TRU TEMPERATURE REFERENCE MODEL 937

User Maintenance Manual/Handbook

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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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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

RECOMMENDATION

The life of your **ISOTECH** Instrument will be prolonged if regular maintenance and cleaning to remove general dust and debris is carried out.

We recommend that this instrument to be re-calibrated annually.

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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 handbook)
	IEC 417	Caution, Hot Surface

⚠ ELECTRICAL SAFETY

This equipment must be correctly earthed.

This equipment is a Class I Appliance. 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 coloured green/yellow MUST be connected to a suitable earth.

The Blue conductor should be connected to Neutral and the Brown conductor to Live (Line).

Warning: Internal mains voltage hazard. Do not remove the panels.

There are no user serviceable parts inside. Contact your nearest Isotech agent for repair.

Voltage transients on the supply must not exceed 2.5kV.

Conductive pollution, e.g. Carbon dust, must be excluded from the apparatus. EN61010 pollution degree 2.

ENVIRONMENTAL RATINGS

Operating Temperature	0-50°C
Relative Humidity	5-95%, non condensing

⚠ HEALTH AND SAFETY INSTRUCTIONS

1. Read this entire handbook before use.

2. Wear appropriate protective clothing.

3. Operators of this equipment should be adequately trained in the handling of hot and cold items and liquids.

4. Do not use the apparatus for jobs other than those for which it was designed, i.e. the calibration of thermometers.

5. Do not handle the apparatus when it has hot (or cold), unless wearing the appropriate protective clothing and having the necessary training.

6. Do not drill, modify or otherwise change the shape of the apparatus.

7. Do not dismantle the apparatus.

8. Do not use the apparatus outside its recommended temperature range.

9. If cased, do not return the apparatus to its carrying case until the unit has cooled.

10. There are no user serviceable parts inside. Contact your nearest Isotech agent for repair.

11. Ensure materials, especially flammable materials are kept away from hot parts of the apparatus, to prevent fire risk.

THERMOCOUPLE REFERENCING

It cannot be emphasised too strongly that thermocouple outputs are dependent upon emfs generated by temperature differentials along individual conductors and not upon the presence of junctions in the circuitry. However, access to an emf of this type, for measurement purposes, requires the connection of additional conductors, and these ineluctably introduce their own characteristic thermo-emfs into the circuit. The resultant nett emf will be the algebraic sum of the individual emfs corresponding to the respective temperatures of the end-points of each conductor, i.e., of the junctions present in the measuring circuit. Indeed, it is this principle that governs the practical application of thermocouples, although it should be noted that nett emfs are functions of actual temperatures and are not uniquely determined by temperature differences. In other words, the Seebeck coefficient (which is defined as the emf generated per unit temperature difference) for a given material is, itself, a function of temperature and, moreover, the uniqueness of its value at any given temperature is conditional upon physical and chemical homogeneity of that material.

For practicability as a measuring device, the principal implication for a thermocouple is that it must contain two junctions, one (the measuring junction) held at the temperature required to be determined and the other (the reference junction) maintained at a known (reference) temperature. Connections to the terminals of a measuring instrument potentially constitute thermocouple junctions and care must be taken in arranging circuitry to eliminate their contribution or to compensate for any influences thereby introduced. Qualitative acknowledgement, from a thermoelectric point of view, of the presence of every element in a composite circuit has led to a variety of arrangements to eliminate unwanted components of emf from thermocouple measurements. However, the practical necessity remains of providing some means of temperature referencing.

Some instruments involve the use of their terminals as reference junctions, for application with a specified type of thermocouple that possesses one other junction only (the measuring junction). Such instruments usually incorporate a facility for (electronic) "cold junction compensation", thus indicating an emf relative to 0°C or, possibly, a direct reading of temperature. However, a fundamentally more satisfactory procedure is to form reference junctions using the conductors themselves and to employ an isothermal environment at a known temperature (typically 0°C) into which these junctions can be immersed. Several Isotech products are dedicated to the provision of such environments; it is interesting to note, also, the application of another thermoelectric phenomenon, Peltier cooling, to establish the working conditions of those Isotech units designed to provide a reference temperature of 0°C.

OUTLINE DESCRIPTION

The TRU 100 unit is intended to produce a 0°C reference temperature environment that is sufficiently accurate and stable for thermocouple applications.

It is a self-contained unit, housing a calibration environment in the form of a metal block cooled by Peltier refrigeration modules controlled by solid-state circuitry, thus providing essentially maintenance-free operation. Heat sinks and fan-cooling are incorporated in the assembly.

A feature of the TRU 100 is its rapid rate of cooling; a stable working temperature can normally be attained within a period of ten minutes of switching on. The unit is very tolerant of high ambient temperatures.

Two models are available. They differ when the number of thermocouples to be referenced is more than 50 double junctions. Above 50 both sides have an isothermal enclosure fitted to accommodate the additional connectors.

TEMPERATURE CONTROL

Set in the underside of the block is a platinum resistance thermometer (PRT), which is used to control the cooling function.

A Eurotherm 3216 PID Controller is used to give excellent stability and accuracy at the desired temperature.

INSTALLATION

The thermocouple connections will be found by unscrewing a retentive screw on the side panel (s) and opening the isothermal enclosure.

The top section of the klippon connectors have the wires for the reference thermocouples. Each klippon is identified by a number and its polarity for both the thermocouple inputs and copper wire outputs.

The top rows of the klippons are the inputs and the bottom rows are the outputs. When viewing the klippons and the numbers 1, 2 etc. appear for the second time, these are the corresponding copper outputs to the thermocouple inputs.

Termination should be with the correct sized screwdriver to avoid damage to the connectors.

Once all wires have been terminated secure the side panel (s).

SUPPLY AND ALARM WIRING

The colour convention for the mains-supply cable is:

LIVE	-	BROWN
NEUTRAL	-	BLUE
EARTH	-	YELLOW AND GREEN

An Amphenol 7-pin circular socket is provided to facilitate connection to an alarm system, if desired, to signal out-of-temperature or power failure conditions.

ALARM WIRING

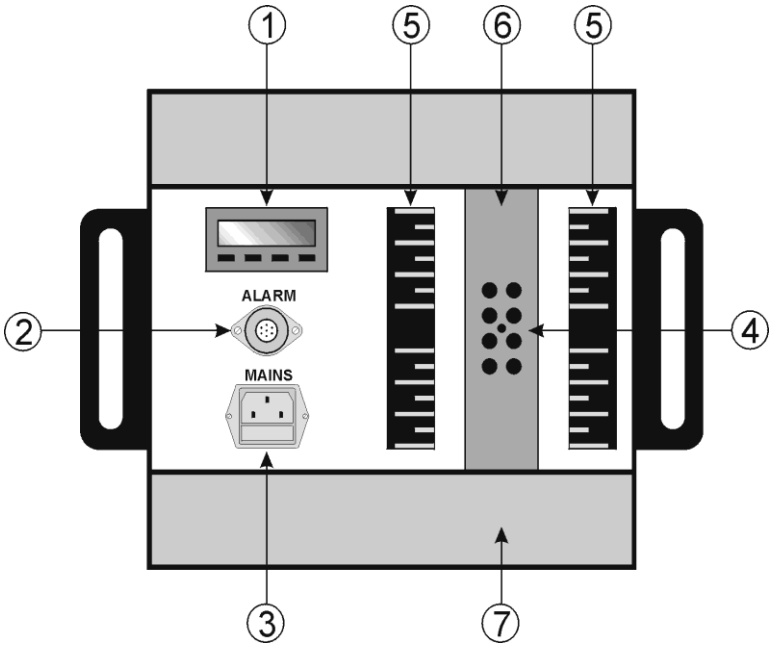
The alarm leads have two wires on cool down or heat up, the alarm will switch for as long as the TRU has deviated more than ±0.2°C of its set temperature.

MAINTENANCE

Units intended for use in dusty environments can be equipped with a fan filter for the purpose of keeping the heat-sink surfaces clean, thus maintaining efficiency of heat dissipation.

Other than changing the fan filter (if fitted), no maintenance is normally required.

PANEL AND LAYOUT FUNCTION



1. Controller
2. Alarm Cable Socket
3. Switched mains-cable socket and fuse holder
4. Metal block with pockets for thermocouple junctions
5. Cooling ducts and heat sink fins
6. Isothermal probe enclosure
7. Isothermal enclosure for thermocouples

TRU 100 SPARE PARTS LIST

DESCRIPTION	PART NUMBER
Controller 3216	935-06-116
Block Assembly	940-02-00
P.R.T	935-14-33
Mains Transformer	935-19-29
Capacitor	935-04-01
Bridge Rectifier	935-38-08
Power Transistor	935-24-01
Switch Mains Plug & Fuse Holder	935-15-17
Alarm Socket	935-16-40
Fan 110V	935-17-31
Fan 240V	935-17-35
Fan Guard	935-17-18A
Fan Filter	935-17-32
Fuse 1.6A (T)	935-12-13