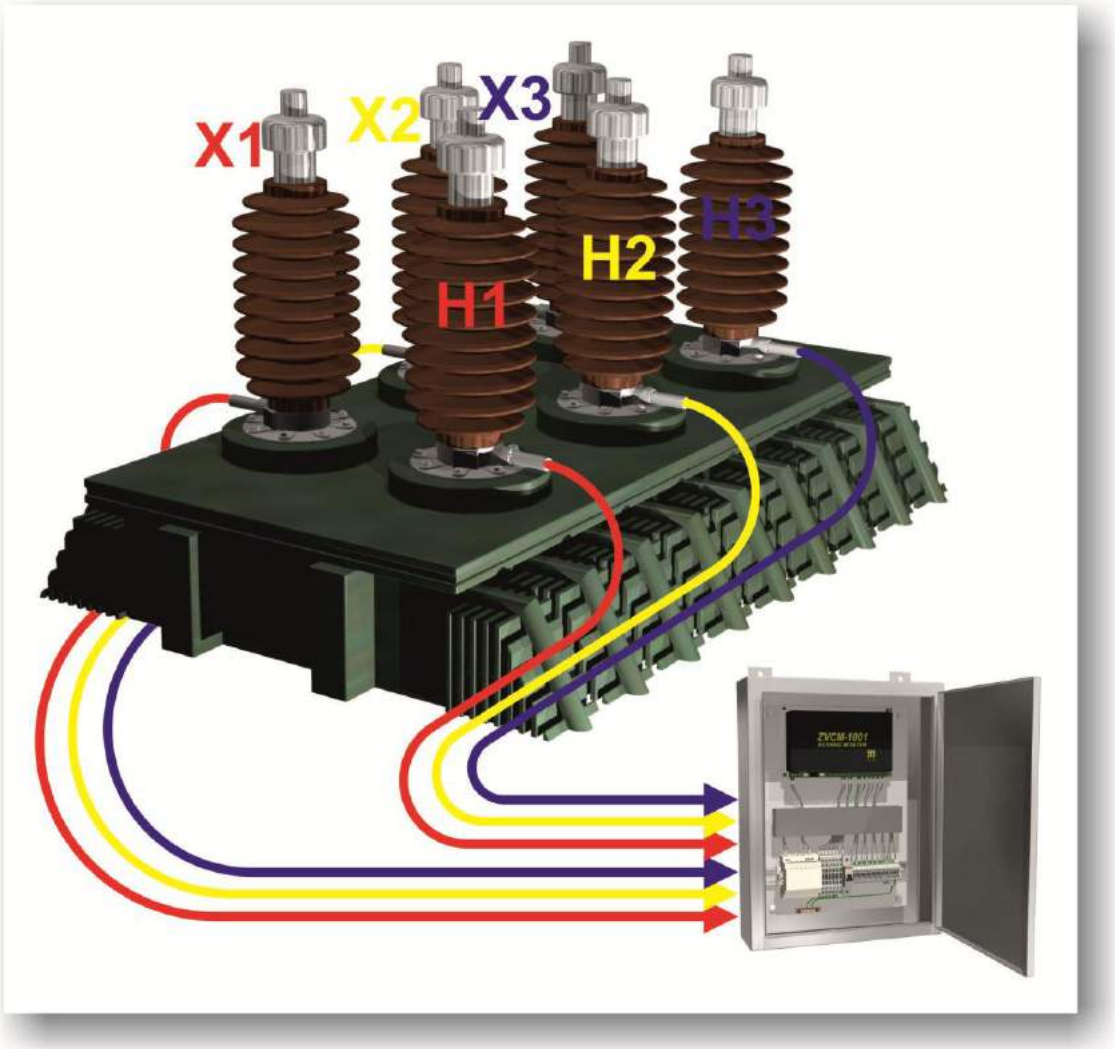
MTE Meter Test Equipment

Bushing Monitor ZVCM-1001

On-line Bushing Monitoring System



Bushing failures are considered as one of the major causes for transformer outages. Historically bushings were tested off-line to measure the capacitance and the dissipation / power factor.

The Bushing Monitor ZVCM-1001, which is an extension package to the MTE HYDROCAL family, is a permanently installed on-line bushing monitoring system. It continuously measures up to six leakage currents, tests the power factor and capacitance values and monitors the condition of bushings, CCVT`s [1)] and free standing CT`s.

The bushing monitoring system incorporates three measurement modes for standard and two for optional configurations:

Standard configuration with 6 current inputs:

- Sum of three current test
- Adjacent phase reference test
- Phase comparison

Optional configuration with 3 voltage and 3 current inputs:

- Reference test (3 bushings and 3 CCVT`s [1)])

Optional configuration with 6 voltage inputs:

- CCVT [1)] Reference test (6 CCVT`s [1)])

The bushing sensors / adapters are connected to the capacitor taps designed for all types of bushings to allow measurement of the leakage current up to 140 mA AC.

The adapters are designed for bushings with grounded and undergrounded capacitor taps. The adapter is designed to prevent a voltage developing on the equipment, in case that the sensor becomes disconnected from the bushing monitoring system.

The Bushing Monitor ZVCM-1001 (joint development with ZTZ services) communicates directly with HYDROCAL 1005 and 1008 units and in conjunction with these units, it offers a complete transformer and bushing monitoring system in one package.

Key Advantages

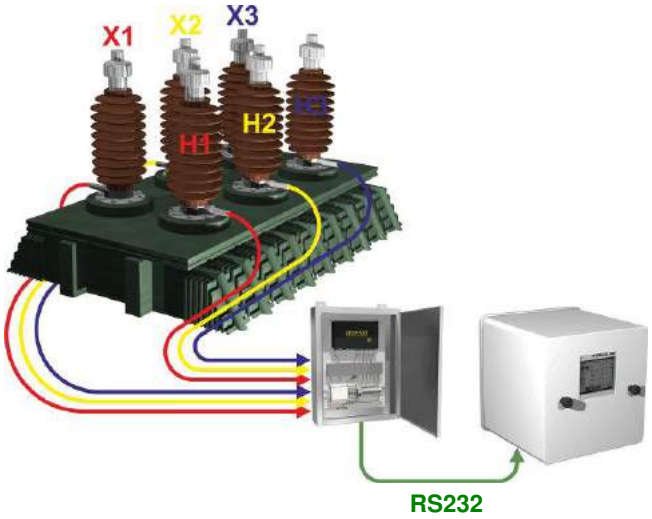
- Simultaneous measurement of up to six bushing leakage currents, providing following data:
  - Relative capacitance in percentage to the start-up value
  - Relative power factor (%PF) for each bushing
  - Magnitude of imbalance currents for two three phase sets of bushings
  - Phase angles of the imbalance currents
  - Alarm in case the measured values exceed the threshold
- Complete on-line transformer monitoring and bushing monitoring system in conjunction with HYDROCAL 1005 and 1008

Bushing monitoring setup

The Bushing Monitoring system ZVCM-1001 can be ordered in different versions with 3, 6, 9 [2)], 12 [2)] or 16 [2)] bushing sensors according to the specification.

The system contains following parts:

- Bushing sensors with connection cable
- Bushing Monitor ZVCM-1001 including mounting plate, power supply, circuit breaker, terminals and wiring
- HYDROCAL communication cable
- Cabinet (Option)



Application examples with one Bushing Monitor ZVCM-1001 unit

ZVCM-1001-3

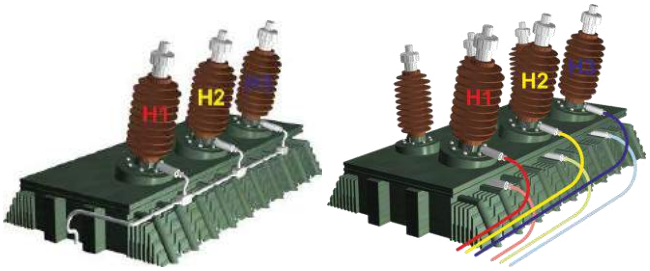
VBS / VBC

ZVCM-1001

Application (typical):

GSU 3-phase / AUTO 3-phase / DISTR 3-phase

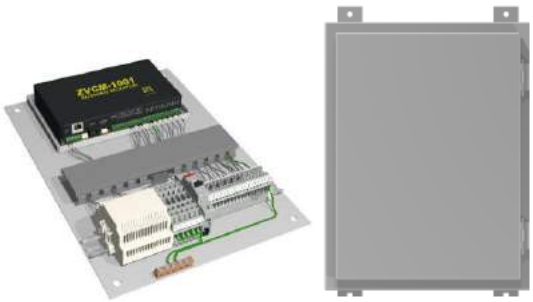
- Monitoring of high voltage side only



ZVCM-1001-6

VBS / VBC

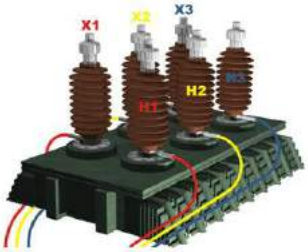
ZVCM-1001



Application (typical):

AUTO 3-phase / DISTR 3-phase

- Monitoring of low- and high voltage side



Application examples with two Bushing Monitor ZVCM-1001 units

ZVCM-1001-9

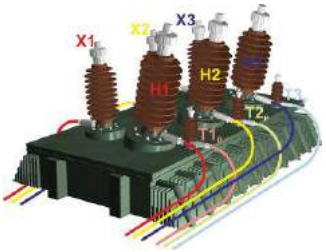
VBS / VBC

ZVCM-1001

Application (typical):

AUTO 3-phase

- Monitoring of low-, high- and tertiary voltage side



ZVCM-1001-12

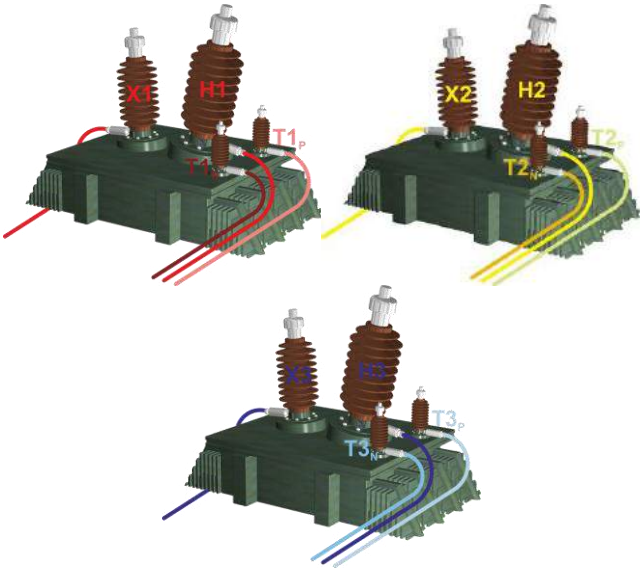
VBS / VBC

ZVCM-1001

Application (typical):

3 AUTO 1-phase transformers

- Monitoring of low-, high- and tertiary voltage side



ZVCM-1001-4S (only in conjunction with ZVCM-1001-12)

VBS / VBC

Application (typical):

Spare AUTO 1-phase transformer

- Monitoring of low-, high- and tertiary voltage side

Technical data Bushing Monitor ZVCM-1001

General ZVCM-1001

Supply voltage:	85 ... 264 V AC / 47 ... 63 Hz or 120 ... 370 V DC
Power consumption:	max. 24 VA
Cabinet:	Stainless steel 304
Dimensions:	
3 and 6 channels	W 420 x H 595 x D 153 mm
9 and 12 channels	W 610 x H 686 x D 229 mm
Weight:	
3 and 6 channels	approx. 15 kg
9 and 12 channels	approx. 23 kg
Operation temperature:	-40 °C ... +65 °C
Storage temperature:	-40 °C ... +85 °C
AD converter:	16 Bit
Sampling rate:	10 kHz

Safety

Electrostatic discharge:	IEC 801-2

General Bushing sensor VBS / VBC

Voltage range: (Bushing primary)	69 ... 765 kV AC
60 Hz voltage: (on the tap at monitoring)	max. 2.5 kV AC
60 Hz voltage: (on the tap at opened or mis-takenly cut coax cable)	max. 120 V AC
Power frequency current : (through bushing insulation)	max. 140 mA AC, RMS
Housing:	Aluminium
Dimensions:	Size is different depending on the voltage
Weight:	approx. no more than 1 kg
Operation temperature:	-55°C ... +90°C, 95 % relative humidity (non condensing)
Storage temperature:	-50 °C ... +55 °C
Installation environment:	Outdoor, no corrosive agents in the air
Type of capacitor tap:	Any manufacturer
Connection to test tap:	¾" / 1 ¼" / 2 ¼" others on request

Measurements

Measurements		Accuracy
Measuring Quantity	Range	
Leakage current	0 ... 140 mA AC	± 1.5 % of reading
Power factor / Dissipation factor	0 ... 100 %	± 0.045 % absolute
Capacitance	100 ... 5000 pF	± 1.0 % of reading
Phase angle of imbalance current	0 ... 360 °	± 1.0 % of reading

Digital Outputs

3 x Digital Outputs		**Max. Switching Capacity**
Type	Control Voltage	
3 x Relay [3]	5 V DC	250 V AC / 10 A AC or 125 V DC / 8 A DC

Operation principle

- Bushing sensor - Resistive bridge / capacitive bridge

Communication

- RS 232 – Screw terminals and RJ45 (Proprietary protocol) - Communication interface for HYDROCAL 1005 and 1008
- DNP3 serial or MODBUS® RTU Controller (Option)

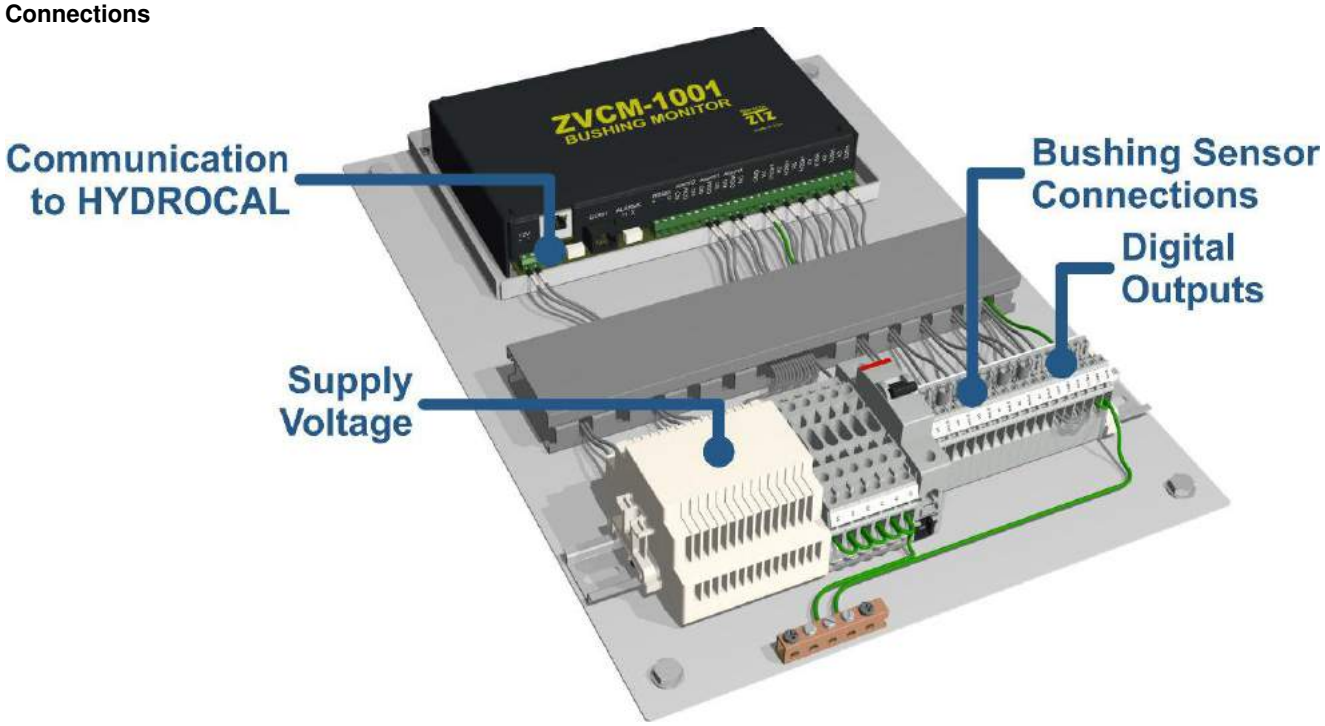
Notes

[1] Capacitance coupled voltage transformer (note on front page)

[2] Two Bushing Monitor ZVCM-1001 units necessary (note on 2nd page)

[3] Relay 1 ... 3: Alarm relay outputs with changeover contact

Connections



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