BLACKBODY SOURCE
MODEL 989

User Maintenance Manual/Handbook

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GUARANTEE

This instrument has been manufactured to exacting standards and is guaranteed for twelve months against electrical break-down or mechanical failure caused through defective material or workmanship, provided the failure is not the result of misuse.

In the event of failure covered by this guarantee, the instrument must be returned, carriage paid, to the supplier for examination and will be replaced or repaired at our option.

FRAGILE CERAMIC AND/OR GLASS PARTS ARE NOT COVERED BY THIS GUARANTEE INTERFERENCE WITH OR FAILURE TO PROPERLY MAINTAIN THIS INSTRUMENT MAY INVALIDATE THIS GUARANTEE

The company is always willing to give technical advice and assistance where appropriate. Equally, because of the programme of continual development and improvement we reserve the right to amend or alter characteristics and design without prior notice. This publication is for information only.

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CE EMC Information

This product meets the requirements of the European Directive on Electromagnetic Compatibility (EMC) 89/336/EEC as amended by EC Directive 92/31/EEC and the European Low Voltage Directive 73/25/EEC, amended by 93/68/EEC. To ensure emission compliance please ensure that any serial communications connecting leads are fully screened.

The product meets the susceptibility requirements of EN 50082-1, criterion B.

Symbol Identification	Publication	Description
	ISO3864	Caution (refer to manual)
	IEC 417	Caution, Hot Surface

⚠ Safety Warnings

Environmental Conditions

- Operating temperature: 5-40°C (41-122°F)
- Relative Humidity: 5-80% - Non-condensing

Do Not Modify or Disassemble

- Do not use the apparatus for jobs other than those for which it was designed, i.e. the calibration of thermometers
- There are no user serviceable parts inside. Do not dismantle or modify the apparatus. For repair information contact Isothermal Technology Ltd
- For equipment with fans, the fan should be kept free from dust build up; a soft brush or vacuum cleaner may be used on the external grill

Beware of Electrical Considerations

- The equipment is for installation category II (transient voltages) and pollution degree II in accordance with IEC 664 at altitudes to 2000 metres

Be Careful Where It Is Used

- The equipment is not for use in hazardous areas or in an environment close to flammable materials or gases
- The equipment must be used with adequate space around it for air flow and avoid blocking ventilation slots
- Ensure free space above the unit to avoid risk of burn or fire
- The equipment should only be used indoors
- Site in a way that allows access to the power switch, and to allow the cable to be disconnected
- Avoid excessive heat, humidity, dust and vibration ensuring it will not be subjected to dripping or splashing liquids

Consider the Environment

The equipment should be recycled or disposed of in a proper way; following the Waste Electrical and Electronic Equipment (WEEE) directive

Unpacking and Initial Inspection

Our Packing Department uses custom designed packaging to send out your unit, but as accidents can still happen in transit, you are advised, after unpacking the unit to inspect it for any sign of shipping damage. Confirm that your delivery is in accordance with the packing note. If you find any damage or that part of the delivery is missing notify us or our agent, and the carrier immediately. Keep the packing, if damaged, for possible inspection by an insurance assessor.

Electricity Supply

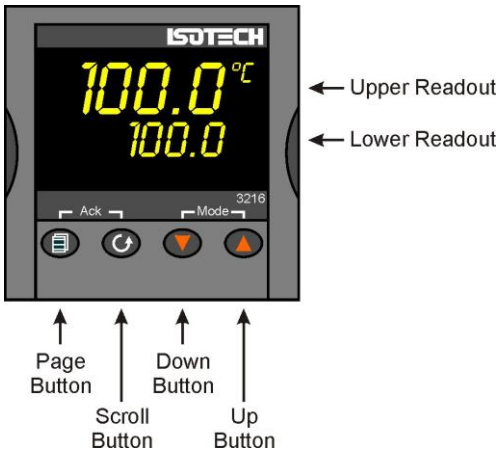
The power supply operates from any standard AC electrical supply (90-264V RMS at 47-63Hz), so unless your supply is unusual you can simply connect the power supply to a suitable electrical outlet. Plug the DC connector from the power supply into the “DC Power” socket on the rear of the unit. Use the on/off switch on the side panel to turn on the device on and off.

Specification

Model	989
Temperature Range	20°C to 50°C
Resolution	± 0.01°C
Target Size	70mm Diameter
(Using Extension Tube)	54mm Diameter
Combined Accuracy / Stability	±0.2°C (0.3°F)
PC Interface	Included, optional cable
Units	°C, °F, K
Block Stability	<±0.01°C
Power	60 Watts
Voltage	12 Vdc (universal supply included)
Dimensions	200mm x 135mm x 170mm
Weight	4kg

Operating the Controller

Front Panel Layout



The Temperature Controller

The controller has a dual display, the upper display indicates the nominal block temperature, and the lower display indicates the desired temperature or setpoint.

Altering The Setpoint

To change the setpoint of the controller simply use the UP and DOWN keys to raise and lower the setpoint to the required value. The lower display changes to indicate the new setpoint.

Advanced Controller Features

Setpoint Ramp Rate

By default, the Model 989 is configured to heat and cool as quickly as possible. There may be some calibration applications where it is advantageous to limit the heating or cooling rate.

The source can have its heating rate limited with the Setpoint Ramp Rate feature. This feature is accessed from the Scroll key. Depress the key until the display shows,

SP.RAT

The upper display will show the current value, and is adjustable from OFF to 999.9. The units are °C/min and are adjustable via the UP/DOWN keys.

When the SP.RAT is active the lower setpoint display will now automatically update with the current value, known as the working setpoint. The setpoint can be seen by pressing either the UP and DOWN key.

The Setpoint ramp rate operates when the bath is heating and cooling.

Instrument Address

The controller has a configurable "address" which is used for PC communications. Each instrument has an address; this allows several instruments to be connected in parallel on the same communications bus. The default value is 1. This address would only need to be changed if more than one Dry Block is connected to the same PC port.

To check the Address value, press the scroll key until the lower display indicates,

ADDR

The upper display will show the current value that can be modified with the UP and DOWN keys.

Monitoring The Controller Status

A row of beacons indicates the controller status as follows,

OP1	Heat Output
OP2	Cool Output (only for models which operate below 0°C)
REM	This beacon indicates activity on the PC interface
ALM	This indicated the setpoint is locked

For models fitted with cooling, the lower display will alternate between the setpoint and the message, cooling to temperature. It will automatically switch off when the temperature is within 5°C of the setpoint.

Units

Momentary pressing of the Scroll key will show the controller units °C or °F.

Setpoint Lock

The controller has a setpoint lock system to prevent the accidental tampering with setpoint. When enabled it will disable the UP/DOWN buttons when on the home page.

To enable the setpoint lock press the SCROLL button until L-R is displayed (default setting is NO). Use the UP/DOWN buttons and change to YES. The setpoint is now locked and can be confirmed by the flashing red ALM beacon. To disable is a reversal of the above and confirmed by the extinguishing of the red ALM beacon.

Mounting

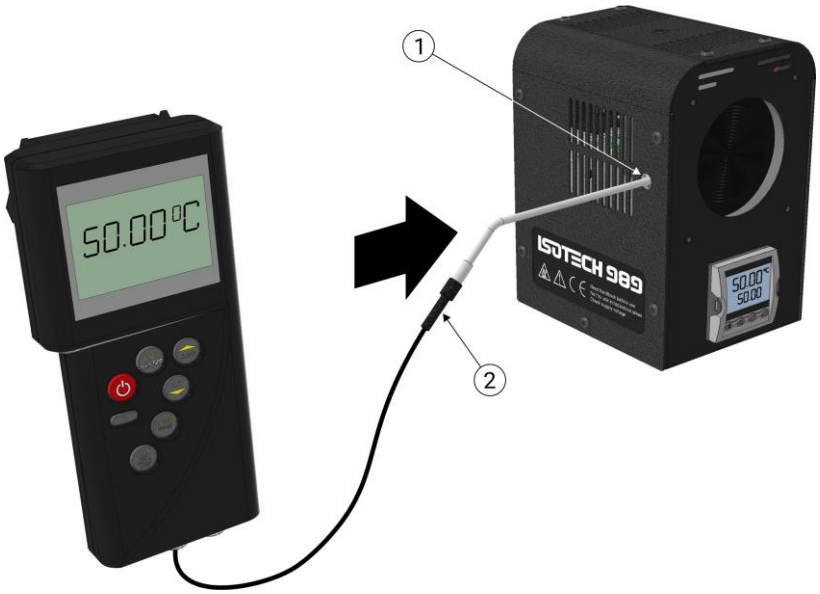
Model 989 can be mounted on a tripod or suspended from a bracket. There are two easy mount points with 1/4"-20 UNC thread to accept commonly used tripods and mounting brackets.

Using the External Thermometer Reference Pocket

The unit has a reference thermometer pocket that is located in the blackbody block just below the surface.

If desired a calibrated platinum resistance thermometer can be added for traceability.

The reference thermometer pocket also allows for easy checking and recalibration of the model 989 Blackbody.



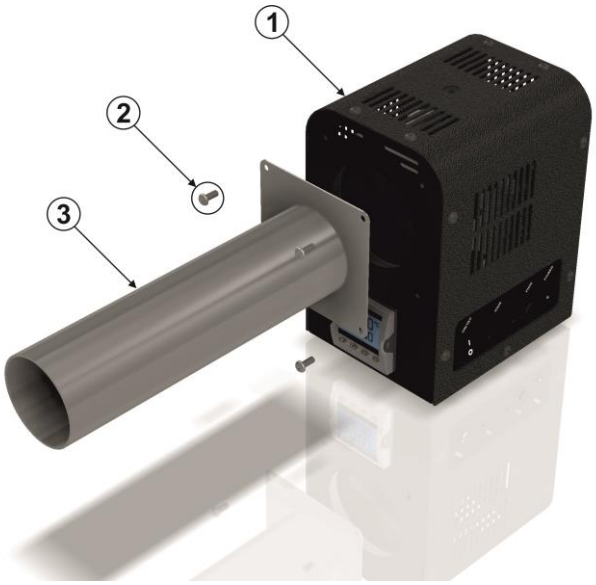
1. Remove the dust cover over the thermometer reference hole ①
2. Locate the pocket in the side of the plate.
3. Insert the thermometer ② until it reaches the bottom of the pocket (≈58mm)
4. On completion of the calibration remove the thermometer and replace the dust cover

How to install the Optical Extension Tube Accessory

① Model 989

② M4 screws (x4)

③ Extension tube



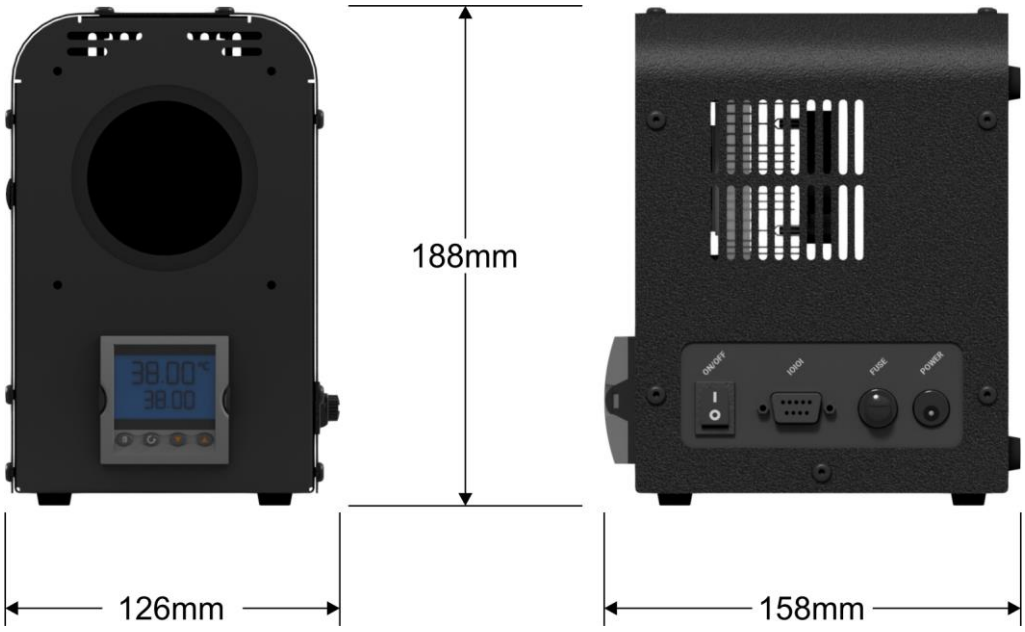
To install the extension tube, follow the procedure below:

A. Remove four screws ② from the front panel of the model 989 ① using the hex key supplied.

B. Align the extension tube ③ mounting holes to the holes on the model 989.

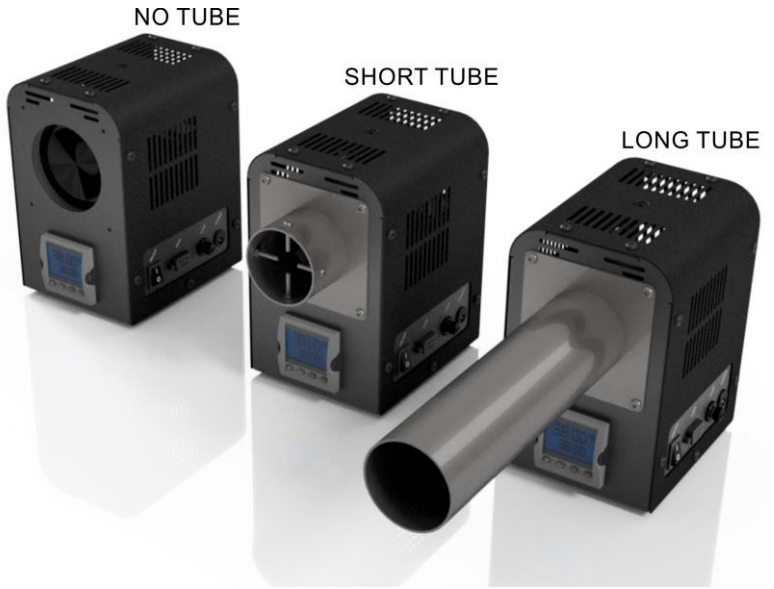
C. Replace the screws using the hex key supplied. **Caution:** Do not over-tighten screws

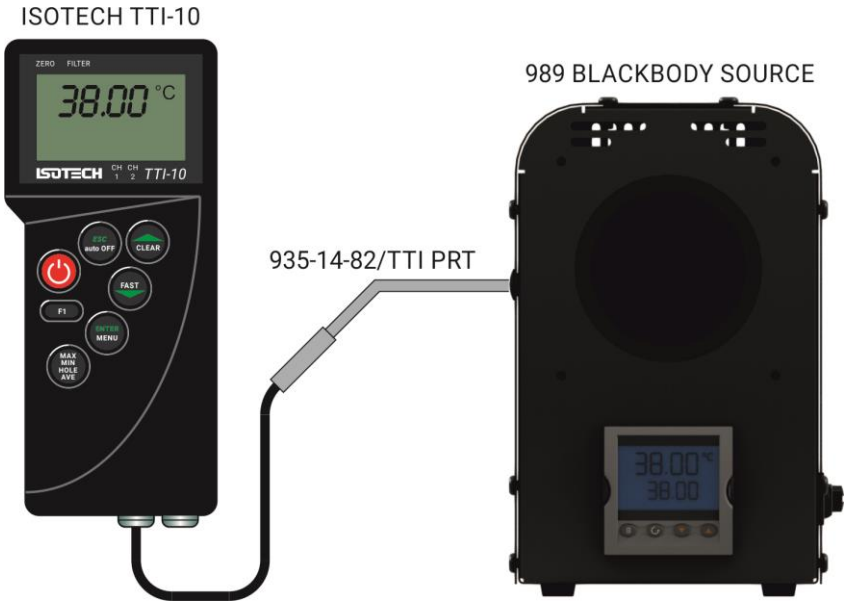
Dimensions



Accessories

935-16-112	RS422 to RS232 Converter Lead
935-14-82/BW	Semi Standard PRT – Temperature Range -50°C to 250°C
989/01 Calibration Kit	Comprising of TTI-10 Handheld Thermometer, 935-14-82/TTI Semi Standard PRT – Temperature Range -50°C to 250°C and 3 Point UKAS System Calibration, uncertainty 0.02°C (20mK)
988-02-06 Short Tube	40mm
988-02-03 Long Tube	210mm





Using the PC Interface

The Model 989 includes an RS422 PC interface, the pin connections are

RS422 Connections

Pin	Connection
4	Tx+ A
5	Tx- B
8	Rx+ A
9	Rx- B
1	Common

Converter Cable

There is an optional RS422 to RS232 converter cable from Isotech, part number 935-16-112

Note: The RS 422 standard specifies a maximum lead length of 1200M (4000ft). A true RS422 port will be required to realise such lead lengths. The Isotech conversion leads are suitable for maximum combined lead lengths of 10M that is adequate for most applications.

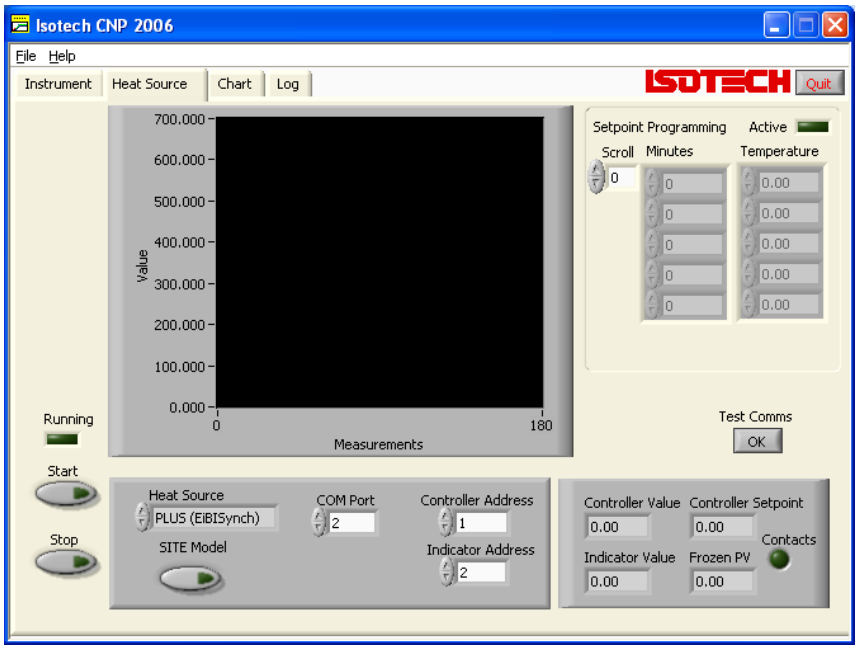
Protocol

The instruments use the "Modbus Protocol"

If required, e.g. for writing custom software the technical details are available from our Document Library at www.isotech.co.uk

CAL Notepad

Cal Notepad can be used can be used to log and display values from the unit and an optional temperature indicator such as the milliK or TTI-10. The software requires Windows a minimum of 5Mb of free hard drive space and free serial ports (or an RS232 to USB Converter) for the instruments to be connected.



Development

Cal Notepad was developed by Isothermal Technology using LabVIEW from National Instruments. The license details are shown on the download page and in the Cal Notepad manual.

Software Download – Cal Notepad can be downloaded at https://www.isotech.co.uk/downloads

Diagnostic Alarms

Diagnostic alarms indicate a possible fault within the controller or connected devices.

Display shows	What it means	What to do about it
E.Conf	A change made to a parameter takes a finite time to be entered. If the power to the controller is turned off before the change has been entered then this alarm will occur. Do not turn the power off to the controller while ConF is flashing	Enter configuration mode then return to the required operating mode. It may be necessary to re-enter the parameter change since it will not have been entered in the previous configuration.
E.CaL	Calibration error	Re-instate Factory calibration, refer to Isotech
E2.Er	EEPROM error	Return to Isotech for repair
EE.Er	Non-vol memory error	Note the error and contact Isotech.
E.Lin	Invalid input type. This refers to custom linearisation which may not have been applied correctly or may have been corrupted.	Go to the INPUT list in configuration level and set a valid thermocouple or input type
Emod	IO1, OP2, or OP3 has been changed	If this has been field changed by the installation of a new board, enter config level, then exit back to operator level. If the message occurs at any other time return to factory for repair.

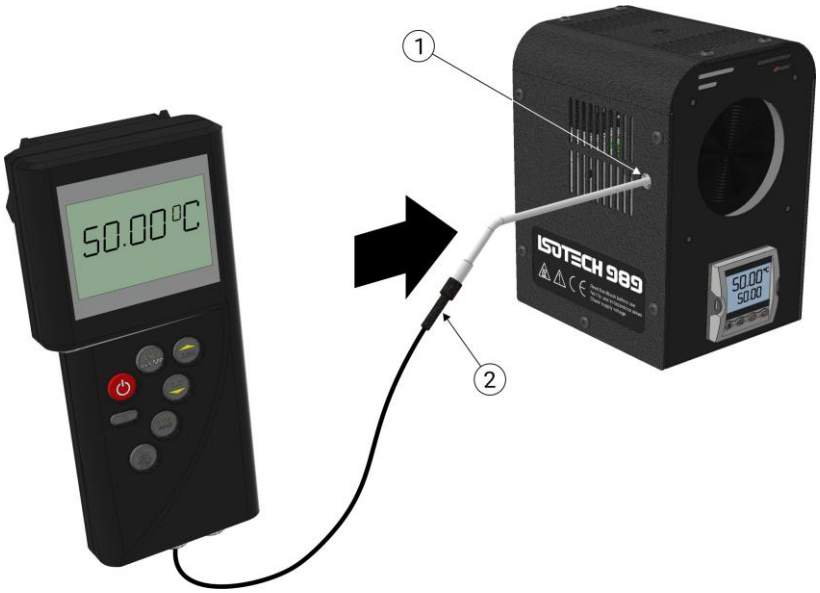
Additional Information;

1. If the input is too high HHHHH will be displayed.
2. If the input is too low LLLLL will be displayed.

Calibration Procedure

The model 989 can be recalibrated at Isotech or an authorised partner. It is also possible to recalibrate in the field. Isotech can provide a calibration kit for suitably experienced calibration engineers.

Fitting the Thermometer for Calibration



1. Remove the dust cover over the thermometer reference hole ①
2. Locate the pocket in the side of the plate.
3. Insert the thermometer ② until it reaches the bottom of the pocket (≈58mm)
4. On completion of the calibration remove the thermometer and replace the dust cover

Procedure to calibrate a controller by entering the measured temperature into the instrument. The instrument then computes the Point and Offset values from the entered temperature.

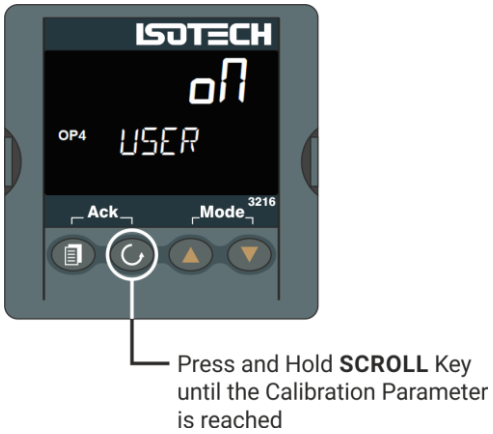
Caution: This procedure will change the controller calibration and is non reversible.

Set the plate to the required calibration temperature and measure the temperature of the block with a suitably calibrated thermometer.

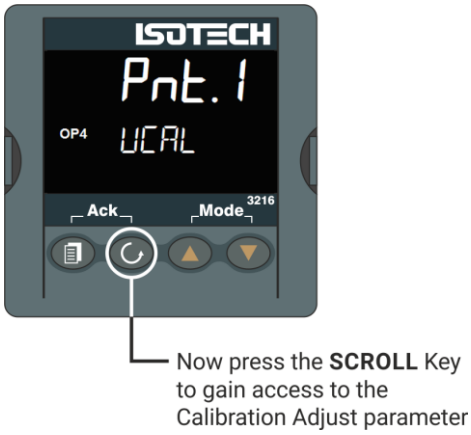
The Display will then Change to Level 2, and then prompt for the Pass Code

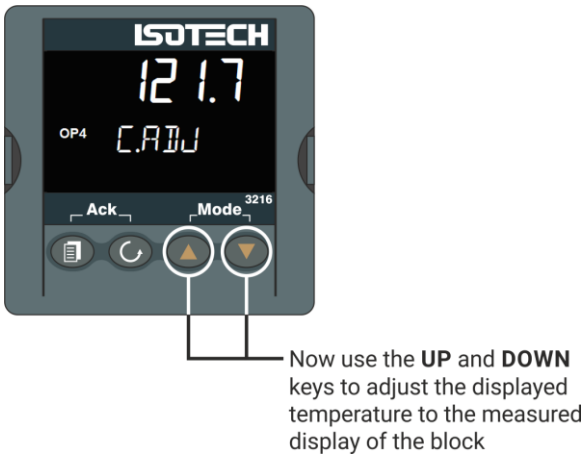
Enter the Pass Code
The controller Pass Code is 2

The instrument will now return to normal operating mode but there are now extra parameters available, reached by pressing the **SCROLL** Key



To Adjust the First Point press the **UP** key to select Point 1





The plate can now be set to the next calibration point.

There is a maximum of five points that the plate can be adjusted at.

By default Isotech calibration the 989 at:
Pnt 1 20 °C
Pnt 2 38 °C
Pnt 3 50 °C
Pnt 4 & Pnt 5 are left untouched

Important Notes:

1. The Calibration Points Must be set in ascending temperature order
   e.g. 20 °C, 38 °C, 50 °C is good
   38 °C, 20 °C, 50 °C is bad

2. At the end of the calibration set the Point parameter to a value of “On”

3. Setting the Point Parameter to a value of Reset will clear out all the calibration data!

Take care not to select this unless you really want to clear the calibration!

(Order = rSet, Off, On, Pnt 1, Pnt 2, Pnt 3, Pnt 4, Pnt 5)