# Absolute rotary encoder

# ENA58PL-R***-CANopen redundant

- Recessed hollow shaft
- Up to 30 bit overall resolution
- Redundant CANopen Interface
- Independent photoelectric and magnetic redundant sampling
- Redundant connection option with 2 connectors
- High resolution and accuracy

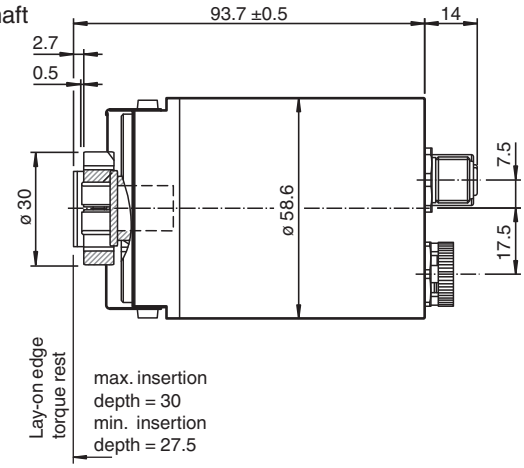
## Function

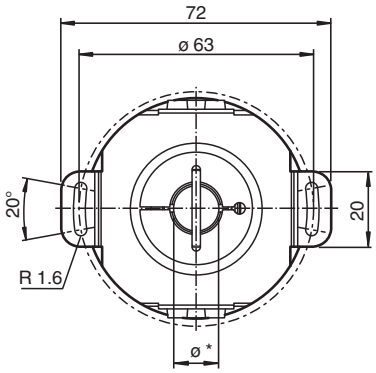
The absolute rotary encoder is equipped with an independent optical and magnetic sampling.
Optionally, versions with a combined connector or separate connector outlets for each sampling technology are available.
Due to the redundancy, the absolute rotary encoder is ideally suited for safety-relevant applications. The integrated CAN bus interface supports all CANopen functions.
Thus the following modes can be programmed to either enabled or disabled:

- Polled mode
- Cyclic mode
- Sync mode

## Dimensions

Recessed hollow shaft

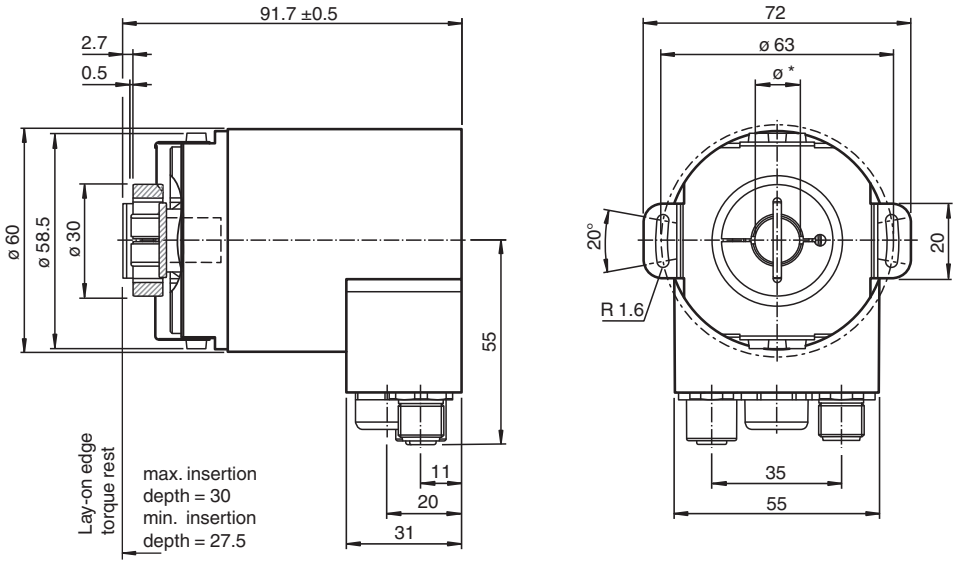



* see type code

## Dimensions

Recessed hollow shaft




* see type code

## Technical Data

| | | |
|---|---|---|
| **General specifications** | | |
| Detection type | | photoelectric and magnetic sampling |
| Device type | | Absolute rotary encoder |
| Linearity error | | ≤ ± 0.1 ° |
| UL File Number | | E223176 "For use in NFPA 79 Applications only" , if UL marking is marked on the product. |
| **Functional safety related parameters** | | |
| Performance level (PL) | | Suitable for PL d; both channels of the encoder must be connected to a safety PLC and evaluated there. |
| Category | | Suitable for cat. 3; both channels of the encoder must be connected to a safety PLC and evaluated there. |
| MTTF | | 100 a at 40 °C (based on EN ISO 13849-1) |
| Mission Time ($T_M$) | | 10 a |
| **Electrical specifications** | | |
| Operating voltage | $U_B$ | 10 ... 30 V DC (with galvanic isolation) |
| Power consumption | $P_0$ | ≤ 3.7 W |
| Time delay before availability | $t_v$ | < 250 ms |
| Output code | | binary code |
| Code course (counting direction) | | adjustable |
| **Interface** | | |
| Interface type | | CANopen |
| Resolution | | |
| Single turn | | up to 16 Bit |
| Multiturn | | up to 14 Bit |
| Overall resolution | | up to 30 Bit |
| Transfer rate | | min. 20 kBit/s , max. 1 MBit/s |
| Cycle time | | ≥ 1 ms |
| Standard conformity | | DSP 406 |
| **Connection** | | |

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## Technical Data

| | | |
|---|---|---|
| Connector | | 1 plug M12 x 1, 5-pin, A-coded (with connection type BD)<br>1 plug M12 x 1, 5-pin, A-coded and 1 socket M12 x 1, 5-pin, A-coded (with connection type BN) |
| **Standard conformity** | | |
| Degree of protection | | DIN EN 60529, IP65 or IP67 |
| Climatic testing | | DIN EN 60068-2, no moisture condensation |
| Emitted interference | | EN 61000-6-4 |
| Noise immunity | | EN 61000-6-2 |
| Shock resistance | | DIN EN 60068-2-27, 100 *g*, 6 ms |
| Vibration resistance | | DIN EN 60068-2-6, 20 *g*, 10 ... 1000 Hz |
| **Approvals and certificates** | | |
| UL approval | | cULus Listed, General Purpose, Class 2 Power Source , if UL marking is marked on the product. |
| **Ambient conditions** | | |
| Operating temperature | | -40 ... 85 °C (-40 ... 185 °F) |
| Storage temperature | | -40 ... 85 °C (-40 ... 185 °F) |
| Relative humidity | | 98 % , no moisture condensation |
| **Mechanical specifications** | | |
| Material | | |
| Housing | | nickel-plated steel , painted |
| Flange | | Aluminum |
| Shaft | | Stainless steel |
| Mass | | approx. 300 g |
| Rotational speed | | max. 12000 min $^{-1}$ |
| Moment of inertia | | 50 gcm$^2$ |
| Starting torque | | < 5 Ncm |
| Shaft load | | |
| Axial | | 24 N |
| Radial | | 198 N |
| Angle offset | | ± 0.9 ° |
| Axial offset | | ± 0.3 mm static |
| Radial offset | | ± 0.5 mm static |
| Dimensions | | |
| Diameter | | 58 mm |

## Type Code

**Aufbau des Typenschlüssels**

| E | N | A | 5 | 8 | P | L | – | R | (1) | (1) | D | A | (2) | – | (3) | (3) | (4) | (4) | C | R | D | – | (5) | (6) | (6) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| ENA | Device type |
|---|---|
| ENA | Absolute rotary encoder |

| 58 | Size |
|---|---|
| 58 | Housing diameter 58 mm |

| PL | Version |
|---|---|
| PL | Performance Line |

| R | Shaft tye |
|---|---|
| R | Recessed hollow shaft |

| (1) (1) | Shaft diameter |
|---|---|
| 12 | 12 mm (d = 12F7) |
| 15 | 15 mm (d = 15F7) |

| DA | Flange |
|---|---|
| DA | Dual spring plate |

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## Type Code

| (2) | Degree of protection |
|---|---|
| 5 | IP65 |
| 7 | IP67 |

| (3) (3) | Multiturn resolution |
|---|---|
| 12 | Multiturn rotary encoder, 12 Bit |
| 14 | Multiturn rotary encoder, 14 Bit |

| (4) (4) | Singleturn resolution |
|---|---|
| 13 | 13 Bit |
| 16 | 16 Bit |

| CRD | Interface, electric |
|---|---|
| CRD | CANopen redundant, $U_B$ 5 V ... 30 V |

| (5) | Connection alignment |
|---|---|
| A | Axial |
| R | Radial |

| (6) (6) | Connection type |
|---|---|
| BD | M12 device plug, 5-pin |
| BN | M12 device plug, 5-pin<br>and M12 socket, 5-pin |

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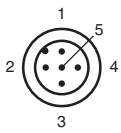
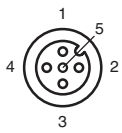
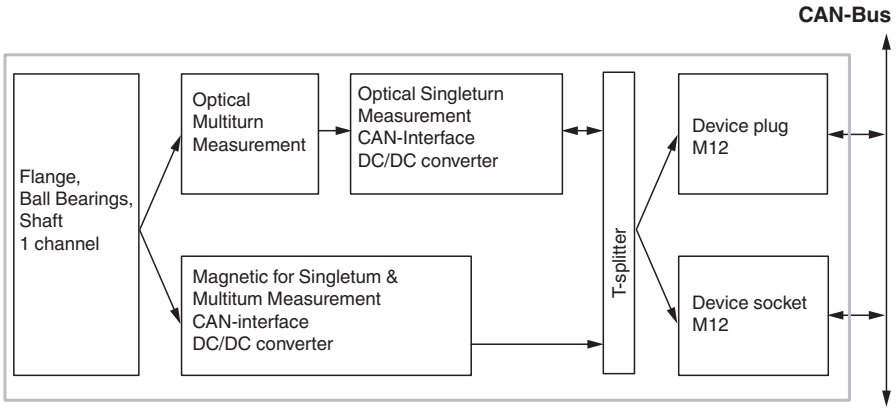
## Connection

| Signal | Device plug M12 x 1, 5-pin, A-coded | Device socket M12 x1, 5-pin, A-coded |
|---|---|---|
| | always present | only with connection type BN |
| CAN GND | 1 | 1 |
| $+V_S$ | 2 | 2 |
| GND | 3 | 3 |
| CAN-High | 4 | 4 |
| CAN-Low | 5 | 5 |
| Shielding | Housing | Housing |
| Pinout |  |  |





The following scheme illustrates the relationships for the electrical connection:




## Indication

### LED-indicator with dual color LED

| CAN Run (green) | State | Description |
|---|---|---|
| Blinking | Pre-Operational | Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“ |
| Single flash | Stopped | The Encoder is in CAN state „Stopped“ |
| On | Operational | The encoder is in CAN state „Operational“ |
| Off | | No power supply |

| Err (red) | State | Description |
|---|---|---|
| Off | No error | The Encoder is in operating mode |
| Flickering | AutoBitrate | Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement |
| Single flash | Warning limit reached | At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames) |
| Double flash | Error control event | A guard event (NTM slave or NTM master) or a heartbeat event has occured |
| On | Bus off | The CAN controller is in stae bus off. No communication possible anymore. Too many error frames in the network. |

## Programming

### Programmable CAN operating modes

| Mode | Explanation |
|---|---|
| Polled mode | The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier. |
| Cyclic mode | The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms. |

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| | |
|---|---|
| Sync mode | After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams. |

## Programmable rotary encoder parameters

| Parameter | Explanation |
|---|---|
| Operating parameter | The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend. |
| Resolution per revolution | The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution. |
| Preset value | The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value. |
| Min. and max. limit switch | A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions. |
| Cam | 8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism. |

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