HEAT MONITORING AND CONTROL INSTRUMENTS FOR TRANSFORMERS

“MB 103”
TEMPERATURE CONTROL UNIT
“PT 100”
TEMPERATURE SENSOR
**MB 103** TRANSFORMER TEMPERATURE CONTROL UNIT WITH CONTROL SIGNAL

![MB 103 Transformer Temperature Control Unit Diagram]
Recent approval of new and rigorous European Laws protecting health and the environment require electrical machines to be manufactured with quality and safety standards that are substantially higher than the average standards applied up to now. Given the full and total liability of the manufacturer with respect to third parties however, it is still highly recommended, if not an absolute need, to monitor machine operation and to be able, whenever the need arises, to stop machine operation in order to prevent severe harm to persons and property.

Comem Engineering Office has designed and developed an electronic control unit, called MB 103, for use in air-insulated electric transformers - commonly called resin or dry transformers - and which also easily adapts for use in oil transformers. MB 103 units use PT 100 temperature probes for constant monitoring of transformer temperatures in 4 points: 3 on the transformer winding columns + 1 on the machine’s magnetic circuit. If the transformer malfunctions, causing its temperature to rise, the MB 103 unit generates an electric alarm signal. If the temperature reaches danger levels the unit generates a 2nd intervention level. This can be connected to a machine stoppage switch that functions independent of alarms. A cooling system control program is also implemented in the unit.

Back Panel Wiring Diagram

MB 103 temperature control units are equipped with a serial port for connection to a PC. (A data management program is furnished on request on a floppy disk, together with a small instruction manual.) When testing the transformer real time data can be furnished for all temperature information measured on the various active channels. This can be used to check intervention settings. There is also an automated acquisition function that can generate a graphic history of readings monitored at adjustable time intervals.

1. Plastic isolating body.
2. Pull-out polarized terminal board.
3. Fastening components.
4. Screws.
5. Front panel made of self-extinguishing plastic.
APPLICATION
4 PT 100 temperature detection probes can be connected to the MB 103 temperature control unit. Software is designed so that any temperature malfunction is acquired, stored and a simple and clear signal is generated so that the machine operator knows how to intervene.

Two temperature control alarm levels are provided: one to signal any probe breakdowns and one for control of cooling fan systems.

A simple and flexible program is used to set thresholds and determine functions to be enacted and is able to set alarm levels and control for all channels either independently or in groups. It is divided into two sections: a first simplified section that includes the most common values and permits quick setting of parameters that are common for all channels and a second, more complex section that is used to change all programming parameters.

A reset function is also installed, bringing all parameters back to default values.

The 19 LEDs plus the display permit MB 103 temperature control units to clearly signal and control all information on the temperature status of the equipment being protected.

Software characteristics:
• 2 alarm thresholds signaled by two relay switching contacts
• Autotest circuit with relay exchange contact and with probe malfunction signaled on the display as well (SSP, OPP).
• Fan operation setting with programmable hysteresis. This can be connected to all probes with NA relay contact signal.
• Activation of 1-4 channel operation.
• Digital linearization of probes.
• Display test command.
• Relay test command.
• Automatic indication of the hottest channel.
• Storage and retention of the highest temperature reading reached by the probes (MAX).
• Front panel programming.
• Recall of the basic pre-set program.
• Serial port for connection to a PC.

PROGRAM GRAPH TESTING

**GENERAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Input</th>
<th>4 PT100 (or PTC) temperature sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control temperatures</td>
<td>minimum -10 °C, maximum 200 °C</td>
</tr>
<tr>
<td>Outputs</td>
<td>4 relay outputs with 5A, 250 V A.C. contacts</td>
</tr>
<tr>
<td>Accuracy</td>
<td>1 °C</td>
</tr>
<tr>
<td>Precision</td>
<td>± 1% on full-scale value + 1 digit</td>
</tr>
<tr>
<td>Power</td>
<td>Universal range 24÷220 V D.C. or A.C. ± 10%</td>
</tr>
<tr>
<td>(Polarity and +12 V D.C. separate input must not be respected)</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>EEPROM with data retention for more than 10 years</td>
</tr>
<tr>
<td>Working temperature</td>
<td>-20 °C to +60 °C</td>
</tr>
<tr>
<td>Max. humidity 80%, without condensate</td>
<td></td>
</tr>
<tr>
<td>VA Absorbed</td>
<td>4 VA</td>
</tr>
<tr>
<td>Terminal board (IEC 988-1/IEC 998-2-1)</td>
<td>Removable and polarized</td>
</tr>
<tr>
<td>Insulation</td>
<td>Double galvanic insulation between supply, microprocessor and temperature probes (2500 V test voltage)</td>
</tr>
<tr>
<td>Weight</td>
<td>0.5 kg</td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP 54</td>
</tr>
</tbody>
</table>

**Inputs and Outputs**

Input: 4 PT100 (or PTC) temperature sensors
Control: minimum -10 °C, maximum 200 °C
Outputs: 4 relay outputs with 5A, 250 V A.C.
Accuracy: 1 °C
Precision: ± 1% on full-scale value + 1 digit
Power: Universal range 24÷220 V D.C. or A.C. ± 10%
(Polarity and +12 V D.C. separate input must not be respected)
Memory: EEPROM with data retention for more than 10 years
Working temperature: -20 °C to +60 °C
Max. humidity 80%, without condensate
VA Absorbed: 4 VA
Terminal board (IEC 988-1/IEC 998-2-1): Removable and polarized
Insulation: Double galvanic insulation between supply, microprocessor and temperature probes (2500 V test voltage)
Weight: 0.5 kg
Protection degree: IP 54

**Program Graph Testing**

![Heat Monitoring and Control Instruments for Transformers]

MB 103 Temperature Control Unit
PT 100 Temperature Sensor

- Parameters:
  - CH1 OFF
  - CH2 OFF
  - CH3 OFF
  - CH4 OFF

- Temperatures Diagram:
  - CH1
  - CH2
  - CH3
  - CH4

- Graphs:
  - CH1 OFF Temperature
  - CH2 OFF Temperature
  - CH3 OFF Temperature
  - CH4 OFF Temperature

- Fan Control:
  - Fan OFF
  - Fan Alarm
  - Fan Trip
  - Fan Low
  - Fan High

- Alarm Control:
  - Max
  - Trip
  - Fan Low
  - Fan High

- Reset Alarm

**Input:** 4 PT100 (or PTC) temperature sensors
**Control Temperatures:** minimum -10 °C, maximum 200 °C
**Outputs:** 4 relay outputs with 5A, 250 V A.C. contacts
**Accuracy:** 1 °C
**Precision:** ± 1% on full-scale value + 1 digit
**Power:** Universal range 24÷220 V D.C. or A.C. ± 10%
(Polarity and +12 V D.C. separate input must not be respected)
**Memory:** EEPROM with data retention for more than 10 years
**Working Temperature:** -20 °C to +60 °C
Max. humidity 80%, without condensate
**VA Absorbed:** 4 VA
**Terminal Board (IEC 988-1/IEC 998-2-1):** Removable and polarized
**Insulation:** Double galvanic insulation between supply, microprocessor and temperature probes (2500 V test voltage)
**Weight:** 0.5 kg
**Protection Degree:** IP 54
TESTS

MB103 temperature control units have successfully passed both type testing required for achieving the CE brand and all testing required by internal COMEM technical standards:

- Radiant electromagnetic emission test according to EN 55011 standards: passed
- Harmonic components emission test according to EN 61000-3-2: passed
- Conducted electromagnetic emission test according to EN 55011 standards: passed

General standards CEI EN 50081-2 (Industrial environmental emissions)

- Radiant electromagnetic emission test according to EN 55011 standards: passed
- Harmonic components emission test according to EN 61000-3-2: passed
- Conducted electromagnetic emission test according to EN 55011 standards: passed

General standards CEI EN 50082-2 (Industrial environmental immunity)

- Electrostatic discharge immunity test according to EN 61000-4-2 standards: passed
- Radiant electromagnetic field immunity test according to EN 61000-4-3 standards: passed
- Radiant electromagnetic field immunity test according to ENV 50204 standards: passed
- Common mode fast transient immunity test (BURST) according to EN 61000-4-4 standards: passed
- Pulsed transient immunity test (SURGE) according to EN 61000-4-5 standards: passed
- Radio frequency field-induced disturbance immunity test according to EN 61000-4-6 standards: passed

The following routine tests are also performed before shipping each single unit:

- Visual inspection of the hardware cards
- Start-up and testing of the supply cards: 24÷220 V ±10% D.C. and A.C. at a 5 Hz ±2% frequency
- Functional testing of display keys and LEDs
- Temperature test with sample temperature sensors.

DELIVERY TERMS

MB1034 temperature control units, product code 1MB1030000, are supplied individually in sturdy cardboard packing (dimensions 170x130h x 105 mm). Weight is 0.6 kg. and units are complete with the following accessories:

- installation and operation instruction manual
- complete fastening kit
- removable terminal boards.

INSTALLATION INSTRUCTION FOR ASSEMBLY ON CONTROL PANEL

- Make a 90x90 mm square hole on the control panel.
- Insert the MB 103 temperature control unit in the hole and clamp it using the screw spacers furnished with it.
- Connect the temperature control unit to the PT100 temperature probes, the signal relays and the power supply, pulling out its terminal board for easier access and following the instructions given on the rear panel of the MB104 temperature control unit.
- No polarity needs to be complied with for Direct Current supply.
- If possible group instrument components in a zone that is separate from power and relay components.
- Avoid housing the following components in the same board: high power switches, contactors, relays, etc.; thyristor power units and, in particular, power factor correction units, motors, etc.
- It is good practice to avoid dust, humidity, corrosive gases and the vicinity to sources of heat.

MB 103 TEMPERATURE DETECTOR

The temperature probes indicated below are all perfectly compatible with MB 103 temperature control units. Each of these, however, has different structural and commercial characteristics designed to meet the all possible needs of different customers.
PT 100 TEMPERATURE SENSORS

PT4I - PT100 platinum temperature sensor designed to DIN 43760, CEI EN 60751 Class. CEI 65-8/IEC 751 standards.
Class B precision.
N° 1 stainless steel dia. 4 x 40 mm. cylindrical bulb.
Connection to 3 silver-tinned copper conductors insulated with teflon and twisted.
Rubber cover protecting against sharp edges.
Standard cable length: 2500 mm.
Electric rigidity test: 2500 VCA for 60°.
Insulating resistance: >100 MΩ at 500 V DC.
Maximum operating temperature +180 °C.

PT6I - PT100 platinum temperature sensor designed to DIN 43760, CEI EN 60751 Class. CEI 65-8/IEC 751 standards.
Class B precision.
N° 1 stainless steel dia. 6 x 65 mm. cylindrical bulb.
Cover in heat-shrunk kynar.
Connection to 3 silver-tinned copper conductors insulated with teflon.
Shielded cable (CU-St) insulated with silicone rubber.
Standard cable length: 2500 mm.
Electric rigidity test: 3000 VCA for 60°.
Insulating resistance: >100 MΩ at 500 V DC.
Maximum operating temperature +180 °C.

PT6V - PT100 platinum temperature sensor designed to DIN 43760, CEI EN 60751 Class. CEI 65-8/IEC 751 standards.
Class B precision.
N° 1 flat fiberglass 60 x 10 mm bulb, 3 mm thick.
Connection to 3 silver-tinned copper conductors insulated with teflon.
Shielded cable (CU-St) insulated with teflon.
Standard cable length: 2500 mm.
Electric rigidity test: 3000 VCA for 60°.
Insulating resistance: >100 MΩ at 500 V DC.
Maximum operating temperature +180 °C.

PT8V - PT100 platinum temperature sensor designed to DIN 43760, CEI EN 60751 Class. CEI 65-8/IEC 751 standards.
Class B precision.
N° 1 flat fiberglass 80 x 10 mm bulb, 3 mm thick.
Connection to 3 silver-tinned copper conductors insulated with teflon.
Shielded cable (CU-St) insulated with teflon.
Standard cable length: 2500 mm.
Electric rigidity test: 3000 VCA for 60°.
Insulating resistance: >100 MΩ at 500 V DC.
Maximum operating temperature +180 °C.
EXTENSION CABLE

Extension cable for PT100 probes. Reference standards: CEI 20.22. No. 4 triads of 20 AWG conductors in silver-tinned copper with teflon insulation. Shielded cable (Cu-St) insulated with rubber, dia. 8.8 mm. Cable length: on request. Dielectric rigidity test: 2000 VCA for 60". Operating temperature: minimum -35 °C, maximum +90 °C.

N.B.: reading error with cable > 10 m. Optional calibration with >10 m. cable lengths: extra charge.