

PEGASUS 'R'

MODEL 970

This manual is issued under the authority of

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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.

CONTENTS

<u>PAGE</u>	<u>DESCRIPTION</u>
3 - 4	EMC Information
5	Health and Safety Information
6	Guarantee
7 - 11	Tutorial
12	Cautionary Note
13	Figure 1
14	Black Body Target Calibration Bench - Figure 19071
15	Black Body Target for Pegasus Ass. Drwg. 970-20-02
16	Pegasus R T/C. Drwg. 970-20-01
17	Introduction
18	Unpacking and Initial Inspection
19	The Basic Workings of the Pegasus
20	Initial Testing
21 - 22	Maintenance
23	Assembling the Insert
24	Appendix 1 Trouble Shooting



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 (RS232 or RS422(485)) 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 1 Appliance. A protective earth is used to ensure the conductive parts can not 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, eg. Carbon dust, must be excluded from the apparatus. EN61010 pollution degree 2.

The apparatus has input connectors for temperature sensors, see Figure 1. This input is only suitable for a thermocouple. No other sensor or signal may be connected.

ENVIRONMENTAL RATINGS

Operating Temperature 5-50°C

Relative Humidity 5-95%, non condensing

INSERT WARNING:

The inserts are specially processed for use with the Pegasus. It is important that only inserts supplied by Isothermal Technology Ltd are used. Failure to comply with this information may result to damage which would not be covered under warranty.



HEALTH AND SAFETY INSTRUCTIONS

1. Read all of this 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, ie. 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.

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.

Serial No:.....

Date:.....

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TUTORIAL

THE USE OF A PEGASUS 'R' CALIBRATED SOURCE TO CALIBRATE RADIATION PYROMETERS

INTRODUCTION

The Pegasus 'R' is designed as a source for the calibration of radiation pyrometers over the range 200 °C to 1200 °C. Most users of radiation pyrometers are unfamiliar with the procedures for calibration and the tutorial below is intended to help new users. It is meant only as a guide and not as a gospel.

1. SETTING UP THE SOURCE

The Pegasus 'R' comprises a small tube furnace of diameter approximately 35mm.

Separately is a 3 part assembly plus a thermocouple which assembles into the tube furnace as diagram 970-20-02.

The thermocouple, as can be seen from diagram 970-20-01 has a right-angled bend in the ceramic sheath at its tip. This bend is to facilitate insertion of the thermocouple tip into the cavity at the base of the black body target (970-01-02) see diagram 970-20-02. (The internal wires of the thermocouple may be visible at the bend in the ceramic but this is normal - the thermocouple is not broken). Once the tip of the thermocouple has been situated in the cavity of the target, the target is assembled into the well of the Pegasus. The insulation piece 970-01-03 (as shown in diagram 970-20-02) is then assembled into the Pegasus with the thermocouple alongside (which sits in the groove in the insulation piece).

The thermocouple is connected to an indicator situated on the front of the Pegasus 'R' as shown on figure 1. The size and shape of the insulation and the position of the thermocouple are all important and if the assembly is modified, the calibration certificate may become invalid. Having assembled the Pegasus 'R' a temperature is set (see commissioning later in this document).

3 steps are required to obtain the radiance temperature of the source:

- a) Set the required temperature on the controller.
- b) Take the reading on the indicator.
- c) Add or subtract the correction from the calibration sheet, (correction may be considered to vary linearly between calibration points) to obtain the radiance temperature.

For example: Say 1000 °C is the controller set point. The indicated value might be 991 °C. If the calibration certificate is consulted, the radiance temperature is noted to be 10 °C lower than the indicated value ie. 981 °C.

TUTORIAL

2. USING THE SOURCE

The simplest and least accurate method of using the source is to set its temperature, calculate its radiance temperature as described above and point the radiation pyrometer at the source.

More usually a small optical bench is built to accurately hold the source and pyrometer enabling proper alignment to take place.

3. REQUIREMENTS FOR AN OPTICAL BENCH (SEE FIG. 19071)

An optical bench can be a very expensive piece of apparatus of precision ground components, or a very basic piece of equipment built onto a wooden board.

For normal industrial pyrometers a simple bench is quite adequate. My suggestion is a slide piece to enable pyrometers of varying focal length to be calibrated and a holder for the pyrometer which allows 2 freedom of movement ie. height and lateral position.

4. A TYPICAL CALIBRATION/EVALUATION OF AN INDUSTRIAL PYROMETER

A typical calibration sequence for a land/minolta cyclops 330 is given below adapted from our UKAS submission.

DESCRIPTION

A calibrated target is used as the source of information, together with the certificate of calibration - see ref NPL 12317/91/001 dated 15.5.1991.

An optical bench was built (see drawing 19071) which allowed a Land Cyclops 330 to be calibrated.

The optical bench allowed 3 freedom of movements:-

BACK & FORTH

The distance to the cyclops transfer standard from the rear of the Black Body is 750mm. An optical bench allows the cyclops transfer standard to be moved from 660mm to 1000mm.

TUTORIAL

HEIGHT

The height of the Cyclops can be adjusted by -10, +15mm from the normal position

LATERAL MOVEMENT

The Cyclops can be moved sideways by -10, +15mm from the normal position.

METHOD

1. EVALUATION OF THE OPTICAL BENCH

The Pegasus 'R' item was set up in the 'normal' position as described above. The controller temperature was set to 1000°C. After stabilisation the 3 freedom of movement were evaluated.

a. BACK & FORTH

The cyclops was moved back & forth by 100mm. The following readings were obtained.

	CYCLOPS READING
650mm from rear of target to cyclops	984
750mm	983
850mm	983

b. At a distance of 750mm. The focal length of the Cyclops was changed.

METRES FOCAL LENGTH	READING
.75	983
.8	983
.85	983
.9	983

TUTORIAL

c. The height of the Cyclops was altered

	READING °C
-2mm	982
Normal	983
+2mm	982

d. The lateral position of the Cyclops was adjusted and the Cyclops rotated to align with the centre of the target.

LATERAL MOVEMENT	READING °C
Right (mm)	
5	983
10	983
Left (mm)	
5	983
10	983

2. AUDIT CALIBRATION

Having established confidence in the optical bench system and the cyclops.

The calibrated source, Pegasus 'R' was set to the first calibration temperature and allowed to stabilise. The cyclops was placed in its holder as shown in fig. 19071.

The controller temperature, the indicated source temperature and the cyclops temperatures were noted. From the calibration certificate the radiance temperature was calibrated.

The difference between the radiance temperature and the cyclops temperature gives the error of the cyclops reading within the uncertainty stated.

Results obtained at 5 temperatures are tabulated over-leaf.

TUTORIAL

TABLE 1

CALIBRATION RESULTS

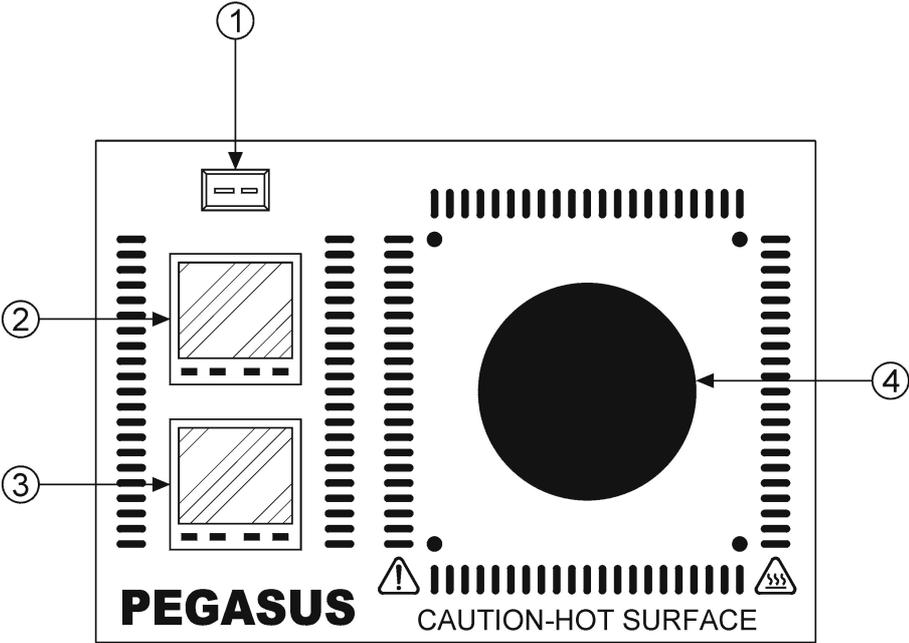
PEGASUS R	CONTROLLER TEMP °C	T/C INDICATED TEMP SOURCE	CYCLOPS READING °C	RADIANCE TEMP. READING CORRECTED FROM NPL CERT °C
Standard	220	222	220	226
Standard	440	442	438	448.8
Standard	660	660	656	662
Standard	800	797	793	795
Standard	1000	991	986	981

CAUTIONARY NOTE

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

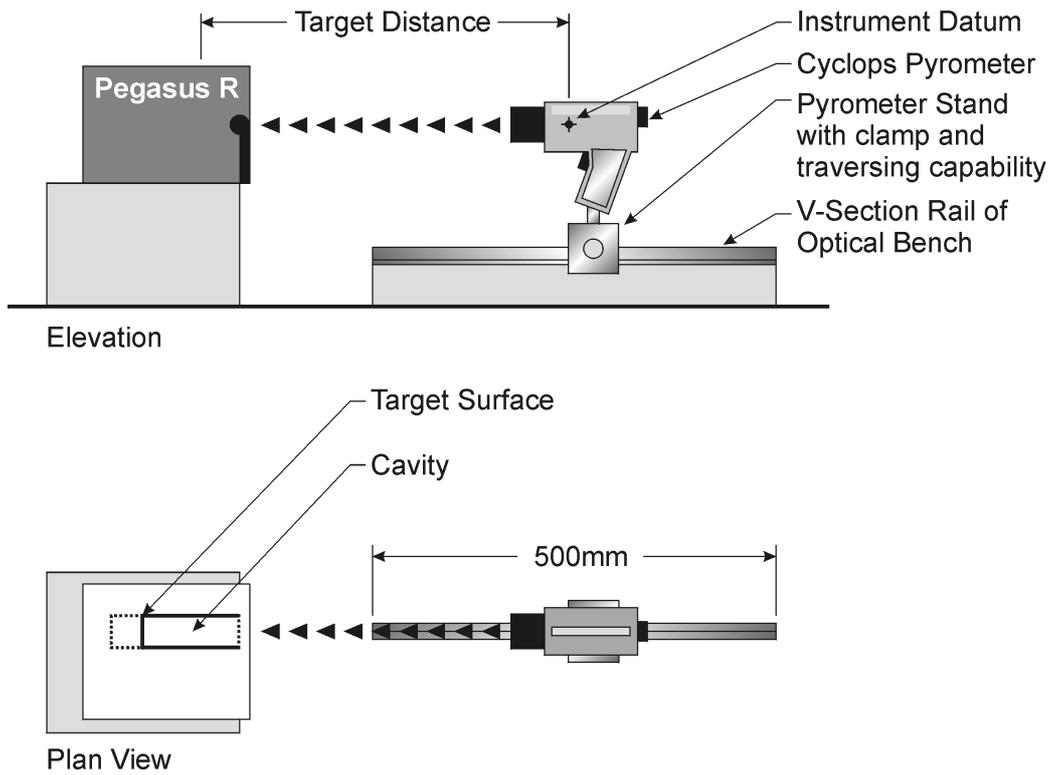
IT IS EXPECTED THAT PERSONNEL USING THIS EQUIPMENT WILL BE COMPETENT WITH THE MANAGEMENT OF APPARATUS WHICH MAY BE POWERED OR UNDER EXTREMES OF TEMPERATURE AND ARE ABLE TO APPRECIATE THE HAZARDS WHICH MAY BE ASSOCIATED WITH AND THE PRECAUTIONS TO BE TAKEN WITH, SUCH EQUIPMENT

FIGURE 1
PEGASUS 'R'
PANEL LAYOUT AND FUNCTIONS



- 1. T/C SOCKET
- 2. INDICATOR
- 3. CONTROLLER
- 4. CALIBRATION AREA

FIGURE 19071



INTRODUCTION

The Pegasus 'R' has been designed to be rugged and easily maintainable.

By using a proprietary plug-in controller the total electronics package can be replaced in a few minutes. As can be seen from the parts list, remarkably few components have been used, each of which are easily removed and replaced.

PEGASUS 'R' (SEE FIG 1)

This model provides a volume of constant temperature in which an N.P.L. designed black body source is situated according to the accompanying assembly drawing. (Fig. 970-20-02)

The temperature required is set on the bottom controller.

The indicator above the controller, when connected to a type R thermocouple positioned centrally at the target matrix indicates the temperature of the source.

Radiance temperature - that is read by a radiation pyrometer is found from the calibration certificate.

The Pegasus model is part of a range of portable calibrators designed and made by ourselves. Please contact us if you require more information about our other products.

WARNING

To prolong the life of the heater windings the temperature should not be increased by more than in 200 °C increments, allow the temperature controller to indicate it is at the fixed point before resetting the next temperature increment.

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, and 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

Before connecting to the electricity supply please familiarise yourself with the parts of the handbook relevant to your model.

Your unit's supply voltage requirement is specified on a plate on the base of the instrument along with the serial number. All Pegasus instruments will work on an electricity supply frequency of 50Hz or 60Hz. (Consult temperature controller handbook).

The unit's electricity supply cable is colour-coded as follows:-

<u>COLOUR</u>	<u>FUNCTION</u>
Green/yellow	Earth (Ground)
Brown	Live (Line)
Blue	Neutral

Please ensure that your unit is correctly connected to the electricity supply.

THE BASIC WORKINGS OF THE PEGASUS

The purpose of the Pegasus 'R' model is to provide an adjustable isothermal enclosure for calibration purposes.

The isothermal enclosure consists of a fixed heated furnace.

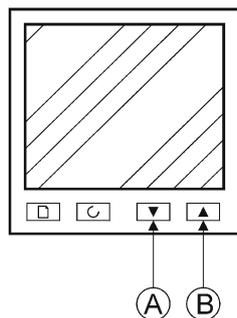
The heated furnace houses a graded heater winding and the control sensor used by the temperature controller to sense the furnace temperature. To obtain and maintain a required temperature the controller varies the power to the heater via a solid state relay.

A fan runs continuously and cools the electronics in the instrument.

OPERATION

Altering the Furnace Temperature (Set point)

- 1) Switch on - The controller will briefly show its software version before displaying an indication of the block temperature.



- 2) Momentarily press either the UP or DOWN key once to display the setpoint (desired temperature).
- 3) To alter the value press and hold the UP key to raise the value or the DOWN key to lower the value.
- 4) The display will return to show the nominal block temperature when no key is pressed for 0.5 second.



The other controller functions are hidden from the operator. The values are pre-set and should not be changed.

PEGASUS 'R'

INITIAL TESTING

This unit was tested before despatch to you but please check its operation as outlined below and in Appendix 1 and Fig 1.

After connecting the Pegasus 'R' to the electricity supply, the temperature controller display will show the temperature of the furnace and the last set-point value. The 'R' controller and indicator both go through a self-test sequence first. The fan on the side panel should be heard running.

Change the set-point to 200°C and observe that the furnace temperature rises and settles to this value. For the 'R'; place a thermometer in the source and connect it to the suitably configured (see 'R' procedure) indicator. Confirm that the indicator agrees within a few degrees of the controller.

Your unit should have performed as described above and can now be used for calibration.

If any problems or faults arise during these tests please contact us or our agents for help and advice.

WARNING

To prolong the life of the heater windings the temperature should not be increased by more than in 200°C increments, allow the temperature controller to indicate it as at the fixed point before resetting the next temperature increment.

The controller's function settings should not normally require any changes from what we have set them to.

PEGASUS 'R'

MAINTENANCE

The only moving part is the fan. It has sealed-for-life bearings. Depending on the environment in which it is used, periodic cleaning of them and the inside of the case 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.

PEGASUS 'R'

CALIBRATION USING THE TEMPERATURE INDICATED ON THE CONTROLLER

1. Remove the Pegasus 'R' from its case and visually inspect it for any damage it may have sustained since it was last used. Insert the black body source assembly (see fig 970-20-02) into the furnace tube with the ceramic insulators.
2. Connect the Pegasus 'R' to a suitable power supply and set the controller to the required temperature (see the controller's handbook for details and Fig 1).
3. Wait for the temperature to stabilise.
4. When the temperature indicated by the controller and the output of the thermometer are both stable (see specification for typical values) record three sets of readings over a period of about six minutes. Check that these readings are consistent and then calculate their average values.
5. The Pegasus 'R' has itself been calibrated, correct the average values accordingly.
6. Reset the controller and/or repeat the calibration for another thermometer.
7. When the calibration is complete, reset the controller to 0°C and wait until the unit has cooled to below 400°C before moving the Pegasus to a new location. The Pegasus must be cooled to about 100°C before it can be put back into its carrying case.



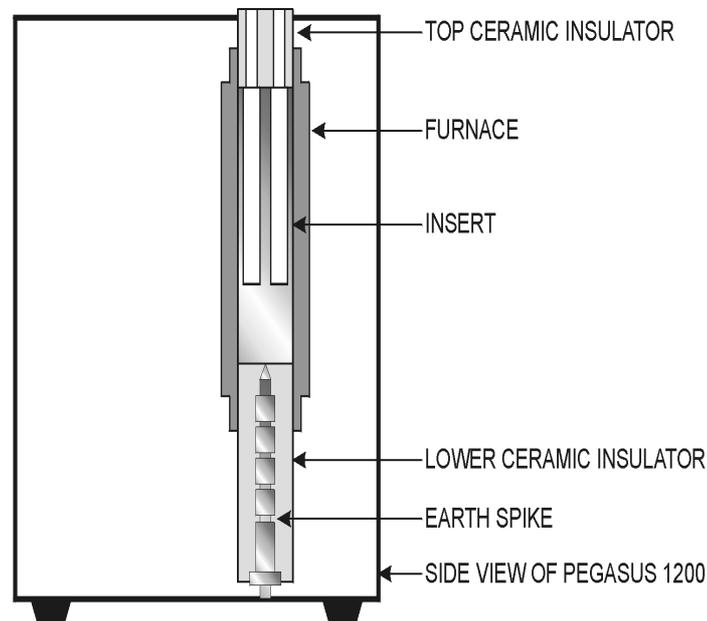
ASSEMBLING THE INSERT

Where the unit is to be used with a standard or special insert, the insert ceramics must be assembled as per the drawing below and the earth spike must be installed .

The insert is connected to EARTH (Ground) by a metal spike, see diagram. It is essential this connection is made.

TO ASSEMBLE THE INSERT

1. Ensure furnace is cool.
2. Slide the long ceramic insulator down the furnace tube so that the tip of the spike protrudes. (This can be checked by using a ruler or similar).
3. Carefully lower the insert using the extractor tool.
4. Unscrew extractor tool.
5. Finally add the smaller top ceramic insulator.



THE INSULATORS MUST BE USED AS SHOWN

APPENDIX 1

PEGASUS 'R'

TROUBLE SHOOTING

TEMPERATURE UNSTABLE

Controller has incorrect parameters set; reset to standard. If still unstable try the self-tune option. Check the electricity supply is stable.

UNIT FAILS TO HEAT.

Check controller is set correctly. If the output indicator on the controller is lit the relay should operate the heater. If the output indicator stays off it is likely the controller is set incorrectly.

CONTROLLER DISPLAY UNUSUAL

Error or system message. Refer to Isotech or your local Agent.

HEATER FAIL ON

If the temperature of the block increases rapidly with the controller output staying off the relay and sensor are suspect. Do not use the unit, contact Isotech or your agent.

WARM UP TIME UNUSUALLY LONG.

Controller set incorrectly, failure of one heater, or cooling fan permanently on. Check controller settings. The cooling fan on the case of the unit should only be on when the alarm indicator is active.

The fan on the side panel should always be on.

INDICATOR MISBEHAVES ('S' ONLY)

Wrong configuration code entered, check against table.

If SnSr FAIL is displayed, check probe connections. If displayed with no probe connected, check that the link is fitted correctly and that the configuration is for a thermocouple type.