



# Absolute encoders – multiturn

|  |                            |            |
|--|----------------------------|------------|
| <b>Large hollow shaft<br/>optical / magnetic</b> | <b>9081 (hollow shaft)</b> | <b>SSI</b> |
|--|----------------------------|------------|

## Technical data

| Mechanical characteristics                       |  |
|--|--|
| <b>Maximum speed</b>                             | 6000 min <sup>-1</sup> , 3000 min <sup>-1</sup> (continuous) |
| <b>Mass moment of inertia</b>                    | approx. 65 x 10 <sup>-6</sup> kgm <sup>2</sup>               |
| <b>Starting torque - at 20°C [68°F]</b>          | < 0.2 Nm   |
| <b>Weight</b>                                    | approx. 0.7 kg   |
| <b>Protection acc. to EN 60529</b>               | IP65   |
| <b>Working temperature range</b>                 | -20°C ... +70°C [-4°F ... +158°F]                            |
| <b>Materials</b>                                 | hollow shaft stainless steel H7                              |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 2500 m/s <sup>2</sup> , 6 ms                                 |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 10 ... 2000 Hz                        |

| Electrical characteristics                             |   |
|--|---|
| <b>Power supply</b>                                    | 5.0 ... 30 V DC <sup>4)</sup>                         |
| <b>Power consumption</b><br>(no load)                  | typ. 89 mA<br>max. 138 mA                             |
| <b>Short circuit proof outputs <sup>2)</sup></b>       | yes <sup>3)</sup>                                     |
| <b>Reverse polarity protection of the power supply</b> | yes   |
| <b>Performance against magnetic influence acc. to</b>  | EN 61000-4-8, severity level 5                        |
| <b>UL approval</b>                                     | file 224618   |
| <b>CE compliant acc. to</b>                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |

| Control inputs (V/R, SET) |  |
|---------------------------|--|
| <b>Voltage</b>            | 5 ... 30 V DC = +V                           |
| <b>Response time</b>      | 10 ms  |
| <b>Switching level</b>    | LOW max. 25% +V<br>HIGH min. 60% +V, max. +V |
| <b>Max. current load</b>  | 0.5 mA                                       |

## Control inputs

### V/R input for change of direction

The encoder can output increasing code values when the shaft is rotated either clockwise or counter-clockwise (when looking from the shaft side).

The appropriate option can be selected via a hardware configuration of the V/R input BEFORE powering up the encoder.

The following table shows the function selection dependent on hardware and software settings:

| Hardware configuration of the V/R input: | Function:<br>increasing code value when the shaft is in the following direction |
|--|---|
| „LOW“<br>(0V) on the V/R input (=cw)     | cw  |
| „HIGH“<br>(+V) on the V/R input (= ccw)  | ccw   |
| „LOW“<br>(0V) on the V/R input (=cw)     | ccw   |
| „HIGH“<br>(+V) on the V/R input (= ccw)  | cw  |

1) For shaft version only (at shaft end).  
2) If power supply +V correctly applied.

| SSI interface  |   |
|--|---|
| <b>Output driver</b>                                   | RS485   |
| <b>Permissible load / channel</b>                      | max. +/- 20 mA  |
| <b>Update rate for position data</b>                   | approx. 1600/s  |
| <b>SSI clock rate</b>                                  | min. / max. 100 kHz / 500 kHz                                 |
| <b>Signal level</b>                                    | HIGH typ. 3.8 V<br>LOW (I <sub>Load</sub> = 20 mA) typ. 1.3 V |
| <b>Resolution singleturn</b>                           | 1 ... 8192 (13 bit), scaleable                                |
| <b>Number of revolutions (multiturn)</b>               | 1 ... 4096 (12 bit), scaleable                                |
| <b>Falling edge time t<sub>f</sub> (without cable)</b> | max. 100 ns   |
| <b>Rising edge time t<sub>r</sub> (without cable)</b>  | max. 100 ns   |

| Control outputs  |  |
|--|--|
| <b>Output driver</b>                                   | Push-Pull                              |
| <b>Max. current output</b>                             | ± 10.0 mA                              |
| <b>Signal level</b>                                    | HIGH min. +V - 2.8 V<br>LOW max. 1.8 V |
| <b>Falling edge time t<sub>f</sub> (without cable)</b> | max. 1 µs                              |
| <b>Rising edge time t<sub>r</sub> (without cable)</b>  | max. 1 µs                              |

### Note:

- Any hardware configuration of the V/R input must take place BEFORE powering up the encoder!
- If the V/R input is not configured, then a 0 V configuration will apply (default condition)!
- If the direction of rotation is changed due to the V/R configuration, without activating the SET function again, and if the encoder is also then powered up again, a new position value may be outputted, even if the physical shaft position of the encoder has not moved! This is due to internal conversion processes.
- The start-up procedure for the encoder should therefore follow this sequence:
  1. Determine the count direction of the encoder either via the V/R input or via programming
  2. Apply power to the encoder
  3. Activate the SET function, if desired (see SET input below)
- If using a cable wire to configure the V/R input, then for EMC reasons the wire should not remain open but should be tied either to 0 V or +V!
- The response time of the V/R input with +V = 5 ... 30 V DC power supply is 10 ms.

3) Only one channel allowed to be shorted-out:  
at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.  
at +V ≥ 5 ... 30 V DC short circuit to channel or 0 V is permitted.  
4) The power supply at the encoder input must not be less than 4.75 V (5 V - 5%).

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## SET input

This input is used for a one-time alignment (zeroing) of the encoder immediately after installation. A high control pulse (+V) applied to this input for a minimum of 10 ms will reset the current encoder position to the pre-programmed setpoint value. The default value is zero.

### Notes:

- The SET function should only be implemented when the encoder shaft is at rest.
- For the duration of the SET pulse the SSI interface does not function and therefore does not output any valid position values! In order to avoid malfunctions, no SSI clock pulse should occur during the SET pulse.
- If a cable wire is used to configure the SET input, then for EMC reasons the wire should not remain open but should if at all possible be tied to 0 V, provided no SET pulse is triggered!
- The response time of the SET input with +V = 5 ... 30 V DC power supply is 10 ms.

## Output

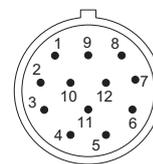
| Output | Default-function |
|--------|------------------|
| A1     | battery control  |

## Terminal assignment (SSI Synchronous Serial Interface with 12 pin connector)

| Interface | Type of connection | Features             | M23 connector |     |    |    |    |    |    |    |    |    |    |
|-----------|--------------------|----------------------|---------------|-----|----|----|----|----|----|----|----|----|----|
|           |                    |                      | Signal:       | 0 V | +V | C+ | C- | D+ | D- | ST | VR | A1 | ⊥  |
| 2         | 2                  | SET<br>Up/down input | Pin:          | 1   | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | PH |
|           |                    |                      | Cable colour: | WH  | BN | GN | YE | GY | PK | BU | RD | BK |    |

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- ST: Set input. The current position becomes defined as position zero.
- VR: Up/down input. As long as this input (High-Level = +V) is active, decreasing code values are transmitted when shaft turning clockwise.
- A1: Output battery monitoring
- ⊥ PH: Plug connector housing (Shield)

Top view of mating side, male contact base



M23 connector, 12 pin

## Dimensions

Dimensions in mm [inch]

- 1 Spring element, long (flange no. 3)  
cylindrical pin DIN 6325,  $\varnothing$  6 [0.24]
- 3 3 x M6, 10 [0.4] deep
- 4 3 x M4, 7 [0.28] deep
- 5 Recommended torque for the  
clamping ring 1.0 Nm

