NORIFID – our solution for the wireless transmission of measured values

Ideal for condition monitoring and predictive maintenance

Discover new possibilities with the wireless transmission of measured values

Predictive maintenance needs measured data to the greatest possible precision. On components with moving or rotating parts, the relevant variables (e. g. temperature of an electric motor's rotor or planetary gearbox bearing) sometimes cannot be accessed with wired sensors. Accordingly, the data needed for condition monitoring can be obtained only with complex calculations and estimates. However, precise and reliable measured data are obtained only when a sensor is placed directly on the moving part.

For requirements of this kind we have developed ***NORIFID***, a simple, cost effective measuring system that is based on established technologies, supplies wirelessly power by induction to a sensor on a moving part, and transmits the measured data via *RFID* to a fixed receiver.

System setup

NORIFID consists of a reader that is fitted on the fixed component and a transponder with measuring element attached to the moving component. This measuring element can be a fixed integral part of the transponder or, if necessary, placed outside at the measuring site and wired to the transponder.

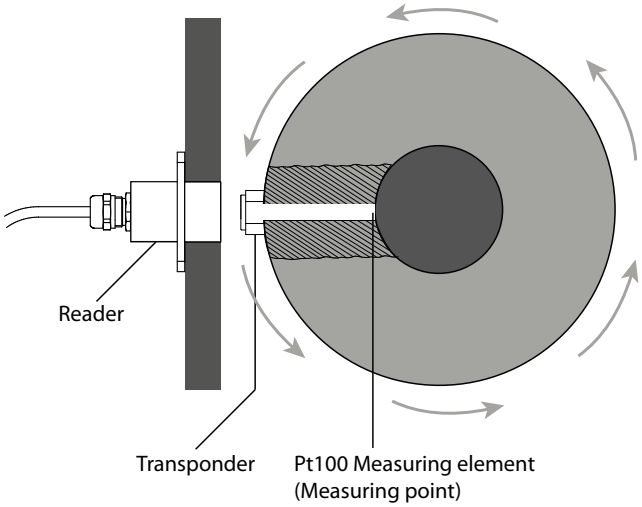
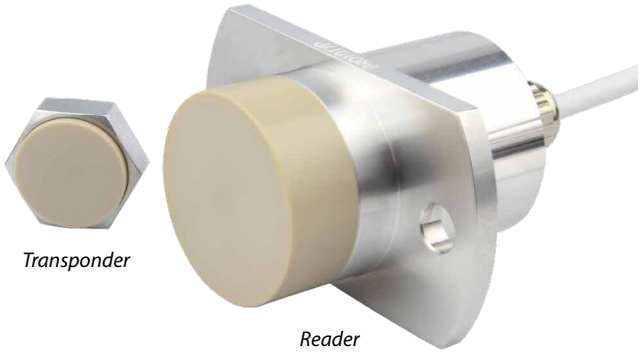


Figure 1: Scheme for wireless transmission of measured values

Your benefits at a glance

- ***NORIFID*** measures values on moving parts
- Reliable, robust *RFID* data transmission (13.56 MHz)
- Maintenance-free system (transponder without battery)
- Compact system with small installed height
- No large analysis unit necessary
- Low cost and reliable thanks to established technologies
- Various output signals



Transponder

Reader

Functional principle

Power and data are transmitted wirelessly by induction, via an RF magnetic field (13.56 MHz *RFID*). The reader consists basically of a transformer, analysing electronics, and a signal converter and is supplied with voltage from an external source. The transponder likewise is fitted with a transformer, an integrated circuit, and a Pt100 measuring element and is installed on the moving object. It operates passively and therefore does not require its own power supply.

The transponder positioned on the rotating object moves cyclically past the reader. When the transponder enters the reader's range, the reader's alternating magnetic field induces a voltage in the transponder coil, supplying it with the necessary power. Once the transponder is in the reader's active zone, its connected Pt100 measuring element detects the temperature and transmits the measurement value immediately and wirelessly to the reader. Depending on the requirements, the reader then converts and outputs the measurement signals as a voltage or current value.

General technical data of the NORIFID wireless sensor system	
Operating voltage (reader)	9 ... 32 VDC
Number of measuring channels	1 ... 5
Measuring range	-50 ... 350 °C, application specific
Signal transmission	13.56 MHz RFID
Resolution	10 bit, depending on the measuring range and channels
Output signal	Current: 0 ... 20 mA, 4 ... 20 mA Voltage: 0 ... 10 V, 2 ... 10 V
Reverse voltage protection	Yes
Overvoltage protection	Yes
Operating temperature	Reader: -40 ... +120 °C Transponder: -40 ... +120 °C
Protection class	Reader: IP68, Transponder: IP68
Transmission distance (reader - transponder air gap)	≤ 6 mm
Passing speed	Max. 30 m/s, application specific and dependent on number of measuring channels

Features and system properties

Passive transponder and wireless transmission

One of the essential advantages of ***NORIFID*** lies in its wireless transmission that allows reading measured values of measuring points on moving parts. The transponder is passive and therefore maintenance-free. In other words, it does not require its own voltage supply (battery), but is supplied inductively from the reader's RF magnetic field. Moreover, one reader can receive data from up to five transponders at present, and so collect measurement values from more than one measuring point.

Ready to use, robust design

One further property is the robustness of the system. ***NORIFID*** is insensitive to soiling and so ideal for applications in harsh environments. It does not require complex system based calibration, but is ready for immediate use – buy, install, done.

Small, compact, and reliable thanks to established technologies

NORIFID does not require any complex analysis units either. The reader and transponder are scarcely bigger than conventional sensors, are based on tried and tested technologies, and are therefore more cost-effective than other systems and are extremely reliable. The system fulfils the general industrial standards for ambient effects (DIN IEC 60068) and does not require a signal converter.

The reader outputs industrial standard signals (voltage e. g. 0 ... 5 V, 0 ... 10 V or current e. g. 0 ... 20 mA, 4 ... 20 mA). The first generation does not offer an interface for serial bus output, but can be fitted accordingly on customer request.

Suitable for expansions and combinations with additional measured variables and sensors

NORIFID can be expanded for the transmission of further measured values, e. g. strain, acceleration or pressure. This option is planned for the next product generation. Furthermore, the reader can be fitted with additional integral sensors that combined can measure e. g. acceleration and temperature.

Applications

In general, ***NORIFID*** is designed for temperature measurements on moving parts that necessitate wireless transmissions. These are in particular applications where measured data must be collected for condition monitoring and predictive maintenance, for instance:

- Winding temperature measurements on an electric motor's rotor
- Bearing temperature measurements in planetary gearing
- Temperature measurements on torsional vibration dampers
- Temperature measurements on connecting rod bearings

Customer-specific transponder variants

The transponder can be customised to your application. The standard version consists of the transponder head with male thread and integrated Pt100 measuring element (cf. Variant 1, Figure 2). If necessary, the transponder can be fitted with a sensor tube containing the integrated Pt100 measuring element (cf. Variant 2, Figure 3). This sensor tube may be of varying rated length. The Pt100 measuring element may also be fitted externally and connected to the transponder with a cable of varying length (cf. Variant 3, Figure 4).

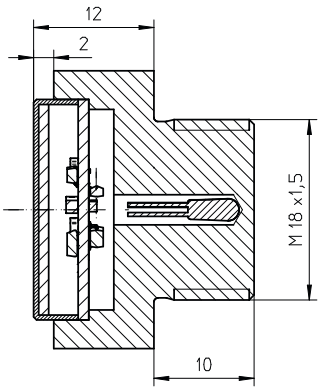


Figure 2: Transponder standard version with integrated Pt100 (Variant 1)

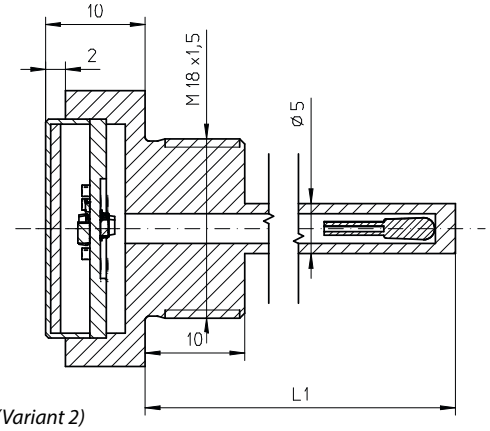
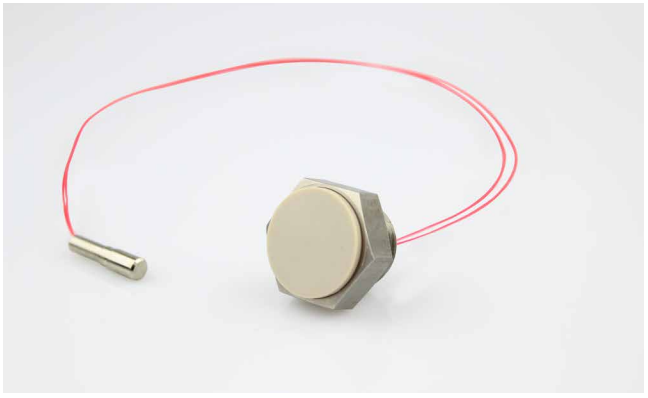


Figure 3: Transponder with sensor tube (Variant 2)



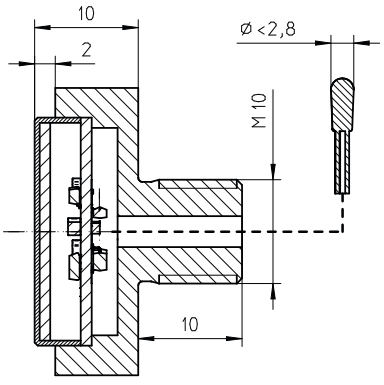


Figure 4: Transponder with external Pt100 measuring element (Variant 3)

Application examples

Your application, our ideas

Today, the development of new products can no longer do away with predictive maintenance that is to safeguard the reliability, operability, and availability of systems. Drawing up prognoses and trend analyses on the condition of separate components, assessing the progress of component wear (cf. Figure 5) under the prevailing operating conditions, and planning on this basis the maintenance and service measures all help to prevent machine downtimes, expensive failure times, and high repair investments. Collecting the measured data relevant to this is a challenge that must be mastered.

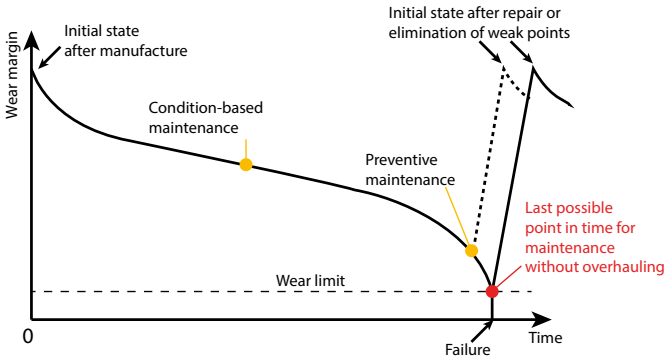


Figure 5: Scheme of component wear [according to DIN 31051, p. 8]

And it is exactly here where we can assist you. For more than 90 years, we have cooperated closely with motor and gearbox manufacturers in the most diverse industrial segments. Our extensive knowhow and our experience in the fields of instrumentation and automation make us your competent partner for integrated solutions. Based on established technologies, ***NORIFID*** also gives you the reliability you need to plan in your development phase.

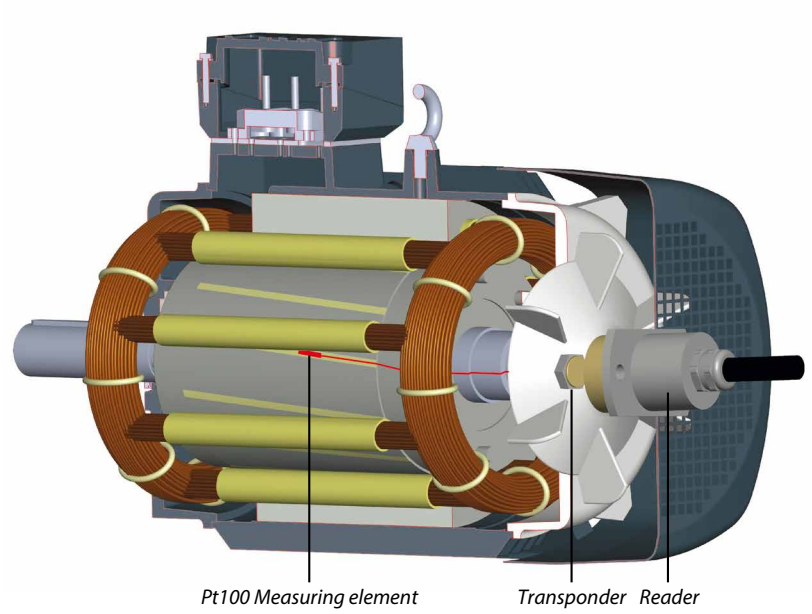


Figure 6: Application example of NORIFID on an electric motor

Application example for measuring the winding temperature of an electric motor's rotor

Figure 6 presents an example of the wireless transmission of temperature values measured on an electric motor's rotor. How the components are installed depends on the customer's application. The measured data is available at the reader's signal output for analysing equipment.

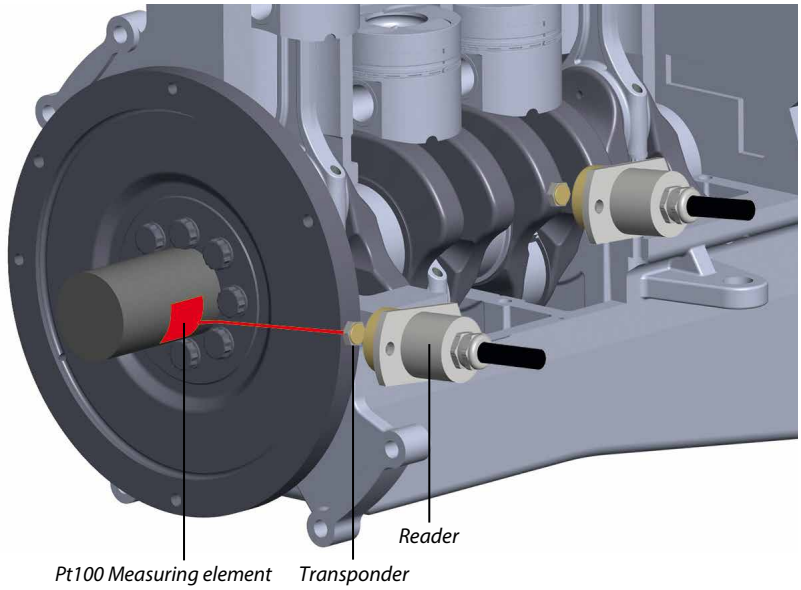


Figure 7: Application example for NORIFID on a combustion engine

Application example measuring bearing temperatures

Figure 7 presents an example wireless transmission of temperature values measured on a motor's shaft or connecting rod bearings. How the components are installed depends on the customer's application. The measured data is available at the reader's signal output for analysing equipment.