PROGRAMMABLE TEMPERATURE CONTROLLER

The Inside Stuff

> **Kindly forward this product manual to the end user. The user is requested to read the manual thoroughly before operating the instrument.**

As you unpack

Congratulations
on buying a
Programmable Temperature Controller!

As you unpack kindly ensure that
1. The material received is in good condition
2. You have received the following material:
    a)   Programmable Temperature Controller as per your order
    b) Mounting bracket pair
    d) This manual along with Warranty certificate

In case of any discrepancies contact our customer support department immediately.

We are sure you will get long and trouble free service
from our system.

We need your feedback :

Every attempt is made to make this manual clear and easy to understand, so that the user can install, take care of and feel confident in using our product. We welcome your valued suggestions to help us improve this product as well as the document and make it more user friendly.

Programmable Temperature Controller

Introduction

Temperature Indicators and Controllers play an important part in any process industry. Quick and accurate measurement and control of a process temperature will improve the final product quality, reliability and reduce rejection. Temperature indication and control is therefore one of the prime considerations in any process industry

The Sleek 92 series is a Microcontroller based Linearised Temperature Indicator cum Controller with user friendly programming facility. The Sleek 92 has been designed for fast and accurate measurement and control of temperature. Linearisation of signals provides high accuracy even for most nonlinear sensors. The instrument is designed using highly reliable electronic components. Process temperature is displayed directly in digits, giving better resolution.

The Sleek 92 accepts all types of Thermocouples, Pt - 100, 0 to 20 mA as well as 4 - 20 mA as input. Wide ranges of measurements are available depending on the sensor used.

The instrument is immune to mechanical vibrations. Even the mounting position will not affect the measurement accuracy. Use of highly reliable electronic components with low tempearature coefficient ensures long and trouble free service.The instrument is tested for its performance under various climatic conditions.

Principle of Operation :

Sleek 92 series is based on the principle high input impedance amplifier feeding an analog to digital convertor. The input signal generated by the transducer is fed to a signal conditioning amplifier, output of which is digitised by the ADC. This digital signal is linearised by software, displayed and compared to the set value by the microcontroller which initiates the programmed relay action. The linearisation, display and relays are controlled by the microcontroller by virtue of the system software.

Features :

- Microcontroller based logic
- Linearisation of controlled variable achieved throug software giving high accuracy
- Highly compact
- LED display gives better readability at longer range
- Highly accurate
- Dust and vermin proof enclosure with epoxy powder coating.
- User selectable Control Logic
- Programming through tactile membrane keys
- NVRAM enables data storage even in events of prolonged power failure
- Fast response time

Specifications

Model	: Sleek 9228 / 9220 / 9222 / 9223 / 9243
Control action	: On / Off
Ranges	: -200 to 1600 ºC as per sensor used.
Input	: Pt - 100 (3 wire) / Thermocouple / 4 - 20 mA
Display	: 1. 4 digit seven segment 10 mm RED LED (9228)
	2. 4 digit seven segment 12.5 mm RED LED (9222)
	3. 4 digit seven segment 12.5 mm RED LED fo Process value and 1 GREEN LED for Parameter value(9222 /9223 / 9243)
Indication accuracy	: +/- 0.2 % of FS +/- 1 digit
Least count	: 0.1 ºC upto 400.0 ºC, 1ºC above 400 ºC
Accuracy deviation due to	
a) Temperature chang	: +/- 0.02 % / ºC , ref at 25 ºC
b) Supply Variation	: +/- 0.01 % /V
Ambient Temp. range	: 0 to 55 ºC
Amb. Temp. compensation	: Built in upto 55 ºC (for thermocouple input)
Sensor break indication	: Up scale [0PEn]
Sensor break protectio	: Relay 'Off' (Relay 'On' by demand)
Power supply	: 230 V AC, +/- 10 % , 50 Hz
Transmitter Supply	: 24 VDC,+/-1V, @30 mA (Not available in Sleek 9228)
No. of Setpoints	: Two / Four
Setpoint Adjust and Read	: Through Flat Membrane key pads and 4 digit display respectively on front panel
Outputs	:1 set of potential free Relay change over contact rated 5Amp resistive at 230V AC per setpoint
Relay logic	: User selectable High or Low logic.
	High Logic : Actual temp. < Set point - Relay ON for heating
	Low Logic : Actual temp. > Set point - Relay ON for cooling
Relay ON indication	: By Red LED per setpoint
On / Off hystersis	: Programmable from 0.1 to 9.9 ºC
Recalibration (if reqd)	: By software using keypad
Programming	: Using membrane keypad Defualt password is 134
Power consumption	: 6 VA
Weight	: 450 / 1200 gms
Mounting	: Flush panel mount ing
Dimensions	: 48 (W) x 48(H) x 95 (D) mm (Sleek 9228)
	96 (W) x 48 (H) x 125 (D) mm (Sleek 9220)
	72 (W) x 72(H) x 125 (D)mm (Sleek 9222)
	96 (W) x 96(H)x 105 (D) mm (Sleek 9223 / 9243)
Optional	
A)Retransmission o/p	: Isolated 4-20mA proportional to process value
Resolution	: 10 bit (0.016 mA step change)
Load resistance	: Max 500 ohms
B)Serial Interface	: RS 485 (2 wire) / RS 232
Protocol	: Modbus RTU

Illustrations

Sleek 9228

A) FrontView

B) Rear View

Pt 100

4 - 20 mA

Sleek 9220

A) FrontView

B) Rear View

Pt 100

4 - 20 mA

For RS 485

Pt 100

4 - 20 mA
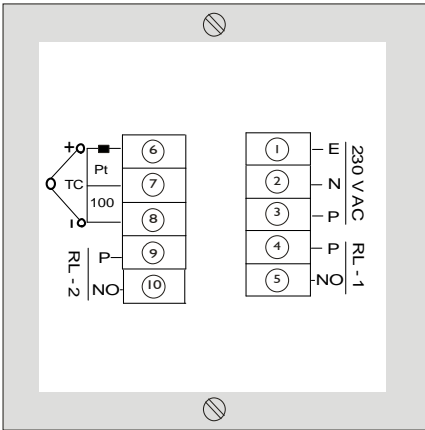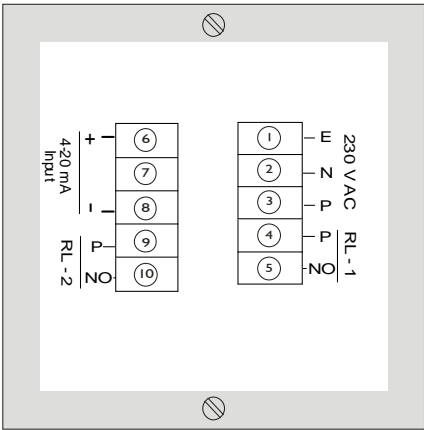
Sleek 9222

A) FrontView

B) Rear View
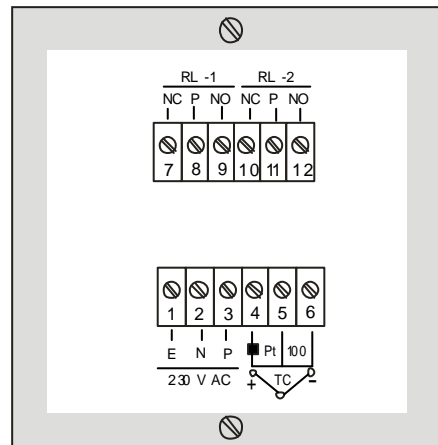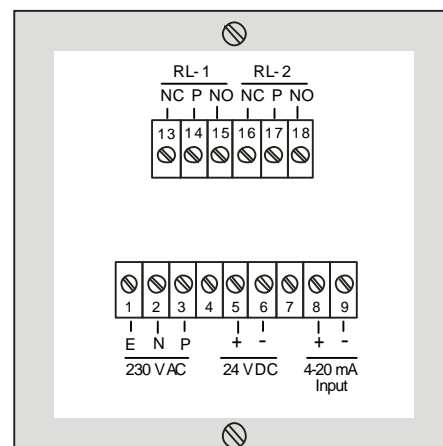
Pt 100

4 - 20 mA

Sleek 9223

A) FrontView

B) Rear View
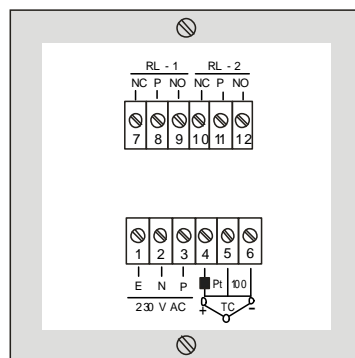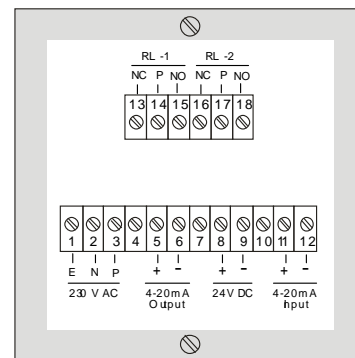
Pt 100
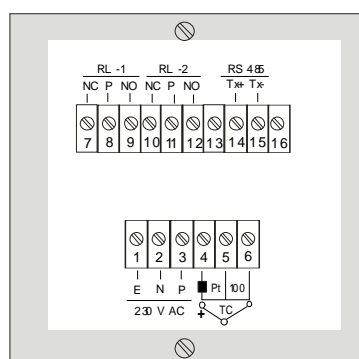
4 - 20 mA
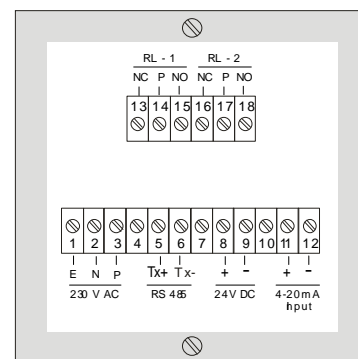
For RS 485
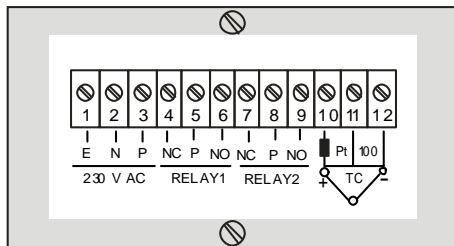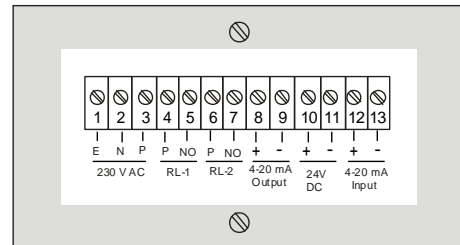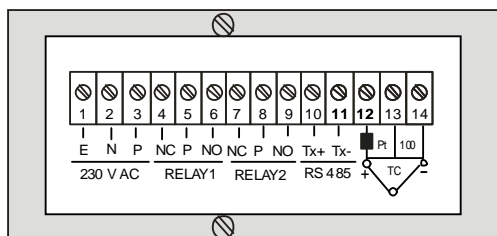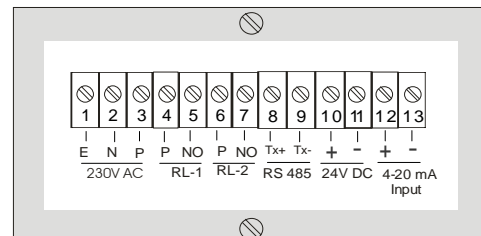

Pt 100

4 - 20 mA

Sleek 9243

A) FrontView

B) Rear View
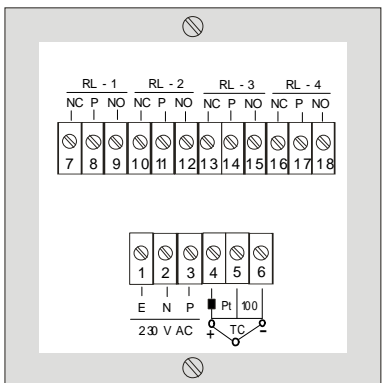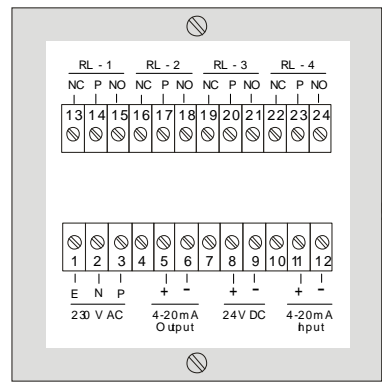
Pt 100

4 - 20 mA

For RS 485
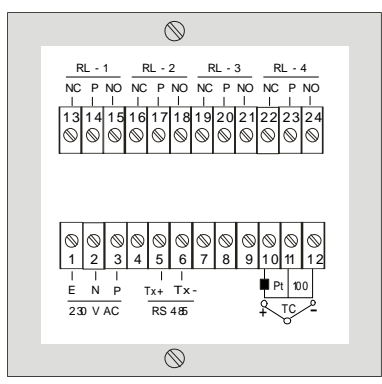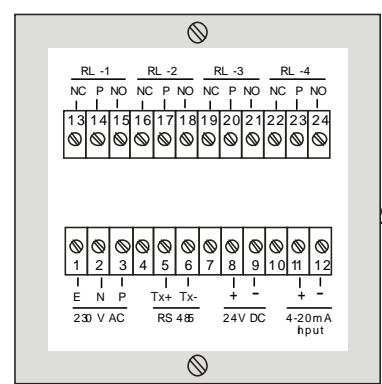
Pt 100

4 - 20 mA

Operation

Block Diagram

| Transducer & Transmitter | Signal Conditioner | Amplifier | Display | Field — Control through Contactor |

Field (Keyboard → Micro-controller → Relay)
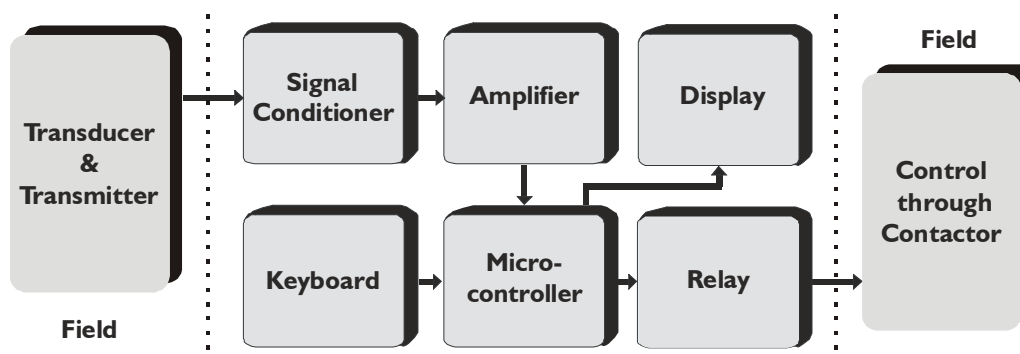
1. **Transducer :** This is externally connected to the instrument. Types available are Pt - 100, Thermocouple, 4-20 / 0-20 mA current signal

2. **Signal conditioner:** This circuit accepts the process signal from the sensor performs the necessary compensation (Ambient compensation for T/C and lead wire compensation for PT- 100) and converts it into suitable signal level for ADC.

3. **ADC:** This is a 12 bit Successive Approximation type ADC inbuilt the microcontroller.It accepts the analog input signal,converts it into digital data and feeds it to the processor forurther action.

4. **Microcontroller**: This is the heart of the unit and is interfaced to all other peripherals. The transducers, membrane keypad, display, memory and output relays function under the command of the microcontroller.

5. **Memory :** There are two memory elements provided in the circuit. One is the EPROM for monitor (main) program storage and the other is the NVRAM for storage of various user programmed parameters and process variables(even in events of prolonged power failure)

6. **Keypad :** Feather touch membrane keys are provided on the front panel for user programming. These keys hav features like long life, negligible contact bounce, ease of operation.

7. **Display :** The front panel carries all the indications. These are controlled by the CPU. There are five digits on the front panel for indicating various mes sages and parameter values. 4 LED's indicate the relay status of 4 correspond ing setpoints . This acts as an interface between user and CPU.

8. **Output relays :** There are four relays, one for each setpoint.

Modes of Operations :

1. Program Mode :
   In this mode the user can program all the setpoints, control action etc.

2. Run Mode :
   In this mode the display shows the process value.

For programming sequence please refer program flow chart.

Installation procedure :

☞   Also observe **"Precautions"** as given in this manual

The instrument should be mounted in a place where it is clearly visible and accessible.

1. Insert the instrument in a suitable cut out and fix it using the brack pair provided on the sides.
2. Make the connections as shown in Rear View diagram.
3. All connections should be firm.
4. In case of Platinum Resistance bulb connect Red wire to the to the terminal with small resistance shown, Green wire to the next terminal & Black wire to the third terminal. The Black and Green wires are shorted and connected together at one end of the bulb inside the bulb head.
5. In case of Thermocouple connect the positive of the sensor to ' + ' terminal and negative of the sensor to ' - ' terminal.
6. Ensure proper earthing to the instrument.
7. Ensure all the connections are as per System connection diagram.
8. Connection details for 2 wire transmitter refer following scheme.

Example: for Sleek 9243 -

FlowChart (Main Menu) :

FLOWCHART

I.0 MAIN MENU

Power On

Display Process
Value & function
in accordance
with Prog. mode

RUN MODE

P i 00.0

PARAMETER   VALUE

No

No

Func
key pressed?

F

Incr & Func
key pressed
for 2 secs?

▲ + **F**

Dec & Func.
Key pressed
for 2 secs?

▼ + **F**

Ent & Func.
Key pressed
for 2 secs?

↵ + **F**

Yes

Yes

Yes

Yes

A
PROGRAM MODE

B
SETTINGS MODE

C
INPUT
CALIBRATION MODE

D
OUTPUT
CALIBRATION MODE

FlowChart (Program Mode) :

2.0 PROGRAM MODE

A
PROGRAM MODE

Parameter Display
flashing for Set 1 as
| i | SI-PI- |

By incr. & dec. keys select the setpoint
to be programmed

Program selected Setpoint
| i | 2OOO |

By incr. & dec. keys, program the value.for
selected setpoint

Display Hystersis mode
| i | Hysl- |

Indicates that selected set point Hystersis value is
being programmed .

Program Hystersis
| i | iO |

By inc & dec keys hystersis can be set from 0.2
to 9.9 Deg. C.

Display On Delay Time mode
| i | ⊬ᴛᵢⱼⱼ |

Indicates that selected set point ON DELAY time
is being is being programmed .

Program On Delay Time
| i | O3O |

By inc & dec keys On delay can be set from 0 to
240 seconds

Display & Program Relay logic
| i | ᴛi_.i_⊬ |

By incr. and dec key high or low logic can be
selected
Hi - indicates high logic and Lo - indicates low

RUN MODE

**Repeat the procedure
for other Setpoints.**

Note:
In program mode if function key **F**
is pressed then unit will branch to auto
mode. All values followed by Enter key
will be stored, else the value will be discarded.
In sleek 9228 function key also corrosponds
to enter key

FlowChart (Setting Mode) :

3.0 SETTINGS MODE

(B) SETTINGS MODE

Select decimal position
| ᴅᴄ.Pᴄ |

By inc & dec keys set the decimal point (Only for 4-20 mA input)

Display decimal position
| d123.4 |

Indicates decimal point position(Only for 4-20 mA input)

Display lower limit mode
| iLoLᴄ |

Indicates that lower limit of the setpoint and range of the unit corresponding to 4mA is being programmed

Program lower limit
| L 0000 |

By inc & dec keys setpoint lock at lower value can be programmed. Setpoint will not go below the value set here. Set the range of the unit corresponding to 4-20 mA input only

Display upper limit mode
| i Upl ᴄ |

Indicates that upper limit of the setpoint & range of the unit corresponding to 4-20mA is being programmed

Program upper limit
| u 2000 |

By inc & dec keys setpoint lock at upper value can be programmed. Setpoint will not go above the value set here. Set the range of the unit corresponding to 4-20 mA input only

Display lower limit mode
| oLoLᴄ |

Indicates that lower limit of the range of 4-20mA output is being programmed

Program limit mode
| L 0000 |

By inc & dec keys lower limit corresponding to 4mA can be programmed

Display upper limit mode
| oUpl ᴄ |

Indicates that upper limit of the range of 4-20mA output is being programmed

Program upper limit
| u 2000 |

By inc & dec keys upper limit corresponding to 20mA can be programmed

Display trimming mode
| oFSᴄ |

Indicates offset value, to be added or subtracted from process value

Program trimming value
| o 000 |

By inc & dec keys offset value can be programmed between-200 to +200

Display Device Address
| Addr |

Indicates that device address used for communication is being programmed

Program Device Address
| 200 |

By inc & dec keys device address can be set between 1 to 247

Display baud rate mode
| bAud |

Indicates that baud rate of communication is being programmed

Program baud rate
| 192 |

By inc & dec keys baud rate in kbps is selectable between 012 = 1200, 024 = 2400, 048 = 4800, 096 = 9600 or 192 = 19200

Parity Mode
| Prᴄy |

By inc & dec keys, parity mode can be selected.
1. None
2. Even
3. Odd

RUN MODE

Input Calibration procedure for Pt 100 input

Warning : This procedure is to be carried out strictly by ☠ technically qualified personnel only.

The instrument is calibrated at the factory using 0.05 % accurate calibrating instruments. No calibration should be required in normal case, however if the instrument requires re-calibration, the procedure to be followed is given below.
FOR PT-100 input

C

INPUT CALIBRATION MODE

Pass
191

This mode is password protected and the default password is 191

Display shows message for 2 seconds
l- 2erH

Display shows the Zero calibration message for 2 seconds. If the range of unit is on negative side, i.e between -100 Deg C to 200 Deg C feed 60.26 ohms as input. If the range of the unit is on positive side i.e between 0 to 400 Deg C feed 100 ohms as input.

Unit displays ADC count
l- 200

Feed the ohms corresponding to the ZERO calibration value from a stable source. Unit displays the ADC count corresponding to input. The count must be between 50 to 400 to be accepted.

Display shows message for 2 seconds
l-. spaH

Display shows the Span calibration message for 2 seconds. If the range of unit is on negative side, i.e between -100 Deg C to 300 Deg C feed 212.05 ohms as input. If the range of the unit is on positive side i.e between 0 to 400 Deg C feed 247.09 ohms as input.

Unit displays ADC count
l-.3790

Feed the ohms corresponding to the SPAN calibration value from a stable source. Unit displays the ADC count corresponding to input. The count must be between 3600 to 4000 to be accepted.
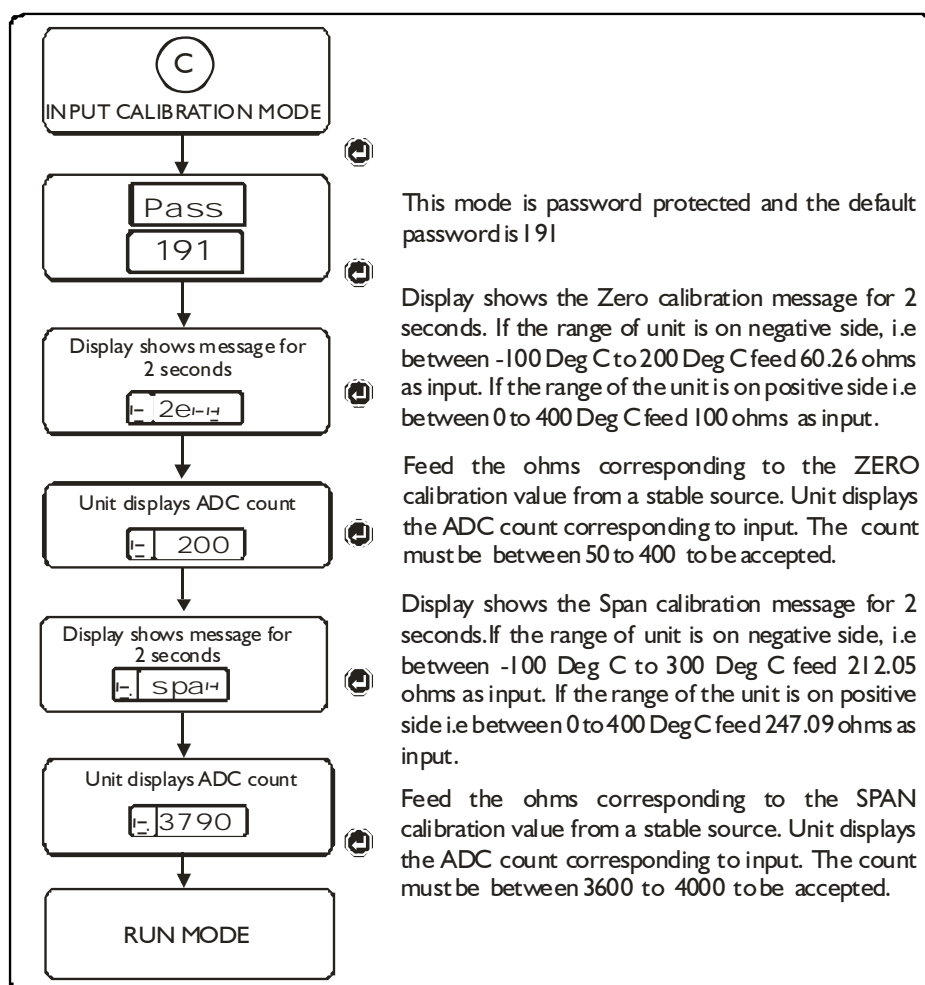
RUN MODE

Calibration procedure for 4-20 mA Input

Warning : This procedure is to be carried out strictly by technically qualified personnel only.

The instrument is calibrated at the factory using 0.05 % accurate calibrating instruments. No calibration should be required in normal case, however if the instrument requires re-calibration, the procedure to be followed is given below.
FOR 4 - 20 mA input

C INPUT CALIBRATION MODE	Remove the sensor connections and connect a stable mA source to the input terminals of the unit. Allow 5 minutes for thermal stabiliyty
Pass 191	This mode is password protected and the default password is 191
Display shows message for 2 seconds ⊢ 2e⊢н	Display shows the Zero calibration message for 2 Seconds indicating 4mA is to be given as input
Unit displays ADC count ⊢ 760	Feed the 4mA corresponding to the ZERO calibration value from a stable source. Unit displays the ADC count corresponding to input. The count must be between 600 to 900 to be accepted.
Display shows message for 2 seconds ⊢. span	Display shows the Span calibration message for 2 Seconds indicating 20mA is to be given as input.
Unit displays ADC count ⊢. 3890	Feed the 20mA corresponding to the SPAN calibration value from a stable source. Unit displays the ADC count corresponding to input. The count must be between 3400 to 4000 to be accepted.
RUN MODE	

Input Calibration procedure for CR-AL Input

Warning : This procedure is to be carried out strictly by
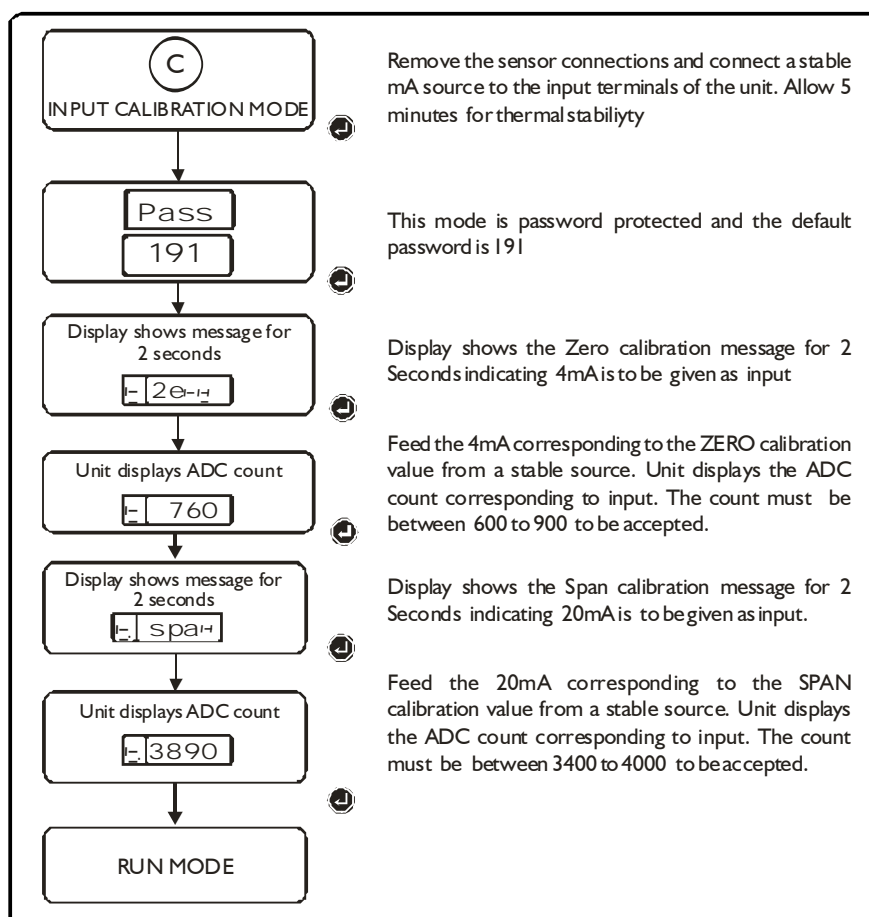☠ technically qualified personnel only.

The instrument is calibrated at the factory using 0.05 % accurate calibrating instruments. No calibration should be required in normal case, however if the instrument requires re-calibration, the procedure to be followed is given below.
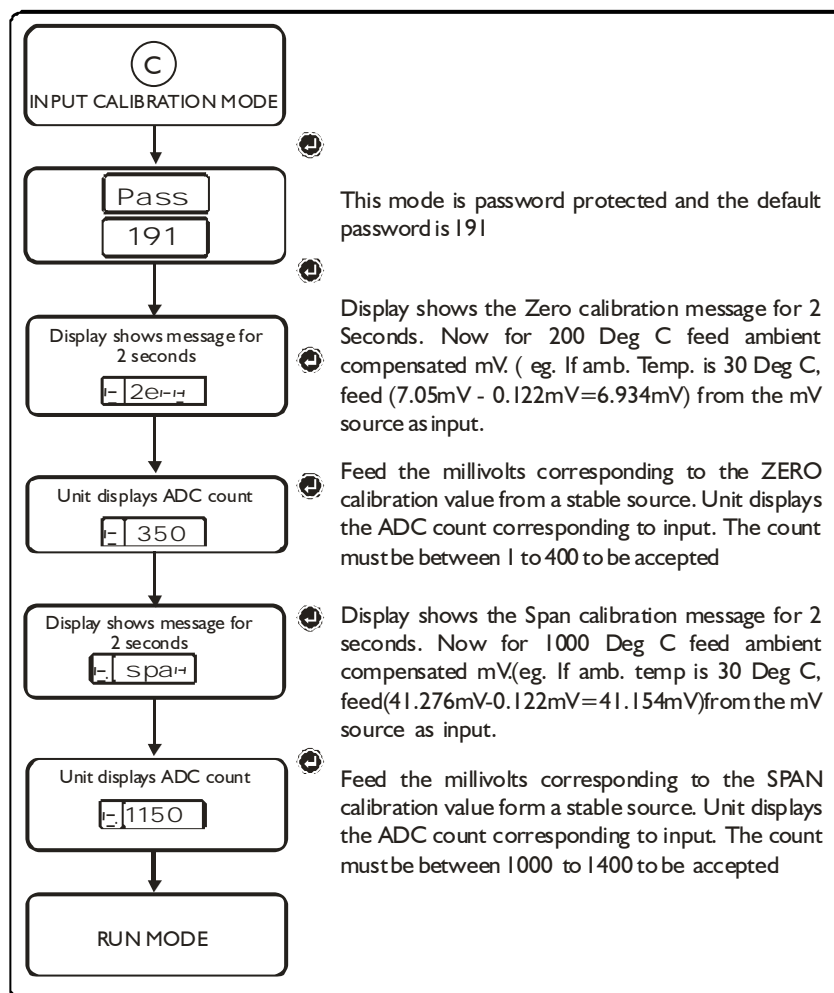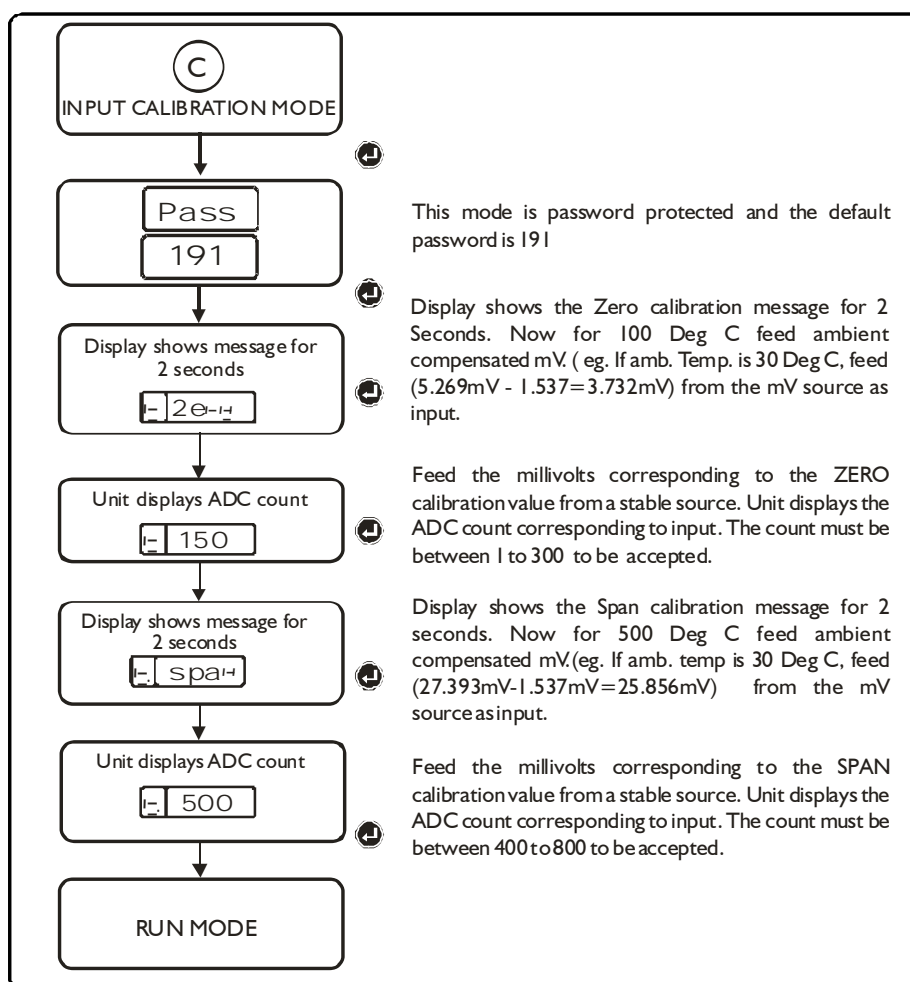For CR-AL (K type) thermocouple input

Flowchart	Description
INPUT CALIBRATION MODE (C)	
Pass / 191	This mode is password protected and the default password is 191
Display shows message for 2 seconds / ⊢ 2er-r	Display shows the Zero calibration message for 2 Seconds. Now for 200 Deg C feed ambient compensated mV. (eg. If amb. Temp. is 30 Deg C, feed (7.05mV - 0.122mV=6.934mV) from the mV source as input.
Unit displays ADC count / ⊢ 350	Feed the millivolts corresponding to the ZERO calibration value from a stable source. Unit displays the ADC count corresponding to input. The count must be between 1 to 400 to be accepted
Display shows message for 2 seconds / ⊢ span	Display shows the Span calibration message for 2 seconds. Now for 1000 Deg C feed ambient compensated mV.(eg. If amb. temp is 30 Deg C, feed(41.276mV-0.122mV=41.154mV)from the mV source as input.
Unit displays ADC count / ⊢ 1150	Feed the millivolts corresponding to the SPAN calibration value form a stable source. Unit displays the ADC count corresponding to input. The count must be between 1000 to 1400 to be accepted
RUN MODE	

Input Calibration procedure for FEKO(J Type) Input

Warning : This procedure is to be carried out strictly by technically
☠ qualified personnel only.

The instrument is calibrated at the factory using 0.05 % accurate calibrating instruments. No calibration should be required in normal case, however if the instrument requires re-calibration, the procedure to be followed is given below.
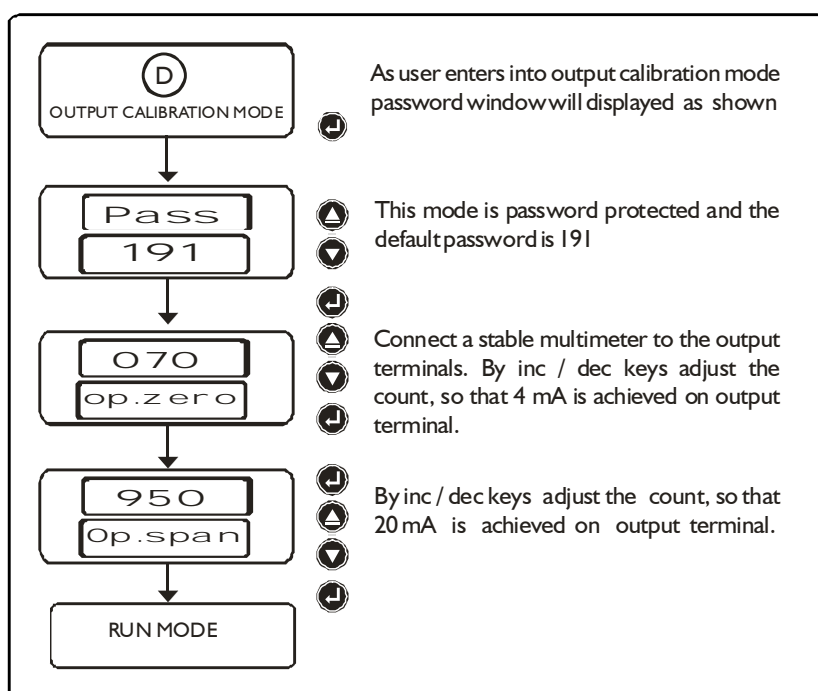For FE KO (J type) thermocouple input

C
INPUT CALIBRATION MODE

Pass
191

This mode is password protected and the default password is 191

Display shows message for 2 seconds
l- 2e-н

Display shows the Zero calibration message for 2 Seconds. Now for 100 Deg C feed ambient compensated mV. (eg. If amb. Temp. is 30 Deg C, feed (5.269mV - 1.537=3.732mV) from the mV source as input.

Unit displays ADC count
l- 150

Feed the millivolts corresponding to the ZERO calibration value from a stable source. Unit displays the ADC count corresponding to input. The count must be between 1 to 300 to be accepted.

Display shows message for 2 seconds
l- spaн

Display shows the Span calibration message for 2 seconds. Now for 500 Deg C feed ambient compensated mV.(eg. If amb. temp is 30 Deg C, feed (27.393mV-1.537mV=25.856mV) from the mV source as input.

Unit displays ADC count
l- 500

Feed the millivolts corresponding to the SPAN calibration value from a stable source. Unit displays the ADC count corresponding to input. The count must be between 400 to 800 to be accepted.

RUN MODE

Output Calibration Procedure

Warning : This procedure is to be carried out strictly by technically qualified personnel only.

The instrument is calibrated at the factory using 0.05 % accurate calibrating instruments. No calibration should be required in normal case, however if the instrument requires re-calibration, the procedure to be followed is given below.

Ⓓ OUTPUT CALIBRATION MODE	As user enters into output calibration mode password window will displayed as shown
Pass 191	This mode is password protected and the default password is 191
O 7 O op.zero	Connect a stable multimeter to the output terminals. By inc / dec keys adjust the count, so that 4 mA is achieved on output terminal.
950 Op.span	By inc / dec keys adjust the count, so that 20 mA is achieved on output terminal.
RUN MODE	

Modbus Protocol

Communication : RS 485 or RS 232

Protocol   : MODBUS RTU

Device Address : Programmable from 1 to 247

Baud Rate   : Selectable between 1200, 2400,
                   4800 or 9600 kbps

Parity Selectable : Odd, Even and None

Other settings   : Stop bit 1, Data 8 bit

Functions supported :

1. Read Input Registers   (04)

2. Preset Multiple Registers (16)

Exception Codes :

1. Invalid Function Code (01)

2. Invalid Start Address   (02)

3. Invalid Data Value   (03)

Starting Address	Contents of the location
0000	Process Value
0001	Value of Setpoint No - 1
0002	Value of Setpoint No - 2
0003	Value of Setpoint No - 3
0004	Value of Setpoint No - 4

Function : Read Input Registers (04)

Message Format : (Request initiated by the master)

Slave Address	Function Code	Start Address (Hi)	Start Address (Lo)	No. of Points (Hi)	No. of Points (Lo)	Error Check (Lo)	Error Check (Hi)

Message Format : (Response by the slave for the request initiated by the master)

Slave Address	Function Code	Byte Count	Data (Hi)	Data (Lo)	Error Check (Lo)	Error Check (Hi)

Function : Preset Multiple Registers (16)

Message Format : (Request initiated by the master)

Slave Address	Function Code	Start Address (Hi)	Start Address (Lo)	No. of Registers (Hi)	No. of Registers (Lo)	Byte Count	Date Byte High	Date Byte Low	Error Check (Lo)	Error Check (Hi)

Message Format : (Response by the slave for the request initiated by the master)

Slave Address	Function Code	Start Address (Hi)	Start Address (Lo)	No. of Registers (Hi)	No. of Registers (Lo)	Error Check (Lo)	Error Check (Hi)

Message Format : (Response by the slave for the invalid request initiated by the master)

Slave Address	Function Code	Exception Code	CRC Check Low	CRC Check High

Precautions

Taking care of your equipment is just as important as buying the best equipment. So simply take the following precautions and ensure a long,

USE

- Three wire system for connecting Pt-100 sensor to the instrument.
- Same area of cross section for all the three wires.
- Appropriate compensating cables for connecting T/C to an instrument
- Appropriate Thermally conductive media between Thermowell & sensor sheath.
- Proper sheathing material as per application and environment.
- Proper size crimped wire termination lugs with insulated sleeves & ferrule no's.
- Proper size screw driver for making connections to the terminations and also while adjusting calibration and set points.

DO'S

- Sensor cables must be isolated from power cables.
- Insert minimum required sensitive length in the measurement object.
- Operating temperature should be 80 % of the maximum specified temperature.
- Check that all the wiring is firm and as per wiring diagram.
- Recalibrate instruments only when errors are confirmed with the help of certified calibrators.
- Output loads connected should be within specified limits.
- Select a Sensor / Instruments / Instrumentation Panel manufacturer who has the

AVOID

- Terminal joints or junction boxes. Only firm soldered joints must be made if necessary.
- Exposure of thermocouple head to temperatures greater than 90°C.
- Too large sheath diameter as this may introduce time lag.
- Mechanical stresses and vibrations.
- Sharp objects for operating front panel membrane keys.
- Excessive relative humidity.
- Magnetic field / inductive pick up / noise.
- Excessive Ambient temperature variations.
- Direct radiant heat.
- Corrosive gasses in the surroundings.
- Chemicals or pressure wash for cleaning instruments.
- Excessive tightening of mounting accessories.

Fault diagnosis

1 *Erroneous / Irrelevant indication*
>   Improper sensor / improper sensor connection
>   / improper sensor location.
>   Calibration error.
>   System Hang (Restart the system).

2 *No indication on display*
>   No Supply .
>   Supply voltage not as per specifications.
>   Loose PCB interconnections.
>   System Hang (Restart the system).

3 `OPEn' *indication on display*
>   Improper sensor connection.
>   Sensor open.

4. *No relay output*
>   Relay faulty.
>   Incorrect Relay logic.
>   Improper Set point.
>   Change over tracks on PCB burnt due to overload.

5. *Fluctuations in Readings*
>   Supply voltage not within specified limit.
>   Sensor faulty / improper sensor connection.
>   Noise pick-up on sensor / sensor cable (use proper 1) **Control Logic (CL) :**
   The logic for relay actuation, i.e.

   a) *CL* = High Control Logic. The control action is such that the process temperature must not go above the setpoint. Process value < Setpoint Relay ON

   This is generally used in heating applications.
   b) *CL* = Low Control Logic . The control action is such that the process temperature must not go below the setpoint. Process value > Setpoint, relay ON
   This is generally used in cooling applications.

2) **Hysteresis :** The On / Off differential gap for an On / Off controller. Figures below show the hysteresis for both high and low control logic.
   Arrows indicate Process temperature trajectory.
>   SP   = Setpoint
>   HYS   = Hysteresis

3) **On Delay Time :** The minimum time duration which has to elapse before a relay status can change over again. This delay time overrides the hysterisys settings for the setpoints.shielding / isolation
>   Excessive ambient temperature.

If a problem persists please contact our customer service

Important Terms

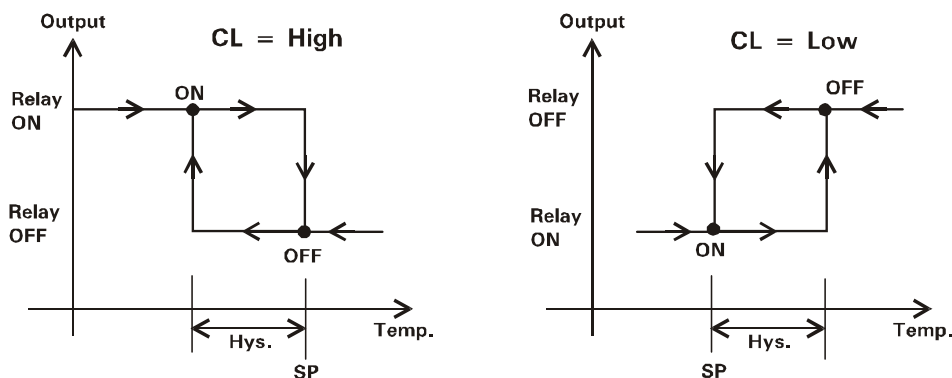1) **Control Logic (CL) :** The logic for relay actuation, i.e.

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Look-up Table

Temperature V/s Sensor output

Temp in°C	Pt-100 Res. in Ω	T/C Output in mV (Reference junction at 0°C)			
		Fe-Ko (J)	Cr-Al (K)	Pt-Pt-13% Rh (R)	Pt-Pt-10% Rh (S)
-150	39.71	-6.499	-4.912	-	-
-100	60.25	-4.632	-3.553	-	-
-50	80.31	-2.431	-1.889	-	-
-25	90.13	-1.239	-0.368	-	-
0	100.00	0.000	0.000	0.000	0.000
10	103.90	0.507	0.397	0.111	0.055
15	105.85	0.762	0.597	0.082	0.084
20	107.79	1.019	0.798	0.171	0.113
22	108.57	1.122	0.879	0.123	0.125
24	109.35	1.225	0.960	0.135	0.137
26	110.12	1.392	1.041	0.147	0.148
28	110.90	1.432	1.122	0.158	0.161
30	111.67	1.536	1.203	0.232	0.173
32	112.45	1.640	1.285	0.183	0.185
34	113.22	1.745	1.366	0.195	0.197
36	113.99	1.849	1.468	0.207	0.210
38	114.77	1.994	1.529	0.220	0.222
40	115.54	2.058	1.611	0.296	0.235
50	119.40	2.585	2.022	0.363	0.299
60	123.24	3.115	2.436	0.431	0.365
70	127.07	3.649	2.850	0.501	0.432
80	130.89	4.186	3.266	0.573	0.502
90	134.70	4.725	3.681	0.643	0.573
100	138.50	5.268	4.095	0.723	0.645
120	146.06	6.359	4.919	0.879	0.795
140	153.58	7.457	5.733	1.041	0.950
160	161.04	8.560	6.539	1.208	1.109
180	168.46	9.667	7.338	1.380	1.273
200	175.84	10.777	8.137	1.557	1.440
250	194.07	13.553	10.151	2.017	1.873
300	212.02	16.325	12.207	2.498	2.323
350	229.67	19.089	14.292	2.997	2.786
400	247.04	21.846	16.395	3.511	3.260
500	280.90	27.388	20.640	4.580	4.234
600	313.59	33.096	24.902	5.696	5.237
700	345.13	39.130	29.128	6.860	6.274
800	-	-	33.277	8.072	7.345
900	-	-	37.325	9.203	8.448
1000	-	-	41.269	10.503	9.585
1100	-	-	45.108	11.846	10.754
1200	-	-	48.828	13.224	11.947
1300	-	-	-	14.624	13.155
1400	-	-	-	16.035	14.368
1500	-	-	-	17.445	15.576
1600	-	-	-	18.842	16.771

°F = (1.8 x °C) +   **°K = 273.15 + °C**

Warranty Certificate

*This instrument is warranted against any manu-
facturing defects for a period of twelve months
from the date of installation, or eighteen months
from the date of supply, which ever is early.*

Kindly note that:
1. *The warranty is limited to repairing the instru-
   ment and no responsibility is taken for any
   other damage resulted*
2. *The warranty will be void if the instrument is
   opened or tampered in any way*
3. *The faulty instrument has to be returned to
   our factory, carriage prepaid & duly insured.*

Product Category   : Programmable
                            Temperature Controller

Model No.   : Sleek 9228 ☐
                             Sleek 9220 ☐
                             Sleek 9222 ☐
                             Sleek 9223 ☐
                             Sleek 9243 ☐

Serial number   : _____

Date of despatch   : _____

Authorized signatory   : _____

Company seal