

User's Guide



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MADE IN UNITED KINGDOM

CL1201 Dry-Block Calibrator



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It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.

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INTRODUCTION

The OMEGA CL1201 is designed to provide an exceptionally stable and accurate heat source from between 150 and 1200°C that can be used in a Calibration laboratory or a field environment. These units enable precise temperature calibration of a wide range of temperature sensors and thermostats to be carried out. They offer fast heat up times, with unrivalled accuracy and repeatability.

The OMEGA CL1201 accepts interchangeable insert blocks allowing for many sizes of probes to be calibrated. The unit uses an R-type Thermocouple control sensor and a special heater design for optimum temperature uniformity and rapid heating rates. Heaters are semi-embedded in a vacuum formed light-weight refractory ceramic-fibre material which form a two-part heating assembly to achieve stable and uniform temperatures throughout the block.

A ceramic tube covers the entire test area of the furnace which insulates the isothermal block and test probes from the high-power heater windings. The ceramic tube supports the isothermal block and assists with homogeneity of temperature distribution.

The isothermal block assembly is machined from a special alloy giving excellent thermal conductivity and also resists high-temperature oxidation. This block is designed to optimize performance between sufficient mass for good stability and uniformity and to have a low enough mass to have rapid heating and cooling rates and good stabilisation periods.

The standard insert block has 4 test holes which accept Ø8mm probes x 80mm deep for use with a reference probe typically an R type thermocouple or an SPRT. We also offer a range of other interchangeable insert blocks as detailed later in this manual.

This product offers a wide temperature range and enables high-temperature calibration routines to be carried out easily and affordably.

Typical applications are in the glass manufacturing, electrical power, automotive and material processing industries.

The built in controller features a dual LED display allowing operating parameters including the block temperature, heating status, and current set-point to be reviewed. The temperature can be easily set using the control buttons to any desired temperature within the calibrator's specified range.

If the unit is used correctly this instrument will provide continued accurate calibration of temperature sensors and thermal devices in many applications.

OMEGA CL1201 calibrator is designed to give the same as the actual display temperature as the test sensor in the block. If the unit is set to 1200°C and the display reads 1200°C and the calibration well is at 1200°C.

Before using the OMEGA CL1201 make sure you have read this manual carefully.



SAFETY

Operator Safety

Please read this manual carefully before using the OMEGA CL1201 Calibrator. If the equipment is not used in the manner described in this manual the protection provided by the equipment might be impaired.

If a safety problem should be encountered then switch off the unit at the mains socket and remove the plug from the electricity supply.

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.

Warnings

HIGH TEMPERATURES ARE DANGEROUS as they can cause serious burns to operators and ignite combustible material. Users should be aware of the following to avoid personal injury:



- USE CARE AND WEAR PROTECTIVE GLOVES TO PROTECT HANDS
- DO NOT use combustible substances near hot objects
- DO NOT operate the instrument in the vicinity of inflammable liquids or gases
- DO NOT operate the instrument under any structure or in a cabinet – clearance of 20cm on all sides and 1m above the calibrator is recommended
- NEVER use any liquids or heat transfer fluids such as silicone oil paste as dangerous fumes may be given off
- After heating test samples, remember that parts of the instrument, namely the block and any associated accessories may be very hot.
- The ceramic materials used in furnace manufacture become electrically conductive to some extent at high temperatures. Also, there are partially exposed heating coils in the chamber. DO NOT use any conductive tools within the working area of the unit without isolating first.

Cautions

Users should be aware of the following to avoid damage to the instrument:



- DO NOT use if the cooling fan in the instrument is not working correctly
- DO NOT operate if the instrument if it appears damaged or operates abnormally
- DO NOT place any liquids or heat transfer fluids such as silicone oil paste etc onto the instrument
- DO NOT use this instrument if it is excessively wet, dirty or dusty
- DO NOT interchange slim metric inserts with slim Imperial inserts as they will become jammed. Slim Inserts are available to suit both models
- Note that the lifetime of some components can be shortened by continuous high temperature operation

Additional Notes

The OMEGA CL1201 is a precision calibration instrument designed for optimum durability and trouble free operation but it must be handled with care.

The unit should always be carried by the handle in the upright position to prevent the insert blocks or ceramic insulators from being dropped and damaged.

Test probes and the CL1201 insert block may have differing thermal expansion rates. The precision bores are manufactured to a very close tolerance to allow for probe expansion inside the well as the block heats up. Otherwise, the probe may become stuck in the well.

Some test probes have temperature limits so it is advisable not to exceed this temperature. Ensure that the air temperature above the CL1201 does not exceed the probe handle's temperature limit.

The air above the block may be over 200°C and if the probe handle limits are exceeded, the probe may be permanently damaged.

Unpacking

When unpacking please ensure that the following have been removed from the packaging:

- OMEGA CL1201 Calibrator
- Calibration certificate
- Mains cable
- Software on CD
- Allen key
- Insertion extraction tool

The user is advised to keep the original packaging in case the instrument ever needs to be returned for service or repair. Omega accepts no responsibility for damage incurred unless the unit is correctly packed and transported in its original packaging.

INSTALLATION

The instrument should be carried with the carrying handle provided. Never move or carry the instrument when in use or connected to the mains electricity supply.

1. All CL1201 instruments are supplied with a mains power cable.

Before connecting the instrument to the mains electricity supply, check the voltage against the rating plate (located on the side of the unit). Please note that the unit must be earthed to ensure proper electrical safety. Connect the mains cable to a suitable plug according to the table below. For 230V units an RCD can be used to provide additional safety protection against fault conditions.

| Connection | 220/240V, 50/60Hz Supply | 110V/120V Supply, 50/60Hz |
|------------|--------------------------|---------------------------|
| Live | Brown | Black |
| Neutral | Blue | White |
| Earth | Green/yellow | Green |

2. UK ONLY: The fused plug supplied with the mains cable is fitted with a 10 Amp fuse to protect the instrument and the user.

3. Units showing 230V, 50/60Hz on the rating plate also operate between 210 and 260V; units with 120V, 50/60Hz also operate between 100 and 130V and units marked with 100V will operate between 90 and 110V. In all cases the heating rate will degrade by approximately 8% at the extremes of the voltage range.

4. Plug the mains cable into the socket on the side of the instrument.

5. Place the unit on a suitable flat bench ensuring that the air inlet vents on the underside are free from obstruction.

6. Switch on the instrument next to the mains supply cable entry :

mains switch On

mains switch Off



Power Supply switch: when the CL1201 is connected to the electrical supply and the switch made the neon illuminates



Heat Supply Neon: the neon illuminates when power is being supplied to the elements

Replacement cable

Should the mains lead need replacement, a cable of 1.5mm² of harmonized code H05VV-F should be used. **IF IN DOUBT CONSULT A QUALIFIED ELECTRICIAN.**

Working Conditions

The OMEGA CL1201 calibrator is designed to operate under the following conditions:

- Indoor use
- Ambient temperature range +5°C to +40°C
- Altitude to 2000m
- Relative humidity not exceeding 95%
- Mains supply fluctuations not exceeding 10%
- Pollution degree 2
- Environmental conditions should not be excessively dusty or dirty

Note: The control specifications are quoted at an ambient temperature of 20°C. The specification may deteriorate outside an ambient temperature of 10°C to 30°C.

The instrument has been tested for radio frequency interference and is certified under EN61326.

SPECIFICATIONS

Temperature

| | |
|--|------------------------------|
| Temperature range (min set point 10°C) | 400°C to 1200°C |
| Temperature set point precision | 0.1°C, °F, K (1° above 1000) |
| Display Accuracy | ±3°C |

Stability (in amb of 20°C) after 10-20 mins at temperature over 30 minute period

960 - 1200°C ±0.012°C 660 - 960°C ±0.017°C 420 - 660°C ±0.015°C 150 - 420°C ±0.035°C

Radial Uniformity (well to well in - standard insert A)

| | |
|--------------|---------|
| 960 - 1200°C | ±0.25°C |
| 660 - 960°C | ±0.2°C |
| 420 - 660°C | ±0.1°C |
| 150 - 420°C | ±0.03°C |

Heating/Cooling Rate

| | |
|---------------------------------------|-------------|
| Heating rate between 50°C and 1200°C | 25 minutes |
| Cooling rate between 1200°C and 100°C | 130 minutes |

Well dimensions

| | |
|-------------------|-------------|
| Diameter x length | Ø34 x 155mm |
|-------------------|-------------|

Insert dimensions (80mm immersion depth)

| | |
|--|---------------------------------|
| Insert A (standard - supplied with unit) | Ø8 x 4 off |
| Insert B | Ø3, 4, 6 mm x 2 off each. |
| Insert C | Ø1/8", 1/4", 3/16", 5/16", 3/8" |
| Insert D | Ø3/16", 1/4", 3/8" x 2 off each |
| Insert E | Ø1/4" x 6 off |

System

| | |
|---------------|-----------|
| Fan cooling | Automatic |
| Communication | RS-232 |

Dimensions

| | |
|----------------------|--------------------|
| Dimensions H x W x D | 350 x 200 x 297 mm |
|----------------------|--------------------|

Weight

12kg / 24lbs

Power

| | |
|---|-------|
| Main Supply 230V ($\pm 10\%$) 50/60Hz | 1625W |
| Main Supply 120V ($\pm 10\%$) 50/60Hz | 1625W |

The performance will vary and will not necessarily meet the above typical specification at the extremes of voltage.

Fuse Rating

| | |
|------|-----|
| 230V | 10A |
| 120V | 16A |

Standard NIST traceable cert

150, 420, 660, 960, 1200°C

USER OPERATION SET UP

Place the unit on an even horizontal surface with clearance around the unit of 20cm on all sides and 1m above.

The area around the calibrator should be free of draught, dirt, flammable substances, etc. Carefully lower the insert block into the well and use the threaded tool to screw it lightly into place.

Then gently lower the insulation plug onto the relevant insert block. Test Probes should be of the closest diameter possible to the selected insert while still allowing the probe to slide in and out easily. Insert to suit various probe sizes are available from Techne.

The well should be clear of any dirt, foreign objects, grit or grease before the insert is fitted.

Plug the mains cable with the correct grounded mains supply into the unit.

Turn ON the power to the unit with the switch above the mains cable inlet.

The power neon is ON whenever the furnace is connected to the supply.

Then turn ON the power switch on the front panel which supplies the control circuit. The display on the controller should illuminate and the fan start running. The controller initially goes through a short test cycle.

The display on the unit will show the current block temperature and heat or cool to the current set point.

The heater neon will illuminate when power is applied to the heater. When the set point is entered the block may take 25 minutes to reach the set-point temperature depending on the set point value.

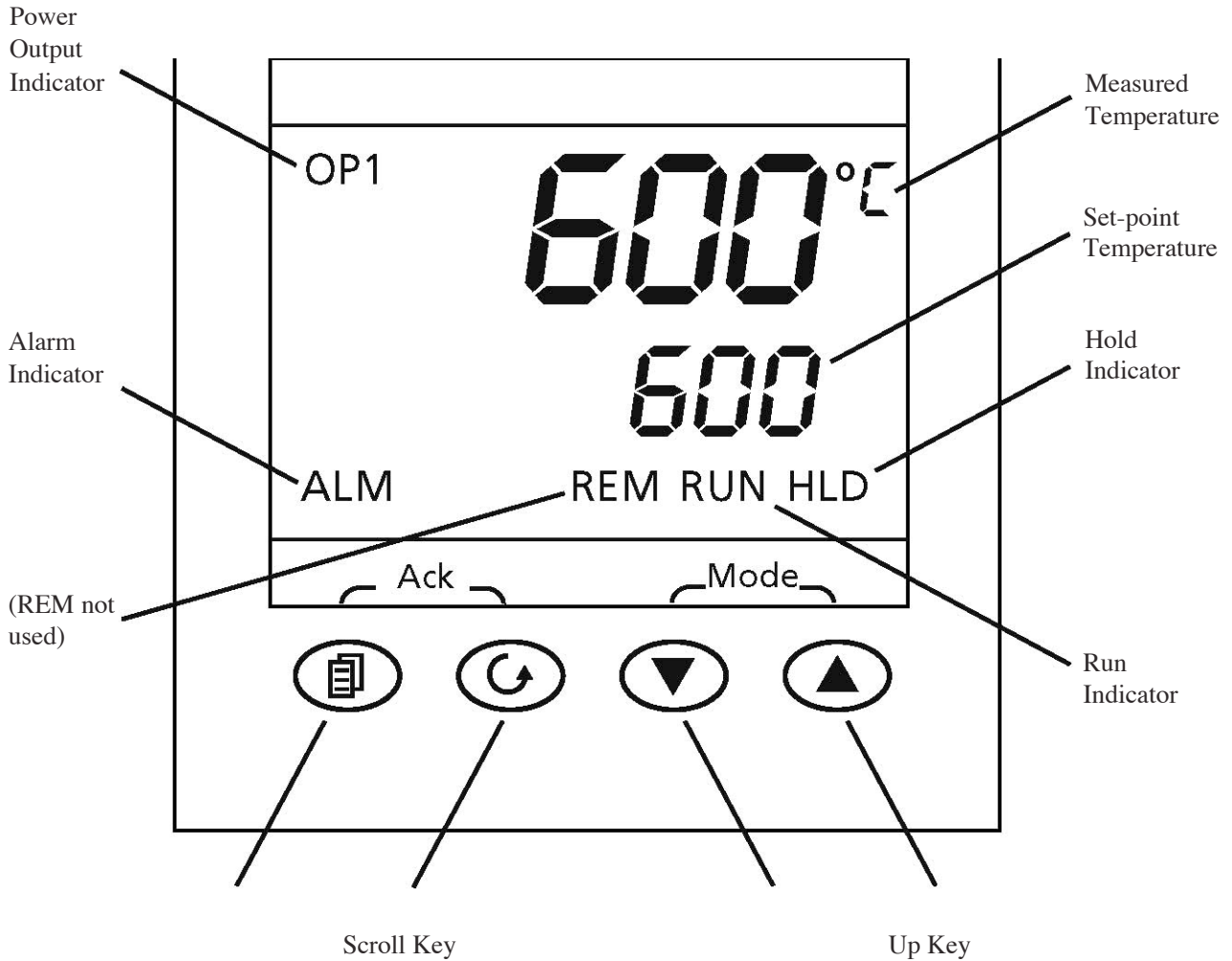
It may take a further 10 to 20 minutes to stabilise to within $\pm 0.5^{\circ}\text{C}$ of the set-point.

Ultimate stability may take 15 to 20 minutes more of stabilisation time.

General Operating Advice

The Heating element life is shortened by use at temperatures close to maximum. Do not leave the furnace at high temperature when not required.

CONTROLLER LAYOUT (HOME DISPLAY)



Keys

Page Key



The *Page* key is used to access level 2 when held down for 3 seconds.

Scroll Key



The *Scroll* key is used to scroll through the parameters.

ACK

Page + Scroll



When pressed simultaneously the ACK function is used to:

- Return to the Home Menu.
- Acknowledge timer end.
- Acknowledge an alarm if activated.

Arrow Keys



The arrow keys are used individually to adjust the selected parameters and in combination to run a program.

CONTROLLER TEST INSTRUCTIONS



When switched on, the controller goes through a short test routine and then shows the measured temperature (PV = Process Value) in the upper part of the display, and below it, the set temperature (Set Point).

Note: If a parameter is selected and no further action is taken, the display will time out and revert back to the home display in its working level after approximately 1 minute.

The OMEGA CL1201 has been set for Operation as a Simple Controller

When switched on, the controller goes through a short test routine and then shows the measured temperature (PV = Process Value) in the upper part of the display, and below it, the set temperature (Set Point).

Changing the Set Point

Press  Up or  Down required SP. If the SP is higher than the measured temperature, the OPI indicator will illuminate in the top left corner of the display, indicating that the controller is calling for power (giving an output). The controller will immediately attempt to reach the set temperature and then maintain it. The temperature range has 5 setting levels. To enter the correct control RECipe NO set in LEVEL 2 see **Understanding User Levels** section below.

Scroll to RECNO and set to which temperature range in operation.

RECNO 1 = 150°C

RECNO 2 = 450°C

RECNO 3 = 660°C

RECNO 4 = 960°C

RECNO 5 = 1200°C

Using the Controller

The parameters in the controller are first shown by a short code (mnemonic). After 5 Seconds a description of the parameter will scroll once along the display and then revert back to the mnemonic. The scrolling text can be interrupted at any time by a single press of any of the buttons, but will not scroll again until the parameter is returned to. In this manual the mnemonic will be shown first followed by the scrolling text in brackets;

e.g. WRK.OP <WORKING OUTPUT>







Understanding User Levels

There are two user levels in the controller; Level 1 (Operator) and Level 2 (Supervisor).

Level 1 (Operator) is for the day to day operation of the controller. These parameters are not protected by a security code.

Level 2 (Supervisor) provides access to additional parameters. Access to these is protected by a security code


To Enter Level 2

- 1 Press and hold the page key  for 3 seconds.
- 2 The display will show Leu 1 GOTO
- 3 Release the page Key 
- 4 Press the Up  or Down  to choose LEu (Level 2)
- 5 Press the Up  or Down  to enter the code (Level 2 Code = 9).

If the correct code is entered, the display show the level 2 home display. If an incorrect code is entered the display reverts back to Level 1 home display

When level 2 operations have been completed, the supervisor must return to Level 1 either manually or by 'power cycling', there is no time out function.

To Return to Level 1

Press and hold the page Key 

Press Down  to select LEu 1

It is not necessary to enter a code when going from a higher level to a lower level when level 1 is selected; the display reverts to the home display at the start of the user operation section.

Table showing parameters accessible in level 1 and Level 2

| Operator LEVEL 1 | Supervisor LEVEL 2 |
|------------------|---|
| Home display | Home Display |
| | Timer |
| | Timer Status |
| | Alarms (if configured) |
| | Current Transformer Input (if configured) |
| | Comms (if configured) |
| | Controller setup (if configured) |
| | Customer Calibration (if configured) |

Setting up the controller

Before using the controller (or during its lifetime) certain parameters may have to be set, depending on specific requirements. To do this the controller must be set to supervisor level (Level 2).




Set Point Ramp Rate



To control the rate at which the temperature rises to setpoint, the SP.RATE function is used.

Before setting the ramp rate, it is advisable to set the setpoint to a low value, preferably 0°C. Once the ramp rate has been set the required setpoint can be entered from the home menu. Doing so will activate the ramp rate, which can be identified with the run indicator showing on the bottom of the display. While the ramp rate is active the working setpoint will be shown on the lower temperature display (This is the setpoint controlled by the ramp rate).

When the process temperature has reached the setpoint value at the given ramp rate, the run indicator will turn off and the instrument will control at the required Setpoint temperature. Any further modifications to set point will cause the ramp rate to be activated and the instrument to control as described above.




NOTE: Ensure timer configuration is set to 'none' (Section 0) to use the setpoint ramp rate feature without any timer functions.

Press scroll  until the display shows SP.Rate <setpoint rate limit>. Using Up  and Down  select the ramp rate required, in °C/Min.

To check the Setpoint during ramping press the Up  and Down  once.

To cancel the ramp rate, the SP.Rate <setpoint rate limit> must be set to OFF.

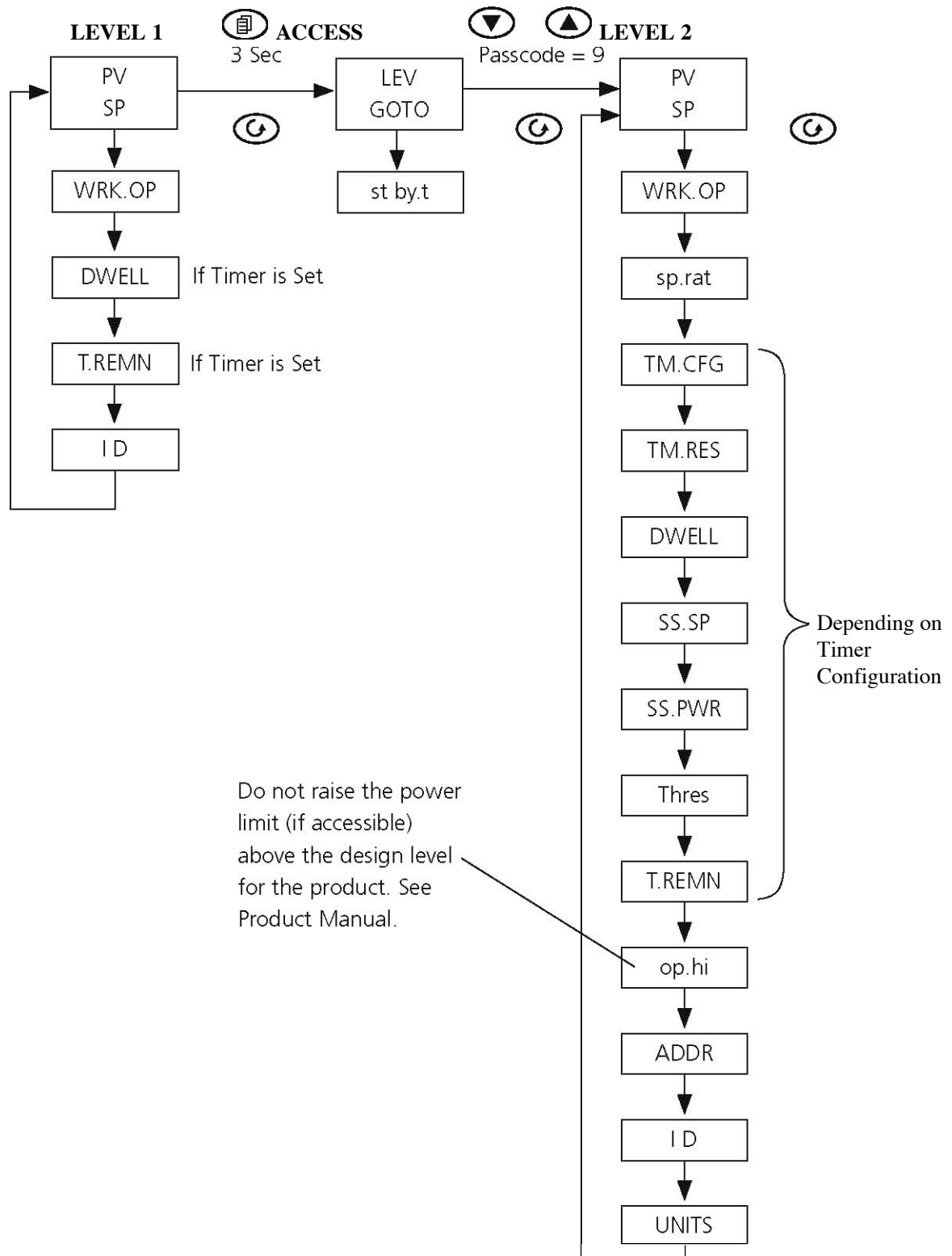
Units

Press scroll  select the required unit display shows units <Display Units>. Using the Up  and Down 

| Mnemonic | Description |
|---------------|-----------------------|
| NonE | No units (Default °C) |
| °C Celsius | |
| °F Fahrenheit | |
| °K Kelvin | |
| PErc % | |

Navigation Diagram

3216CC



Controller Fault Code

Diagnostic Table

| Error Code | Explanation | Actions |
|------------|----------------------------|--------------------------------|
| S.br | Temperature sensor failure | Replace the Temperature Sensor |

Glossary of Terms

| | | |
|----------------------------|--|--------|
| Process Value (PV) | The actual temperature of the OMEGA CL1201. | °C |
| Setpoint (SP) | The target temperature the OMEGA CL1201 is trying to reach. | °C |
| SP Ramp Rate | The speed at which the furnace or oven is allowed to heat up or cool down. | °C/Min |
| Control Setpoint | The temperature that can be directly set into the controller using the Up and Down keys | |
| Element | The heating device used in the unit. | |
| Thermocouple | The temperature-measuring device used in the unit | |
| PID | Proportional Integral Derivative: the control system used by the controller. | |
| Overtemperature (O/T) | The condition which a furnace or oven may enter if part of the main control circuit fails. | |
| Overtemperature Protection | A system to prevent the product or process being damaged if it has gone into an overtemperature condition. | |
| Ramp/Dwell Pairs | A Program is split up into segments, each segment. Contains a RAMP and a dwell. | |
| Program | A sequence of stored Parameters set by the operator, which will run automatically when started. | |
| Latched Alarm | Will hold the alarm condition once it has been detected. | |
| Non-Latching Alarm | Will reset itself when the alarm condition is removed. | |
| Power Cycling | The Power to the controller is turned off and then back on. | |

RUNNING THE CL1201 FROM A PC

The OMEGA CL1201 can be run from a PC using software included. This software is also available free of charge to download from the OMEGA web site at www.omega.com, then click on the FTP software button.

Connecting the unit to the computer using an RS-232 cable

When connecting the CL1201 to a PC for the first time using the RS-232 connection software includes a help file giving full instructions for use with the CL1201.

If the RS232 option is supplied, then the CL1201 is fitted with 9 way D-socket connected to the controller communications (comms) module. The CL1201 is suitable for direct connection to a personal computer, using a “straight through” cable as follows (the linked pins at the computer end are recommended but may not be necessary). The cable is usually 9-pin at the furnace end and 9-pin at the computer, but other alternatives are shown in parentheses.

| OMEGA CL1201 end of cable female 9-pin (25-pin) | RS232 Cable: Tecal 1200S to PC | Computer end of cable 9-pin (25-pin) male |
|---|---------------------------------------|--|
| Rx 3 (2) | _____ | 3 (2) Tx |
| Tx 2 (3) | _____ | 2 (3) Rx |
| Com 5 (7) | _____ | 5 (7) Com |
| | | 7, 8 (4, 5) Link together |
| | | 1, 4, 6 (6, 8, 20) Link together |

Comms Address

Typically the comms address is set to 1, but this can be changed.

To change the address value access the level 2 list. In level 2 press the scroll key  until the ADDR (ADDRESS) parameter is displayed. Use the Up  Down  to select the address value.

AFTER USE

When you have finished heating samples, remember that parts of the unit, inserts and associated accessories may be very hot. Take the precautions listed earlier. We recommend that the inserts should be allowed to cool to 100°C before being removed from the OMEGA CL1201 unit. They will still have to be handled with care.

INSERT BLOCK REMOVAL

If you need to remove an insert while it is hot, first remove the ceramic top insulator, then use the allen key supplied to loosen the insert block and then screw the extractor tool into the threaded hole and lift the insert out carefully.

Never leave the extractor tool in the insert while it is being used in the CL1201 unit.

The ceramic top insulator must be in place when operating the unit.

Brief fault finding notes and lists of replacement parts, accessories and inserts for the CL1201 are given in this section. NOTE THAT THIS EQUIPMENT SHOULD ONLY BE DISMANTLED BY PROPERLY TRAINED PERSONNEL.

REMOVING THE OUTER COVERS EXPOSES POTENTIALLY LETHAL MAINS VOLTAGES.
THERE ARE NO OPERATOR SERVICEABLE PARTS WITHIN THE EQUIPMENT.

GENERAL ADVICE/TROUBLESHOOTING

Cleaning your Omega unit

Before cleaning your unit, disconnect from the power supply and allow to cool to ambient temperature.

You can clean the case of the CL1201 with a cloth dipped in water or ethanol (methanol can also be used). No part of the case or cover should be immersed in the solvents.

Do not use acetone or abrasive cleaners.

Fuses

The OMEGA CL1201 should be connected to an HRC Fused and Isolated supply rated at 10A for 230v or 16A for 120v.

If neither the power light nor display (on the front panel) is lit check that there is no external cause (such as a faulty plug or lead).

Should the fuses blow persistently, a serious fault is indicated and you should return the calibrator to your supplier for repair.

Never fit a fuse rated higher than the value indicated on the unit, serious damage or personal injury may result.

Insulation testing

This equipment is fitted with RFI suppression circuitry. Any check of the electrical insulation by means of high voltage dielectric testing (for example as in BS EN 61010-1) must be carried out using only a DC voltage.

This unit contains semiconductor components which may be damaged by electric field effects.

Safety Warning – Disconnection from Supply



Always ensure that the furnace is disconnected from the supply before repair work is carried out.

Safety Warning - Refractory Fibrous Insulation



This unit contains refractory fibers in its thermal insulation. These materials may be in the form of fibre blanket or felt, vacuum formed board or shapes, mineral wool slab or loose fill fibre.

Normal use of the furnace does not result in any significant level of airborne dust from these materials, but much higher levels may be encountered during maintenance or repair.

Whilst there is no evidence of any long term health hazards, we strongly recommend that safety precautions are taken whenever the materials are handled.

Exposure to dust from fiber which has been used at high temperatures may cause respiratory disease. When handling fiber always use an approved mask, eye protection, gloves and long sleeved clothing.

Avoid breaking up waste material. Dispose of waste fiber in sealed containers. After handling rinse exposed skin with water before washing gently with soap (not detergent). Wash work clothing separately.

Before commencing any major repairs we recommend reference to the European Ceramic Fibre Industry Association Bulletin No. 11 and the UK Health and Safety Executive Guidance Note EH46. We can provide further information on request.

INSERT BLOCKS Ø34 x 155mm long - Immersion Depth 80 mm Inserts are made from a specialist alloy and alternatives bores may be ordered separately from the calibrator. Each insert is stamped for identification.

Insert Block

| NUMBER | PROBE DIAMETER |
|------------|---|
| CL1200IB-A | Insert Block probe 4x Ø8.0mm (Standard insert) Included with the unit |
| CL1200IB-B | Insert Block probe 2xØ3mm, 2 x Ø4mm,2 x Ø6mm |
| CL1200IB-C | Insert Block probe Ø1/8", Ø1/4", Ø3/16", Ø5/16", Ø3/8" |
| CL1200IB-D | Insert Block probe 2xØ3/16", 2xØ1/4", 2xØ3/8" |
| CL1200IB-E | Insert Block probe 6x Ø1/4" |

Ceramic Top Insulator

| NUMBER | PROBE DIAMETER |
|------------|---|
| CL1200CB-A | Insulator A for block 4 x Ø8.0mm (Standard insert) Included with the unit |
| CL1200CB-B | Insulator B for block 2 x Ø3mm, 2 x Ø4mm,2 x Ø6mm |
| CL1200CB-C | Insulator C for block Ø1/8", Ø1/4", Ø3/16", Ø5/16", Ø3/8" |
| CL1200CB-D | Insulator D for block 2 x Ø3/16", 2 x Ø1/4", 2 x Ø3/8" |
| CL1200CB-E | Insulator E for block 6 x Ø1/4" |

NOTES:

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **37 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **three (3) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, 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 having been 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 in which wear is not warranted, include but are 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, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are 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 have the following information available BEFORE contacting OMEGA:

1. Purchase Order 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. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the 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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