IDD

Intelligent Diagnostic Devices for Bushings

The IDD, Intelligent Diagnostic Device for Bushings and CTs, is a revolutionary on line diagnostic package that continually monitors bushings and CT's. The IDD with its field-proven embedded expert system will detect abnormalities in the insulation system and when appropriate, will issue alerts.

IDD Intelligent Diagnostic Devices

Introduction

The IDD, *Intelligent Diagnostic Device* for Bushings and CTs, is a revolutionary on line diagnostic package that continually monitors bushings and CTs. The IDD with its field-proven embedded expert system will detect abnormalities in the insulation system and when appropriate, will issue alerts. The IDD will display alerts locally and remotely. There are currently over 100 installations around the world relying on this expert system to identify impending problems. More importantly, IDD is keeping these asset managers informed of the status of their bushing, providing them lead-time to determine the appropriate corrective action.

Features

- **Continuous Assessment** – the IDD performs an analysis on the bushing leakage current, providing assessment of the insulation system.
- **Identifies Problem Bushing** – knowing the bushing which is manifesting abnormality, provides the information needed to plan the appropriate corrective actions.
- **Diagnoses Severity of Problem** – after detecting a problem, the expert system calculates the absolute and rate of change of power/dissipation factor and capacitance of the problem bushing, providing diagnostic information to determine the severity of the problem.
- **Eliminates False Alerts** – advance signal processing and field proven algorithms eliminate the effect of noise and other environmental conditions that could lead to incorrect diagnosis of the bushing status and inappropriate corrective actions.
- **Remote Alert Notification** – industry-standard DNP 3.0 SCADA protocol and supervisory I/O interface enables the operator to monitor the IDD remotely.
- **Detailed Alert Messages** – an alert will indicate the problem and critically provide valuable information to schedule corrective action.

Description

The IDD, Intelligent Diagnostic Device for Bushings and CTs, is a cost-effective solution to continuously evaluate the condition of bushings and CTs while in service. This IDD measures the electrical signal at the bushing and CT taps. The conditions of the bushings and CTs are evaluated by summing the leakage currents measured at each tap. The analysis requires monitoring all bushings or CTs in a three-phase set. One IDD can monitor up to two sets of bushings associated with the same apparatus.

Tap adapters specifically designed for the particular bushing/CT are mounted to the tap, allowing the IDD to measure the leakage current.

Bushing and CT Analysis

Bushings and CTs are evaluated by measuring the current at each tap. The analysis sums the three phasor values. If the bushings or CTs are identical and the system voltages are balanced, the resulting sum vector will be zero. Since bushings or CTs are never identical and system voltages are not perfectly balanced, the sum current will be a non-zero value. As a result, the sum current is a vector unique to the bushing or CT set. The IDD expert system establishes a benchmark sum current during the data collection cycle, which is then compared to the measured nameplate configuration data.

Subsequent measurements are compared to the benchmark value. Once a change is detected, the expert system will identify the specific bushing or CT that is experiencing a problem. The magnitude and phase of the change is used to calculate the absolute change in capacitance and power/dissipation factor. A thirty-day trend is also used to determine rate of change.

Bushing and CT Tap Adapters

Tap adapters are specific to manufacturer, type and voltage class. Doble has developed a number of adapters for the most commonly used bushing and CT types. If a particular adapter is not currently available, Doble will develop an adapter to meet a specific need.

Protection for Bushing & CT Taps

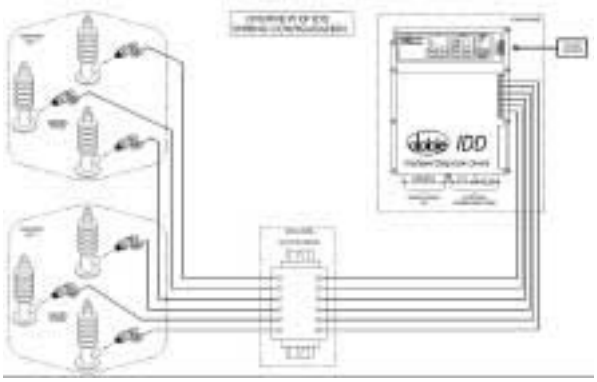
Most bushings and CTs are designed with the tap grounded while in service. The grounding of the tap is usually achieved through the tap cap. On an IDD installation, the tap cap is replaced with an IDD bushing adapter and the grounding of the tap is maintained through the IDD instrument. There are features designed into the IDD tap adapters to prevent a voltage from developing on the tap, should the sensor become disconnected from the IDD. The tap protection consists of:

- Two redundant voltage limiters (13V peak maximum), under normal operating conditions.
- Surge suppression circuit which includes surge arrestors and a 2800Vac spark gap.

Installation

The installation is very straightforward:

1. Mount the tap adapter to the bushing or CT tap.
2. Connect 20 AWG shield wire between the tap adapters and IDD.
3. Connect IDD to substation power source (AC/DC).
4. Connect PC to IDD and configure the IDD.
5. The IDD is now fully operational.



Continuous Diagnostics

The IDD is designed to operate reliably under extreme weather conditions and electrical interference. The self-diagnostic continuously tracks the condition of the unit and issues an alert if an abnormality is detected.

Communication Protocol

Communication with the IDD is viewable through any web browser, and is accessible locally over the RS232 port or remotely through the Ethernet and Modem connections. No additional software is required. (DNP3.0 interface with SCADA via Ethernet, RS485, and Modem)

Remote Communication Options

An IDD can be configured with any of the following remote communication options:

- Ethernet TCP/IP
- RS485 requires DNP3
- Modem (available mid 2002)
- Supervisory I/O

The Supervisory I/O offers a SCADA interface for the IDD. This communication option consists of four outputs and two inputs. The input serves to acknowledge and reset the alerts. The outputs are potential-free contacts that correspond to low, medium and high alerts and the status of the IDD.

Technical Specifications

IDD Electrical Inputs:

Input Measuring Range .....0 - 100ma
Accuracy .....+ 1% of reading
Resolution .....12 bit
Sampling rate 5kHz
Isolation between phases .....2500V RMS, 60Hz, for one minute

Power Supply: .....90 - 264 volts, 47 - 63 Hz or 100 - 280 Vdc

Environment:

Surge withstand .....ANSI/IEEE C37.90.1-1989 (R1994)
ESD: EN 61000-4-2
Ambient Operating Temp.....-40° to 65° C
Shortage Temp.....-40° to 85° C
Humidity .....5% to 95% non-condensing

Physical dimensions:

17.25 in. H x 15.25 in. W x 3 in. D (438.2mm H x 387.4mm W x 76.2mm D) for control cabinet mounting

Supervisory I/O:

Four output contacts:

ACTION ALERT!
WARNING ALERT!
INFORMATION ALERT!
Self Monitoring

Ratings:
Switching 10A @ 240Vac resistive, 3A @ 240Vac inductive, 0.5A @ 125Vdc, 0.25A @ 250Vdc Dielectric Strength 3000Vac, coil to contacts, 1000Vac between contacts.
Surge Strength.....6000V, coil to contacts.

Two inputs:

Remote ALERT! Acknowledge
Remote ALERT! Reset

Ratings:
Input Range .....12V to 300Vdc, 12V to 264Vac
Input Current .....1mA @ 24Vdc, 2mA pk @ 264V RMS
Isolation voltage.....2500V RMS, 60 Hz, 1 minute

IDD





Knowledge Is Power℠
Apparatus Maintenance and Power Management for Energy Delivery

Doble Engineering Company, 85 Walnut Street, Watertown, MA USA 02472
Tel +1-617-926-4900 Fax +1-617-926-0528 www.doble.com

MKT-SL-IDDBB-09/02