

# Absolute encoders - SSI

## Shaft with clamping or synchro flange

### Optical multiturn encoders 14 bit ST / 12 bit MT

#### GM400, GM401 - SSI



GM400 with clamping flange

#### Technical data - electrical ratings

Voltage supply	10...30 VDC
Reverse polarity protection	Yes
Consumption w/o load	≤50 mA (24 VDC)
Initializing time (typ.)	20 ms after power on
Interfaces	SSI, Incremental A 90° B (optional)
Steps per turn	16384 / 14 bit
Number of turns	4096 / 12 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/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

#### Features

- Encoder multiturn / SSI
- Optical sensing
- Resolution: singleturn 14 bit, multiturn 12 bit
- Clamping flange or synchro flange
- Electronic setting of zero point
- Counting direction input
- Suitable for high positive and negative accelerations
- Available with additional incremental output

#### Optional

- Stainless steel design

#### Technical data - mechanical design

Housing	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 gcm <sup>2</sup>
Admitted shaft load	≤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
E-connection	Connector or cable
<b>GM400</b>	
Shaft	ø10 mm
Flange	Clamping flange
<b>GM401</b>	
Shaft	ø6 mm
Flange	Synchro flange

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#### Part number

#### Clamping flange

GM400.

				<u>Pulses / Incremental output</u>
				02 No incremental output
				04 2048 pulses / push-pull
				06 2048 pulses / RS422
				07 2048 pulses / sine 1 Vpp
				<u>E-connection</u>
				A0 Connector M23, 12-pin, axial
				A1 Connector M23, 12-pin, radial
				A2 Connector M23, 12-pin, axial, for incremental output 04/06/07
				A3 Connector M23, 12-pin, radial, for incremental output 04/06/07
				11 Cable 1 m, axial
				21 Cable 1 m, radial
				<u>Voltage supply / signals</u>
	10			10...30 VDC / gray code 25 bit
	12			10...30 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
				<u>Flange / Shaft</u>
	0			Clamping flange / ø10 mm IP 54
	A			Clamping flange / ø10 mm IP 65

#### Synchro flange

GM401.

				<u>Pulses / Incremental output</u>
				02 No incremental output
				04 2048 pulses / push-pull
				06 2048 pulses / RS422
				07 2048 pulses / sine 1 Vpp
				<u>E-connection</u>
				A0 Connector M23, 12-pin, axial
				A1 Connector M23, 12-pin, radial
				A2 Connector M23, 12-pin, axial, for incremental output 04/06/07
				A3 Connector M23, 12-pin, radial, for incremental output 04/06/07
				11 Cable 1 m, axial
				21 Cable 1 m, radial
				<u>Voltage supply / signals</u>
	10			10...30 VDC / gray code 25 bit
	12			10...30 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
				<u>Flange / Shaft</u>
	1			Synchro flange / ø6 mm IP 54
	B			Synchro flange / ø6 mm IP 65

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##### Accessories

###### Connectors and cables (page %S)

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.)

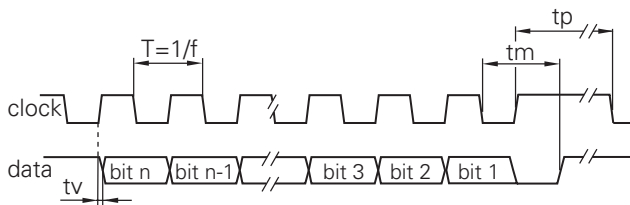
###### Mounting accessories for GM400 (page %S)

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

###### Mounting accessories for GM401 (page %S)

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

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	<20 mA
Load 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	<20 mA
Load Low	<20 mA

##### Outputs

Outputs	Sine / Cosine
Input level	1 Vpp ±10 %
Load	<10 mA

# Absolute encoders - SSI

## Shaft with clamping or synchro flange

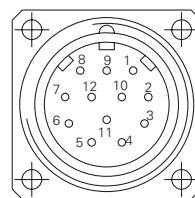
### Optical multiturn encoders 14 bit ST / 12 bit MT

#### 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/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 downstream 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.
$\overline{\text{UP/DOWN}}$	$\overline{\text{UP/DOWN}}$ counting direction input. This input is standard on High. $\overline{\text{UP/DOWN}}$ means ascending output data with clockwise shaft rotation when looking at flange. $\overline{\text{UP/DOWN-Low}}$ 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	$\overline{\text{UP/DOWN}}$
Pin 10	black/yellow	$\overline{\text{DATAVALID MT}}$
Pin 11	–	–
Pin 12	–	–

GM400, GM401 with incremental tracks		
Connector	Core colour	Assignment
Pin 1	brown	UB
Pin 2	white	GND
Pin 3	blue	Clock+
Pin 4	green	Data+
Pin 5	grey	Zero setting
Pin 6	yellow	Data-
Pin 7	red	Clock-
Pin 8	red/blue	Track B inv.
Pin 9	pink	$\overline{\text{UP/DOWN}}$
Pin 10	violet	Track a inv.
Pin 11	black	Track A
Pin 12	grey/pink	Track B



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

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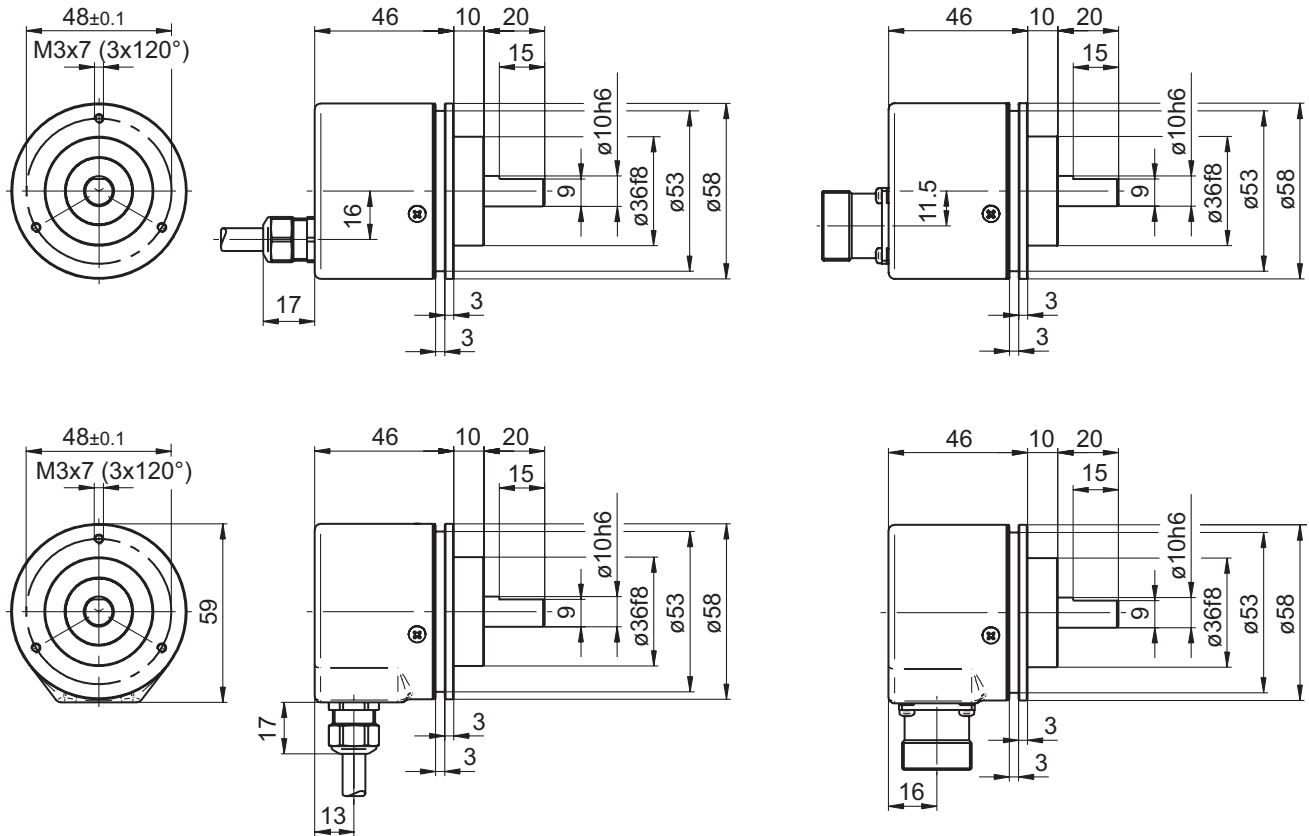
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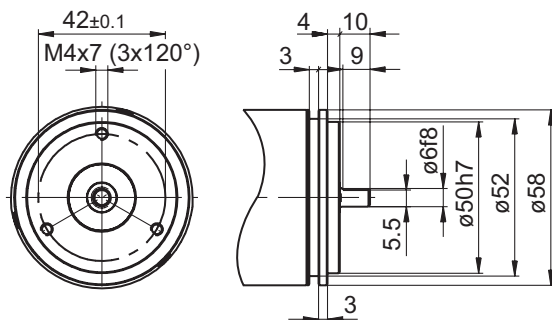
## GM400, GM401 - SSI

### Dimensions

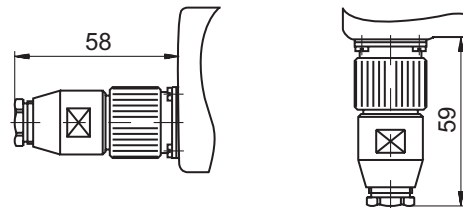
#### GM400 clamping flange



#### GM401 synchro flange



#### GM400, GM401 connector dimensions



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