Your Global Automation Partner

TURCK

RI…QR24…
Encoders with SSI Interface

Instructions for Use

Contents

Contents

1 About these instructions

These instructions for use describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use during the service life of the product. If the product is passed on, pass on these instructions as well.

1.1 Target groups

These instructions are aimed at qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols used

The following symbols are used in these instructions:

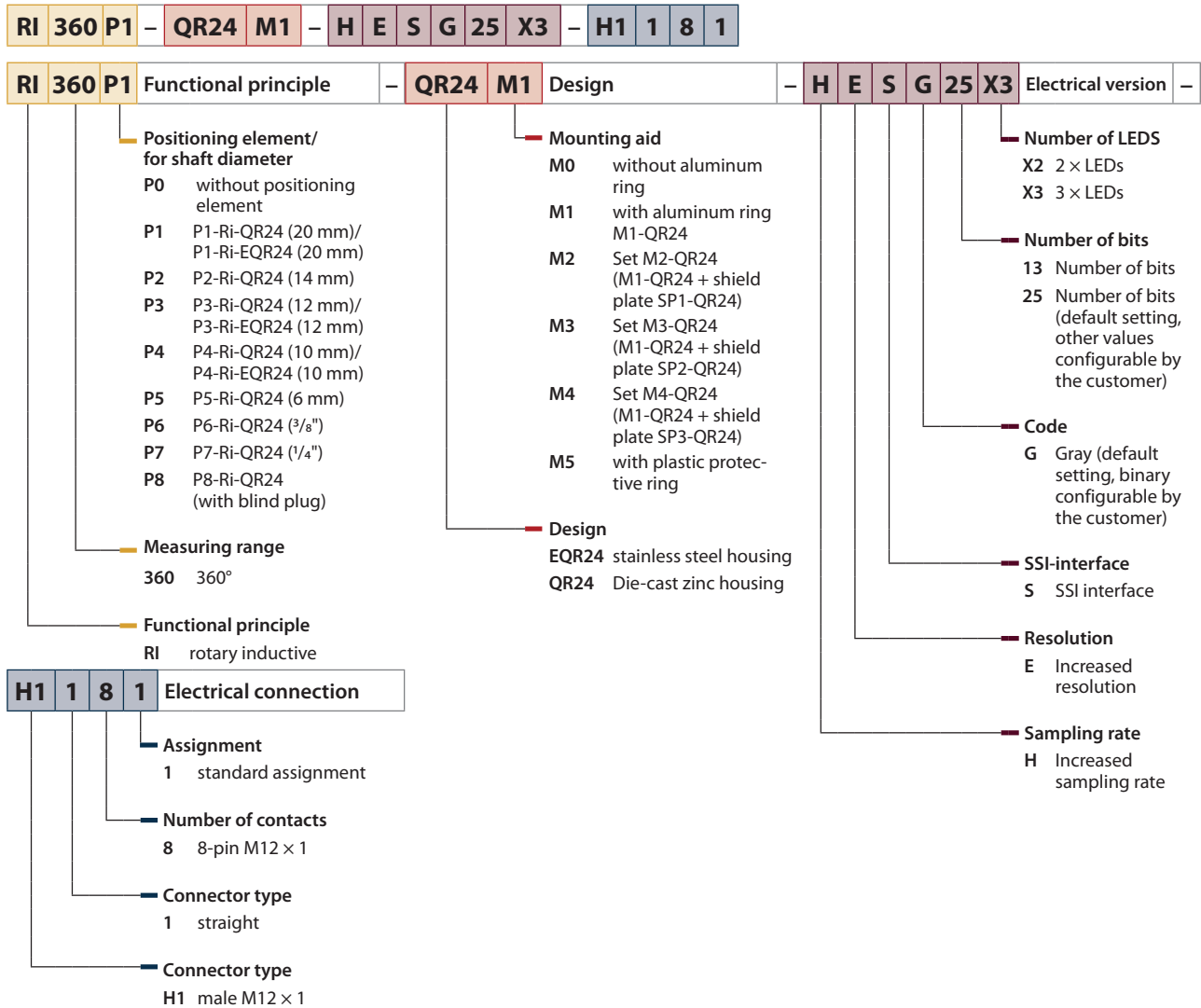|	
⚠	**DANGER** DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.
⚠	**WARNING** WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.
⚠	**CAUTION** CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.
❗	**NOTICE** NOTICE indicates a situation which may lead to property damage if not avoided.
ℹ	**NOTE** NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.
▶	**CALL TO ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULTS OF ACTION** This symbol denotes relevant results of actions.

1.3 Other documents

- Data sheet

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to **techdoc@turck.com**.

2 Information about the product

2.1 Product identification

RI	360	P1	–	QR24	M1	–	H	E	S	G	25	X3	–	H1	1	8	1

RI	360	P1	Functional principle	–	QR24	M1	Design	–	H	E	S	G	25	X3	Electrical version	–

Positioning element/ for shaft diameter

P0   without positioning element
P1   P1-Ri-QR24 (20 mm)/ P1-Ri-EQR24 (20 mm)
P2   P2-Ri-QR24 (14 mm)
P3   P3-Ri-QR24 (12 mm)/ P3-Ri-EQR24 (12 mm)
P4   P4-Ri-QR24 (10 mm)/ P4-Ri-EQR24 (10 mm)
P5   P5-Ri-QR24 (6 mm)
P6   P6-Ri-QR24 (³/₈")
P7   P7-Ri-QR24 (¹/₄")
P8   P8-Ri-QR24 (with blind plug)

Measuring range

360   360°

Functional principle

RI   rotary inductive

H1	1	8	1	Electrical connection

Assignment

1   standard assignment

Number of contacts

8   8-pin M12 × 1

Connector type

1   straight

Connector type

H1   male M12 × 1

Mounting aid

M0   without aluminum ring
M1   with aluminum ring M1-QR24
M2   Set M2-QR24 (M1-QR24 + shield plate SP1-QR24)
M3   Set M3-QR24 (M1-QR24 + shield plate SP2-QR24)
M4   Set M4-QR24 (M1-QR24 + shield plate SP3-QR24)
M5   with plastic protective ring

Design

EQR24   stainless steel housing
QR24   Die-cast zinc housing

Number of LEDS

X2   2 × LEDs
X3   3 × LEDs

Number of bits

13   Number of bits
25   Number of bits (default setting, other values configurable by the customer)

Code

G   Gray (default setting, binary configurable by the customer)

SSI-interface

S   SSI interface

Resolution

E   Increased resolution

Sampling rate

H   Increased sampling rate

> **NOTE**
> Sensor, mounting element and positioning element of the encoders are available both as individual components and as a complete set.

2.2 Scope of delivery

The scope of delivery includes:

- Encoder – sensor
- MT-QR24 mounting aid
- Quick Start Guide
- Optional: positioning element and mounting element

2.3 Turck service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database under **www.turck.com** contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats.

The contact details of Turck subsidiaries worldwide can be found on p.

3 For your safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

3.1 Intended use

The RI360…-QR24 … series encoders with an SSI interface are used to measure speeds or angle movements.

The devices may only be used as described in these instructions. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

3.2 Obvious misuse

- The devices are not safety components and must not be used for personal or property protection.
- Any use that exceeds the maximum permissible mechanical speed (see technical data) is deemed to be not in accordance with the intended purpose.

3.3 General safety notes

- The device meets the EMC requirements for industrial areas. When used in residential areas, take measures to avoid radio interference.
- The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.

4 Product description

The inductive encoders of the RI360-QR24 series measure speeds and angle movements of up to 360º. The sensor and the positioning element of the encoders are fully encapsulated and designed as two independent and sealed units with protection to IP68/IP69K and contactless operation. The optionally available adapter sleeves and mounting elements enable either the front or the rear of the encoder sensor to be fitted to shafts with a diameter of up to 20 mm. A mounting element for mounting on large rotatable machine parts is also provided in the program.

The devices are available as absolute encoders with different output variants and also as incremental encoders. A robust stainless steel EQR24 variant is available for use in the food and beverage industry.

The QR24 encoders can be connected via a standard 8-pin male connector.

4.1 Device overview
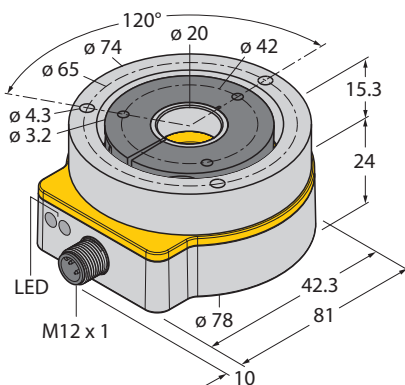
Fig. 1: QR24 encoder with sensor, P1 positioning element (optional) and protecting ring (optional)
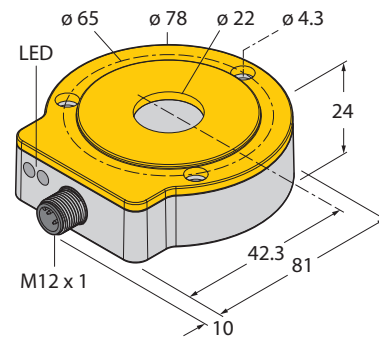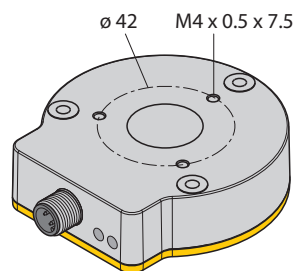
Fig. 2: Encoder – sensor (front)
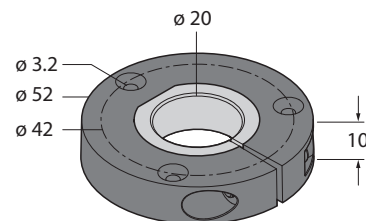
Fig. 3: Encoder – sensor (rear)

Fig. 4: Encoder – positioning element P1

4.1.1 Indication elements

The RI…-QR24…-X2… devices are provided with a green operating voltage LED and a yellow status LED. The RI…-QR24…-X3… devices are also provided with a red error LED.

4.2 Properties and features

- SSI output
- Gray-coded
- SSI clock rate: 62.5 KHz…1 MHz
- Compatible with all standard SSI master devices
- Immune to electromagnetic interference
- 15… 30 VDC
- Male connector, M12 × 1, 8-pin

4.3 Operating principle

The QR24 encoders have contactless operation based on the inductive resonant circuit measuring principle. This measuring principle makes it possible to design a fully encapsulated sensor housing without seals, which is separated from the positioning element. Magnetic fields cannot disturb the measuring process since the positioning element is not based on a magnet but on an inductive coil system, through which the sensor and the positioning element (resonator) can form an oscillation circuit. The inductive measuring principle of the QR24 encoder is absolute.

The inductive measuring principle of the QR24 encoder is absolute. To generate an incremental output signal from the absolute rotation angle, the sensor detects the actual rotation angle per millisecond and from this calculates the resulting number of pulses to be output.

4.4 Functions and operating modes

4.4.1 Output function

The devices are provided with an SSI interface according to the RS422 standard. The process value is transmitted digitally via the interface either directly to the higher-level controller (with an SSI card) directly or to a fieldbus device. The SSI interface can also transmit diagnostic bits in the SSI telegram in addition to the process data. In an SSI transmission, the master sets a clock signal by which the sensor responds in synchronization with the SSI telegram. The clock rate and data frame lengths can be adjusted and are set by the master. The recommended clock rate depends on the length of the connection cable.

The following tables describe the parameters and timings of the Turck SSI interface:

SSI interface – dynamic parameters

Timing	Meaning	Value range
Cycle time	Time interval of the individual clock sequences	Synchronous mode: 200…2000 µs asynchronous mode: > 150 µs
Cycle time jitter	Time variation of cycle times	Synchronous mode: < 5 µs asynchronous mode: not available
Monoflop time	Time from the last falling edge to the parallel serial conversion	25…35 µs (generated by the sensor)
Tbit	Bit time (1/Tbit = clock rate)	1…14.8 µs
Delay time	Time from the parallel serial conversion to the next clock sequence	≥ Cycle time – clock sequence – monoflop time

SSI interface – DC parameters

Parameter	Meaning	Value range
CLKin dU min.	Minimum difference of input voltage	> 2.3 V
CLKin dU max.	Maximum difference of input voltage	< 5 V
Dout dU min.	Minimum output voltage at RL = 120 Ω (RS-422)	> 2.3 V
Dout dU max.	Maximum output voltage	< 3.5 V

4.4.2 Update mode

The RI…-QR24…-HESG25… devices can be operated in synchronous or asynchronous update mode. The operating modes can be changed via the Teach function. Asynchronous mode is factory set. The synchronous update mode is not available for RI…-QR24…-HESG13 devices.

Asynchronous update mode

The clock signal rate of the controller sets the frequency for reading the position data. The sensor transmits one position data bit to the controller with each pulse. The first clock pulse edge of the controller indicates to the sensor to carry out a new position measurement. The updated position data is transferred in the next read cycle.

NOTE
In asynchronous mode, the position data available for the controller is no more than one update cycle old.

Synchronous update mode

The sensor synchronizes itself with the clock signal of the controller. The device starts position measuring in time, before the next query is started by the controller. This reduces the contouring error, but causes a precise scan pause (controller update) between two position queries of the controller.
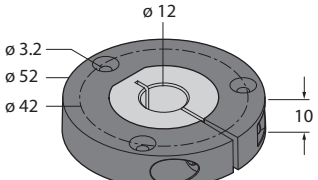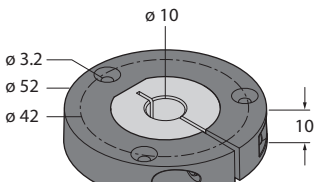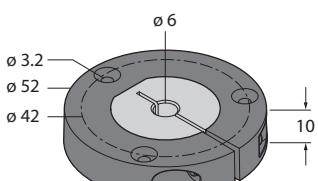
4.5   Encoders – components and accessories
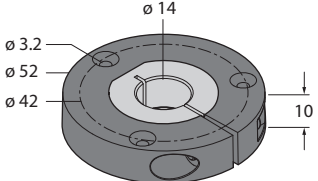
4.5.1   Encoder – QR24 sensor
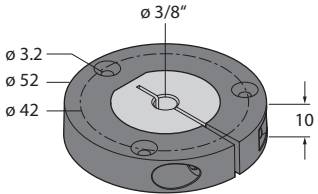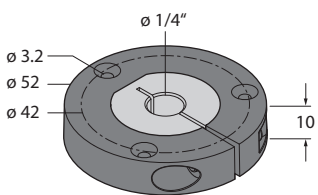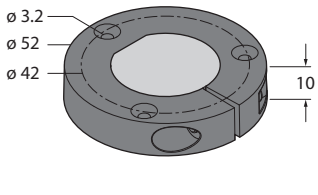
Dimension drawing	Type	Description
	RI360P…-QR24	Encoder – sensor, QR24 design, die cast zinc housing (without positioning element)

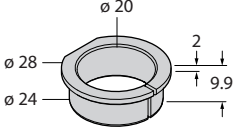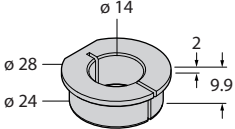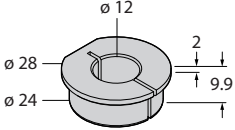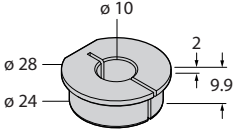### 4.5.2   Encoder – QR24 positioning element

The positioning elements are connected with the moving part of the machine (shaft) but move freely (without any mechanical connection to the sensor) over the active face of the sensor. Different reducing bushings are available to adapt the positioning element to the particular shaft diameter.
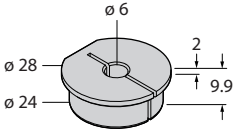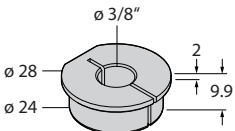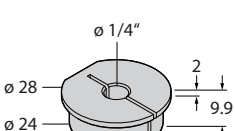
Dimension drawing	Type	Description
	PE1-QR24	Positioning element without reducing bushing with stainless steel fitting
	P1-RI-QR24	Positioning element with reducing bushing to connect to Ø 20 mm shafts

Dimension drawing	Type	Description
ø 14 ø 3.2 ø 52 ø 42 10	P2-RI-QR24	Positioning element with reducing bushing to connect to Ø 14 mm shafts
ø 12 ø 3.2 ø 52 ø 42 10	P3-RI-QR24	Positioning element with reducing bushing to connect to Ø 12 mm shafts
ø 10 ø 3.2 ø 52 ø 42 10	P4-RI-QR24	Positioning element with reducing bushing to connect to Ø 10 mm shafts
ø 6 ø 3.2 ø 52 ø 42 10	P5-RI-QR24	Positioning element with reducing bushing to connect to Ø 6 mm shafts

Dimension drawing	Type	Description
ø 3/8" ø 3.2 ø 52 ø 42 10	P6-RI-QR24	Positioning element with reducing bushing to connect to Ø 3/8" shafts
ø 1/4" ø 3.2 ø 52 ø 42 10	P7-RI-QR24	Positioning element with reducing bushing to connect to Ø 1/4" shafts
ø 3.2 ø 52 ø 42 10	P8-RI-QR24	Positioning element with blanking plug, e.g. for mounting on large rotatable machine parts

4.5.3   Encoders – QR24 adapter sleeves

Dimension drawing	Type	Description
ø 20 / ø 28 / ø 24 / 2 / 9.9	RA1-QR24	Reducing bushing to connect to Ø 20 mm shafts
ø 14 / ø 28 / ø 24 / 2 / 9.9	RA2-QR24	Reducing bushing to connect to Ø 14 mm shafts
ø 12 / ø 28 / ø 24 / 2 / 9.9	RA3-QR24	Reducing bushing to connect to Ø 12 mm shafts
ø 10 / ø 28 / ø 24 / 2 / 9.9	RA4-QR24	Reducing bushing to connect to Ø 10 mm shafts

Dimension drawing	Type	Description
ø 6 ø 28 ø 24 2 9.9	RA5-QR24	Reducing bushing to connect to Ø 6 mm shafts
ø 3/8" ø 28 ø 24 2 9.9	RA6-QR24	Reducing bushing to connect to Ø 3/8" shafts
ø 1/4" ø 28 ø 24 2 9.9	RA7-QR24	Reducing bushing to connect to Ø 1/4" shafts
ø 28 ø 24 2 9.9	RA8-QR24	Blanking plug for mounting without reducing bushing (e.g. mounting the positioning element on large rotatable machine parts)

4.5.4 Encoders – protecting rings and mounting sets for QR24/EQR24 device types

Different mounting sets are required for different mounting types (see section "Installing"). Each mounting set contains an aluminum protecting ring and an aluminum shielding plate. The shielding plates enable the quality of the signal between the positioning element and the sensor to be increased depending on mounting type and application. The protecting rings are also available individually in aluminum and plastic.

Dimension drawing	Type	Description
ø 4.5 ø 74 ø 57 ø 65 120° 14.3	M1-QR24	Aluminum protecting ring
ø 4.5 ø 74 ø 65 120° 2	SP1-QR24	SP1-QR24 aluminum shielding plate: Ø 74 mm for front mounting of the sensor on shafts up to Ø 20 mm
ø 4.5 ø 74 ø 22 ø 65 120° 2	SP2-QR24	SP2-QR24 aluminum shielding plate: Ø 74 mm, with Ø 22 mm hole for shaft feedthrough for rear mounting of the sensor on shafts up to Ø 20 mm
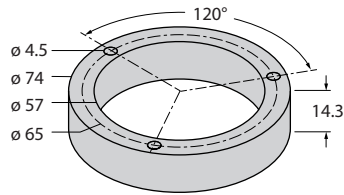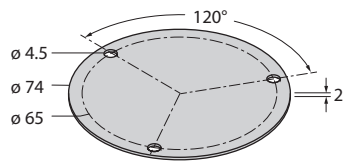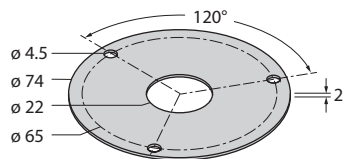
Dimension drawing	Type	Description
	SP3-QR24	SP3-QR24 aluminum shielding plate: Ø 52 mm for mounting the positioning element on large rotatable machine parts
	M5-QR24	Plastic protecting ring
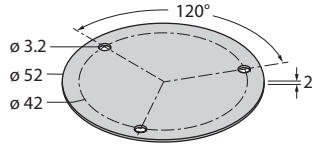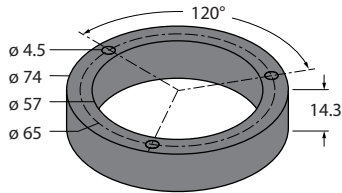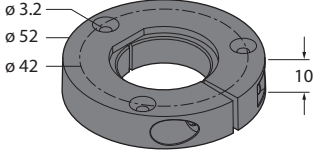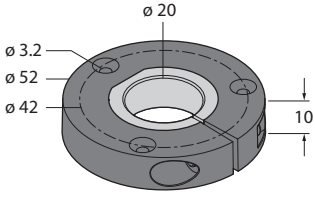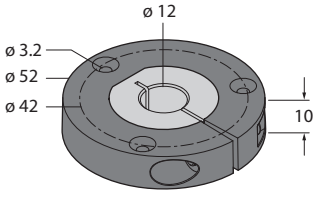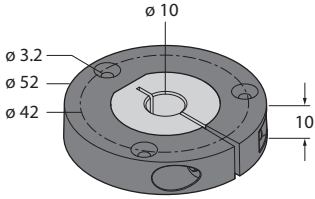
4.5.5 Encoder – EQR24 sensor
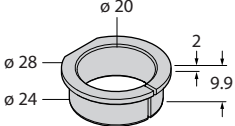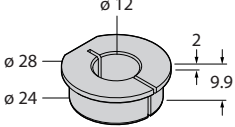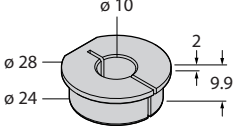
Dimension drawing	Type	Description
	RI360P…-EQR24	Encoder – sensor, QR24 design, stainless steel housing
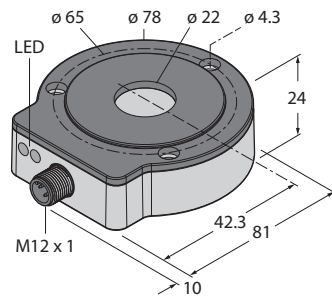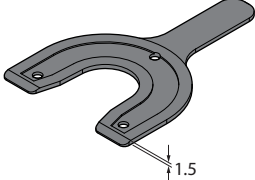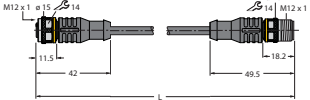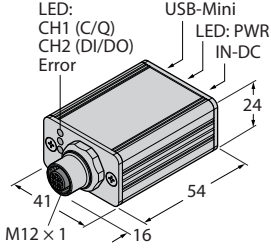
4.5.6   Encoder – EQR24 positioning element
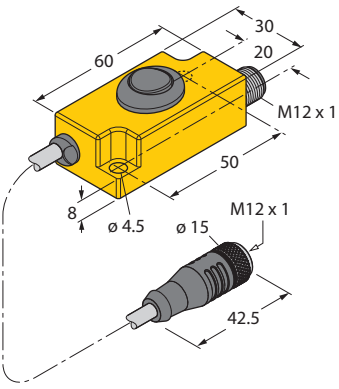
Dimension drawing	Type	Description
ø 3.2 ø 52 ø 42 10	PE-EQR24	Positioning element without reducing bushing with stainless steel fitting
ø 20 ø 3.2 ø 52 ø 42 10	P1-RI-EQR24	Positioning element with reducing bushing to connect to Ø 20 mm shafts, stainless steel fitting
ø 12 ø 3.2 ø 52 ø 42 10	P3-RI-EQR24	Positioning element to connect to Ø 12 mm shafts, stainless steel fitting
ø 10 ø 3.2 ø 52 ø 42 10	P4-RI-EQR24	Positioning element with reducing bushing to connect to Ø 10 mm shafts, stainless steel fitting

4.5.7   Encoder – EQR24 adapter sleeves

Dimension drawing	Type	Description
ø 20 ø 28 ø 24 2 9.9	RA1-EQR24	Stainless steel reducing bushing to connect to Ø 20 mm shafts
ø 12 ø 28 ø 24 2 9.9	RA3-EQR24	Stainless steel reducing bushing to connect to Ø 12 mm shafts
ø 10 ø 28 ø 24 2 9.9	RA4-EQR24	Reducing bushing to connect to Ø 10 mm shafts

4.5.8   Encoders – general accessories

Dimension drawing	Type	Description
	MT-QR24	Mounting aid for optimum alignment of the positioning element (supplied)
	RKC8.302T-1,5-RSC4T/ TX320	Adapter cable to connect the sensor to the USB-2-IOL-0002 USB IOL-Link adapter; M12 female connector, straight, 8-pin; M12 male connector, straight, 3-pin; cable length 1.5 m; sheathing material: PUR; sheathing color: black; cULus approved; RoHS compliant; protection type IP67
	E-RKC8T-264-2	Connection cable, M12 female connector, straight, 8-pin (twisted pair), shielded, cable length: 2 m, sheathing material: PVC, black; UL approval; other cable lengths and types available, see www.turck.com
	RKSV8T-5/TEL	Connection cable; M12 female connector, straight, 8-pin, stainless steel coupling nut, cable length 5 m, sheathing material: PVC, black; cULus approval; other cable lengths and types available, see www.turck.com
	USB-2-IOL-0002	IO-Link adapter with integrated USB interface

Dimension drawing	Type	Description
30 60 20 M12 x 1 50 8 ø 4.5 ø 15 M12 x 1 42.5	TX2-Q20L60	Teach adapter for parameterization

5   Installing

The optionally available adapter sleeves and mounting elements enable the front or rear of the encoder sensors to be fitted to the shafts with a diameter of up to 20 mm. With large rotatable machine parts, the positioning element is screwed directly onto the machine part and not fitted on the shaft.

⚠️ **WARNING**
Improper fixing
Possible fatal injury from fast moving parts
▶ Observe mounting instructions in all cases.
▶ Check the secure seating of the positioning element, tightening torque:
M = 0.6…0.8 Nm.

❗ **NOTICE**
Insufficient clearance from metal surrounding the positioning element
Loss of functionality due to weakening of resonant circuit
▶ Ensure sufficient clearance between the surrounding area and positioning element.
▶ Carry out a function test prior to commissioning.

ℹ️ **NOTE**
The positioning element must be located in the middle of the measuring range of the sensor before the power supply is applied.

5.1 Front mounting – shaft diameters up to 20 mm
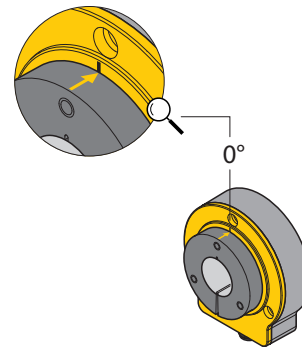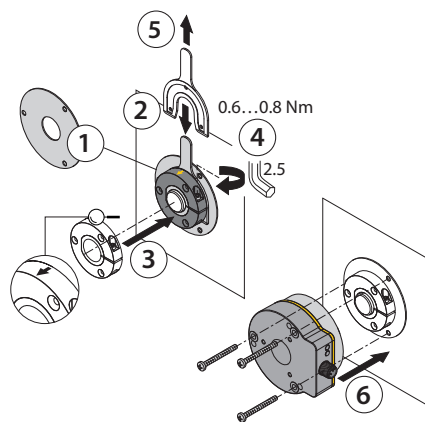
Fig. 5: Front mounting – shaft diameters up to 20 mm

Fig. 6: Zero point default value

1. Optional: use SP2-QR24 aluminum shield plate.
2. Mounting aid for optimum alignment of the positioning element.
3. Push the positioning element – with the front (active face) to the shaft – onto the shaft.
4. Fasten clamp fitting of the positioning element with hexagon spanner.
5. Remove mounting aid.
6. Place the encoder sensor including the protecting ring with the front to the shaft over the positioning element and align to the required position of the zero point. (Factory setting for 0°: yellow arrow on the positioning element pointing to the black mark on the sensor, see figure "Zero point default value".)

▶ Fasten the encoder with three screws in order to produce a closed and protected unit.

5.2 Rear mounting – shaft diameters up to 20 mm
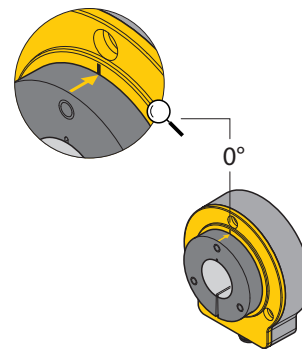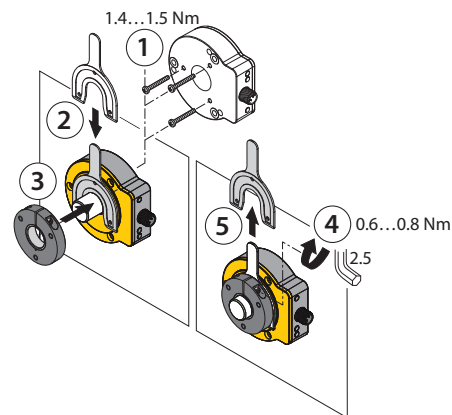
Fig. 7: Rear mounting – shaft diameters up to 20 mm

Fig. 8: Zero point default value

1. Push the encoder sensor – with the rear to the shaft – onto the shaft and fasten with three screws.

2. Mounting aid for optimum alignment of the positioning element.

3. Push the positioning element onto the shaft and align to the required position of the zero point. (Factory setting for 0°: yellow arrow on the positioning element pointing to the black mark on the sensor, see figure "Zero point default value".)

4. Fasten clamp fitting of the positioning element with hexagon spanner.

5. Remove mounting aid.

▶ Optional: use protecting ring and SP1-QR24 aluminum shield plate.

5.3 Mounting on large rotatable machine part
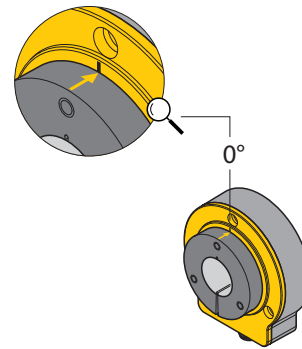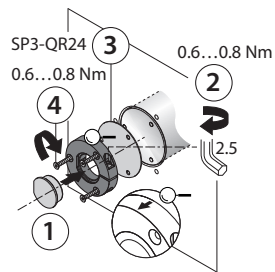
Fig. 9: Mounting on large rotatable machine part

Fig. 10: Zero point default value

1. If not yet present: insert RA8-QR24 blanking plug into positioning element.

2. Fasten clamp fitting of the positioning element with hexagon spanner.

3. Optional: use SP3-QR24 aluminum shield plate.

4. Fasten positioning element with three M3 countersunk screws (recommended: stainless steel screws).

   ▶ Depending on the application, mount the encoder and align to the required position of the zero point. (Factory setting for 0°: yellow arrow on the positioning element pointing to the black mark on the sensor, see figure "Zero point default value".)

6 Connection

The encoder is provided with an 8-pin M12 × 1 male connector with an SSI output. Turck recommends shielded twisted pair connection cables for the connection.

> **NOTE**
> Turck recommends that the length of the connection lines should be kept as short as possible.

The running lengths of the connection cables are limited and depend on the SSI clock frequencies. Different clock rates are recommended depending on the length of the connection cables. The clock rate and data frame lengths are set by the master.

Cable length	Clock frequency
< 25 m	< 1000 kHz
< 50 m	< 500 kHz
< 100 m	< 400 kHz
< 200 m	< 200 kHz
< 400 m	< 100 kHz

▶ Connect the female connector of the connection cable to the male connector of the device.
▶ Connect the sensor to the higher level as per terminal layout.

6.1 Wiring diagram

> **NOTE**
> Keep pin 8 potential-free in order to prevent any accidental teach operations.
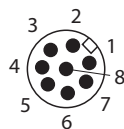
Fig. 11: M12 male connector – pin layout

1 GND
2 24 VDC
3 CLK +
4 CLK –
5 Data +
6 Data –
7 n.c.
8 Teach / Progr.
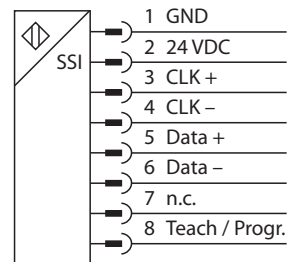
Fig. 12: M12 male connector – wiring diagram

7 Commissioning

After connecting and switching on the power supply, the device is automatically ready for operation.

Refer to the table below for the assignment of the output bits:

Device	Data frame length	Bit (MSB…LSB)	Description
RI…-QR24…-HESG25…	25 bits, adjustable	24…22	Diagnostic data
		21…16	Multiturn process data
		15…0	Single-turn process data
RI…-QR24…-HESG13…	13 bits, permanently set	12…0	Single-turn process data

▶ Synchronize the data frame length and coding of SSI master and sensor.
▶ Set the clock frequency on the SSI master.
⇨ The sensor accepts the clock frequency set by the SSI master.

8 Operation

If the encoder is moved during a power failure, this is indicated on restart by a red LED and a status bit. The status bit makes it possible to evaluate the correctness of the multiturn process data. The multiturn process data is calculated internally from the number of single-turn zero crossings. The sensor does not detect any revolutions when de-energized.

8.1 Maximum speed

> ⚠️ **WARNING**
> Improper fixing
> **Possible fatal injury from fast moving parts!**
> ▶ Do not exceed the maximum speed of 6000 rpm.
> ▶ Observe mounting instructions in all cases.
> ▶ Check the secure seating of the positioning element regularly, tightening torque: M = 0.6…0.8 Nm.

8.2 LED display

In normal operation the green Power supply LED and a yellow Status LED have the following indication functions. The RI…-QR24…-HESG25 devices are also provided with a red error LED.

Color/state	Meaning
Green	The sensor power supply is correct, asynchronous mode.
Green flashing	The sensor power supply is correct, synchronous mode.
Fast green flashing	The sensor power supply is correct, but is not receiving CLK pulses from the SSI master.
Yellow	The positioning element is within the measuring range with reduced signal quality.
Yellow flashing	Positioning element is not within the measuring range.
Red	The position was changed during a power loss.

9 Setting

The encoder can be assigned parameters as follows:

- Setting via the Easy teach function
- Setting by manual bridging (shorting)
- Setting via PACTware (FDT/DTM)

> **ℹ NOTE**
> When the IO Link USB adapter is connected, it is possible that a single teach operation is triggered by accident.

The following parameters can be set. The parameters marked with * can only be set for RI…-QR24…-HESG25… devices.

Parameter	Description
Zero point	Zero point: Position of the sensor is defined as the zero point.
Switching between synchronous mode and asynchronous mode*	The device is factory set for asynchronous mode. A teach pulse switches the device to synchronous mode
Effective direction	Effective direction of the encoder in the clockwise direction. The multiturn values are reset.
Multiturn error flag*	Multiturn error flag and multiturn counter are reset.
Switching between single-turn or multiturn mode*	A teach pulse is used to switch the device between single-turn and multiturn mode.
Easy teach reset	The effective direction, zero point, multiturn error and multiturn counter parameters are reset.

The factory settings are provided in the Technical data section.

9.1 Setting via the Easy teach function

The devices can be taught as follows via the Easy teach function:

	Teach to GND	Teach to U_B
Teach adapter	Press the pushbutton to GND.	Press the pushbutton to U_B.
Manual bridging (shorting)	Short circuit pin 1 with pin 8.	Short circuit pin 2 with pin 8.

A relay can be used to also set the device automatically via the Easy teach function.

9.1.1 Setting via teach adapter

The TX2-Q20L60 teach adapter is not supplied with the device and must be ordered additionally. To use the teach adapter connect it between the sensor and the connection cable.

Setting the position of the Z signal (zero point)

Requirement: Positioning element must be mounted (yellow Status LED off)

- ▶ Set the required zero point by the yellow arrow marking on the positioning element (factory setting for 0°: yellow arrow on the positioning element pointing to the black marking on the sensor)
- ▶ Press and hold down the pushbutton on the adapter for 2 s to GND.
- ⇨ If the Status LED is permanently lit after 2 s, the position of the Z signal has been successfully taught.

Switching between synchronous and asynchronous mode

Requirement: Positioning element must be mounted (yellow Status LED off).

- ▶ Press and hold down the pushbutton on the adapter to U_B for 2 s.
- ⇨ If the Status LED is permanently lit after 2 s and the Power LED is permanently lit green after 2 s, the asynchronous mode has been successfully taught.
- ⇨ If the Status LED is permanently lit after 2 s and the Power LED flashes green after 2 s, the synchronous mode has been successfully taught.

Setting the effective direction of the encoder clockwise

Requirement: Positioning element must be mounted (yellow Status LED off)

- ▶ Press and hold down the pushbutton on the adapter to U_B for 10s.
- ⇨ If the Status LED flashes for 2 s, the effective direction has been successfully set in the clockwise direction.

Setting the effective direction of the encoder counterclockwise

Requirement: Positioning element must be mounted (yellow Status LED off)

- ▶ Press and hold down the pushbutton on the adapter for 10 s to GND.
- ⇨ If the Status LED flashes for 2 s, the effective direction has been set in the counterclockwise direction.

Resetting the multiturn error flag

Requirement: Positioning element must be mounted (yellow Status LED off)

- ▶ Press and hold down the pushbutton on the adapter for 15 s to GND.
- ⇨ If the Power supply LED and the Status LED flash alternately, the multiturn error flag is successfully reset.

Switching between multiturn mode and single-turn mode

Requirement: Positioning element must be mounted (yellow Status LED off)

- ▶ Press and hold down the pushbutton on the adapter to U_B for 20 s.
- ⇨ If the red LED flashes, the switch between single-turn or multiturn mode is successful.

Resetting the device to factory settings

Requirement: Positioning element must be mounted (yellow Status LED off)

▶ Press and hold down the pushbutton on the adapter to U_B for 15 s.

⇨ If the Power supply LED and the Status LED flash alternately, the device is successfully reset to the factory settings.

9.2 Setting by manual bridging (shorting)

Setting the position of the zero point

Requirement: Positioning element must be mounted (yellow Status LED off)

▶ Set the required zero point by the yellow arrow marking on the positioning element (factory setting for 0°: yellow arrow on the positioning element pointing to the black marking on the sensor)

▶ Bridge pin 1 (GND) and pin 8 for 2 s.

⇨ If the Status LED is permanently lit after 2 s, the position of the zero point has been successfully taught.

Switching between synchronous and asynchronous mode

Requirement: Positioning element must be mounted (yellow Status LED off).

▶ Bridge pin 2 (U_B) and pin 8 for 2 s.

⇨ If the Status LED is permanently lit after 2 s and the Power LED is permanently lit green after 2 s, the asynchronous mode has been successfully taught.

⇨ If the Status LED is permanently lit after 2 s and the Power LED flashes green after 2 s, the synchronous mode has been successfully taught.

Setting the effective direction of the encoder clockwise

Requirement: Positioning element must be mounted (yellow Status LED off)

▶ Bridge pin 2 (U_B) and pin 8 for 10 s.

⇨ If the Status LED flashes for 2 s, the effective direction has been successfully set in the clockwise direction.

Setting the effective direction of the encoder counterclockwise

Requirement: Positioning element must be mounted (yellow Status LED off)

▶ Bridge pin 1 (GND) and pin 8 for 10 s.

⇨ If the Status LED flashes for 2 s, the effective direction has been set in the counterclock-wise direction.

Resetting the multiturn error flag

Requirement: Positioning element must be mounted (yellow Status LED off)

▶ Bridge pin 1 (GND) and pin 8 for 15 s.

⇨ If the Power supply LED and the Status LED flash alternately, the multiturn error flag is successfully reset.

Switching between multiturn mode and single-turn mode

Requirement: Positioning element must be mounted (yellow Status LED off)

▶ Bridge pin 2 (U_B) and Pin 8 for 20 s.

⇨ If the red LED flashes, the switch between single-turn or multiturn mode is successful.

Resetting the device to factory settings

Requirement: Positioning element must be mounted (yellow Status LED off)

▶ Bridge pin 2 (U_B) and pin 8 for 15 s.

⇨ If the Power supply LED and the Status LED flash alternately, the device is successfully reset to the factory settings.

9.3 Setting via FDT/IODD

> **NOTE**
> The RI…-QR24…-HESG25… devices can only be set via FDT/IODD.

The devices can be set via a PC with an FDT frame application (e.g. PACTware). All the required Turck software components can be downloaded via the Turck Software Manager:

- PACTware
- IODD
- DTM for USB-2-IOL-002 IO-Link adapter

The Turck Software Manager can be downloaded free of charge from www.turck.com.

The USB-2-IOL-002 USB IO-Link adapter (ID 6825482) is required for connecting to the PC.

The RKC8.302T-1,5-RSC4T/TX320 cable (ID 6625003) is required to connect the sensor to the USB-2-IOL-002 IO-Link adapter.

The following parameters of the device can be set via the FDT/IODD. The parameters marked * can only be set via FDT/IODD.

Parameter	Description
Multiturn reset	In multiturn mode the multiturn process data is also saved in the encoder after a power failure. The device resumes counting with the saved multiturn value after the power supply is reconnected. A multiturn error flag is set if the position of the positioning element was changed when the power supply is insufficient. The Status LED is lit red. The error display and the multiturn data are reset via the multiturn reset.
SSI Bitlength*	23, 24, 25 or 26 bits can be set (factory setting: 25 bits)
SSI Single Turn Bitlength*	10…18 bits configurable Depending on the setting Bit 0 to Bit 11 (12-bit), Bit 0 to Bit 12 (13-bit), Bit 0 to Bit 13 (14-bit), Bit 0 to Bit 14 (15-bit), Bit 0 to Bit 15 (16-bit), Bit 0 to Bit 16 (17-bit) or Bit 0 to 17 (18-bit) can be used for single-turn process data. (factory setting: 16 bits)
SSI Code (Gray/Binary) *	Bit coding (Gray, binary) configurable (factory setting: Gray)
SSI mode (Async/Auto-Sync/Sync)	Parameterization of the encoder for operation with the synchronous (deterministic) SSI master (jitter < 5 µs) or asynchronous SSI master. An optimum signal propagation time is present in synchronous mode. (factory setting: Async)
SSI Flags Enabled*	Bits 22, 23 and 24 provide status information. The SSI Flags Enabled command makes it possible to disable status bits 22, 23 and 24. The released bits are used in this case for the multiturn process data. If 23 or 24-bit is set at SSI bit length, the SSI flags are automatically disabled. (factory setting: SSI flags on)
Zero point	Both single-turn and multiturn process data and the multiturn error flag are reset.
Effective direction	The effective direction can be set from clockwise to counterclockwise. (factory setting: CW clockwise)
Factory setting *	All parameters are reset to the factory setting.

Further information on setting the devices via IODD with a configuration tool is provided in the IO-Link commissioning manual.

10 Troubleshooting

The strength of the resonance coupling is indicated by an LED. Any faults are indicated via the LEDs.

If the device does not function as expected, first check whether ambient interference is present. If there is no ambient interference present, check the connections of the device for faults.

If there are no faults, there is a device malfunction. In this case, decommission the device and replace it with a new device of the same type.

11 Maintenance

Ensure that the plug connections and cables are always in good condition.

The devices are maintenance-free, clean dry if required.

12 Repair

The device must not be repaired by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to Turck.

12.1 Returning devices

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from
https://www.turck.de/en/retoure-service-6079.php
and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Decommissioning

▸ Disconnect the connection cable from the power supply and/or processing units.
▸ Disconnect the connection cable from the device.
▸ Undo the connections of the device or if necessary the mounting aid for the mounting area.
▸ If present: undo the connection between the device and the mounting aid.

14 Disposal

The devices must be disposed of correctly and must not be included in general household garbage.

15 Technical data

Technical data	
Angle range	0…360°
Max. speed	10.000 rpm (mech. max. speed 6.000 rpm) Calculated with a standard setup with a Ø 20 mm steel shaft, L = 50 mm and Ø 20 mm reducing bushing
Resolution	Up to 16-bit
Effective direction	CW/CCW (factory setting: CW)
Zero point setting	Factory setting: 0° (yellow arrow on the positioning element pointing to the black marking on the sensor)
Starting torque, shaft load	Not applicable with contactless measuring principle
Repetition accuracy	≤ 0.01 % of full scale
Linearity deviation	≤ 0.05 % of full scale
Temperature drift	≤ ± 0.003 %/K
Ambient temperature	-25…+85 °C
Operating voltage	10…30 VDC
Ripple	≤ 10 % U_{ss}
Rated insulation voltage	≤ 0.5 kV
Output function	8-pin, push pull/HTL
Output type	SSI
Sampling rate	Max. 5000 Hz
Current consumption	< 100 mA
Dimensions	81 × 78 × 24 mm
Connection	Male connector, M12 × 1, 8-pin
Vibration resistance	55 Hz (1 mm)
Vibration resistance (EN 60068-2-6)	20 g, 10…3000 Hz, 50 cycles, 3 axes
Shock resistance (EN 60068-2-27)	100 g, 11 ms ½ sine, 3 × each, 3 axes
Continuous shock resistance (EN 60068-2-29)	40 g, 6 ms ½ sine, 4000 × each, 3 axes
Degree of protection	IP68/IP69K
MTTF	138 years acc. to SN 29500 (Ed. 99) 40 °C
Operating voltage indication	LED green
Status display	LED yellow
Error indication (only RI…-QR24…-HESG25)	LED red

15.1 Factory settings

Setting	
Data frame length	16-bit or 13-bit
Effective direction	CW
Zero point setting	Factory setting: 0° (yellow arrow on the positioning element pointing to the black marking on the sensor)

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