

SATURN/CYCLOPS 878 BLACK BODY SOURCE 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.

CONTENTS




	<u>PAGE NO:</u>
EMC Information	3 - 4
Health & Safety Instructions	5
Guarantee	6
Introduction	7
Theory of Operation	8
Spherical Black Body Source - Features	9
Figure 1 - Saturn/Cyclops Assembly Detail	10
Principle of Operation	11
Specifications	12
Each Unit Comprises	13
Precautions	14
On Arrival	15
Caution	16
Commissioning	17
Spare Parts List	18



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 two input connectors for temperature sensors, see Figure 1. These inputs are only suitable for either a thermocouple or resistance thermometer. No other sensor or signal may be connected.

ENVIRONMENTAL RATINGS

Operating Temperature 5-35°C

Relative Humidity 5-95%, non condensing

**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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INTRODUCTION

This patented furnace has been uniquely designed.

Introduced by Isothermal Technology in 1984, the full potential of the bath has yet to be realised.

The lower temperature limit is dictated by the controller and the furnace time constant so that by reducing the heater power (HL) to about 5 to 10% of full power good results can be obtained even at temperatures just above room temperature.

THEORY OF OPERATION

The windings that heat the Cyclops are specially profiled to give a uniform area of constant temperature in the central part of the oven or furnace.

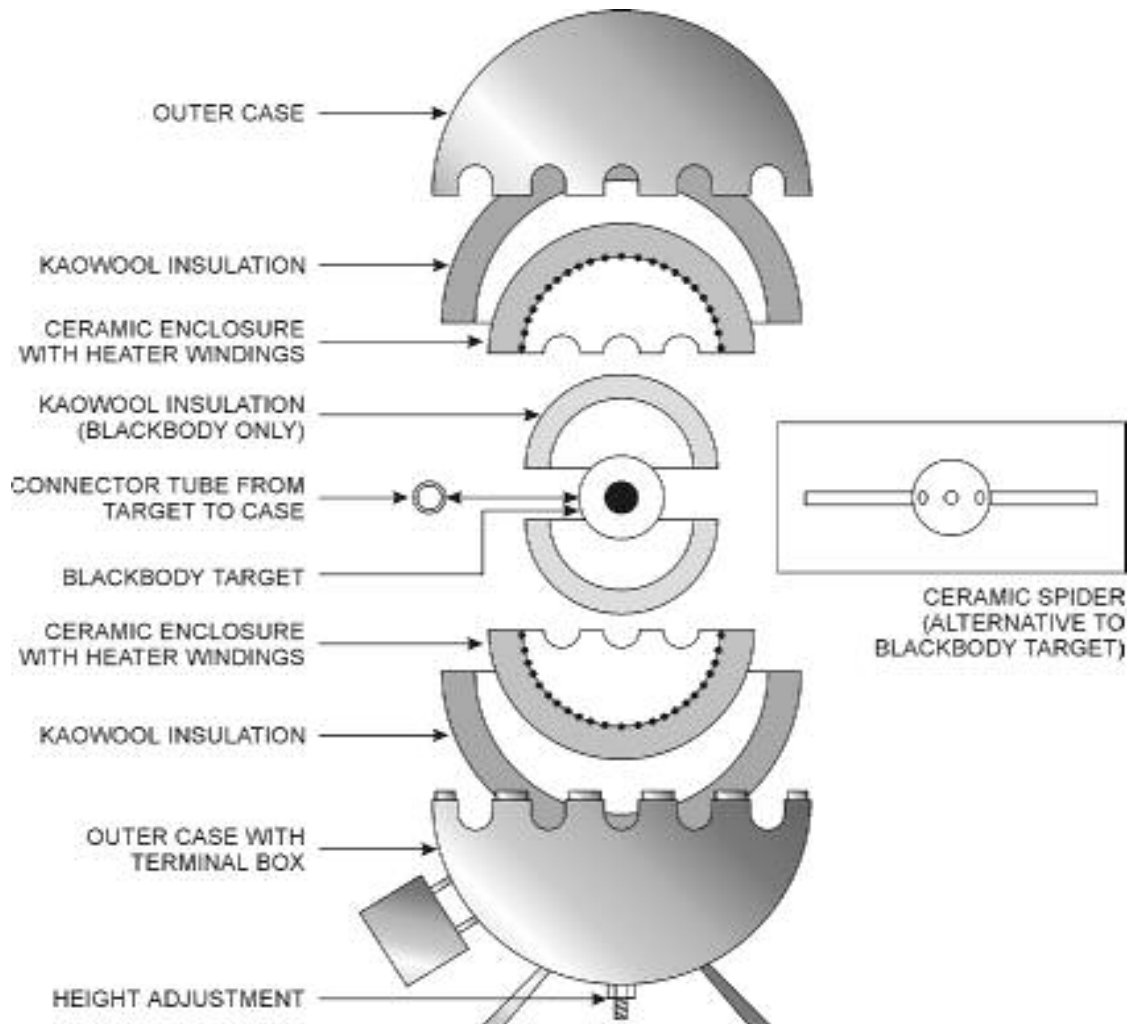
The theory behind the Isotech Spherical Black Body Source is that a solid conducting sphere suspended in the centre of a hollow outer, heated sphere will take up the temperature of the outer hollow heated sphere by convection and radiation to give a very stable temperature reference, without end, or edge effects.

SPHERICAL BLACK BODY SOURCE

FEATURES

1. It is spherical and its design ensures a central zone of constant temperature.
2. The temperature of the furnace is controlled from a microprocessor based controller which can incorporate remote facilities, enabling the furnace temperatures to be pre-programmed from a computer. Thus, totally automatic readings become possible and easily realisable.
3. Normally the windings will require replacing after 2 or 4 years of operating (dependant on work cycle) and so the furnace has been designed with ease of maintenance in mind. A spare set of windings is provided free with each furnace, as is a comprehensive handbook.

FIGURE 1 - SATURN/CYCLOPS ASSEMBLY DETAIL



PRINCIPLE OF OPERATION

The Spherical Black Body Source comprises of a number of concentric shells. (See Figure 1)
The outer layer of the spun metal is for containment and support, inside this is a layer of ceramic fibre. Within the fibre is a ceramic spherical mantle containing the heater windings.

Lastly in the centre of the furnace is the Cyclops Black Body Source.

SPECIFICATIONS

Size: 425mm diameter sphere

Weight: 25 Kilos

Temperature Range: 100°C to 1300°C

Warm-up times*
1 hour to 700°C
3 hours to 1300°C

Power Supply:
240V, 50Hz
3KW Typically
Single Phase

Ambient Operating Temperature:
0 to 50°C
<70% RH

* These times may increase as the windings age or if the supply voltage is low.

EACH UNIT COMPRISES:

1. Spherical Black Body Source
2. Cyclops
3. Controller
4. Spare set of windings
5. Thermocouple
6. Handbook/Guarantee
7. Unpacking Instructions

PRECAUTIONS

Some precautions should be noted as follows:

1. Although the furnace has been insulated with the best available ceramic fibre material, some heat does escape, in fact it is essential for the correct operation of the furnace that it should.

This means that, at high temperatures the outside surface of the furnace becomes hot. If this is a safety problem then a protecting grill should be built round the furnace.

2. Over Temperature:- All the materials used in the construction of the furnace have been rated to 1,400°C. However, at these temperatures the life expectancy of the heater windings for example are very short. We therefore recommend an upper temperature of 1300°C for the bath.
3. The furnace must be mounted on a suitable solid flat surface, horizontal to within $\pm 5^\circ$.

ON ARRIVAL

On unpacking the Spherical Black Body Source you will find 4 parts:

1. The controller.
2. The Furnace itself.
3. The Spherical Black Body Source and a pack of kaowool.
4. A packet containing the control thermocouple, a spare set of windings and this instruction book, (sometimes the windings will be stored inside the furnace).

To assemble the furnace use the following procedure:

- a. Carefully remove all the packing material.
- b. Stand the furnace on a flat surface and carefully unscrew the upper half of the outer Sphere.
- c. Lift off the upper half of the sphere and the ceramic fibre insulation.
- d. You will then see the inner sphere containing the heater windings.
- e. The Cyclops fits inside the inner sphere with a layer of kaowool around it, see Figure 1. It is recommended that two people continue with the procedure. Carefully lift the upper hemisphere taking care not to stress the two heater lead wires. When the top half ceramic is clear, position the insulation and the target to allow access for the target hole through the furnace aperture. Ensure the control thermocouple and ceramic tube are located as Figure 2. Should the height need adjusting use the adjustment screw on the base of the unit.
- f. Reassemble the furnace.
- g. Unpack the controller and connect the cable marked "heater" to the cable from the lower half of the furnace.
- h. Connect a plug to the cable from the controller marked "supply". Note - the controller will normally require a 13 amp supply at 220/240V.
- i. Put the control thermocouple inside the winding shell as shown in diagram below.

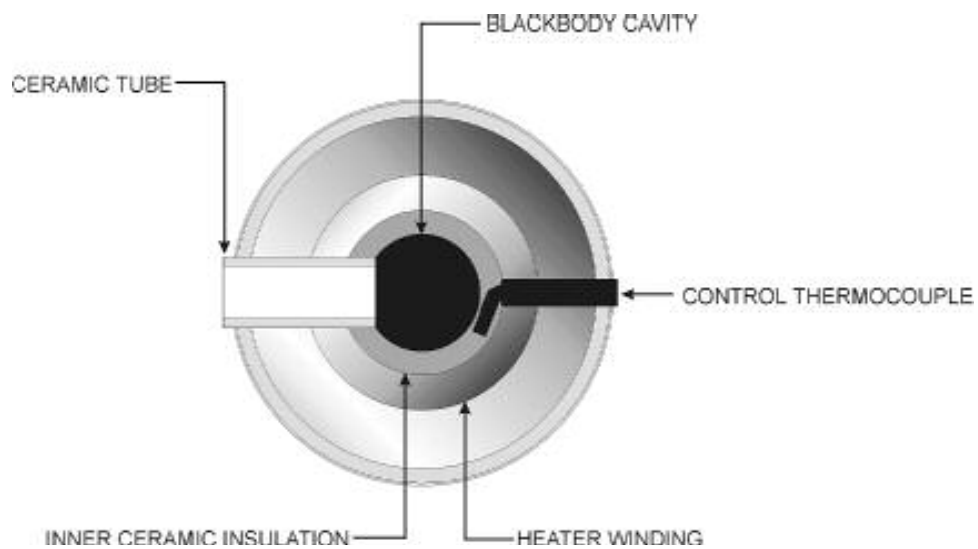
CAUTION

Before switching on, check that there is approximately 20Ω between the furnace heater windings and greater than 5 Megohms between windings and outer furnace case.

Assuming this is so you may now commission the furnace.

Please read the controller instruction manual carefully before proceeding.

FIGURE 2



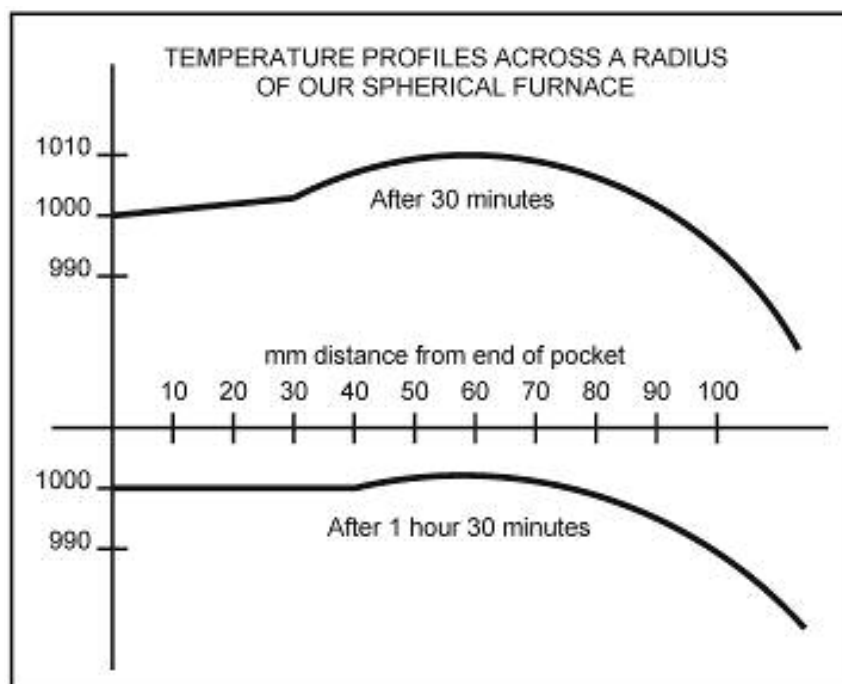
COMMISSIONING

During its trip to you, the package containing the furnace may have become damp, therefore, we recommend the following initial procedure:

1. Switch on the furnace/controller and set the temperature to 100°C. Allow the temperature to reach 100°C and stabilise there for 2 hours.
2. Increase the set temperature to 200°C. Allow 2 hours for stabilisation.
3. Increase the temperature in 100°C steps allowing 1 to 2 hours between each change until the furnace has reached 1,000°C.

Your Spherical Black Body Source is now ready for use!

SAMPLE RESULTS



SPARE PARTS LIST

PART NO:	DESCRIPTION:
877-01-02	Windings (2)
932-20-16	Kaowool
935-10-24	Cable Gland/Con Block
935-35-58/59B	Plug/Socket
935-21-21	Relay 240V
935-12-20	Relay 110V
935-12-04	Fuse
935-11-05	Fuse Holder
935-27-01	Neon/Switch
935-06-25	Controller - 807 Eurotherm
935-14-21	Control Thermocouple
878	Black Body Cyclops