ETM140 / ETM600

Portable Dry Block Calibrator

User Manual

Inhoudsopgave

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1. Before You Start

1.1 Symbols used

Table 1 lists the International Electrical Symbols. Some of these symbols may be used on the instrument or in this manual.

Table 1: International Electrical Symbols

	AC (Alternating Current)
	AC-DC
	Battery
	CE Complies with European Union Directives
	DC
	Electric Shock
	Fuse
	PE Ground
	Hot Surface (Burn Hazard)
	Read the User's Manual (Important Information)
	Off
	On

1.2 Safety Information

Use this instrument only as specified in this manual. Otherwise, the protection provided by the instrument may be impaired.

The following definitions apply to the terms "Warning" and "Caution".

- "WARNING" identifies conditions and actions that may pose hazards to the user.
- "CAUTION" identifies conditions and actions that may damage the instrument being used.

1.2.1 WARNINGS 

To avoid personal injury, follow these guidelines.

- Use only a grounded AC mains supply of the appropriate voltage to power the instrument. The dry-well requires a maximum of 1 amp, 50/60 Hz, 110/220 VAC.
- **DO NOT** connect this unit to a non-grounded, non-polarized outlet.
- **DO** use a ground fault interrupt device.
- **HIGH VOLTAGE** is used in the operation of this equipment. **SEVERE INJURY** or **DEATH** may result if personnel fail to observe safety pre- cautions. Before working inside the equipment, turn power off and dis- connect power cord.
- **DO NOT** use this unit in environments other than those listed in the user's manual.
- **DO NOT** use this unit for any application other than calibration work.
- Follow all safety guidelines listed in the user's manual.
- Calibration Equipment should only be used by Trained Personnel.

1.2.2 CAUTIONS 

To avoid possible damage to the instrument, follow these guidelines.

- Operate the instrument in room temperatures between 15°C ~60℃. Allow sufficient air circulation by leaving at least 6 inches of space between the instrument and nearby objects. Overhead clearance needs to allow for safe and easy insertion and removal of probes for calibration.
- The dry block calibrator is a precision instrument. Although it has been designed for optimum durability and trouble-free operation, it must be handled with care. The instrument should not be operated in excessively wet, oily, dusty, or dirty environments. It is important to keep the wells of the instrument clean and clear of any foreign matter. Do not operate near flammable materials.
- **DO NOT** use fluids to clean out the well.
- If a mains supply power fluctuation occurs, immediately turn off the instrument. Power bumps from brownouts and blackouts could damage the instrument. Wait until the power has stabilized before re-energizing the instrument.

1.3 Authorized Service Centers

Please contact Eurotron Instruments Service center to coordinate the service on your product:

Eurotron Instruments Benelux B.V.
Vossenkamp 7A
9351 VR LEEK
The Netherlands
sales@eurotronbenelux.nl
+31 (0) 594 696 131
www.eurotronbenelux.nl

2 Introduction

The ETM series dry well furnace is perfect for the calibration of thermal sensors in industries such as glass making, electrical power, automotive and material processing.

This dry well furnace utilizes a specially profiled heater that gives a central zone of constant temperature, and at just 5kg, it is compact and portable enough for easy use onsite. With convenient touch screen and one point set function, which provides optimal control and accuracy throughout the full range of the unit.

This dry well furnace cools quickly and can stabilize in 15 minutes. The insert dimensions are: 24.8mm(diameter) x 140mm(depth), and custom inserts can be machined by customer specifications.

Figure 1: Dry Block Calibrator

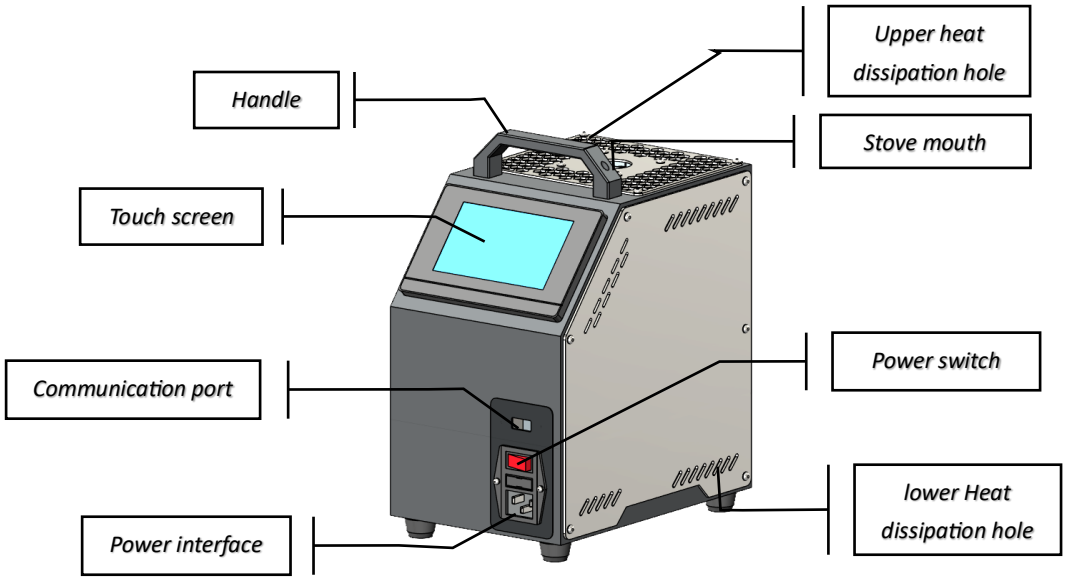


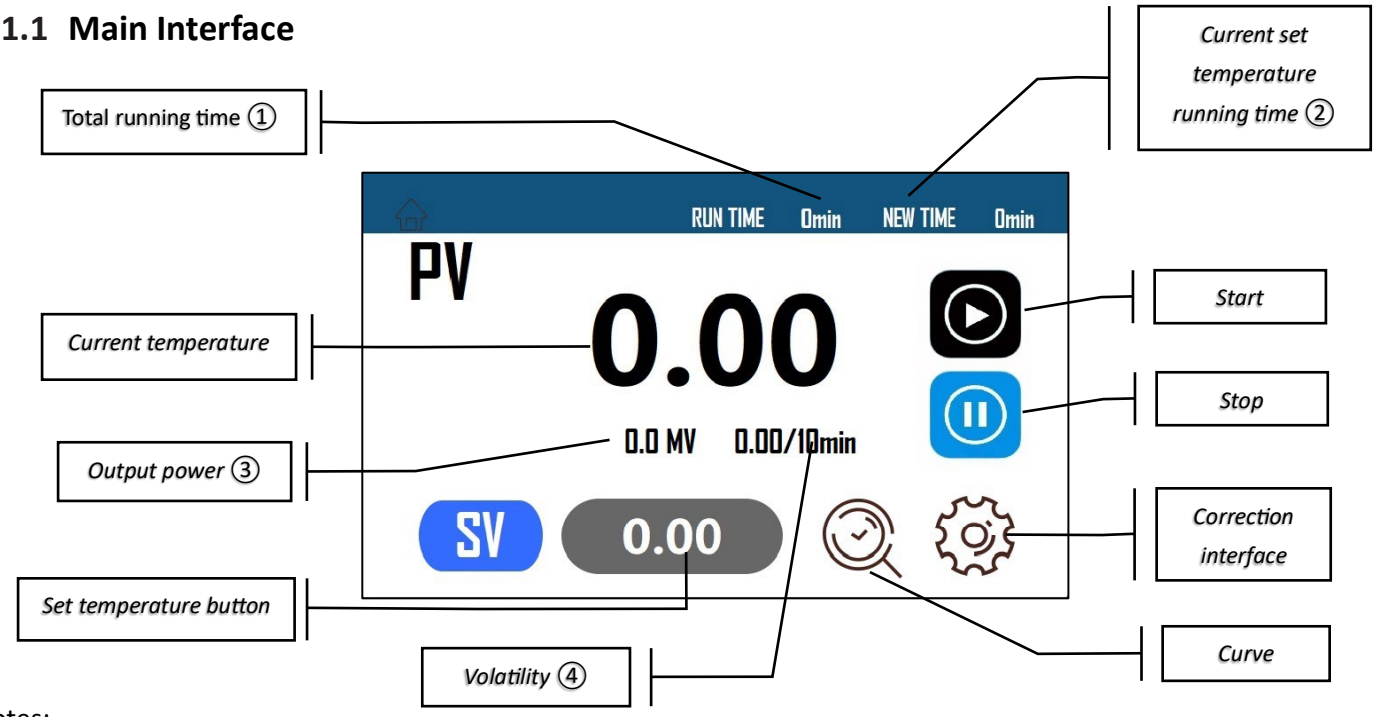
Figure 2: Machine Diagram

Note:

- Power switch: Power switch "O" means off and "-" means on. When the power is turned on, the switch light will light up.
- Power interface: Power input: AC110 or AC220V ±10%. Please confirm according to the ordering information. Do not connect AC110V equipment to a power supply system higher than AC110V. This may cause the fuse to burn out or even damage the equipment!
- Communication: The communication interface includes a USB interface and an RS232 interface. The USB interface is used for software upgrades and debugging equipment. It does not serve the purpose of a standard USB interface. Please do not connect any USB devices and lines other than the U disk used for debugging and upgrades. Please be responsible for any damage to equipment and lines caused by incorrect connection. For the definition of the RS232 interface and communication-related information, please refer to the communication protocol chapter in the manual. (Note: Some models of equipment do not have communication functions and are not equipped with an RS232 interface. Please refer to the ordering information)
- Touchscreen: The device has no physical operation buttons. All operations are completed by the LCD touch screen. Do not press hard when using it. Do not use sharp and hard objects to operate. Do not use corrosive solvents to wipe the screen. Do not try to disassemble the device. Please do not use it when transporting the device. Do not place the screen on the bottom, do not place heavy objects on the screen during transportation, and be sure to stay away from high temperature, extreme cold, and other environments that may cause damage to the screen.
- Handle: The device handle can only bear the weight of the device itself. Do not lift the device with other heavy objects attached!
- Dissipation hole: When the equipment is running, please be careful not to place any light objects or dust particles around the air inlet. Otherwise, foreign matter may be inhaled during operation and cause damage. Do not place anything that blocks the air outlet at the air outlet. This may cause poor heat dissipation and damage the equipment!

2.1 User interface

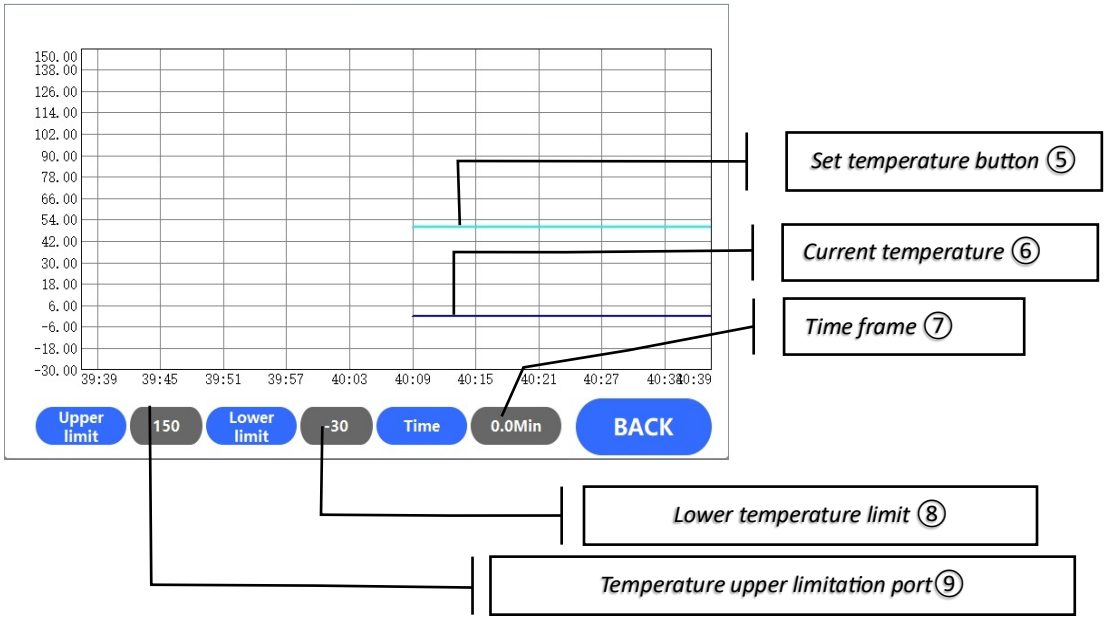
2.1.1 Main Interface



Notes:

1. Total running time: The total running time after setting the temperature and starting. After stopping, the timer ends and is cleared.
2. Current set temperature running time: When the temperature is reset, the running time of the current set temperature will be restarted from zero.
3. Output power: The output power of the current device. The power will be automatically adjusted and cannot be changed manually.
4. Volatility: The degree of fluctuation of the current temperature within 10 minutes. It takes a certain time for the temperature to stabilize. Different equipment will eventually stabilize with different stabilization times.

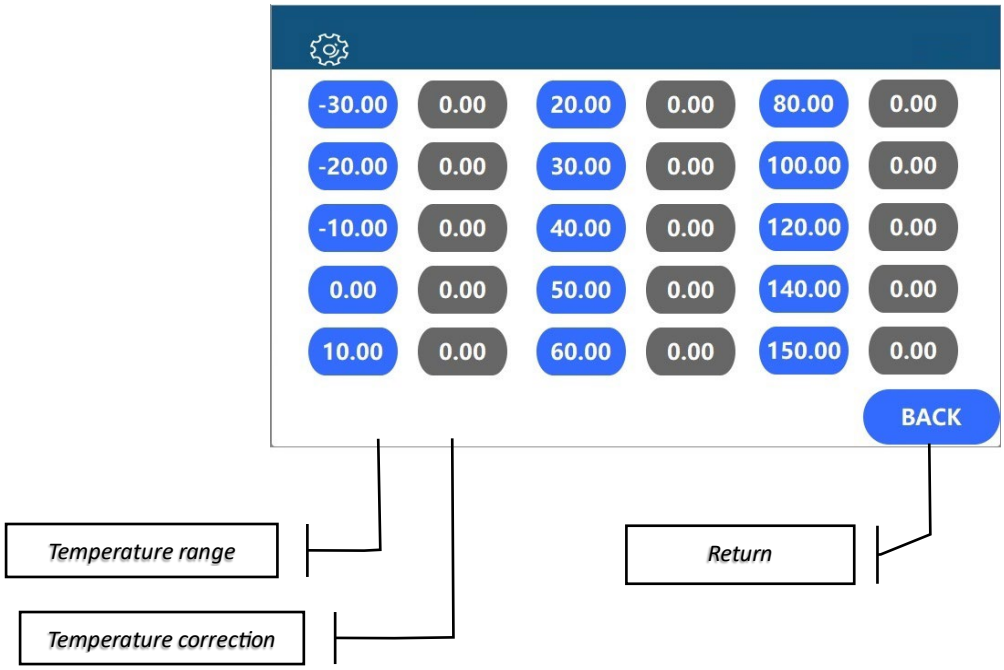
2.1.2 Temperature Curve Interface



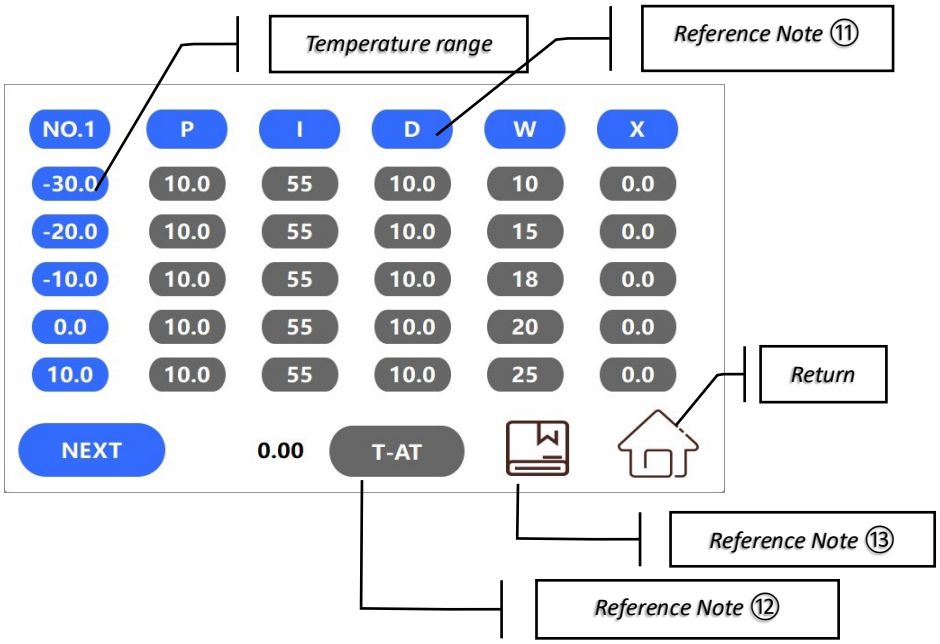
Notes:

5. Set temperature button: The cyan line indicates the current set temperature.
6. Current temperature: The blue line indicates the current actual temperature.
7. Time frame: The time range of the temperature curve.
8. Lower temperature limit: The lower temperature limit setting value of the curve.
9. Temperature upper limitation port: The temperature upper limit setting value of the curve.

2.1.3 Temperature Curve Interface



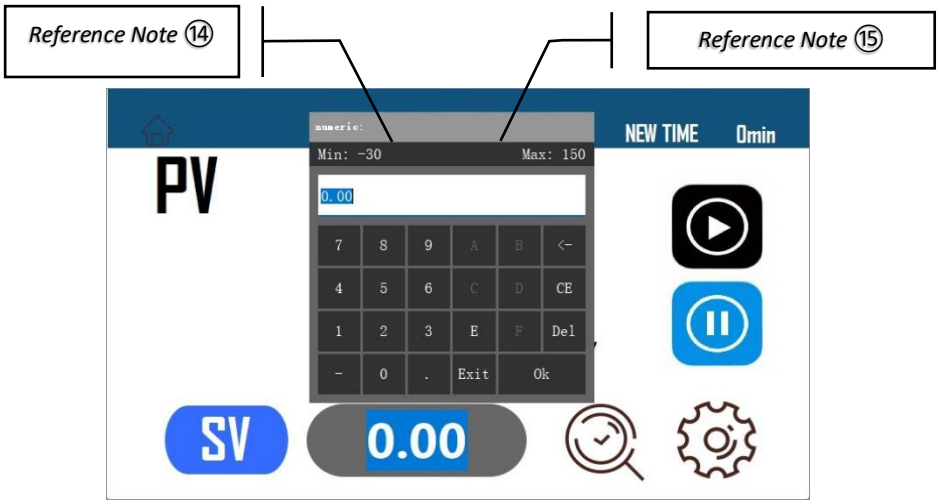
2.1.4 PID Interface ⑩



Notes:

10. Internal parameter setting interface: Internal parameters have been set at the factory. Please do not modify any parameters without the consent of the supplier.
11. Internal parameter setting interface:
    a. NO.1: This is currently the first page of the internal parameter setting interface.
    b. The three parameters P, I, and D are automatically generated by the self-tuning function. Only in special circumstances, professionals can fine-tune the parameters.
    c. W: Set different power upper limits corresponding to different temperature ranges. The power size is set according to the balance between the speed of temperature rise and fall and the stabilization time. Too large or too small power will cause stability problems. Please do not adjust by yourself. Otherwise, the equipment will be permanently damaged!
    d. X: Corresponds to the correction value in different temperature ranges. This correction value is the factory calibration value. Please do not modify it without authorization, otherwise it will cause a certain temperature deviation. Users should adjust the calibration value in the external temperature correction interface.
12. Self-tuning function: When the temperature is unstable, the self-tuning function can automatically adjust the stability. Please do not use it casually!
13. Save: When auto-tuning or manually modifying parameters, you must click the save button to modify the parameters.

2.1.5 Numeric Key Board



Notes:

14. Numeric keyboard: The lowest temperature that can be set by the current device.
15. Numeric keyboard: The maximum temperature that can be set by the current device.

3 Specifications and Environmental Conditions

3.1 Specifications

	ETM140	ETM600
Temperatur Range	-25°C to 140°C	35°C to 600°C
Display Accuracy	± 0.3°C	
Display Stability	± 0.1°C	
Working Condition	0°C to 35°C, 20% to 75% RH (No condensation), < 2000m	
Working Environment	20°C ± 5°C	
Depth	Insert depth 150mm	Insert depth 135mm
Insert Diameter	25mm	24.8mm
Hole Size	3mm to 12 mm (customizable)	
Stable Time	15 minutes	
Resolution	0,1 °C	
Display	LCD Display, °C or °F	
Dimensions	235mm * 170mm * 245mm	
Weight	5 kg	
Power	100V to 115V (±10%), 50/60 Hz, 575 W	
	200V to 230V (±10%), 50/60 Hz, 575 W	

Table 2: Specifications

3.2 Environmental Conditions

Although the instrument has been designed for optimum durability and trouble-free operation, it must be handled with care. The instrument should not be operated in an excessively dusty or dirty environment. Maintenance and cleaning recommendations can be found in the Maintenance Section of this manual.

The instrument operates safely under the following conditions:

- Temperature range: 15~25°C
- Humidity range:≤75%RH
- Pressure: 75kPa–106kPa
- Mains voltage within ±10% of nominal
- Vibrations in the calibration environment should be minimized
- Altitude :2000m at most

3.3 Warranty

Eurotron Instruments warrants this product to be free from defects in material and workmanship under normal use and service for a period as stated in our current product catalog from the date of shipment. This warranty extends only to the original purchaser and shall not apply to any product which, in Eurotron 's sole opinion, has been subject to misuse, alteration, abuse or abnormal conditions of operation or handling.

Software is warranted to operate in accordance with its programmed instructions on appropriate Eurotron products. It is not warranted to be error free.

Eurotrons obligation under this warranty is limited to repair or replacement of a product which is returned to Eurotron within the warranty period and is determined, upon examination by Eurotron, to be defective. If Eurotron determines that the defect or malfunction has been caused by misuse, alteration, abuse or abnormal conditions or operation or handling, Eurotron will repair the product and bill the purchaser for the reasonable cost of repair.

To exercise this warranty, the purchaser must forward the product after calling or writing an Authorized Service Center (see) for authorization.

The Service Centers assume NO risk for in-transit damage.

THE FOREGOING WARRANTY IS PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR MECHANTABILITY, OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE.BSC SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAM- AGES OR LOSS WHETHER IN CONTRACT, TORT, OR OTHERWISE.

4 General Operation

4.1 Unpacking

Unpack the instrument carefully and inspect it for any damage that may have occurred during shipment. If there is shipping damage, notify the carrier immediately.

And here's notice before use:

1. It is strictly prohibited to tilt, invert or lay flat during transportation. If there is any tilt, be sure to leave it 24 hours before normal use.
2. After removing the outer packaging of the equipment, it must be left undisturbed for 24 hours before it can be used normally and powered on.
3. Be sure to unpack and inspect the goods within 3 days of receiving them. If there are any damaged parts or incomplete parts, please contact our company in time.

Verify that the following components are present:

- Dry block calibrator*1
- Power cable*1
- Insert *1
- Insert lift*1
- Carrying suitcase*1

4.2 Set Up

Place the instrument upright on a flat stable surface. The area around the instrument must be clear to allow adequate air circulation. For best results operate the instrument in room of constant temperature between 15 to 25°C free from drafts. Stable ambient temperatures allow stable well gradients and less drift.

Connect the power cord provided into the instrument and plug the other end into a power socket of specified voltage. Normally this will be 110/220 VAC, 50/60 Hz.

Turn on the power to the calibrator by toggling the power switch on. The touch screen will light up and show the ambient temperature, the unit is not at the correct temperature until the touch screen is lighting up.

4.3 Measurements

When the instrument is ready use the insert lift to put the insert in the dry block calibrator. Enter a probe into one of the well holes at the top of the instrument. The probe should be inserted the full depth of the well since the temperature is most accurate at the bottom. The probe must make good contact with the bottom of the well. It helps to apply a small constant sideways and downwards force on the probe. After inserting the probe set the desired temperature and allow approximately 10 minutes for the temperature to stabilize. At this point, the probe may be measured for accuracy or used as a stable zero reference.

4.4 After use

1. Wait for the calibrator to cool down to around the room temperature.
2. Turn off the power of the machine.
3. Put the calibrator stand on the flat and avoid the heat/cold object until next use.

5 Test probe Calibration

For optimum accuracy and stability, allow the calibrator to warm up for 10 minutes after power-up and then allow adequate stabilization time after reaching the set-point temperature. After completing calibration, allow the block to cool before switching the power off.

Never introduce any foreign material into the probe hole of the insert. Fluids, etc., can leak into the calibrator causing damage to the calibrator or binding and damage to your probe.

5.1 Calibration Methods

5.1.1 Comparison Calibration

Comparison calibration involves testing a probe against a similar reference probe. The advantage to this method is that better accuracy can be achieved since errors due to dry-well inaccuracy, stem effect, and drift can be reduced.

After inserting the probes to be calibrated, allow sufficient time for the probes to settle and the temperature of the dry-well to stabilize.

It is best if both the reference probe and the probe under test are the same size and construction. Using probes with different lengths, diameters and materials will have different stem effects causing an unknown temperature difference. All dry-wells have horizontal and vertical gradients that change with temperature. This is an unknown variable which can be factored out if probes are the same type, length, diameter, and material. Probes should be inserted to the same depth in the well. The following procedure can be used to calibrate a probe against a reference while eliminating error due to temperature gradients between wells.

- Place the reference probe in one well.
- Place the probe to be calibrated, the unit under test (UUT), in another well.
- With the reference inserted into one well and the probe under test inserted into a second well, make measurements of each.
- Swap the locations of the reference probe and probe under test. Allow plenty of time for thermal settling.
- Make another set of measurements of the reference probe and the probe under test.
- Average the two measurements of the reference probe. Average the two measurements of the probe under test. Averaging the two measurements in this way eliminates error due to temperature gradients between the two wells.
- Compare the averaged measurement of the probe under test with the aver- aged measurement of the reference probe.
- For best results repeat the test several times at the same temperature and at different temperatures.

This method can be used with several types of probes, but the user must deter- mine the uncertainty of the measurement.

5.1.2 Calibration of multiple probes

Fully loading the calibrator with probes increases the time required for the temperature to stabilize after inserting the probes. Be sure that the temperature has stabilized before starting the calibration.

Multiple probes may be calibrated simultaneously using either the direct or comparison calibration method. Stem effect will cause less error in the comparison calibration method than with the direct calibration method.

5.2 Dry-Well Characteristics

5.2.1 Vertical gradient

There is a temperature gradient vertically in the test well. The heater has been applied to the block in such a way as to compensate for nominal heat losses out of the top of the dry-well and minimize vertical temperature gradients. However, actual heat losses will vary depending on the number and types of probes inserted into the calibrator and the block temperature. For best results, insert probes the full depth of well.

5.2.2 Stabilization and Accuracy

The stabilization time of the dry-well calibrator will depend on the conditions and temperatures involved. Typically, the dry-well will be stable to 0.1°C within 5 minutes of reaching the set-point temperature as indicated by the display. Ultimate stability will be achieved 20 to 30 minutes after reaching the set temperature.

Inserting a cold probe into a well will require another period of stabilization depending on the magnitude of the disturbance and the required accuracy. For example, inserting a ¼ inch diameter room probe at temperature into a sleeve at 300°C will take approximately 5 minutes to be within 0.1°C of its setpoint and will take 10 minutes to achieve maximum stability.

Decreasing the time required for the calibration process can be accomplished by knowing how soon to make the measurement. It is recommended that typical measurements be made at the desired temperatures with the desired test probes to establish these times.

5.2.3 Heating and Cooling time Reference Table ETM 140

Temperature	Heating Time	Stable Time
Room Temperature to -25°C	45 min	15 min
Room Temperature to 140°C	35 min	15 min
140°C to Room temperature	55 min	15 min

Table 3: Heating/Cooling time ETM140

5.2.4 Heating and Cooling time Reference Table ETM 600

Temperature	Heating Time	Stable Time
Room Temperature to 200°C	25 min	15 min
200°C to 140°C	25 min	15 min
140°C to 100°C	35 min	15 min

Table 4: Heating/Cooling time ETM600

6 Maintenance

The calibration instrument has been designed with the utmost care. Ease of operation and simplicity of maintenance have been a central theme in product development. Therefore, with proper care the instrument should require little maintenance. Avoid operating the instrument in an oily, wet, dirty, or dusty environment.

- If the outside of the instrument becomes soiled, it may be wiped clean with a damp cloth and mild detergent. DO NOT use harsh chemicals on the surface which may damage the paint.
- It is important to keep the well of the calibrator clean and clear of any foreign matter. DO NOT use fluid to clean out the well.
- The dry-well calibrator should be handled with care. Avoid knocking or dropping the calibrator.
- DO NOT slam the probe stems into the well. This type of action can cause a shock to the sensor.
- If a hazardous material is spilt on or inside the equipment, the user is re- sponsible for taking the appropriate decontamination steps as outlined by the national safety council with respect to the material.
- If the mains supply cord becomes damaged, replace it with a cord with the appropriate gauge wire for the current of the instrument. If there are any questions, call us for more information.
- If the instrument is used in a manner not in accordance with the equipment design, the operation of the dry-well may be impaired or safety hazards may arise.

Distributed By:
Eurotron Instruments Benelux B.V.
Vossenkamp 7A
9351 VR LEEK
The Netherlands
+31 (0)594 696 131
sales@eutoronbenelux.nl