# RA & RO SERIES ROTATIONAL MEASUREMENT TRANSDUCER DATASHEET

**Rotational measurement transducers**
**RO Series for 360° or RA Series for**
**limited angle measurement**

**Rota's new Rotational Measurement** transducers for continuous zero-contact angle monitoring.

## BENEFITS

- Non-contacting measurement with large distance tolerance between sensor and rotating magnet
- Easy and quick to fit
- Compact assembly - 10 mm thick
- Available as single-piece or two-piece hinged retrofittable design

## PERFORMANCE

- Full 360° or limited angle measurement
- Up to 700 rpm measurement
- Absolute signal output
- Solid-state, zero wear
- 0.2° resolution
- Exceeds ECE R10 Automotive EMC Specifications
- High vibration ratings

## ENCLOSURE

- Nylon 12 Plastic enclosure as standard
- Encapsulated electronics
- Sizes available to fit around ≤ 76.2 mm [3"], ≤ 127 mm [5"], ≤ 177.8 mm [7"] shafts
- 316 Stainless steel subsea version available

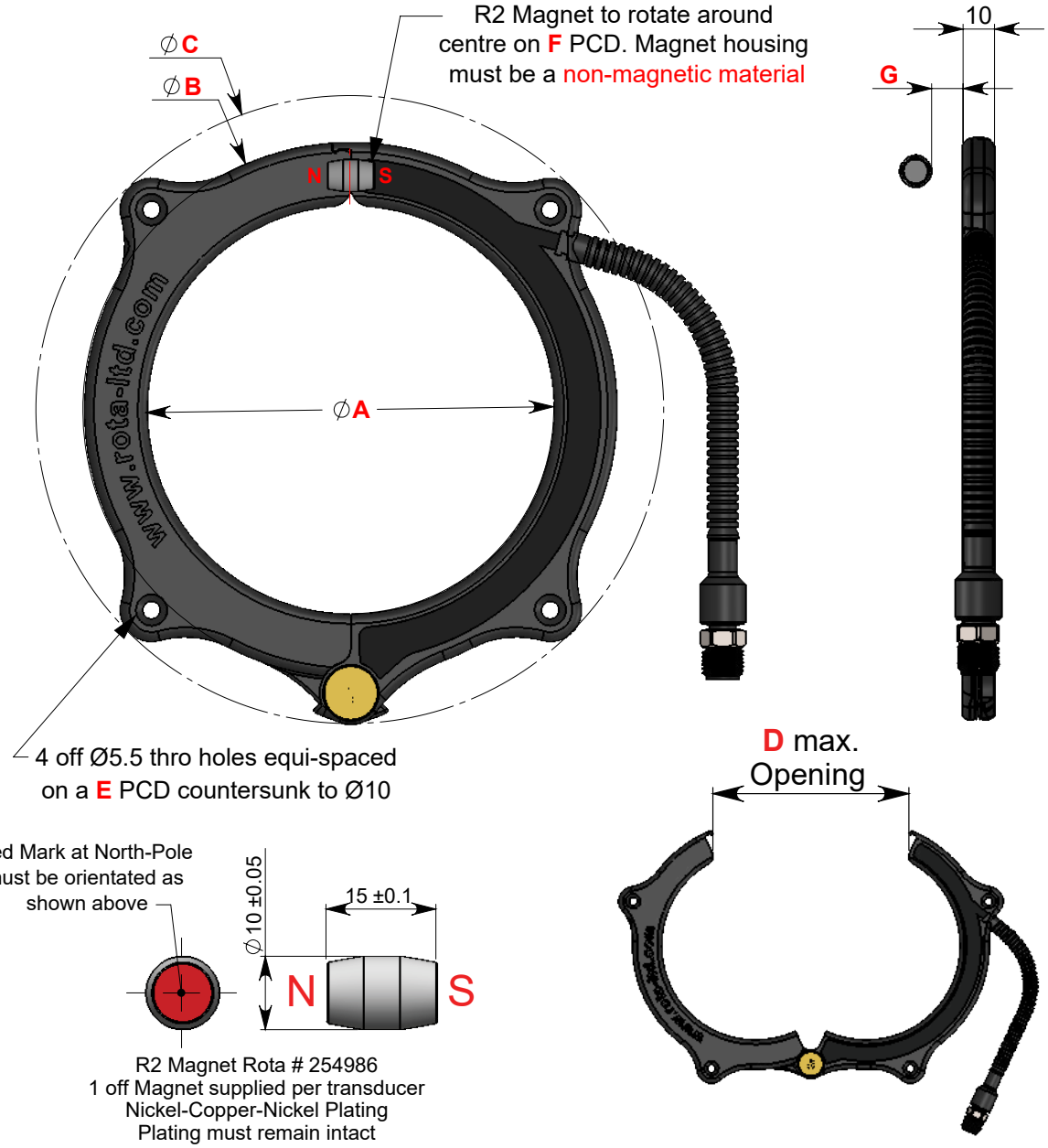
## OUTPUTS

- Analogue Voltage/Current/PWM options
- CANbus SAE J1939, CANopen and ISOBUS

## TERMINATION

- AMP, Deutsch DT & DTM connectors with Rota un-mated IP68/IP69K pins
- Cable-mounted IP69K M12

# SENSOR DIMENSIONS FOR UP TO 360° MEASUREMENT

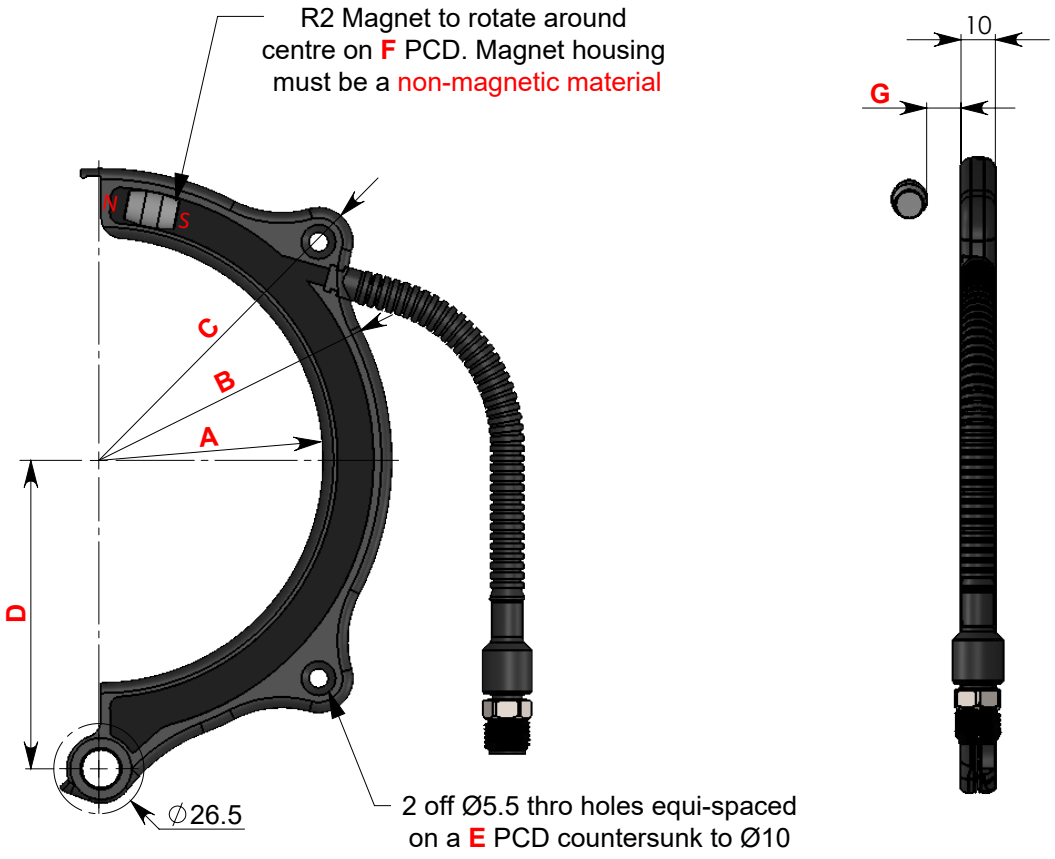



| Sensor Size Code | A - ID (mm) | B - OD (mm) | C - Footprint Dia (mm) | D - Sensor Opening (mm) | E - Mounting Holes PCD (mm) | F - Magnet PCD (mm) | G - Optimal Magnet Distance* (mm) |
|---|---|---|---|---|---|---|---|
| **80P** | 80 | 116 | 148 | 90 | 128 | 99 | 10 ±2 |
| **130P** | 130 | 170 | 200 | 135 | 180 | 149 | 12 ±3 |
| **182P** | 182 | 220 | 250 | 185 | 230 | 199 | |

*Magnet distance to give optimal output resolution. Distance given is for a sensor installed on a magnetic surface. Please see page 4 for more information.

# SENSOR DIMENSIONS FOR UP TO 160° MEASUREMENT

For measurement of angles up to 150° or 160° the RA Series sensor will be supplied as a half-moon design as below.




| Sensor Size Code | Max. Angle** | A (mm) | B (mm) | C (mm) | D (mm) | E (mm) | F (mm) | G - Optimal Magnet Distance* (mm) |
|---|---|---|---|---|---|---|---|---|
| **80P** | 150° | 40 | 58 | 74 | 64 | 128 | 99 | 10 ±2 |
| **130P** | 160° | 65 | 85 | 100 | 90 | 180 | 149 | 12 ±3 |
| **182P** | 160° | 91 | 110 | 125 | 115 | 230 | 199 | |

*Magnet distance to give optimal output resolution. Distance given is for a sensor installed on a magnetic surface. Please see page 4 for more information.

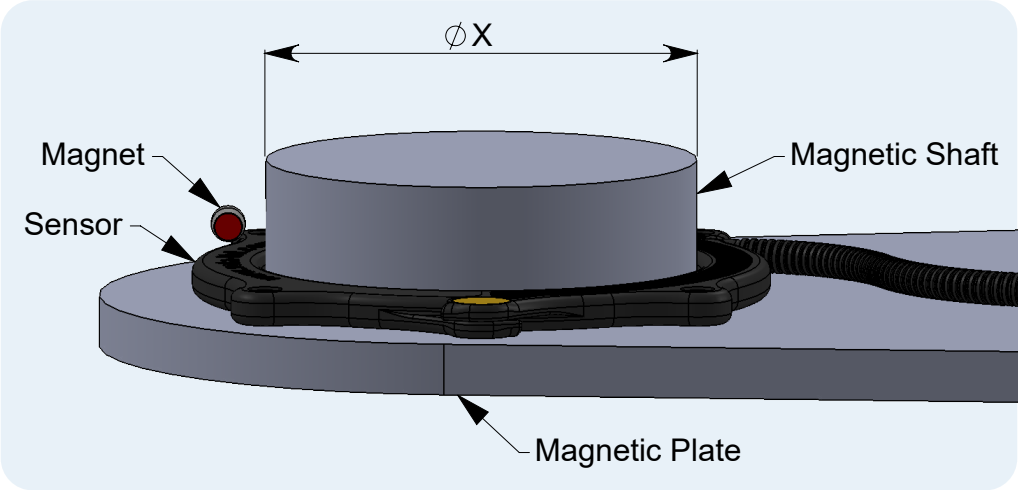
Optimal magnet distances given on pages 2 & 3 provide the best possible signal resolution (0.2°). Distances given in the tables on pages 2 & 3 are for sensors installed on a magnetic surface with no other magnetic material near the sensor or magnet.

The sensor will operate with the magnet closer than the optimal distance, but accuracy decreases. 3 mm minimum separation is required.

Distance tolerance can be increased by installing the sensor on a non-magnetic surface, or using a spacer between sensor and magnetic mounting surface.

Magnetic material within 40 mm of the surface of the magnet or sensor will affect the optimal magnet distance and tolerance.

A magnetic shaft that fills the sensor ID will reduce the tolerance on the optimal magnet distance. E.g., for a 130 mm ID sensor with a magnetic shaft where X = 127 mm [5”], the optimal magnet distance will be 11 ±2 mm.




For assemblies where X is ≥25 mm smaller than the sensor ID there will be no change to the optimal magnet distance given on pages 2 & 3.

Other magnetic material around the magnet (above or to the side) will also affect the required magnet distance. For assemblies with additional magnetic material, please contact Rota.

# CABLE-MOUNTED PLASTIC CONNECTORS

Rota's Rotational Measurement Transducers are supplied with unscreened PVC or PUR cables, with protective Polypropylene conduit. Both cable options can be supplied with the following Deutsch or AMP connector options.

All Deutsch and AMP connectors supplied with solid nickel-plated brass Rota pins for un-mated IP68 sealing.

| Connector Model Rota pins for DT | Rota Order Code* | Connector Model Rota pins for DTM | Rota Order Code* | Connector Model Rota pins for AMP Superseal | Rota Order Code* | Connector Model M12** | Rota Order Code |
|---|---|---|---|---|---|---|---|
| DT04 2-pin | 2RT | DTM04 2-pin | 2RM | 282104-1 2-pin | 2RP | M12 4-pin | 4BH |
| DT04 3-pin | 3RT | DTM04 3-pin | 3RM | 282105-1 3-pin | 3RP | M12 5-pin | 5BH |
| DT04 4-pin | 4RT | DTM04 4-pin | 4RM | 282106-1 4-pin | 4RP | M12 90° 4-pin | 4B9 |
| DT04 6-pin | 6RT | DTM04 6-pin | 6RM | 282107-1 5-pin | 5RP | M12 90° 5-pin | 5B9 |
| DT04 8-pin | 8RT | DTM04 8-pin | 8RM | 282108-1 6-pin | 6RP | | |

* For pre-fitted pins/contacts only (no connector body), codes change as follows: '3RT' becomes '3RC', '3RM' becomes '3RCM', '4RP' becomes '4RCP' etc.

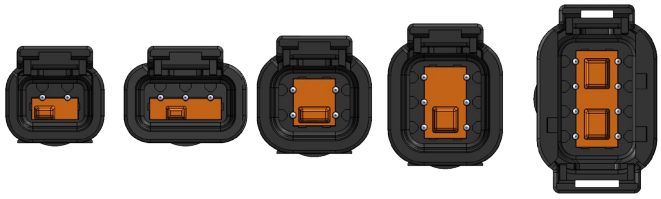
**M12 connector available with PUR cable only.

## Rota/Deutsch RT - Superior Sealing

Deutsch connector with Rota machined male pins
IP69k un-mated (Steam Jet Clean 99°C at 150 Bar)
IP68 un-mated (3 m for 90 minutes)
Enables transducer's Deutsch connector to be left safely un-mated

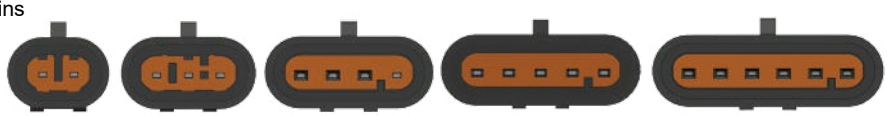
## Rota/Deutsch RM - Series

Miniature Rota pins for smaller wire gauge applications
Operating Temperature:
-55°C to +125°C
IP68 un-mated (3 m for 90 minutes)



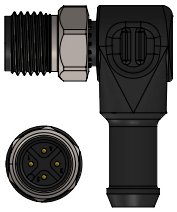
## AMP Superseal 1.5 RP - Series

AMP Superseal connector with Rota machined male pins
Operating Temperature:
-40°C to +125°C
IP68 rated when mated (3 m for 90 minutes)



## M12 Connector - Straight or 90 Degree

M12 A connector male pins
Operating Temperature:
-25°C to +90°C
IP67 & IP69K rated when mated



Subject to reasonable modifications due to technical advances

## 20G RMS VIBRATION RESISTANCE INCLUDING RESONANT FREQUENCIES

To assure an extended life for our products, Rota is one of only a few companies that exceed standard requirements during vibration testing. In particular, Rota sensors are tested at 20g (RMS) from 10-2000Hz (including resonant frequencies) and additionally held at 1g for one hour at resonant frequencies.

Rota's Rotational Measurement transducers will meet and exceed the requirements of the following IEC standards:

- IEC 60068-2-64 (Vibration, Broadband Random & Guidance) at 20g 10-2000Hz (RMS) in all 3 axes
- IEC 60068-2-6 (Vibration, Sinusoidal) at 20g 10-2000Hz in all 3 axes
- IEC 60068-2-27 (Shock) Total of 10 shocks at 100g over all 3 axes
- Resonant Frequency Search and Dwell Test - 10-2000Hz up to 7 found and each held @1g for 1 Hour

## OUTSTANDING EMC PERFORMANCE

Rota Rotational Measurement transducers meet some of the highest EMC standards worldwide, enabling safe and secure operation in electromagnetic environments whilst ensuring superior and reliable performance. All Rota Rotational Measurement transducers meet and exceed the requirements in the standards listed below.

- UN ECE Reg. 10.05: October 2014 (AUTOMOTIVE)
- EN ISO 14982:2009 (AGRICULTURAL AND FORESTRY MACHINERY)
- ISO 13766:2018 (EARTH-MOVING AND BUILDING CONSTRUCTION MACHINERY)

E11 10 R

| RA | 130 | P | 220 | R2 | 0.2 | A | R | 4RT | N | 0.3 | 1234 |
|---|---|---|---|---|---|---|---|---|---|---|---|

**Transducer Type**
**RO** = Continuous 360° rotation
**RA** = Limited angle measurement

**Inside Diameter (mm)**
**80**
**130**
**182**

**Housing Material**
**P** = Plastic (Nylon 12)

**Measurement Angle (°)**

**Magnet**
**R2** = 10 mm diameter, 15 mm long magnet

**Measurement Resolution (°)**

**Output Signal**

| | | |
|---|---|---|
| **A** | = Current 4 to 20 mA (3 Wire) | (13 to 32 V Input) |
| **B** | = Current 4 to 20 mA (3 Wire) | (10 to 18 V Input) |
| **C** | = Voltage 0.5 to 3.5 V | (4 to 10 V Input) |
| **F** | = Voltage 0.25 to 4.75 V | (9 to 32 V Input) |
| **G** | = Voltage 0.5 to 4.5 V | (9 to 32 V Input) |
| **H** | = Voltage 0.5 to 10.0 V | (13 to 32 V Input) |
| **J** | = CANbus SAE J1939 | (9 to 32 V Input) |
| **L** | = Voltage 0.5 to 4.5 V | (5 to 10 V Input) |
| **O** | = CANopen | (9 to 32 V Input) |
| **P** | = P.W.M 500 Hz | (9 to 32 V Input) |
| **R** | = Voltage 0.5 to 4.75 V | (9 to 32 V Input) |
| **T** | = Current 4 to 20 mA (2 Wire) | (11 to 28 V Input) |
| **V** | = Voltage 0.5 to 5.0 V | (9 to 32 V Input) |
| **Z** | = ISOBUS | (9 to 32 V Input) |

**Optional**
**R** = Reversible signal

**Unique Transducer Calibration Number**

**Cable Length (m)**
Standard lengths:
0.15, 0.3, 0.5, 1.0, 1.5, 2.0

**Electrical Termination (Includes polypropylene conduit)**
**N** = PVC Cable
**U** = PUR Cable
**W** = Individual Wires

**Optional**
**2RT** = Deutsch DT04-2P with Rota contacts
**3RT** = Deutsch DT04-3P with Rota contacts
**4RT** = Deutsch DT04-4P with Rota contacts
**6RT** = Deutsch DT04-6P with Rota contacts
**2RM** = Deutsch DTM04-2P with Rota contacts
**3RM** = Deutsch DTM04-3P with Rota contacts
**4RM** = Deutsch DTM04-4P with Rota contacts
**6RM** = Deutsch DTM04-6P with Rota contacts
**2RP** = AMP 282104-1 with Rota contacts
**3RP** = AMP 282105-1 with Rota contacts
**4RP** = AMP 282106-1 with Rota contacts
**5RP** = AMP 282107-1 with Rota contacts
**6RP** = AMP 282108-1 with Rota contacts
**4BH** = M12 connector (Moulded) - 4 pin [PUR cable only]
**5BH** = M12 connector (Moulded) - 5 pin [PUR cable only]
**4B9** = 90° M12 connector (Moulded) - 4 pin [PUR cable only]
**5B9** = 90° M12 connector (Moulded) - 5 pin [PUR cable only]