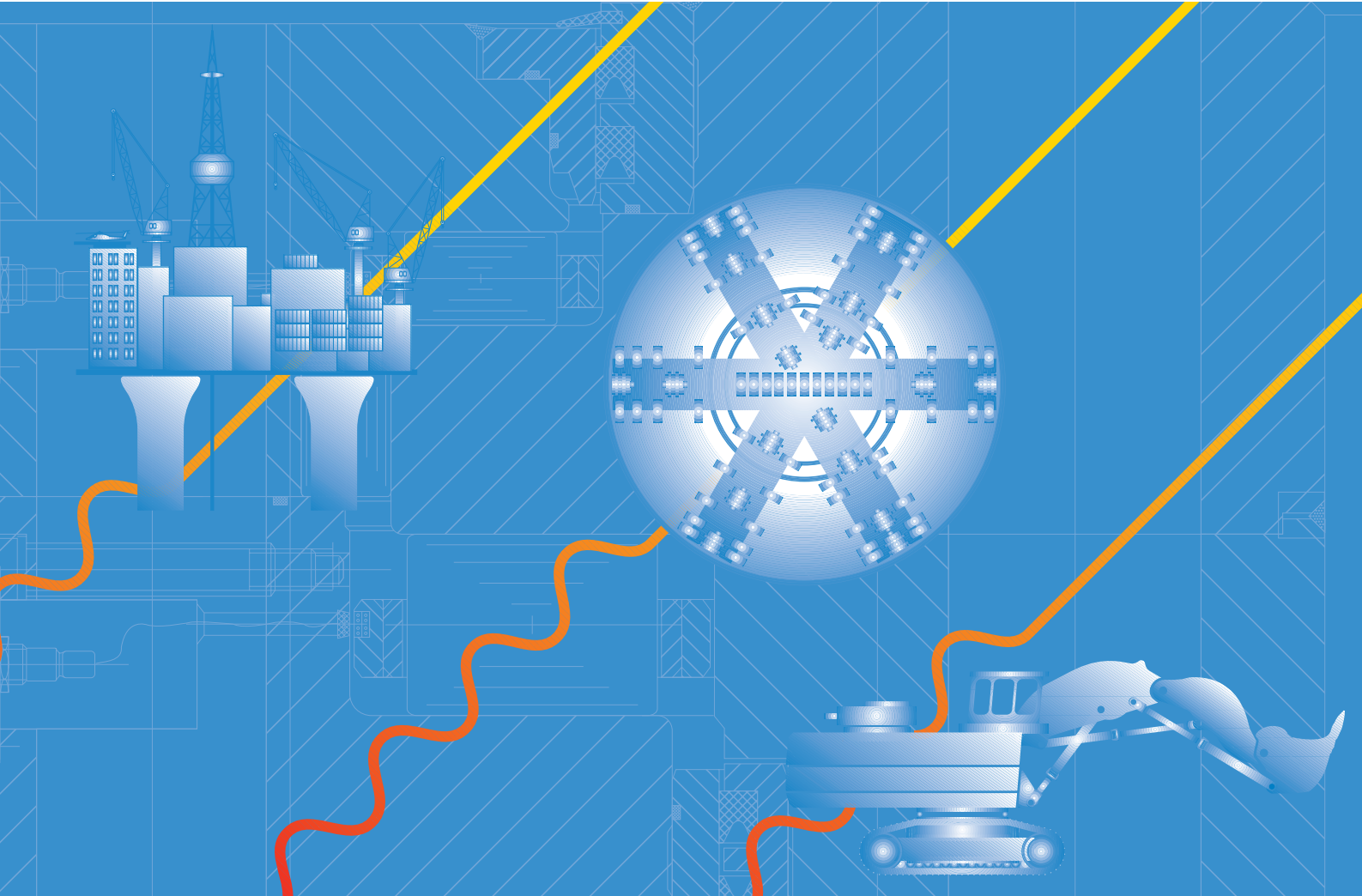


Rothe Erde Eddy Current Monitoring System.

Applications: Offshore Equipment, Tunnelling Machines, Construction Equipment.



A ThyssenKrupp
Technologies
company

Rothe Erde



ThyssenKrupp

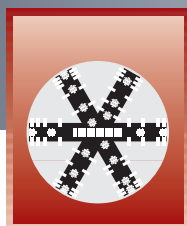
Rothe Erde Eddy Current Monitoring System (ECMS).

The Rothe Erde Eddy Current Condition Monitoring System is a bearing-integrated measuring system to check the raceways and radii of all designs of large-diameter bearings, predominantly roller bearings, for possible damage such as wear, pittings and cracks.

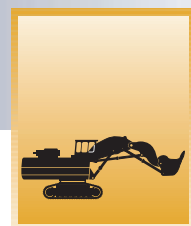
The system can be used for new bearings as well as for retrofit programs. Applications for the Rothe Erde Eddy Current Monitoring System are tunnelling machines, construction- or offshore equipments.



Offshore
Equipment

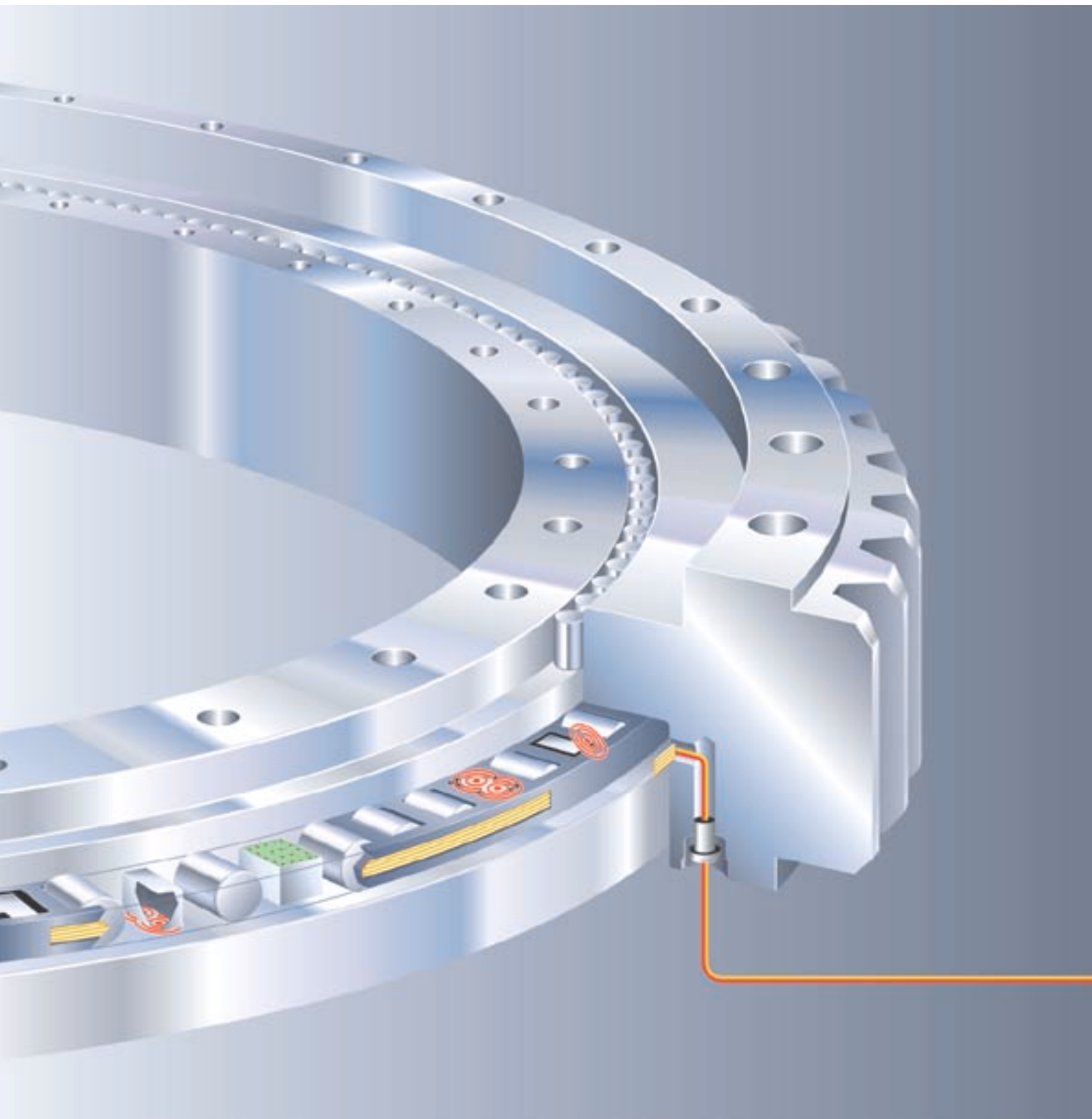


Tunnelling
Machines

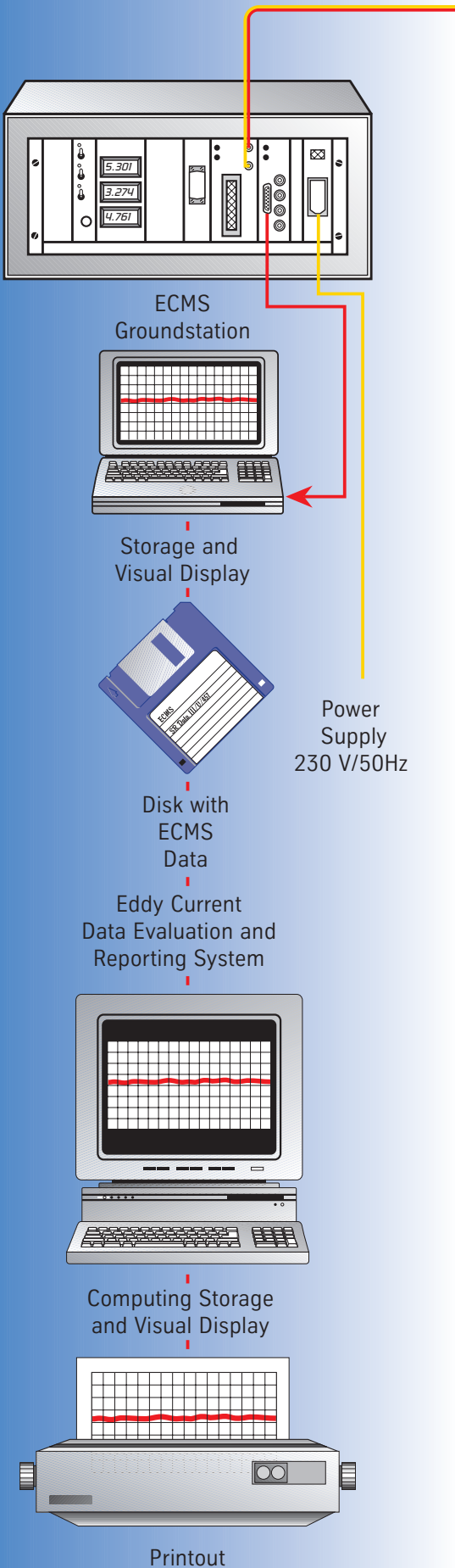


Construction
Equipment





System components and sensors



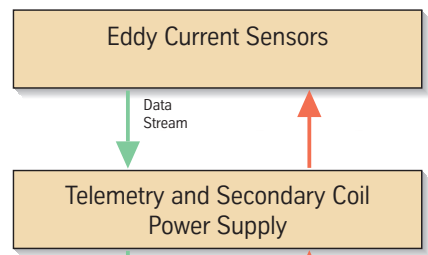
ECMS-equipped large-diameter anti-friction bearings are linked up with the measuring instruments via an environmentally protected, isolated plug connection.

The basic requirement for running the measurements is an ECMS groundstation providing power supply and data transfer.

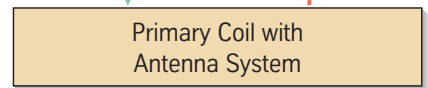
The data can either be stored on diskette by laptop or visually displayed on site. If data processing and evaluation are not possible at the equipment site, the diskette may be evaluated at a central point or at Rothe Erde, respectively.

The power generator integrated in the groundstation supplies electricity to the stationary ring with the primary coil. From here, high-frequency power is inductively coupled to the secondary coil and then to the supply module which is located in the cage inside the bearing and distributes the power to the individual sensors. The signal measured over the entire circumference of the bearing (720° rotation) is telemetrically transmitted from the supply module via the antenna system of the secondary coil back to the primary coil. From there, the data are fed to the groundstation receiver for central data evaluation.

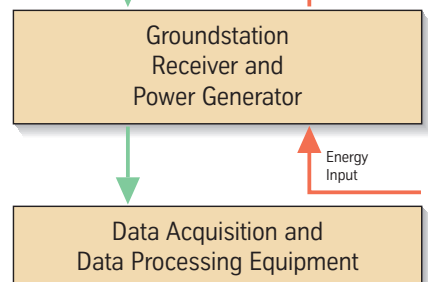
Inside Bearing moving Cage



Interface Hardware

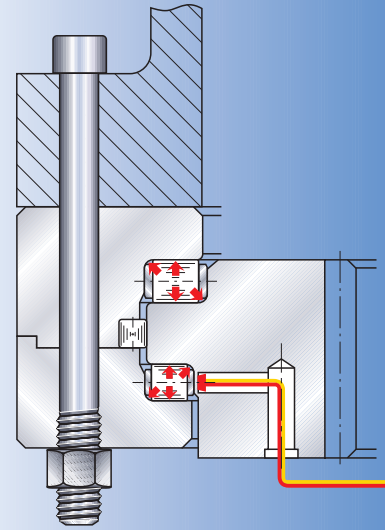
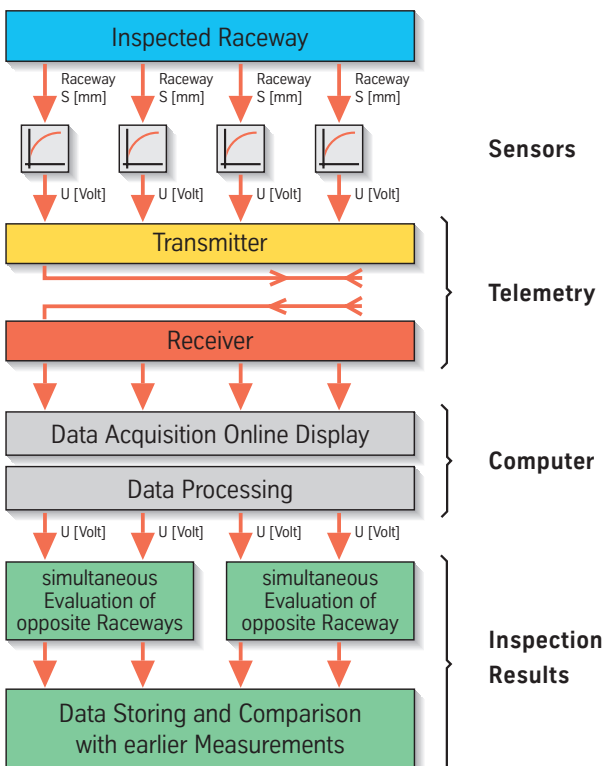


Outside Bearing

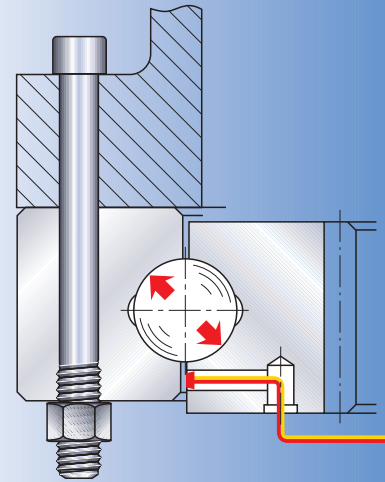


The diagram illustrates the flow of the data and their evaluation. The sensor data are transmitted by telemetry and then centrally processed with particular emphasis on the simultaneous evaluation of the opposite raceways, thereby eliminating any influences from tiny cage movements. The data obtained are then compared with the base measurement or earlier measurements.

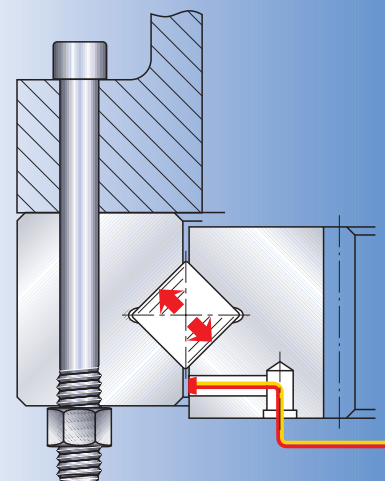
In this connection it is important to know that the measurements will not be affected by nonmetallic substances. Any pittings present in the grease will change their position with each rotation and are, therefore, identifiable.



Three-row roller bearing slewing ring



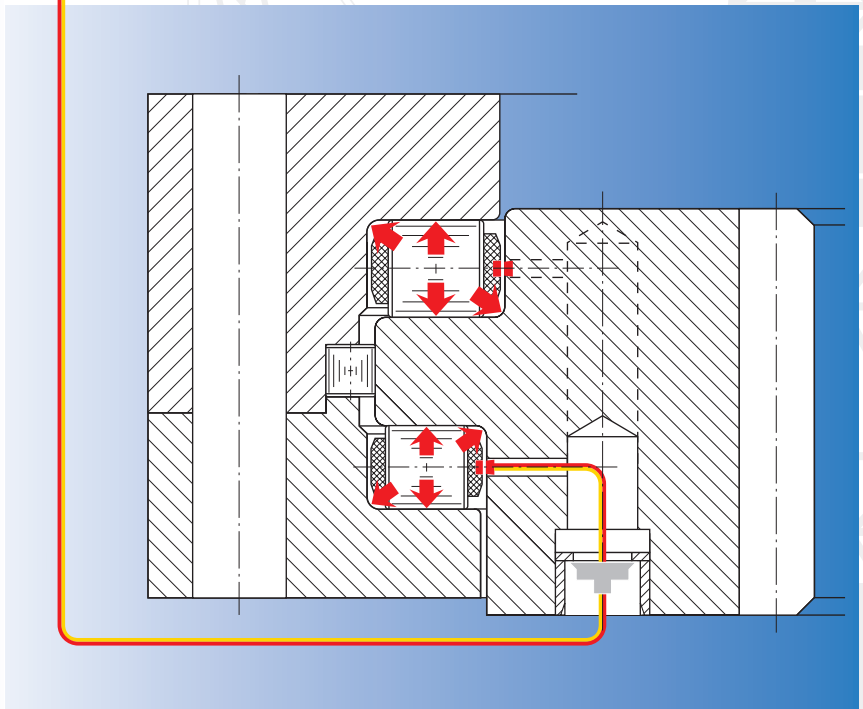
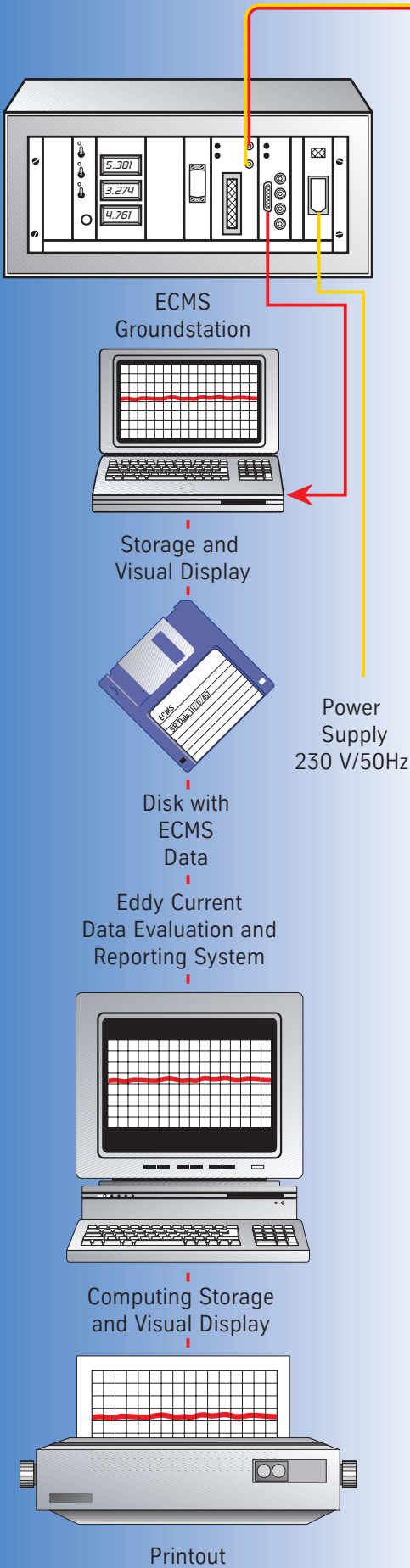
Single-row ball bearing slewing ring



Cross-roller bearing slewing ring

System components and sensors

... for Offshore Equipment.



Roller bearing slewing ring

The system consists of:

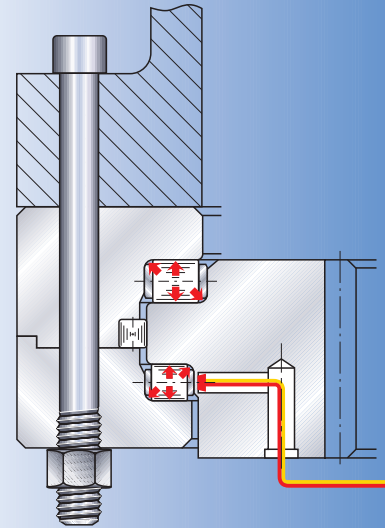
- Groundstation including Power Supply and Receiver
- Computer with Windows Operating System with serial and parallel Interface
- Printer for Documentation
- Contactless Eddy Current Sensors
- Power Supply and Telemetry Modul



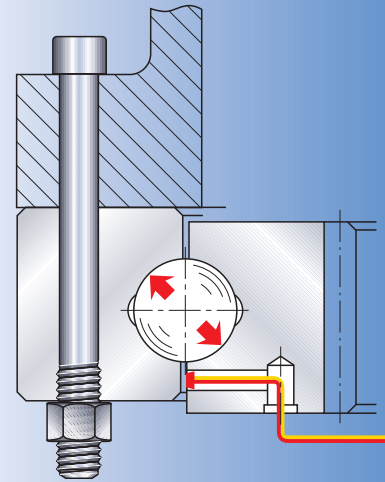
Rothe Erde ball and roller bearings are globally recognized for their outstanding performance and reliability in offshore-cranes.

These bearings have to meet rigorous requirements of international classification companies and of course of the users. The Rothe Erde Eddy Current Monitoring System is a measurement system, which is fully integrated into the bearing. It monitors the condition of the bearing without requiring any time-consuming and cost-intensive intervention. The system is widely used in the offshore industry since 1982 not only for offshore cranes but also for offshore oil mooring applications like FPSO's and for bearing diameters up to 8,000 mm diameter.

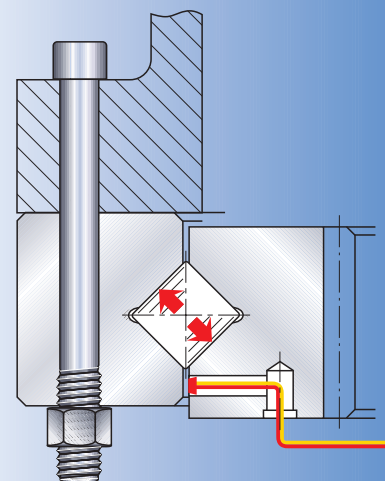
Retrofitting existing bearings with the monitoring system is no problem, as its installation leaves the installed dimensions and the dimensions of the bearing itself intact.



Three-row roller bearing slewing ring



Single-row ball bearing slewing ring

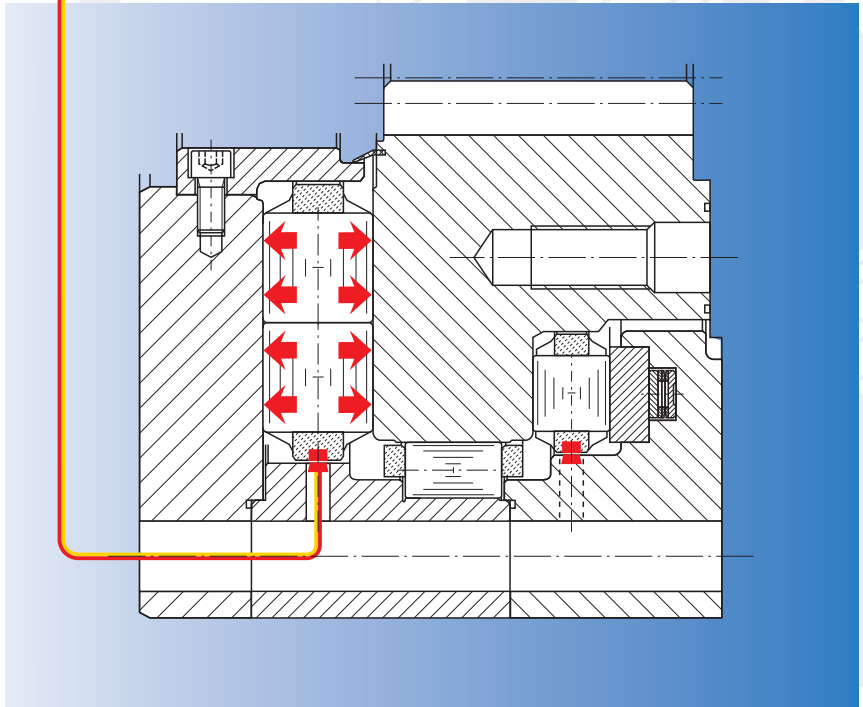
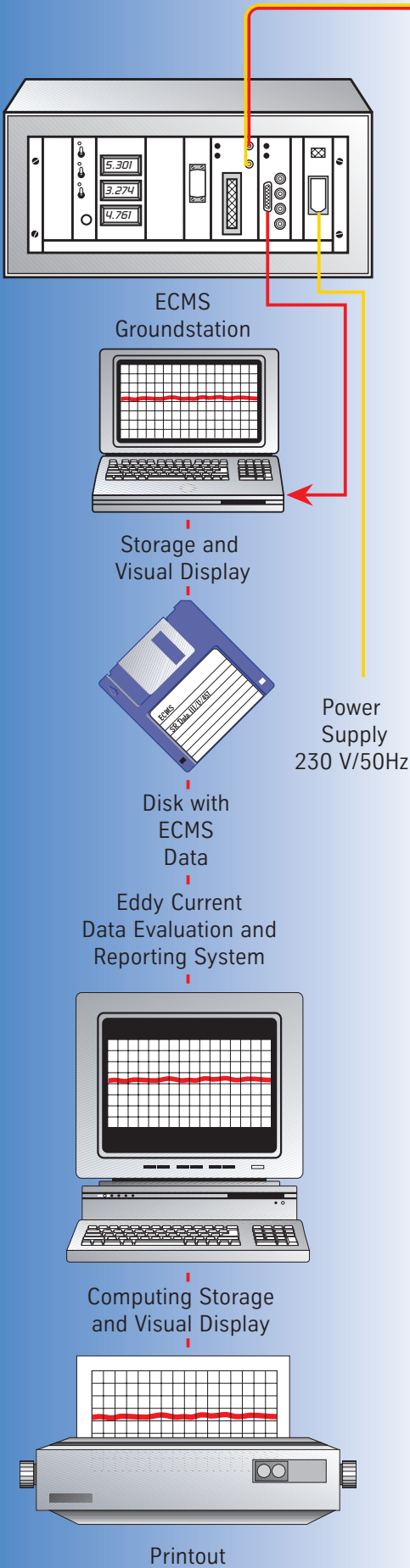


Cross-roller bearing slewing ring



System components and sensors

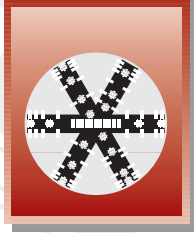
... for Tunnelling Machines.



Roller bearing slewing ring

The system consists of:

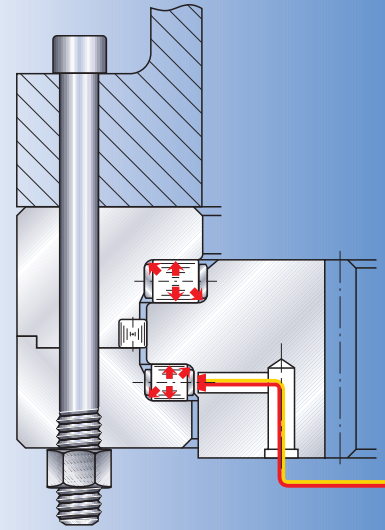
- Groundstation including Power Supply and Receiver
- Computer with Windows Operating System with serial and parallel Interface
- Printer for Documentation
- Contactless Eddy Current Sensors
- Power Supply and Telemetry Modul



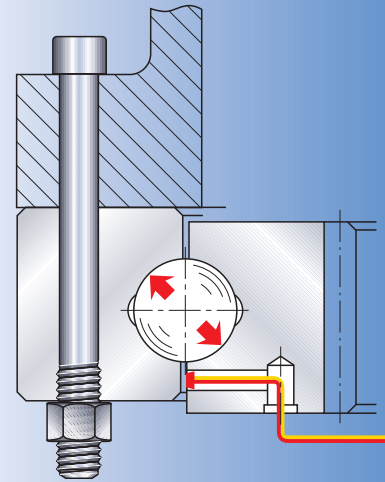
It is Rothe Erde's objective to develop design and produce optimum cutter-head bearings meeting all requirements of specific applications such as hard-rock or soft-rock drilling.

The selection of the bearing design depends on load circles, shock-factor, torque, speed, etc. Small tunnelling machines are mostly fitted with four-point contact ball bearings, the enormous loads involved in larger machines will in the majority of cases, require three-row roller bearings. Rothe Erde bearings have proven their reliability in more than a 1,000 cases as for instance in the Channel-tunnel project and the recently commissioned Trans-Tokyo Bay Highway. The Rothe Erde Eddy Current Monitoring System allows to monitor the bearing condition at any time during the drilling operation. Tunnelling machines require a very high reliability, because any repair would be extremely cost-consuming.

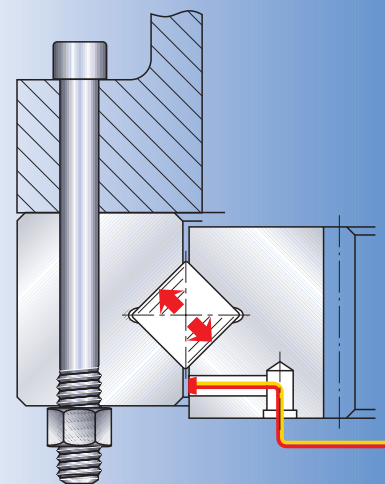
With this system the condition of the bearing may be checked and if necessary, respective measures like reducing the forces can be taken.



Three-row roller bearing slewing ring



Single-row ball bearing slewing ring



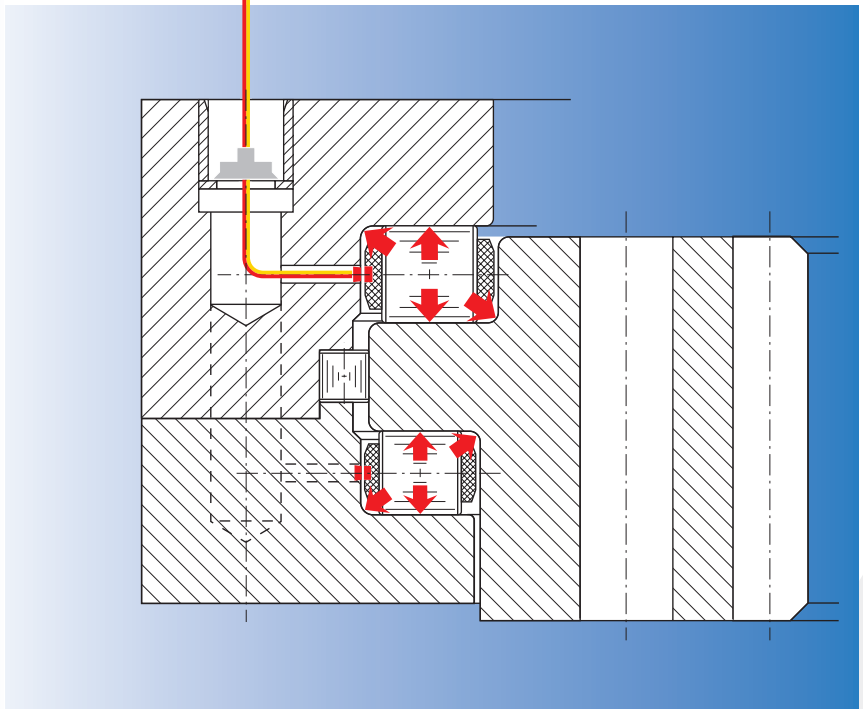
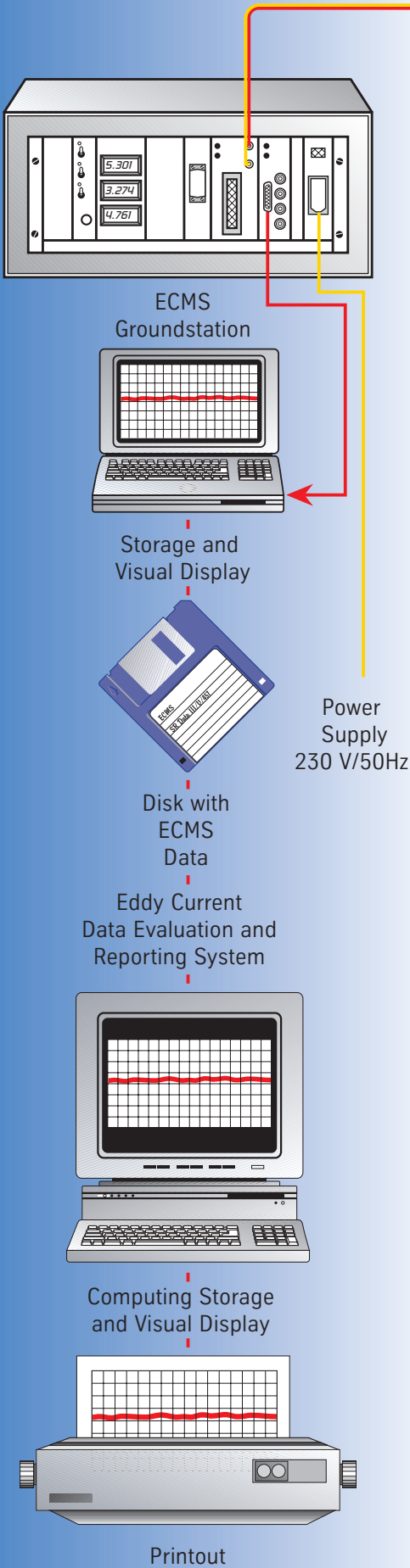
Cross-roller bearing slewing ring



Lovat Tunnel Equipment Inc, Etobicoke, Ontario, Canada

System components and sensors

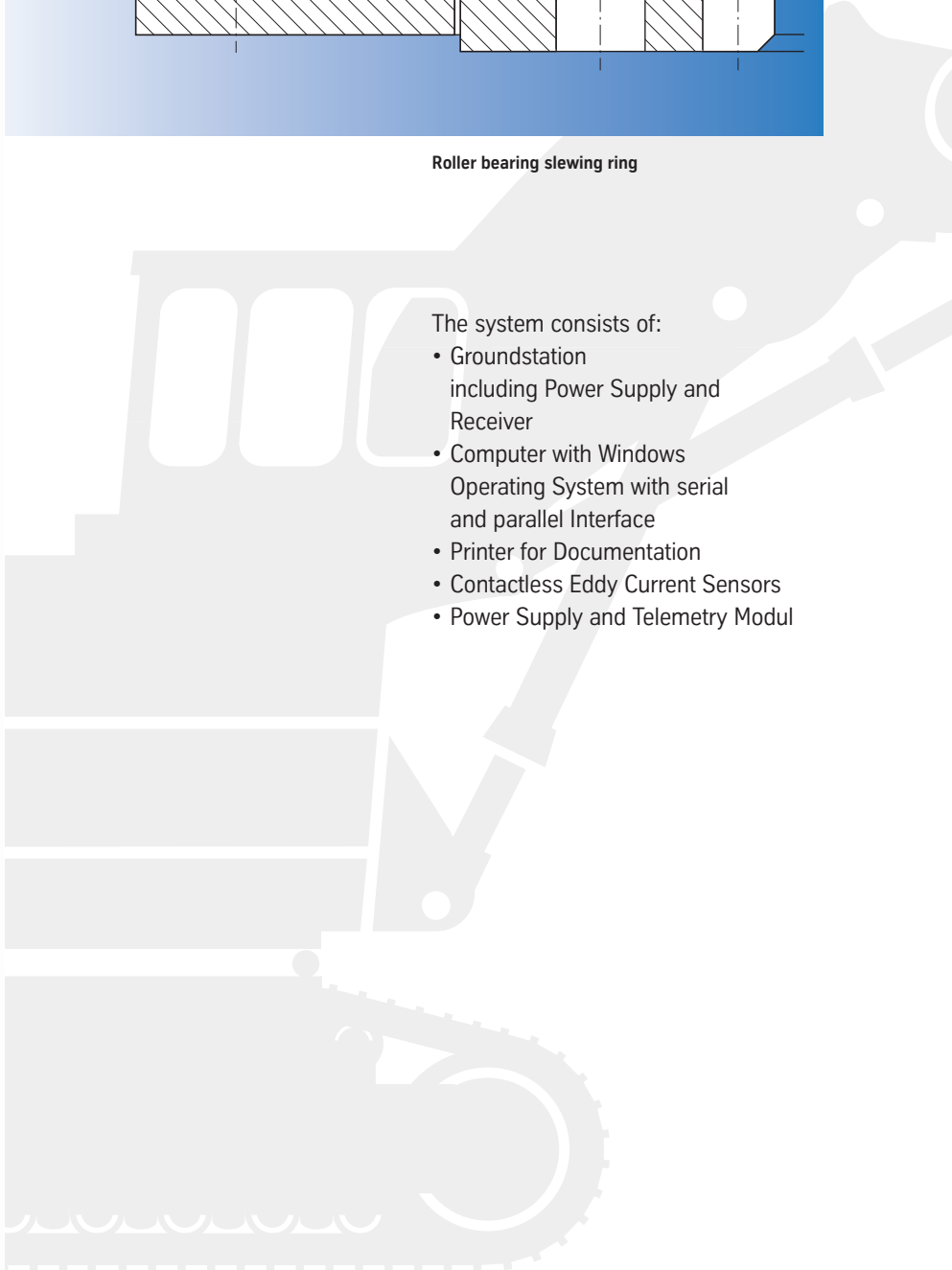
... for Construction Equipment.

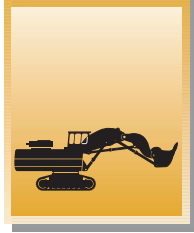


Roller bearing slewing ring

The system consists of:

- Groundstation including Power Supply and Receiver
- Computer with Windows Operating System with serial and parallel Interface
- Printer for Documentation
- Contactless Eddy Current Sensors
- Power Supply and Telemetry Modul

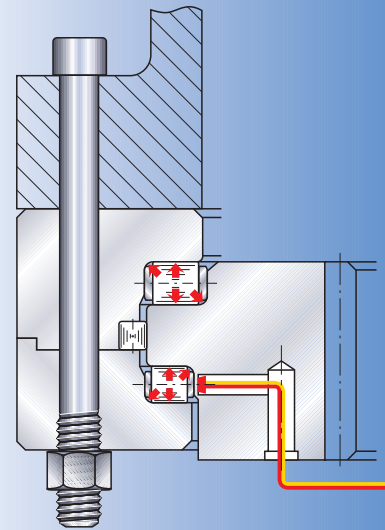




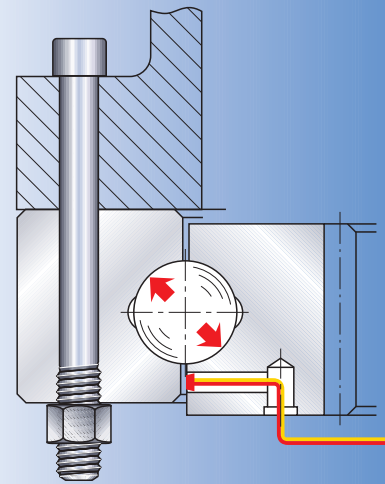
The breakneck speed of development in the construction equipment industry in recent years, in particular with regard to hydraulic excavators, has resulted in ever larger and heavier machines. These mammoth earth moving machines have little in common with the small conventional hydraulic excavators that we are familiar with and are predominantly used as overburden excavators in opencast mining in the extraction of iron ore, coal, oil sand, etc.

They must be extremely reliable and long-lived, even under most extreme working conditions. It is obvious that such equipment needs custom-designed large-diameter antifriction bearings that are capable of sustaining these extreme loads and of meeting such high service life requirements, in theory as well as in practice.

This is another application where the Rothe Erde ECMS system which allows periodical monitoring and control has proven extremely useful. The measured data can be stored and compared with earlier measurements again and again. It is also possible to transfer the data by satellite to a central monitoring station.



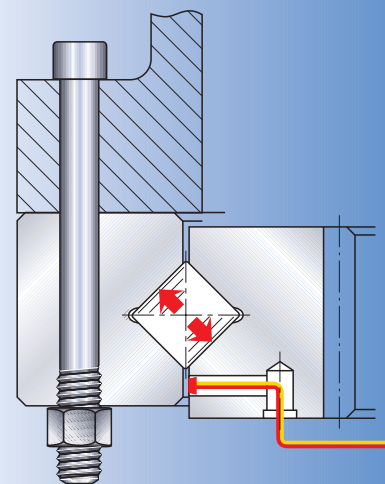
Three-row roller bearing slewing ring



Single-row ball bearing slewing ring

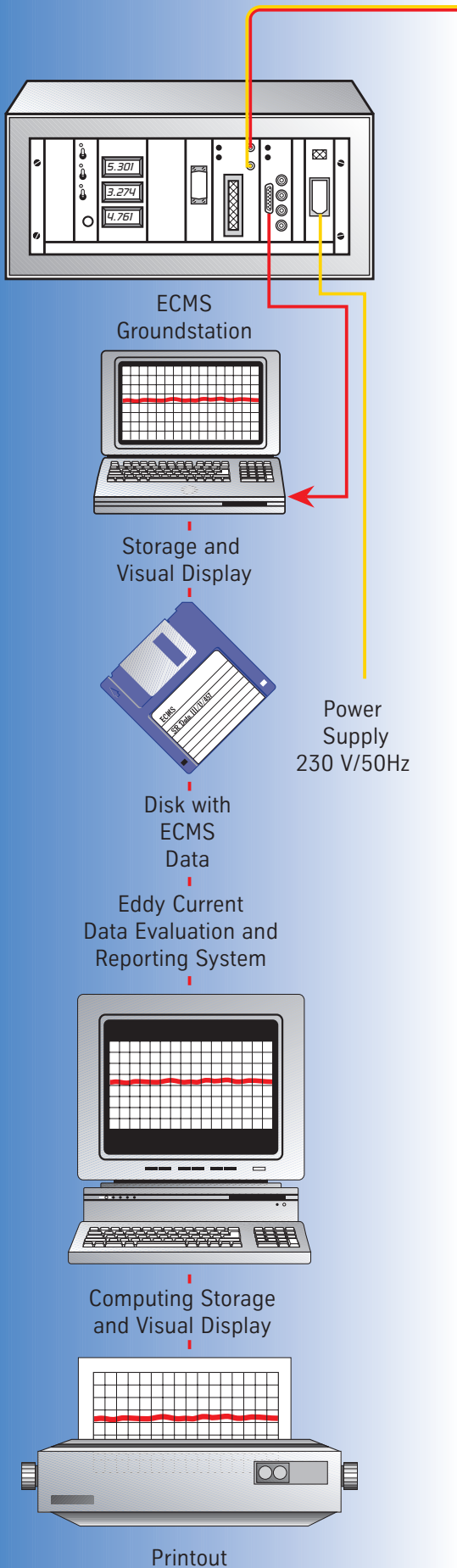


O & K Mining GmbH, Dortmund, Germany



Cross-roller bearing slewing ring

System components and sensors



Design engineering and development.

Offshore technology, tunnelling machines and also construction equipment demand the utmost in performance and structural safety from Rothe Erde bearings.

Finite element analysis has shown to be a reliable method for determining the occurring stresses in new bearing designs as well as for analysing load distributions and load transfer into the mating structures, that are otherwise difficult to assess. Finite element analysis is an equally valuable tool for bearing optimization.

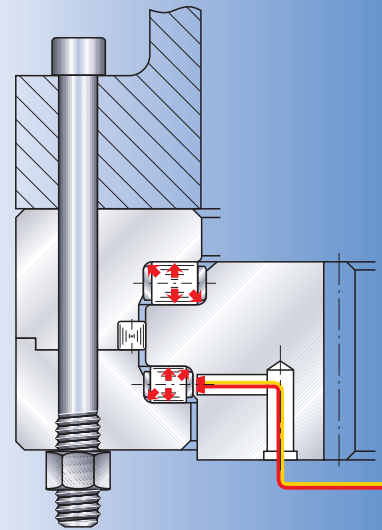




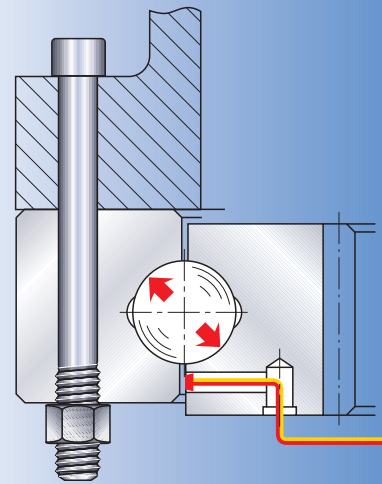
To ensure that Rothe Erde bearings will continue to enjoy their reputation for reliability and economy in extreme situations, our R&D Centre subjects all new bearing designs to relentless and vigorous testing.

We are known for our pioneering development work and search for advanced, practicable solutions. The latest findings, experience and innovation combine in the creation of new technologies.

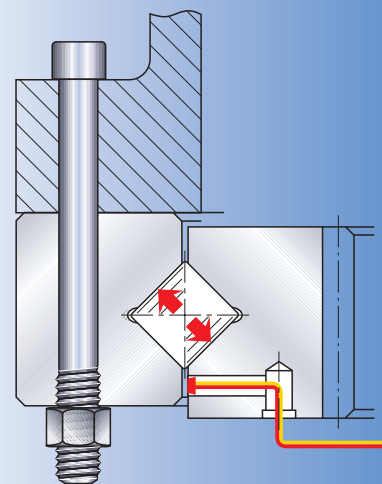
Segmental bearings of various types, like compact or sandwich bearings. Corrosion-proof bearings with special sealing systems. Lubrication sampling and bearing condition monitoring systems.



Three-row roller bearing slewing ring



Single-row ball bearing slewing ring



Cross-roller bearing slewing ring

Quality management.

Rothe Erde bearings meet the highest technical requirements. This applies in particular to offshore technology, tunnelling machines, construction equipment and many other applications.

The Rothe Erde quality system is approved by all national and international classification and acceptance companies and complies with DIN EN ISO 9001.



Our quality planning begins with our first contact with the customer. We determine whether the customer's requirements or concepts can be safely transformed into a viable product. Following clear definition of the requirements, the quality features are defined in cooperation with the responsible departments and laid down in drawings, work plans, test specifications, etc., including packaging and customer service.



Internal audits guarantee production quality and the functional safety of our quality system. The audit results combined with the quality data stored in the EDP systems permit effective quality control.

Regular staff training keeps us alert to the ever increasing requirements and raises quality awareness throughout our company.



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