

# Data Sheet for Angle Sensors



Optical Encoders

Series MOL40



- Optical resolution 10 to 5000 pulses per revolution
- Metal housing, ball bearing
- 40 mm housing diameter
- 6 or 8 mm shaft diameter
- Output: NPN, Open Collector, Linedriver, Push Pull
- 2 m signal cable
- Shaft coupling included in delivery

The robust encoder design of the MOL40 series is particularly suitable where high operational shaft speeds and a long service life are required. The MOL40 is established on the market for many years in hundreds of applications and is a guarantor of high reliability. The linedriver option provides a reliable measurement value transmission over long distances between encoder and evaluation unit.

| Electrical Data               | Push Pull<br>"B"   | Open Collector<br>"K"            | Voltage Output<br>"NPN"          | Line Driver<br>"N"                     |
|-------------------------------|--|----------------------------------|----------------------------------|--|
| Output channels               | A, B, Z  |                                  |                                  | A, A', B, B', Z, Z'                    |
| Number of pulses              | 10..5000 pulses per rev. (other pulses per revolution on request)  |                                  |                                  |  |
| Output voltage high           | Residual voltage<br>0.4 VDC  | Residual voltage<br>max. 0.4 VDC | Residual voltage<br>max. 0.4 VDC | Output voltage<br>min. 2.5 VDC         |
| Output voltage low            | Output voltage<br>VSUP 5 VDC:<br>min. VSUP -2.0 VDC<br>Output voltage<br>VSUP 12..24 VDC:<br>min. VSUP-3.0 VDC |                                  |                                  | Residual voltage<br>max. 0.5 VDC       |
| Limit frequency               | 300 kHz  |                                  |                                  |  |
| Supply voltage                | 12..24 VDC ±5 %<br>5 VDC ±5 %  |                                  |                                  |  |
| Current consumption (no load) | ≤ 80 mA  |                                  | ≤ 50 mA                          |  |
| Output load                   | (High) max. 30 mA<br>(Low) max.10 mA   | max. 30 mA                       | max. 10 mA                       | (High) max. -20 mA<br>(Low) max. 20 mA |
| Insulation voltage 1.)        | ≥ 100 MOhm @ 500 VDC   |                                  |                                  |  |
| Insulation resistance 1.)     | 750 VAC (1 min.)   |                                  |                                  |  |
| Output electronics            | Push Pull  | Open Collector                   | Voltage output NPN               | Linedriver                             |
| Switch-on delay               | max. 1 µs  |                                  |                                  | max. 0.5 µs                            |

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## Mechanical and Environmental Data, Miscellaneous

|   |  |
|---|--|
| Mechanical angle of rotation/stroke 1.) | 360° without stop  |
| Bearing                                 | Ball bearing   |
| Max. operational speed                  | 5000 rpm   |
| Operational torque @ RT 1.) 2.)         | ≤ 0.4 Ncm  |
| Operating temperature range             | -10..+70 °C  |
| Storage temperature range               | -25..+85 °C  |
| Protection grade (IEC 60529) standard   | IP50   |
| Vibration (IEC 68-2-6, Test Fc)         | 10..55 Hz (1 min.); 1.5 mm; each 2 h in X, Y, Z  |
| Shock (IEC 68-2-27, Test Ea)            | max. 50G   |
| Housing diameter                        | 40 mm  |
| Housing depth                           | 31 mm  |
| Shaft diameter                          | 6 mm, 8 mm   |
| Shaft type                              | Solid shaft  |
| Max. radial load                        | < 19.61 N  |
| Max. axial load                         | < 9.81 N   |
| Connection type                         | Standard: round cable 2 m, Ø5 mm<br>Option: 250 mm, Ø5 mm signal cable with plug<br>(standard: 6 pol., linedriver: 8 pol.) |
| Connection position                     | Radial   |
| Sensor mounting                         | Threaded holes in the sensor front (screws not included in delivery)   |
| Mass                                    | app. 120 g   |
| Fastening parts included in delivery    | none   |
| Accessory included in delivery          | Ø6 mm shaft coupling   |
| Material shaft                          | Stainless steel  |
| Material housing                        | Aluminium  |
| Material disc                           | Plastic  |
| Immunity ESD                            | ± 4 kV (CE standard)   |

1.) According IEC 60393

2.) Determined by climatic conditions according to IEC 68-1, para. 5.3.1 without load collectives

# Data Sheet for Angle Sensors

## Optical Encoders

Series MOL40

### Order Code

#### Description

Selection: standard=black/bold, possible options=grey/cursive

| Series  | MOL40 |  |   |                         |  |   |
|---|-------|--|---|-------------------------|--|---|
| <b>Shaft:</b><br><b>Ø6 x 15 mm</b><br><i>Option Ø8 x 15 mm</i><br><i>Option shaft length in mm</i><br><i>Option shaft diameter in mm (≤2,5 mm)</i>  |       | <b>6</b><br><i>8</i><br><i>Ax,xx</i><br><i>Dx,xx</i> |   |                         |  |   |
| <b>Resolution in pulses per revolution:</b><br><i>Option 10 ppr.</i><br><i>Option 50 ppr.</i><br><i>Option 100 ppr.</i><br><i>Option 256 ppr.</i><br><b>360 ppr.</b><br><i>Option 500 ppr.</i><br><i>Option 1000 ppr.</i><br><b>1024 ppr.</b><br><i>Option 1200 ppr.</i><br><i>Option 1500 ppr.</i><br><i>Option 1800 ppr.</i><br><i>Option 2000 ppr.</i><br><i>Option 2048 ppr.</i><br><i>Option 2500 ppr.</i><br><i>Option 3000 ppr.</i><br><b>3600 ppr.</b><br><i>Option 5000 ppr.</i> |       |  | <i>10</i><br><i>50</i><br><i>100</i><br><i>256</i><br><b>360</b><br><i>500</i><br><i>1000</i><br><b>1024</b><br><i>1200</i><br><i>1500</i><br><i>1800</i><br><i>2000</i><br><i>2048</i><br><i>2500</i><br><i>3000</i><br><b>3600</b><br><i>5000</i> |                         |  |   |
| <b>Supply voltage:</b><br><b>12..24 V</b><br><b>5 V</b>   |       |  |   | <b>1224</b><br><b>5</b> |  |   |
| <b>Output signal:</b><br><i>Option A+B</i><br><b>A+B+Z</b>  |       |  |   |                         | <i>B</i><br><b>BZ</b>                          |   |
| <b>Output electronics:</b><br><b>Push Pull</b><br><i>Option Open Collector</i><br><i>Option voltage output (NPN)</i><br><b>Line Driver</b> (output voltage 5V/DC)   |       |  |   |                         | <b>B</b><br><i>K</i><br><i>NPN</i><br><b>N</b> |   |
| <b>Electrical Connection (radial):</b><br><b>Round cable 2 m cable length</b><br><i>Option round cable with plug (0,25 m cable length)</i><br><i>Option round cable user defined cable length</i><br><i>[x,xx meter] without plug</i><br><i>Option round cable user defined cable length</i><br><i>[x,xx meter] with plug</i>   |       |  |   |                         |  | -<br><i>ST</i><br><i>CVRX,XX</i><br><i>CVRX,XX ST</i> |

### Order example MOL40

#### Requirement:

Shaft diameter 6 mm, resolution 360 pulses per revolution, supply voltage 5 V, 2 channels A+B and Index, output electronics Push Pull, 2 m signal cable length

**Example for order code:** MOL40 6 360 5 BZ B

### For higher quantities or on-going demand, additional options are available as described below

For example:

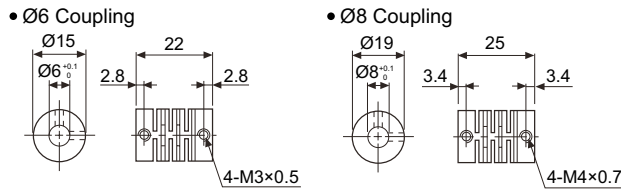
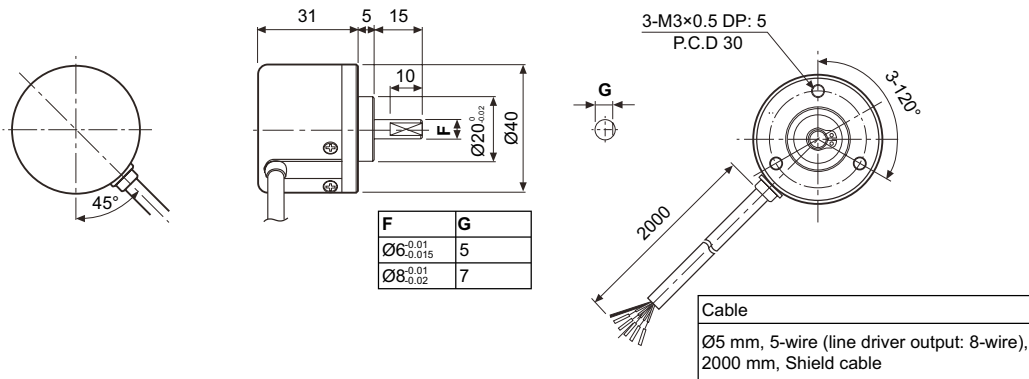
- Other resolutions
- Special cable length
- Modified shaft shape
- Special cable and connector design

# Data Sheet for Angle Sensors

Optical Encoders

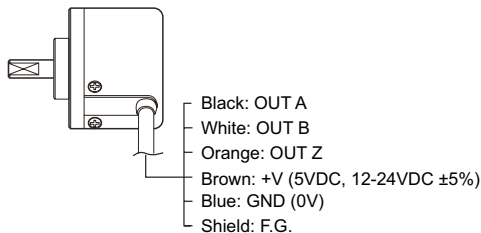
Series MOL40

## Technical Drawing



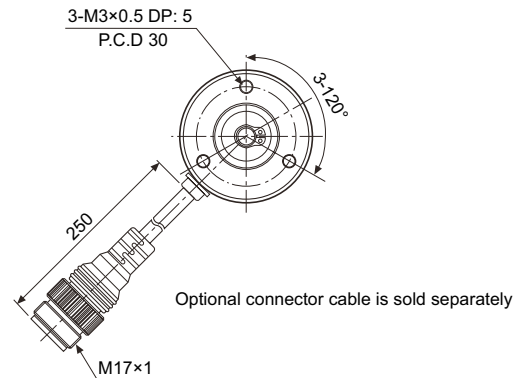
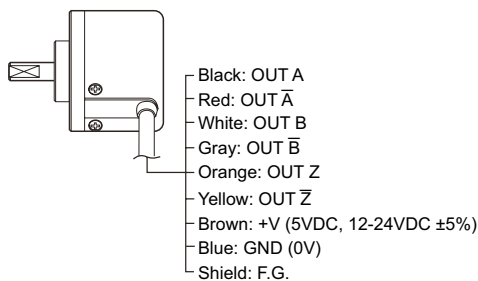
Dimensions in mm

### Totem pole output / NPN open collector output / Voltage output

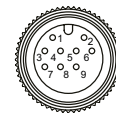


Unused wires must be insulated.  
The metal case and shield wire of encoder should be grounded (F.G.).

### Line driver output



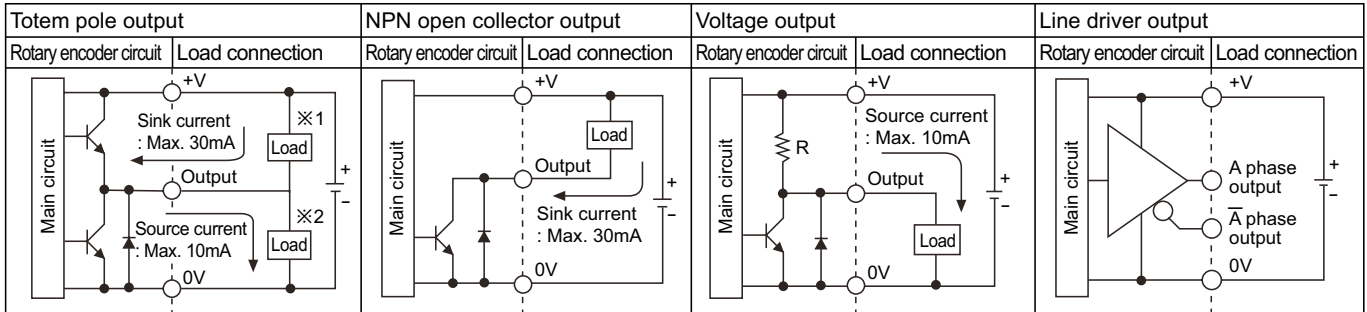
### Totem pole output / NPN open collector output / Voltage output



| Totem pole output/<br>NPN open collector output/<br>Voltage output |          |             | Line driver output |               |             |
|--|----------|-------------|--------------------|---------------|-------------|
| Pin No   | Function | Cable color | Pin No             | Function      | Cable color |
| ①  | OUT A    | Black       | ①                  | OUT A         | Black       |
| ②  | OUT B    | White       | ②                  | OUT $\bar{A}$ | Red         |
| ③  | OUT Z    | Orange      | ③                  | +V            | Brown       |
| ④  | +V       | Brown       | ④                  | GND           | Blue        |
| ⑤  | GND      | Blue        | ⑤                  | OUT B         | White       |
| ⑥  | F.G.     | Shield      | ⑥                  | OUT $\bar{B}$ | Gray        |
|  |          |             | ⑦                  | OUT Z         | Orange      |
|  |          |             | ⑧                  | OUT $\bar{Z}$ | Yellow      |
|  |          |             | ⑨                  | F.G.          | Shield      |

F.G. (field ground): It should be grounded separately.

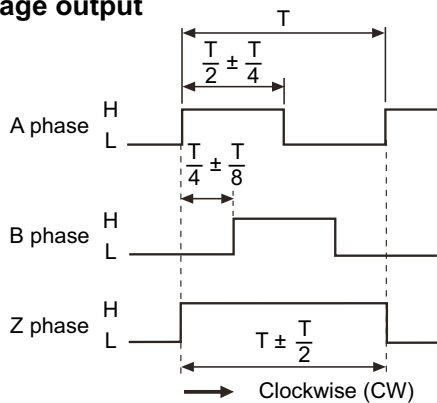
### Output Diagram



Totem pole output type can be used for NPN open collector output type (※1) or Voltage output type (※2).  
 All output circuits of A, B, Z phase are same. (line driver output is A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$ )

### Output Waveform

Totem pole output /  
 NPN open collector output /  
 Voltage output



※Z reverse phase output is optional.

Line driver output

