Modular temperature controllers

WT-WM

CE

GENERAL DESCRIPTION

USE

WT - WM series controllers are used in heating, thermoventilation, air-conditioning plants to control ambient, duct, and immersion temperature.

MANUFACTURING CHARACTERISTICS

Modular electronic controller of integrated and hybrid circuit type to control one or more functions with direct setting and with easily readable parameters. The controllers consist in protection housing, electronic card and terminal board for both wall and flush (Rack 19") mounting.

Input signals

- From SB. sensors and TU. transmitters (only for WM557)
- From WM master module for summer/winter compensation
- From RM selectors for remote set-point adjustment.
- From DIGITROLL 7000 control unit.

Output signals

- For single, contemporary or sequence control of final control elements: actuators, motorized valves, step controllers, power units
- For remote trasmission of the physical unit under control : Analogical and digital indicators - recorders

CONTROLLERS TECHNICAL CHARACTERISTICS

WT510 series **-** Proportional-Integral-Derivative control- Direct/reverse action - Set point precision ± 1 K

Model	Scale °C	Proportional band scale width %	Integral action		Output signal V	Power supply V~	Consumption VA
			%	timing s.			
WT513 **WT515**	0÷50 20÷120	2÷40	0÷100	0÷600	0÷15	24 ±10%	3

WT530 series **-** As WT 510, with 2 positions second output - SPDT 2 (0,5)A - 250 V a.c.

Model	Scale °C	Proportional band scale width %	Integral action		Output signal V		Power supply V~	Consumption VA
			%	timing s.	threshold V	differ. V		
WT533 **WT535**	0÷50 20÷120	2÷40	0÷100	0÷600	0÷11	0,5÷3	24 ±10%	3

WT540 series **-** As WT 510, with maximum and minimum proportional-integral-derivative limit action.

Model	Scale °C	Proportional band scale width %	Integral action		Limit action		Power supply V~	Consumption VA
			%	timing s.	threshold °C	prop. band		
WT543 **WT545**	0÷50 20÷120	2÷40	0÷100	0÷600	0÷50 20÷120	2÷40	24 ±10%	3

WM 552 - 554 series - As WT 510, with compensation from SB. temperature sensors
WM 551 - 553 - 555 series - As WM with maximum and minimum limits
WM 557 series - temperature controller with compensation from TU humidity ttransmitter (see relavant data sheet).
WM can act as compensation Masters for WT controllers (up to 10 max).

Model	Main scale °C	Limit scale °C	Proportional band scale width %	Integral action		Compensation		Power supply V~	Consumption VA
				%	timing s.	type	slope		
WM551	0÷50	0÷60	2÷40	0÷100	0÷600	invernale	0÷3,5	24 ±10%	3
WM552		-				invernale	0÷3,5		
WM553		0÷120				invernale	0÷3,5		
WM554		-				estiva	0÷1		
WM555		0÷60				estiva	0÷1		
WM557		-				inversa	0÷3,5		

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WT 220 series- Three positions control - Set point precision ± 1 K.

Model	Scale °C	Differential Xd K	Dead zone Xz K	Control relay	Power supply V~	Consumption VA
WT223	0÷50	1	1÷10	n° 2 SPDT	24 ±10%	3
WT225	20÷120	2	1÷20	24V~ max 2(0,5)A		

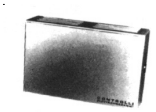
Case: blue ABS
Protection: IP30 (DIN 40050)
Weight: 0,8 kg

Room temperature limits:
- working T50 °C
- storage -25T 65 °C

Product conforms to EMC89/336 according to:
- EN 50081-1 for emission - EN50082-1 for immunity

SENSORS AND TRANSMITTERS TECHNICAL CHARACTERISTICS - SB. temperature sensors with Balco thermoresistance sensing element 1000 Ohm at 21,1 °C - TU humidity transmitters (See TU. data sheet)

Model	Description
SBA	room type - Grey ABS case with glazed aluminium front part - Overall dimensions 85 X 55 X 32 mm - max temp. 50 °C - Protection IP30 (DIN 40050) - Max cable section 1,5 mm^2
SBA20	as SBA with double sensing element - Overall dimensions 115 X 85 X 32 mm - Max cable section 2,5 mm^2
SBA55	as SBA with set point adjustment knob 5÷35 °C - set point precision ±1K - Overall dimensions 115 X 85 X 32 mm - Max cable section 2,5 mm^2
SBC	immersion type - Grey Noryl case with Ø 10 conduit opening - AISI304 stainless steel well - ½" nickel-plated brass gas connection - length 113 mm - max room temp. 50 °C - max fluid temp. 140 °C - max fluid pressure 40 bar - Protection IP44 (DIN40050)
SBD	duct type - Grey Noryl case with Ø 10 conduit opening - AISI304 stainless steel tube, Ø 7,5 mm - length 300 mm - Sliding mounting flange - max room temp. 50 °C - max air temp. 95 °C - Protection IP44 (DIN40050)
SBE	Outdoor type - Grey Noryl case with Ø 10 conduit opening - Overall dimensions 45 X 83 X 53,5 mm - max temp. 60 °C - Protection IP44 (DIN40050)
SBV	as SBD with uncovered fast detecting sensing element - length 315 mm - max air temp. 65 °C **Note: not suitable for application with possible condensate**


SBA


SBC


SBD

421 - AISI304 steel connection for SBC sensor.

W SERIES CONTROLLERS TERMINAL BOARD UNIT

Note - Each controller needs the terminal board unit which should be ordered separately .

Model	Controller mounting
MW1	wall or panel mounting
MW2	Rack 19" or flush mounting

The following apparels can be connected to the controller to achieve supplementary functions.
- WS506 Min/max signal selection module
- WD500 On-off control module
- CP8500 Electronic-pneumatic transducers

The technical characteristics of such equipments are contained in the relevant data sheets.

REMOTE SELECTOR

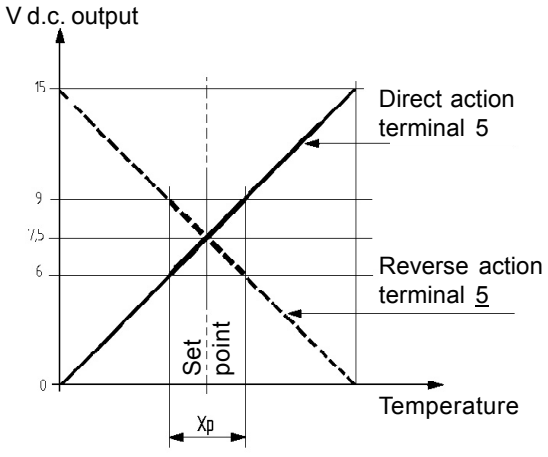
It is meant for remote set-point adjustment of WT-WM controllers (up to max. 10) Set-point precision ± 1%

Model	Scale °C	Mounting
RM51	0÷50	flush mounting
RM52	20÷120	

For further information see CM-RM data sheet

PROGRESSIVE CONTROL SIGNAL

W500 controllers have the following output signals:
0÷15 V at terminal 5 (direct action)
15÷0 V at terminal 5 (reverse action)
processed in proportional function or P.I.D. according to how the apposite I% knob (scale 0÷100%) is set. The set proportional band Xp, corresponds to a controller output of 3 V~. Whenever required, W500 can be supplied in special version for 0÷10 V~ progressive control; in such case the set corresponds to 5 V~.



N1036

INSTALLATION

The controller and transmitters should be installed in environments with temperature between 0 and 50 °C and must not be subjected to humidity conditions with condensate, aggressive or explosive vapors. Avoid mounting on panels subjected to vibrations and disturbance electrical sources (i.e. contactors, switches, power cables). In case of mounting on both control and power switchboards, control must be separated from power by means of a metallic shield.
For controller mounting, see MW terminal board data sheet.
For transmitters mounting see TU. data sheet.

SENSOR MOUNTING

SBA/SBA20/SBA55 (ROOM) - Max temp. 5O °C
The sensor should be installed at about 1,5 m from the floor, in a zone respresenting the average temperature of the environment under control. Avoid mounting in air stagnation areas, next to doors, windows, heating sources. Wall mount the base by screwing it using the apposite holes.

SBD/SBV (DUCT) - Max air temp.: 95 °C (SBD)
65 °C (SBV)
The sensor should be mounted with its flange in such position that the sensing element detects an air temperature which actually represents the process under control, possibly in the middle of the duct, at least 1m. downstream the valve or the damper.

SBC (IMMERSION) - Max fluid temperature: 140 °C
Max fluid pressure: 40 bar
The sensor should be mounted with its threaded 1/2" gas connection. Install the connection in such position that the sensing element detects a fluid temperature actually representing the process under control: it must be immersed into the controlled fluid (generally in an elbow) 1m. downstream the valve.
Insert the sensor into the connection, tightening it with a screw.

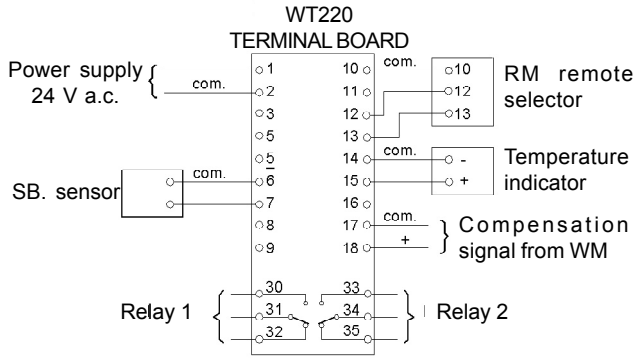
SBE (OUTDOOR) - Max temperature: 60 °C
The sensor should be mounted outdoors on the side of the building receiving less sunlight (NORTH-NORTH WEST) and the most protected from pouring rain. Avoid mounting near chimneys or other heating or cooling sources. Fix the sensor using the supplied bracket which must be previously mounted on wall, through the two holes.

ELECTRICAL CONNECTIONS

Perform the electrical connections according to the following diagrams and in compliance with existing rules.
Supply 1 and 2 terminals with 24 V ~ voltage (max tolerance ± 10%) obtained with an adequate power transformer.
Never use autotransformers
Using more than one controller, one power supply phase must be common to all the terminals 1, and the other to all 2 terminals on the controllers.
Note -2 terminal is connected to the system common.
For transmitter and actuator connections use cables having the sections indicated in the following table:

Cable section mm^2	Cables max. length m.	
	With transmitter	With actuator
1	50	150
1,5	90	220
2,5	150	370

Attention: The cables connecting the transmitters should be separated from those connecting the actuator and must not be lodged in elios pipes with voltage lines higher than 24 V.
A proportional controller can drive up to a max. of either 3 actuators simultaneously (control range 6÷9 V~) or 2 actuators in sequence (control range 4÷7 and 8÷11 V~).
Using more than one ctuator make sure the same power supply phase is connected to all 1 or L1 terminals and the remaining one to all 2 or L2 terminals on the actuators.
Depending on the action required (for variable increase), connect 5 or Y terminal on the actuator to:
– 5 terminal on the controller for **direct action** (0÷15 V ~)
– 5 terminal on the controller for **reverse action** (15÷0V ~).
In order to send the temperature value detected by the sensors to more than one controller connect the terminals 14-15 (14-16) of the first controller, to the terminals 6-7 or 8-9 of the second, and so on, up to a maximum of 10 controllers.
The temperature indicators should be connected to the terminals 14-15 (14-16) which have been left disconnected.



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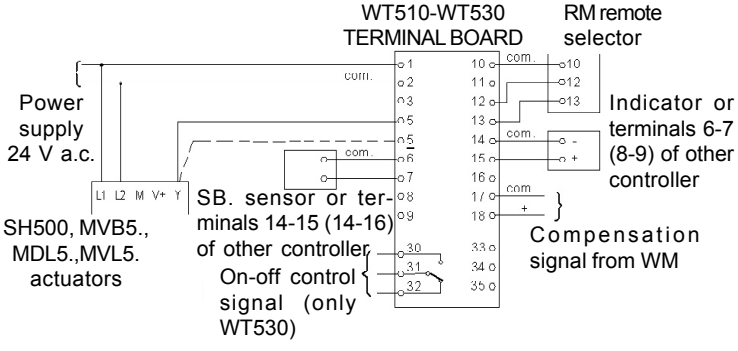

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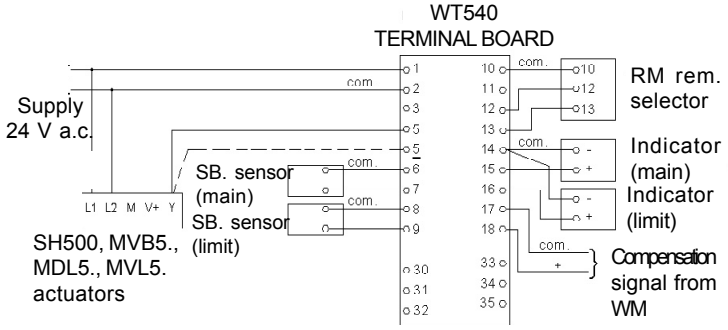
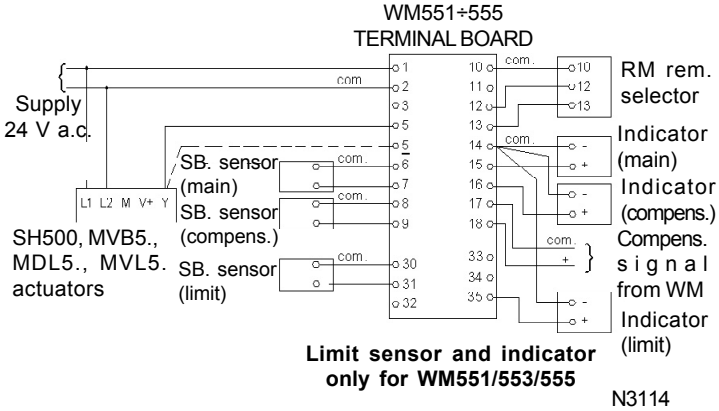


N3113



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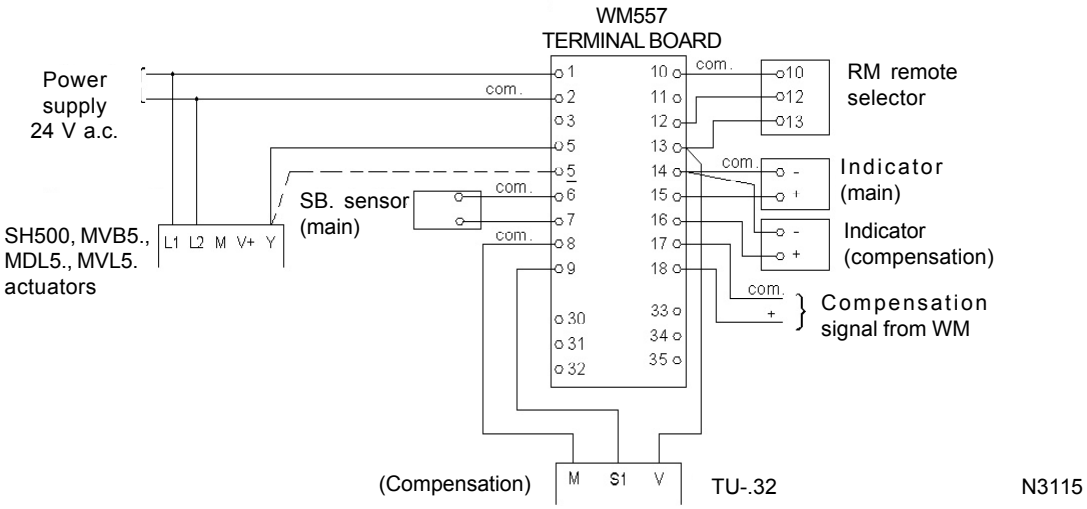


N3115

START-UP

Make sure power supply is 24 V~ ± 10%.
Green LED on.
ATTENTION: IF SUPPLIED WITH HIGHER VOLTAGE, THE CONTROLLER CAN BE DAMAGED.
Make sure the controls on the printed circuits are pre-set for the required operation:

a) SW1 switch on:
INT - for set-point adjustment with manual knob
RM - for set-point adjustment with remote selector

b) TP switches must be closed if the related input is from Balco (SB.) sensor, and open if the input derives from another controller (output for indicators), precisely :

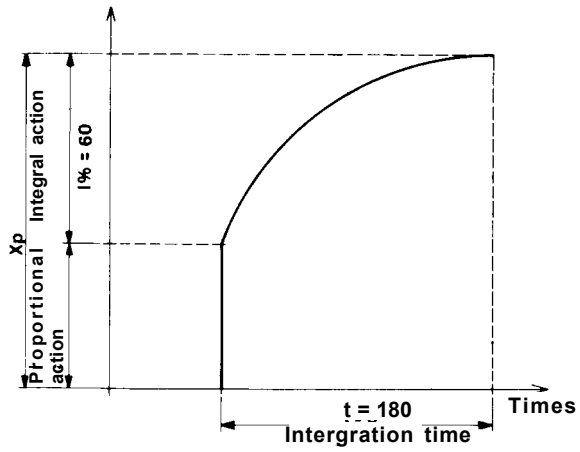
- TP1-TP2 switches closed with Balco (SB.) sensor main input (terminals 6-7)
- TP3-TP4 switches closed with Balco (SB.) sensor limit or compensation input (terminals 8-9)
- TP5-TP6 switches closed with Balco (SB.) sensor limit input (terminals 30-31, only for WM551-553-555).

On the controllers printed circuit is inserted a trimmer **"CAL"** ± 5 °C for eventual set corrections due to specific plant requirements. All apparels having modulating output allow proportional (P) or proportional-integral-derivative (PID) operation for processes with fast load variations and requiring minimum changes from the pre-set value. Integral action is effected by choosing according to requirements:

I% - (knob 6) integration percentage (0÷100%) of the signal to be sent with delay to the final control element: the knob 0% represents operation with excluded integral and the timing scale has no effect. When the knob is set on whatever I% value, it means that the 100% signal variation complement passes immediately to the actuator with proportional action; the chosen percentage will pass progressively to the actuator during the integration time indicated by knob 7.

t - (knob 7) integration time (0600 s) fixes the time in which integral action should be ended.

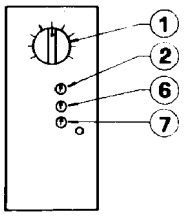
Example: I% = 60; t = 180 s.



N1037

WT510 CALIBRATION (Fig. 1)

– Using knob 1, set the percentage value of the external air damper minimum opening.
– Set the proportional band at half scale using knob 2.



N4114

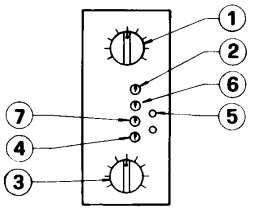
FIG. 1

When the plant is at normal operation, eventually correct the set value until it reaches the minimum value assuring a control without oscillations; in case of instability increase such value.

– Using knob 6, set the I% integral action value.
– Using knob 7, set the integral action time value.

WT 530 CALIBRATION (Fig. 2)

– Adjust the set point using knob 1.
– Set the proportional band at half scale using knob 2.



N4110

FIG. 2

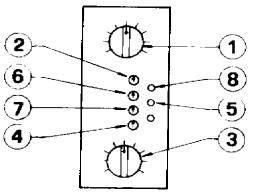
When the plant is at normal operation, eventually correct the set value until it reaches the minimum value assuring a control without oscillations; in case of instability increase such value.

– Using knob 6, set the I% integral action value.
– Using knob 7, set the integral action time value.
– Set the relay switching point using knob 3.
– Set the differential at half scale using knob 4.
– The relay closes the contact 30-31 when the controller output signal goes under the threshold set with knob 3.

The red LED 5 switches on.

WT 540 CALIBRATION (Fig. 3)

– Using knob 1, set the T1 value of the required room temperature.
– Set the proportional band Xp at half scale using knob 2.
– Impostare con la manopola 3 il valore della temperatura di inizio dell'azione limite.



N4115

FIG. 3

– Using knob 4 set the proportional band limit XP_2 at half scale.
  When the plant is at normal operation, eventually correct the set value until it reaches the minimum value assuringa control without oscillations; in case of instability increase such values.
– Using knob 6 set the I% integral action value.
– Using knob 7 set the integral action time.
– Select the limit action (minimum or maximum) on the switch located in the apparel on its printed circuit.

Minimum limit: when the limit signal is lower than the principal one, the controlled device goes under limit sensor control and the red LED 5 is on.
Max. limit: when the limit signal is higher than the main one, the controlled device goes under limit sensor control and the red LED 8 is on.

WM 552 and 554 CALIBRATION (Fig. 4)

– Using knob 1 set the T1 minimum supply temperature value.
– Using knob 3 set the T2 value of the external compensation start temperature.
– Using knob 4 adjust the pre-set slope, according to project data.

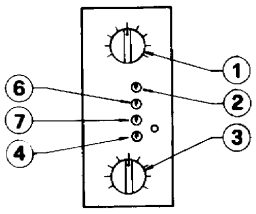


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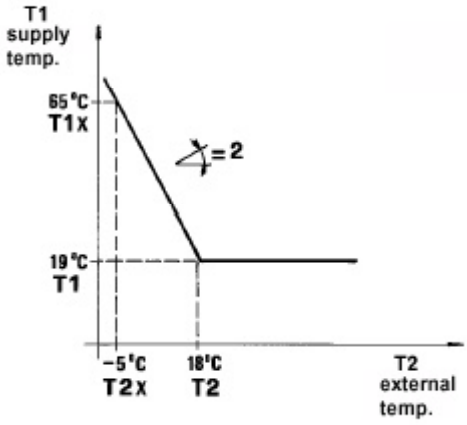
FIG. 4

– Set the proportional band Xp at half scale using knob 2. When the plant is at normal operation, eventually correct the set value until it reaches the minimum value assuring a control without oscillations; in case of instability increase such values.

Ex. 1 **Winter compensation (WM552)** T1 increases correspondingly to T2 decrease (for T2 temperature higher than the set value, T1 remains constant).

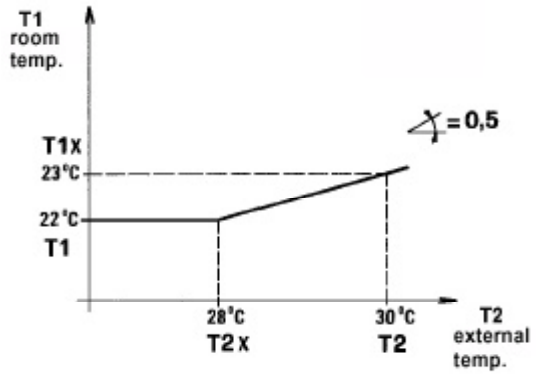


N1038

Project data: T1 (supply) variation from 19 to 65 °C
T2 (external) variation from 18 to -5 °C
Slope value to be set

$$\frac{\Delta T1}{\Delta T2} = \frac{65\text{-}19}{18\text{-}(\text{-}5)} = 2$$

Ex. 2 **Summer compensation (WM554)** T1 increases for T2 increase (for T2 temperature lower than the set value, T1 remains constant).



N1038

Project data: T1 (room) variation from 22 to 23 °C
T2 (external) variation from 28 to 30 °C
Slope value to be set:

$$\frac{\Delta T1}{\Delta T2} = \frac{23\text{-}22}{30\text{-}28} = 0{,}5$$

WM557 CALIBRATION

As WM552, but use knob 3 to set the compensation start humidity value.

WM551 - 553 - 555 CALIBRATION

The setting of the parameters related to supply temperature control T1 in function of T2 external temperature and proportional band corresponds completely to what the paragraph “WM552 and 554 CALIBRATION” indicates.
In particular, for WM551 and 553 controllers are valid the indications regarding WM552, and for WM555 the ones related to WM554.

LIMITS CALIBRATION

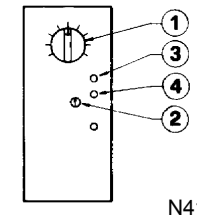
- by positioning the SW 2 switch, located on the printed circuit panel, select direct (D) or reverse (I) limit action;
- fix the maximum limit set point on Trimmer TM and theminimum limit set point on Trimmer tm. The Trimmers are located on the printed circuit panel;
- set using Trimmer Xp, located on the printed circuit panel, the proportional band range common to both limits.

LIMIT OPERATION

When the variable detected by the limit sensor is higher than the value set on TM, control passes to this sensor and the Led MAX is on.
When the variable detected by the limit sensor is lower than the value set on tm, control passes to this sensor and the Led MIN is on.
This also happens in case the variable value is lower than the one set by T1 knob.

WT220 CALIBRATION (Fig. 5)

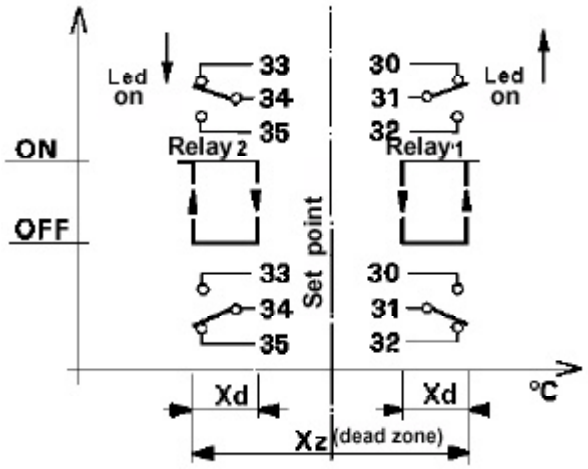
Check the correctness of the control system electrical connections.
The LEDs indicate the relay switching.



N4111

FIG. 5

- Using knob 1 set the required set point.
- Using knob 2 set the required Xz dead zone value.
- For temperature higher than the set point (above dead zone) relay 1 is energized, the contact 31-30 closes and the red LED 3 is on.
- For temperature lower than the set point (below dead zone) relay 2 is energized, the contact 34-33 closes and the red LED 4 is on.
- For temperature coinciding with the set point, the contacts 31-30 and 33-34 are open.



N1039

CONTROLLER OVERALL DIMENSIONS See MW (W series terminal board unit) data sheet

SENSOR OVERALL DIMENSIONS See SB. (DBL034E) data sheet

REMOTE SELECTOR OVERALL DIMENSIONS See CM-RM data sheet