

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 ² |
| 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 |
| GM400 | |
| Shaft | ø10 mm |
| Flange | Clamping flange |
| GM401 | |
| 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.) |

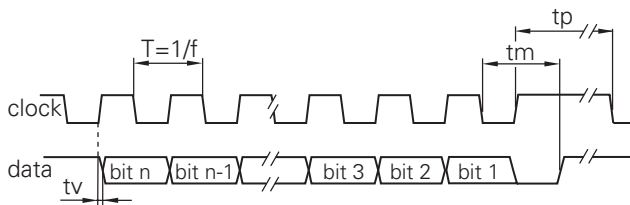
Mounting accessories for GM400 (page %S)

| | |
|-----------|--|
| 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 |

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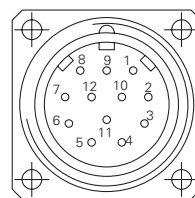
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| Terminal significance | |
|----------------------------------|--|
| UB | Encoder voltage supply. |
| GND | Encoder ground connection relating to UB. |
| Data+ | Positive, serial data output of differential linedriver. |
| Data- | Negative, serial 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 ≥ 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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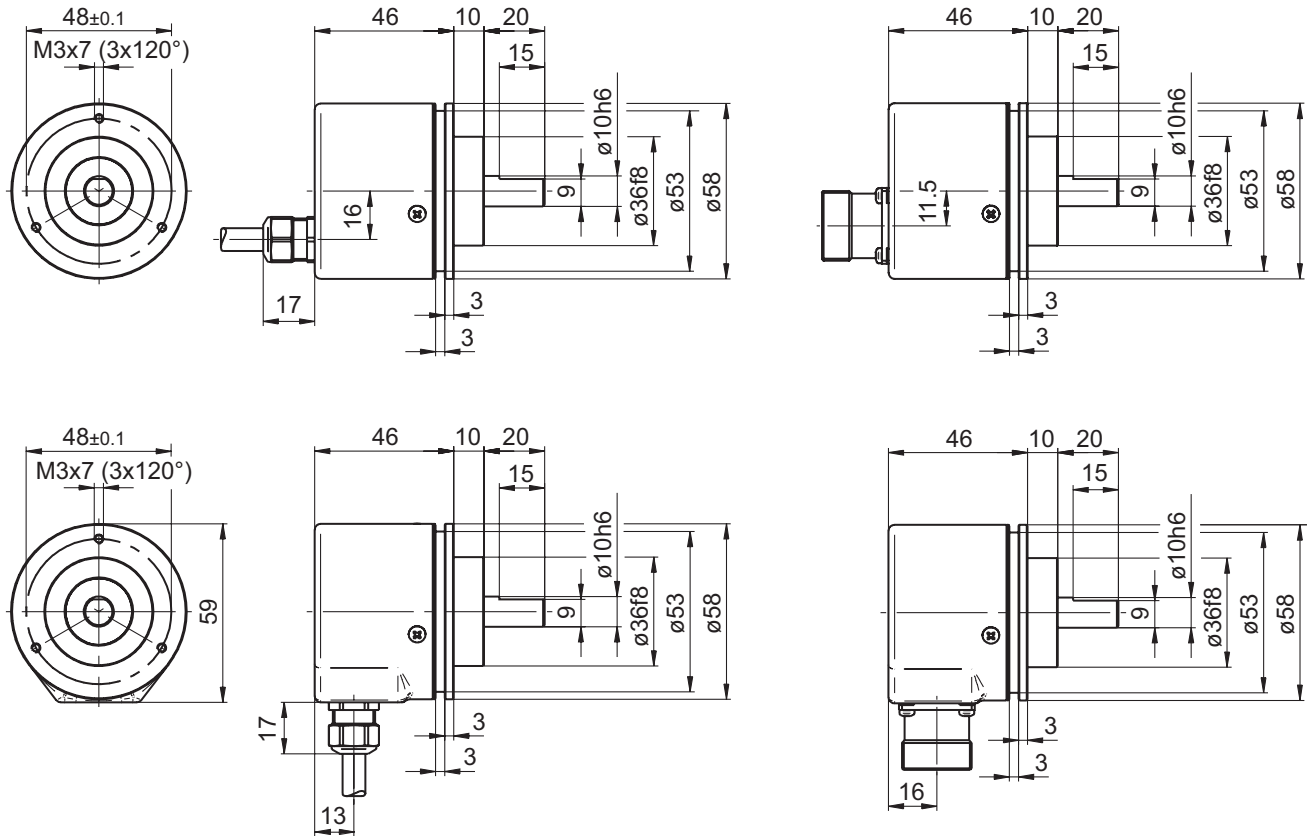
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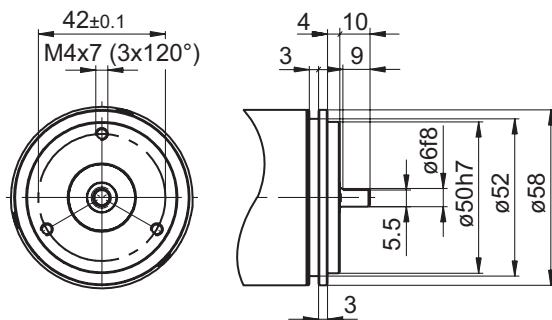
GM400, GM401 - SSI

Dimensions

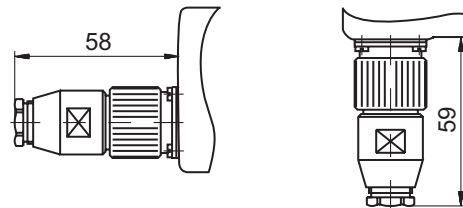
GM400 clamping flange



GM401 synchro flange



GM400, GM401 connector dimensions



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