

GM401

Solid shaft with synchro flange

Optical multturn 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 $\pm 10\%$
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	$\pm 0.025^\circ$
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)	$\varnothing 58$ mm
Shaft type	$\varnothing 6$ 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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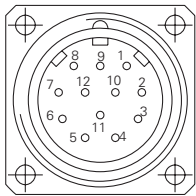
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Terminal assignment

Cable or connector M23

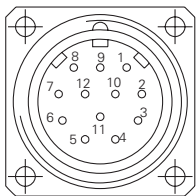
Pin	Core colour	Assignment
1	brown	UB
2	black	GND
3	blue	Clock+
4	beige	Data+
5	green	Zero setting
6	yellow	Data-
7	violet	Clock-
8	brown/yellow	DATAVALID inv.
9	pink	UP/DOWN inv.
10	black/yellow	DATAVALID MT inv.
11-12	–	–



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

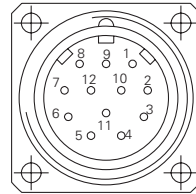


Please use cores twisted in pairs (for example clock+ / clock-) for extension cables of more than 10 m length.

Terminal assignment

Cable or connector M23 with SinCos

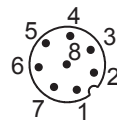
Pin	Core colour	Assignment
1	brown	UB
2	white	GND
3	blue	Clock+
4	green	Data+
5	grey	Zero setting
6	yellow	Data-
7	red	Clock-
8	red/blue	Cosine inv.
9	pink	UP/DOWN inv.
10	violet	Sine inv.
11	black	Sine
12	grey/pink	Cosine



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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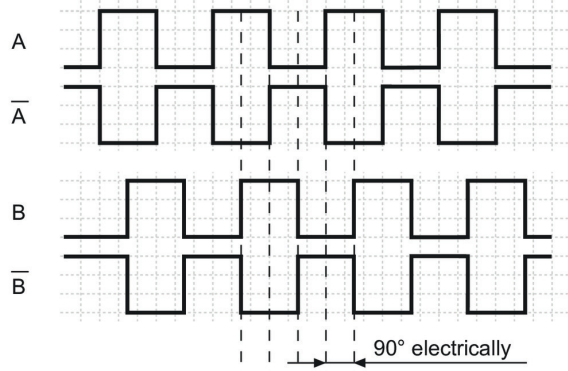
Terminal significance

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 multturn 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

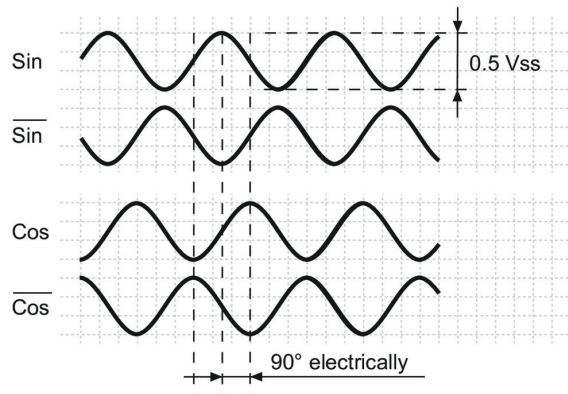
Push-pull and RS422

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

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

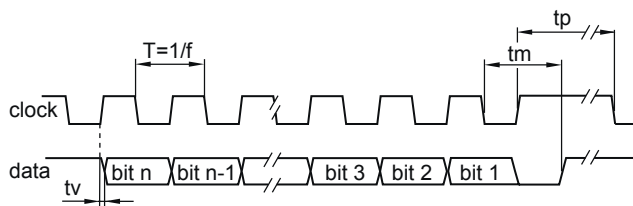
Incremental outputs

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

Data transfer



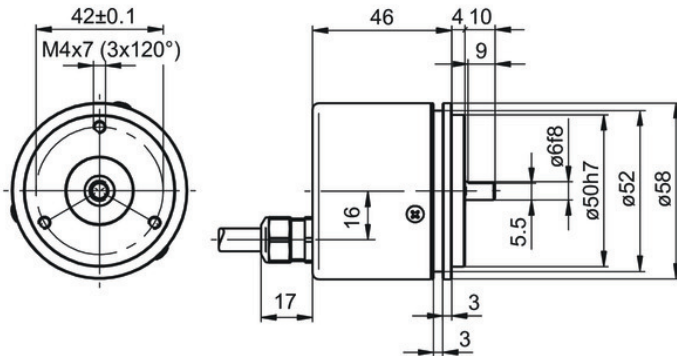
Clock frequency f	62.5...1500 kHz
Duty cycle of T	40...60 %
Delay time tv	150 ns
Monoflop time tm	26 μs + T/2
Clock interval tp	30 μs

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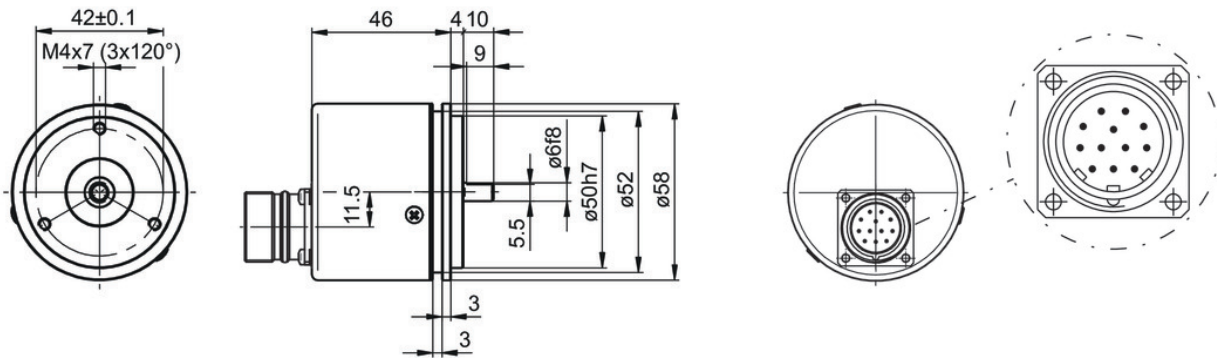
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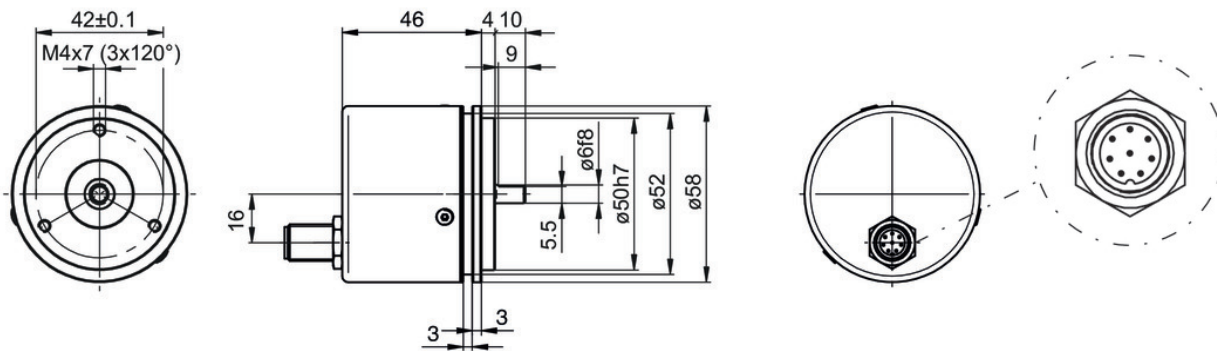
Dimensions



Cable, axial



Connector M23, axial



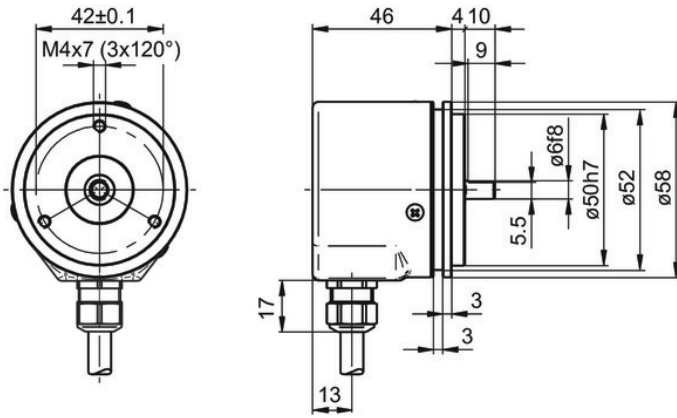
Connector M12, axial

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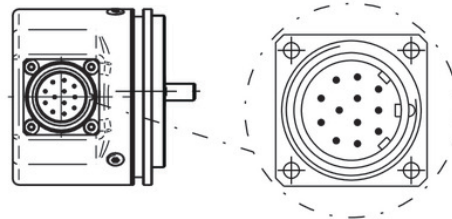
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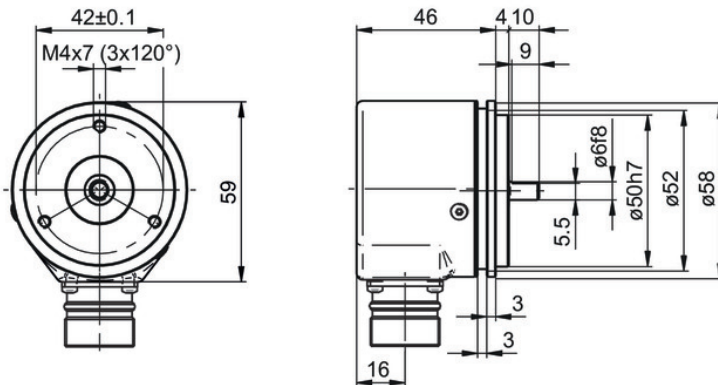
Dimensions



Cable, radial



Connector M23, radial

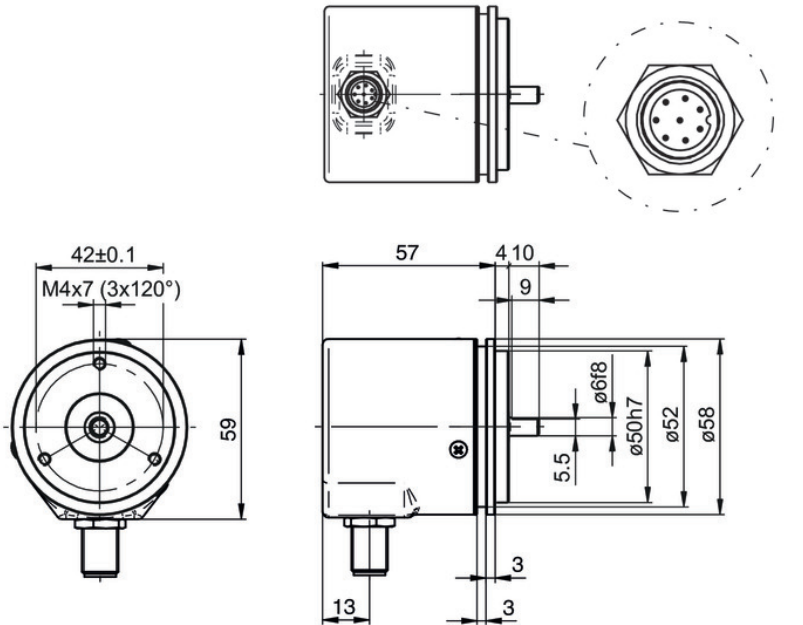


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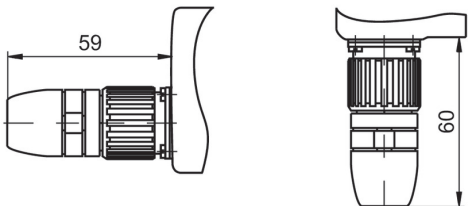
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Dimensions



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

Accessories

Mounting accessories

10117669	Eccentric fixing, single (Z 119.006)	11065916	Coupling CPS25 (L=19, D1=06 / D2=06)
10158124	Bearing flange for encoders with synchro flange (Z 119.035)	10141132	Spring washer coupling (D1=6 / D2=10)
11050507	Bellows coupling (D1=06 / D2=10)	10141131	Spring washer coupling (D1=6 / D2=6)
11065922	Coupling CPS25 (L=19, D1=10 / D2=06)	11069333	Coupling CPS37 (L=24, D1=06 / D2=06)
		11069337	Coupling CPS37 (L=24, D1=10 / D2=06)
		11065545	Set of eccentric fixings type A
		10117667	Mounting adaptor

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Accessories

Mounting accessories

10117668	Set of eccentric fixings for mounting clamp (10117667)
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