

TRANSFORMER COMPONENTS

## Temperature monitoring unit

### DTI and eDTI

Instruction manual



## Content index

Safety .....	4
DTI and eDTI .....	5
Electrical diagram.....	7
Front panel description.....	8
Programming of the device .....	9
Modality of tripping and restore .....	15
Diagnostic .....	16
Visualization of the maximum measured temperature .....	17
Visualization of the channels with the higher temperature .....	17
Test of the light signaling .....	17
Exclusion of the input probes not used.....	17
Technical features .....	18
Movement, transport and storage ....	18
Appendix A: MODBUS address .....	19
Dimensions.....	20

## Safety

### Safety instructions

Make sure that any person installing, taking into operation and operating the "temperature monitoring unit DTI/eDTI":


- is technically qualified and competent.
- fully comply with these assembling instructions.


Improper operations or misuse could cause danger to:


- life and limb
- to the equipment and other assets of the operator
- to the equipment proper function


Opening of the device will void your warranty.


Safety instructions in this manual are shown in three different forms to emphasize important information.


	<b>WARNING</b>
This information indicates particular danger to life and health. Disregarding such a warning can lead to serious or fatal injury.	

	<b>NOTE</b>
These notes give important or specific information concerning the equipment or as to work with the equipment.	

	<b>WARNING</b>
All relevant fire protection regulation must be strictly observed.	

	<b>CAUTION</b>
This information indicates particular danger to equipment or other property of the user. Serious or fatal injury cannot be excluded.	

	<b>CAUTION</b>
Installation, electrical connection and fitting the device may only be carried out by qualified personnel and only in accordance to this instruction manual. It is responsibility of the user to make sure that the device is used for specified application only. For safety matters, please avoid any unauthorized and improperly works.	

	<b>CAUTION</b>
The temperature control unit DTI/eDTI must not be installed near sources of electromagnetic interference.	

## DTI and eDTI

### Product description

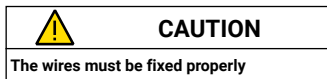
The Temperature monitoring device DTI/eDTI is used in resin or dry type transformers and can also be easily adapted for use in oil transformers.

The DTI/eDTI uses PT100 temperature probes for a constant monitoring of transformer temperatures. The device generates two intervention levels of electric signals (alarm and trip).

### Safety notes on the equipment operation

The electrical installation must conform to the national safety regulations.

The Temperature monitoring device DTI/eDTI has double insulation. Earthing is not required.



The DTI family are devices which use PT100 temperature probes for constant monitoring of transformer temperatures in 4 points: three on the transformer winding columns and one on the machine's magnetic circuit.

If the transformer malfunctions, causing its temperature to rise, DTI unit generates an alarm signal. If the temperature reaches danger levels the unit generates a second intervention level. Moreover, a switch can manage the fan.

### Installation

The device must be installed and used by personal opportunely learned.

Before to proceed at the installation it's necessary to verify if the device is intact and it hasn't damages due to transportation or handling. The power supply must be compatible with the device range. The instrument installation must be done in total absence of voltage and observing the security norm in force.

All operation of maintenance and reparation executed by not authorized persons are forbidden.

If during the functioning the device becomes unsafe, it's necessary to put it out of action and to be sure that this device won't be used unintentionally.

The use shall be considered unsafe when the instrument:

- doesn't work regularly
- has damage clearly visible
- has damage caused of transport or handling
- is stored in bad condition

## DTI and eDTI

### Connection of the temperature sensors

For the connection of the sensor RTD PT100 it's necessary to follow the indication of the wiring diagram of this manual: pay attention to not invert the position between the conductors with red insulator and the conductor with white insulator. The probes type PT100 with three wires use the third wire to compensate the resistance of the conductors (max 20  $\Omega$ ).

If the sensor has two wires (normally white and red) it's necessary to short-circuit the terminals with the red wire (1-2, 4-5, 7-8, 10-11).

To reduce the external noises, it's necessary to use the following indication for the wires:

- use probes with shielded wire connected at earth and wires twisted
- separate the wires of the probes from wires of power supply
- use wires with section at least of 0,5 mm<sup>2</sup>
- use wires with conductor with tin or silver-plated

### Output relays

For the connection of the output contacts it's necessary to follow the indication in the diagram.

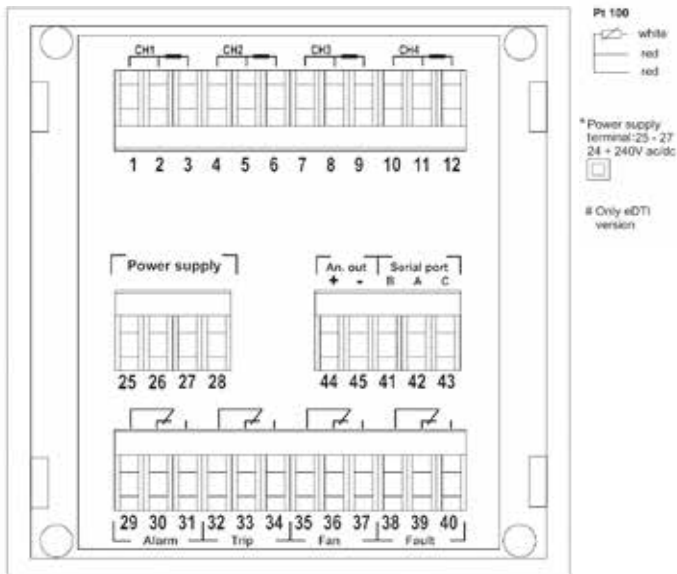
The ALARM and TRIP relays commute when the threshold set value gets over.

The FAULT relay is normally energized, and it commutes in presence of a PT100 anomaly or of the device.

During the normal functioning of the device the contact 38-39 is open, while the 39-40 is closed.

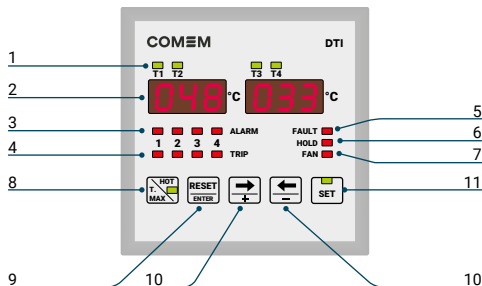
The FAN relay is used to control the cooler fan, according to the on/off thresholds set.

## Electrical diagram



View rear panel of the instrument with terminals for the connections

## Front panel description



### Legend:

1. LEDs **T1-T2-T3-T4** for the on-measuring channel displayed
2. T1-T2 and T3-T4 **displays** for the channel temperature visualization and settings
3. LEDs **ALARM** for the Alarm status in the related channels (1 to 4)
4. LEDs **TRIP** for the Trip status in the related channels (1 to 4)
5. LED **FAULT**: failure indication (device or PT100 probes)
6. LED **HOLD**: the manual reset is active
7. LED **FAN**: the ventilation output is active
8. Push - button **HOT / T. MAX** to display the measured channel with higher temperature (LED indication activated) and to display maximum temperatures achieved
9. Push - button **ENTER / RESET** to confirm programming set and the manual alarm reset intervention
10. Push - buttons **→+ / ←-** for selecting the displayed channel and for changing parameter of programming
11. Push - button **SET** for the settings

## Programming of the device

When the device is switched on, on the display will flash the index of the internal software: later the device starts to display the temperature read on the measured input.

To enter in the programming mode, press the button SET for some second up to light the relative SET LED.

The settings appear in the sequence showed after. To go out of the programming mode without changing the preset values, it's necessary to press SET without confirming with the ENTER key the modified data.

To modify the values or the status, it's necessary to use → and ← keys and the ENTER key to store the modification.

The pressure of the ENTER key move automatically the programming at the successive function or value.

### Selection of the HOLD function

This is the first function in the set menu. In this programming phase the HOLD LED switches on.

The Hold function allows to store the alarm condition that can be rearmed only manually with the RESET button when the temperature is lower than the threshold set.

If this function is disabled it's possible to rearm the ALARM with the RESET button even if the temperature is higher than the threshold set, while the value of temperature come back under the threshold set the alarm will be automatically deleted.

To set the Hold function it's necessary to use the ← and → keys:

ON function enabled

OFF function disabled

Press the ENTER key to confirm the operation.

HOLD mode	T1-T2 display	T3-T4 display
HOLD mode deactivated	HLD	Off



## Programming of the device

### Selection of the number of active inputs

It is possible to select the number of activated inputs. It's possible to choose between 3 and 4 inputs enabled; if there are 3 inputs enabled the T4 display remain off.

Select 3 or 4 inputs with ← and → keys.

Confirm with ENTER.

Active inputs mode	T1-T2 display	T3-T4 display
HOLD mode deactivated	Ch	123
All inputs activated	Ch	ALL

### Control ventilation

The FAN led will switch on indicating the programming of the ventilation control.

If 3 inputs are selected the following setting are available:

- ventilation control inhibited
- fan control active on 3 inputs

Select the configuration with ← and → keys.

Confirm with ENTER.

Fan mode (3 inputs)	T1-T2 display	T3-T4 display
Fan control inhibited	FAN	Off
Fan control on 3 inputs	FAN	ON

If 4 inputs are selected the following setting are available:

- ventilation control inhibited
- fan control active on 3 inputs
- control active only on fourth input

Select the configuration with ← and → keys.

Confirm with ENTER.

Fan mode (3 inputs)	T1-T2 display	T3-T4 display
Fan control inhibited	FAN	Off
Fan control on 3 inputs	FAN	ON
Fan control on 4 inputs	FAN	4

## Programming of the device

### Selection of the threshold of switch-on and switch-off ventilation

It is possible to program the threshold for enabling and disabling the ventilation.

- Selection the threshold for disabling ventilation

The FAN LED is on, with fixed light indicates this phase of programming.

With ← and → keys select the value of temperature indicated on display.

Interval of programming: from -25°C up to (enabling threshold -1°C)

Confirm with ENTER.

- Selection the threshold for enabling ventilation

The FAN LED is on, with flashing light indicates this phase of programming.

With ← and → keys select the value of temperature indicated on display.

Interval of programming: from (disabling threshold +1°C) up to 200°C

Confirm with ENTER.

### Selection of the alarm and trip threshold

The FAN This setting starts to program from the channel number 1.

The ALARM LED ON indicates the programming of the alarm:

With ← and → keys select the value of temperature

Interval of programming: from -25°C up to (trip threshold -1°C)

Confirm with ENTER.

The TRIP LED ON indicates the programming phase of the tripping threshold.

With ← and → keys select the value of temperature

Interval of programming: from (alarm threshold +1°C) up to 200°C.

Confirm with ENTER.

Repeat the same operation for the successive channels.

### Selection of address network identification for the communication of the serial port (MODBUS-RTU protocol)



#### NOTE

This setting is significant only for eDTI model.

This setting is indicated on displays with:

- value to set on T1-T2 display
- ID on T3-T4 display.

With ← and → keys select the number choice

The range for accepted value is from 1 to 247.

Confirm with ENTER.

Modbus setting	T1-T2 display	T3-T4 display
Setting address MODBUS network	001	ID

## Programming of the device

### Selection of the baud rate



#### NOTE

This setting is significant only for eDTI model.

This setting is indicated on displays with:

- BDR on T1-T2 display
- value to set on T3-T4 display.

With ← and → keys select the baud rate

It's possible to choose between the following values: 2,4 - 4,8 - 9,6 - 19,2 kbps.

Confirm with ENTER.

Baud rate setting	T1-T2 display	T3-T4 display
Baud rate: 19200	BDR	19.2
Baud rate: 9600	BDR	9.6
Baud rate: 4800	BDR	4.8
Baud rate: 2400	BDR	2.4

### Selection data bit and stop bit



#### NOTE

This setting is significant only for eDTI model.

This setting is indicated on displays with:

- the type of parity on T1-T2 display
- the number of data bit and stop bit on T3-T4 display.

With ← and → keys select the options.

Confirm with ENTER.

Data-stop bit setting	T1-T2 display	T3-T4 display
No parity / 8 data bit - 1 stop bit	NO	8-1
No parity / 8 data bit - 2 stop bit	NO	8-2
Even parity / 8 data bit - 1 stop bit	EVE	8-1
Odd parity / 8 data bit - 1 stop bit	ODD	8-1

## Programming of the device

### Selection of the linked channel with the analogue output



#### NOTE

This setting is significant only for eDTI model.

This setting is indicated on displays with:

- AN on T1-T2 display
  - the linked measure channel on T3-T4 display: CH 1/2/3/4 for the 1/2/3/4 measure channel, ALL to link the measure channel with the higher temperature.
- With ← and → keys to select the options.

Confirm with ENTER.

Link channel setting	T1-T2 display	T3-T4 display
Channel with higher temperature	AN	ALL
Measure channel CH 1	AN	Ch 1
Measure channel CH 2	AN	Ch 2
Measure channel CH 3	AN	Ch 3
Measure channel CH 4	AN	Ch 4

### Configuration output signal



#### NOTE

This setting is significant only for eDTI model.



#### NOTE

The maximum load for analogue output is 400 Ω.

In this phase it's possible to define the type of signal of analogue output as 0-20 mA or 4-20 mA.

This setting is indicated on displays with:

AN0 -20 to set the output as 0-20mA or (0 mA = -30°C; 20 mA = 200°C)

AN4 -20 to set the output as 4-20 mA or (4 mA = -30°C; 20 mA = 200°C)

With ← and → keys select the options.

Confirm with ENTER.

4-20 signal setting	T1-T2 display	T3-T4 display
Output proportional 0 - 20 mA	AN 0	-20
Output proportional 4 - 20 mA	AN 4	-20
Measure channel CH 2	AN	Ch 2
Measure channel CH 3	AN	Ch 3
Measure channel CH 4	AN	Ch 4

## Programming of the device

### Configuration diagnostic probes

This function allows to enable or to disable the control on the probes. This functionality controls the variation of the temperature in a defined time. A flag raise if this variation is higher than a set value.

FDC setting	T1-T2 display	T3-T4 display
FDC mode disabled	FDC	Off
FDC mode enabled	FDC	ON

It's necessary to indicate the maximum variation temperature:

- FDC: min 5°C or max 30°C

and after the time in which to do the control:

- FDC: min 10" or max 90" (time in seconds)

The →+ key is used to increase the values while the ←- key to decrease.

Confirm with ENTER.

Temperature configuration FDC	T1-T2 display	T3-T4 display
Min °C	FDC	-5°
Max °C	FDC	30°

Time configuration FDC	T1-T2 display	T3-T4 display
Min in seconds	FDC	10"
Max in seconds	FDC	90"

### Exit from the programming phase

Press the SET key or wait for about 8 seconds without to press any key to come out of the programming phase.

## Modality of tripping and restore

### Alarm

On the relative channel, if the threshold value set is exceeded of  $+1^{\circ}\text{C}$ , after 5 seconds the ALARM relay is energized and the ALARM led is.

The alarm rearm (relay de-energized and the involved LED off) occurs when the temperature goes down of  $2^{\circ}\text{C}$  respect at the threshold value set.

### Trip

On the relative channel, if the threshold value set is exceeded of  $+1^{\circ}$ , after 5 seconds the TRIP relay is energized and the TRIP led is.

The trip rearm (relay de-energized and the involved LED off) occurs when the temperature goes down of  $2^{\circ}\text{C}$  respect at the threshold value set.

### To silence alarm

If the Hold function is disabled, it's possible to silence the alarm condition. During the alarm condition the ALARM relay and the "ALARM" optical signalling are enabled.

Pressing the Reset button, the relay will be de-energized while the optical signalling of the alarm condition becomes flash.

If the temperature increases up to reach the (TRIP temperature -  $1^{\circ}\text{C}$ ), the relay and the optical signalling are enabled another time.

If after the reset, the temperature goes down under the threshold value set, the flashing optical signalling will be automatically deleted.

## Diagnostic

The device is provided of the thermic probes diagnostic function.

The condition controlled on the measured input are:

- Probe PT100 interrupted: signalling on the display the message O P E (open).
- Probe in short circuit: signalling on the display the message S H R (short circuit).
- Probe out of order for wrong read temperature: signalling on the display the message F D C.

When the device switches on the auto-diagnostic, FAULT relay commutes and it remains in the energized status until one of the above-described conditions appears, or if a device failure occurs, or if the power supply is absent.

The anomaly conditions are signalled also by the FAULT led on.

Every time that a probe is out of order because it is interrupted (OPE) or in short circuit (SHR) or the delta of temperature is too elevated (FDC), the corresponding channel LED flashes until the anomaly stop.

The alarm of interrupted probe (SHR) or open probe (OPE) will be reset automatically while the alarm for the delta of temperature (FDC) disappears by pressing this sequence:

- push the ENTER key
- keep it pressed
- press the →+ key at least for 5 seconds.

The status of the relay contact (all available with exchange contact) is showed in the following table:

RELAY	DISABLE STATUS	ENABLE STATUS	UNPOWERED STATUS
ALARM	OFF: closed 29-30	ON: closed 29-31	closed 29-30
TRIP	OFF: closed 32-33	ON: closed 32-33	closed 32-33
FAN	OFF: closed 35-36	ON: closed 35-37	closed 35-36
FAULT	OFF: closed 38-40	ON: closed 38-39	closed 38-39

## Visualization of the maximum measured temperature

On the relative channel, if the threshold value set is exceeded of  $+1^{\circ}\text{C}$ , after 5 seconds the ALARM relay is energized and the ALARM led is. The alarm rearm (relay de-energized and the involved LED off) occurs when the temperature goes down of  $2^{\circ}\text{C}$  respect at the threshold value set.

## Visualization of the channels with the higher temperature

Pressing the HOT key for some seconds till switching to the HOT led.

On the T1-T2 display, the hotter temperature among the inputs 1 and 2 will appear.

On the T3-T4 display, the hotter temperature among the inputs 3 and 4 will appear.

To come back in the standard visualization mode, press the HOT key for some second up to switch-off the relative signalling led.

## Test of the light signaling

Press at the same time ← and → keys: all the signalling lights will start to flash for some seconds.

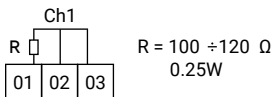
## Exclusion of the input probes not used

If one or more inputs are not used, it's necessary to connect a resistance of value included between  $100$  and  $200\ \Omega$ , or  $0.25\text{W}$ .

The input 4 can be disabled through the "Selection number of active inputs" on page 5.

In the figure is showed the connection to disable the input Ch1.

The same connection can be used for the other inputs.





## Technical features

Auxiliary power supply	24/230 V dc/ac $\pm 15\%$ 50-60 Hz
Maximum consumption	4 VA
Measured inputs	3 - 4 inputs by RTD PT100 (max wire resistance 20 $\Omega$ )
Interval of measure	-30°C up to +200°C / precision $\pm 2^\circ\text{C}$
Interval of visualization	-30°C up to +220°C
Tripped delay-hysteresis	5 seconds - 2°C
Measured visualization	2 displays with led 7 segments, 3-digits
Outputs	DTI: 4 relay NO-C-NC (250 V 5 A resistive load) eDTI: 4 relay NO-C-NC (250 V 5 A resistive load), 0-20 mA or 4-20 mA (Default); Modbus RTU
Output functions	alarm, trip, fan, auto-diagnostic
programmable functions	ALARM, TRIP, HOLD, FAN, T.MAX, HOT, FDC
Connection	Extractible terminal with screws, section wires max 2.5 mm <sup>2</sup>
Insulation	2500 Vrms 50 Hz per 60 s :U aux - input PT100 / U aux - relay outputs / inputs PT100 - relay outputs
Protection degree	IP52 front panel, IP20 rear panel, as CEI-EN 60529
Dimensions - enclosure	Flash mounting DIN 96x96 mm, depth 120 mm / Enclosure thermoplastic self-extinguishing as UL94 V0
Working temperature	-10°C up to +60°C, humidity max 95%
Storing temperature	-25°C up to +70°C
Standards	Security: EN 61010-1 EMC: EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-11; EN 61000-6-4
Management software for eDTI	Contact us at: <a href="mailto:customerservice@it.comem.com">customerservice@it.comem.com</a>

## Modality of tripping and restore

The DTI/eDTI temperature monitoring devices are shipped inside a cardboard box to facilitate transport and storage. As soon as the temperature monitoring device DTI is received, the customer must perform the following operations:

- examine the outer packaging surface to be sure that it is intact
- check that there are no breakages

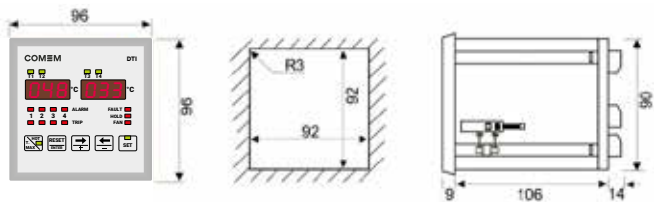
If damage is found, please contact COMEM and provide the shipping data together with the serial number of the unit.

The temperature monitoring device DTI/eDTI must be stored in a dry place at temperatures as indicated above.

## Appendix A: MODBUS Address

Register address	Operations	Description	Notes
<b>Operation for monitoring</b>			
0x280	R	CH1 Instantaneous Temperature [°C]	
0x281	R	CH2 Instantaneous Temperature [°C]	
0x282	R	CH3 Instantaneous Temperature [°C]	
0x283	R	CH4 Instantaneous Temperature [°C]	
0x288	R	CH1 Maximum Temperature [°C]	
0x289	R	CH2 Maximum Temperature [°C]	
0x28A	R	CH3 Maximum Temperature [°C]	
0x28B	R	CH4 Maximum Temperature [°C]	
0x290	R	CH1 Diagnostic	0x0000 Input is right connected
0x291	R	CH2 Diagnostic	0x0001 Input is shorted
0x292	R	CH3 Diagnostic	0x0002 Input is open
0x293	R	CH4 Diagnostic	0x0003 Input is failure
0x258	R	CH1 Instantaneous Temperature & Diagnostic [°C]	
0x259	R	CH2 Instantaneous Temperature & Diagnostic [°C]	0x0000 Input is shorted
0x25A	R	CH3 Instantaneous Temperature & Diagnostic [°C]	0x0001 Input is open Real Value= Read Value (dec) - 25
0x25B	R	CH4 Instantaneous Temperature & Diagnostic [°C]	
<b>Operation for controlling</b>			
0x300	R / W	CH1 Alarm Setting [°C]	
0x301	R / W	CH2 Alarm Setting [°C]	
0x302	R / W	CH3 Alarm Setting [°C]	
0x303	R / W	CH4 Alarm Setting [°C]	
0x310	R / W	CH1 Trip Setting [°C]	
0x311	R / W	CH2 Trip Setting [°C]	
0x312	R / W	CH3 Trip Setting [°C]	
0x313	R / W	CH4 Trip Setting [°C]	
0x272	R / W	Fan OFF Temperature Setting [°C]	
0x273	R / W	Fan ON Temperature Setting [°C]	
0x27F	W	Reset Maximum Temperature	Write 0xA55A to reset Unsigned int

## Dimensions



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The data and illustrations are not binding. We reserve the right to modify the contents of this document without prior notice following the technical and product developments.

This installation manual contains essential information for the user required to install & operate the product. In case you need any further information, contact us at [customerservice@it.comem.com](mailto:customerservice@it.comem.com).

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