User's Guide

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CL552

Portable Temperature Calibrator

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OMEGA

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INTRODUCTORY NOTE

ATTENTION: THIS MANUAL MUST BE REFERRED TO INSTRUMENTS WITH SERIAL N. 015298 ONWARDS.

*This publication contains operating instructions, as well as a description of the principles of operation, of the **CL552** portable temperature calibrator. The information covers all models of the instrument, including the basic equipment and its options and accessories.*
The instructions reported in this manual, for the above mentioned equipment, are those relevant to:

- *Start-up preparation*
- *Operation description*
- *Start-up instructions*
- *Shut-down instructions*
- *Typical faults and their remedies*

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*The instrument uses sophisticated analog and digital technologies. Repair and service require highly qualified personnel. **OMEGA Engineering, inc** will supply, on request, all pertinent instructions and procedures for service and calibration. **OMEGA Engineering, inc** specialists will be glad to give any technical support you may require.*

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WARNING

THE CALIBRATOR CONTAINS CERAMIC FIBRE. AVOID COMING INTO CONTACT WITH THIS MATERIAL AND, IN ANY CASE, TAKE THE NECESSARY PRECAUTIONS WHEN HANDLING THE CALIBRATOR.

WARNING

HAZARDOUS VOLTAGE IS 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 HANDLING, OPERATION AND MAINTENANCE

TABLE OF CONTENTS

1 GENERAL PERFORMANCE

An highly accurate and powerful system to test and calibrate temperature sensors built into a transportable and compact instrument.
The temperature parameter represents the most important factor to fulfil quality, operational safety and reliability of industrial processes.
Thermocouples, resistance thermometers and any other temperature sensor, when installed in an industrial process, should be inspected as they undergo mechanical, thermal and chemical stresses which accelerate their aging.
Therefore, it is a recommended procedure to inspect, check and calibrate each sensor during the commissioning phase and at regular-programmed time intervals.

The temperature calibrator series **CL552** is a transportable unit designed to obtain a controlled temperature with high stability, high uniformity in a range from +200 °C to +1100 °C.

The internal metal block, designed with a self-lock feature to avoid dangerous undesired block drop , is interchangeable and standard equipped with a multiple hole block with an immersion depth of 155 mm.

The portable temperature calibrator **CL552** is a multifunction instrument designed to meet the needs of instrumentation engineers, both in laboratory and in fieldwork.

Accurate, compact, rugged, easy to use; the ideal solution to test and calibrate:

- thermocouples
- resistance thermometers
- thermostats
- gas filled thermometers
- mercury thermometers
- material thermal test

CL552 has been designed using the most advanced thermal and electronic technologies to provide high stability and accuracy with easy operation combined with a powerful operating flexibility.

1.1 Specifications

- **Range:**
  from +200 to +1100 °C
- **Stability:**
  ±0.3 °C at 1100°C. *Data recorded with ambient temperature of 20°C ±3°C, power supply of 230 Vac ±10% and thermocouples type N and type K inserted inside the block.*
- **Reading accuracy:**
  ± (0.2% + 1 digit) at 1000°C
- **Radial Uniformity:**
  ± 0.2 °C at 800°C
- **Axial Uniformity:**
  ± 0.3 °C at 100mm depth
- **Heating rate:**
  17 °C/min (from +250 °C to + 1000 °C). *Data recorded with ambient temperature of 20°C ±3°C, power supply of 230 Vac ±10% and thermocouples type N and type K inserted inside the block.*
- **Cooling rate**
  6 °C/min (from +1000 to +300 °C). *Data recorded with ambient temperature of 20°C ±3°C, power supply of 230 Vac ±10% and thermocouples type N and type K inserted inside the block.*
- **Stabilising time:**
  approximately 20 min.
- **Internal metal block:**
  standard INCONEL600 ø44x175mm depth with n. 6 holes ø 6.5 / 9.5 / 4.75 / 19 / 3.25 / 8.0 mm x 155mm depth
- **Dimensions:**
  Oven: ø44 mm x 200 mm
  Metal Block: ø44 mm x 175 mm
- **Display:**
  LED display 2 lines of 4 digits
- **Display resolution:**
  1 °C
- **Regulating System:**
  PID microprocessor
- **Tc Reference:**
  Type N connected to the PID regulator
- **Thermal protection.**
  Thermostat with type K thermocouple
- **Digital interface:**
  RS 232
- **Power:**
  1200 VA
- **EMC:**
  EN50081-I / EN50082-2
- **Chassis:**
  separate shell for thermal and electronic sections with a carrying handle
- **Size and Weights:**
  200 x 330 x 420 mm
  Net 12 kg Gross 17 kg

2 GENERAL FEATURES

2.1 Main switch

The main switch can be found on the rear of the instrument; it is fitted with a socket for the voltage cable, a main switch and two fuses of 6A for 230V mod. & 8A for 115V models.

NOTE: USE ONLY FUSES F. 6,3X32 MM

All the electrical part can be found below the main switch; we recommend allowing calibrator cooling before switching it off.

2.2 Thermal characteristics

The Inconel 600 block is inserted in to a resistor heated quartz tube ; the special alloy block insert , provides uniform temperature all over it. The fan fitted inside the regulating block, expels the hot air from the rear of the equipment ; in this way the head connection of the probe is always at ambient temperature. The internal microcontroller system handles, through the keyboard, man-machine communications, the internal logic and grants the stability of the internal thermal equalizing metal block of ±0.3 °C. The temperature control uses a sophisticated PID algorithm with memory stored optimized tuning constants.

2.3 Temperature sensors

The temperature sensor used to adjust the instrument is an N thermocouple; the sensor used for protection is a K thermocouple. Both are inserted directly into the equalizing block in order to supply a temperature value close to the real value in the block. However, there could be some differences due to the tolerance of the sensors themselves.

2.4 Temperature protection

A light has been fitted on the rear part of the calibrator in order to warn that the safety device has been triggered by reaching maximum temperature. When the temperature inside the calibrator is over 1150°C the lamp is on while the heating has been switched off; the safety device is automatically reset at a temperature of about 1100°C. If the light is on only temporarily and this situation is not going to repeat, there are no problems; if, however, this situation should be repeated, the technical assistance service should be contacted in order to detect a possible fault.

2.5 Ventilation holes

Holes have been made on the base and on the rear of the calibrator so that air may circulate inside the calibrator; do not obstruct these ventilation holes.

2.6 External digital indicator

When high accuracy is required, the portable temperature calibrator **CL552** can be used in combination with high accuracy and with an external high accuracy calibrated resistance thermometer (ask OMEGA for the pertinent literature).

2.7 Serial communication

CL552 is standard equipped with a full bi-directional RS232 digital interface for communication with a Personal Computer. The transportable temperature calibrator can be part of an automatic calibration system with a programmable cycle and the acquisition of all data can be required to generate a full calibration report. OMEGA engineers are ready to support you with components, accessories and software that can fulfil your application requirements.

2.8 Carrying handle

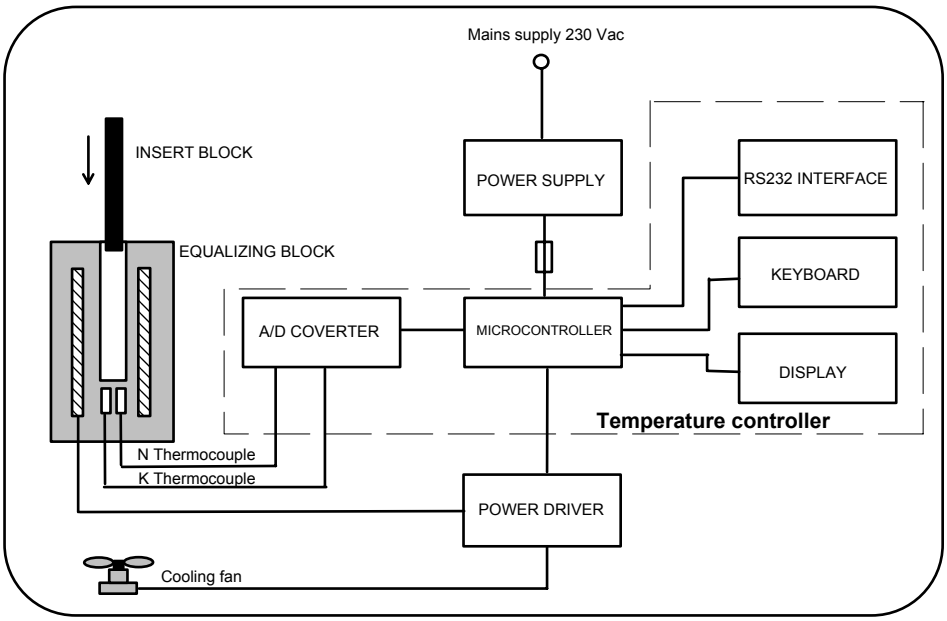
The calibrator is fitted with a multi-position carrying handle which makes it easy to use as the handle can be placed so as not to get in the way of the user. Never leave the handle lifted with the calibrator switch on at high temperatures

3 PHYSICAL DESCRIPTION

CL552 portable temperature calibrator consists of two modules mechanically and electrically interconnected.
The module on the left incorporates the heater, the thermal equalizing metal block, the thermocouple sensors and an air blower.
The calibrator uses a microprocessor controller and a reference thermocouple type N ; the controller is equipped with an RS232 serial interface. The controller displays the set point value and the actual temperature value inside the block.

4 FUNCTIONAL DESCRIPTION

The **CL552** portable temperature calibrator functional block diagram is shown below.



The instrument functional blocks are the following ones:

- **power supply**
- **power driver**
- **temperature controller**
- **keyboard**
- **digital interface**
- **display**

2.4 Heating resistance

The resistance is made in ceramic fiber with a flooded heating element. The power of the resistance is 1100VA and it can reach temperatures approaching 1150°C. Bear in mind, however, that a continuous use of the calibrator at extreme temperatures reduces the life of the resistance itself. Limit the number of hours in which the resistance is used at maximum temperatures to the time required by the calibrator in order to prolong the resistance life.

2.5 Equalizing block

The equalizing block is in INCONEL 600; it has a 45mm diameter and 200mm depth hole to make it possible to fit various types of insert blocks. The function of these blocks is to find the mean temperature and make it uniform throughout all the block depth.
Two slots have been made in the block into which the regulating and safety probes are inserted. A standard 6 hole insert block is supplied with the calibrator to make it possible to fit various types of sensors. It should be inserted into the equalizing block.
In addition to the holes for the test probes, a threaded hole has been made to screw the extractor. If you want to fit the calibrator with an insert block having different hole diameters, we recommend to contact OMEGA technical support department that will check if it is possible. This will avoid any unfortunate problems which might arise by using the wrong tolerances are used

4.1 Temperature controller

A temperature controller is a PID microprocessor which can be set from 0 to 1110°C. The upper display shows the measured value while the lower one displays the input set point value (this state is defined as "normal display mode").

4.2 Temperature sensors

The temperature sensor used to control the temperature, is a type N thermocouple; the sensor used to protect the system is a thermocouple type K. Both are inserted directly into the equalizing block measure the temperature value close to the real value in the block.

4.3 Keyboard

The operative mode set-up is made simple and easy with a sequence of menu pages that only requires 4 keys :

<F> (Function)= allows to enter in configuration mode. Allows to confirm the program changes.

<⏻> (Auto/Manual)= This function is always disabled.

<▲> = to increase the value of the displayed parameter.

<▼> = to decrease the value of the displayed parameter.

4.4 Display

The internal digital indicator is a double 4 digit LED display: the upper display shows the measured values while the lower display shows the programmed set point value (we define the above condition as "normal display mode").

5 PRE-OPERATIONAL CHECK

5.1 Unpacking

The insert block is packed separately to avoid breaking the quartz tube during transport. The block must be fitted into the calibrator when it is ready to be used.
Remove the instrument from its packing case and remove any shipping ties, clamps, or packing materials.
Carefully follow any instruction given on any attached tag.
Inspect the instrument from scratches, dents, damages to case corners etc. which may have occurred during shipment.
If any mechanical damage is noted, report the damage to the shipping carrier and then notify **OMEGA Engineering, inc** directly or its nearest agent, and retain the damaged packaging for inspection.
A label, on the back of the instrument case, indicates the serial number of the instrument.
Refer to this number for any inquiry for service, spare parts supply or application and technical support requirements.
OMEGA Engineering, inc keeps an updated data base with all information regarding your instrument.

WARNING

THE INSERT BLOCK IS PACKED SEPARATELY TO AVOID BREAKING THE QUARTZ TUBE DURING TRANSPORT. THE BLOCK SHOULD BE FITTED INTO THE CALIBRATOR WHEN IT IS READY TO BE USED AND SHOULD BE REMOVED WHEN THE CALIBRATOR HAS TO BE MOVED.

5.2 Supply

The calibrator runs on a voltage of 115 Vac, single-phase, 50/60Hz. A 2.5 meter cable is supplied with the calibrator fitted with two conductors plus ground (2.5 mm^2). Make sure that the plant is connected to ground correctly before switching the instrument on.

5.3 Thermocouple wires

When making measurements where additional wires have to be connected to the thermocouple leads, care must be exercised in selecting these wire types, not only when they are claimed to be of the same composition as the thermocouple involved, but, also, of the same "quality".
Performance results, where high precision is required and in circumstances where some types of thermocouple wire leads are added to the original installation, should be reviewed carefully for the impact of the choice of the additional wire leads.
The quality of the thermocouple wire is established by the limit of error to be expected with its use.
There are three recognized levels of quality:

- Special or Premium grade
- Standard grade
- Extension wire grade

The error limits determining the grade quality differ from thermocouple type to thermocouple type, reflecting the degree of difficulty in maintaining the precise levels of purity of the metal used.

Table A
Colour code & polarity for extension wires (ANSI)

Thermocouple			Wires	Color code
E	Chromel	(+)	Chromel	Purple
	Constantan	(-)	Constantan	Red
J	Iron	(+)	Iron	White
	Constantan	(-)	Constantan	Red
K	Chromel	(+)	Chromel	Yellow
	Alumel	(-)	Alumel	Red
R	Pt 13% Rh	(+)	Copper	Black
	Platinum	(-)	Alloy 11	Red
S	Pt 10% Rh	(+)	Copper	Black
	Platinum	(-)	Alloy 11	Red
T	Copper	(+)	Copper	Blue
	Constantan	(-)	Constantan	Red
B	Pt 6% Rh	(+)	Copper	
	Pt 30% Rh	(-)	Copper	
N	Nicrosil	(+)	Nicrosil	Orange
	Nisil	(-)	Nisil	Red

The table below summarizes the error limits for Premium and Standard grades, while the Extension grade wire is characterized by limits of error exceeding those in the table.
Errors up to ±4°C may be experienced when using the Extension grade thermocouple wire for J and K thermocouples.

Thermocouples limits of Error

The following ranges state the temperature limit for the indicated errors. Cold junction at 0 °C

Tc	Class 1	Class 2	Class 3
type T	0.5°C (-40 to +125°C) 0.004 . T (T >125°C)	1°C (-40 to 133°C) 0.0075 . T (T >133 °C)	1°C (-67 to 40°C) 0.015. T (T <-67°C)
T range	-40 to +350°C	-40 to +350°C	-200 to 40°C
type E	1.5°C (-40 to 375°C) 0.004.T (T >375°C)	2.5°C (-40 to 333 °C) 0.0075.T (T >333°C)	2.5°C (-167 to +40°C) 0.015.T (T <-167°C)
T range	-40 to 800°C	-40 to 900°C	-200°C to 40°C
type J	1.5°C (-40 to 375°C) 0.004.T (T >375°C)	2.5°C (-40 to 333 °C) 0.0075.T (T >333°C)	2.5°C (-167 to +40°C) 0.015.T (T <-167°C)
T range	-40 to 750°C	-40 to 750°C	-----
type K & N	1.5°C (-40 to 375°C) 0.004.T (T >375°C)	2.5°C (-40 to 333 °C) 0.0075.T (T >333°C)	2.5°C (-167 to +40°C) 0.015.T (T <-167°C)
T range	-40 to 1000°C	-40 to 1200°C	-200°C to 40°C
type R & S	1°C (0 to 1100°C) 1 + 0.003 (T-100) (T >1100°C)	1.5°C (-40 to 600 °C) 0.0075.T (T >600°C)	4°C (600 to +800°C) 0.005.T (T>800°C)
T range	0 to 1600°C	0 to 1600°C	----
type B	1°C (0 to 1100°C) 1 + 0.003 (T-100) (T >1100°C)	1.5°C (-40 to 600 °C) 0.0075.T (T >600°C)	4°C (600 to +800°C) 0.005.T (T>800°C)
T range	-----	600 to 1700°C	600 to 1700°C

Note *: Specially selected "premium grade" wires are available on request*

6 OPERATION & APPLICATION

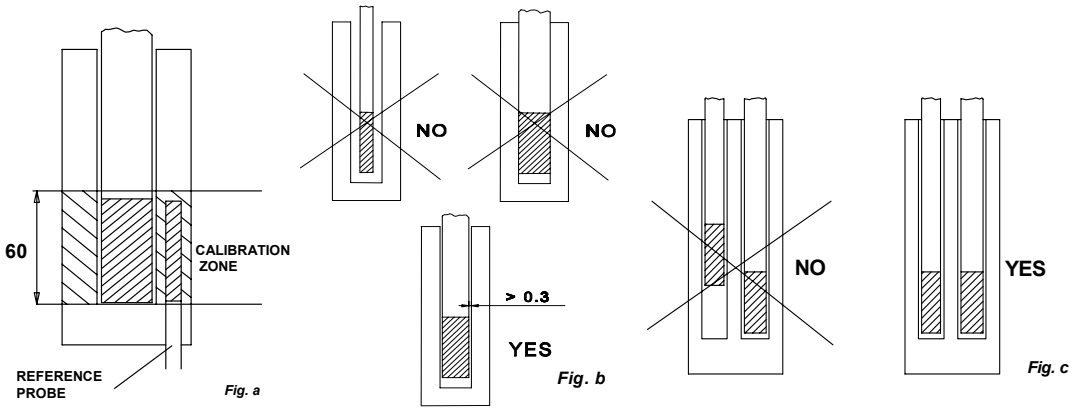
6.1 Recommendations

ATTENTION

THE MICROPROCESSOR REGULATOR HAS BEEN CONFIGURED IN FACTORY WITH THE PARAMETERS SUITED TO WORK WITH REGARD TO TECHNICAL SPECIFICATIONS.
DON'T CHANGE THESE PARAMETERS TO AVOID MISFUNCTION OR BREAKING OF THE CALIBRATOR WITH RISKS OF SERIOUS PERSONAL INJURY.

Probe positioning:
To obtain the best result, follow these pieces of advice:

- Measure the diameter of the probe being checked.
- Check that the diameter of the hole in the calibration block is at least 0.3mm bigger than the diameter of the probe. If this is not the case, use the block with the above-mentioned tolerances (fig.a).
- Avoid using holes which are too accurate and do not force the probes into the block.
- Insert the probe up to the bottom of the block: the sensitive element is in the optimal calibration zone (fig. b).
- When calibrating using probes shorter than the length of the hole in the block, position the sample reference sensor at the same height as the sensor which is to be checked
- Calibration with a reference: take care to position the two probes, the standard one and the calibration one, at the same depth and as close together as possible (fig. c).
- Always verify the range of the probes to be calibrated before using; the maximum temperature of the probes should be higher than the temperature of the liquid otherwise the probe could break.



WARNING

THE TEMPERATURE DIFFERENCE IS PROPORTIONAL TO THE DIFFERENCE BETWEEN THE DIAMETER OF THE PROBE AND THE DIAMETER OF THE HOLE.
DO NOT INSERT THE PROBE WHEN THE INSTRUMENT HAS ALREADY REACHED THE SET TEMPERATURE; THERMAL SHOCK CAUSES INSTABILITY AND BREAKAGE OF THE SENSITIVE ELEMENT.
FOR THE CALIBRATION OF TEMPERATURE TRANSDUCER WITH SPECIAL EXECUTION, CALL OUR TECHNICAL OFFICE AND ASK FOR EQUALISER BLOCK WITH SPECIAL DRILLINGS.

6.2 Start-up

6.2.1 Preparation for the start-up

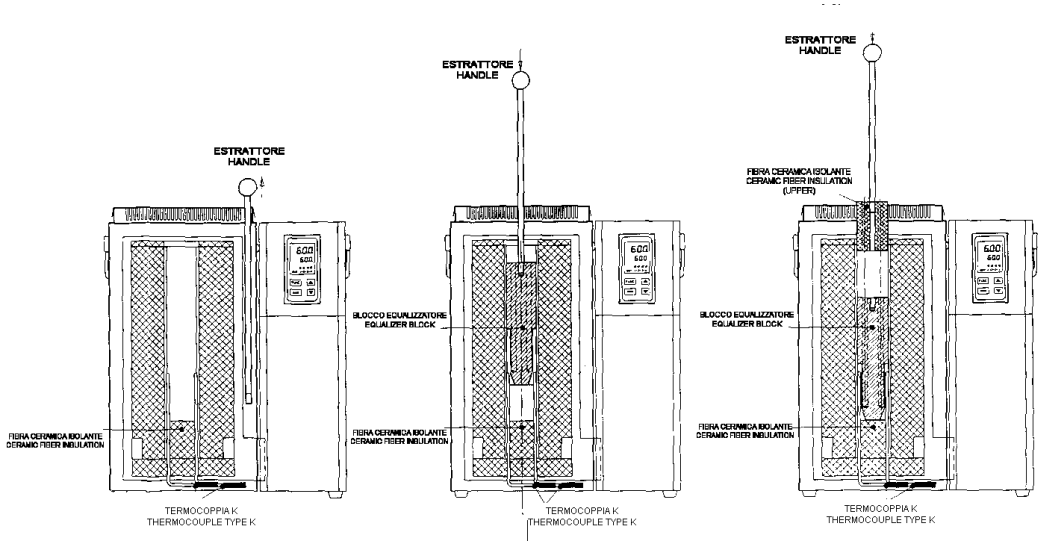
Remove the calibrator from the carrying case and place it on a flat surface. Position the calibrator in a safe clean place; leave enough space around the calibrator to allow the air to circulate well. Fit the equalizing block into the calibrator. Connect the instrument to a mains supply with the nominal voltage specified on the back label. Remember that the instrument requires a power of approximately 1200 VA. For safe operations the equipment must be correctly connected to the ground.

WARNING

TO AVOID ANY SMELL IN THE ROOM IT IS BETTER TO SWITCH ON THE CALIBRATOR OUTSIDE THE ROOM FOR THE FIRST TIME
WHENEVER THE CALIBRATOR HAS TO BE MOVED, REMOVE THE BLOCK FROM THE QUARTZ TUBE IN ORDER TO PREVENT ANY BREAKAGE OF THE TUBE.
IT IS A GOOD IDEA IF THESE OPERATIONS ARE CARRIED OUT WITH THE CALIBRATOR AS CLOSE TO AMBIENT TEMPERATURE AS POSSIBLE.

6.2.2 How to fit the equalizing block

Generally after installing the furnace, the equalizer block and the ceramic fiber insulation may be inserted. Carefully insert the block and the ceramic fiber insulation into the tube (see the following drawing).



Care should be taken to prevent dirt, insulation, or other foreign materials from getting between the block and the quartz tube it might also break during heat up due to thermal expansion differences. The fit between the block and the tube is typically loose in order to accommodate this expansion.
A handle is provided to insert the block. It consists of a stainless steel rod with a M8x15 threaded end which is screwed into the top of the block. The block is then lowered down over the control and the sensor is cut-out using the handle allowed to rest on the ceramic fiber insulation on the bottom of the well. There are grooves on either sides of the block for the sensor to slide into. The grooves have a tapered opening at the bottom to make the entry of the sensor easier.
Insert the ceramic fiber insulation on the top of the block, using the handle. Make the holes of the ceramic fiber match with the holes of the equalization block.

6.2.3 Start-up instructions

ATTENTION

THE CALIBRATOR CAN ONLY BE USED CORRECTLY IF THE USER HAS A GOOD KNOWLEDGE OF ITS BASIC FEATURES.
BEFORE STARTING THE CALIBRATION FOLLOW THE INSTRUCTIONS FOR THE POSITIONING OF THE EQUALISING BLOCK

ATTENTION

DO NOT INSERT THE SENSOR UNDER TEST INTO THE THERMAL EQUALISING BLOCK WHEN THE OVEN IS AT A HIGH TEMPERATURE. A THERMAL SHOCK COULD DAMAGE THE SENSING ELEMENT OF THE PROBE.
AT THE END OF THE TEST DO NOT REMOVE IMMEDIATELY THE PROBE/S FROM THE THERMAL EQUALISING BLOCK.
WAIT FIRST FOR THE TEMPERATURE CALIBRATOR COOLING.
AT THE END OF THE OPERATION : WAIT FOR THE THERMAL EQUALISING BLOCK TO BE COMPLETELY COOLED BEFORE PLACING THE CALIBRATOR INTO THE CARRYING CASE.

There are two ways to calibrate the probe: calibration with internal indicator, or calibration with external reference.

Calibration with internal indicator:
Make reference to the temperature value of the display (fig. 4).
It is advisable to refer the value to the test report to compensate for the error of the display.

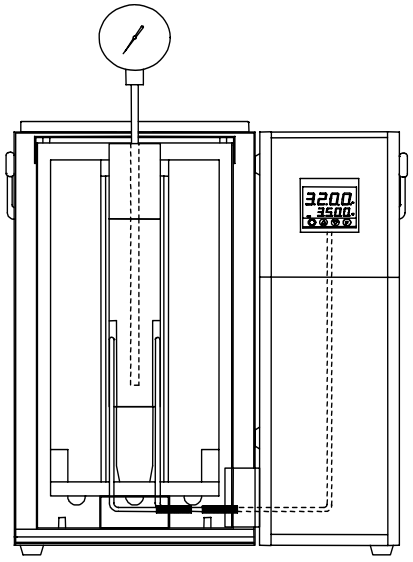


fig. 4

Calibration with external reference:
Make reference to the temperature value of the external standard instrument (fig. 5).
Put the sensitive elements of the probes near and at the same depth.

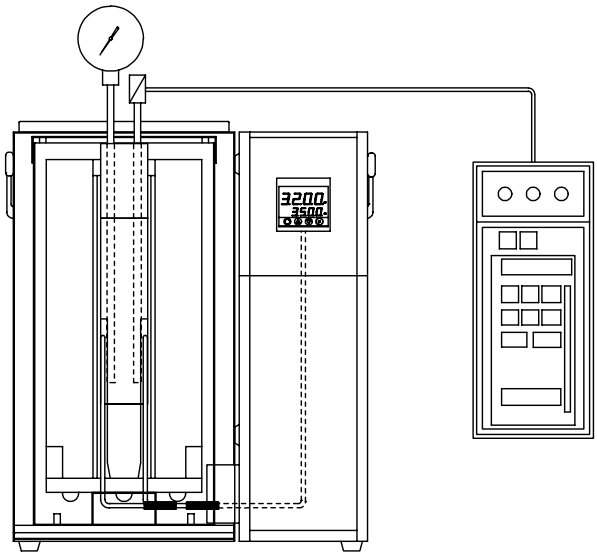


Fig. 5

Before undertaking any calibration follow these pieces of advice:
Start the calibration only at ambient temperature: any thermal shock can break the sensitive element of the probe and injure the operator.
Fit the equalizer block inside the oven.
Put the probe to check into the equalizer block:.
Push on the main switch and wait for the end of the autotest procedure.
Set the required temperature value on the set point:

- Press the <▲> key to increase the set point value.
- Press the <▼> key to decrease the set point value.

The input value is confirmed automatically.

Wait for the stabilization of the oven before starting any calibration.
When working at different temperatures set the set point on the new value and wait for the stabilization.
When the set point has been changed, the temperature read on the display and the measured one in the block may not proceed at the same speed; this is because there are differences between the sensors used and the position of the same inside the block. Temperature stability inside the block will have to be checked on the external reader and not on the temperature controller display because the probe connected to it is very close to the heating resistance.

The temperature indicated by the display must not be considered as a reference temperature but only as a general indication of the temperature inside the block.
We suggest to insert a primary standard with SIT certificate into the block; compare the probe indications with the values indicated by the standard.
Never use the primary standard: it's possible to calibrate the instrument in more significant points, comparing the displayed temperature to the temperature of standard one.

ATTENTION

AT THE END OF THE CALIBRATION DO NOT REMOVE THE PROBE IF IT IS STILL AT A HIGH TEMPERATURE. ALWAYS ALLOW THE CALIBRATOR TO COOL OFF WITH THE PROBE STILL INSERTED IN ORDER TO AVOID THERMAL SHOCKS TO THE PROBE ITSELF AND ANY HARM TO PEOPLE OR THINGS.
BEFORE SWITCHING THE CALIBRATOR OFF MAKE SURE THAT THE BLOCK TEMPERATURE IS ALMOST THE SAME AS THE AMBIENT TEMPERATURE.

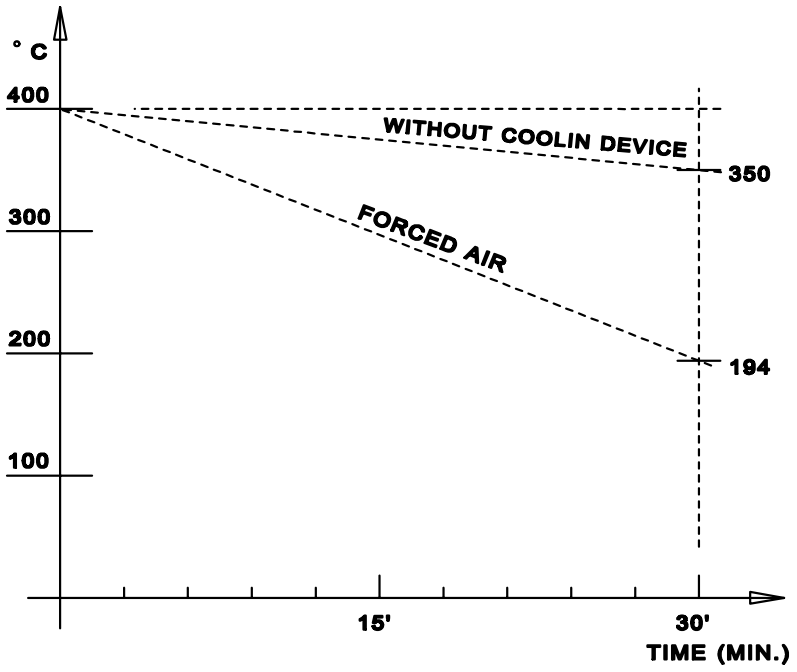
6.3 Cooling

To reduce the oven temperature, change the set point and wait for the cooling.

If necessary, the **CL552** with the standard insert block, can be completed with a cooling device. It is important to use this system only with temperature below 650°C.

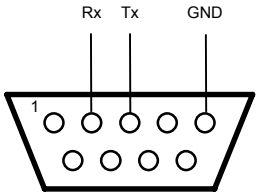
How to use:
- Insert into the block the cooling device only with the temperature below 650°C
- Supply with forced air at 6bar.
- Set the air flow with the pin valve.

The diagram reported below shows the cooling times with and without the cooling device.



7 SERIAL INTERFACE

On the rear part of **CL552** there is a 9 pole socket connected to the temperature controller which enables the calibrator to be completely controlled by a computer. The serial link protocol is a full bi-directional RS232 digital interface. The Portable Temperature Calibrator can be part of an automatic calibration system with a programmable cycle and the acquisition of all data can be required to generate a full calibration report.



8 MAINTENANCE

CL552 portable temperature calibrator has been factory tested and calibrated before shipment.
The calibration should be verified and re-adjusted if the instrument shows an error exceeding the declared specifications or when a critical active or passive component is replaced (either at component level or at board level)
OMEGA Engineering, inc will supply, on request, a technical reference manual, with all instructions and recommendations for service and calibration.
OMEGA Engineering, inc engineers will give prompt support for any assistance request.
The calibrator does not require any special type of maintenance. Clean the equalizer block periodically to remove any waste. Keep the calibrator in a clean dry place and avoid moving it with the equalizer block inserted.

8.1 Typical faults

Before carrying out these operations the instrument must be disconnected from the power supply; the equalizer block must be at ambient temperature

N°	FAULT DESCRIPTION	FAULTY COMPONENT OR FUNCTION	METHOD FOR REMOVAL
1	The calibrator does not work when the power cable is connected and the main switch is turned on.	- The fuse is cut off. - The power cable is cut off. - The main switch is faulty.	- Replace the fuses. - Replace the power cable with a similar one. - Replace the cup socket
2	The fuses are triggered when the power cable is connected and the main switch is turned on.	- The main switch is faulty - There is a short circuit in the heating element.	- Replace the cup socket. - Contact our technical office
3	The control panel is working properly but the temperature does not increase.	- The static relay is faulty. - The heating element is cut off. - The safety thermostat has been triggered. - The temperature controller is not generating a signal.	- Replace the static relay. - Contact our technical office - Replace the temperature controller
4	The display indicates a different temperature from the one measured in the block.	- The thermocouple N is faulty. - The temperature controller is faulty.	**- Replace the thermal element** - Replace the temperature controller
5	The temperature does not stop at the value which has been set.	The static relay is faulty.	Replace the static relay.
6	The temperature does not decrease to the set value as quickly as it should.	- The temperature controller is faulty. - The cooling fan is faulty.	- Replace the temperature controller - Contact our technical office
7	The display indicates ' -Sbr '	The thermal control element is cut off or is in short circuit.	Replace the probe.
8	The temperature is different from ±40°C compared to the set point.	The safety thermostat is working.	Contact our technical office.

8.2 Safety recommendations

1. Due to the fact that **CL552** is a portable instrument to be used on the field, it is very important to ensure that the socket has been grounded correctly when connecting it to the power supply.
2. Carry out the maintenance and repair operation only with the equipment at ambient temperature and disconnected from the electric power.
3. During the use of the calibrator, the upper protection grid may overheat.
4. Never leave the handle lifted with the calibrator switch on at high temperatures.
5. Don't touch the probe to calibrate when it's in the block.
6. Don't switch the calibrator off when it is working at high temperature because the protection grid and the carpentry may overheat.
7. When the calibrator has to be moved, remove the block from the quartz tube in order to prevent any breakage of the tube. It is a good idea if these operations are carried out with the calibrator as close to ambient temperature as possible.

8. Never put any type of liquid inside the block.

ATTENTION:

THE EQUIPMENT HAS BEEN DESIGNED TO PROTECT THE OPERATOR FROM ELECTRICAL AND HIGH TEMPERATURE HAZARDS. HOWEVER, THE FOLLOWING CAUTIONS SHOULD BE TAKEN: WEAR PROTECTIVE GLOVES.
DO NOT PLACE ANY COMPONENT ON THE TOP OF THE OVEN.
DO NOT OPERATE THE UNIT CLOSE TO FLAMMABLE COMPOUNDS.

8.3 Protections

The equipment is based on the following devices to protect any operation from hazard:

- When there is a breakage in the temperature sensor this is recognised by the temperature controller which switches off the heat output.
- If the temperature exceeds 1110°C the temperature controller switches on a safety device which, in turn, switches off the static heating relay
- Max. temperature safety thermostat, with a K thermocouple, to disconnect the heating resistance each time the temperature exceeds 1500°C.
- Protection grid to avoid any contact with the internal oven.
- Protection fuses
- Ground conductor.

8.4 Calibration

Efficiency and accuracy of **CL552** can be grant with a periodical calibration. Frequency of calibration is not a fix period but depends by the use if the instrument; our suggestion is to calibrate the instrument every year.

8.5 Storage

Store the instrument in the original package, at a temperature from -30°C to +60°C, with R.H. less than 90%.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSEO OR IMPUED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABIUTY AND RTNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein ate exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence. Indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please has the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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