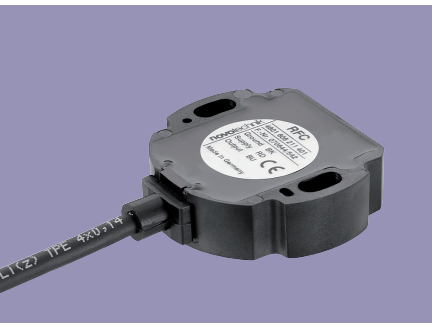
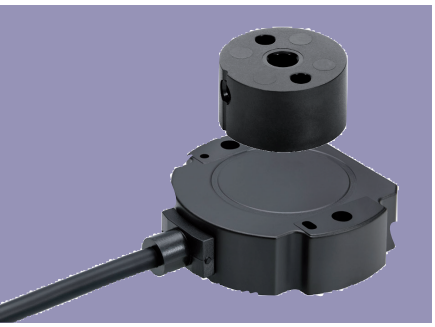
novotechnik
Siedle Group

NOVOHALL
Rotary Sensor
touchless technology
transmissive

Series RFC4800
analog





Special features

- fully touchless - no shaft or seals to wear
- measure directly through any non-ferromagnetic material
- electrical range up to 360°
- linearity ±0.5 %
- simple mounting
- large allowable radial offset for magnetic pickup
- protection class IP67/IP69k
- single and redundant versions
- unlimited mechanical lifetime
- resolution 12 bit
- wide temperature range -40°C up to +125°C
- optimized versions for mobile or industrial applications
- single channel or redundant versions
- for digital interface versions - see separate data sheet

The RFC 4800 utilizes a separate magnet or magnetic position marker, attached to the rotating shaft to be measured.

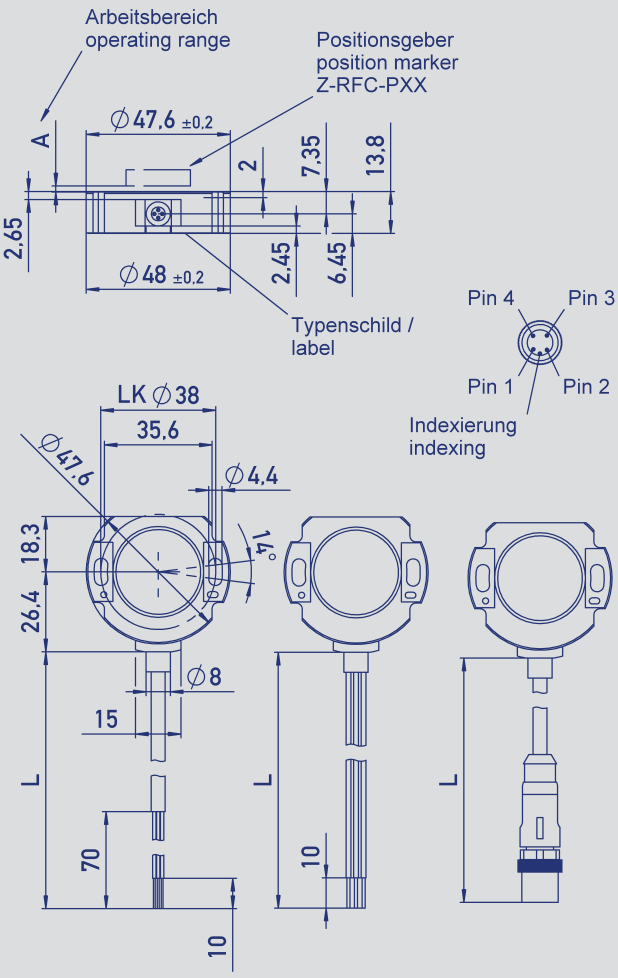
The orientation of the magnetic field is measured and an analog voltage representing the angle is the output signal.

The two-part design, with the RFC sensor itself, and its magnetic position marker, offers great flexibility when mounting. The absence of shaft and bearing makes the assembly much less sensitive to axial and radial application tolerances. Measurements can be made transmissively through any non-ferromagnetic material.

The housing is made of high grade temperature-resistant plastic material. Elongated holes allow for simple mounting and easy mechanical adjustment. The sensor is totally sealed and is not sensitive to dust, dirt or moisture.

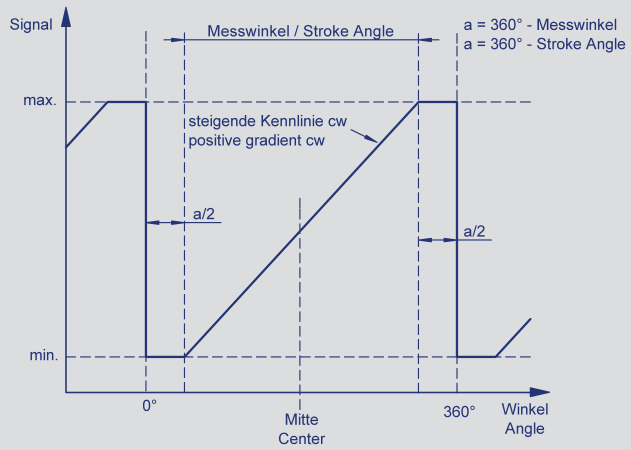
Electrical connection is made via a shielded cable or lead wires, or by optional M12 connector.

Description	
Housing	high grade, temperature resistant plastic
Electrical connections	shielded cable AWG 26 (0.14 mm²) unshielded cable AWG 26 (0.14 mm²) lead wires AWG 20 (0.5 mm²) M12 connector

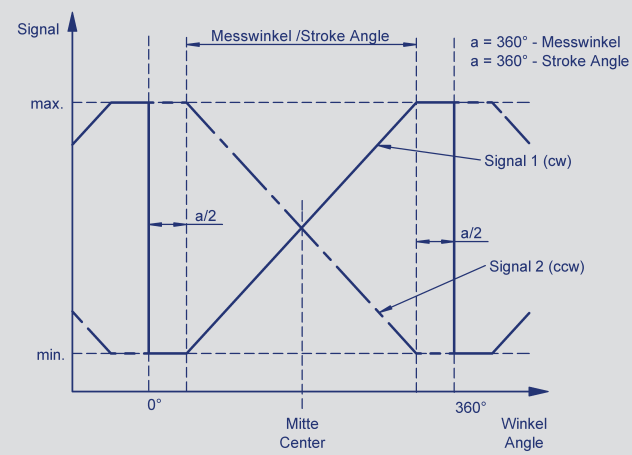


When the indicator on the position marker is pointed towards the cable, the sensor output is in an electrical center position.

Output characteristics single channel (code 6 _ _)

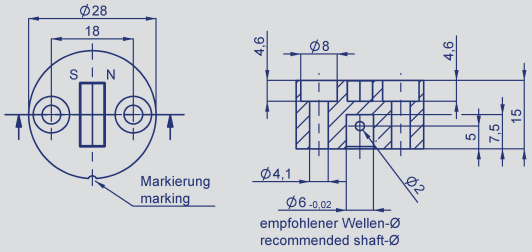


Output characteristics redundant (code 7 / 8 _ _)

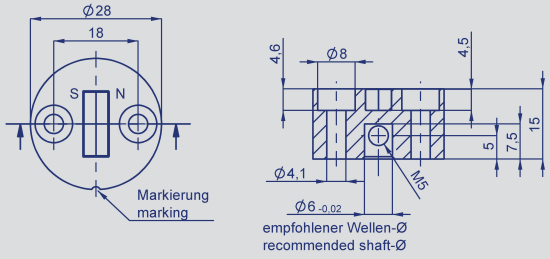


Position marker examples

Position marker Z-RFC-P02 (accessories)



Position marker Z-RFC-P08 (accessories)



Connection assignment

One-channel versions

Signal	Lead wires	Cable	M12
Supply voltage	Red	Green	1
GND	Black	Braun	3
Signal output	Blue	White	2
Shield	-	Shield (if existing)	Shield
not assigned	-	Yellow	4

Multi-channel versions

Signal	Lead wires	Cable	M12
Supply voltage 1	Red	Green	1
GND 1	Black	Braun	3
Signal output 1	Blue	White	2
Supply voltage 2	Red/White	-	-
GND 2	Black/White	-	-
Signal output 2	Blue/White	Yellow	4
Shield	-	Shield (if existing)	Shield

For position marker options and data, see separate data sheet. Novotechnik-approved magnets are used to achieve specified performance.

Technical Data - Versions for Industrial Applications

Design optimized for use in machine and plant applications. High reliability. Simple interface to PLC. Many options.

Type designations	**RFC - 4801 - _ _ _ - 2 _ _ - _ _ _** **ratiometric**	**RFC - 4801 - _ _ _ - 1 1 _ - _ _ _** **voltage**	**RFC - 4801- _ _ _ - 1 2 _ - _ _ _** **current**	
Mechanical Data				
Dimensions	see dimension drawing			
Mounting	with 2 M4 screws (included)			
Maximum torque of mounting screws	250			Ncm
Mechanical travel	360 continuous			°
Maximum operational speed	unlimited			
Weight	ca. 50			g
Electrical Data				
Supply voltage Ub	5 (4.5 ... 5.5)	24 (18 ... 30)	24 (18 ... 30)	VDC
Current consumption (w/o load)	typical 15 (typ. 8 on request) per channel			mA
Reverse voltage	yes, supply lines	yes	yes	
Short circuit protection	yes (vs. GND and Ub)			
Measuring range	0 ... 30 up to 0 ... 360, in 10° steps			°
Number of channels	1 / 2	1	1	
Update rate	typ. 5			kHz
Resolution	12			bit
Repeatability	0.1			°
Hysteresis	< 0.1			°
Independent linearity	≤ 0.5			±% FS
Output signal	ratiometric to supply voltage (Ub) 0.25...4.75 V 0.5...4.5 V (load >1 kΩ)	0.1...10 V (load >10 kΩ)	4...20 mA (load ≤ 500 Ω)	
Temperature error at angular range 30 up to 170°	±0.825	±1.24	±1.24	% FS
Temperature error at angular range 180 up to 360°	±0.41	±0.66	±0.66	% FS
Insulation resistance (500 VDC)	≥ 10			MΩ
Cross-section cable	AWG 26, 0.14			mm^2
Environmental Data				
Temperature range	-40...+125	-40...+125	-40...+105	°C
			-40...+125, if Ub ≤ 28 V	°C
	generally -25...+85 with M12 connector			°C
Vibration (IEC 60068-2-6)	5...2000			Hz
	Amax = 0.75			mm
	amax = 20			g
Shock (IEC 60068-2-27)	50 (6 ms)			g
Life	mechanically unlimited			
MTTF	290 (single)	98	111	years
	288 (per channel) partly redundant			years
Functional Safety	When using our products in safety-related systems, please contact us			
Protection class (DIN EN 60529)	IP67 / IP6k9k (IP67 with M12 connector)			
EMC compatibility	EN 61000-4-2 electrostatic discharges (ESD) 4kV, 8kV EN 61000-4-3 electromagnetic fields 10V/m EN 61000-4-4 electrical fast transients (burst) 1kV EN 61000-4-6 conducted disturbances, induced by RF fields 10V/m eff. EN 61000-4-8 power frequency magnetic fields 3A/m EN 55011/EN 55022/A1 radiated disturbances class B			

Ordering specifications
Versions for Industrial Applications

Preferred types printed in bold:
- reduced delivery time for up to 25 pcs
- best low volume pricing

Oprating voltage
1: Ub = 24 V (18...30 V)
2: Ub = 5 V (4.5...5.5 V)

Output signal Ub = 24 V
1: 0.1 ... 10 V (only one-channel)
2: 4 ... 20 mA (only one-channel)

Output signal Ub = 5 V
1: 0.25 ... 4.75 V ratiometric to supply voltage
2: 0.5 ... 4.5 V ratiometric to

Output characteristics
1: rising CW
2: rising CCW
3: crossed output channel 1 rising CW (partly redundant)

Electrical connections
201: round cable 4-pol., 0.5 m shielded
202: round cable 4-pol., 1 m shielded
206: round cable 4-pol., 3 m shielded
210: round cable 4-pol., 5 m shielded
220: round cable 4-pol., 10 m shielded
501: M12 connector with round cable, length = 0.21 m, shielded
Cable versions and assembled connectors on request

R F C – 4 8 0 1 – 6 3 6 – 2 1 1 – 2 0 2

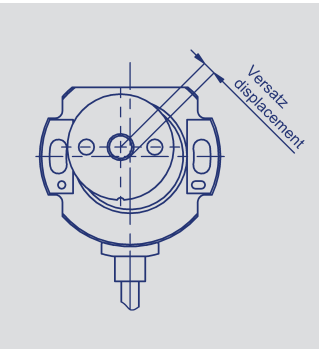
Measuring range
03: angle 0° ... 30° min.
...
06, 12, 18, 24, 36
...
36: angle 0° ... 360° max.
Other angles on request

Number of channels
6: single output: three wires, one output
7: partly redundant: four wires, two outputs (only with 5 V version)

Series

Mechanical version
4801: elongated holes for mounting and adjustment
4802: round mounting holes

Lateral magnet offset	
Generally a lateral offset between the sensor and the position marker produces an additional linearity error. This is dependent upon the magnitude of the radial offset and the magnetic field strength of the selected magnet or magnetic marker.	
Working distance A / magnet constant	Z-RFC-P07: A = 0 ... 1.5 mm / magnet constant = 1.85°/mm2 / max. radial offset: ±1,5 mm Z-RFC-P08: A = 0 ... 4 mm / magnet constant = 0.8 °/mm2 / max. radial offset: ± 3 mm
Calculation linearity error	The maximum additional linearity error caused by lateral offset between the sensor and the position marker can be approximated as: Error [°] = magnet constant x (offset [mm])^2 Example: Z-RFC-P02: magnet constant = 0.8 °/mm^2; offset =0.5 mm Error [°] = 0.8°/mm^2 x (0.5 mm)^2 = 0.2



Technical Data - Versions for Mobile Applications

These versions are optimzed for the high requirements in mobile applications.
Tested to the highest requirements as ISO-pulse and high interferences to ISO 11452.

Type designations	**RFC - 4801 - _ _ _ - 2 _ _ - _ _ _** **ratiometric**	**RFC - 4801 - _ _ _ - 3 _ _ - _ _ _** **voltage**	**RFC - 4801- _ _ _ - 3 2 _ - _ _ _** **current**	
Mechanical Data				
Dimensions	see dimension drawing			
Mounting	with 2 M4 screws (included)			
Maximum torque of mounting screws	250			Ncm
Mechanical travel	360 continuous			°
Maximum operational speed	unlimited			
Weight	ca. 50			g
Electrical Data				
Supply voltage Ub	5 (4,5 ... 5,5)	12/24 (9...34)	12/24 (9 ... 34)	VDC
Current consumption (w/o load)	typical 15 (typ. 8 on request) per channel			mA
Reverse voltage protection	yes, supply lines	yes	yes	
Short circuit protection	yes (vs. GND and Ub)			
Measuring range	0... 30 up to 0 ... 360, in increments of 10°			°
Number of channels	1 / 2	1 / 2	1	
Update rate	typ. 5			kHz
Resolution	12			bit
Repeatability	0.1			°
Hysteresis	< 0.1			°
Independent linearity	≤ 0.5			±% FS
Output signal	ratiometric to supply voltage (Ub) 0.25...4.75 V 0.5...4.5 V (load >1 kΩ)	0.25...4.75 V 0.5...4.5 V (load >10 kΩ)	4...20 mA (max. load 250 Ω)	
Temperature error at angular range 30 up to 170°	±0.825	±1.24	±1.24	% FS
Temperature error at angular range 180 up to 360°	±0.41	±0.66	±0.66	% FS
Insulation resistance (500 VDC)	≥ 10			MΩ
Cross-section cable	AWG 26, 0.14			mm^2
Cross-section lead wires	AWG 20, 0.5			mm^2
Environmental Data				
Temperature range	-40...+125 -25...+85 with M12 connector	-40...+125	-40...+105 -40...+125, if Ub ≤ 28 V	°C °C
Vibration (IEC 60068-2-6)	5...2000 Amax = 0.75 amax = 20			Hz mm g
Shock (IEC 60068-2-27)	50 (6 ms)			g
Life	mechanical unlimited			
MTTF (ISO 13849-1, parts count method, w/o load)	290 288 (partlly redundant) per channel 290 (fully redundant) per channel	91	109	years years years
Functional Safety	When using our products in safety-related systems please contact us			
Protection class (DIN EN 60529)	IP67 / IP6k9k (IP67 with M12 connector)			
EMC compatibility	ISO 11452-2 Radiated EM HF-fields, Absorber-hall 100V/m ISO 11452-4 BCI (Bulk current injection) 100mA CISPR25 Radiated emission GW5 SAE J1113-2 Conducted immunity level 2 SAE J1113-13 Packaging and handling 4-20kV SAE J1113-22 Radiated magnetic field 80 µT SAE J1113-26 AC power line electric field 15kV EN61000-4-2 Immunity to static discharges (ESD) 4kV, 8kV, 15 kV EN 55011/EN 55022/A1 radiated disturbances class B	ISO 11452-5 Radiated EM HF-fields, Stripline 300V/m ISO 11452-2 Radiated EM HF-fields, Absorber hall 100V/m ISO 7637-2 pulse 1a, 2a, 3a, 3b, 4, 5 CISPR25 Radiated emission GW5 ISO 7637-1/2/3 ISP TR10605 Packaging and handling + Component test 8kV/15kV ISO 7637-3 Transient transmission (on/off) SG3		

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Ordering specifications
Versions for Mobile Applications

Preferred types printed in bold:
- reduced delivery time for up to 25 pcs
- best low volume pricing

Operating voltage Ub
2: Ub = 5 V (4.5 ... 5.5 V)
3: Ub = 12/24 V (9.0 ... 34.0 V)

Output signal Ub = 5 V
1: 0.25 ... 4.75 V ratiometric to supply
2: 0.5 ... 4.5 V ratiometric to Ub

Output signal Ub = 12/24 V
2: 4 ... 20 mA (only single-channel)
4: 0.5 ... 4.5 V
5: 0.25 ... 4.75 V

Output characteristics
1: rising cw
2: rising ccw
3: crossed output channel 1 rising cw (partly redundant)
4: crossed output channel 1 rising cw (fully redundant)
Other characteristics on request

Electrical connection
251: round cable 4-pol., 0.5 m unshielded, one-channel. partlly redundant
252: round cable 4-pol., 1 m unshielded, one-channel, partly redundant
256: round cable 4-pol., 3 m unshielded, one-channel, partly redundant
401: lead wires 3 x 0.5 m (0.5 mm²), single
411: lead wires 4 x 0.5 mm (0.5 mm²), partly redundant
421: lead wires 6 x 0.5 m (0.5 mm²), fully redundant (only Ub = 5 V)
551: M12 connector with round cable, length = 0.21 m, unshielded version, one-channel and partly redundant
Cable versions and assembled connectors on request

R	F	C	–	4	8	0	1	–	6	3	6	–	2	1	1	–	2	5	2

Measuring range
03: angle 0° ... 30° min.
...
06, 12, 18, 24, 36
...
36: angle 0° ... 360° max.
Other angles on request

Number of channels
6: single output: three wires, one output
7: partly redundant: four wires, two outputs
8: fully redundant: six wires (two power, two ground), two outputs (only at Ub = 5 V)

Series

Mechanical version
4801: elongated holes for moluntig and adjustment
4802: round mounting holes

Required accessories

Position marker Z-RFC-P01, P/N 005660;
Position marker Z-RFC-P02, P/N 005661
(See position marker datasheet for working distances and other information)

Recommended accessories

Mating connector M12x1, EEM 33-88, 90 degree angle, IP67, P/N 005633:

Cable sets with mating connector M12x1, IP67:
cable length 2 m, EEM 33-32, P/N 005600;
cable length 5 m, EEM 33-62, P/N 005609;
cable length 10 m, EEM 33-97, P/N 005650.
MAP process control indicator with display.