

IDD



INTELLIGENT DIAGNOSTIC DEVICE

Online Monitoring for Bushings and Current Transformers

Bushings can fail slowly, giving you time to plan for replacement; they can also fail rapidly, leaving little time to act. With intelligent monitoring from Doble Engineering Company you can proactively manage risk in both situations and plan for replacements. With an embedded Expert System, Doble's Intelligent Diagnostic Devices (IDDs) detect abnormalities in the bushing insulation and issue appropriate alerts.



Benefits

- Save costly equipment by quickly reacting to rapid deterioration warnings
- Identify problem bushings and diagnose the severity of the situation
- Plan for bushing replacements in a proactive, risk management approach

Key Features

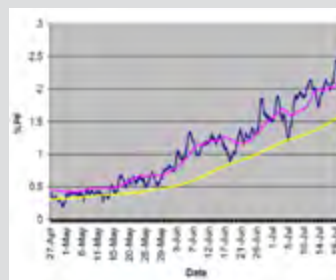
- Bushing current waveforms captured
- Measure leakage current magnitude and relative phase angles
- Scalable device can monitor up to 12 bushings
- Links to dissolved gas analysis & moisture devices such as the Delphi & DOMINO
- Intelligent Expert System learns what is normal for your individual bushings
- Displays alerts locally and remotely
- Responds to subtle changes that may not be noticed by simple limit files
- Optional armored cables & junction boxes for optimal performance in harsh environments

IDD: Applying Doble Expertise

The IDD Expert System identifies variation in the raw data leakage current and phase angle values but also applies to calculated C1 capacitance and Power Factor of the monitored bushings. The IDD Expert System will then provide notification alerts and alarms based on comparisons between the offline and calculated online data.

Bushings Saved

Bushings can fail gracefully or rapidly. The IDD is designed to detect both types of failures, giving you the time you need to act to save the bushings.

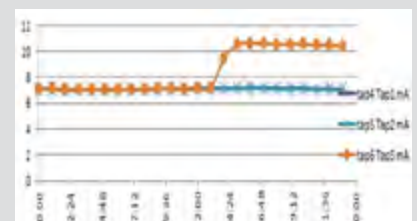


Graceful Failure

This chart shows a deteriorating power factor measured using an IDD over several weeks. Offline testing confirmed the results and the subsequent teardown found damage and discoloration of foils.

Rapid Failure

This raw data shows a significant increase in leakage current: a 30% increase in two hours. Offline testing confirmed the power factor at three times its normal value. The teardown found punctured foils and deteriorated paper.



In both situations the Doble IDD allowed bushings to be removed from service before possibly catastrophic failures.

Technical Specifications

Input Measuring Range	0 - 100mA
Accuracy	+/- 1% of reading
Resolution	12 bit
Sampling rate	5kHz
Isolation between phases	2500V RMS, for one minute
Power Supply	90 - 264 VAC, 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 Storage 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
Output 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
Input Ratings	Input Range: 12V to 300Vdc, 12V to 264Vac Input Current: 1mA @ 24Vdc, 2mA pk @ 264V RMS Isolation voltage: 2500V RMS, 1 minute
Remote communication options	
Ethernet TCP/IP RS485 supports DNP3 and ASCII Modem Supervisory I/O RS232 supports DNP3 and ASCII IEC 61850	

Safety Starting at Installation



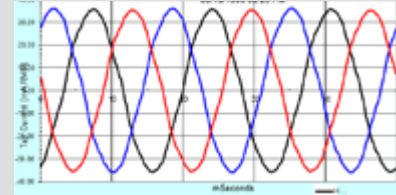
The IDD uses multiple redundant safety systems & ground paths, including transorbs & sparkgaps, to ensure transients are safely conducted to ground. During an installation, the tap cap is replaced with an IDD bushing adapter; the grounding of the tap is then maintained through the IDD.

The IDD follows Doble's three C's of bushing monitoring



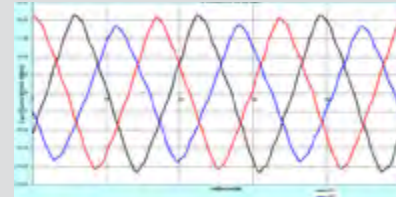
- ✓ **Control** the measurement & ensure validity of data
- ✓ Understand the **Context** – operational & condition data & design specific information
- ✓ Draw appropriate **Conclusions**

With the IDD, you can look at the raw data, which is often critical to understanding the root cause of a problem. The IDD lets you look at the raw waveforms.



It is important to be able to verify the raw data from each bushing, which should be symmetrical and sinusoidal, as per the three phases shown above.

However, in some cases the data is neither sinusoidal nor even; in the case below the raw data is almost triangular in form and has one phase of lesser amplitude than the others. This is worth investigating.



Sum currents have been a popular approach to visualize leakage current data. Over the years Doble has found cases where sum currents are inadequate and possibly misleading. In the case shown in this example, the normal state for the sum current is displaced from the origin, and abnormal operation moves the sum closer to the origin.



With two decades of experience monitoring over 10,000 bushings across the globe, Doble can help you make sense of the raw data to better understand what is happening and why.

