TURCK

Your Global Automation Partner

REM…|RES… Encoders with Analog Output

Instructions for Use

Contents

1 About these instructions

These instructions describe the setup, functions and use of the product and help you to operate the product according to its intended purpose. Read these instructions carefully before using the product. This will prevent the risk of personal injury and damage to property. Keep these instructions safe 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

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a hazardous situation with a high level of risk, which, if not avoided, will result in death or serious injury.
	**WARNING** WARNING indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in death or serious injury.
	**CAUTION** CAUTION indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in moderate or minor injury.
	**NOTICE** CAUTION indicates a situation which, if not avoided, may cause damage to property.
	**NOTE** NOTE indicates tips, recommendations and important information about special action steps and issues. The notes simplify your work and help you to avoid additional work.
▶	**MANDATORY ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULT OF ACTION** This symbol denotes the relevant results of an action.

1.3 Other documents

Besides this document, the following material can be found on the Internet at www.turck.com:

- Data sheet
- EU Declaration of Conformity (current version)
- Quick Start Guide

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 Notes on the product

2.1 Product identification

These instructions apply to the following encoders with analog output:

- RES-06
- RES-07
- RES-180
- RES-181
- REM-97
- REM-98
- REM-116
- REM-E-116

2.2 Scope of delivery

The delivery consists of the following:

- Encoder – sensor
- Quick Start Guide

2.3 Turck service

Turck supports you in your projects – from the initial analysis right through to the commissioning of your application. The Turck product database at **www.turck.com** offers you several software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats.

The contact data for Turck branches is provided at [▷ 19].

3 For your safety

The product is designed according to state of the art technology. Residual hazards, however, still exist. Observe the following safety instructions and warnings in order to prevent danger to persons and property. Turck accepts no liability for damage caused by failure to observe these safety instructions.

3.1 Intended use

Encoders with analog output are used to measure angular movements. To do this, the devices record mechanical rotary movements and convert them into analog output signals of 4…20 mA or 0…10 V.

The device must 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 the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- The device must only be fitted, installed, operated, parameterized and maintained by trained and qualified personnel.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.
- If safe operation is no longer guaranteed: Take the device out of operation and ensure that it cannot be switched on again accidentally.

4 Product description

The encoders in the REM… and RES… product series are available as solid shaft or hollow shaft versions. The REM/RES-E-… product series contains only solid shaft devices. Devices are available in three different sizes, ranging from 36 to 100 mm.

The encoders with analog output measure angular movements. To do this, they convert mechanical movements into analog output signals of 4…20 mA.

4.1 Device overview

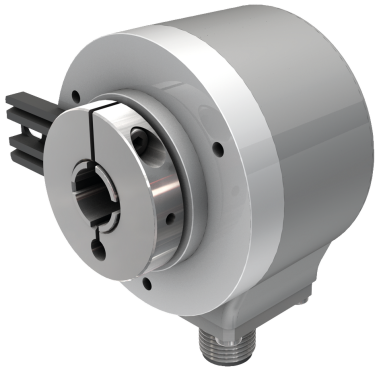

Fig. 1: Example — encoder with hollow shaft

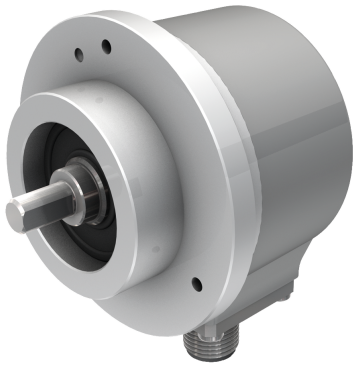

Fig. 2: Example — encoder with solid shaft

4.1.1 Display elements

The device has two LED displays.

4.2 Operating principle

Encoders detect rotational movements, such as the angle velocity of a shaft. Encoders convert the rotational movements into electrical signals. The devices pass on the electrical signals to a higher-level controller for evaluation. Encoders are designed as absolute and incremental encoders with hollow or solid shafts.

Absolute encoders also supply the angle value after a startup if the value has changed when deactivated. Incremental encoders only detect position changes when active by counting periodic patterns. This normally involves the optical scanning of a rotating disk.

4.3 Functions and operating modes

Zero point function

For singleturn devices, the measuring range can be shifted using the zero point function.

Limit switch function

For multiturn devices, a signal jump is added to the last measured end value via the limit switch function. If the teach-in is set, signal jumps are displayed at the start value and end value of the previously set teach-in. The connected controller evaluates the signal jumps.

The signal jumps are set at the factory. The signal jump is 0.4 mA or 0.25 V at the start point of a teach range and 2 mA or 0.25 V at the end value of a teach range.

Teach-in function

For multiturn devices, the following settings can be made using the teach-in function:

- Desired measuring range with start and end values
- Reset the set teach-in

4.3.1 Output function

The output signal is scaled linearly within the measuring range. The encoders are available with clockwise (CW) or counterclockwise (CCW) direction of rotation. The reference point of 0…1° is indicated via the LED.

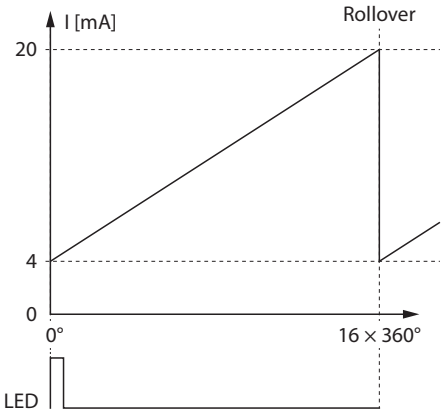

Fig. 3: Output function – CW version (Example: multiturn, current output)

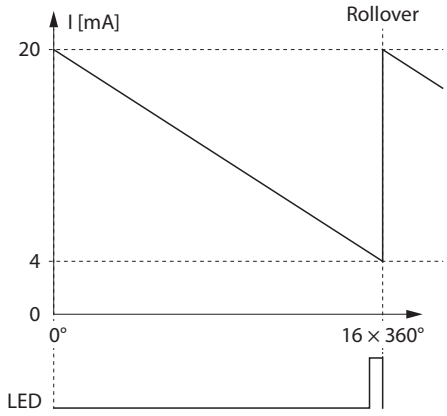

Fig. 4: Output function – CCW version (Example: multiturn, current output)

4.4 Technical accessories

Dimension drawing	Type	ID	Description
	RKC4.5T-2/TEL	6625016	Connection cable; M12 female connector, straight, 5-pin, cable length 2 m, jacket material: PVC, black; chemical and oil resistant, flame retardant, resistant to acids and alkalis, microbe and hydrolysis resistant, LABS free; cULus approved; RoHS compliant; IP67 protection; other cable lengths and types available, see www.turck.com

5 Installing

NOTICE
Incorrect mounting
Risk of damage to the sensor

- Do not modify or disassemble the encoder.
- Do not make adjustments to the shaft after mounting.
- Do not use a hammer to align the device.
- Avoid impact loads.
- Load the encoder shaft only within the permissible values (see technical data).
- Do not rigidly connect the rotary encoder to shafts and flanges at the same time. Use the coupling between the drive shaft and the encoder shaft or the hollow shaft encoder flange.

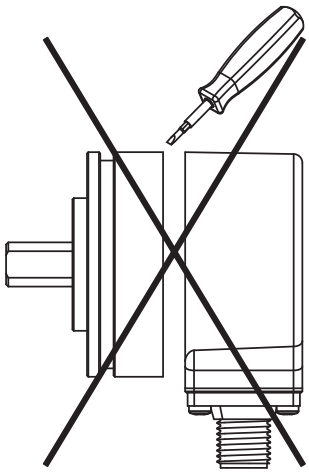

Fig. 5: Mounting view — do not open

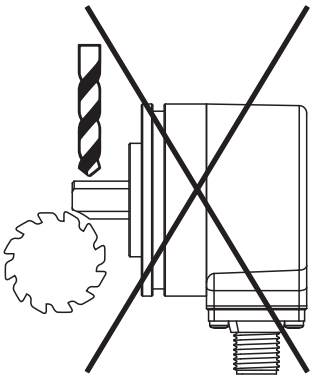

Fig. 6: Mounting view — do not make adjustments after mounting

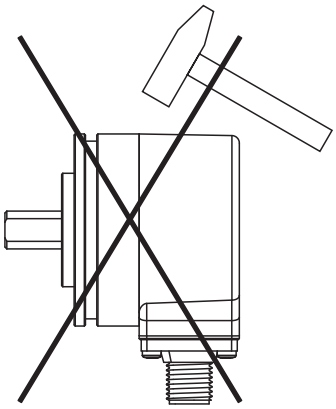

Fig. 7: Mounting view — do not use a hammer to align the device

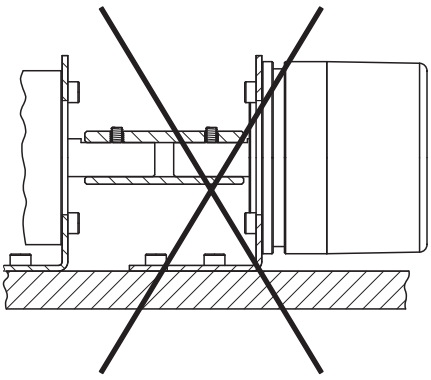

Fig. 8: Mounting view — do not rigidly connect the device to shafts and flanges at the same time

5.1 Installing the solid shaft encoder

- Check shaft for displacement.
- Refer to the technical data for the coupling for the maximum axial displacement, radial displacement, and angular displacement values.

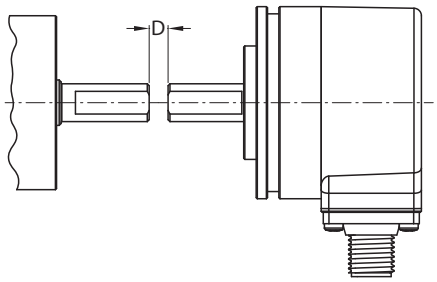

Fig. 9: Axial displacement

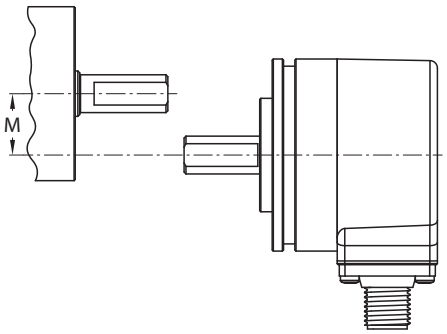

Fig. 10: Radial displacement

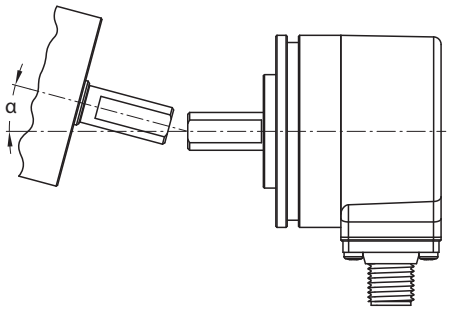

Fig. 11: Angular displacement

- During mounting, protect the coupling against excessive bending and damage.
- Align the coupling on the shaft.
- Secure the coupling on the device using tensioning screws or clamping screws. For the maximum tightening torque, refer to the data sheet of the screws used.

5.2 Installing the hollow shaft encoder

- Slide the encoder onto the shaft.

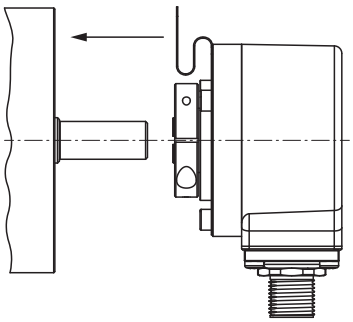

Fig. 12: Sliding the encoder onto the shaft

- Screw the female connector to the drive flange.

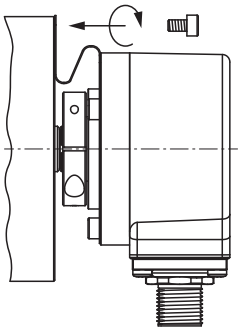

Fig. 13: Screwing the female connector to the drive flange

- Tighten the clamping hub by hand.

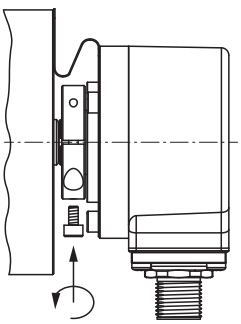

Fig. 14: Tightening the clamping hub

6 Connection

The encoder has a 5-pin M12 × 1 male connector with analog output. The pin assignment can be found on the sensor label or the data sheet.

Turck recommends the following cable lengths:

- For asymmetrical transmission (no inverted signals): max. 10 m
- For symmetrical transmission (e.g. RS422 standard): max. 50 m with twisted pairs

- ▶ Connect all required cable cores as per the wiring diagram. Insulate the cable ends that are not required to avoid short circuits.
- ▶ Follow the operating instructions for the connecting cable used.
- ▶ Disconnect the encoder from the connecting cable only when the encoder is de-energized.
- ▶ Connect the shielding (if present) to the encoder housing.
- ▶ The encoder and processor must always be switched on and off simultaneously.
- ▶ Observe the operating voltage and maximum permissible output current (see technical data).

EMC-compliant installation

- ▶ Use shielded connection cables as control cables.
- ▶ For symmetrical transmission (e.g. via RS422): Use twisted pair cables.
- ▶ Connect protective earth to the rotary encoder and the evaluation unit (low impedance).
- ▶ Route the connection cables separately from cables with high noise levels.
- ▶ Do not connect devices with high noise levels to the encoder's power supply (e.g. frequency converters, solenoid valves, or contactors), or ensure that suitable voltage filtering is in place.

6.1 Wiring diagram – current output

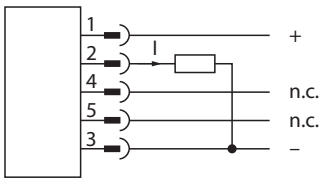

Fig. 15: Wiring diagram – current output

6.2 Wiring diagram – voltage output

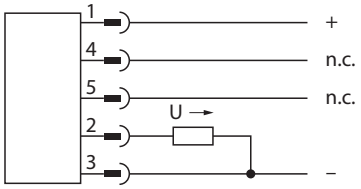

Fig. 16: Wiring diagram – voltage output

7 Commissioning

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

8 Operation

8.1 LED display

LED display	Meaning
Green	Device ready for operation.
Green and red	Reference point display
Green flashing (4 Hz)	Service mode Contact Turck.
Red/green flashing alternately (4 Hz)	System error internal system error Contact Turck.
Red/green flashing alternately (2 Hz)	Wire break The load on the analog output is too small. Connection to the controller is interrupted. Check wiring.
Off	Device is not ready for operation. Faulty power supply. Check power supply and wiring.

9 Setting

9.1 Setting singleturn devices using the zero point function

For singleturn devices, the measuring range can be shifted using the zero point function. The extent of the measuring range (0…10 V or 0…20 mA) remains unchanged.

The zero point can only be changed manually and cannot be reset.

- ▶ Turn the shaft to the desired zero point.
- ▶ Short pin 5 (SET 1) to pin 1 (+) for at least one second.
- ⇨ The LED indicator flashes green/red/green.

9.2 Setting multiturn devices using the teach-in function

The teach-in function sets a start point and end point within the measuring range. The set measuring range must be > 22.5 ° and must not exceed 65,536 revolutions.

Setting the start point

- ▶ Turn the shaft to the desired start point.
- ▶ Short pin 5 (SET 1) to pin 1 (+) for at least one second.
- ⇨ The LED indicator flashes 1 × green.

Setting the end point

- ▶ Turn the shaft to the desired end point.
- ▶ Short pin 4 (SET 2) to pin 1 (+) for at least one second.
- ⇨ The LED indicator flashes 3 × green.

Resetting the set teach-in

To reset the teach-in, the shaft must be stationary.

- ▶ Short pin 5 (SET 1) and pin 4 (SET 2) to pin 1 (+) for at least one second.
- ⇨ The LED indicator flashes green/red/green.

LED Display	Meaning
Green flashing × 1	Start point is set
Green flashing × 3	End point is set
Red flashing × 3	Error during the teach-in process
Green/red/green flashing	The measuring range has been reset

Devices with voltage output

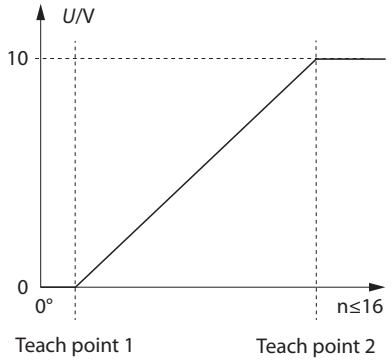

Fig. 17: Teach-in without limit switch function (voltage output)

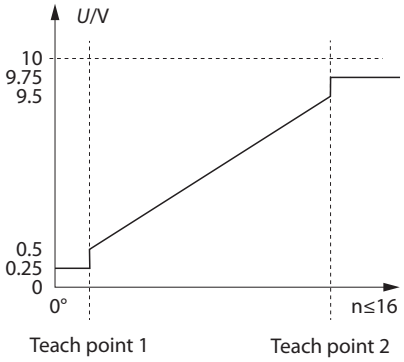

Fig. 18: Teach-in with limit switch function (voltage output)

Devices with current output

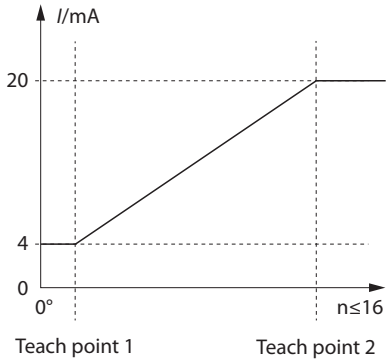

Fig. 19: Teach-in without limit switch function (current output)

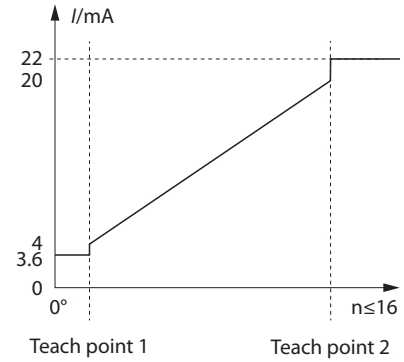

Fig. 20: Teach-in with limit switch function (current output)

10 Troubleshooting

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 regularly that the plug connections and cables are in good condition.

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

12 Repair

The device is not intended for repair 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

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. This is available for download at
https://www.turck.de/en/return-service-6079.php
and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal

The devices must be disposed of properly and do not belong in the domestic waste.

14 Turck branches — contact data

Germany	Hans Turck GmbH & Co. KG Witzlebenstraße 7, 45472 Mülheim an der Ruhr **www.turck.de**
Australia	Turck Australia Pty Ltd Building 4, 19-25 Duerdin Street, Notting Hill, 3168 Victoria **www.turck.com.au**
Austria	Turck GmbH Graumanngasse 7/A5-1, A-1150 Vienna **www.turck.at**
Belgium	TURCK MULTIPROX Lion d'Orweg 12, B-9300 Aalst **www.multiprox.be**
Brazil	Turck do Brasil Automação Ltda. Rua Anjo Custódio Nr. 42, Jardim Anália Franco, CEP 03358-040 São Paulo **www.turck.com.br**
Canada	Turck Canada Inc. 140 Duffield Drive, CDN-Markham, Ontario L6G 1B5 **www.turck.ca**
China	Turck (Tianjin) Sensor Co. Ltd. 18,4th Xinghuazhi Road, Xiqing Economic Development Area, 300381 Tianjin **www.turck.com.cn**
Czech Republic	TURCK s.r.o. Na Brne 2065, CZ-500 06 Hradec Králové **www.turck.cz**
France	TURCK BANNER S.A.S. 11 rue de Courtalin Bat C, Magny Le Hongre, F-77703 MARNE LA VALLEE Cedex 4 **www.turckbanner.fr**
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