

# NOVOHALL Angle Sensor touchless technology transmissive

Series RFC4800  
analog



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.

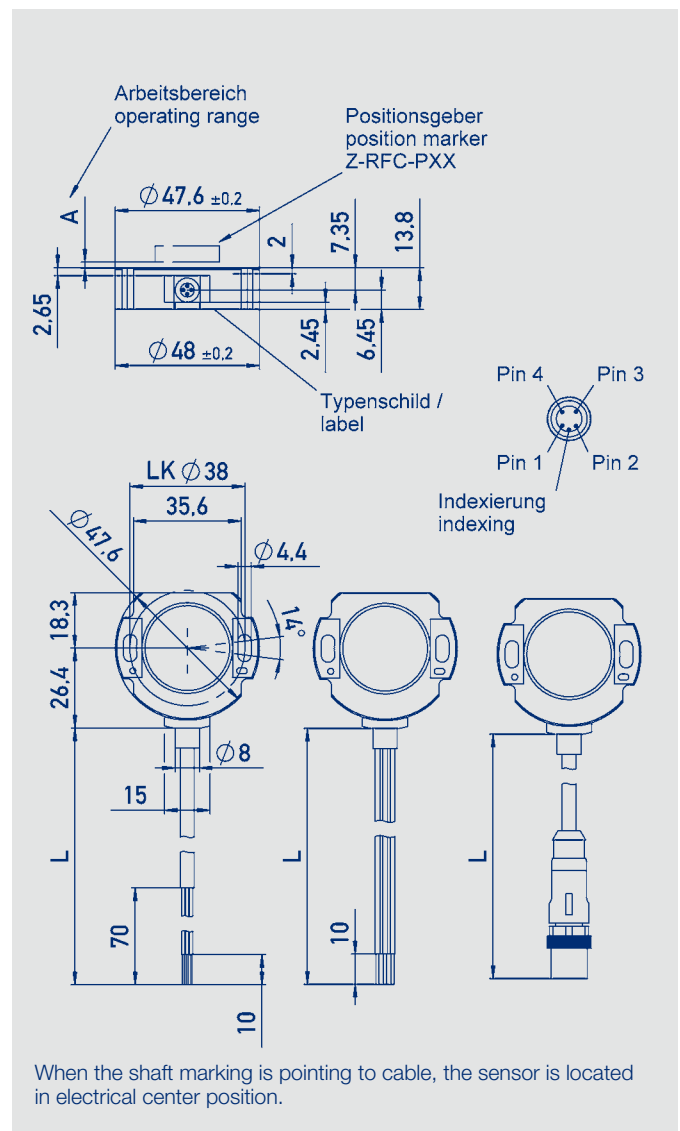
The two-part design of the sensor Series RFC and its position marker offers the customer maximal flexibility when mounting the sensor. Because the sensor uses a touchless technology with no shaft or bearings, application shaft offsets can be accommodated and measurements can be made transmissively through various non-magnetic materials such as plastic or aluminium.

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

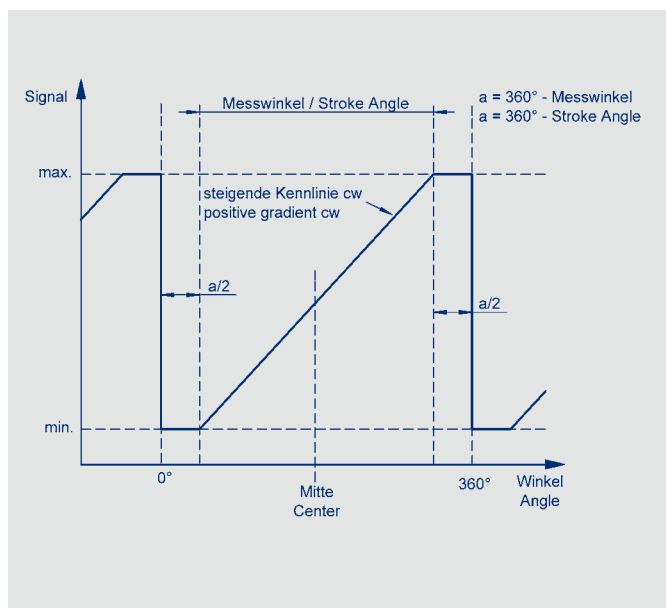
## Special features

- touchless technology, magnetic measurement
- enables for transmissive measurements
- electrical range up to 360°
- simple mounting
- protection class IP67 /IP6k9k
- unlimited mechanical lifetime
- resolution 12 bit
- independent linearity <±0.5%
- wide temperature range -40 °C 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

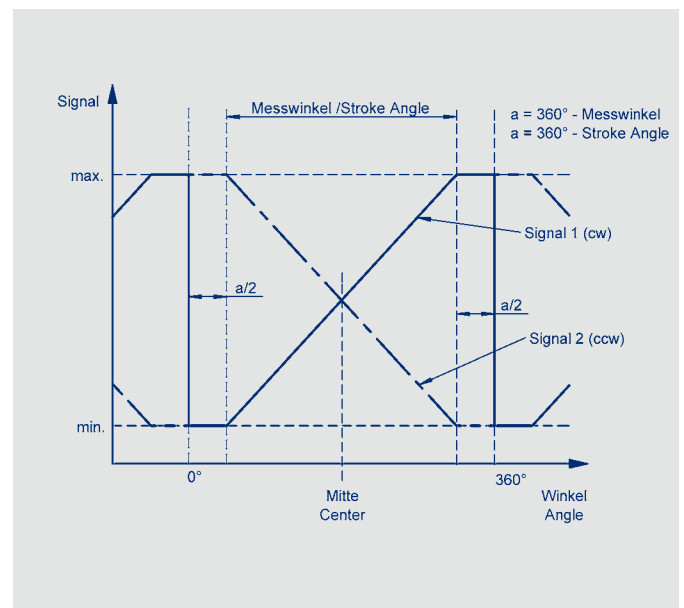
Description	
Housing	high grade, temperature resistant plastic
Electrical connections	shielded cable AWG 26 (0.14 mm <sup>2</sup> ) unshielded cable AWG 26 (0.14 mm <sup>2</sup> ) lead wires AWG 20 (0.5 mm <sup>2</sup> ) M12 connector



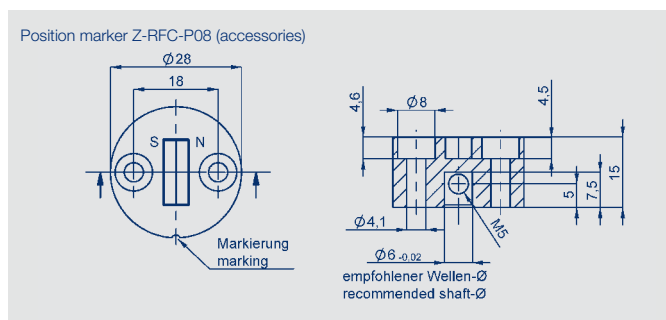
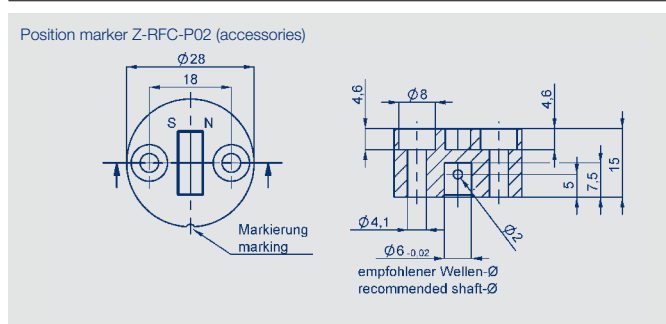
Output characteristics single (code 6 \_\_)



Output characteristics redundant (code 7 / 8 \_\_)



### Position marker examples



### 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

Technical data and more position marker see data sheet  
Positionmarker\_rotary. Only Novotechnik approved magnets  
may be used.

#### 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	
<b>Mechanical Data</b>				
Dimensions	see dimension drawing			
Mounting	with 2 M4 screws (included)			
Starting torque of mounting screws	250			Ncm
Mechanical travel	360 continuous			°
Maximum operational speed	unlimited			
Weight	ca. 50			g
<b>Electrical Data</b>				
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 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)	
Temperature error at measuring range 30 up to 170°	±0,825	±1,24	±1,24	% FS
Temperature error at measuring 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			mm²
<b>Environmental Data</b>				
Temperature range	-40...+125	-40...+125	-40...+105 -40...+125, if Ub ≤ 28 V	°C °C °C
	generally -25...+85 with M12 connector			°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	mechanically unlimited			
MTTF	290 (single) 288 (per channel) partly redundant	98	111	years years
Functional Safety	When using our products in safety-related systems, please contact us			
Protection class (DIN EN 60529)	IP67 / IP6k9k (not 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 General Engineering

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

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

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

Series

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

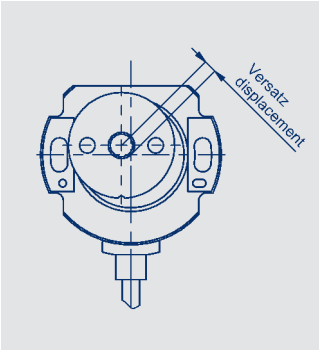
Measuring range  
03: angle 0° ... 30° min.  
...  
**06, 12, 18, 24, 36**  
...  
36: angle 0° ... 360° max.  
Other angles on request

Number of channels  
**6: single output 1 x Ub / 1 x output**  
**7: partly redundant 1 x Ub / 2 x output (only at Ub = 5 V)**

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°/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 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 °/mm²; offset =0.5 mm Error [°] = 0.8°/mm² x (0.5 mm)² = 0.2



#### Technical Data Versions for Mobile Applications

These versions are optimized 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	
<b>Mechanical Data</b>				
Dimensions	see dimension drawing			
Mounting	with 2 M4 screws (included)			
Starting torque of mounting screws	250			Ncm
Mechanical travel	360 continuous			°
Maximum operational speed	unlimited			
Weight	ca. 50			g
<b>Electrical Data</b>				
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, 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 / 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 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)	
Temperature error at measuring range 30 up to 170°	±0,825	±1,24	±1,24	% FS
Temperature error at measuring 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			mm²
Cross-section lead wires	AWG 20, 0.5			mm²
<b>Environmental Data</b>				
Temperature range	-40...+125	-40...+125	-40...+105 -40...+125, if Ub ≤ 28 V	°C °C °C
	generally -25...+85 with M12 connector			
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 (partly 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 (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 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		



## 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 $U_b$

- 2:  $U_b = 5\text{ V}$  (4.5 ... 5.5 V)  
3:  $U_b = 12/24\text{ V}$  (9.0 ... 34.0 V)

### Output signal $U_b = 5\text{ V}$

- 1: 0.25 ... 4.75 V ratiometric to  $U_b$   
2: 0.5 ... 4.5 V ratiometric to  $U_b$

### Output signal $U_b = 12/24\text{ V}$

- 2: 4 ... 20 mA (only one-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, partly 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 mm<sup>2</sup>), single  
411: lead wires 4 x 0.5 m (0.5 mm<sup>2</sup>), partly redundant  
421: lead wires 6 x 0.5 m (0.5 mm<sup>2</sup>), fully redundant (only  $U_b = 5\text{ V}$ )  
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**

Series

Mechanical version

- 4801: Elongated hole mounting for fixation and adjustment  
4802: Round hole mounting

### 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 1x  $U_b$  / 1 x output  
7: partly redundant 1 x  $U_b$  / 2 x output  
8: fully redundant 2 x  $U_b$  / 2 x output (only at  $U_b = 5\text{ V}$ )

## 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

Connector M12x1, EEM 33-88,  
IP67, P/N 005633:

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