

# Iris Power FluxTracII-S™

Continuous On-line Rotor Flux Monitor: a second generation continuous monitor to find rotor winding shorted turns, during service, in salient pole motors and hydro generators



# IRIS POWER FluxTracII-S

The condition of the rotor pole insulation is difficult to assess during minor or major maintenance outages. Access to the poles is severely restricted without some disassembly and removal of components. Off-line tests like the pole-drop test for detection of shorted turns can also be frustratingly ineffective due to the frequently intermittent nature of the faults at speed and at standstill. These off-line tests are also time-consuming, tying up resources and personnel that,

during an outage, could be better utilized elsewhere. Consequently, continuous on-line measurements are preferred to off-line tests and inspections.

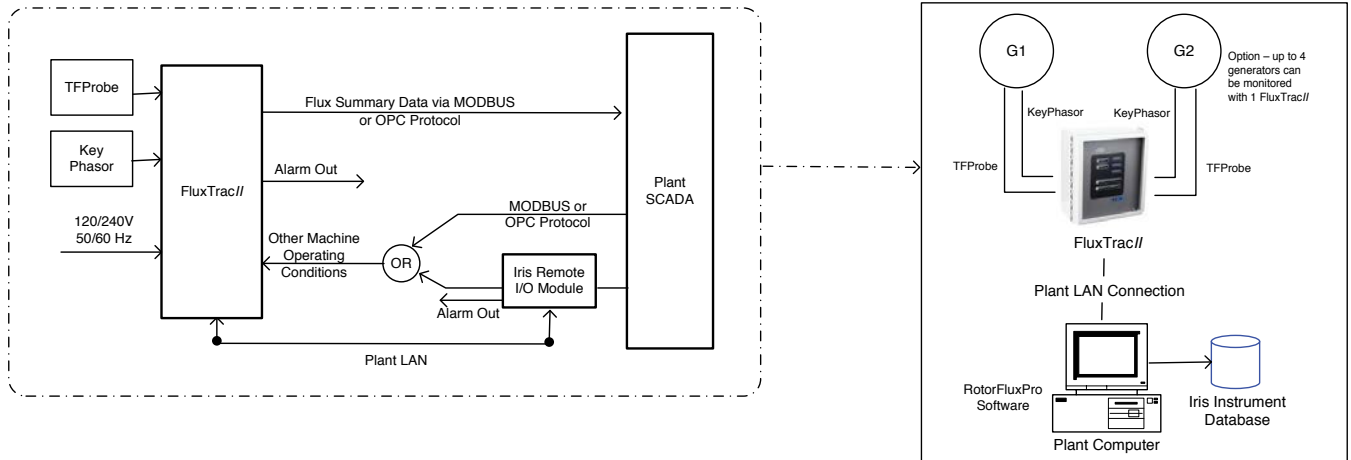
The Iris Power FluxTracII-S instrument is a continuous on-line rotor flux monitor for rotor winding shorted turn detection in salient pole machines such as hydro generators, motorgenerators in reversible pump-turbines, and salient pole motors. It was developed in cooperation with

the US Electric Power Research Institute, the New York Power Authority, and the US Bureau of Reclamation.

The Iris Power FluxTracII-S instrument uses the Iris Power TFProbe™ flux sensor. The Iris Power FluxTracII-S is compatible with the portable RFAII-S instrument, and uses the same analyzing software. The Iris Power FluxTracII-S can also accept signals from other flux probes mounted on stator wedges.

## CONTINUOUS ON-LINE FLUX MONITORING

The Iris Power FluxTracII-S instrument can monitor and evaluate up to four machines at the same time, so that when a rotor shorted turn is detected, an alert relay is activated. The instrument stores the base line measurements, the latest set of alerted measurements, and the latest set of non-alerted measurements. The data can be locally or remotely downloaded or can be automatically transmitted through Modbus TCP/IP protocol to a plant SCADA system.



## MONITORING AND INTERPRETATION OF FLUX DATA

Flux monitoring relies on measurements of the local magnetic field emanated from each rotor pole. Factors affecting the magnetic field from each pole include:

- Air-gap size change
- Rotor out-of-round or off-centre
- Loose pole – key migration

- Stator migration
- Natural variations of pole's physical position
- Shorted turns on a pole

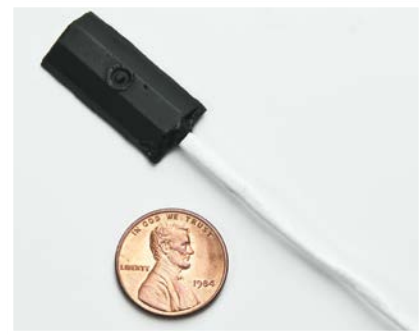
During normal machine operation, the flux from each passing pole will induce a voltage in the TFProbe. In salient pole machines, the radial magnetic flux profile across each

pole depends on the loading of the machine. The Iris Power FluxTracII-S instrument acquires, in real time, the flux signal over several machine rotations and averages and compares these readings to identify shorted poles and activate a relay to alert the user.

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## FEATURES OF THE FLUXTRACII-S

- Accepts Total Flux probes (TFProbe) and other flux probes
- Inputs for shaft sync sensor (Keyphasor) for pole determination when shorts are detected
- Monitors up to four machines (option)
- Monitors 4 to 128 poles per machine
- Provides relay contact to alert user
- Data compatible with RFAII-S portable instrument
- Storage for baseline, latest set of non-alerted measurements and the latest set of alerted measurements
- Multiple communication ports: USB, Ethernet
- Measurements can be locally or remotely downloaded to a computer with RotorFluxPro™ software
- Modbus TCP/IP protocol available for built-in server and client capability, for data interchange with third party systems



Iris Power TFProbe

## TFProbe SENSOR KIT

The FluxTracII requires a magnetic flux signal from a sensor mounted on a stator tooth or other flux probe. The preferred sensor is an Iris Power TFProbe, which is supplied in a kit with the following:

- TFProbe sensor dimension 12mm x 25.4mm
- Rotor position indication (shaft sync sensor or key phasor)
- Termination box to be mounted at a convenient location to terminate the sensor
- All necessary cabling and miscellaneous installation material
- TFProbe can normally be easily installed with the rotor present in the machine

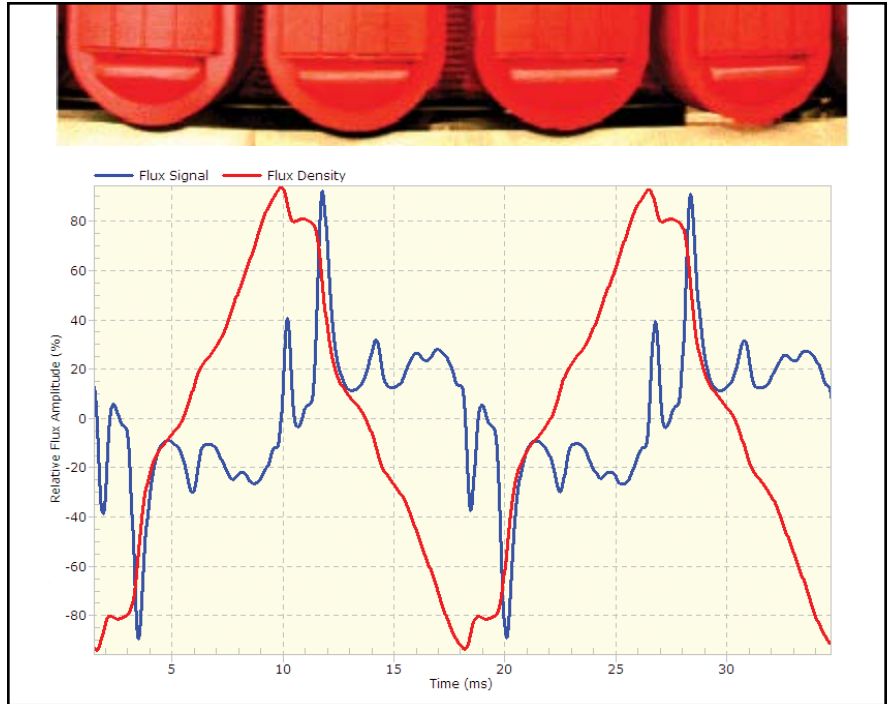


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## SOFTWARE FEATURES

The operation of the Iris Power FluxTracII-S is configured by software that can be installed on any Windows™ computer. The software also ensures data storage and provides instant analysis of results. There is a clear indication of the presence and location (assuming a shaft sync is installed) of any poles with shorted turns.

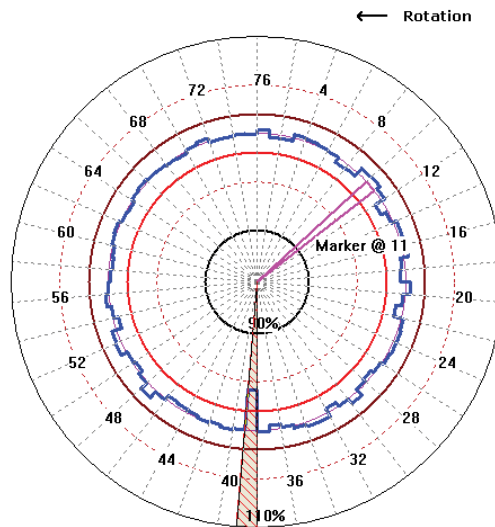
The figure shows a typical voltage waveform from a flux probe on a hydro generator (blue trace) as well as the real time integrated flux trace (red trace). Each peak of the voltage represents the magnetic flux around one rotor pole. An inter-turn short in a coil reduces the peaks associated with that pole. Analyzing the voltage waveforms in real time, comparing average and discrete flux readings, and trending readings from all poles helps to identify anomalies in the flux due to shorted turns.



Flux pattern measured by Iris Power FluxTracII-S

'Unit8' - 07/07/2009 9:54:14 AM

*Polar plot showing shorted turns on pole 39 of a 76-pole hydro generator rotor*



### Legend:

- Summary Data
- 100% Level
- Lower Alert Level
- Upper Alert Level

### Pole Information:

Pole: 39  
 Summary: 95.81  
 Lower Alert: 98.00  
 Upper Alert: 102.00

Status: The pole result is lower than the defined 'Low Alert' level.

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