LHC 650

TEMPERATURE DRY WELL CALIBRATOR MANUAL

INSTRUMENTS
leyro

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Version manual: 0.1

INDEX
TEMPERATURE DRY WELL CALIBRATOR LHC 650

INDEX

DRY WELL CALIBRATOR LHC 650

DRY WELL CALIBRATOR LHC 650

1. General Information

- This instruction manual provides important information about the instrument operation. To work with this instrument safely it is essential to comply with all safety and handling instructions provided.
- Always comply with the regulations on accident prevention and safety rules in force at the place of use of the instrument.
- The instruction manual is an integral part of the instrument and must be stored in the vicinity thereof so specialized staff can refer to it at any time.
- The qualified personnel must have read and understood the instruction manual before starting any work.
- The manufacturer is discharged from any liability for damages caused by usage not according to the intended purpose of use, non-observance of this manual, handling by insufficiently qualified personnel as well as unauthorized modification of the instrument.
- General conditions of sale included in the sales documentation apply.
- Technical modifications reserved.
- Factory calibration and calibration by the Spanish association of calibration (ENAC / ISO 17025) are performed in accordance with international standards.

For more information refer to:

- Web page:	www.leyro.net
- Relevant technical sheet:	LHC 650
- Technical service:	+34 91 283 5502 sat@leyro.net

DRY WELL CALIBRATOR LHC 650

1.1. Symbology

DANGER

Indicates an immediately dangerous situation which causes death or serious injury if not avoided.

WARNING

It indicates a potentially dangerous situation which may cause death or serious injury if not avoided.

WATCH OUT

It indicates a potentially dangerous situation which may cause death or minor or medium injury or material or environmental damage if not avoided.

INFORMATION

Marks useful tips and recommendations as well as information for efficient and fault-free use.

DANGER

Indicates hazards caused by electric current. There is a risk of serious or deadly injuries if safety instructions are not observed.

WARNING

It indicates a possibly dangerous situation which may cause burns due to hot surfaces if not avoided.

2. Safety

WARNING

Switch off the instrument at ambient temperature (approximately 50ºC / 122ºF)

Before installation commissioning and operation make sure you have selected the appropriate dry well calibrator respect to measuring range, version, and specific measurement conditions.
Risk of serious injury and / or property damage if not avoided.

The different chapters of this manual contain other important safety instructions observed.

2.1. Use as planned

The Dry Well Calibrator is a portable unit for technical service, industrial and laboratory tasks. Leyro Instruments' Dry Well Calibrator is provided for calibrating thermometers, switches / thermostats thermos, pyrometers electrical resistance and thermocouples.

The product has been designed and built only for the purpose described here and should be used in accordance to it. Meet the technical specifications of this manual. An inappropriate handling or use of the equipment is not in accordance with the technical specifications requires the immediate service and verification by an authorized Leyro Instruments technician.

Handle the electronic precision instrument with due diligence (protects against humidity, strong impacts magnetic fields, static electricity, extreme temperatures; Do not introduce any objects into the openings instrument). Pins must be protected against dirt.

If the instrument is moved from a cold to a warm environment, a malfunction due to condensation can occur. In this case you have to wait until the temperature of the instrument suits the room temperature before putting it back into operation.

No claim due to inappropriate handling is admitted.

2.2. Staff qualification

WARNING

Risk of injury due to insufficient qualification!

Improper handling can cause considerable personal and property damage. The activities described in this manual should be performed only by qualified personnel with the appropriate qualifications.

Specialized staff

Because of their professional training, their knowledge, control and measurement technology, as well as their experience and knowledge of regulations, standards and guidelines in the country of use, specialized staff is able to perform the works described and recognize possible dangers by themselves.

Some specific usage conditions require additional knowledge about aggressive environments.

2.3. Personal protective equipment

The personal protective equipment protects qualified personnel from hazards which may harm their health and safety during work. The specialized personnel must wear personal protective equipment during the different works on and with the instrument.

¡Comply with the indications about personal protective equipment in the work area!

Wearing protective glasses!

These protect the eyes from projected parts and splashes.

2.4. Specific Risks

WARNING

In the case of dangerous substances to be measured, e.g. oxygen, acetylene, flammable toxic substances, as well as in refrigeration premises, compressors, etc., the relevant provisions must be observed in each case, plus all general rules.

DANGER

Risk of death by electric current. There is direct danger of death from touching live parts.

- The installation and assembly of electric products must only be performed by a qualified electrician
- Before replacing the fuse circuit breakers, cleaning and maintenance / conservation and in the case of danger, disconnect the dry well calibrator network by removing the power cord from the electrical outlet.

WARNING

Residual media in dismounted instruments can cause risks to people, the environment and installation. Take appropriate precautions.

Overheating protection

WARNING

For your safety and the dry well calibrator is equipped with a protection on independent temperature that disconnects the power supply of heating in case of excessive temperature inside the housing. After cooling,must send the dry well calibrator to control to Leyro Instruments.

WARNING

The dry well calibrator is designed as a product of measurement and regulation. You need to take further protective measures if the dry well calibrator for applications not explicitly mentioned in this manual is used.

Do not use the dry well calibrator in atmospheres hazardous **(flammable or explosive atmosphere)**
If a malfunction of dry well calibrator can cause personal injury or property damage, it is necessary to ensure the subsequent installation of electromechanical protection devices.

2.5. Explanation of Symbols

¡It is necessary to read the instruction manual before installation and commissioning of the equipment!

EC European Community
Instruments with this mark comply with applicable European directives.

3. LHC 650 dry well calibrator

	LHC 650
Temperature range	40 … 650 ºC / 104 …842 ºF **(1)**
Accuracy	± 0.4 ºC / 0.5 ºF
Uniformity	± 0,1 ºC / 0.05 ºF
Screen Resolution	0.1 ºC / 0.1 ºF
Heating time	50 to 425 ºC: 19 min. 122 to 797 ºF:19 min.
Cooling time	425 to 100 ºC: 38 min. **(2)** 797 to 212 ºF: 3 min. **(2)**
Immersion depth	160 mm
Diameter	28 mm
Tank dimensions	28 X 160 mm
Power	8 A 240 VAC, 45-65 HZ
Electricity consumption	1.300 W MAX
Connection cable	AC 320 for Europe
Instrument dimensions	190x270x428 mm (ANXAlxP)
Weight	**8.7** kg

(1) The probe of the reference thermometer with which measurement is made has a diameter of 6 mm at anambient temperature of 20 ºC ± 3 ºC / 68 ºF ± 5.4 ºF.

(2) To change the unit of measurement of the temperature from degrees Centigrade to degrees Fahrenheit, contact with Leyro Instruments.

4. Design and function

4.1. Description

The dry well calibrator is a portable unit for technical, industrial service task at the laboratory. Leyro Instruments' dry well calibrator is provided for calibrating thermometers, switches / thermostats, electrical resistance pyrometers and thermocouples. The operational safety of the equipment is only guaranteed when used asplanned (control of temperature sensors).

The limit values specified should not be exceeded under any circumstances (see Chapter 3 "Technical Data"). The corresponding equipment must be selected according to the application. The product is then properly connected, and tests must be conducted0 and monitor the proper maintenance of all components.

The product is manufactured in several versions. The version is indicated on the nameplate on the dry well calibrator.

4.2. Supply volume

The dry well calibrator is shipped in a special safety packaging. The packaging must be kept sending the dry well calibrator safely to the manufacturer for repair or recalibration.

Standard supply volume of the dry well calibrator model LHC 650

- dry well calibrator
- Standard insert
- Power connection cable
- Calibration certificate
- Instructions Manual

Compare by packing list if all parts have been delivered.

WARNING

Use only the supplied power cable.

DRY WELL CALIBRATOR LHC 650

4.4. Isometric views of micro dry well calibrator series LHC

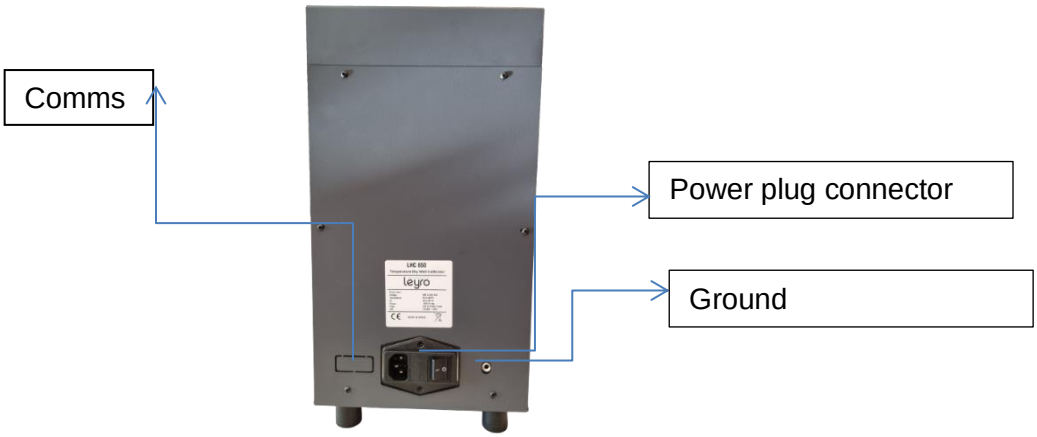
Front and top model LHC 650

At the top of the calibration is the refill opening (27 mm x 110m).

The controller with the display and control elements is located on the front of the dry well calibrator.

Rear of the equipment

At the rear of the instrument is the nameplate with the most important information about the specific model.



4.5. Description of command elements

Front Controller PID

DRY WELL CALIBRATOR LHC 650

Overview of the control elements of the regulator front

1) **P key:** **Access to the defined nominal temperature**
   Access to menu items and parameters
   Confirmation of introduction

2) **6 key:** **Reduction of the adjustable values**
   Selection of each menu item
   It goes back 1 level in the menu

3) **5 key:** **Increase of the adjustable values**
   Selection of each menu item
   It goes back 1 level in the menu

4) **U key:** **Recovery of saved nominal temperatures**

5) **LED OUT 1: Indicates the status of the output for temperature regulation**
   If the LED OUT 1 illuminate dry well calibrator is heated
   If it does not illuminate the LED OUT 1 dry well calibrator **is not heated**

6) **LED OUT 2:**

   a) **Heating equipment**
   Indicates the status of the output for fan control

   If the LED lights OUT 2 the fan rotates faster
   If it does not illuminate the LED OUT 2 The fan rotates at a slower speed

   b) **Heating and cooling equipment**
   Indicates the status of the output for temperature regulation

   If the LED lights OUT 1 dry well calibrator is cooled
   If the LED OUT 1 does not illuminate dry well calibrator **is not cooled**

7) **PV indicator: The current reference temperature is displayed**
   Each one of the modes and parameters menu items are displayed

8) **SV indicator: Visualization of the nominal temperature**
   Certain parameters are displayed in each of the modes and menu items

9) **LED SET:** **Flashing indicates access to each of the menu items and parameters**

DRY WELL CALIBRATOR LHC 650

5. Transport, packaging, and storage

5.1. Transport

Check if the dry well calibrator shows any damage caused during transport. Report evident damages immediately.

5.2. Packaging

Do not remove the packaging until just before installation.
Keep the packaging as it is the ideal protection during transport (e.g., if the installation site changes or if the product is shipped for possible repairs).

5.3. Storage

Permissible conditions at the place of storage

- Storage temperature: -10 ... + 60ºC.
- Humidity: 30 ... 95% RH (non-condensing).

Avoid the following

- Direct sunlight or proximity to hot objects.
- Mechanical vibration, mechanical shock (sudden standing).
- Soot, steam, dust, and corrosive gases.
- Potentially explosive environment, flammable atmospheres.

6. Commissioning, operation

6.1. Checking the temperature sensors

To check the temperature sensors, connect a measuring instrument distinct of the checking sensor. By comparing the temperature indicated on the external measuring instrument with the reference temperature, you can check the status of the checking sensor. Watch that the sensor requires little time to reach the temperature.

WARNING

Thermocouples with grounding cannot be calibrated because they are grounded, so measurements could lead to erroneous results.

6.2. Starting Procedure

If the calibrator is not used for a long period, it is possible that moisture penetrates in the heating towers due to the materials used (magnesium oxide). After transportation or storage of dry well calibrator in humidity environment, heating towers must be preheated slowly. During the drying process it is assumed that the dry well calibrator has not yet reached the required isolation voltage for the protection class.

6.3. Starting the dry well calibrator

1) Connect the instrument to the power.

2) Press the switch on. The controller is activated. At the top PV screen, the word TEST appears. On the lower display the version number is displayed, for example RI 2.7.

3) After about 5 seconds activation has been completed and the calibration mode is automatically displayed. Mounted heating and cooling towers regulate dry well calibrator temperature automatically modifying the room temperature to match the adjusted nominal temperature on the regulator.

6.4. Viewing the reference temperature and the nominal temperature

Upper indicator

The 4 digit – seven segments red indicator displays the current temperature of the dry well calibrator.

Lower indicator

On the 4 digit-7 segment green indicator the current nominal temperature of the dry well calibrator is displayed. After reaching the nominal temperature, the issue of heat energy generated by the dry well calibrator continues through start pulses in order to maintain the temperature level inside stable.

6.5. Regulation of reference temperature up to the maximum

The red LED OUT 1 indicates that the heating is on. During the heating phase a constant light indicates the input of heat energy. A flashing LED means that the reference temperature (adjusted nominal temperature) will be reached soon and thus the heat energy will only enter at short intervals.
To ensure proper temperature stability the cycle time of the regulator is adjusted to a low level and the regulation output is activated with high frequency.

6.6. Operating position

The vertical service position of the dry well calibrator is optimal as this position guarantees the ideal distribution of the temperature in the **dry well calibrator**.
The position should never be horizontal.

6.7. Inner sleeves

After use remove the inner sleeve with the aid of a tool for sleeves and then proceed to cleaning. This prevents sleeves from adhering to the **dry well calibrator**.

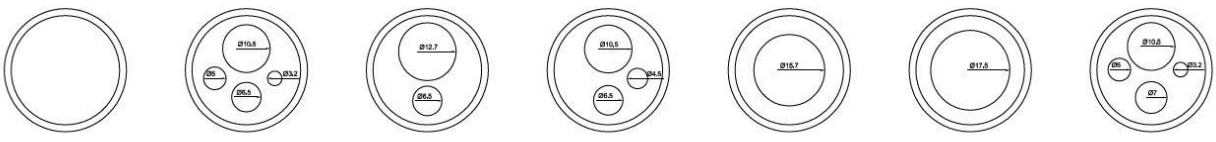
6.8. Preparation of dry well calibrator

To achieve maximum accuracy of a **dry well calibrator**, fill with an appropriate insert.

6.8.1. Properties of calibration inserts

Due to the specific features of the different calibration inserts different calibration results are obtained. A compensation of calibration inserts should be performed, even in factory by the manufacturer if necessary.
Recommended calibration inserts for the different temperature probes:

Standard Insert (mm): B: 2 x Ø 3,5 /2x Ø 4,5/ 2 x Ø 6,5/ 2 x Ø 8,5/ 2 x Ø 10,5
Optional Insert (mm): C: 1 x Ø 6,5 / 1x Ø 12,5
D: 1 x Ø 4,5 / 1 x Ø 6,5/ 1 x Ø 10,5
E: 1 x Ø 15,7
F: 1 x Ø 17,5
G: 1 x Ø 3,2 / 1 x Ø 5 / 1 x Ø 7 / 1 x Ø 10,5
A: Blank (without holes).



DRY WELL CALIBRATOR LHC 650

7. Dry well calibrator handling

For handling three modes are available.

Calibration mode: In this normal operating state calibration of the tester can be performed.

Nominal values mode: Enter the nominal temperatures in this mode.

Main menu: Perform all settings like the nominal temperature given and the adjustment of the control parameters in this mode.

7.1. Operating in calibration mode in each operation mode

Operation mode of operation

- The equipment must be turned off
- Put the Insert into dry well calibrator
- Switch on the equipment
- Introduce probes to calibrate

Cleaning operating mode

- Switch off the instrument at ambient temperature (approximately 50 ºC / 122ºF)
- Remove inserts with the tool

7.2. Calibration (Calibration Mode)

The trunk is constructed to achieve the best result. The drilling depth of the PT100 probe is set to a sensitive length. If a separate external reference is used for a comparative calibration, ensure that the sensitive length is known, and it is in center of the surface and calibration.

Once activated dry well calibrator, is in the calibration mode after initialization. In the upper indicator current reference temperature is shown. The nominal temperature appears in the lower display.

If the OUT 1 LED lights up, the temperature rises.

If the OUT 1 LED is not lit, the heating is off.

If the OUT 2 LED lights up, the temperature drops.

If the OUT 2 LED is not lit, the cooling is off.

DRY WELL CALIBRATOR LHC 650

Heating instrument

The LED OUT 2 indicates the status of the output for fan control.

- If the LED lights OUT 2 the fan rotates faster.
- If it does not illuminate the LED OUT 2 the fan rotates at a slower speed.

Heating and cooling instrument

There are two methods to adjust the nominal temperature:

- You can set a temporary nominal temperature.
- You can save fixed nominal temperatures in the main menu.

Setting a temporary set temperature (nominal values mode)

To temporarily modify a nominal temperature stored in this state of operation follow these steps:

1 Briefly press the P key indicator in the upper memory currently active nominal values shown. The corresponding nominal temperature appears in the lower display.

2 Pressing the key  nominal temperature is increased.
Pressing the key  nominal temperature is reduced.

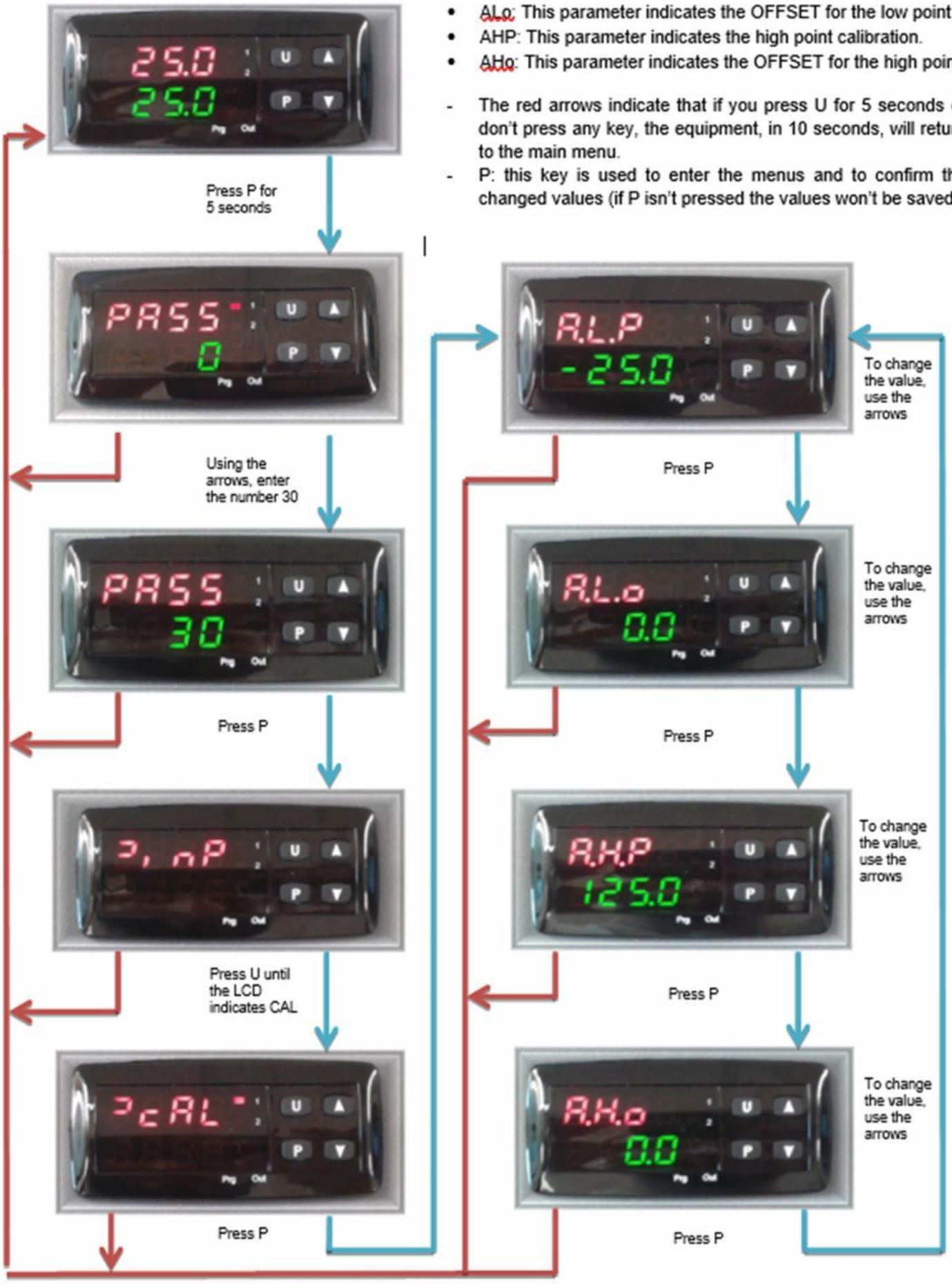
3 Pressing the key P again the nominal value confirms new set.

DRY WELL CALIBRATOR LHC 650

7.3. Calibration (main menu)

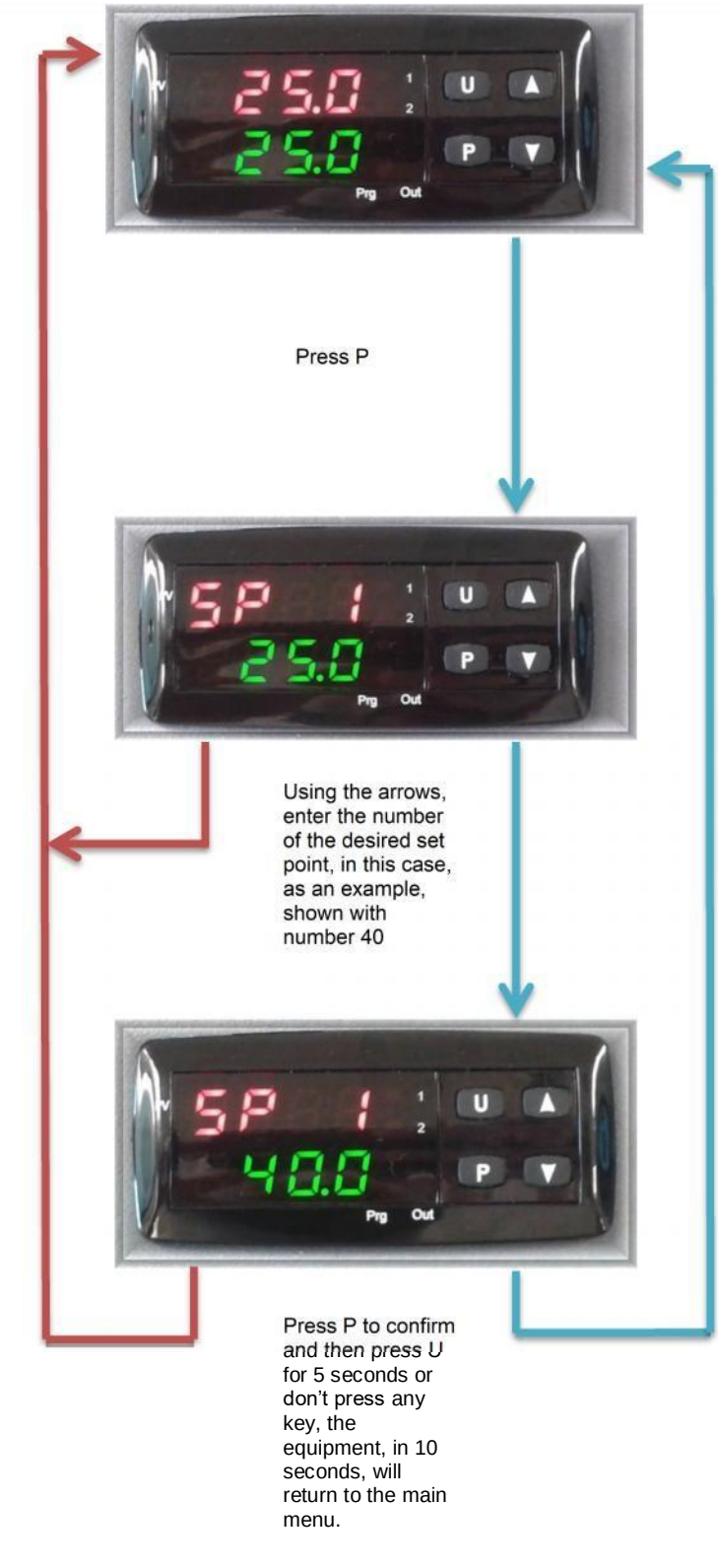
- ALP: This parameter indicates the low point calibration.
- ALo: This parameter indicates the OFFSET for the low point.
- AHP: This parameter indicates the high point calibration.
- AHo: This parameter indicates the OFFSET for the high point.

- The red arrows indicate that if you press U for 5 seconds or don't press any key, the equipment, in 10 seconds, will return to the main menu.
- P: this key is used to enter the menus and to confirm the changed values (if P isn't pressed the values won't be saved)



7.4. Set Point (Main menu)

- The red arrows indicate that if you press U for 5 seconds or don't press any key, the equipment, in 10 seconds, will return to the main menu.
- P: this key is used to enter the menus and to confirm the changed values (if P isn't pressed the values won't be saved)



8. Cooling the dry well calibrator

WARNING RISK OF BURNS

Before transporting or touching the dry well calibrator it is necessary to ensure that it is sufficiently cold because, otherwise, there is a risk of burns both in the dry well calibrator and in the voucher. To bring the dry well calibrator from a high temperature to a low temperature as quickly as possible, the nominal temperature must be adjusted to a temperature lower than the ambient temperature.
The fan integrated in the heating instruments slowly increases the speed of rotation thus creating more cooling air.

ATTENTION

After turning off or removing the network connection the built-in fan does not generate more cooling air. However, sufficient thermal decoupling between the dry well calibrator and enclosure is guaranteed.

9. Maintenance, Cleaning and Re calibration

9.1. Maintenance

The instruments described here do not require maintenance. All repairs must be made only by the manufacturer. The change of the fuse is excluded. Before changing this, turn off the calibrator and the dry well calibrator and disconnect them from the network by removing the network cable from the electrical outlet.

9.2. Cleaning

ATTENTION

- Cool the dry well calibrator.
- Before cleaning the dry well, calibrator turns it off and disconnects it from the network.
- Clean the instrument with a damp cloth.
- Make sure that the electrical connections do not get wet.
- Once the instrument has been disassembled, it must be rinsed and cleaned before returning it to protect people and the environment against waste from the measuring medium.

- Residual media in the disassembled instrument can cause risks for people, the environment and installation. Take correct protection measures.

See chapter 11.2 “Return for more information about the return of the instrument.

9.2.1. Cleaning of calibrators

In gauges with insert bushing a small amount of metal powder is produced, which can clog the nozzle and the bushing. To prevent this, disassemble the inner bushes periodically and before any long period out of service. C lean the perforation of the dry well calibrator with pressurized air and with a dry cloth the perforation and the cap.

9.2.2. Cleaning of the fan grille

All the dry well calibrator has a fine mesh grid inside, through which cooling air enters the dry well calibrator. Clean the grille regularly depending on air pollution with a vacuum cleaner or brush.

9.2.3. Internal cleaning of the dry well calibrator

Remove all inserts from the tank and clean the tank, applying water with a large amount of cleaning substances. Allow all components to dry. If distilled water is used,

9.2.4. External cleaning of the dry well calibrator

Clean the outside of the calibration dry well calibrator with a damp cloth and a little water or with a non-aggressive cleaning product without solvent.

9.3. Re calibration

ISO /17025 Certificate

The calibration dry well calibrator has been adjusted and checked before shipment using standard quality internationally recognized measuring instruments. According to ISO / 17025 the calibration dry well calibrator must be checked at appropriate periodic intervals depending on the use. It is recommended to calibrate the instrument by the manufacturer at periodic intervals of approximately 12 months or every 500 hours of approximate operation. All Factory Re-calibration also includes an exhaustive and free check of all system parameters in terms of specifications. Any deviation from the basic values is corrected. The bases of the Re-calibration are the guidelines of ISO / 17025. The measurements detailed in this document must be observed and applied during the Re calibration.

10. Accessories included LCH 650

- 1,8 mm network cable with connector type F according to CEE7/4.
- Standard insert
- Extractor tool

10.1. Additional options

- Transport (Trolley) carry case aluminum
- Optional inserts
- º F / Fahrenheit degrees
- Communications Modbus RS 485 (software included)

11. Failures

Failure	Causes	Solutions
- - - -	The reference sensor stops or is defective	Send the instrument to the manufacturer or service center for repair
uuuu	Measured temperature below the limit value of the internal reference sensor (below the range -200ºC)	Send the instrument to the manufacturer or service center for repair
0000	Measured temperature above the limit value of the internal reference sensor (above the range + 850 ° C)	Send the instrument to the manufacturer or service center for repair
EREP	Possible failure in the EEPROM memory of the controller	Press the Key P
The fan does not work	The fan is defective or blocked. It is possible that the temperature switch has switched and thus cut the power supply to the heating cartridges	Send the instrument to the manufacturer or service center for repair
The end temperature is not reached	The semiconductor relay is defective, or the heating or cooling tower have shorted or got old.	Send the instrument to the manufacturer or service center for repair
No indication	The regulator is defective	Send the instrument to the manufacturer or service center for repair
No function	The network connection is not successful, or fuse is defective	Check power connection and fuse

ATTENTION

If it is not possible to correct the defects by means of the measures detailed above, the instrument must be immediately put out of service and prevent erroneous commissioning. In this case, the manufacturer should be consulted. If you wish to return the instrument notes the indications in the “return” chapter.

12. Disassembly, Return and disposal of waste

WARNING
Residual mediums in the disassembled instrument can cause risks for people, the environment and installation. Take correct protection measures.

12.1. Disassembly

WARNING
Risk of burns. Let the instrument be cold enough before disassembling it. Danger due to very hot mediums that can escape during disassembly.

To avoid damage

1. Cool the instrument as described in the chapter " dry well calibrator ".
2. Turn off the dry well calibrator.
3. Remove residues from the dry well calibrator. See the chapter " dry well calibrator ".

12.2. Return

WARNING
It is essential to observe the following for the delivery of the instrument. All the equipment sent to LEYRO INSTRUMENTS should be free of dangerous substances (acids, bleach, solutions, etc.).

Use the original packaging or a suitable packaging for the return of the instrument.

To avoid damage

1. Place the instrument together with the insulating material in the packaging. Evenly insulate all sides of the transport packaging.
2. If possible, attach a bag with blotter.
3. Apply a marker indicating that it is the shipment of an extremely sensitive measuring instrument.

12.3. Disposal of waste

Incorrect disposal can cause environmental hazards, Dispose of the components of the instruments and packaging materials in accordance with the regulations on waste treatment and disposal in force in the country of use.

Remove the dust as it is described in the safety data sheet.

Note: Those Instruments with this mark should not be disposed in domestic garbage for the elimination.

DRY WELL CALIBRATOR LHC 650

TEST REPORT ACCORDING TO DIN EN 10204/3.1

Date:	**30/4/2021**
Certificate Nº:	**XXXXXXXXX**
Calibration object:	**LHC 650**
Temperature range:	**60 … 650 ºC / -31 … 329 ºF**
Measurement inaccuracy:	**+/- 0.3 K**
Serial Number:	**XXXXXXX**
Ambient temperature:	**23ºC ± 3ºC / 68ºF ± 5.4 ºF**

We herewith certify that above listed products are manufactured in compliance with the latest technical standards. All used materials and components have passed the quality assurance system. Manufacturing, calibration and quality testing are performed according to the Quality Assurance Systems.

The products are calibrated against factory standards traceable to international standard units administrated by the national metrology institutes like ENAC, NIST, PTB, NBL, BEV or other recognized national standard laboratories.

For engineering samples and repair parts extent of certification is restricted to test results only.

Traceable Standards	
Temperature reference	LDT 2000 (class 0.007 K)
Serial Number	XXXXXXXXXX
Certificate ISO 17025 (ENAC)	43907

	Reading on calibration	
Dry well calibrator LHC 75 Temp.	**Temperature reference**	**Deviation**
[ºC]	[ºC]	[ºC]
100.0	99.963	0.037
280.0	280.089	0.089
360.0	359.989	- 0.011
450.0	449.962	- 0.038
600.0	600.057	0.057

The calibrated values are valid under above conditions only at the time of measurement and are referenced to marked reference and working standards.

Technician

DRY WELL CALIBRATOR LHC 650

Declaración de Conformidad UE
EU Declaration of Conformity

Documento Nº.:
Document No.: 8723418 .25

Declaramos bajo nuestra sola responsabilidad, que los equipos marcados CE, según ficha técnica en vigor LC 94, cumplen con los requerimientos esenciales de seguridad de las Directivas Normas aplicadas y armonizadas.

We declare under our sole responsibility that the CE marked products, according to the valid data sheet LC 94, comply with the essential protection requirements of the directives Harmonized standards.

Modelo de equipo: **LHC 650**
Type Designation: ***LHC 650***

Descripción: Calibrador de Bloque Seco
Description: ***D****ry Well Calibrator*

Homologaciones y certificados, serie LCB, conformidad CE. Normas aplicadas y armonizadas

Directiva de baja tensión	2004/108 CE, EN 61326 Emisión (grupo1, clase B) y resistencia a interferencias (ámbito industrial)
Directiva de baja tensión	2006/95/CE, EN 61010-1, disposiciones de seguridad para instrumentos eléctricos de medición, control, regulación y de laboratorio
Certificado	Certificado de calibración 3.1 según DIN EN 10204
Calibración	Opción: certificado de calibración ENAC ISO 17025

Homologation and certificates, LCB series CE compliance. Harmonized standards.

Low Voltage Directive	*2004/108 CE, EN 61326 Emission (Group 1, Class B) and resistance to interferences (industrial locations)*
Low Voltage Directive	*2006/95 / EC, EN 61010-1, safety regulation for electrical measuring, control, regulation, and laboratory instruments*
Certificate	*3.1 calibration certificate according to DIN EN 10204*
Calibration	*Option: calibration certificate ISO 17025 ENAC*

Firmado en nombre de / *Signed by*

Leyro Instruments SL

España /Spain 26-04-2021

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DRY WELL CALIBRATOR LHC 650

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