

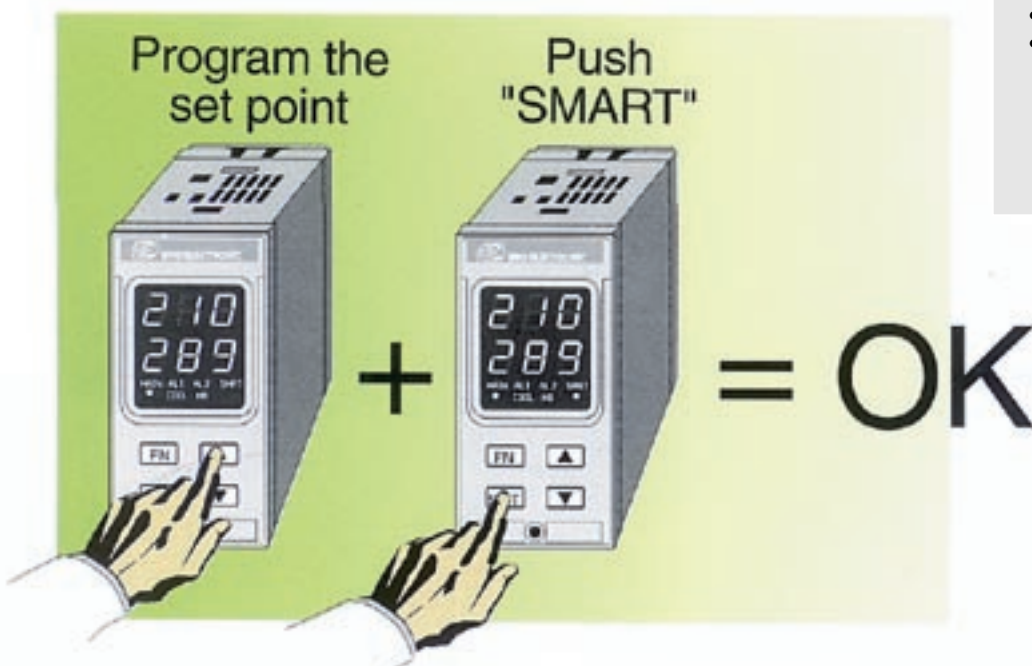
The TMS is a temperature controller developed with the most advanced technologies. Light and compact (1/8 DIN size) it is able to respond to the most sophisticated demands of temperature control and yet it is easy to use and extremely reliable.

To use this instrument and to obtain the best result in control stability and reliability, it is necessary only:

- To connect the instrument;
- To set the set point and alarm thresholds;
- To push the SMART pushbutton.

Applications

- Polymerization and synthetic fibers plants.
- Packaging and packing equipment.
- Plastics extrusion, coextrusion, films, injection molding and blow molding.
- Rubber production plants.
- Chemical and pharmaceutical industries.
- O.E.M. (Original Equipment Manufacturers).
- Food industries.
- Refrigeration, cooling and chilling processes.
- Environmental chambers.
- Hot runners.



Operators do not need to know how to set-up PID controllers. They can obtain the best control possible and one which automatically adjusts itself to temperature load variations or to changes in process parameters.

The SMART function

This new self-tuning method makes large use of the artificial intelligence concepts and logic decision structures. In addition to the standard control algorithms, this instrument incorporates sophisticated mathematical models. This instrument is able to change control strategies as needed and also to self-tune control parameters in an optimal manner.

The result is fast acting control with no overshoot, responsive to process variations and process disturbances and not requiring any operator intervention.

You achieve optimum control on all your processes, all of the time.

Everyone can achieve the optimum control of the processes just by pushing the "SMART" pushbutton.

The proprietary heat/cool algorithm further improves control of the process. Alarms give the operator useful alarm information when it is needed.

Heater monitoring includes display of current in Ampere and heater break-down alarm.



MAIN FEATURES

The TMS was developed by a dedicated R &D team which has extensive experience and know-how in many areas.

These include automatic control, hardware, firmware, software and mechanical engineering.

The manufactured process guarantees a product with superb reliability and maintenance free operation.

Surface mount technology is used throughout. A computer is used to test all circuits and to make functional tests as well. Finally, the controller is operated for an extended period of time in an environmental chamber.

The basic features are:

- 1/8 DIN 48x96 mm dimensions.
- Switching power supply (100 to 240 V AC).
- IP 65 (*) and NEMA 4X (*) front protection.
- SMART function for the selftuning of control parameters.
- Alarms programmable as temperature alarms or temperature alarm + heater break down alarm.
- Proprietary algorithm for heating/cooling control.
- Programmable ramp for set point changes.
- Timed output power limiter.
- Measurement and display of heater current in amperes.
- Process value can have an offset or percent change applied.
- TC and RTD input with programmable range.
- Selection between relay or SSR made by internal jumpers.
- Output power OFF.

Access levels

Different software keys enable the access to different programming levels in order to protect all the parameters.

(*) Test were performed in accordance with CEI 70-1 and NEMA 250-1991 STD.

Lower display

It shows the actual set point value or the heater consumption in Ampere.

During initial set-up it shows the alphabetic description of the set-up parameter.

Keyboard

FUNC select the configuration and operating parameters.

SMRT enables the SMART function.

▲ increases the selected parameter value.

▼ decreases the selected parameter value.



Upper display

It shows the measured value. During initial set-up it shows the numeric value of the set-up parameter.

Indicators

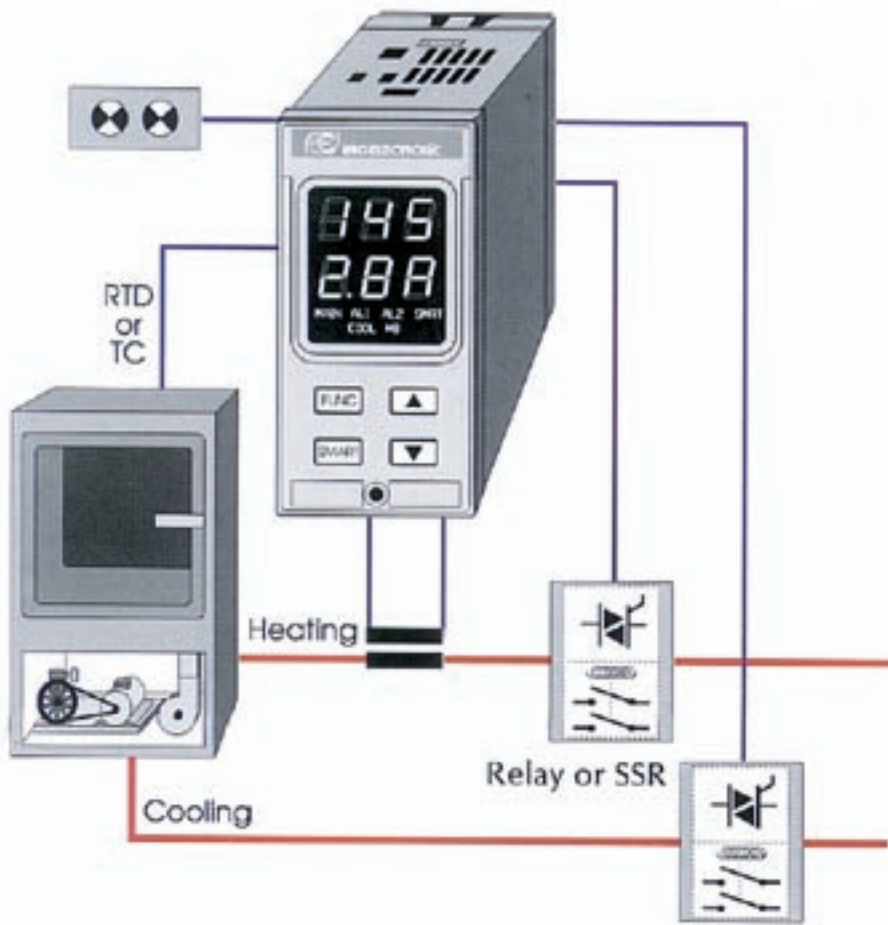
MAIN lit during the ON period of the heating cycle.

AL1 lit when alarm 1 is ON or during the ON period of the cooling cycle.

AL2 lit when alarm 2 is ON or **HB** when heater break down alarm is ON.

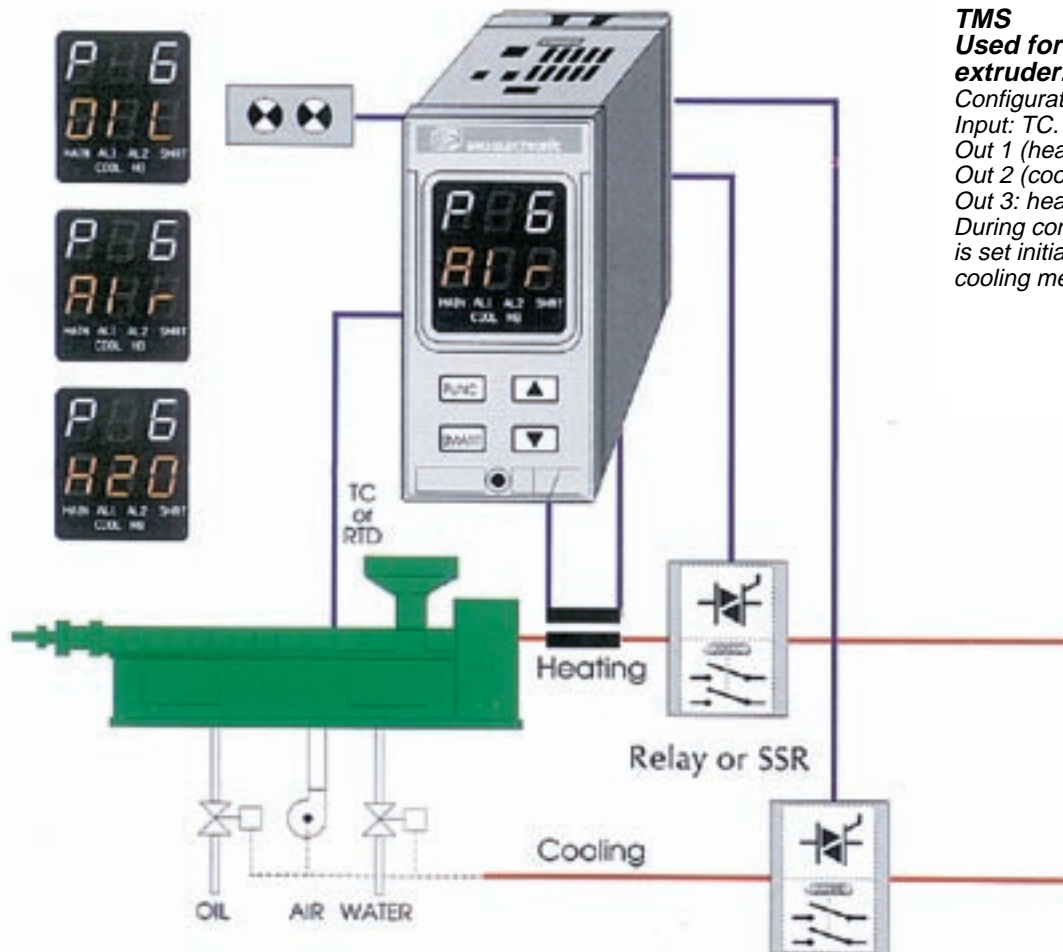
SMRT lit when the SMART function is enabled.

TMSmart



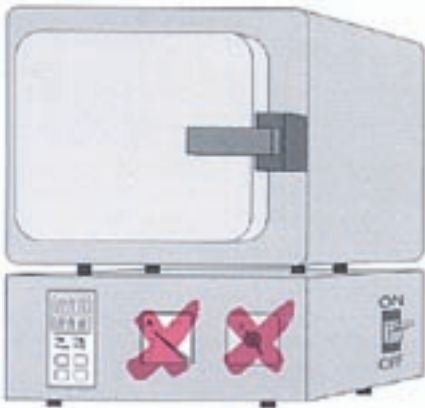
TMS
Used for the control of an environmental chamber.

Configuration:
Input: RTD.
Out 1 (heating): SSR.
Out 2 (cooling): relay.
Out 3: heater break-down.
Thanks to this optional third relay it is possible to display the break-down of one or more heater elements.



TMS
Used for the control of an extruder.

Configuration:
Input: TC.
Out 1 (heating): relay or SSR.
Out 2 (cooling): relay or SSR.
Out 3: heater break-down.
During configuration, the cooling gain is set initially by only selecting the cooling medium (air, oil or water) type.



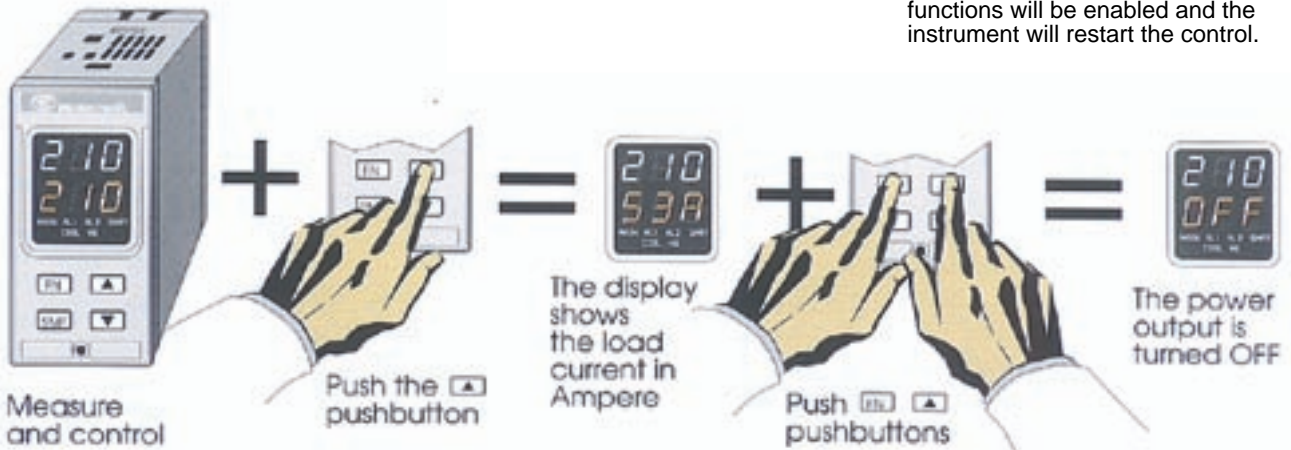
LOAD CURRENT MEASUREMENT AND HEATER BREAK DOWN ALARM

The capability to measure the load current by the control unit allows to synchronize the current measurement with the ON period of the output cycle. The result is a stable, reliable and fast measurement on which it is possible to applied an alarm threshold in order to obtain a timely indication about anomalous condition of the load.

OUTPUT POWER OFF

This function allows to inhibit contemporaneously the output signal, the alarm functions and the control algorithm of the instrument in order to turn off the controlled load and to transform the instrument into an indicator. In this way it is possible to maintain the monitoring of the process variable also when the load is OFF.

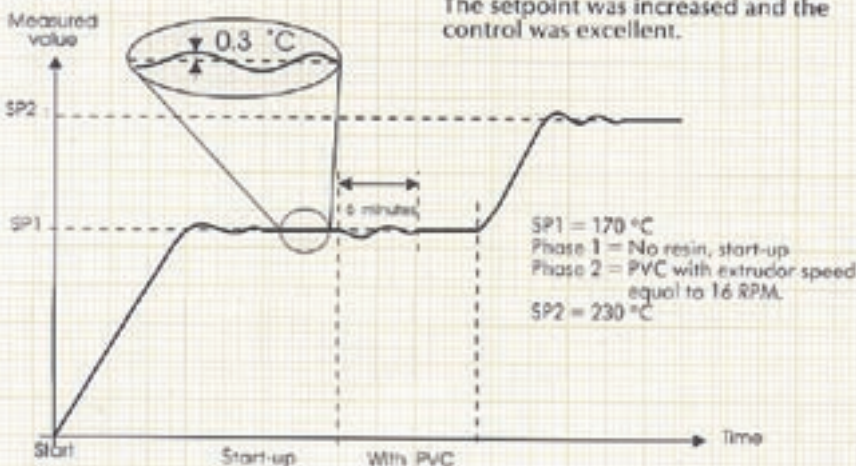
When the control will be enabled, the instrument will be operative as in presence of a start up: the integral component of the output signal will be set to zero, the soft start and the alarm masking functions will be enabled and the instrument will restart the control.

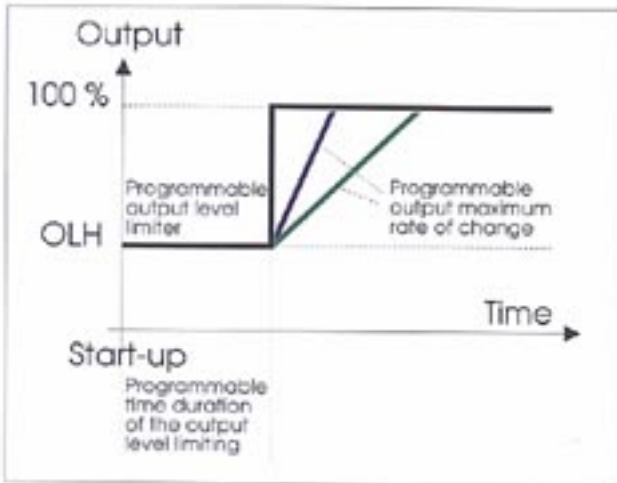


Results of a test for the temperature control of an extruder

The machine was equipped with electric heating and oil cooling systems. At start-up the extruder had no resin and the first set point was equal 170 °C.

Without resin, the maximum deviation at the steady state was equal to 0,3 °C. After few minutes, the machine was loaded with PVC and started normal operation. Steady state was achieved in only six minutes and the maximum deviation at the steady state was equal to 0,3 °C. The setpoint was increased and the control was excellent.





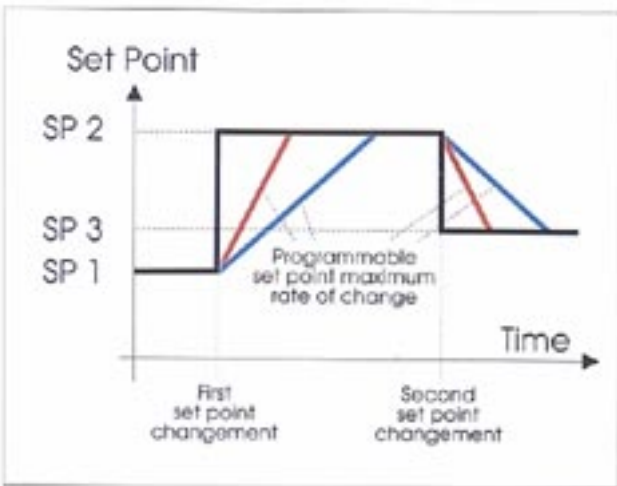
Soft Start function

This function allows to preheat the controlled process in order to increase the heater life and to avoid thermal shock of the products and machines.

When this function is desired, it is sufficient to program the power output to be used during preheating and its duration.

The alarm masking function assures that no false indications will occur during preheat.

Another opportunity offered by this product is the possibility to transform the soft start function in a continuous power output limiting function (infinite duration). In this way it is possible to assure that the process will be ever operative in safety conditions. In addition to the functions previously described, the TMS gives also the possibility to program the output power maximum rate of change in order to avoid thermal shock during normal operation.



Programmable ramp between two different set point values

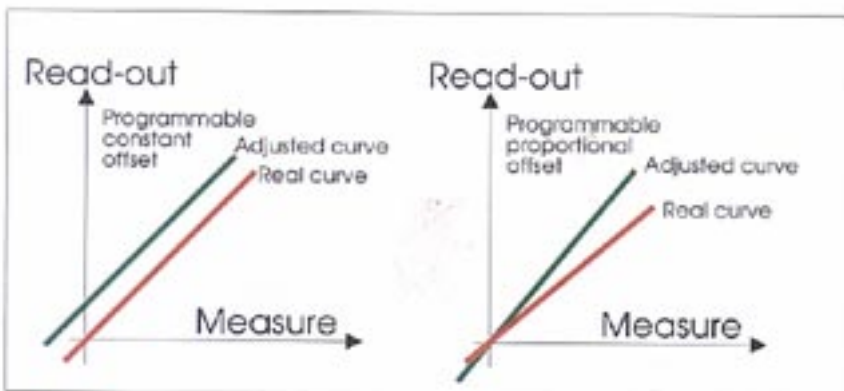
A real process frequently requires to reach gradually a new set point value.

To obtain this function, it is possible to operate in 3 different ways:

- 1) to limit the maximum power output of the instrument;
- 2) to limit the maximum rate of change of the control output;
- 3) to limit the maximum set point rate of change.

The first solution is used when it is desired that the process will be ever operative in safety conditions. As second effect, the control will be more gradual but it reduces the process response capability. The second solution allows to the control unit to use all the process resources but it introduces a delay on the control response.

The third solution is advisable when it is desired to reach gradually the new set point value without limiting the system response to the disturbances or other process variations.



OFFSET on the measured value

In many cases, during machinery engineering, it is impossible to locate the sensor unit in the ideal position.

In these cases, the sensor unit will be located in a peripheral position on the controlled element.

This incorrect position produces an error on the measured value.

This error is usually constant on the complete range or proportional to the measured value.

The TMS encompasses the possibility to program a proportional or a constant offset on the measured value in order to re-align the measured value with the real value of the plant.



GENERAL SPECIFICATION

Case:	PC/ABS black;
Front protection:	Self-extinguishing degree: V-0 according to UL - VDE CSA. designed and tested for IP 65 (*) and NEMA 4X (*) for indoor locations (when panel gasket is installed).
Rear terminal block:	with screw terminals and completed with connection diagram and safety cover.
Upper display:	3 digits, 7 segments LED, green color for measurement indication, figure height 10 mm.
Lower display:	3 digits, 7 segments LED, orange color for set point indication, figure height 10 mm.
Indicators:	4 red LED, diameter 3 mm.
Sampling time:	500 ms.
Accuracy:	(@ 25 °C ambient temperature): ±0.2% of the input span or ±1 °C.
Common mode rejection ratio:	> 120 dB @ 50/60 Hz.
Normal mode rejection ratio:	> 60 dB @ 50/60 Hz.
Electromagnetic compatibility:	This instrument is CE marked. Therefore, it is conformed to council directive 89/336 and subsequent amendments (reference harmonized standard EN-50081-2 and EN-50082-2).
Safety requirements:	This instrument is marked CE. Therefore, it is conforming to council directives 73/23/EEC and 93/68/EEC (reference harmonized standard EN 61010-1).
Temperature drift:	< 200 ppm/°C (RJ excluded) < 400 ppm/°C for RTD input with -19.9/99.9 °C range.
Reference junction accuracy:	0.1 °C/°C .
Insulation resistance:	> 2GΩ for 500 V DC according to IEC 348.
Insulation voltage:	1500 V according IEC 348.
Operating temperature:	from 0 to +50 °C.
Storage temperature:	from -20 to +70 °C.
Humidity:	from 20% to 85% RH non condensing.
Power supply:	- from 100 to 240 V AC - 50/60 Hz (-15% to +10% of the nominal value) or - 24 V AC/DC (±10% of the nominal value).
Dimensions:	48x96 mm, depth 89 mm.

IPUTS

Thermocouples

Type:	L, J, K, N programmable by front pushbuttons.
Line resistance:	max. 100 Ω with error < ±0.1% of the input span.
Engineering unit:	°C or °F programmable.
Reference junction:	automatic compensation of the ambient temperature from 0 to +50 °C.
Burn-out:	up scale or down scale programmable.
Calibration:	according IEC 584-1 and DIN 43710 - 1977 (TC type L).

STANDARD RANGES

TC type	°C	Measuring range	°F
L	0 / +800		0 / + 999
J	0 / +800		0 / + 999
K	0 / +999		0 / + 999
N	0 / +999		0 / + 999

RTD

Type:	Pt 100 3 wires connection.
Current:	150 μA.
Line resistance:	automatic compensation up to 20 Ω/wire with error < ±0.1% of the input span for range -19.9 to 99.9 °C. No measurable error for all other ranges.
Engineering units:	°C or °F programmable.
Burn-out:	open circuit indication. On RTD input, a special test is provided to signal OVERRANGE when input resistance is less than 15 Ω (Short circuit sensor detection).
Calibration:	according to DIN 43760.

STANDARD RANGES

RTD type	°C	Measuring range	°F
RTD Pt 100	-199 / +500		-199 / +999
RTD Pt 100	-19.9 / +99.9		-

Current transformer input

The current transformer is shipped with the option.

Ranges:	10A, 25A, 50A, 100A.
Indication:	in engineering units.
Resolution:	2 digits.
Note:	the "heater break-down" alarm function is available for the main output only.

(*) Test were performed in accordance with CEI 70-1 and NEMA 250-1991 STD.

OUTPUTS

OUTPUT 1

Heating

Type: a) Relay output with SPDT contact; contact rating 3A/250 V AC on resistive load.
 b) Logic voltage for SSR drive.
 Logic status 1: 24 V \pm 20% @ 1 mA
 14 V \pm 20% @ 20 mA.
 Logic status 0: < 0.5 V.
 The selection between relay or SSR is made by internal jumper.

OUTPUT 2

Cooling or Alarm 1

Type: a) Relay output with SPST contact; contact rating 2A/250 V AC on resistive load.
 By internal jumper it is possible to select the NC or NO contact.
 b) Logic voltage for SSR drive.
 Logic status 1: 24 V \pm 20% @ 1 mA
 14 V \pm 20% @ 20 mA.
 Logic status 0: < 0.5 V.
 The selection between relay or SSR is made by internal jumper.

OUTPUT 3

Alarm 2 or Heater break-down

(optional)

Output type: relay SPST.
Contact rating: 2A/250 V AC on resistive load. NO contact only.

OUTPUT

PROGRAMMABILITY

- 1) Heating + alarm 1 + alarm 2
- 2) Heating + cooling + alarm 2
- 3) Heating + alarm 1 + heater break-down
- 4) Heating + cooling + heater break-down
- 5) Heating + alarm 1
- 6) Heating + cooling

TRADITIONAL PARAMETERS

Proportional band: - for 1 control output, it is programmable from 1.0% to 99.9% of the selected input span;
 - for 2 control outputs, it is programmable from 1.5% to 99.9% of the selected input span;
 Setting Pb = 0 an ON/OFF control is performed.

Hysteresis (for ON/OFF control action): from 0.1% to 10.0% of the input span.

Integral time: from 1'20" to 20 minutes; resolution 10 seconds. A value greater than 20 minutes will exclude integral action from control.

Derivative time: from 0 to 9 minutes and 59 seconds.

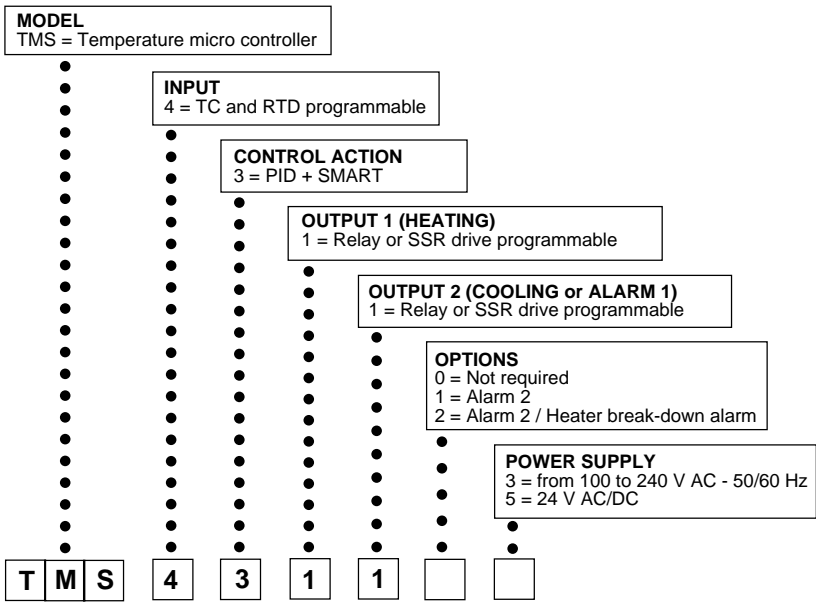
Heating cycle time: from 1 to 200 s.

Cooling cycle time: from 1 to 200 s.

Relative cooling gain: from 0.20 to 1.00.

Overlapping/dead band: from -20% to 50%.

Programmable ramp for set point changes: from 1 to 100 units/minute.

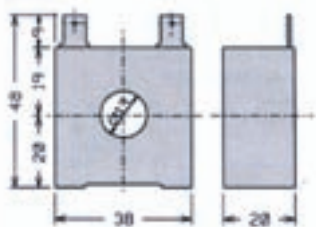
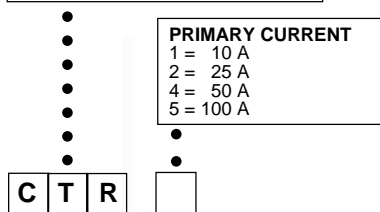


optional ACCESSOIRES

CURRENT TRANSFORMER

MODEL
CTR = Current transformer

This accessory is applicable only to models with heater break down alarm function.



REAR TERMINAL BLOCK

DIMENSIONS AND PANEL CUT-OUT

