Absolute encoders - SSI

Shaft with clamping or synchro flange

Optical multiturn encoders max. 14 bit ST / 16 bit MT

GM400, GM401 - SSI

GM400 with clamping flange

Features

- **Encoder multiturn / SSI**
- **Optical sensing**
- **Resolution: max. singleturn 14 bit, multiturn 16 bit**
- **Clamping or synchro flange**
- **Electronic setting of zero point**
- **Counting direction input**
- **Available with additional incremental output**

Optional

- **Stainless steel design**
- **Corrosion protection for offshore applications**

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
Interfaces	SSI, Incremental A 90° B (optional)
Function	Multiturn
Steps per turn	≤16384 / 14 bit
Number of turns	≤65536 / 16 bit
Incremental output	2048 pulses A90°B + inverted
Absolute accuracy	±0.025 °
Sensing method	Optical
Code	Gray or binary
Code sequence	CW/CCW coded by connection
Inputs	SSI clock Control signals UP/$\overline{\text{DOWN}}$ and zero
Output circuit	SSI data: linedriver RS485 Diagnostic outputs push-pull
Interference immunity	DIN EN 61000-6-2
Emitted interference	DIN EN 61000-6-4
Diagnostic functions	Self-diagnosis Code continuity check Multiturn sensing
Approval	UL approval / E63076

Technical data - mechanical design

Dimensions (flange)	ø58 mm
Protection DIN EN 60529	IP 54 (without shaft seal), IP 65 (with shaft seal)
Operating speed	≤10000 rpm (mechanical) ≤6000 rpm (electric)
Starting torque	≤0.015 Nm (IP 54) ≤0.03 Nm (IP 65)
Rotor moment of inertia	20 gcm²
Shaft loading	≤20 N axial ≤40 N radial
Materials	Housing: steel Flange: aluminium
Operating temperature	-25...+85 °C -40...+85 °C (optional)
Relative humidity	95 % non-condensing
Resistance	DIN EN 60068-2-6 Vibration 10 g, 16-2000 Hz DIN EN 60068-2-27 Shock 200 g, 6 ms
Weight approx.	400 g
Connection	Connector M23, 12-pin Cable 1 m
GM400	
Shaft	ø10 mm
Flange	Clamping flange
GM401	
Shaft	ø6 mm
Flange	Synchro flange

3/5/2012

GM400, GM401 - SSI

Part number

Clamping flange

GM400. ☐☐☐☐

Pulses / Incremental output
- 02 No incremental output
- 04 2048 pulses / push-pull
- 06 2048 pulses / RS422
- 07 2048 periods / Sin/Cos
- 24 1024 pulses / push-pull
- 26 1024 pulses / RS422
- 27 1024 periods / Sin/Cos
- 34 512 pulses / push-pull
- 36 512 pulses / RS422
- 37 512 periods / Sin/Cos

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

Voltage supply / signals
- 10 10...30 VDC / gray code 25 bit
- 11 5 VDC / gray code 25 bit
- 12 10...30 VDC / binary code 25 bit
- 13 5 VDC / binary code 25 bit
- 20 10...30 VDC / gray code 24 bit
- 30 10...30 VDC / gray code 25 bit + parity
- 40 10...30 VDC / gray code 24 bit + DV
- 90 10...30 VDC / gray code 26 bit
- 92 10...30 VDC / binary code 26 bit
- A0 10...30 VDC / gray code 29 bit

Flange / Shaft
- 0 Clamping flange / ø10 mm IP 54
- A Clamping flange / ø10 mm IP 65

Synchro flange

GM401. ☐☐☐☐

Pulses / Incremental output
- 02 No incremental output
- 04 2048 pulses / push-pull
- 06 2048 pulses / RS422
- 07 2048 periods / Sin/Cos
- 24 1024 pulses / push-pull
- 26 1024 pulses / RS422
- 27 1024 periods / Sin/Cos
- 34 512 pulses / push-pull
- 36 512 pulses / RS422
- 37 512 periods / Sin/Cos

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
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Voltage supply / signals
- 10 10...30 VDC / gray code 25 bit
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- 30 10...30 VDC / gray code 25 bit + parity
- 40 10...30 VDC / gray code 24 bit + DV
- 90 10...30 VDC / gray code 26 bit
- 92 10...30 VDC / binary code 26 bit
- A0 10...30 VDC / gray code 29 bit

Flange / Shaft
- 1 Synchro flange / ø6 mm IP 54
- B Synchro flange / ø6 mm IP 65

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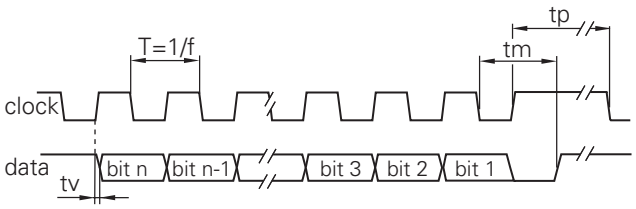
Accessories	
Connectors and cables	
Z 130.001	Female connector M23, 12-pin, less cable
Z 130.003	Female connector M23, 12-pin, 2 m cable
Z 182.001	Female connector M23, 12-pin, less cable (incr.)
Z 182.003	Female connector M23, 12-pin, 2 m (incr.)
Mounting accessories for GM400	
Z 119.006	Eccentric fixing, single
Z 119.013	Adaptor plate for clamping flange for modification into synchro flange
Z 119.017	Mounting angle for clamping flange (M3)
Mounting accessories for GM401	
Z 119.006	Eccentric fixing, single
Z 119.015	Mounting adaptor for synchro flange
Z 119.035	Bearing flange for encoders with synchro flange

Data transfer



Clock frequency f	62.5...1500 kHz
Scan ratio of T	40...60 %
Time lag tv	150 ns
Monoflop time tm	25 µs + T/2
Clock interval tp	30 µs

Trigger level	
SSI	**Circuit**
SSI-Clock	Optocoupler
SSI-Data	Linedriver 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	<20 mA
Load 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	<20 mA
Load Low	<20 mA
Outputs	**Sine / Cosine**
Output level	1 Vpp ±10 %
Load	<10 mA

GM400, GM401 - SSI

Terminal significance	
UB	Encoder voltage supply.
GND	Encoder ground connection relating to UB.
Data+	Positive, serial data output of differential linedriver.
Data-	Negative, serial data output of differential linedriver.
Clock+	Positive SS clock input. Clock+ together with clock- forms a current loop. A current of approx. 7 mA towards clock+ input means logic 1 in positive logic.
Clock-	Negative SSI clock input. Clock- together with clock+ forms a current loop. A current of approx. 7 mA towards clock- input means logic 0 in positive logic.
Zero setting	Input for setting a zero point anywhere within the programmed 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/$\overline{\text{DOWN}}$). Connect to GND after setting operation for maximum interference immunity. Impulse duration $\geq$100 ms.
$\overline{\text{DATAVALID}}$	Diagnostic output. An error warning is given at level Low. Important: Interferences must be drained by the downstram electronics.
$\overline{\text{DATAVALID MT}}$	Diagnostic output for monitoring the multiturn sensor voltage supply. Upon dropping below a defined voltage level the $\overline{\text{DV MT}}$ output is switched to Low.
UP/$\overline{\text{DOWN}}$	UP/$\overline{\text{DOWN}}$ counting direction input. This input is standard on High. UP/$\overline{\text{DOWN}}$ means ascending output data with clockwise shaft rotation when looking at flange. UP/$\overline{\text{DOWN}}$-Low means ascending values with counterclockwise shaft rotation when looking at flange.
Incremental Outputs	Incremental tracks A 90° B and inverted.

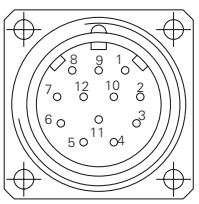
Terminal assignment

GM400, GM401

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

With incremental tracks | sine/cosine

Connector	Core colour	Assignment Incremental	Sine/cosine
Pin 1	brown	UB	UB
Pin 2	white	GND	GND
Pin 3	blue	Clock+	Clock+
Pin 4	green	Data+	Data+
Pin 5	grey	Zero setting	Zero setting
Pin 6	yellow	Data-	Data-
Pin 7	red	Clock-	Clock-
Pin 8	red/blue	Track B inv.	$\overline{\text{Cosine}}$
Pin 9	pink	UP/$\overline{\text{DOWN}}$	UP/$\overline{\text{DOWN}}$
Pin 10	violet	Track A inv.	$\overline{\text{Sine}}$
Pin 11	black	Track A	Sine
Pin 12	grey/pink	Track B	Cosine



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

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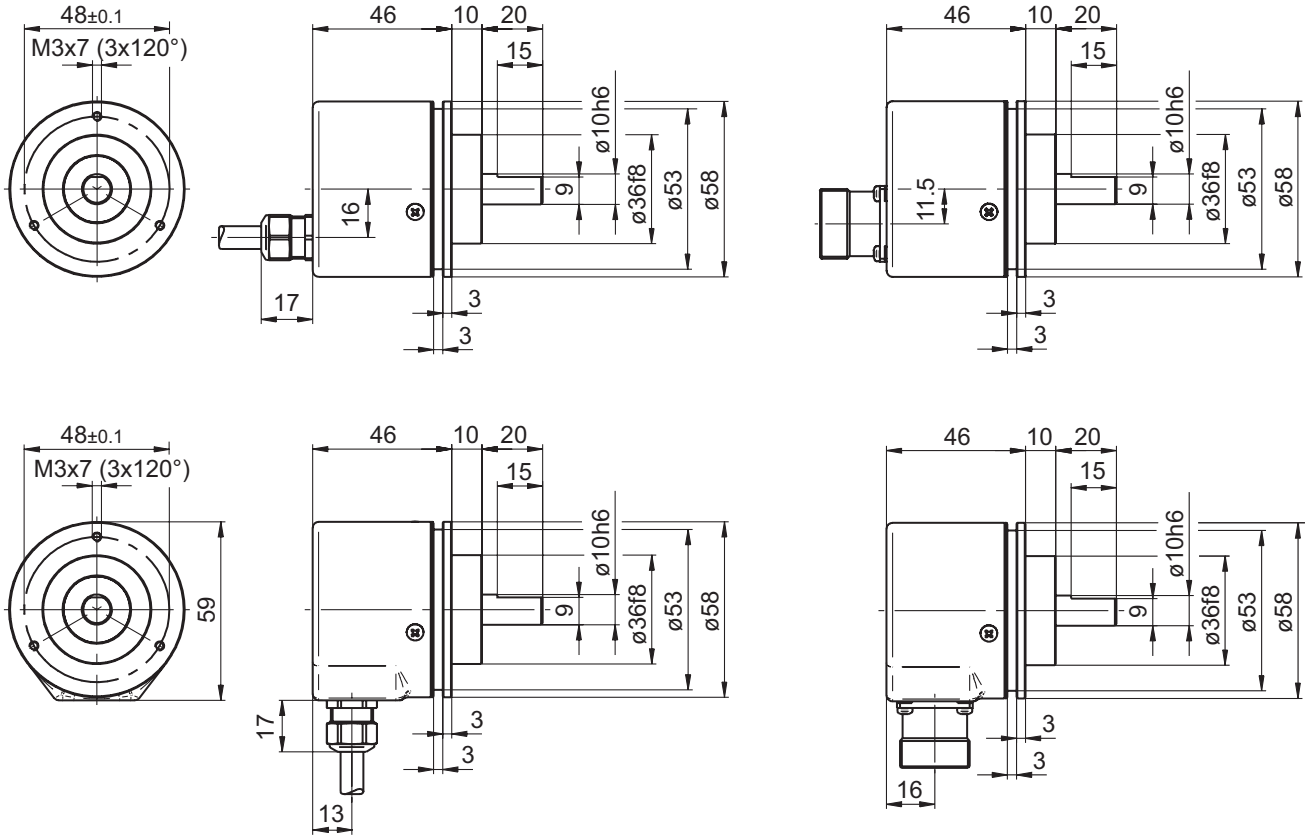
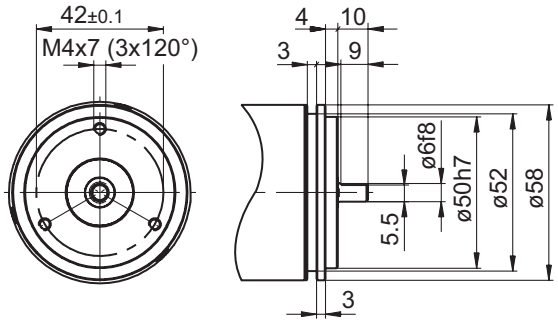
Dimensions

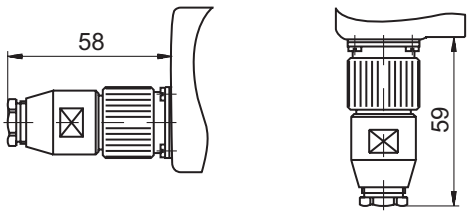
GM400 - clamping flange



GM401 - synchro flange



GM400, GM401 - connector dimensions



GM400, GM401 - SSI