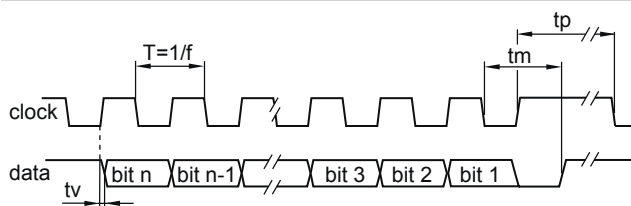
Control inputs	Input circuit
Input level High	>0.7 UB
Input level Low	<0.3 UB
Input resistance	10 kΩ

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

Data transfer



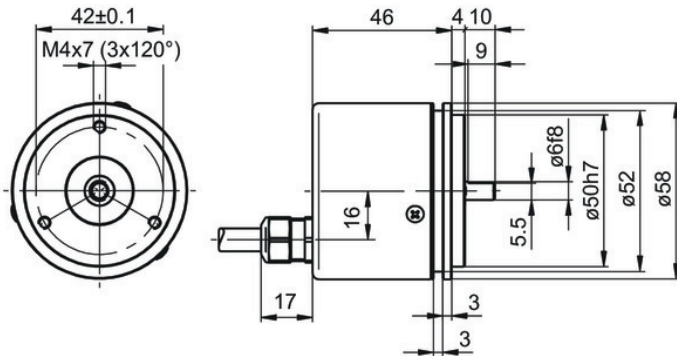
Clock frequency f	62.5...1500 kHz
Duty cycle of T	40...60 %
Delay time tv	150 ns
Monoflop time tm	26 μs + T/2
Clock interval tp	30 μs

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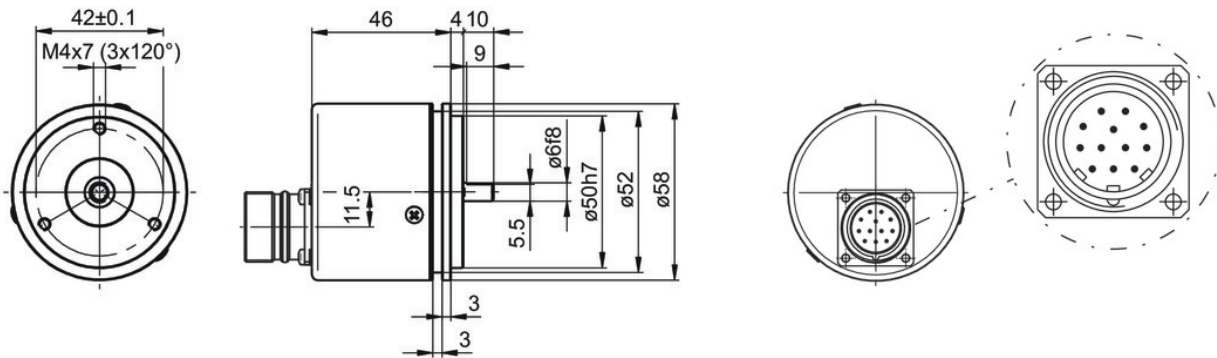
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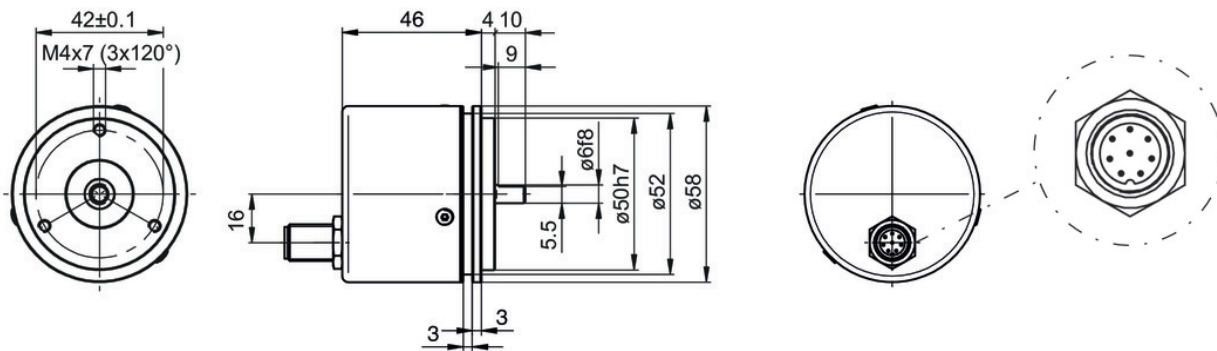
Dimensions



Cable, axial



Connector M23, axial



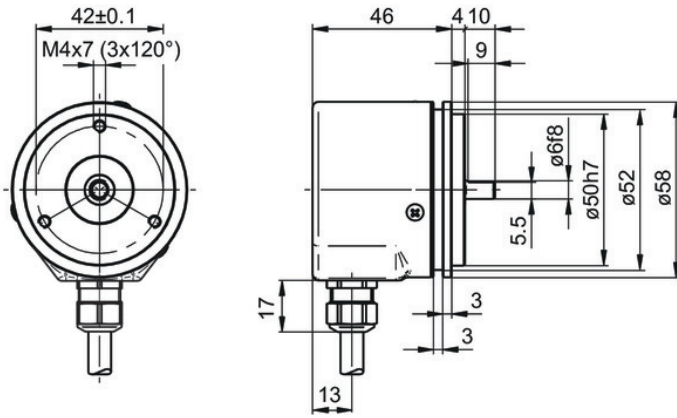
Connector M12, axial

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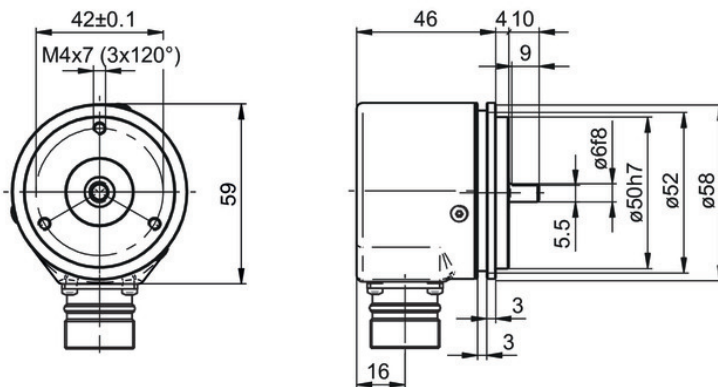
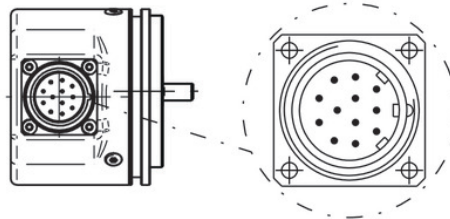
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Dimensions



Cable, radial



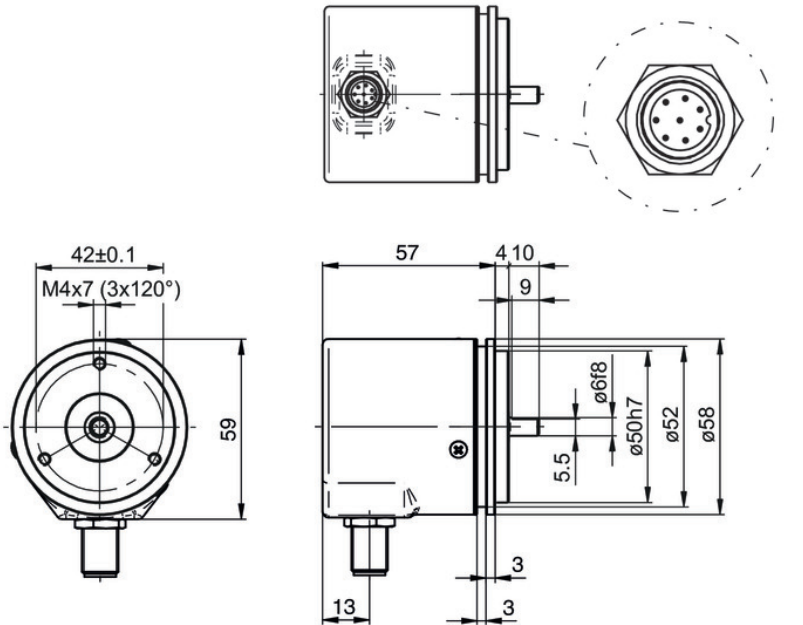
Connector M23, radial

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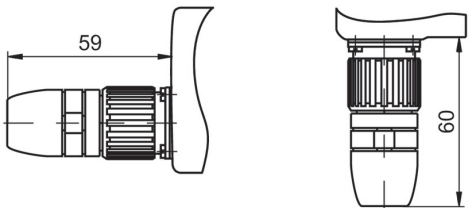
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Dimensions



Connector M12, radial



Connector dimensions M23

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Ordering reference

	GM401.	#	###	##	##
Product	GM401.				
Flange / Solid shaft					
Synchro flange, ø6 mm, IP 54		1			
Synchro flange, ø6 mm, IP 65		B			
Voltage supply / Signals					
10...30 VDC, Gray code 25 bit (ST 13 + MT 12)			10		
5 VDC, Gray code 25 bit (ST 13 + MT 12)			11		
10...30 VDC, binary code 25 bit (ST 13 + MT 12)			12		
5 VDC, binary code 25 bit (ST 13 + MT 12)			13		
10...30 VDC, Gray code 24 bit (ST 12 + MT 12)			20		
10...30 VDC, Gray code 25 bit (ST 13 + MT 12) + parity bit			30		
10...30 VDC, Gray code 24 bit (ST 12 + MT 12) + DV bit			40		
10...30 VDC, Gray code 26 bit (ST 14 + MT 12)			90		
10...30 VDC, binary code 26 bit (ST 14 + MT 12)			92		
10...30 VDC, Gray code 29 bit (ST 13 + MT 16)			A0		
Connection					
Cable axial, 1 m					11
Cable radial, 1 m					21
Cable 1 m, axial, for incremental output					31
Cable 1 m, radial, for incremental output					41
Flange socket M23, axial, 12-pin, male contacts, CW					A0
Flange socket M23, radial, 12-pin, male contacts, CW					A1
Flange socket M23, axial, 12-pin, male contacts, CW, for incremental output					A2
Flange socket M23, radial, 12-pin, male contacts, CW, for incremental output					A3
Flange socket M12, axial, 8-pin, male contacts, A-coded					M4
Flange socket M12, radial, 8-pin, male contacts, A-coded					M5
Pulses / Incremental output					
No incremental output					02
2048 pulses, push-pull					04
2048 pulses, RS422					06
2048 periods, SinCos 1 Vpp ⁽¹⁾					07
1024 pulses, push-pull ⁽¹⁾					24
1024 pulses, RS422 ⁽¹⁾					26
1024 periods, SinCos 1 Vpp ⁽²⁾					27
512 pulses, push-pull ⁽²⁾					34
512 pulses, RS422 ⁽²⁾					36
512 periods, SinCos 1 Vpp ⁽²⁾					37

(1) Version with 5 VDC on request

(2) On request

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Accessories

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)