

TB300-M

THERMOSTATIC BATH

DRUCK & TEMPERATUR
LEITENBERGER GMBH





WARNING

Hazardous voltage are present in this electrical equipment during operation. Non-observance of the safety instruction can result in severe personal injury or property damage.

Only qualified personnel should work on or around this equipment after becoming familiar with all warnings, safety notices, and maintenance procedures contained herein.

Only qualified personnel or our personnel should work on this equipment for maintenance operation.

The successful and safe operation of this equipment is dependant on proper handing, operation and maintenance.

SYMBOLS BEING USED IN THIS MANUAL OR ON THE INSTRUMENT



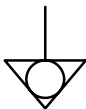
CAUTION: HOT SURFACE OR PART



CAUTION: REFERED TO ACCOMPAINING DOCUMENTS



CAUTION: RISK OF ELECTRIC SHOCK



EQUIPOTENTIALITY TERMINAL



CHARACTERISTICS AND/OR INSTRUCTIONS OF TB300-M WITH FLUID LEVEL ADAPTER

N.B:

In this manual: where not specified, the numbers in parentheses make reference to the annexed drawing.

CONTENTS

1 - INTRODUCTION	4
1.1 - Purpose and summary of instructions	4
2 - SCOPE OF SUPPLY	5
3 - GENERAL RECOMMENDATIONS	7
4 - SAFETY INSTRUCTIONS	8
5 - PREPARATION FOR OPERATION	9
5.1 - Installation	9
5.1.1 - Positioning the calibrator	9
5.1.2 - Electric supply	9
5.1.3 - Hydraulic connection & filling	9
6 - OPERATION PROCEDURE	11
6.1 - Operation description	11
6.2 - Description of instrument	11
6.2.1 - Thermoregulator	11
6.2.2 - Main switch (1)	11
6.2.3 - Mixer group	11
6.2.4 - Safety thermostat	12
6.2.5 - Bath	12
6.2.6 - Temperature sensors	12
6.3 - Start-up instructions	13
6.3.1- Use of the function	15
6.3.1.1- Reading of external probe Pt100 3 Wires (PT100 EXT.)	15
6.3.1.2 - Serial communication (19) RS232/C	15
6.4 - Re-calibration procedure	16
6.5- Checks during operation	16
6.6 - Shut-down instructions	16
☞ 6.7 - Device for overflow	17
7 - MAINTENANCE INSTRUCTIONS	18
7.1 - Routine inspections instructions	18
9 - TYPICAL FAULTS	19
10 - APPENDICES	21

1 - INTRODUCTION

1.1 - Purpose and summary of instructions

This manual contains the use and maintenance instructions valid for the following equipment:
Thermostatic bath **TB-300M and derived models**.

The instructions reported in this manual, for the above mentioned equipment, are those relevant to:

- Start-up preparation
- Operation description
- Start-up instruction
- Shut-down instruction
- Re-calibration procedure
- Preventive maintenance
- Typical faults and ways of their removal

Users must observe all the usual safety rules out in this manual for own security and to avoid equipment failure.

2 - SCOPE OF SUPPLY

1- Name:

- Thermostatic bath **TB-300M**, complete of accessories, as listed (reference to paragraph 2.7).

2- Technical data:

☞ Environmental range: temperature +10÷+35°C, R.H. max. 90%

RANGE **	RECOMMENDED LIQUID	STABILITY **	UNIFORMITY	RISE TIME
Amb.÷80°C	Water	±0,03°C (at 80°C)	±0,04°C	2°C/1'
Amb.÷150°C	Silicon oil 47V20	±0,04°C (at 100°C)	±0,05°C	5°C/1'
+50÷220°C (Recommended intermittent high temperature use: 240°C)	Silicon oil 47V100	±0,05°C (at 200°C)	±0,05°C	6°C/1'
+50÷250°C (Recommended intermittent high temperature use: 280°C)	Silicon oil 710	±0,05°C (at 200°C)	±0,05°C	6°C/1'

- Resolution : 0,1-0,01°C
- Accuracy : ±0,015°C a 0°C
- Power supply : 230V, 50Hz.
- Power : 1500W
- Size : LxPxH (total) 330x360x850mm
- Weight : 25 Kg (35Kg with package)
- Reading & regulation probe : PT100 DIN43760
- °C/°F readings.
- Input of an external PT100.
- RS232.
- Regulation of temperature with PID μ controller
- Temperature ramps : minimum. 0,1°C/1'
- Structure in flanged iron plate with handle; superior protection inox cover with \varnothing 110 hole.
- Tank dimension \varnothing 200 mm, 340 mm deep, capacity 10 L.
- Security cover with 5 drive-pipes \varnothing 16.
- Calibration zone dimension \varnothing 100mm, 330mm deep.
- Stainless steel mixer with electric motor power (100W).
- 1400W heating resistance.
- Over temperature safety system thermostat.
- Frontal command panel.
- Electromagnetic compatibility : Emission EN50081-1
Immunity EN50082-1

☞ The fluid level adapter slides directly into the test well of the TB300M bath is designed to calibrate glass thermometers

NOTE: **The data marked with * has been recorded at an ambient temperature of 20°C±3, power supply 230V±10%, with Pt100 \varnothing 4.5mm inserted in the block and with silicone oil 47V100. The above-mentioned data keep valid for one year after the issuing of the calibrating certificate; afterwards it is necessary to carry out the oven re-calibration.**

μCONTROLLER DATA

- Display : 2 lines 20ch x linea (3,2x5,5) back lighting.
- μcontroller : 80C552
- A/D converter : Σ - Δ 24 bits
- Memory : E2PROM per salvataggio parametri.
- Serial communication RS232C.

3- Service (function)

The thermostatic bath TB-300M has been designed for:

- Control and calibration of temperature sensors, in the laboratory and in the field, in conformity with ISO 9000 standards.
- Control of sensitive elements: thermocouple, bimetallic strips, RTD sensors.
- Control of thermostatic valve and bulb thermostats.
- Possibility to set temperature ramps.
- The thermostatic bath has been designed to reduce the EMC effect in accordance with the harmonised regulation for residential, commercial and light industry.

N.B: The bath **TB300M** with the software AQ2sp for Windows™ can carry out:

- ◇ complete control of the oven from the PC
- ◇ manual or automatic calibration of one or more probes
- ◇ cyclic life or stress test on temperature sensors
- ◇ filling and printing of the results obtained, guaranteeing that the ISO 9000 standard are observed

4- Quantity

- 1piece

5- Supplier

- DRUCK & TEMPERATUR Leitenberger GmbH: www.druck-temperatur.de

6 - N° del foglio catalogo:

- TB300M 07-99 E

7 - List of first equipment accessories

- Models
 - * **TB300 M** : base version
 - * **TB300M/TR** : version with fluid level adapter
- Standard equipment
 - * Electric power cable.
 - * Protection cover with \varnothing 16mm tubes (TB300M model)
 - * Probe support (TB300M/TR model).
 - * External Pt100 socket.
 - * Instruction manual.
- Accessories by request
 - * 9Kg tank of Silicon Oil 47V20.
 - * 9Kg tank of Silicon oil 47V100.
 - * 9Kg tank of Silicone oil 710.
- Certification: all the instruments are supplied with final testing, stability and accuracy certification traceable to SIT standards.

3 - GENERAL RECOMMENDATIONS

➔ **ATTENTION**

The μ processor regulator has been configured in factory with the parameters suited to work in the respect of the technical specifications.

Don't change these parameters to avoid malfunction or breaking of the calibrator with risks of serious personal injury.

- **Position of the probe**

To obtain the best result, follow the advises:

- Immerse the probe in the drive-pipes $\varnothing 16$ or directly in the liquid in case of probes oversized
- Immerse the probe in the liquid to have a dept equivalent to at least 15 times the diameter of the probe.
- Don't immerse the probe up to the bottom of the bath; the best calibration area is: 3-4cm far from the bottom and from the top of the liquid (fig. 1).
- In the case of calibration of two or more probes, it's advisable to immerse the probes at the same dept (reference to fig. 2)
- Always verify the range of the probes to be calibrated before using, the maximum temperature of the probes should be higher then the temperature of the liquid otherwise the probe could break or explode (especially in case of glass thermometers)

N.B:do not put the probe in the liquid when the bath is at high temperature; thermal shock can break the sensitive element of the probe

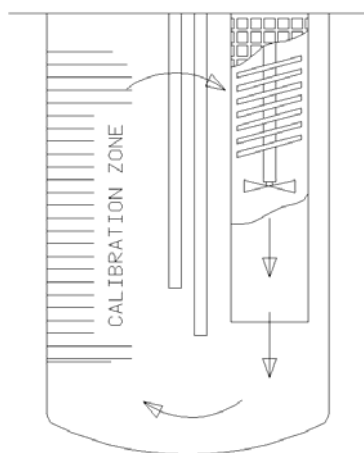


Fig.1

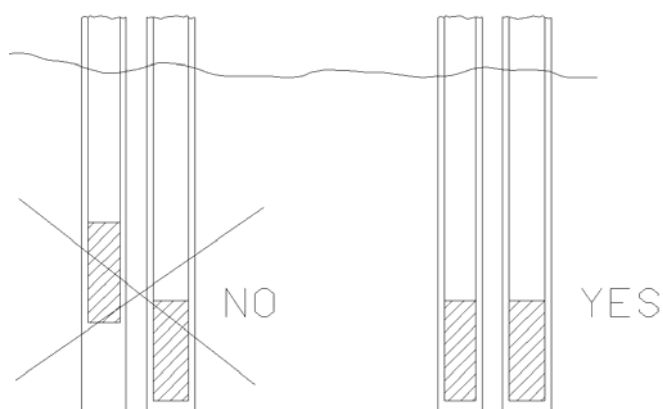


Fig.2

4 - SAFETY INSTRUCTIONS



It is absolutely forbidden to operate with the bath before have it filled with the just quantity of calibration liquid (reference to par. 5)

ATTENTION:

- Carry out the maintenance and repair operation only with the equipment at ambient temperature and disconnected from the electric power.
- Pay attention during the handling. Move the bath only if empty and disconnected from main power.
- For calibration use the recommended liquid in relation with the required operation range (reference to technical data of the liquids and the general recommendation chapter 3).
- If you use silicon oil, foresee a smoke suction cowl placed over the thermostatic bath.
- If you use cooling water, prepare an exclusion cock on the supply and convey the coil-drain with discharge.



- The over flow pipe and the drain pipe should be to temperature elevated
- NEVER discharge the liquid at high temperature.
- During the use, the work plane may overheat.

The equipment adopt the following devices to protect operation from hazard:

- Over flow to discharge the extra liquid.
- Magnetothermic main switch (1): to protect the bath against short circuit.
- Max. temperature safety thermostat (8) with alarm lamp (6): to disconnect the heating system at 280°C.
- Protection cover: to avoid any contact to the inside liquid.



- Ground conductor and external equipotentiality terminal.

Suggest:

- Don't put anything on the work plane.
 - Don't put fuel objet on the bath.
 - Do not use any fuel liquids near the bath.
 - Use only the recommended liquids.
- use common sense any time.

Movement instruction:

We suggest to move the bath in this way:

1. Open the box board
2. Lift the bath with the mixer motor in the upper side.
3. Take away from the bath the plastic bag.
4. Move the equipment in two person, using the carpentry hallow for transport.

5 - PREPARATION FOR OPERATION

5.1 - Installation

5.1.1 - Positioning the calibrator



Remove the calibrator from the box board and place it in laboratory 20cm far from the wall to permit the recovery of the liquid from the rear drains (20-21).
For the positioning of the calibrator make reference to paragraph 4
Before start the calibration read with attention the instruction manual, specially the paragraph 3: - General recommendation -.

****DANGER:** The calibrator is suitable for operating at high temperatures with the consequent danger of fire. Keep it away from any type of inflammable materials and don't use calibration liquids different from that suggested.

5.1.2 - Electric supply



- Make sure of the perfect grounding of the equipment and use the external ground bolt.
- Supply with 230V, 50Hz + ground, using the 16A plug connected to the bath.



→ ATTENTION:

The bath must be connected to a switchboard with socket protected by magnetothermic switch or fuses.

5.1.3 - Hydraulic connection & filling

- Connect at the cooling coil (9) the cold water supply.
- Make sure that the drain cock (20) is closed.
- Connect the overflow drain (21) with a tank.
- Fill the liquid up to about 20mm under the top edge: rising in temperature the silicon oil increase its volume.

- Notes about the filling of the calibrator:

Before replacing the liquid inside the calibrator with another type, it is recommended to clean always the container using a paper or absorbing cloth in order to prevent mixtures of different liquids which worsen the operating conditions and which may provoke above all liquid leaks due to the maximum temperature incompatibility.

- Use with water:

In the event that it is necessary to use water, only use the bath for temperature values up to a maximum of 70-80 °C.

At high temperatures (above 60 °C), water evaporation causes falls in the level, which should be compensated by some other liquid.

- Use with Silicone Oil:

Fill the calibrator vessel with about 10 litres of Silicone Oil; do not exceed the recommended amount, since thermal expansion at high temperatures may cause the liquid to leak from the overflow pipe (25).

At high temperatures, silicone oils emit eye-irritating fumes; therefore, it is not recommended to exceed maximum temperatures.

	RECOMMENDED USAGE FIELD *	FUME BURNING POINT **	EQUIVALENT TEMPERATURE FOR 10cst VISCOSITY ***
LIQUID TYPE			
Water	10/80°C	//	//
Sylicon200c5	-40/130 (90°C)	136°C	5°C
Sylicon47V20	-20/230 (130°C)	230°C	60°C
Sylicon47V100	50/240 (150°C)	>300°C	200°C
Sylicon710	80/280 (160°C)	>300°C	150°C

NOTES:

* the value in brackets is the temperature value above which an extractor hood should be used

** temperature value on which steam triggers off in the presence of free flames

*** viscosity value in centistokes below which the thermostatic performance is no longer excellent. The viscosity value tends to decrease as temperature increases. The viscosity water value at 23°C is 1 cst.

****temperature value below which the liquid changes its state and solidifies.

6 - OPERATION PROCEDURE

6.1 - Operation description

The thermostat **TB-300M** consist of a stainless steel insulated tank with a drain cock (20) on the bottom; on the upper side it has an opening for the introduction of the probes to be controlled. The liquid is kept mixed by a suitable mixer (11); eventual pouring-off of the liquid is conveyed into the over-flow pipe (21).

The PT100 probe (18) is placed directly in the liquid.

The probe signal is sent to the microprocessor card; the microprocessor displayed the temperature and enables the static relay. The static relay controls the heating resistor (14) inside in the bath.

The liquid is cooled down by means of the cooling coil (9).

6.2 - Description of instrument

6.2.1 - Thermoregulator

The thermoregulator (3-7) is a PID microprocessor, which can be set from -50 to 125°C.

- UPPER DISPLAY: shows the measured value inside the bath.
- LOWER DISPLAY: shows the input set point value; indication of external probe; configuration parameter (this state is defined as "normal display mode").
- ▲ ▼ keys: increase or decrease the value showed on the display; if you keep pressed the key, the speed rises.
- F key: access to the function menu and change the parameter; pressed with the key (F+)▲ it let you enter in the set up menu.
- E key: confirmation of the value.

6.2.2 – Main switch (1)

The main magneto-thermal switch (16A model) is mounted on the frontal electrical panel; all the electrical parts are protected by the main switch.

6.2.3 - Mixer group

The mixer motor is compound from:

- 100VA motor
- Heating resistance incoloy made of 1400W.
- Optional: fluid level adapter

Note: the motor group can be extract from the bath.

6.2.4 – Safety thermostat

The thermostatic bath is supplied with max. temperature safety thermostat (8) that disconnect the heating system; the thermostat intervenes on heating resistance and switch on the Max. temperature lamp (6).

In case the thermostat intervenes:

- ◇ Waiting the cooling of calibrator: the temperature must decrease at least $15\pm 20^{\circ}\text{C}$ respect to maximum set point
- ◇ Push the rear button on the safety thermostat inside the bath. The TB300 working if the temperature inside is lower than the differential of the thermostat.
- ◇ If problem persist: disconnect the electrical cable and proceeding to repair of eventual faults (reference to paragraph 4); therefore switch on the bath and insert the thermostat. Consulting chapter 9 – typical faults – for any problems on the thermostat.

N.B.: the thermostat mounted on standard ovens has been calibrated in factory to intervene at $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$.

6.2.5 – Bath

The bath is stainless steel made, the dimensions are: $\varnothing 200 \times 340 \text{mm}$

Inside the bath there are:

- Cooling coil copper made.
- Over flow drain and discharge tube.
- Probe holder device
- Mixer.

6.2.6 - Temperature sensors

The temperature sensor used for the reading and thermoregulation is a PT100 Ω probe; the probe is inserted directly into the calibration liquid.

6.3 - Start-up instructions

ATTENTION:

- The bath can only be used correctly if the user has a good knowledge of its basics.
- Before starting with the calibration following the installation procedures (paragraph 5); read the instruction on paragraph 3 & 4.

To calibrate the probe it is possible to follow two way: calibration with internal indicator (8), or calibration with external reference.

Calibration with the internal indicator (4):

Make reference to the temperature value of the display (fig. 3)

It is opportune to refer the value to the test report to compensate the error of the display.

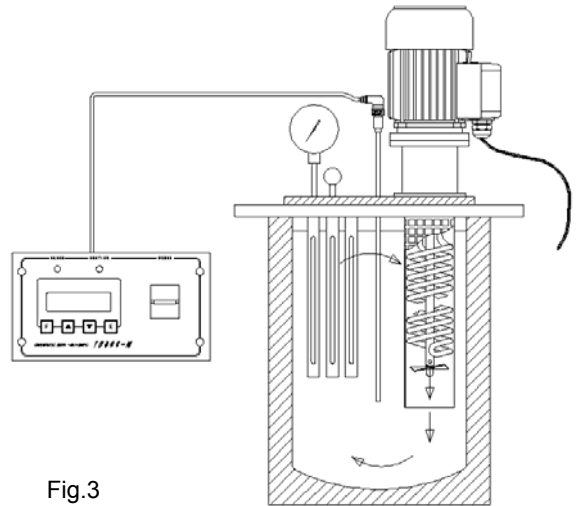


Fig.3

Calibration with external reference:

Make reference to the temperature value of the external standard instrument (fig. 4).

Put the sensitive element of the probes near and at the same dept.

It is possible to read the temperature of the External probe directly on the display of the bath (ref. 6.3.1.1)

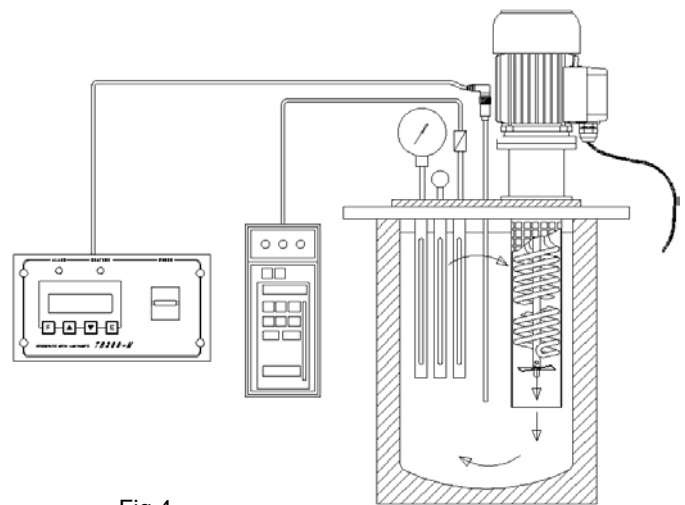


Fig.4

Before any calibration follow the general recommendation (chapter 3):

- Starting the calibration only at ambient temperature: thermal shock can break the sensitive element of the probe and cause harm to operator.
- Put the probe to check into the guide-pipe: reference to chapter 3. (fig 1-2).
- Switch on the bath using the main switch (1); waiting for the end of auto test procedure.
- Set the required temperature value on the display:

- ◇ Press the ▲ key to increment the set point value.
- ◇ Press the ▼ key to decrement the set point value.
- ◇ Press the - E - key to confirm the input value.

- Wait for the stabilisation of the bath before starting any calibration.

N.B: The display shows the temperature of the bath and the set-point; when the temperature is reached and it's stable (within $\pm 0,05^{\circ}\text{C}$), the display shows the symbol \pm .

- To working at different temperatures set the set point at the new value and wait for the stabilisation.

N.B: To modify the regulation parameter or to set the ramp, see the instructions of chapter 10.1.

ATTENTION



At the end of the calibration don't remove the probe from the bath and wait for stabilisation at ambient temperature. Always allow the calibrator to cool off with the probe still inserted in order to avoid thermal shock to the probe itself and harm to people or things.

Cooling of the bath

To reduce the temperature it is possible to use the cooling coil (9).

To obtain falls temperature of few degrees, it is better to change the set point and wait for the natural cooling.

6.3.1- Use of the function

6.3.1.1- Reading of external probe Pt100 3 Wires (PT100 EXT.)

It is possible to read the temperature of the external probe PT100 3 or 4 wires directly on the display (4)

- The external PT100 must be connected to the socket (15) as in fig.5.
- Connect the ext. PT100 terminal to the plug provided with the bath (respect the polarity of fig.5)
- Insert the plug to the socket (13).
- Follow the instruction and the flow chart of chapter 10.1 up to PT100 EXT; the temperature will be indicated on the display (4).
- To read '°F' scale temperature select '°F' as indicated at chapter 10.1.

N.B: The thermostatic bath works with the control probe (18) in the bath. It's possible to calibrate PT100 probe with the thermostatic bath and use the external probe as a primary standard (follow the instruction 6.3 and the general recommendation par.3)

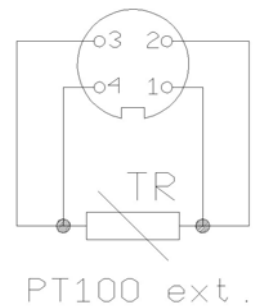


Fig. 5

and the general

6.3.1.2 - Serial communication (19) RS232/C

For PC control use the serial communication RS 232 (19) (references fig.6)

With RS232 you can read and/or change the operative parameters, for example: set point, external probe, slope rate etc..

Reference to communication protocol instruction (chapter 10.2).

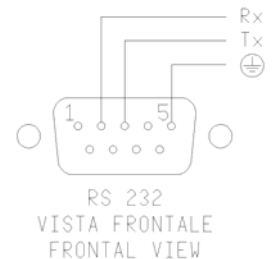


Fig.6



The external PC must be conform to the IEC950 standard

ATTENTION: The RS232 cable has the wires 2 and 3 crossed together

6.4 - Re-calibration procedure

To have instrument always efficient is opportune to re-calibrate it periodically.

Frequency of re-calibration is depending to the use of instrument; however we suggest to re-calibrate instrument every year.

To re-calibrate instrument is necessary to have a standard temperature instrument with SIT certification, the software 'CALIBRA' and follow the instructions of the software.

6.5- Checks during operation

Periodically check the liquid level of the bath; fill-up the liquid to about 20mm under the top edge.

Pay attention the liquid level change: the level increase with the temperature increment

6.6 - Shut-down instructions

At the end of the calibration close the cover and set the ambient temperature in order to cool down the bath before switching off.

Don't move the bath until the liquid is cooled.

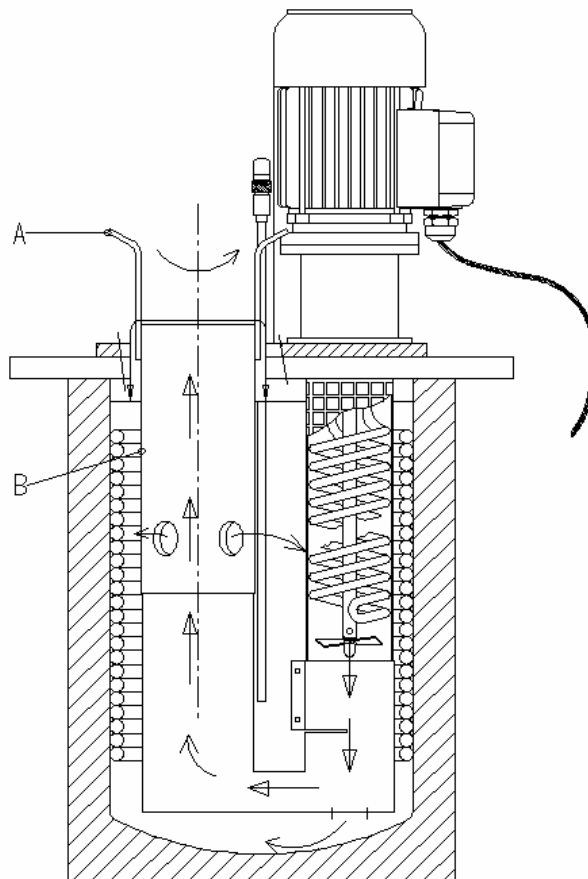
To cool-down quickly the temperature use the cooling-coil (9).

<p>AFTER EVERY USE AT HIGH TEMPERATURE REMEMBER TO SET UP AMBIENT TEMPERATURE IN ORDER TO COOL DOWN THE BATH BEFORE SWITCHING OFF</p>
--

☞ 6.7 - Device for overflow

To use thermostatic baths with the fluid level adapter follow the instructions of succession:

- Filling the bath tank up to around 20mm from the edge (do reference to as indicated formerly); install a container to the exit of the over-flow pipe.
- For the positioning of the probe or of the bulbs follow the general recommendations paragraph 3; if necessary use the adjustable bracket mounted on the piano of the instrument.
NOTE: with this system the calibration zone is between the level of the liquid (point of overflow) and 5cm from the bottom tank.
- To regulate the liquid level inside the central tube (A) proceed as follows:
 - ◊ Lift the tube (A) completely: use the levers (B);
 - ◊ Revolve the tube of a pair of centimetres clockwise, then lower it: to this point the tube is unlocked.
 - ◊ Revolve the two levers (B) for regulate the level.
- During the operation the liquid must go up and overflow a little from the central tube (A); in this way it's possible obtain a correct heat-exchange.
- The liquid change his lubricity with temperature, so it will be necessary adjust the handles (B) every time that change the temperature: open almost completely the flow to low temperatures and close it to high temperatures.
- At the end of calibration lower and block the tube (A):
 - ◊ Revolve completely counterclockwise the tube and lift it of a pair of centimetres;
 - ◊ Revolve again of a pair of centimetres counterclockwise the lower the tube.



7 - MAINTENANCE INSTRUCTIONS

7.1 - Routine inspections instructions

- Check periodically the level of the calibration liquid.
- Check periodically the calibration liquid; when it has busted to replace it.



For the retrieval of the exhausted liquid use petrol tank in plastics.
Don't disperse in the surrounding.

The excesses, the refusals and the containers must be eliminated according to the dispositions of the laws.

9 - TYPICAL FAULTS



Carry out the maintenance and repair operations with the equipment disconnect from the electric line.

N°	FAULT DESCRIPTION	FAULTY COMPONENT OR FUNCTION	METHOD FOR REMOVAL
1	The heating signal lamp (5) remains always on, but the bath temperature doesn't rise.	<ul style="list-style-type: none"> - The heating resistor (14) is cut off. - The socket for mixer motor is not correctly inserted 	<ul style="list-style-type: none"> - Replace the resistor. - Insert the mixer socket.
2	The main switch (1) opens automatically and doesn't switch on again.	<ul style="list-style-type: none"> - Short circuit on the resistor (14). - Short circuit on the supply card (2) or on the varistor - Main switch (1) cut off. 	<ul style="list-style-type: none"> - Replace the resistor. - Replace the supply card or the varistor - Replace the main switch.
3	The control panel is working normally but doesn't rise in temperature.	<ul style="list-style-type: none"> - The supply card (3) is broken. - The heater element is interrupted 	<ul style="list-style-type: none"> - Replace the supply card (3). - Replace the heater element.
4	The temperature shown on the display is different from the actual temperature of the bath.	<ul style="list-style-type: none"> - The PT100 RTD (18) is damaged. - The regulator card (3-4) is damaged. 	<ul style="list-style-type: none"> - Replace the RTD (18). - Replace the regulation card.
5	The temperature doesn't stop at the set point value.	<ul style="list-style-type: none"> - The regulation card (3) is damaged (static relay on conduction) 	<ul style="list-style-type: none"> - Replace the regulation card or the static relay (7)
6	The display shows 'Overrange !' with acoustic signal. After 10±15 sec. the display show 'RTD' failure.	<ul style="list-style-type: none"> - Short circuit on the PT100 RTD (18). - The regulation card is cut off. 	<ul style="list-style-type: none"> - Replace the PT100 RTD - Replace the regulation card.
7	The appliance keeps on heating without interrupting. The lamp (5) remains on (the led on the control card is off).	<ul style="list-style-type: none"> Short circuit on the static relay (7). 	<ul style="list-style-type: none"> Replace the static relay.
8	Differences of temperature inside the bath higher then 1°C	<ul style="list-style-type: none"> - The rotor screwed on the driving shaft has unscrewed - Calibration liquid unemployed. - The conveyor tube (13) is dirty. - Calibration liquid under the minimum level. 	<ul style="list-style-type: none"> - Replace the rotor (to disassemble the mixer group); ensure of the right rotation of the motor. - Replace the calibration liquid - Cleaning the conveyor tube - Fill-up the liquid inside the basin.

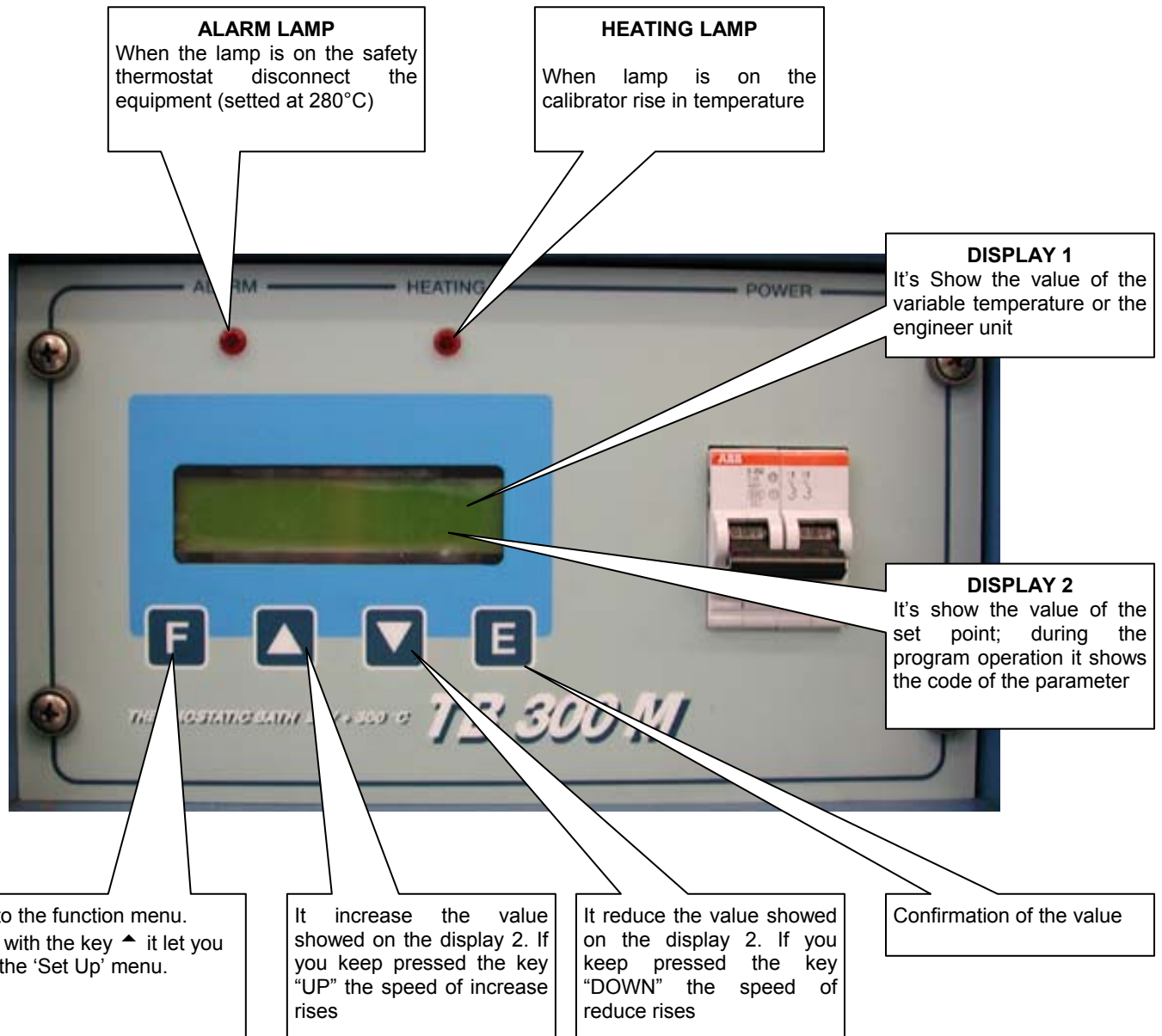
N°	FAULT DESCRIPTION	FAULTY COMPONENT OR FUNCTION	METHOD FOR REMOVAL
9	The safety thermostat (8) doesn't intervene at the set temp. And the alarm lamp (6) doesn't light.	Safety thermostat is faulty.	Replace safety thermostat
10	The thermostat (8) remains always on. The alarm lamp (6) is on and the temperature is inferior at the set point	Safety thermostat (8) faulty.	To check the calibration of the thermostat.
11	The mixer motor (11) turn slowly or anti-clockwise,	- The motor is faulty. - The condenser (18) is faulty.	- Replace the motor. - Replace the condenser.
12	The mixer motor is not working.	- The motor is faulty. - The condenser is faulty.	- Check the motor terminals voltage and replace the motor or condenser if necessary.
13	The mixer motor is working but the liquid isn't mixed.	The rotor screwed on the driving shaft has unscrewed and has fallen on the bottom of the tank.	Disassemble the resistor and mixer set and assemble the rotor again, after having checked that the motor turn clock-wise.
14	Mixer motor is noisy	The motor bearing have an excessive clearance.	Replace bearings or the complete motor.
15	Driving shaft is noisy inside the tank.	The shaft has twisted and the rotor knocks against the resistor.	Replace the motor with the coupled shaft.

10 - APPENDICES

Reference documents

- 10.1 Frontal panel & description of the function of regulator.
- 10.2 Microprocessor regulator: description of the command
- 10.3 Note on the RS232/C communication protocol.
- 10.4 Spare parts list + drawing.
Electric diagram: drawing.
- 10.5 Declaration of conformity.
Check report.

THERMOSTATIC BATH FRONTAL PANEL



10.1 - DESCRIPTION OF THE FUNCTIONS

The calibrator has three function level (see image 10.2):

At the first level there are the functions for the continuous usage

At the second level there are more specific functions and for the regulation of the calibrator

At the third level there are the typical functions for each calibrator

1st LEVEL FUNCTION

FUNCTIONS TO BE SELECTED BY PRESSING THE **F** KEY AND CONFIRMED BY KEY **E**

- **SP**
SET POINT; temperature set which the bath has to reach following technical specifications
- **SP2**
SET POINT2; temperature set which the bath reaches with the set gradient and the ongoing launched ramp procedure.
- **GRAD** (from 0,1 °C/1")
GRADIENT; set point variation speed during the change from one temperature value to the SP2 value. The set gradient must be negative for descent ramps.
NOTE: gradient values to be set must be lower than the ones stated in the technical data, at point 2.2 (cooling grad. max.: -7°C/min.; heating grad. max. 18°C/min).
- **RAMP ON-OFF**
Ramp procedure enabling/disabling.
Select ON by the ▲ or ▼ key and confirm the choice by pressing the "E" key; the oven will reach the set SP2 temperature with the set gradient, starting from the same temperature as the one with which the ramp has been confirmed. The starting temperature does not depend on the Set Point temperature.
If a negative ramp is set put the gradient is left positive and/or the SP2 is higher than the current temperature, the little over will not accept the ramp start and an alarm will begin running.
When the ramp is on, the display will show the word "**Ramp:.....**" followed by the Set Point value on the second line of the text. The Set Point value will reach the speed related to the set gradient.
When the block temperature reaches the SP2 set temperature, the oven will produce an alarm and the ramp procedure will be automatically set off; the SP2 value will be considered as the new set point value and the oven will be steadily set at that temperature.
During the ramp process, the derivative parameter will not be considered.

RAMP PROCEDURE EFFECTIVE EXAMPLE

Let's say that the set temperature is the ambient one and that it is necessary to reach 400°C with a gradient of 2°C/min.

- Press the **F** key and set **SP2** to 400°C using the ▲ or ▼ keys. Press the **E** key to confirm the choice.
- Press the **F** key and set **GRAD** to 2°C/min using the ▲ or ▼ keys. Press the **E** key to confirm the choice.
- Press the **F** key and set **RAMP** to **ON** using the ▲ or ▼ keys. Press the **E** key to confirm the choice.
After pressing the E key to confirm the ramp start, the oven will ascend with the set slope. Of course, there will be some oscillations at the beginning since the ramp slope will not be suitable but they will stop in a short time and then the oven temperature will follow the ramp's set point one.

- **RIS. 0.1/0.01**
Display reading resolution; the values admitted are **0.1°C** and **0.01°C** and they can be selected by the **▲** or **▼** keys.
- **SW. ON**
Switch on; it displays the temperature at which the thermostat's contact tied to the "SWITCH TEST" bushes is closed.
- **SW. OFF**
Switch off; it displays the temperature at which the thermostat's contact tied to the "SWITCH TEST" bushes is open. The value is reset each time the power supply fails or by pressing the two "**▲ ▼**" keys at the same time. The value is updated every time that the contact closing is detected.
- **SENSOR (OFF/EXT/REF/EXT+REF)**
This parameter allows enabling the reading of sensors on the auxiliary inputs:
OFF no input is enable to read the sensors' value.
EXT the four bushes of the input EXT are enabled to read the sensor tied to them, whose value is indicated at the bottom of the Display.
REF the four bushes of the input REF are enabled to read the sensor tied to them, whose value is indicated at the bottom of the Display. (not allowed on the BK40M)
EXT+REF the eight bushes of the two inputs are enabled to read the sensors tied to them, whose value is indicated at the bottom of the Display. (not allowed on the BK40M)

2nd LEVEL FUNCTIONS

FUNCTIONS THAT CAN BE SELECTED BY PRESSING THE "F AND **▲**" KEYS AT THE SAME TIME. ONCE THE SECOND LEVEL OF PARAMETER IS ENTERED, THESE FUNCTION CAN BE SELECTED ONLY BY PRESSING THE "F" KEY; IN ORDER TO COME BACK TO THE FIRST LEVEL, PRESS THE "F AND **▲**" KEYS AT THE SAME TIME OR WAIT FOR ABOUT 20 SECONDS.

- **P.B.**
Value of the Proportional Band expressed in percentage of the value of the end of the scale. Proportional band means per cent of range within which there is the variation of the modulation of the heating element power.
- **T.I.**
Integral Time value expressed in seconds. The integrating action cancel the error between the chosen set point and the temperature reached only by the proportional action. Integral time means the length of time necessary to the integrative action to double up the proportional action
- **T.D.**
Derivative Time expressed in seconds. When there is a step variation of temperatures, the derivative action induces an greater initial adjustment, so that the oven will have a greater power than it usual has due to the proportional and integral action only. Since the error keeps existing, the derivative action reduces the impact giving the integrative action the task of reducing the error.
- **EXT SENSOR TYPE: N, K, J, R, S, Pt3W, Pt.** (Pt=Pt100 with 4 wires, Pt3W=Pt100 with 3 wires)
This parameter allows selecting the kind of sensor read by the display and connected to the four EXT terminals.(item 6.4.1)

- **Units °C/°F**
This parameter allows selecting the temperature measuring unit. By selecting "**°C**" all temperatures will be expressed in Celsius degrees; by selecting "**°F**" all temperatures will be expressed in Fahrenheit degrees
- **Def. Par. ON/OFF**
Default Parameter; this function allows choosing to set the thermo regulator with the P.B., T.I., T.D. parameters either as a default or as a customisable adjustment. By selecting the "**OFF**" parameter and confirming by the "**E**" key it is possible to modify the adjustment parameters, which will keep operational even if the calibrator is turned off. By selecting the "**ON**" key (followed by the confirmation by pressing the "**E**" key) the default parameters will be turned on again.
- **REF SENSOR TYPE: N, K, J, R, S, Pt3W, Pt.**(Pt=Pt100 with 4 wires, Pt3W=Pt100 with 3 wires) (not allowed on the BK40M)
- **KEY**
This is the key for the third programming level. By the ▲ or ▼ keys it is possible to set the number recorded in the "ACCESS KEY" parameters at the second level, and by pressing the "F" and ▲ keys at the same time (*it is not necessary to confirm the choice by pressing the E key*), it is possible to enter to the third level parameters related to serial transmission and instrument configuration. The acceptable values are from 1 to 99; **the default value set by the manufacturer is 2.**

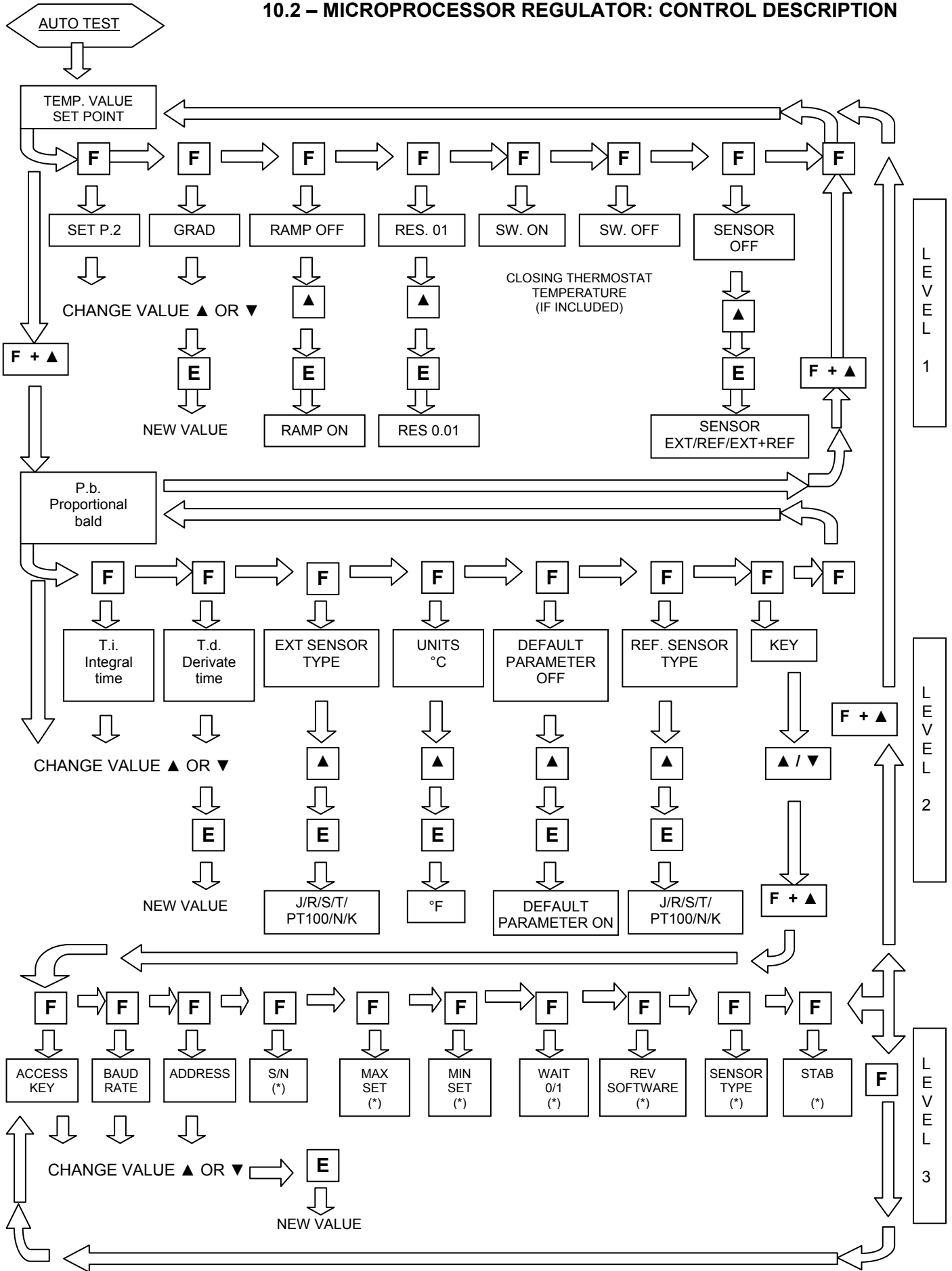
3rd LEVEL FUNCTIONS

FUNCTIONS THAT CAN BE SELECTED BY PRESSING THE "F AND ▲" KEYS AT THE SAME TIME WHEN THE **KEY** PARAMETER IS REACHED AT THE SECOND LEVEL AND WHEN THE SET VALUE CORRESPONDS TO THE RECORDED ONE. ONCE THE THIRD LEVEL OF PARAMETER IS ENTERED, THESE FUNCTION CAN BE SELECTED ONLY BY PRESSING THE "F" KEY; IN ORDER TO COME BACK TO THE FIRST LEVEL, PRESS THE "F AND ▲" KEYS AT THE SAME TIME OR WAIT FOR ABOUT 20 SECONDS.

- **ACCESS KEY**
Access key; numerical value from 1 to 99 that enables passing to the third parameter level. **The default value is 2**
- **BAUD RATE**
Data transmission speed from the computer. Values are from 300 to 19200 (**default value is 9600**).
- **ADDRESS**
Communication address. The value of this parameter is necessary to communicate from the computer to many instruments. The admitted values are from 1 to 32 and once the value is set by using the ▲ or ▼ keys it is necessary to confirm the choice by the **E** key
- **S/N**
Equipment serial number. It is set by the manufacturer and cannot be changed by the user

- **MAX. SET.**
Maximum value to be set by the Set Point. It is set by the manufacturer and cannot be changed by the user.
- **MIN. SET.**
Minimum value to be set by the Set Point. It is set by the manufacturer and cannot be changed by the user.
- **WAIT 0/1**
initial waiting procedure. If the value "0" is set, when it is started up and after having carried out the general check procedure, the calibrator immediately run to the last set point value chosen after turning off when it is started up and after having carried out the general check procedure. If the value "1" is set, when it is started up and after having carried out the general check procedure, the calibrator goes on the waiting position and makes the second reader line flash. It is necessary to press any key in order to move it from the waiting position and to choose the desired parameter or value.
- **REV. SOFTWARE**
Internal software's release number.
- **SENSOR TYPE**
It indicates the type of the main sensor designed to adjust the temperature.
- **STAB:**
It indicates the swinging value of the temperature, which has been set to see on the Display the symbol of the oven ÷ steadiness. The symbol light on when the temperature is stable for over 6 minutes.

10.2 – MICROPROCESSOR REGULATOR: CONTROL DESCRIPTION



(*) DEFAULT VALUES, SET BY THE MANUFACTURER

Note: after 20 seconds the set point values is showed at the bottom of the page

10.3 – NOTE ON THE RS232/C COMMUNICATION PROTOCOL

General characteristics:

Baud Rate: 9600 Parity: No
 N. Bit: 8 Bit of stop: 1

The communication runs in half duplex way witch means that is transmission and reception could not be contemporaneously present.

The regulator replies only after receiving command; it never replies itself.

The command and reply are ASCII character string, as detailed forward. The communication program will be able to convert ASCII to decimal to extract numeric values.

Response velocity: 2400, 4800, 9600 e 19200 baud, the Default value is 9600; the other parameters are standard.

INDEX OF THE VARIABLES AVAILABLE IN READING	
0	Set point
1	Ramp ON/OFF
2	Set point 2
3	Gradient
4	Resolution
5	Prop. Band
6	Integral time
7	Derivative time
8*	Sensor input selection
9	Title
10	Units (°C/°F)
13	Access key
15	Address
16	Serial number
18	Mx. set point
19	Min. set point
21	Wait ON/OFF
22	Switch on temperature
23	Switch off temperature
24	Version
25**	Ext. sensor type
26**	Ref. Sensor type
28	Stability range
100	Temperature
105	Ext. temperature
106	Ref. temperature

INDEX OF THE VARIABLES AVAILABLE IN WRITING	
0	Set point
1	Ramp ON/OFF
2	Set point 2
3	Gradient
4	Resolution
5	Prop. band
6	Integral time
7	Derivative time
8*	Sensor inputs Selection
9	Title
10	Units (°C/°F)
13	Access key
15	Address
25**	Ext. Sensor type
26**	Ref. Sensor. type

* Sensor input selection	** Ext. Sensor type – Ref. Sensor type
1 correspond to the INTERNAL	0 correspond to the Pt 100 4 fili
2 correspond to the INTERNA+EXT	1 correspond to the termocoppia N
3 correspond to the INTERNA+REF	2 correspond to the termocoppia K
4 correspond to the INTERNA+EXT + REF	3 correspond to the termocoppia J
	4 correspond to the termocoppia R
	5 correspond to the termocoppia S
	6 correspond to the Pt100 3 fili

Each commands string are ASCII character succession.

First is \$ character; the next must indicate the instrument address (default 1) and than is the command (4 characters).

Possibility:

RVAR (data reading)

WVAR (data writing)

The ultimate part of string is depending of a type command. To terminate the sequence with the character (cr)

Examples:

We use the character _ to indicate the space, and the character <cr> to finish the command.

DATA READING:

To reading the Set Point (0 index) the command is:

\$1RVAR0_<cr>

Each of 6 characters means:

\$	beginning of message
1	instrument address
RVAR	reading command
0	index of a data to read
_	space
<cr>	end of message

Command to read the temperature of an external probe (index 25):

\$1RVAR25_<cr> (A)

Now the instrument sends the response string.

This is the same string appear on display LCD of the instrument; the string *1_ precede the response:

*	: (asterisk) start of message
1	: address
_	: space

In case of set point:

*1_SP:123,4°C

The character <cr> conclude the message.

In case of external probe reading (A), the response of instrument is:

*1_Te:123,4°C<cr>

Except the initials three characters, this string is the same that appear on display when you set the external probe.

DATA WRITING:

For writing you use the command WVAR.

We supposing to set the set point at 132,4.

The command string is:

```
$1WVAR0_132.4<cr>
```

Meaning of characters:

\$: first character
1 : address
WVAR : writing command
0 : index of the variable to be writing
_ : space
132.4 : numerical value of a data
<cr> : end of message

At reception of the command, the answer of the instrument is:

```
*1<cr>
```

This character shows the recognition of command.

We have just shown the procedure for the writing of numerical data.

The variables 1, 4, 8, 10, 11, 25, 26 have two or more states (for example, the resolution by tenth or hundredth of °C) and to activate them it is necessary to assign to the variable number the number corresponding to that one which should be set, according to the table indicated below:

1	Ramp	ON = 1	OFF = 0				
4	Resolution	0.1°C = 0	0.01°C = 1				
8	Sensor input selection	INT = 1	INT+EXT = 2	INT+REF = 3	INT+EXT+REF = 4		
10	Units	°C = 0	°F = 1				
11	Def. Par.	ON = 1	OFF = 0				
25	Ext. Sensor type	0 = Pt 100	1 = Tc N	2 = Tc K	3 = Tc J	4 = Tc R	
		5 = Tc S	6 = Pt 100 3 wires				
26	Ref. Sensor type	as for the variable 25					

Example 1: the variable 1 corresponds to the activation of the ramp. If you want to set it to ON in order to activate the ramp, you should assign the value 0, otherwise the value 1.

Example 2: the variable 8 corresponds to the activation of the sensor reading which can be connected to the bushes of the external inputs. If you want to read the thermocouple K connected to the Ref. input, you should set the variable 8 to 3 and then set the variable 26 to the number corresponding to the type of sensor which you want to read (2 for the thermocouple K).

Do likewise for the other variables.

10.4 – STANDARD EQUIPMENT SPARE PARTS LIST

Reference number relevant to the annexed drawings

POS.	DESCRIPTION	CODE
1	Main magnetothermic switch 10A	3ABBS252C10
2	Supply card	4ITC02099DS
3-4	Temperature regulation card & display	4ED20048
5	Heating signal lamp	3SGN-24.00
6	Temperature alarm signal lamp	3SGN-24.00
8	Max. temperature safety thermostat	3IMTC542130
9	Cooling coil (chromate copper) + output coil (annealed steel)	2DC013 + 2DC788
10	Socket for mixer motor	A) 3ILMCK03V + 3ILMCKM04 B) 3ILMCK03IA + 3ILMCKF04
11	Mixer motor + condenser	3D1098
13	Flow conveyor tube	2DC006
14	Heater element	3DC663
15	PT100 EXT. socket	3MRC2073245 + 3MRC2073275
16	Insulation	7DVN096127
18	PT100 probe	3DC346
19	RS232	4MRCRS232
20	Drain cock	5FFB1511C4 + 5FRG12-3/8
21	Over flow (ø6x1.5 tube)	2DC007-C
22	10A input filter	3FMT823010
23	Varistor V275LA20A	4RSCV275LA20A

"Declaration of conformity"

DRUCK & TEMPERATUR Leitenberger GmbH
Bahnhofstr. 33 • 72138 Kirchentellinsfurt • Germany • www.druck-temperatur.de

Declares that the: **THERMOSTATIC BATH TB300-M**

is conforms with the requirements of the following European directive:

- Low voltage directive 73/23/EEC amended by 93/68/EEC
- EMC directive 89/336/EEC

and that it has been designed in accordance with the following harmonized regulation:

- EN 50081-1 emission.
- EN 50082-2 immunity.
- EN 6101-1 safety requirements for electrical equipment

The conformity with the above-mentioned requirements is certified by affixing the CE Mark on the product.

DRUCK & TEMPERATUR
Leitenberger GmbH
-Gernot Coulon / General Manager -

