

## Thermal Engineering Solutions

### CALSYS 650

Dry Block Temperature Calibrator

## USER MANUAL



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## Preface

Thank you for purchasing High Quality and Efficient CALsys 650.

Please familiarize yourself with the information contained in the safety precautions sections before using this product.

This user manual contains information about the product and its proper use and should be kept in a place where it will be easy to access.

## Safety Information

This chapter contains important information for the safety. The not observance of these instructions may result in serious personal injury or can cause serious damage to the unit and to the components system included. Use the instrument only as specified in this manual. Otherwise, the protection provided by the instrument may be impaired. Refer to the safety information below and throughout the manual.

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.

**Table 1. Symbols**

Symbol	Description	Symbol	Description
	Risk of Danger. Important Information		Hazardous Voltage. Risk of Electric Shock
	Caution. Hot Surface		Protective Earth Ground

## Electrical Safety

To avoid possible electric shock or personal injury, follow these guidelines.

- This equipment must be correctly earthed 
- A protective earth is used to ensure the conductive parts cannot become live in the event of a failure of the insulation.
- The protective conductor of the flexible mains cable which is colored green/yellow MUST be connected to a suitable earth.
- **Warning:** Internal mains voltage hazard. Do not remove the panels .
- Before connecting to the electricity supply, please familiarize yourself with the parts of the calibrator with the help of operating manual .
- Always replace the fuse with one of the same rating, voltage and type.
- Use only the mains power cord and connect or approved

for the voltage and plug Configuration in your country and rated for the Product.

- Replace the mains power cord if the insulation is damaged or if the insulation shows signs of wear.
- Connect one end of the supplied ground wire to the protective earth ground terminal on the rear panel and the other end to an earth ground.
- Make sure the ground conductor in the mains power cord is connected to a protective earth ground. Disruption of the protective earth could put voltage on the chassis that could cause death.
- Do not put the Product where access to the mains power cord is blocked.
- Do not use an extension cord or adapter plug.
- Do not use the Product if it operates incorrectly.
- Make sure the power cord does not touch with hot parts of the Product.

## Health And Safety Instructions

- Wear appropriate protective clothing.
- Operators of this equipment should be adequately trained in the handling of hot and cold items and liquids.
- Do not use the apparatus for jobs other than those for which it was designed, i.e. the calibration of thermometers.
- Do not handle the apparatus when it is hot (or cold), unless wearing the appropriate protective clothing and having the necessary training.
- Do not drill, modify or otherwise change the shape of the apparatus.
- Do not use the apparatus outside its recommended temperature range.
- If cased, do not return the apparatus to its carrying case until the unit has cooled.
- There are no user serviceable parts inside. Contact Tempsens agent for repair.
- Ensure materials, especially flammable materials are kept away from hot parts of the apparatus, to prevent fire risk.
- Do not use the Product around explosive gas, vapor, or in damp or wet environments.
- Make sure that the space around the Product meets minimum requirements.
- Do not keep the Product in operation and unattended at high temperatures.
- Do not set anything on top of the Product. Very high temperatures can cause the ignition of flammable materials.
- BURN HAZARD - DO NOT touch the well access surface of the unit.
- DO NOT turn off the unit at temperatures higher than 100°C. This could create a hazardous situation. Select a set-point less than 100°C and allow the unit to cool before turning it off.
- Materials used in this furnace may be irritating to skin, eyes, and respiratory tract. Consult the material manufacturer's MSDS (Material Safety Data Sheet).
- HIGH VOLTAGE is used in the operation of this equipment. SEVERE INJURY OR DEATH may result if personnel fail to observe safety precautions.
- The top sheet metal of the furnace may exhibit extreme temperatures for areas close to the well access.

## Cautions

- DO NOT connect this unit to a non-grounded, non-polarized outlet.
- Before working inside the equipment, turn the power off and disconnect the power cord.
- Always replace the fuse with one of the same rating, voltage, and type.
- Overhead clearance is required. DO NOT place this instrument under a cabinet or other structure.
- DO NOT turn the unit upside down with the inserts in place; the inserts will fall out of the unit.
- Use of this instrument at HIGH TEMPERATURES for extended periods of time requires caution.
- Completely unattended high temperature operation is not recommended for safety reasons.
- DO NOT plug the unit into 230 V if the heater switches and fuse holder read 115 V. This action will cause the fuses to blow and may damage the instrument.
- Components and heater lifetime can be shortened by continuous high temperature operation.
- DO NOT use fluids to clean out the well.
- Never introduce foreign material into the probe hole of the insert. Fluids, etc. can leak into the calibrator causing damage.
- DO NOT change the values of the calibration constants from the factory set values. The correct setting of these parameters is important to the safety and proper operation of the calibrator.
- DO NOT drop or force the probe stems into the well. This type of action can cause a shock to the sensor and affect the calibration.

# Chapter - 1

## Introduction

The 'CALsys 650' has been designed to provide stable and accurate temperature to enable professionals to calibrate Temperature Sensing Devices by comparison method. The 'CALsys 650' model has been designed to be rugged and easily maintained. This model provides an isothermal enclosure (Metal block) in which the thermocouple/RTD can be calibrated against the temperature of the calibrator. For traceable calibration a master calibration sensor should be placed into the metal block alongside the unit under calibration. The method is widely accepted because the calibrator provides very stable temperature nearing to its controlled point, the Master Thermocouple / RTD, which is calibrated by independent Laboratory traceable to National standards, compares the sensor under calibration.

The 'CALsys' models are part of wide range of portable calibrators designed and made by us.

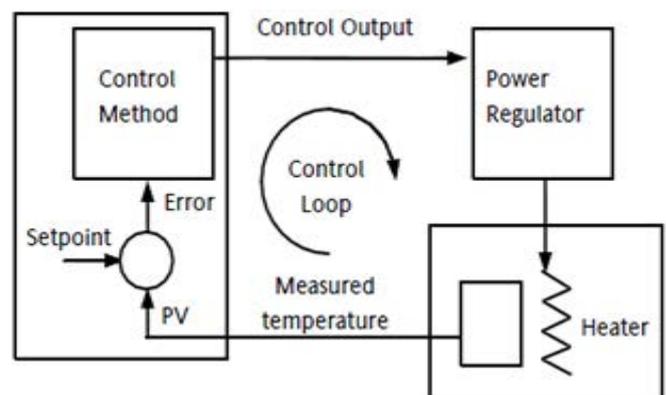
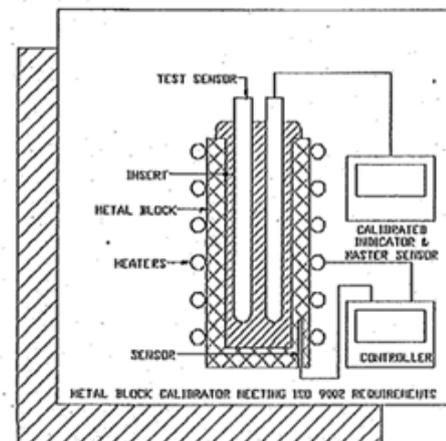
Please contact us in case you required more information about our other products.

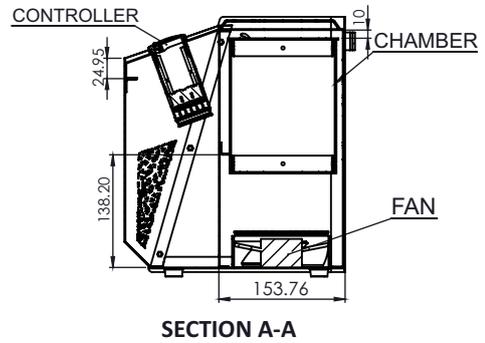
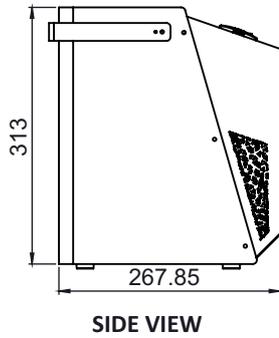
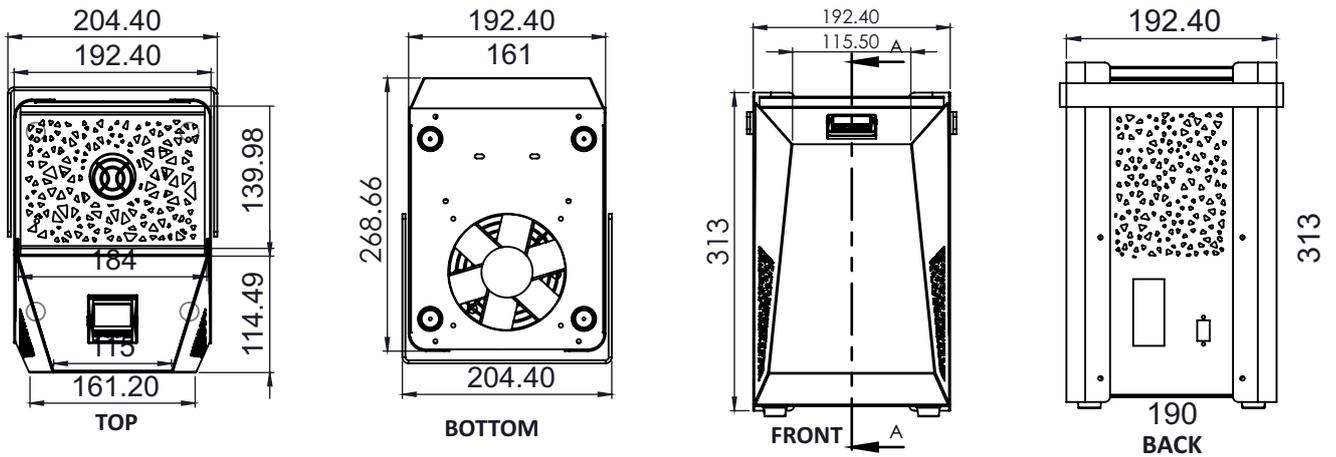


### 1.1 Basic Working of CALsys 650

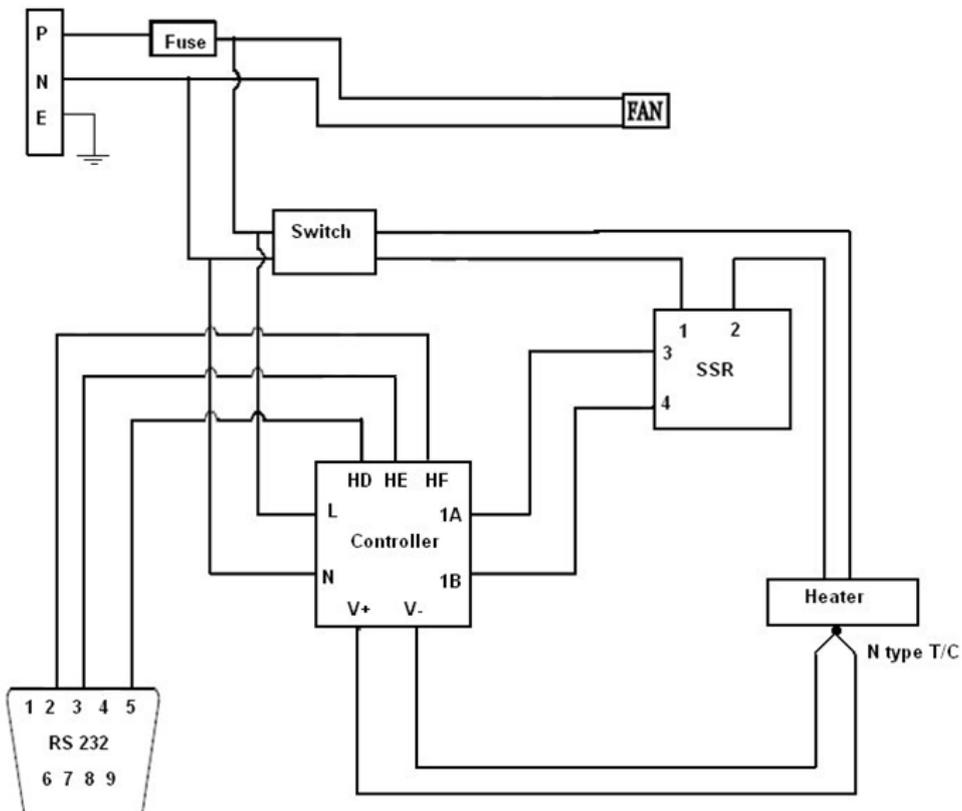
The purpose of the CALsys 650 is to provide an isothermal enclosure for calibration purpose. The heater block houses a heater and a control sensor used by the temperature controller to sense the block temperature. To obtain and maintain a required temperature the controller varies the power to the heater via solid state relay. There is one electricity driven fan in the unit. It runs continuously and situated under the heater chamber for cooling the heater, it runs when PV exceeds the set value.

The calibrator controller uses a precision N type thermocouple as a controlling sensor and controls the well temperature with MI heater. To obtain and maintain a required temperature the controller varies the power to the heater via solid-state relay. There is one electricity driven fan which is situated under the heating chamber for cooling the heater. The CALsys 650 dry block calibrator was designed for portability, moderate cost and ease of operation. With proper use the instrument should provide continued accurate calibration of temperature sensors and devices. The user should be familiar with the safety guidelines and operating procedures of the calibrator as described in the User's Manual.





### 1.3 Wiring Diagram



# Chapter - 2

## Technical Specification

Temperature Range	50°C to 650°C
Accuracy	±1.0°C
Stability	± 0.025°C at 50°C ± 0.035°C at 350°C ± 0.07°C at 650°C
Resolution	0.1°C
Uniformity	± 0.04°C at 50°C ± 0.07°C at 350°C ± 0.09°C at 650°C
Time to Reach Max. Temperature	25 minutes
Operating Temperature	20 to 45°C
Method of Controlling	Digital self-tuned PID controller
Controlling Sensor	T/C “N” Type
Heaters	MI Heaters
Voltage	230 V AC±10
Supply Frequency	50/60 Hz
Power	1.0 KW
Computer Interface	RS-232
Dimensions	325(H) x 185(W) x 265(D) mm
Insert Construction	Diameter 32x150 mm Long with 4 Holes of 6.5 x 120 mm insert depth
Weight	Approximate 9 Kg

# Chapter - 3

## Installation

Place the black body on a flat surface with at least 10 inches of free space around the instrument. Overhead clearance is required. DO NOT Place this unit under a cabinet or structure. Plug the power cord into a grounded mains outlet located on the controlling unit rear panel. Observe that the nominal voltage corresponds to that indicated in the technical specifications in the user's guide.

### 3.1 Environmental Conditions

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

The instrument operates safely under the following conditions:

- Temperature range: 5 - 50°C (41 - 122°F)
- Ambient relative humidity: 15 - 50%
- Pressure: 75kPa - 106kPa
- Mains voltage within  $\pm 10\%$  of nominal
- Vibrations in the calibration environment should be minimized
- Altitude less than 2000 meters

# Chapter - 4

## Unpacking

Our packing department uses custom designed packaging to send out your unit. You are advised, after unpacking the unit, to inspect it for any sign of damage, and confirm that your delivery is in accordance with the packing note. Unpack the Furnace carefully and inspect. If you find any damage or any item is missing notify us or our agent.

After unpacking you will find the following accessories

- CALsys 650
- Power Cord
- RS-232 Cable and Software CD
- Manual
- Certificates
- Ceramic Wool
- Brass Block (Insert)



### 4.1 Initial Inspection

1. Please open the carrying case carefully and takeout the operating manual from the box and read carefully.
2. Take out the Bath carefully and keep it at suitable place.
3. Connect the power plug to the rear power entry and connect the power plug to the mains.
4. As soon as the power in ON you shall observe display on the controller. It shows that the bath is ready for use.

#### Note

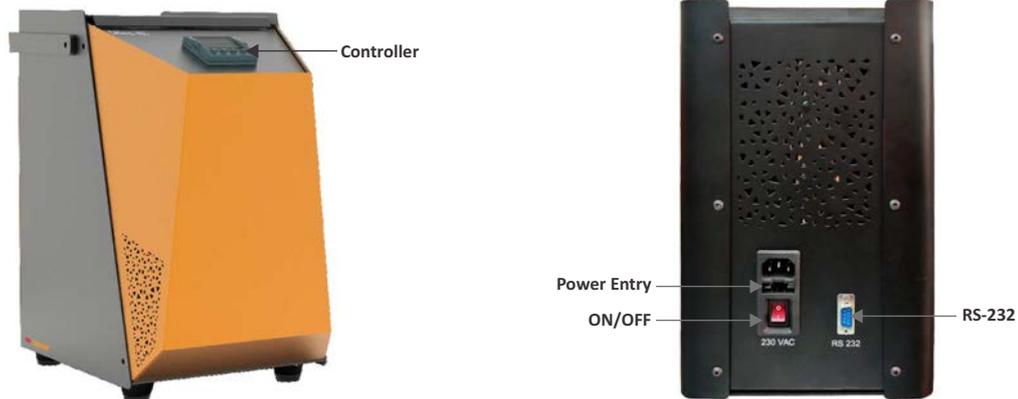
1. Please ensure that your unit is correctly connected to the electricity supply.
2. The apparatus must be correctly earthed (Grounded).
3. The unit's ON/OFF switch is located on the power inlet. Take care NOT to switch the unit OFF when it is hot – allow cooling first.

# Chapter - 5

## Operating Instruction

### 5.1 Power

Plug the calibrator power cord into mains outlet of the proper voltage, frequency and current capability. Typically this will be (230 VAC $\pm$ 10, 50/60 Hz). Turn the controller using the "Mains"(user main power panel) and set the temperature value in the controller. After this, ON the ON/OFF switch which is provided in back side of furnace.



### 5.2 Heating up the source

Press "UP" or "DOWN" key of controller to change the set-point value. When the set-point temperature is changed the controller will switch the calibrator heater on or off to raise or lower the temperature. The displayed temperature will gradually change until it reaches the set-point temperature. The Calibrator may require 15 to 20 minutes to reach the set-point depending on the span. An another 5 to 10 minutes is required to stabilize the bath temperature within  $\pm 0.1^{\circ}\text{C}$  of the set-point.

#### Note

- All other controller parameters are company set and locked. It is recommended not to change them.
- When the source is operated at any temperature above ambient, the front face and plate become hot.
- Always put the fan in "ON" Condition and do not switch the "Mains" off Directly, First set the controller to 0 Deg C and then wait until the unit is not cooled below 100 Deg C.

### 5.3 Operating Instruction

1. Connect the 'CALsys 650' to a suitable power supply.
2. Place the metal insert in the bath.
3. Place the sensors for calibration & master sensor into a suitable insert hole.
4. Put insulation on top of the furnace so that it covers only metal insert (brass block) section. please note at very high temperature we will recommended to use ceramic wool, it will improve stability time.
5. Set the controller to the required Temperature.
6. If test & master sensor is Thermocouple then always use compensating cable (for each type like J, K, T, E, N, R, S, B) for interconnection between sensor and DMM.
7. Keep reference junction at 0 Deg C, if not possible then ADD mili volt (mV) of room (ambient) temperature with sensors output mV to compensate the ambient temperature.
8. When temp of the controller are stable record the reading from DMM with at least 41/2 digit precision which should be calibrated for the measuring range (mV & ohms measurements).
9. Find out the error by comparison method.
10. Reset the controller and / or repeat the calibration for another calibration point or for another sensor.

## Note

1. Metal Insert should be of required hole size so that the hole size is suitable for sensor under calibration.
2. Always use a master sensor (master RTD/TC) for comparison calibration method.
3. Place the metal insert first then all sensors and then set controller at desired set point.
4. Check that all sensors (test & master) are immersed at same depth in insert (metal block).
5. If sensors are not immersed at same depth than there will be an error in temperature reading.
6. Always use a metal block calibrator. Metal block calibrator (insert) heat transfer characteristics should match those of the normal measuring situations.
7. The temperature sensors should be long enough so that immersed a calibration bath, errors due to stem conduction can be ignored.
8. Do not change the set value suddenly until the temperature reaches to existing set value.  
*Ex. : The set value is 100°C and when it reaches at 80°C now you set 150°C, this is improper method / incorrect method.*
9. Plan the calibration point in increasing way then set the controller accordingly. This method will save the time.
10. Take the reading of sensors (master & test) at stable temperature with the help of Digital Multimeter or by using Tempsens make TEMPMET 08 or TEMPMET 09 for reading RTD or TC sensor.

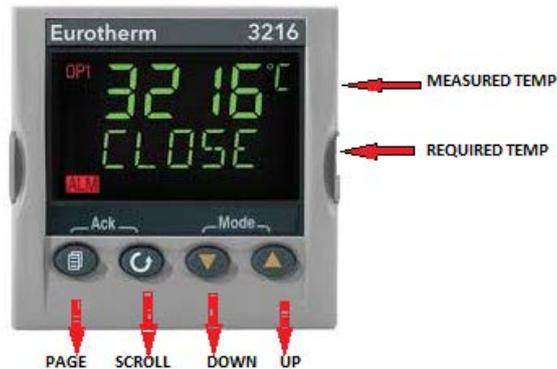
## 5.4 Cooling down the Source

### Risk of Burns

1. Before transport the metal block, ensure that the temperature of bath has cooled sufficiently.
2. If the metal block can be brought quickly from higher temperature to lower temperature set the temperature to the room temperature (ambient temperature).
3. Always cool the heated instrument to ambient temperature before disconnecting it from the mains, switching it OFF / removing the temperature sensor / test item.
4. Always leave a heated instrument supervise / under observation.

# Chapter - 6

## Operation of Controller



### 6.1 The Temperature Controller

The controller has a dual display, the upper display indicates the measured temperature, and the lower display indicates the desired temperature or set point.

### 6.2 Altering the Set point

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

### 6.3 Monitoring the Controller Status

A row of beacons indicate the controllers 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

### 6.4 Units

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

#### **IMPORTANT NOTICE**

*The controller's function settings are preset and will not require adjustment.*

# Chapter - 7

## Digital Communications

RS-232 is a standard communication protocol for linking computer and its peripheral devices to allow serial data exchange. RS-232 communications uses the Modbus protocol. RS-232 communications is not available if Remote Set point is fitted. Cable screen should be grounded at one point only to prevent earth loops.

Digital Communications (or 'comms' for short) allows the controller to communicate with a PC or a networked computer system.

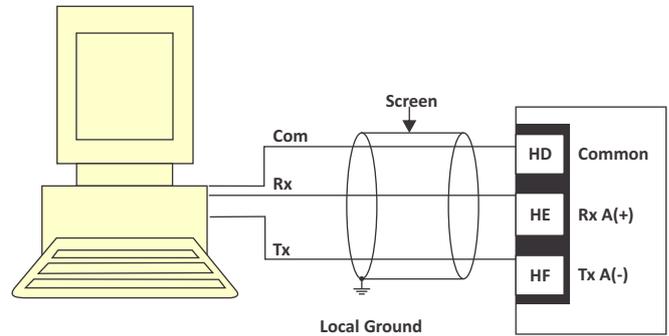
### 7.1 Digital Communications Wiring

To use EIA232 the PC will be equipped with an EIA232 port, usually referred to as COM 1. To construct a cable for EIA232 operation use a three core screened cable. The terminals used for EIA232 digital communications are listed in the table below. Some PC's use a 25 way connector although the 9 way is more common.

Standard Cable	PC Socket Pin No.		PC Function*	Instrument Terminal	Instrument
	9 Way	25 Way			
Colour	9 Way	25 Way			Function
White	2	3	Receive, RX	HF	Transmit, TX
Black	3	2	Transmit, TX	HE	Receive, RX
Red	5	7	Common	HD	Common
Link Together	1 4 6	6 8 11	Rec'd line sig. detect data terminal ready data set ready		
Link Together	7 8	4 5	request to send clear to send		
Screen		1	Ground		

\* These are the functions normally assigned to socket pins. Please check your PC manual to confirm.

### EIA232 Connections



### 7.2 Digital Communications Parameters

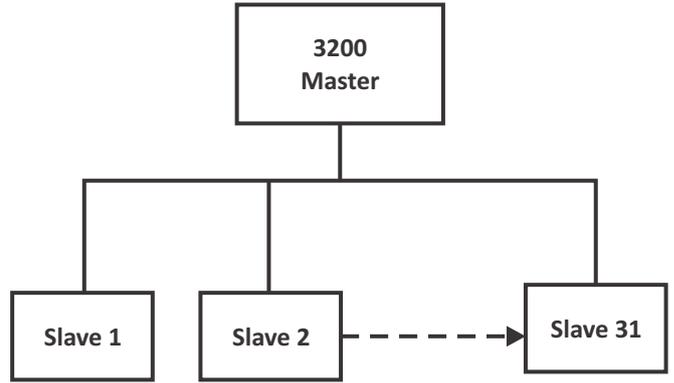
The following table shows the parameters available.

Digital Communication List						
Name	Scrolling Display	Parameter Description	Value		Default	Access Level
ID	MODULE IDENTITY	Comms Identity	nonE	No module fitted	As order code	Conf L3 R/O
			r232	RS232 Modbus interface		
			r485	EIA485 Modbus interface		
			r422	EIA422 Modbus 3216 only		
			dc.P	Remote setpoint input. if fitted this ID replaces the above and no further parameters are shown		
ADDR	COMMUNICATION ADDRESS	Communication address of the instrument	1 to 254		1	L3
BAUD	COMMUNICATION BAUD RATE	Communication Baud Rate	1200	1200	9600	Conf L3 R/O
			2400	2400		
			4800	4800		
			9600	9600		
			19.20	19.200		
PRTY	COMMUNICATION PARITY	Communication Parity	nonE	No Parity	nonE	Conf L3 R/O
			EVEN	Even Parity		
			Odd	Odd Parity		
DELAY	RX/TX DELAY TIME	To insert a delay between Rx and Tx to ensure that drivers have sufficient time to switch over.	OFF	No Delay		Conf L3 R/O
			on	Fixed Delay Applied		
RETRAN	COMMS RETRANSMISSION	Master Comms broadcast parameter see section 15.2.1	nonE	None	nonE	
			WSP	Working setpoint		
			PU	Process variable		
			OP	Output Demand		
			Err	Error		
REGRD	COMMS RETRANSMISSION ADDRESS	Parameter added in slave address to which the master communication value will be written	0 to 9999		0	

### 7.3 Broadcast Communications

The 3200 broadcast master can be connected to up to 31 slaves if no segment repeaters are used. If repeaters are used to provide additional segments, 32 slaves are permitted in each new segment. The master is configured by setting the 'RETRN' parameter to W.SP, PV, OP or Err.

Once the function has been enabled, the instrument will send this value out over the communications link every Control cycle (250ms).

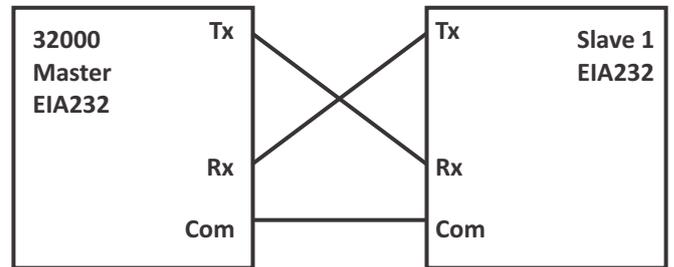


### Wiring Connections

The Digital Communications module for use as a master or slave is fitted in Comms Module slot H and uses terminals HA to HF.

Rx connections in the master are wired to Tx connections of the slave

Tx connections in the master are wired to Rx connections of the slave



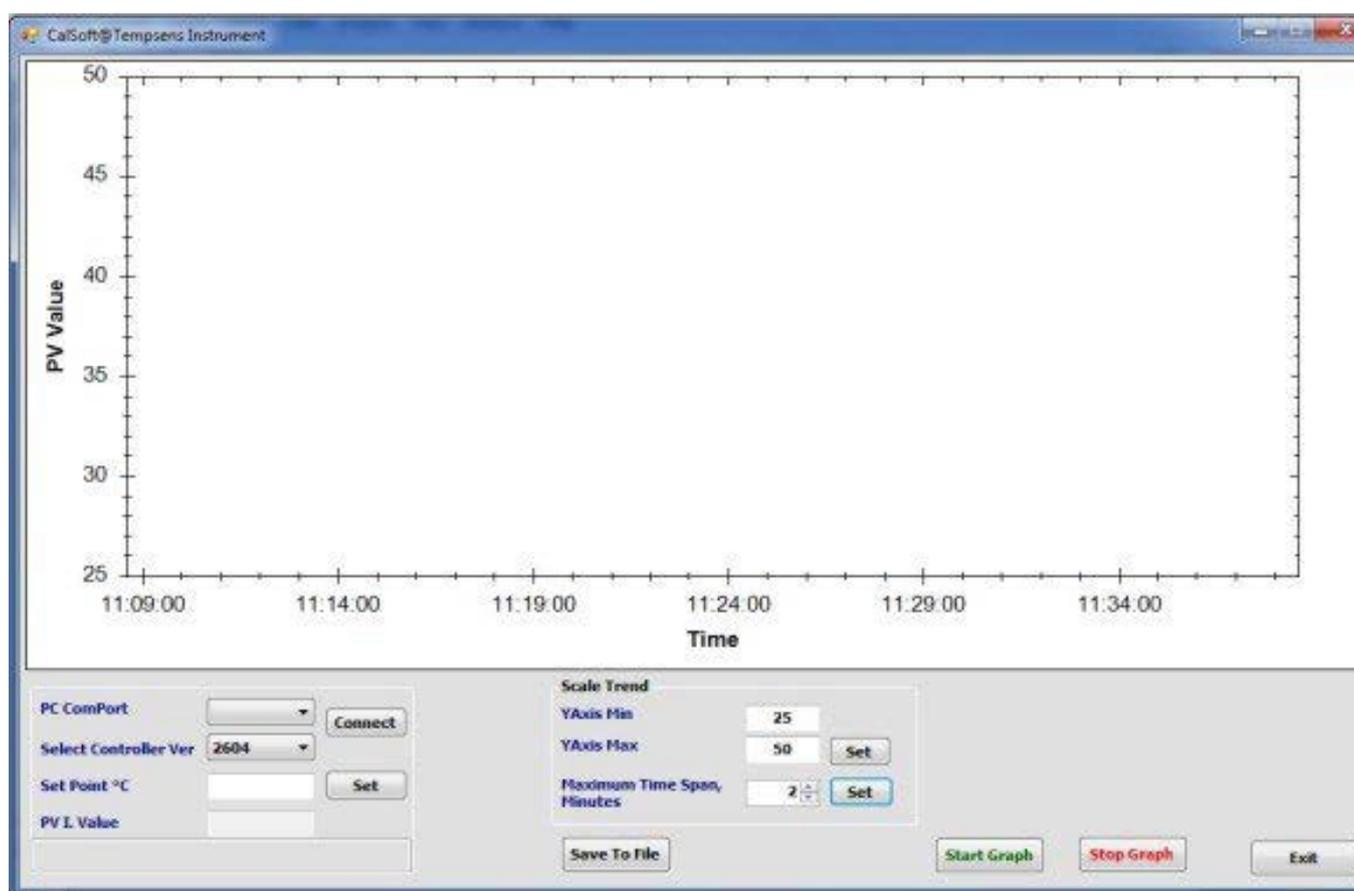
# Chapter - 8

## Software Installation

The provided Tempsens software offers possibilities to connect furnace temperature bath and change set point, maximum time span, view real time graph and evaluate measuring data.

### 8.1 Installation

Install the calibration software using the installation guide file on CD ROM. After installation of the software; Double click the application. It will open the screen of software.



### 8.2 Parameter in mainscreen

#### 8.2.1 Communication

Communication between the furnace and the software is implemented via a RS-232 cable connected between the furnace and the PC serial port. This enables the acquisition and recording of data, as well as the transfer of commands from the software application to the tempsens furnace. Communication can be done by clicking on connect and select correct COM port address (fig. 1) where furnace is connected. Also user has to select type of controller version 3216 (fig. 2). Then click on CONNECT button. Shown com2 connected successfully.



Fig. 1.



Fig. 2.

**8.2.2 Scale Trend :** in scale trend you have to change the Y-Axis Min value 0 and Y-Axis Max value 1500. Maximum Time Span, Minutes have to save data the data logging up to 120 minutes, than click on start graph button. After complete the task click on save to file button.



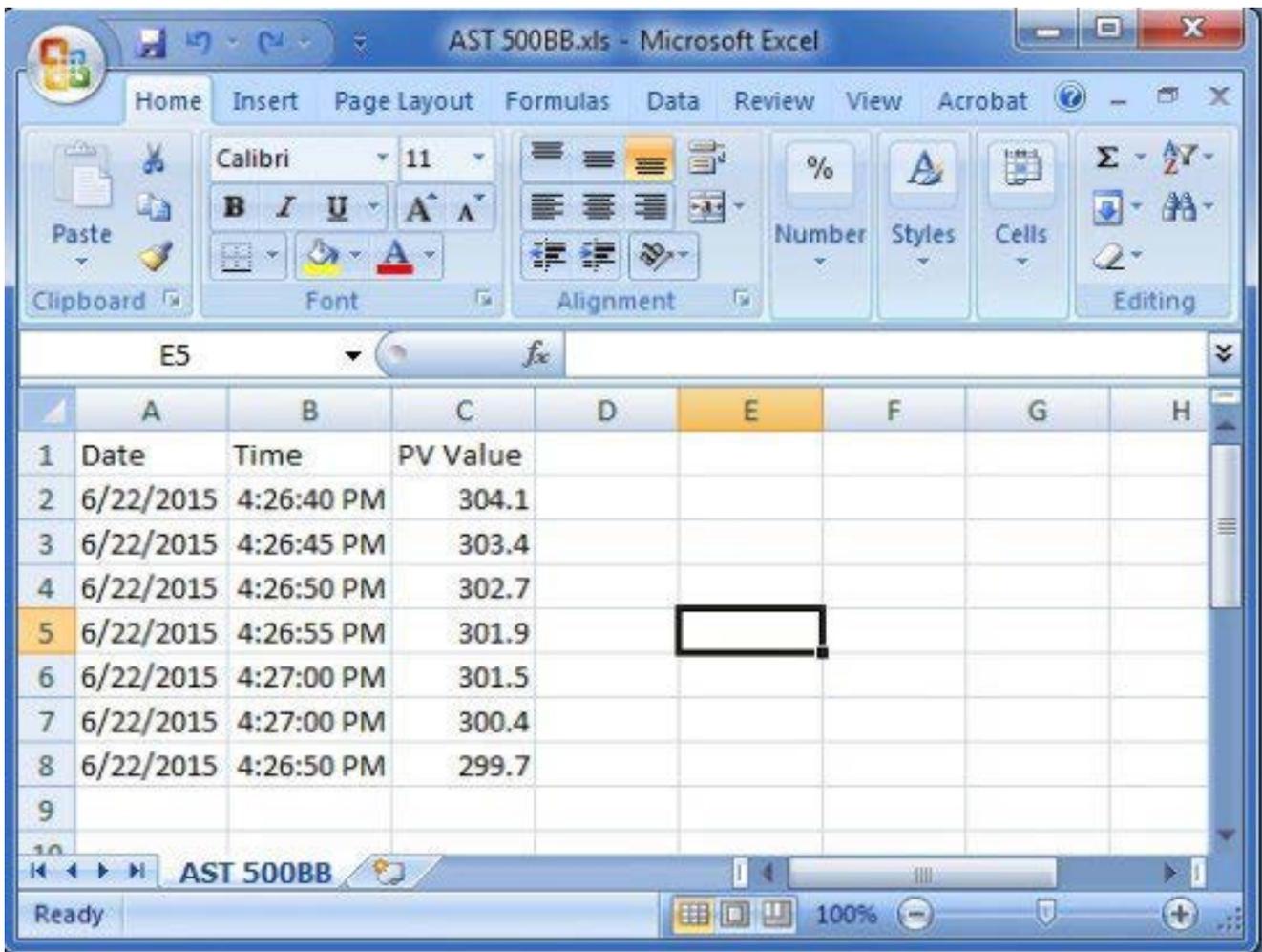
The dialog box titled "Scale Trend" contains the following settings:

- YAxis Min: 0
- YAxis Max: 1500 (with a "Set" button)
- Maximum Time Span, Minutes: 2 (with a "Set" button)
- Buttons: "Save To File" and "Start Graph"

**Set Point (°C) :** in which you can set temperature of furnace as your requirement.

**PVI Value :** Read the current PV value (present value of furnace temperature).

File will be stored in .xls format to save previous record open the file by clicking on menu file open.



The screenshot shows a Microsoft Excel spreadsheet titled "AST 500BB.xls". The active cell is E5. The data table is as follows:

	A	B	C	D	E	F	G	H
1	Date	Time	PV Value					
2	6/22/2015	4:26:40 PM	304.1					
3	6/22/2015	4:26:45 PM	303.4					
4	6/22/2015	4:26:50 PM	302.7					
5	6/22/2015	4:26:55 PM	301.9					
6	6/22/2015	4:27:00 PM	301.5					
7	6/22/2015	4:27:00 PM	300.4					
8	6/22/2015	4:26:50 PM	299.7					
9								
10								

# Chapter - 9

## Maintenance & Trouble shooting

### 9.1 Routine service

Turn the electricity supply off before attempting any cleaning operation. The only moving part is the fan. That has sealed-for-life bearings. Depending on the environment in which it is used, periodic cleaning is recommended. Cleaning may be accomplished by the use of a small dry paint brush. The instrument should be periodically checked to ensure it is in good order both mechanically and electrically.

### 9.2 Replace the Controlling Sensor

Replacement of the controlling thermocouple is carried out as follows:

1. Make sure that the Calibrator Unit is not connected to the mains supply.
2. Remove the cover of the Calibrator.
3. Disconnect the thermocouple from the connector block.
4. Remove the thermocouple from the heating chamber present inside by unscrewing the Screw fitted in the fitting.
5. Fit the new thermocouple.
6. Reconnect the new thermocouple to the connector block.
7. Replace the cover.

### 9.3 Replace Solid state relay

1. Disconnect the Calibrator Unit from the electrical supply.
2. Remove the cover of the furnace.
3. Locate the solid state relay.
4. Disconnect the wires, noting their position.
5. Remove the faulty relay and replace it with a new one.
6. Tighten the fixing screws.
7. Refit the wires has been noted in step 4.
8. Replace the cover.
9. Reconnect the furnace to the electrical supply.

# Chapter - 10

## Troubleshooting:

### 1. Unit fails to operate

Check fuse, if fuse blows repeatedly consult us.

### 2. Unit unstable

Control parameters have been interfered with - consult us.

### 3. If the temperature of the calibrator is not rising, ensure the followings:

- (a) The power cord should not be loose at power entry.
- (b) The switch should be in ON position
- (C) The power supply should be rated capacity. (230V AC $\pm$ 10 & 50/60 Hz)

### 4. If the temperature of the calibrator is not rising even after checking the above

- (a) The heating element may be open.
- (b) The thermocouple may be open.
- (c) The Controller may be not giving output.
- (d) The SSR may be damaged.

## Warranty

This instrument has been manufactured to exacting standards and is warranted for twelve months against electrical breakdown 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 warranty, 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

## Limit of Liability

TEMPESENS not liable for any damages that arise from the use of any examples or processes mentioned in these Specifications are subject to change without notice.

## CAUTIONARY NOTE

TEMPESENS PRODUCTS ARE INTENDED FOR USE BY TECHNICALLY TRAINED AND COMPETENT PERSONNEL FAMILIAR WITH GOOD MEASUREMENT PRACTICES.

IT IS EXPECTED THAT PERSONNEL USING THIS EQUIPMENT WILL BE COMPETENT WITH THE MANAGEMENT OF APPARATUS WHICH MAY BE POWERED OR UNDER EXTREMES OF TEMPERATURE, AND ARE ABLE TO APPRECIATE THE HAZARDS WHICH MAY BE ASSOCIATED WITH, AND THE PRECAUTIONS TO BE TAKEN WITH, SUCH EQUIPMENT.

## Recommendation

The life of your 'CALsys 650' instrument will be prolonged if regular maintenance and cleaning to remove general dust and debris is carried out.

The company is always willing to give technical advice and assistance where appropriate. Equally, because of the program 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.

# Information

## **Packing Instruction**

To transport or store the instrument, please use the original box or a box padded with sufficient shock absorbing material. For storage in humid areas or shipment overseas, the device should be placed in welded foil (ideally along with silicon gel) to protect it from humidity.

## **Warranty**

TEMPESENS CALsys 650 instrument have a warranty of one year from the invoice date. This warranty covers manufacturing defects. User induced faults are not covered under this warranty.

## **Limit of Liability**

TEMPESENS not liable for any damages that arise from the use of any examples or processes mentioned in this

**Specifications are subject to change without notice**

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# ABOUT US

## Tempsens Instruments (I) Pvt. Ltd.

Tempsens Instruments (I) Pvt. Ltd. is a part of Pyrotech Group which was established by four technocrats in 1976 at Udaipur, with their first product as Thermocouples and RTDs. Today 'Tempsens' is one of the largest manufacturers of Temperature Sensors in India.

Tempsens Instruments (I) Pvt. Ltd. U# II was started in 2009 to produce cables with high standard of manufacturing process conforming to national & international specifications. We manufacturer wide range of cables for Temperature sensors and Instrumentation in various insulations as PTFE, FEP/PFA, Kapton, Silicon, Fiber Glass, Ceramic Fiber, Refrasil/Nextel, PVC etc. in variety of configurations. These cables are available in temperature range - 60°C to 1200°C.

All our products are manufactured under strict ISO-9001 quality management system. We also provide Calibration Certificates with all cables. We stock most types of cables which enable us for fast delivery of goods. Our engineering staff are capable to custom design solutions for all applications for customers.

We are dedicated to provide the highest quality products that meet our customer's specifications for various applications.

We continuously focus on improving our manufacturing processes and competitiveness in the industry

