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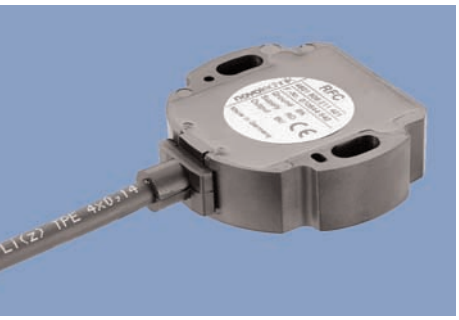
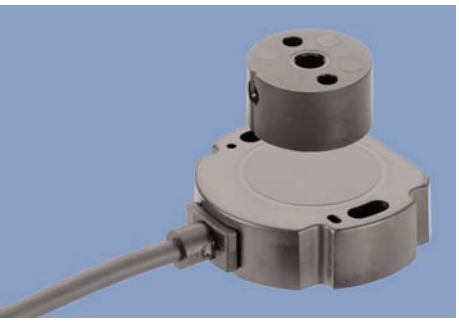
NOVOHALL
Angle Sensor
touchless technology
transmissive

Series RFC4800
analog





Special features

- touchless technology, magnetic measurement
- enables for transmissive measurements
- electrical range up to 360°
- simple mounting
- protection class IP67 /IP69k
- unlimited mechanical lifetime
- resolution 12 bit
- independent linearity ≤±0.5%
- wide temperature range -40° up to +125 °C
- lateral magnet offset up to ±3 mm
- optimized versions depending on use in general engineering or mobile applications
- single and redundant output versions
- Versions with digital interface see separate data sheet

The sensor utilizes the orientation of a magnetic field for the determination of the measurement angle, with a magnetic position marker attached to the application's rotating shaft. An analog output signal represents the calculated angle.

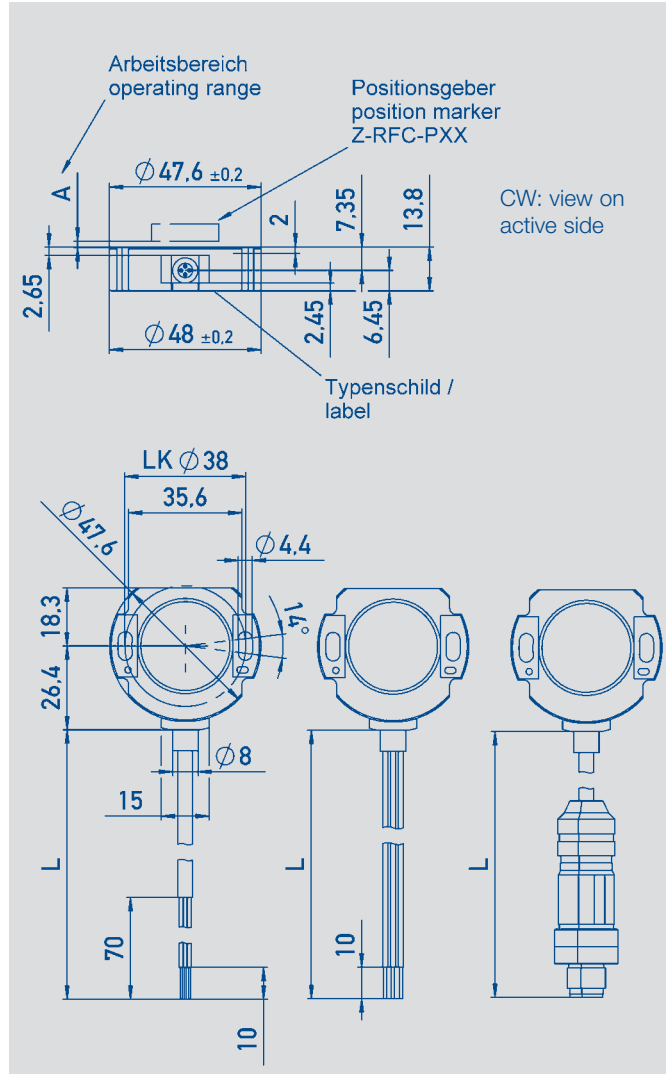
The housing is made of high grade temperature-resistant plastic material. Elongated holes allow for simple mounting and easy mechanical adjustment. The sensor is totally sealed and therefore it is not sensitive to dust, dirt or moisture.

The two-part design of the sensor Series RFC and its position marker offers the customer maximal flexibility when mounting the sensor.

Because the sensor uses a touchless technology with no shaft or bearings, application shaft offsets can be accomodated and measurements can be made transmissively through various non-magnetic materials such as plastic or aluminum.

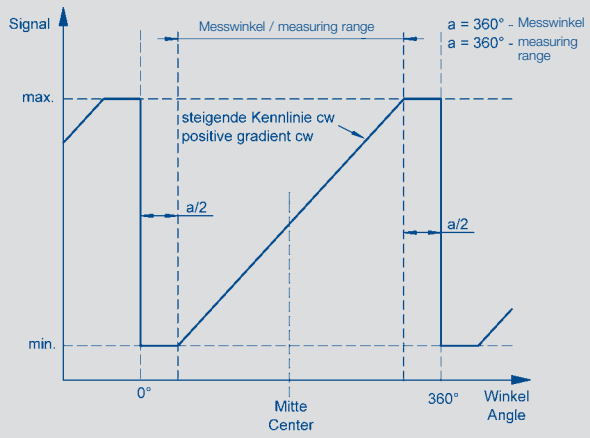
Electrical connection is made via a shielded cable or lead wires, alternatively via M12 connector.

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



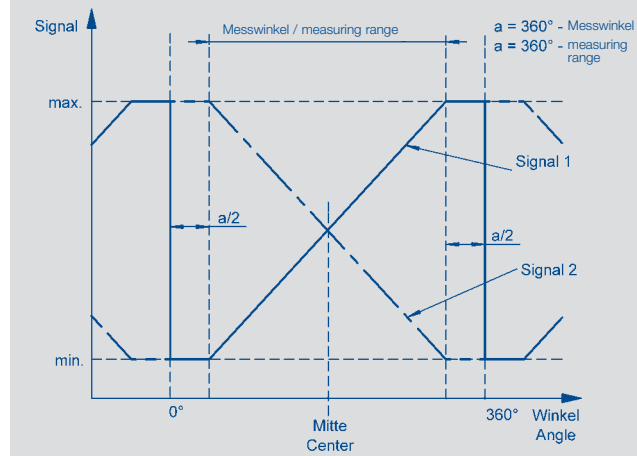
When the shaft marking is pointing to cable, the sensor is located in an electrical center position.

Output characteristic one-channel versions



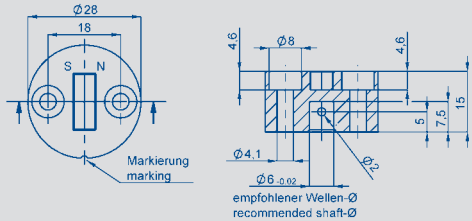
cw: view on sensor through position marker

Output characteristics multi-channel versions

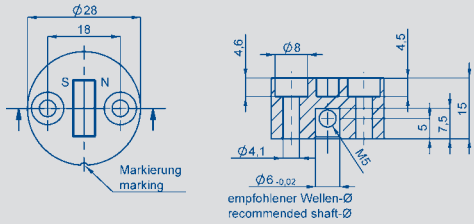


Position marker examples

Position marker Z-RFC-P02 (accessories)



Position marker Z-RFC-P08 (accessories)



Technical data and more position marker see data sheet Positionmarker_rotary.

Connection assignment

One-channel versions

Signal	Lead wires	Cable	M12
Supply voltage	red	green	1
GND	black	brown	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	brown	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

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Versions for use in General Engineering

Technical Data Versions for General Engineering
Design optimized for use in machine and plant engineering. High reliability, simple interface to PLC, high variety.

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)			
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, only supply lines	yes	yes	
Short circuit protection vs. GND and Ub	yes	yes	yes	
Measuring range	0 ... 30 up to 0 ... 360, in 10° steps		°	
Number of channels	1 / 2	1	1	
Update rate	5000 typ.			measur./s
Resolution	12 bit			
Repeatability	0,1			°
Hysteresis	< 0,1			°
Independent linearity	≤ 0,5 of signal range			%
Output signal	ratiometric to Ub 0.25...4.75 V 0.5...4.5 V (load ≥1 kΩ)	0,1...10 V (load ≥10 kΩ)	4...20 mA (burden max. 500 Ω)	
TC at measuring range 30 up to 170° TC at measuring range 180 up to 360°	typ. 100 typ. 50	typ. 150 typ. 80	typ. 150 typ. 80	ppm/K ppm/K
Insulation resistance (500 VDC)	≥ 10			MΩ
Cross-section cable	approx. 0.14			mm^2
Environmental Data				
Temperature range	-40...+125 generally -25...+85 with M12 connector	-40...+125	-40...+105 -40...+125, if Ub ≤ 28V	°C °C °C
Vibration (IEC 60068-2-6)	5...2000 A_{max} = 0.75 a_{max} = 20			Hz mm g
Shock (IEC 60068-2-27)	50 (6 ms)			g
Life	mechanically unlimited			
MTTF	290 (single) 209 (partially redundant)	98	111	years years
Protection class (DIN EN 60529)	IP67 / IP69k (not with M12 connector)		IP67	
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 General Engineering

Preferred types printed in bold:
- delivery time up to 25 pcs. within 10 working days
- no low volume surcharge

Operating voltage Ub
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 Ub
2: 0.5 ... 4.5 V ratiometric to Ub

Output characteristics
1: rising CW
2: rising CCW
3: Crossed output channel 1 rising / channel 2 falling CW

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

other cable lengths and assembled connectors on request

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

Series

Mechanical version
4801: Elongated hole mounting for fixation and adjustment
4802: Round hole mounting

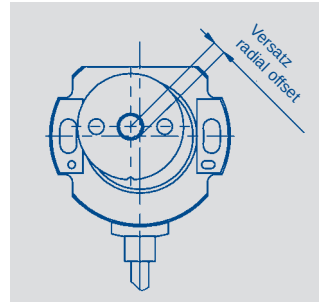
Number of channels
6: one-channel
7: redundant (two-channel) only at Ub=5V

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

Lateral magnet offset

Generally a lateral magnet offset of the sensor and position marker produces an additional linearity error.
This depends on the strength of the lateral magnet offset and the used position marker.

Working distance A / magnet constant	Z-RFC-P07: A = 0 ... 1.5 mm / magnet constant = 1.85°/mm^2 / max. radial offset: ±1,5 mm Z-RFC-P08: A = 0 ... 4 mm / magnet constant = 0.8 °/mm^2 / max. radial offset: ± 3 mm
Calculation linearity error	The maximum error which is caused by lateral offset between sensor and position marker can be approximated as follows: 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°



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Versions for Mobile Applications

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)			
Mechanical travel	360 continuous			°
Maximum operational speed	unlimited			
Weight	ca. 50			g
Electrical Data				
Supply voltage Ub	1 or 2 x 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, only supply lines	yes	yes	
Short circuit protection (vs. GND and +Ub)	yes			
Measuring range	0 ... 30 up to 0 ... 360, in 10° steps		°	
Number of channels	1 / 2	1 / 2	1	
Update rate	5000 typ.			measur./s
Resolution	12 bit			
Repeatability	0.1			°
Hysteresis	< 0.1			°
Independent linearity	≤ 0.5 of signal range			%
Output signal	ratiometric to 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 (burden max. 250 Ω)	
TC at measuring range 30 up to 170° TC at measuring range 180 up to 360°	typ. 100 typ. 50	typ. 150 typ. 80	typ. 150 typ. 80	ppm/K ppm/K
Insulation resistance (500 VDC)	≥ 10			MΩ
Cross-section cable Cross-section lead wires	approx. 0.14 0.5			mm^2 mm^2
Environmental Data				
Temperature range	-40...+125 generally -20...+85 with M12 connector	-40...+125	-40...+105 -40...+125, if Ub ≤ 28V	°C °C °C
Vibration (IEC 60068-2-6)	5...2000 A_{max} = 0.75 a_{max} = 20			Hz mm g
Shock (IEC 60068-2-27)	50 (6 ms)			g
Life	mechanical unlimited			
MTTF	290 (single) 209 (partially redundant) 164 (fully redundant)	91 (single) 86 (partially redundant)	109	years years years
Protection class (DIN EN 60529)	IP67 / IP69k (not 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: 80uT 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 ISO 7637-1/2/3 ISP TR10605 Packaging and handling + Component test: 8kV/15kV CISPR25 Radiated emission: GW5 ISO 7637-3 Transient transmission (on/off): SG3		

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Ordering specifications
Versions for Mobile Applications

Preferred types printed in bold:
- delivery time up to 25 pcs. within 10 working days
- no low volume surcharge

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 Ub
2: 0.5 ... 4.5 V ratiometric to Ub

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

Ouput characteristics
1: rising CW
2: rising CCW
3: crossed output channel 1 rising / channel 2 falling CW

Electrical connection
251: round cable 4-pol., length= 0.5 m unshielded, one-channel and partially redundant
252: round cable 4-pol.,length=1m unshielded, one-channel and partially redundant
256: round cable 4-pol., length=3m unshielded, one-channel and partially redundant
401: lead wires 3 x length = 0.5 m (0,5 qmm), single
421: lead wires 6 x length = 0.5 m (0,5 qmm), fully redundant (only Ub = 5 V)
551: M12 connector with round cable, length = 0.21 m, unshielded version, one-channel and partially redundant

other cable lengths and assembled connectors on request

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

Series

Mechanical version
4801: Elongated hole mounting for fixation and adjustment
4802: Round hole mounting

Numbers of channels
6: one-channel
7: redundant (two-channel)

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

Required accessories
Position marker Z-RFC-P01, P/N 005660;
Position marker Z-RFC-P02, P/N 005661
(Informationen about working distances and other position markers see separate data sheet)

Recommended accessories
Process-controlled indicators MAP... with display.

Available on request
Cable versions
Customized connectors
Specific angle ranges / characteristics
Other interfaces