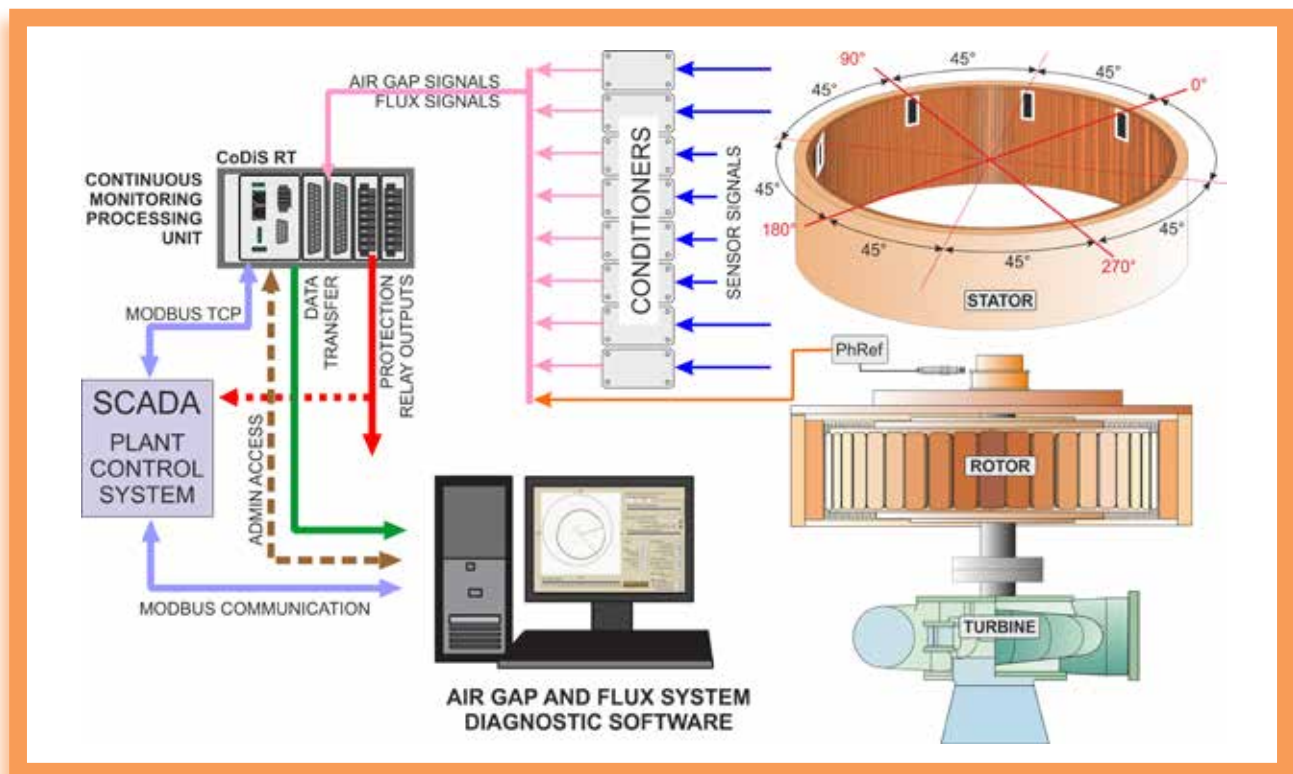


CoDiS MACHINE CONDITION MONITORING SYSTEM Air Gap and Magnetic Flux Monitoring

▶ ▶ ▶ ▶ IMPORTANCE OF AIR GAP MEASUREMENTS

Air gap is the distance between the rotor outside and the stator inside diameter. Air gap monitoring of hydro generators is important because the stator and the rotor geometry can be quite flexible, and their shape and location are significantly influenced by operating conditions (eg. centrifugal and magnetic forces, thermal effects and structure stiffness failures. Off-center or out of-round conditions will at least reduce operating efficiency and, in more severe cases, can lead to damage from magnetically induced heat-

ing or a rotor-to-stator rub. The fact that generated energy is transferred from rotor to stator through air gap, makes reliable identification of conditions in the air gap one of most important tasks in machine behaviour control, providing reliability, efficiency and quality of electric power generation. Measurement in the air gap are important component of machine condition monitoring, providing specific information which cannot be reliably obtained applying some other measurement/analysis method.



CoDiS Air Gap and Magnetic Flux System

Machine monitoring system for air gap, magnetic flux and processing parameters monitoring. The system can be used as a permanent online monitoring system with protection capability as well as a system connected to a computer in order to view raw/analyzed data in real-time during commissioning, operation and/or maintenance.

The complete air gap monitoring system comprises 6 parts:

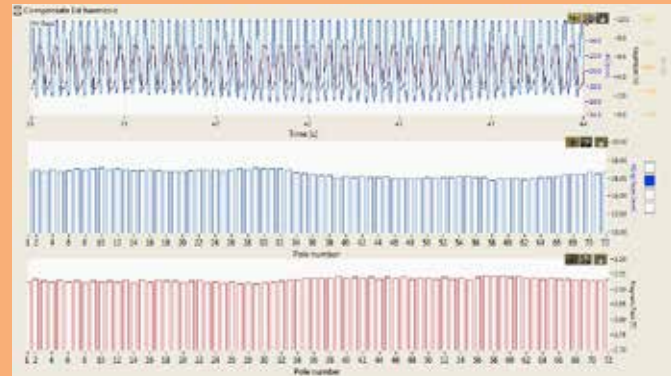
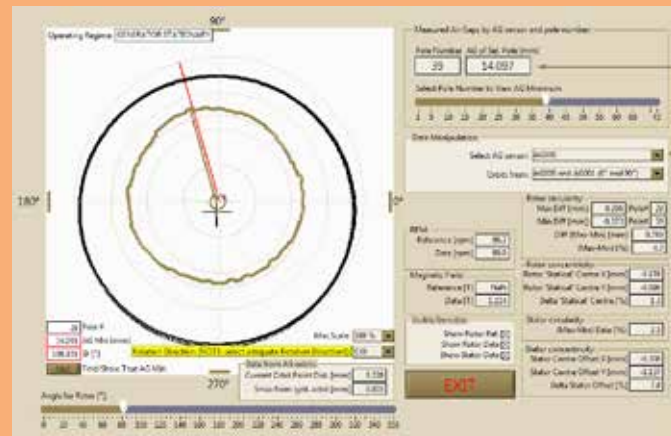
- Air Gap Capacitive Sensors
- Magnetic Flux sensors
- Sensor Signal Conditioners
- Sync Sensor (1 sensor)
- Continuous Monitoring Instrument
- Data Management and Analysis Software.

CoDiS RT controller digitizes the signals from various types of sensors.

- Processes the acquired signals in real time (16 ch or 32 ch analog inputs)
- Detects the various machine modes of operation:
 - Stationary
 - Run up
 - Normal operation
 - Transient
 - Coast down.
- Determines alarm conditions and sends alerts to the plant control system.
- Communicates with the plant SCADA system.
- Transfers relevant condition vector data to the Data Management Software

The Data Management Software provides the following:

- Receives and accepts data as a condition vector from the real time (RT) module in pre-set time sequences and checks operating/alarm conditions as well
- Recognizes condition vector data recorded during transient mode of operation, with increased time resolution.
- Provides duplex communication with the CoDiS RT controller
- Recognizes alarm occurrence and alerts.
- Provides waveform data recording, processing and saving to a database in order to be used for off line analysis.



AIR GAP DATA ANALYSIS SOFTWARE TASKS

- Identifying rotor pole profile/rotor geometry
- Identifying stator and rotor shape with eccentricity impact
- Rotor vibrodynamic influence analysis
- Pole movement detection

DATA ANALYSIS SOFTWARE FOR MAGNETIC FLUX

- Rotor poles flux profile
- Detection of winding shorted turns occurrence and location

Air Gap and Magnetic Flux system is also available in the Diagnostic Monitoring and Analysis Software, CoDiS DM, integrated with Vibration, Electrical and On-line Rotor Temperature monitoring modules.

