

# Absolute encoders - SSI

Hollow shaft max. ø14 mm

Optical multiturn encoders 14 bit ST / 12 bit MT

## G0M2H - SSI



G0M2H hollow shaft

### Features

- Encoder multiturn / SSI
- Optical sensing
- Resolution: singleturn 14 bit, multiturn 12 bit
- Hollow shaft max. ø14 mm
- Compact design
- Cost-efficient mounting
- High reliability by self-diagnostics
- Counting direction input
- Available with additional incremental output

### 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<br>Control signals UP/DOWN and zero                |
| Output circuit              | SSI data linedriver RS485<br>Diagnostic outputs push-pull    |
| Interference immunity       | DIN EN 61000-6-2                                             |
| Emitted interference        | DIN EN 61000-6-4                                             |
| Diagnostic functions        | Self-diagnosis<br>Code continuity check<br>Multiturn sensing |
| Approval                    | UL approval / E63076                                         |

### Technical data - mechanical design

|                         |                                                                                          |
|-------------------------|------------------------------------------------------------------------------------------|
| Housing                 | ø58 mm                                                                                   |
| Shaft                   | ø12 mm hollow shaft<br>ø14 mm hollow shaft                                               |
| Protection DIN EN 60529 | IP 54                                                                                    |
| Operating speed         | ≤6000 rpm (mechanical)<br>≤6000 rpm (electric)                                           |
| Rotor moment of inertia | 20 gcm <sup>2</sup>                                                                      |
| Materials               | Housing: aluminium<br>Flange: aluminium                                                  |
| Operating temperature   | -25...+85 °C<br>-40...+85 °C (optional)                                                  |
| Relative humidity       | 95 % non-condensing                                                                      |
| Resistance              | DIN EN 60068-2-6<br>Vibration 10 g, 16-2000 Hz<br>DIN EN 60068-2-27<br>Shock 200 g, 6 ms |
| Weight approx.          | 400 g                                                                                    |
| E-connection            | Connector, 12-pin                                                                        |

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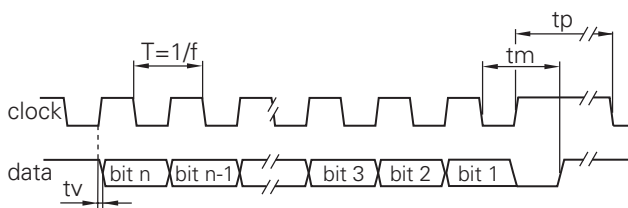
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### Part number

|        |  |  |    |                                                             |
|--------|--|--|----|-------------------------------------------------------------|
| G0M2H. |  |  |    |                                                             |
|        |  |  |    | Pulses / Incremental output                                 |
|        |  |  | 02 | No incremental output                                       |
|        |  |  | 04 | 2048 pulses / push-pull                                     |
|        |  |  | 06 | 2048 pulses / RS422                                         |
|        |  |  |    | E-connection                                                |
|        |  |  | A1 | Connector M23, 12-pin, radial                               |
|        |  |  | A3 | Connector M23, 12-pin, radial, for incremental output 04/06 |
|        |  |  | 21 | Cable 1 m, radial                                           |
|        |  |  |    | Voltage supply / signals                                    |
|        |  |  | 10 | 10...30 VDC / gray code 25 bit                              |
|        |  |  | 12 | 10...30 VDC / binary code 25 bit                            |
|        |  |  | 20 | 10...30 VDC / gray code 24 bit                              |
|        |  |  | 90 | 10...30 VDC / gray code 26 bit                              |
|        |  |  | 92 | 10...30 VDC / binary code 26 bit                            |
|        |  |  |    | Hollow shaft                                                |
|        |  |  | 0  | Hollow shaft ø12 mm without pin                             |
|        |  |  | 1  | Hollow shaft ø12 mm with pin 15 mm                          |
|        |  |  | B  | Hollow shaft ø12 mm with pin 9.5 mm                         |
|        |  |  | 4  | Hollow shaft ø14 mm without pin                             |
|        |  |  | 5  | Hollow shaft ø14 mm with pin 15 mm                          |
|        |  |  | F  | Hollow shaft ø14 mm with pin 9.5 mm                         |

### 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           |

### 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 130.005 | Female connector M23, 12-pin, 5 m cable          |
| Z 130.007 | Female connector M23, 12-pin, 10 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 (page %S)

|           |                                                                       |
|-----------|-----------------------------------------------------------------------|
| Z 119.023 | Spring coupling for encoders with ø58 mm housing                      |
| Z 119.024 | Torque support and spring washer for encoders with 9.5 mm pin         |
| Z 119.041 | Torque support by rubber buffer element for encoders with 15 mm pin   |
| Z 119.050 | Spring coupling                                                       |
| Z 119.053 | Spring coupling height 19.1 mm                                        |
| Z 119.070 | Spring coupling height 29.1 mm                                        |
| Z 119.072 | Spring coupling for encoders with ø58 mm housing, hole distance 73 mm |
| Z 119.073 | Spring coupling for encoders with ø58 mm housing, hole distance 68 mm |
| Z 119.076 | Spring coupling for encoders with ø58 mm housing                      |
| Z 119.082 | Spring coupling for encoders with ø58 mm housing, hole distance 63 mm |

### Trigger level

| SSI       | Circuit          |
|-----------|------------------|
| SSI-Clock | Optocoupler      |
| SSI-Data  | Linedriver RS485 |

| Control input    | Input circuit |
|------------------|---------------|
| Input level High | >0.7 UB       |
| Input level Low  | <0.3 UB       |
| Input resistance | 10 kΩ         |

| Incremental outputs | Output circuit          |
|---------------------|-------------------------|
|                     | Linedriver RS422        |
| Output level High   | >2.5 V (I = -20 mA)     |
| Output level Low    | <0.5 V (I = 20 mA)      |
|                     | 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                  |

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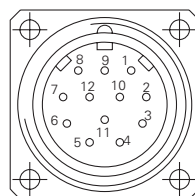
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## G0M2H - SSI

| 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 SSI clock input.<br>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.<br>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.<br>An error warning is given at level Low. Important: Interferences must be filtered 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.<br>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 |              |                                  |
|---------------------|--------------|----------------------------------|
| G0M2H               |              |                                  |
| 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              | –            | –                                |

| G0M2H 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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## Dimensions

