CRYOSTAT
MODEL 459
User Maintenance Manual/Handbook

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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.

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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.

⚠ 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.

INTRODUCTION

The 459 Cryostat needs to be surrounded by liquid nitrogen. Liquid nitrogen at -196°C can burn human flesh; the user should be aware of the hazards associated with liquid nitrogen and its handling.

The Cryostat is in two parts, the mechanical part comprising stainless steel outer assembly housing a copper equalising block.

A plug and socket connect the Cryostat to a controller which heats the equalising block from -196°C to the desired temperature.

A vacuuming part is available as described in the tutorial.

GENERAL PRINCIPLE

A Cryostat comprising a closed end tube about 100mm diameter and attached beneath a flange carrying a special assembly is sealed and lowered into liquid nitrogen. The temperature of the internal assembly can then be adjusted to any desired temperature between -180°C and -80°C.

DESCRIPTION

A stainless steel housing comprising a closed end tube attached by six bolts, to a flange and having an 'o' seal has been built.

The housing contains a large copper equalising block drilled to accept three thermometers i.e. one standard and two units under test. In the central axis of the copper block is a heater and a platinum resistance thermometer. The heater and thermometer wires are attached to a Lemo socket in the flange which in turn is connected via a multi-core cable to a controller.

TUTORIAL

INTRODUCTION

To calibrate two thermometers over the temperature range -80°C to -180°C. A calibrated thermometer is available as a reference.

A suitable dewar is available to accommodate the Cryostat.

METHOD

Firstly check that the standard thermometer and the two units under test (UUT's) will fit into the three wells exiting through the flange. Stainless steel rods will be in the wells during transportation, remove them.

Because the Cryostat will be running below the dew point, moisture will accumulate and then freeze around the wells and can seal the thermometers in the wells. Teflon seals are provided to lightly clamp the thermometers and prevent moisture condensing inside the wells. In any case, make sure the wells are dry before each run.

Alternative bushes or 'o' seals may be needed if the UUT's are of a small diameter and the existing Teflon bushes will not seal around the UUT's.

SPEND SOME TIME AT GETTING THIS ASPECT RIGHT!

Next, with the dewar empty and the thermometers out of the wells, look inside the dewar and note the locating hole at the bottom.

Lower the Cryostat and practice locating it in the dewar locating hole.

Remove the Cryostat, connect the controller and set the temperature to +40°C – this will check that the Cryostat is working properly.

Now fill the dewar with liquid nitrogen and with the controller switched off, but still connected – very slowly lower the Cryostat into the dewar of liquid nitrogen. This can be quite exciting, so make sure you are guarded against splashing by the liquid nitrogen as it boils to cool the Cryostat.

Once the Cryostat is lowered and located close the vacuuming valve. Switch on the controller and set a negative temperature e.g. -100°C.

The control sensor in the Cryostat will indicate the temperature of the copper equalising block.

Now put the three thermometers for calibration in the wells and clamp them lightly in place.

Wait for everything to stabilise and begin calibrating.

Over a period of hours ice will build up on top of the Cryostat. This is normal.

If the thermometers do get stuck in their wells, do NOT try to remove them, wait until the complete Cryostat reaches above 0°C and the ice melts.

Do be careful! Cold ice and liquid nitrogen can cause bad burns.

One filling of liquid nitrogen can last a number of days.

THE VACUUM FLANGE

You can just leave the valve closed and not use it.

However you may wish to enhance the Cryostat's performance as follows: -

Firstly vacuum the Cryostat, and then back-fill with 1 atmosphere of dry nitrogen gas. This will help conductivity and speed the cool-down of the Cryostat.

Once the desired temperature us achieved if a vacuum is pulled conductivity within the Cryostat is minimised giving less gradients in the equalising block.

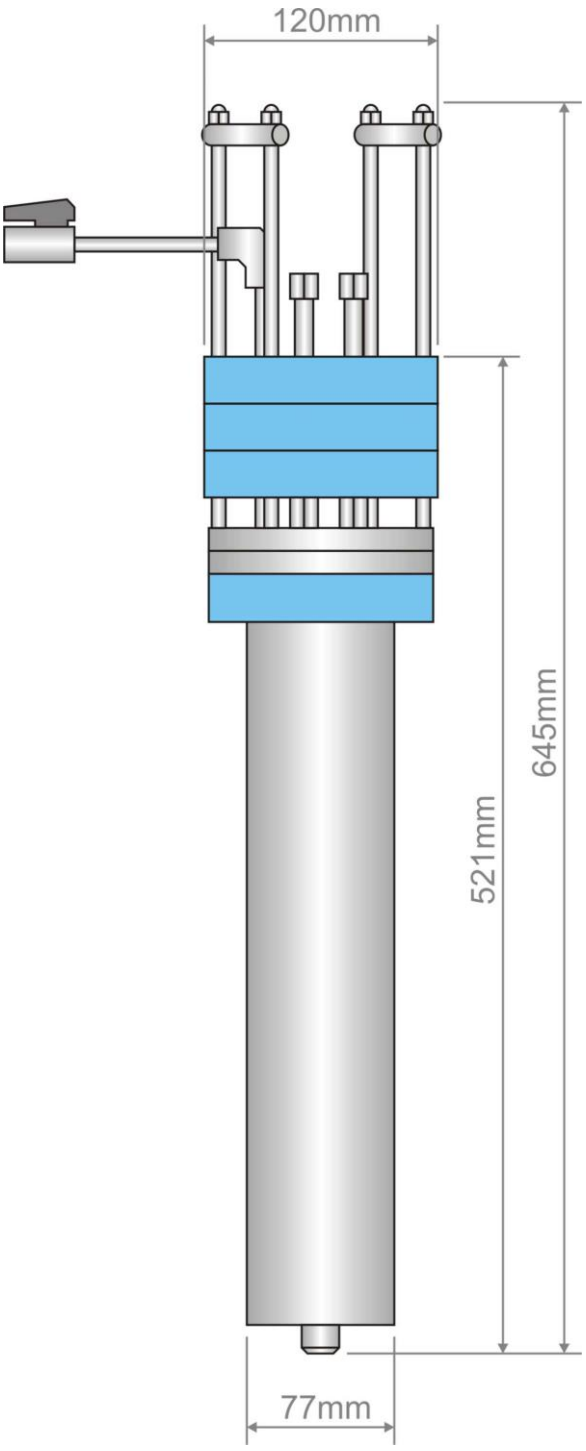
Notes

Suitable clothing can be purchased from your liquid nitrogen supplier or by searching the internet.

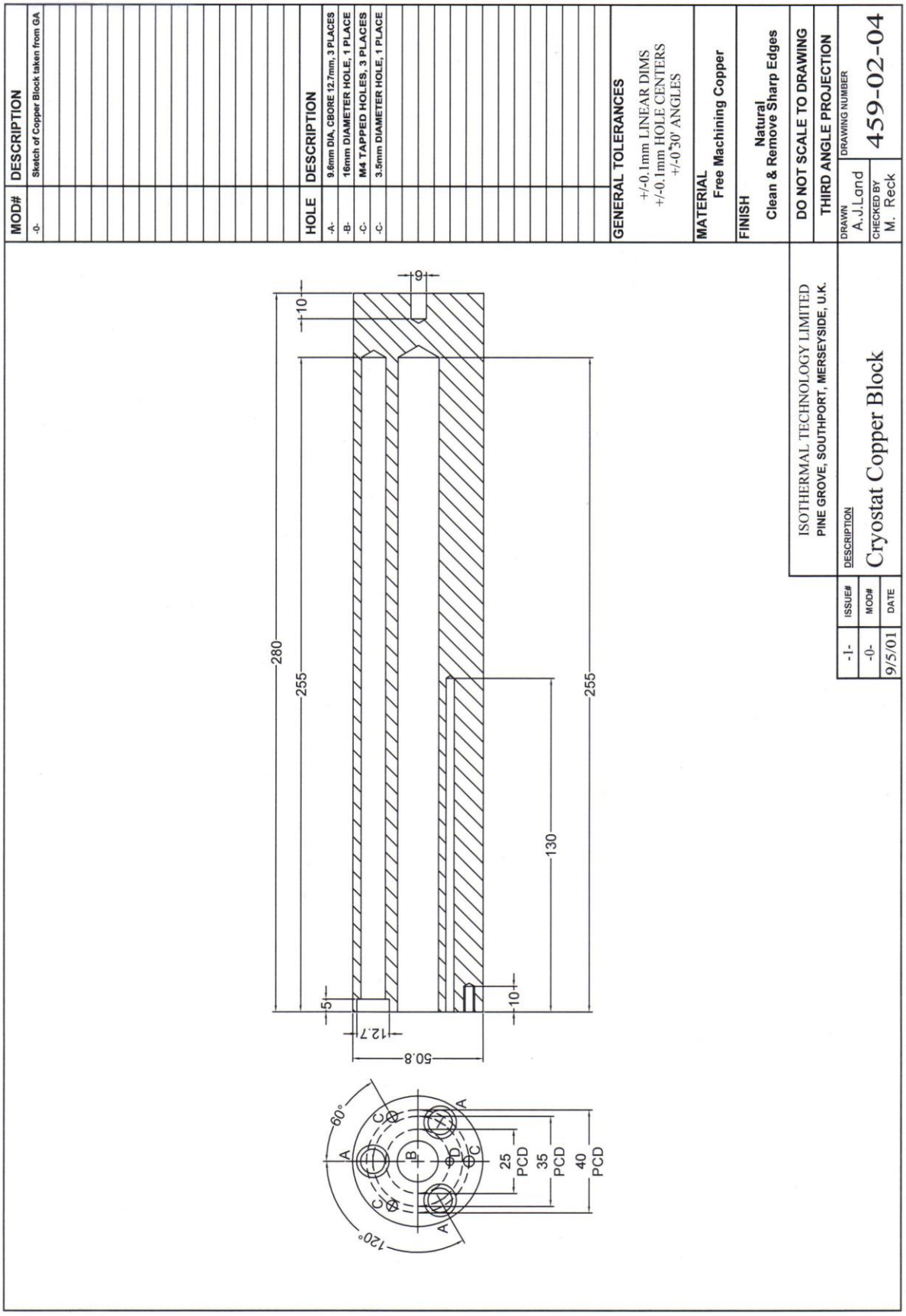
The above tutorial offers guidelines only – each customer should find their own preferred procedure.

Ensure the room is well ventilated and ideally have a low oxygen alarm if the room is small or poorly ventilated.

CRYOSTAT DIMENSIONS



SPECIAL CRYOSTAT DIAGRAM



COPPER BLOCK G.A. DIAGRAM