

# **RFC-4800 IO-Link User Manual**

## **1 General description**

*This device is a magnetic transducer for direct, precise and absolute measurement of a rotary position in control, regulation and measuring applications using touchless magnetic sensing technology.*

## **2 Safety instructions**

### **2.1 Intended conditions of use**

*The RFC transducer is intended to be installed in a machine or system. Together with a controller it comprises a rotary position measuring system and may only be used for this purpose.*

*In case of unauthorized modifications, non-permitted usage or non-observance of installation instructions, the warranty and liability claims will be lost.*

### **2.2 Installation and startup**

*The transducer must be installed only by qualified personnel in consideration of all relevant safety regulations.*

*Non-observance of the installation instructions will void any warranty or liability claims.*

*All personal protection measures in case of a transducer defect or failure must be taken before startup.*



*Strong magnetic or electromagnetic fields in close proximity of the transducer may lead to faulty readings!*

### **2.3 Check connections**

*Improper connections and overvoltage can damage the transducer. Please always check the connections carefully before turning on the system.*

### **2.4 Turning on the system**

*Please note that the system may execute uncontrolled movements when first turned on or when the transducer is part of a closed-loop system whose parameters have not yet been set. Therefore make sure that no hazards can result from these situations.*

### **2.5 Check output values**

*After replacing or repairing a transducer, it is advisable to verify its output values for start and end position of its position marker in manual mode.*

### **2.6 Check functionality**

*The functionality of the transducer system and all its associated components should be regularly checked and recorded.*

### **2.7 Failure malfunction**

*If the transducer system doesn't operate properly, it should be taken out of service and protected against unauthorized use.*

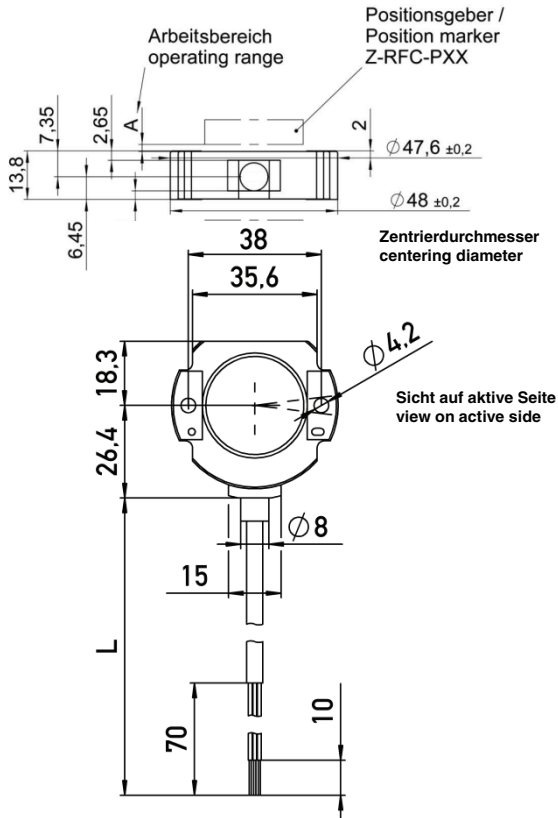
### **2.8. Limitations for application**

*Our products are regularly not approved for aeronautic or aerospace applications and are not allowed to be used in nuclear or military, in particular ABC-relevant applications. For more information see our Terms and Conditions.*

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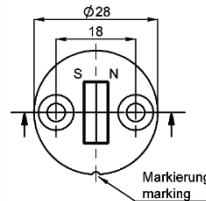
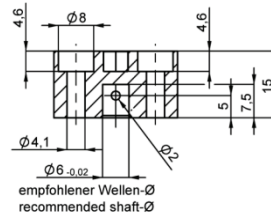
## 3 Installation

### 3.1 Rotary Sensor RFC-4800



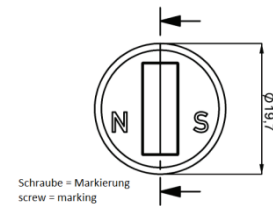
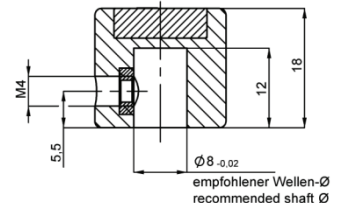
### 3.2 Position markers Further position marker see data sheet.

#### Z-RFC-P02 / -P08



Default: marking of position marker points to cable outlet => center of measuring range (180° position)

#### Z-RFC-P23

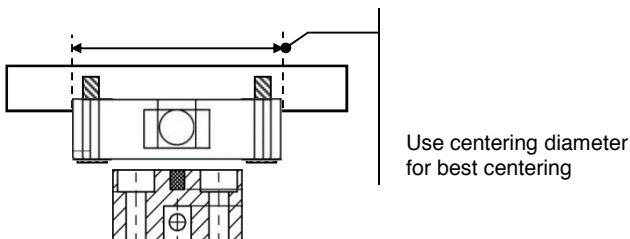


Default: marking of position marker points to cable outlet => start of measuring range (0° position)

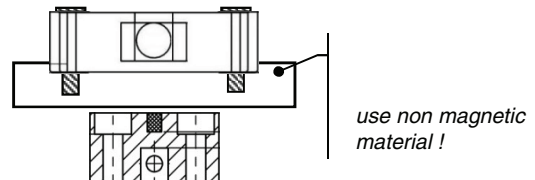
**!** For mounting instructions / operating ranges of position markers please refer to it's corresponding instructions of use.

### 3.3 Mounting examples sensor - position marker

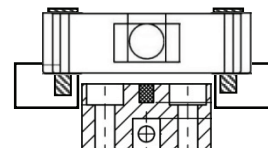
#### Example A: standard mounting



#### Example B: media isolated



#### Example C: position marker through plate



Please Note:  
The operating range of the position marker (see instructions of use position marker) must not be exceeded !  
This is especially valid for example B !

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### 3.4 Installation Instructions

Only the the delivered button head socket screws with flange are to be used. Pay attention to the maximum tightening torque of 250 Ncm when fastening.

Minimum bending radius of the cable is 70mm. Avoid steady tension on the cable in any direction.

If the cable is moving in the application, appropriate action is to be taken to fix the cable after the outlet of the sensor (use of fixation clamp or similar).

### 4. Elektrische Daten / electrical data

Versorgungsspannung / supply voltage:  
24 VDC ( 18...30 VDC)

Kabel / cable:  
4-polige, ungeschirmte Leitung  
4-pol, unshielded cable



**ACHTUNG !**  
Maximale Verlängerung des Kabels  
nur bis Gesamtlänge 20 m



**CAUTION !**  
Extension of the cable only to a  
maximum length of 20 m

#### 4. 1 Elektrische Anschlussbelegung / electrical connections

Signal / Signal	Aderfarbe / Wire color Kabel / Cable Code -25_ - / -26_ - / -27_ -	Anschlussbelegung / Pin assignment M12-Stecker / M12 connector Code -551-
Versorgung / Supply Ub	braun / brown	pin 1
GND	weiss / white	pin 3
C/Q	gelb / yellow	pin 4
Nicht anschliessen * Not connected *	grün / grün	pin 2

\*) Alternativ auf GND legen / Alternatively connect to GND

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## 5 IO-Link Interface

The IO-Link interface is a point-to-point connection based on a UART protocol with 24 V pulse modulation.

Data is exchanged cyclically between the IO-Link Master and the IO-Link device using the IO-Link protocol.

The protocol contains process data and also requested additional data for state determination or configuration.

### 5.1 Device specification

Spezifikation	Specification	IO-Link Beschreibung IO-Link Description	Wert Value
Übertragungsrate	Transfer rate	COM3	230,4 kBaud 230.4 kBaud
Minimale Zykluszeit des Device	Minimum cycle time of device	Min cycle time	0x0A (1 ms)
Spezifikation Datenformat Anzahl benötigter Vor-Betriebsdaten Anzahl benötigter Betriebsdaten Weitere Parameter	Frame specification Number of preoperate data required Number of operate data required Enhanced parameters	M-sequence capability: Preoperate M-sequence type Operate M-sequence type ISDU supported	0x2B Type_1_V Type_2_V supported
IO-Link Protokoll Version	IO-Link protocol version	Revision ID	0x11 (Version 1.1)
Anzahl Prozessdaten (PD) vom Device zum Master	Number of process data (PD) from the device to the master	ProcessDataIn	0x10 (2 byte)
Anzahl Prozessdaten (PD) vom Master zum Device	Number of process data (PD) from the master to the device	ProcessDataOut	0x00 (0 bit)
Hersteller ID	Manufacturer ID	Vendor ID	0x030B (779)
Geräte Identifikation	Device identification	Device ID	0x009C43 (40003)

Übertragungsraten / Transfer times	
Zyklus Prozessdaten mit Master V1.0 Process data cycle with master V1.0	Anzahl PD x Master Zykluszeit = 2 x 1 ms = 2 ms Number of PD x master cycle time = 2 x 1 ms = 2 ms
Zyklus Prozessdaten mit Master V1.1 Process data cycle with master V1.1	Master Zykluszeit = 1 ms Master cycle time = 1 ms

### 5.2 Process data

The process data are transmitted cyclically.

The sensor outputs a signed integer value (**16 bits**) via the IO-Link interface. This integer value is the absolute angle related to the factory default null point. The resolution of position data is 14 bit over 360°.

The factory default null value can be shifted via the parameter "Null point offset".

The validity of the process data is confirmed by a PD Valid Information (process data valid).

In case of an error, if no magnet can be detected, the **error value 0x7FFC** is put out and the data is labeled as invalid.

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## 5.3 Parameter Data

Device parameters are exchanged non-cyclically and on request of the IO-Link master. Parameter values can be written into the sensor (Write) or device states can be read out of the sensor (Read) by means of the "On-Request Data Objects".

### 5.3.1 Identification data

	Index	Sub-index	Parameter	Zugang Access	-	Standardwert Default value
Identification data	0x0010	0	Vendor name	Read only	-	Novotechnik Messwertaufnehmer OHG
	0x0011	0	Vendor Text	Read only	-	www.novotechnik.de
	0x0012	0	Product name	Read only	-	z.B. / f.e. RFC-4851-214-A11-501
	0x0013	0	Product ID	Read only	-	400xxxxxx (see product label „P/N“)
	0x0014	0	Product text	Read only	-	Magnetic Rotary Sensor
	0x0015	0	Serial number	Read only	-	see product label B/N xxxxxx
	0x0016	0	Hardware revision	Read only	-	HW xx.xx
	0x0017	0	Firmware revision	Read only	-	FW xx.xx

### 5.3.2 Geräteparameterdaten / Device parameter data

	Index	Sub-index	Parameter	Zugang Access	Einstellbarkeit Parameter management	Standardwert Default value
Parameters	0x000C	0	Device Access Locks	Read/Write	Ja / Yes	0 (not locked)
	0x000D	0	Profile Characteristics	Read only	Nein / No	0x00 01 80 00 80 02 80 03
	0x000E	0	PD Input Descriptor	Read only	Nein / No	0x02 0x10 0x00
	0x0018	0	Application Specific Tag	Read/Write	Ja / Yes	* * *
	0x0040	0	Null point offset	Read/Write	Ja / Yes	0
	0x0041	0	Averaging	Read/Write	Ja / Yes	0 (not activated)
	0x0042	0	Direction setting	Read/Write	Ja / Yes	0
	0x0050	0	Position	Read only	Nein / No	(actual position value, 16 bit)
	0x0060	0	Measuring range	Read only	Nein / No	360
	0x0061	0	Resolution	Read only	Nein / No	16384

#### Device Access Locks

With this parameter, it is possible to active or deactivate the function of the parameter manager.  
In order to lock the parameter manager, **bit # 1** of the 2 byte value must be set to "1" (locked), to unlock bit # 1 is set to "0".

#### Profile Characteristics

This parameter indicates which profile is supported by the IO-Link device. The RFC-4800 sensor supports the Smart Sensor Profile:

Profile Identifier -> DeviceProfileID: 0x0001 "Smart Sensor Profile"  
 Profile Identifier -> FunctionClassID: 0x8000 "Device Identification"  
 Profile Identifier -> FunctionClassID: 0x8002 "ProcessDataVariable"  
 Profile Identifier -> FunctionClassID: 0x8003 "Sensor Diagnosis"

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### PD Input Descriptor

This parameter describes the composition of the process data variables used. The RFC-4800 sensor processes the process data variable as follows:

Subindex 1: 0x021000  
 0x02 -> Data type = U IntegerT  
 0x10 -> Data size = 16 bits  
 0x00 -> Offset = 0 bits

### Application Specific Tag

This parameter makes it possible to assign the IO-Link device an arbitrary, 32-byte string. This can only be used by the customer for application-specific identification and applied in the parameter manager. The entire object is accessed via subindex 0.

### Null point offset

Same as process data value, this parameter is a signed **16-bit** decimal value. The null point offset can be done without magnet / position marker. The value is added to the factory default null point as a simple offset (maximum value corresponding resolution, max. 16384 Increments). Access takes place via subindex 0.

### Direction setting

With this parameter the direction of rotation can be set.  
 0: cw with view on the magnet / position marker  
 1: ccw with view on the magnet / position marker

### Averaging

The behavior of the output filter can be adjusted for smoothing the signal noise of the output signal. This allows to achieve a better repeatability.

0: without moving average  
 1: moving average across 4 values  
 2: moving average across 16 values  
 3: moving average across 64 values

### 5.3.3 Error Messages while Parametrization

The following IO-Link error messages are stored if parametrization fails:

Fehler Code Error code	Fehlermeldung	Error Message
0x8011	Index nicht vorhanden	Index not available
0x8012	Subindex nicht vorhanden	Subindex not available
0x8020	Dienst momentan nicht verfügbar	Service temporarily not available
0x8030	Wert außerhalb Wertebereich	Value out of range

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### **5.4 Events: Warnings and Errors**

When an event occurs, the sensor sets the so-called "Event Flag". During an event is read by the master, no parameter data can be exchanged.

<b>Code code</b>	<b>Klassifizierung Characteristic</b>	<b>Beschreibung</b>	<b>Description</b>
0x8C10 0x8C30	Warnung/ <i>Warning</i>	Magnet / Positionsgeber ist unterhalb oberhalb des definierten Arbeitsabstandes	<i>Magnet / position marker is below above of the defined working distance</i>
0x8C50	Fehler / <i>Error</i>	Magnet / Positionsgeber fehlt	<i>Magnet / position marker is missing</i>
0x8C20	Fehler / <i>Error</i>	Interner Systemfehler	<i>Internal system failure</i>
0x8C60	Fehler / <i>Error</i>	EEPROM Speicherfehler	<i>EEPROM storage failure</i>

### **5.5 Storage of Parameter Data**

The device parameters that have been set by the configuration tool and IODD are stored non-volatile. They can be changed and stored again in the sensor any time via the configuration tool or by the PLC. The device acknowledges any change of the parameters to the master.

### **5.6 Factory Reset**

Resetting to factory default settings is done with command 0x80 in index 0x0002 subindex 00.