

Operator's Handbook

Pump Control Box

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1 Warnings

- 1. Before you attempt to install or operate this equipment for the first time, please make sure that you are aware of the precautions that you must take to ensure your own safety.**
- 2. High Voltage Hazard. Isolate this equipment by switching off the external AC electrical supply, disconnecting and removing the external supply cable.**
- 3. The AC electrical supply is considered to be the disconnect device for the equipment. Access to this must not be restricted at any time. The external AC electrical supply cable must remain accessible for disconnection of the equipment.**
- 4. Maintenance: Only qualified and authorised persons should carry out servicing and repair work on this equipment.**
- 5. High Voltage Hazard: High voltages are present inside this equipment. Isolate this equipment by switching off the external AC electrical supply, disconnecting and removing the external supply cable before any covers are removed.**
- 6. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**
- 7. The equipment is not suitable for use with explosive or flammable gases. The equipment is not suitable for use in explosive, flammable or hazardous environments.**
- 8. The equipment does not provide protection against the ingress of water. The equipment should be positioned so that it will not be exposed to water ingress.**

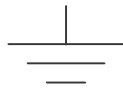
2 Cautions

COOLING HAZARD. *Internal components are air-cooled. Ensure the front lower ventilation space is not obstructed.*

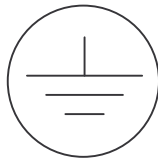
Explanation of symbols used in the Instrument



Attention; please refer to the manual



Functional earth



Protective earth

3 Introduction

The Pump Control Box is used to distribute power to two or three vacuum pumps in conjunction with the IGH electronics unit.

3.1 About this Manual

This manual provides operating and service information for the Oxford Instruments Pump Control Box.

3.2 Important note

This manual is part of the product that you have bought. Please keep it for the whole life of the product and make sure that you incorporate any amendments which may be sent to you. If you sell or give away the product to someone else please give the manual too. Before you attempt to install or operate this equipment for the first time, please make sure that you are aware of the precautions that you must take to ensure your own safety.

3.3 Disposal and recycling

Before disposing of this equipment, it is important to check with the appropriate local organisations to obtain advice on local rules and regulations about disposal and recycling.

You **must** contact Oxford Instruments NanoScience Customer Support (giving full product details) before any disposal begins.

4 Safety

The following general safety precautions must be observed during the operation, service and repair of this instrument.

4.1 Protective Ground

To minimise electric shock hazard the instrument must be connected to an electrical ground. The ground wire (green/yellow) in the instrument AC power cable must be connected to the installation electrical ground system. Do not use extension cords without a protective earth conductor. Do not disconnect the protective ground inside or outside the instrument.

4.2 Hazardous Voltages on Connectors

There are hazardous voltages present on the output mains connectors. Ensure the connector covers are in place whenever a connector has no cable attached to it.

4.3 Repairs

Service and repair tasks may be carried out on this instrument only by personnel authorised by the manufacturer. Such personnel must observe all safety precautions.

It is essential to isolate the pump control box before commencing any repair. See the Warnings section.

5 Installation

5.1 Inspection

When the equipment is unpacked, check for any delivery damage. If there is evidence of delivery damage contact Oxford Instruments.

5.2 Classification

The Pump Control Box is Class1 Equipment,

The equipment is NOT suitable for use in the presence of a flammable anaesthetic mixture with air or with oxygen or nitrous oxide.

5.3 Trip Currents

To set the trip current of the (MCU) Motor Controller Unit, the front panel of the cabinet needs to be opened. This should only be done with the 3 - phase mains inlet lead disconnected.

All the pump output ports have an individual Motor Controller Unit, whose trip limit has been set at the Factory to the values given in Table 1 (for CB1), Table 2 (for CB2) and Table 3 (for CB3). In case a pump is changed, the trip current of the MCU needs to be set to 95% of the new motor Full Load Current by screwdriver adjustment (0.1amp precision) at the front of each circuit breaker.

| Pump voltage | MCB/Motor circuit controller MS116-10A (operates between 6.3-10A) | MCB/Motor circuit controller MS116-6.3A (operates between 4-6.3A) | MCB/Motor circuit controller MS116-4A (operates between 2.5-4 A) |
|---------------------|--|--|---|
| 220 VAC, 3phase | Full load current rating of pump 9.7 A Trip current set to $0.95 \times 9.7 = \mathbf{8.7 A}$ | | |
| 380 VAC, 3phase | | Full load current rating of pump 5.6 A Trip current set to $0.95 \times 5.6 = \mathbf{5.0 A}$ | |

Table 1 Trip currents for CB1 (for He3 pump)

| Pump voltage | MCB/Motor circuit controller MS116-10A (operates between 6.3-10 A) | MCB/Motor circuit controller MS116-6.3A (operates between 4-6.3 A) | MCB/Motor circuit controller MS116-4A (operates between 2.5-4 A) |
|---------------------|---|---|---|
| 220 VAC, 3phase | Full load current rating of pump 6.3 A Trip current set to $0.95 \times 6.3 = \mathbf{5.7\ A}$ | | |
| 380 VAC, 3phase | | Full load current rating of pump 3.7 A Trip current set to $0.95 \times 3.7 = \mathbf{3.3\ A}$ | |

Table 2 Trip currents for CB2 (for ROOTS pump)

Trip currents for CB3 (He4 pump)

| Pump voltage | MCB/Motor circuit controller MS116-10A (operates between 6.3-10 A) | MCB/Motor circuit controller MS116-6.3A (operates between 4-6.3 A) | MCB/Motor circuit controller MS116-4A (operates between 2.5-4 A) |
|-----------------------|---|---|---|
| 220 VAC, single phase | | | Full load current rating of pump 4 A Trip current set to $0.95 \times 4 = \mathbf{3.8\ A}$ |

Table 3 Trip current for CB3 (for He4 pump)

5.4 Replacing Mains Fuses

Warning

High Voltage Hazard: Ensure the equipment is isolated at the external disconnection device before accessing any connection.

The mains supply is switched and fused in all three phases. The fuses are located inside the detachable cover. In case of a fuse replacement, it must be replaced with a type and value specified in the supply specification sheet for that particular part number of Pump Control Box.

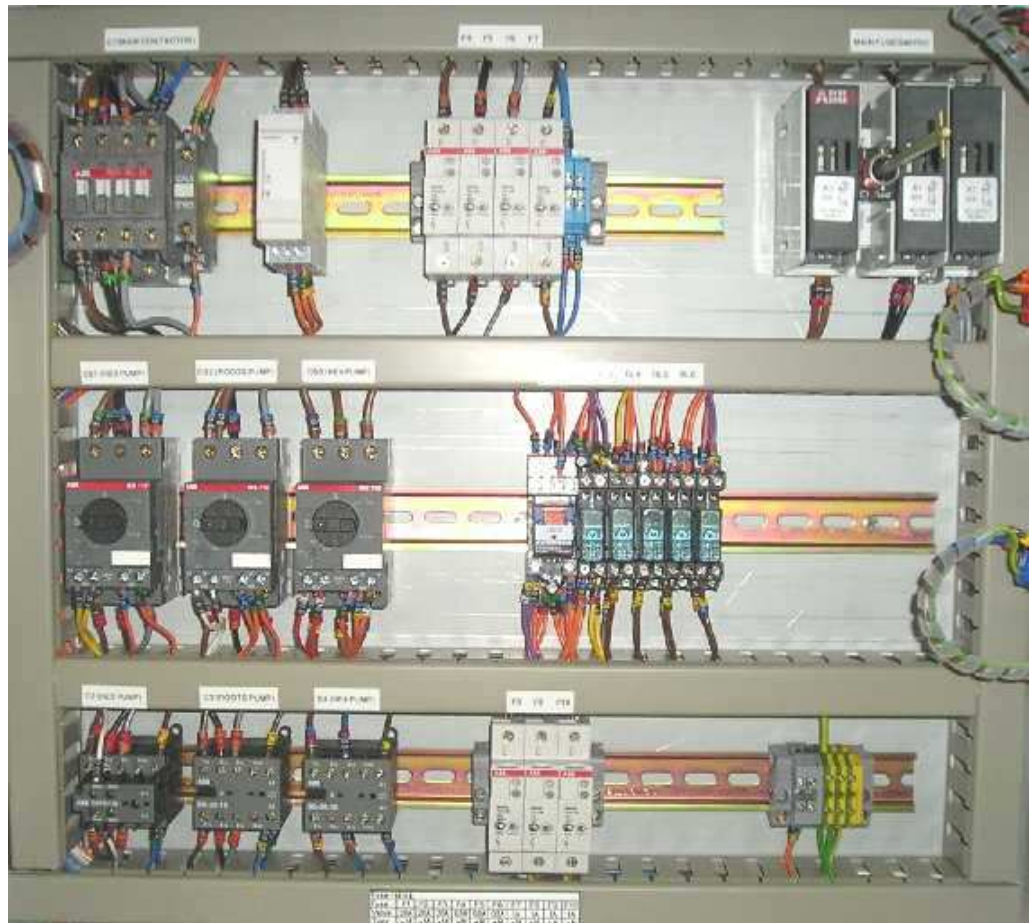


Figure 1 Inside view of Pump Control Box

5.5 Control Port

5.5.1 IGH PORT

Power for the pumps is controlled by the IGH. There is a cable, which interfaces the IGH Electronics with the Pump Control Box.

5.5.2 VSK PORT

This connection is to monitor the pressure difference between inlet and outlet vacuum port of the H3 pump. The trip pressure is normally set to 700 mbar. If the pressure exceeds the trip pressure, it stops the output power from the Pump Control Box.

5.6 Pump connection

Caution:

Ensure the He3 pump and the Roots (If supplied with the system) pumps are connected to the correct connector on the Pump Control Box.

5.6.1 Connecting the cables from Pump Control Box to He3 pump

The He3 pump is hard wired at the factory for the voltage setting of the destination country. The other end of the hard-wired cable must be connected to the Pump Control Box output port, which is assigned and marked for the He3 Pump.

5.6.2 Connecting the cables from Pump Control Box to ROOTS pump

The ROOTS pump is hard wired at the factory for the voltage setting of the destination country. The other end of the hard-wired cable must be connected to the Pump Control Box output port, which is assigned and marked for the ROOTS Pump.

5.6.3 Connecting the cables from Pump Control Box to He4 pump

The He4 pump is a single-phase pump and has a detachable mains connection. The cable must be connected to the Pump Control Box output port, which is assigned and marked for the He4 Pump.

5.7 Supply Connections

The Pump Control Box is a three-phase unit. There are four different versions of Pump Control box depending on the country and number of pumps to be driven –

To connect the Mains input to Pump control box an isolated (switched) 3 phase 4 - wire cord for 208 V, 3 PHASE with socket connector GW62016 or equivalent and 5-Wire for 415V 3 phase supply with Socket type GW 62 020 or equivalent and cable TYPE SY or better with current handling capacity of 32 Amps should be used.

| | EU 59-ZRZ3352EKIT | EU 59-ZRZ3340EKIT | USA/Canada 59-ZRZ3353EKIT | USA/Canada 59-ZRZ3343EKIT |
|--------------------------|---|---|--|--|
| INPUT VOLTAGE | 3 phase 380-420 V \pm 5% , 50 Hz 415-460 V \pm 5% , 60 Hz | 3 phase 380-420 V \pm 5% , 50 Hz 415-460 V \pm 5% , 60 Hz | 3 phase 208 V \pm 5%, 60 Hz | 3 phase 208 V \pm 5%, 60 Hz |
| MAX INPUT POWER | 4450 W | 3000 W | 4400 W | 3000 W |
| He3 pump OUTPUT | 3 phase 380-420 V \pm 5% , 50 Hz 415-460 V \pm 5% , 60 Hz 2200 W | 3 phase 380-420 V \pm 5% , 50 Hz 415-460 V \pm 5% , 60 Hz 2200 W | 3 phase 208 V \pm 5%, 60 Hz 2200 W | 3 phase 208 V \pm 5%, 60 Hz 2200 W |
| ROOTS pump OUTPUT | 3 phase 380-420 V \pm 5% , 50 Hz 415-460 V \pm 5% , 60 Hz 1500 W | NO ROOTS pump O/P PORT | 3 phase 208 V \pm 5%, 60 Hz 1500 W | NO ROOTS pump O/P PORT |

| | EU 59-ZRZ3352EKIT | EU 59-ZRZ3340EKIT | USA/Canada 59-ZRZ3353EKIT | USA/Canada 59-ZRZ3343EKIT |
|-----------------------------|---|--|--|---|
| He4 pump OUTPUT | Single phase 220 V ± 5%, 50/60 Hz 550 W | Single phase 220 V ± 5%, 50/60 Hz 550 W | Single phase 208 V ± 5%, 60 Hz 550 W | Single phase 208 V ± 5%, 60 Hz 550 W |
| INTERNAL FUSE TYPE | aM | aM | Class CC Type with rejection type fuse holder | Class CC Type with rejection type fuse holder |
| INTERNAL FUSE RATING | F1-F3 T 20AH 500 VAC F4-F6 T 0.5AH 500 VAC F7-F10 T 1AH 500 VAC | F1-F3 T 20AH 500 VAC F4-F6 T 0.5AH 500 VAC F7-F9 T 1AH 500 VAC | F1-F3 T 32AH 600 VAC F4-F6 T 0.5AH 600 VAC F7-F14 T 1AH 600 VAC F15-17 T 20AH 600 VAC F18-20 T 15AH 600 VAC F21-22 T 15AH 600 VAC | F1-F3 T 32AH 600 VAC F4-F6 T 0.5AH 600 VAC F7-F12 T 1AH 600 VAC F13-15 T 20AH 600 VAC F16-17 T 15AH 600 VAC |

Table 4 Fuse types and ratings

5.8 Environment

The following operating environment conditions must be observed;

| | |
|------------------------|---------------------------------|
| Maximum magnetic field | 50 Gauss |
| Ambient temperature | 18 to 30 °C |
| Atmospheric pressure | 700 to 1060 mbar (10 to 15 psi) |
| Relative humidity | 30% to 75% non- condensing |

5.9 Handling and storage including transport

The module may be stored for up to 15 weeks in a storage environment as follows;

| | |
|----------------------|------------------------------|
| Ambient temperature | -20 to 55 °C |
| Relative humidity | 30% to 75% (non- condensing) |
| Atmospheric pressure | 700 to 1060 mbar |

If storage is for less than 3 days then the following environmental restrictions apply;

| | |
|----------------------|------------------------------|
| Ambient temperature | -40 to 55 °C |
| Relative humidity | 30% to 75% (non- condensing) |
| Atmospheric pressure | 700 to 1060 mbar |

Marking for packaging and handling complies with international standards ISO 780/BS2770.

5.10 Maintenance

Preventive maintenance

Warning

Access within the equipment and removal of connecting cables is restricted to suitably skilled and competent persons. See WARNINGS and CAUTIONS.

Maintenance interval

If the Instrument fails to operate correctly contact the Oxford Instruments service department.

5.11 Cleaning

External cleaning

Interval between cleaning is as required by appearance.

Warning

Ensure that the AC supply to the equipment is isolated at the external disconnect device before cleaning. See WARNINGS and CAUTIONS.

To remove surface dust and light markings, the equipment may be wiped down using lint free cloth, barely moistened with clean water. For removal of heavy marks, the use of a proprietary aerosol foaming cleaner is permissible. Test carefully on a small inconspicuous area to ensure that the product does not damage the surface finish.

5.12 Connections

Warning

High Voltage Hazard. Ensure that the AC supply to the equipment is isolated at the external disconnect device before accessing any connection.

Check all cables and connections to the equipment for mechanical security and ensure all covers are securely fixed in place.

5.13 Mains cord selection

Mains supply cord shall be rated for the maximum current for the equipment and the cable used shall meet the requirements of IEC227 or IEC245, mains cords certified or approved by any recognised national test house are regarded as meeting this requirement.

Green/Yellow covered conductors shall be used only for connection to protective conductor terminals.

5.14 Mounting instruction

The equipment is designed to be placed on the floor near to the pumps. Ensure the cables are held in a safe position and do not present trip hazard to personnel.

6 Operation of the Instrument

6.1 Description of the Instrument

The equipment monitors the phase sequence and voltage level of the 3 phase input. If the mains input has a wrong phase sequence, or the input phase to phase voltage goes down 85% of other phase to phase voltage, it trips the 3 phase output.

The equipment protects the pumps in case of an overload from stalling or short circuit.

6.2 Pre- start checks

Please ensure the vacuum pump oil levels are correct and all the pump connectors have been correctly connected to Pump control box.



Figure 2 Front view of Pump Control Box

6.3 Pump Turn on Sequence and Lamp status

Check all cables are connected properly, then switch on the main 3-phase electrical supply to the equipment. If the IGH is powered the DC ON will turn on. The mains fail lamp will turn on and the over pressure lamp will also turn on. Press the Mains ON and Reset switch to reset all the interlocks, should the over pressure lamp still continue to be on set the potentiometer on the gauge of He3 pump until it turns off. Now the pumps are ready to be operated by the IGH Electronics.

Should any of the Manual circuit breaker (CB1 or CB2 OR CB3) set to less than 95% of full load current of pump it might trip and corresponding lamp would turn on. Turn off the Pump control box, disconnect the mains input to pump control box, open the front panel and check the trip current setting of Manual circuit breaker (CB1 or CB2 OR CB3) and set it to 95% of full load current of pump. Close the front panel, reconnect the mains input, and Press the Mains ON and Reset switch

6.4 Pump Turn Off Sequence

In order to manually turn off the pumps, follow this sequence using the front panel of the IGH Electronics Unit

1. SWITCH OFF ROOTS pump
2. SWITCH OFF He3 pump
3. SWITCH OFF He4 pump

7 Oxford Instruments part numbers for fuses and circuit diagrams

| Description | Part number |
|---|-------------|
| Pump Control Box Wiring Diagram - 3 Port – EU Version | ZRZ3352 |
| FUSE, T 1AH 500VAC aM TYPE, CE APPROVED | 59-EFF2410 |
| FUSE T 20AH 500VAC aM TYPE, CE APPROVED | 59-EFF4320 |
| FUSE T0.5AH 500VAC aM TYPE, CE | 59-EFF2405 |
| IEC SOCKET REWIRABLE | 59-EPP6003 |

| | |
|---|------------|
| Pump Control Box Wiring Diagram - 2 Port – EU Version | ZRZ3340 |
| FUSE, T 1AH 500 VAC aM TYPE, CE APPROVED | 59-EFF2410 |
| FUSE T 20AH 500 VAC aM TYPE, CE APPROVED | 59-EFF4320 |
| FUSE T0.5AH 500 VAC aM TYPE, CE | 59-EFF2405 |
| IEC SOCKET REWIRABLE | 59-EPP6003 |

| | |
|---|------------|
| Pump Control Box Wiring Diagram - 3 Port – USA/Canada | ZRZ3353 |
| FUSE T 32AH 600 VAC CC TYPE CSA Approved | 59-EFF4332 |
| FUSE CC TYPE T20AH600 VAC CSA Approved | 59-EFF6200 |
| FUSE CC TYPE T15AH600 VAC CSA Approved | 59-EFF6150 |
| FUSE CC TYPE T 0.5AH600 VAC CSA Approved | 59-EFF6005 |
| FUSE CC TYPE T 1AH600 VAC CSA Approved | 59-EFF6010 |
| IEC SOCKET REWIRABLE | 59-EPP6003 |

| | |
|---|------------|
| Pump Control Box Wiring Diagram - 2 Port - USA/Canada Version | ZRZ3343 |
| FUSE T 32AH 600 VAC CC TYPE CSA Approved | 59-EFF4332 |
| FUSE CC TYPE T20AH600 VAC CSA Approved | 59-EFF6200 |
| FUSE CC TYPE T15AH600 VAC CSA Approved | 59-EFF6150 |
| FUSE CC TYPE T 0.5AH600 VAC CSA Approved | 59-EFF6005 |
| FUSE CC TYPE T 1AH600 VAC CSA Approved | 59-EFF6010 |
| IEC SOCKET REWIRABLE | 59-EPP6003 |