

Operation and Maintenance Manual Water Heater Electric - WHE-3 With Remote Panel

| | |
|------------------|--------------------------|
| Part Number: | KI40018 AA, AB and AC |
| Document Number: | KI-OM-0591 |
| Revision: | 3 |

TABLE OF CONTENTS

| | Page |
|---|------|
| Table Of Contents | |
| Approval Sheet | |
| Danger, Warning and Caution | |
| | |
| 1 Introduction | 1 |
| 1.1 Basic Description | 1 |
| 1.2 Specifications | 1 |
| 1.3 Theory of Operation | 2 |
| 1.4 Electrical System Overview | 4 |
| 1.5 Heater System and Heater Selection | 5 |
| 1.6 Control System | 5 |
| | |
| 2 Installation | 9 |
| 2.1 General Mounting and Unit Placement | 9 |
| 2.2 Fluid Connections | 9 |
| 2.3 Electrical Installation | 10 |
| 2.4 Initial System Check | 10 |
| 2.5 Start Up and Function Check – Local Control | 11 |
| 2.6 Start Up and Function Check – Remote Control | 13 |
| | |
| 3 Operations | 14 |
| 3.1 General | 14 |
| 3.2 Heating Requirement | 14 |
| 3.3 Operator Controls | 17 |
| 3.4 Operating Start-Up Procedure | 18 |
| 3.5 Shutdown Procedure | 19 |
| 3.6 Drain System | 19 |
| | |
| 4 Maintenance | 20 |
| 4.1 Routine Maintenance | 20 |
| 4.2 Periodic Maintenance | 20 |
| 4.3 Pump Maintenance | 20 |
| 4.4 Pump Specifications | 21 |
| | |
| 5 Troubleshooting | 22 |
| 5.1 Pump Specific Fault Diagnosis and Maintenance | 22 |
| 5.2 General Troubleshooting Chart | 24 |

| | | |
|----------|----------------------------------|----|
| 6 | Part Identification | 29 |
| 6.1 | Hoses | 33 |
| 6.2 | Spare Parts List | 35 |

Appendix A Temperature Controller Parameter Settings

Appendix B Manufacturer Related Documents

Appendix C System Drawings

APPROVAL SHEET

Document Information

| Advitium No | Title | Classification | Rev | Date |
|-------------|---|-----------------------------|-----|------------|
| KI-OM-0591 | Operation & Maintenance Manual Water Heater Electric - WHE-3 | Commercial in Confidence | 3 | 05/09/2017 |

Revision History

| Rev | Date | BY | CHK | APP | Comments |
|-----|------------|--------------|-----------------|--------------|--------------|
| 0 | 23/02/2011 | Roy Carli | Nick Maske | Nick Maske | First Issue |
| 1 | 12/07/2011 | Roy Carli | Nick Maske | Nick Maske | ECN: CT00312 |
| 2 | 26/10/2012 | Debbie Allen | Vladimir Garzón | Mark Stevens | ECN: 14885 |
| 3 | 05/09/2017 | JR Cusson | A. Bennett | P. Black | ECN: 21209 |

Revision 3 Implemented

| Responsibility | Name | Position |
|----------------|------------|----------------------------|
| By | JR Cusson | Technical Author |
| Checked | A. Bennett | Mechanical Engineer |
| Approved | P. Black | Senior Mechanical Engineer |

Copyright Details

© 2017 JFD

Copyright of this document is the property of JFD and it may not be copied, used or otherwise disclosed in whole or in part except with prior written permission from JFD or, if this document has been furnished under a contract with another party, as expressly authorised under that contract.

Disclaimer

Whilst every effort has been made to ensure the information within this document is correct at the time of publication, JFD Ltd reserves the right to make changes without notification. Users are recommended to visit www.jfdglobal.com for the most up-to-date versions of manuals.

Review

This document is subject to review and revision in accordance with ISO 9001.

Intentionally blank

DANGER, WARNING AND CAUTION

Danger, Warnings, Cautions and Notes where used within this manual are placed prior to the text to which they are pertinent. Their uses are as follows;



DANGER

INFORMS THE READER OF AN OPERATION OR CONDITION WHICH MAY INVOLVE RISK TO LIFE.



WARNING

INFORMS THE READER OF AN OPERATION OR STATE WITH POTENTIAL FOR PERSONNEL INJURY.



CAUTION

Informes the reader of an operation or state with potential for damage to equipment.

Note *Informes the user of additional information for clarification or to assist with an operation.*

Intentionally blank

1 Introduction

The JFD Electric Powered Water Heating Unit, (WHE-3), has been designed and manufactured for use in professional diving systems. The WHE-3 with Remote Control additionally allows the remote fine control of the outlet water temperature. It allows operator manipulation of the temperature set point on the WHE-3 unit from a remote location, usually dive control, through the use of a remote control panel hard wired to the main WHE-3 unit.

The system will control the heating of seawater within an inlet-to-outlet temperature rise range of 0 to 50°C (32 to 122°F) with fine selectable remote control. The system incorporates a positive displacement pump, electric heaters and all electrical controls necessary to provide a complete water heating system for deep diving.

1.1 Basic Description

The WHE-3 assembly is comprised of a motor, pump, heater tank, pipe work and control panel. These components are mounted into a robust stainless steel frame. The system requires a constant supply of seawater and runs from a 440, 3 phase, 60 Hz or 380, 3 phase, 50 Hz power supply. The output is heated seawater at pressures up to 68 bar and 45 litres/min.

The remote control panel of the WHE-3 is a 19" rack-mounted face plate comprising the following:

- Fine Temperature Control Potentiometer
- Water Outlet Temperature Display
- Pump Run Indication
- General Fault Indication
- Emergency Stop Push Button

The remote control panel is supplied with the remote controlled WHE-3 unit as standard, however a remote panel may be fitted to a standard WHE-3 with minimal modifications.

Note *The temperature controller used in a remote controlled version of the WHE-3 differs to that of a standard WHE-3. The remote version makes use of a controller with control set point input and a retransmission module to accommodate the integration of the remote control panel.*

1.2 Specifications

| | | |
|--------------------------------|--------|---|
| Shipping Weight | | 590 kg |
| Dry Weight | | 460 kg |
| Power Requirements | AA, AC | 440 VAC, 3 phase, 60 Hz, 180 kW, 240 to 260 A |
| | AB | 380 VAC, 3 phase, 50 Hz, 180 kW, 260 to 280 A |
| Input Fluid | | Fresh Water or Seawater |
| Input Pressure | | 3 to 10 bar |
| Input Flow | | 45 litres/min minimum |
| Output Pressure | | Up to 68 bar |
| Output Flow | | Up to 45 litres/min |
| Temperature Rise Control Range | | 0 to 50°C (32 to 122°F) |

Temperature Control $\pm 1^{\circ}\text{C}$ ($\pm 2^{\circ}\text{F}$)

1.3 Theory of Operation

1.3.1 Basic Control

The temperature control system of the WHE-3 has been designed to be simple and effective. The unit heats water in the heater tank using five banks of heater elements. These heater banks are controlled with five switches, mounted on the electrical enclosure. The banks of heaters are configured to deliver a variety of heating capacities depending on the combination of banks selected. When all five heater circuits are on, the total rated heater output is approximately 180 kW. The appropriate heater circuits must be selected manually according to the relative temperature rise required. A schedule is attached to the front of the control panel door indicating the heater banks to be used for the required temperature rise.

Example: Temperature rise through the WHE and heater bank selection.

| | | |
|-----|---|---|
| Td | Required outlet water temperature, at diver | 43°C |
| TΔh | Temperature drop (Hose from deck to diver) | 11°C |
| Ti | WHE Inlet water temperature is | 5°C |
| To | WHE desired outlet water temperature | Td + TΔh = 43 + 11°C = 54°C |
| ΔT | Temperature rise through the WHE | To - Ti = 54 - 5°C = 49°C (Use heater banks 1, 2, 3, 4 and 5) |

The above example shows that if a bottom temperature of 43°C is required with a temperature drop through the hose to the diver of 11°C and an inlet water temperature of 5°C. The temperature required at the outlet of the WHE would be 54°C. The Temperature rise through the unit would be 49°C. The heater selection schedule shown in Table 3, indicates that heater banks 1 through to 5 should be used as this would provide a temperature rise of 47 - 50°C through the unit.

Once the correct configuration of heater banks has been selected, the temperature controller regulates the temperature of the outlet by adjusting the flow rate of water passing through the heater tank. This is achieved by controlling the electric actuator on the bypass valve. The valve is connected in such a way that it will dump water overboard to increase the flow rate through the heater tank. A higher flow rate through the heater reduces effective temperature rise and maintains the desired set point temperature. The temperature controller monitors temperature at the fluid outlet manifold using a PT100 temperature sensor and adjusts the temperature control valve position to achieve the set point temperature.

Switching the temperature controller input from local to remote input allows fine control of the outlet temperature by adjustment of the potentiometer on the remote control panel. Manipulation of the potentiometer will change the set point of the temperature controller. Refer to the temperature controller manual in Appendix B for instructions regarding switching between local and remote temperature set-point adjustment.

Notes 1 *The calculated required temperature rise may be indicated on the heater bank selection table as a maximum for one configuration and a minimum on the subsequent selection of heater banks. In this case practical application will dictate*

which configuration should be used. The higher capacity configuration is usually used to allow for better control.

- 2** *If the bypass dump valve remains fully open during normal operation, indicating heating over-capacity then the lower kW heater configuration should be used to improve control and unit performance.*
- 3** *If the bypass valve remains fully closed during normal operation, indicating heating under-capacity or a possible heater bank fault then a higher kW configuration should be used to improve control.*

1.3.2 Fluid System

The WHE-3 may function with either salt water or fresh water as the heating medium. The unit is provided with two inlets for fluid, one for fresh water and one for seawater. The fresh water line is typically used for flushing the system after use. The freshwater line is fitted with a check valve to prevent salt water contamination of the fresh water supply. The unit uses small immersion heater elements mounted in the flange plates at either end of the stainless steel heater tank to heat the fluid. The flow rate of the fluid through the heating tank is governed by the action of the bypass valve.

Note *Fluid supply to the unit by the vessel must be maintained above 45 litres/min at 3 bar for correct operation.*

The flow rate of fluid from the heater tank to the divers is determined by the motor speed and the ratio of the pulley set used to couple the motor to the pump. The pump is a positive displacement pump and is supplied with a pulley arrangement to provide a flow rate of 45 litres/min.

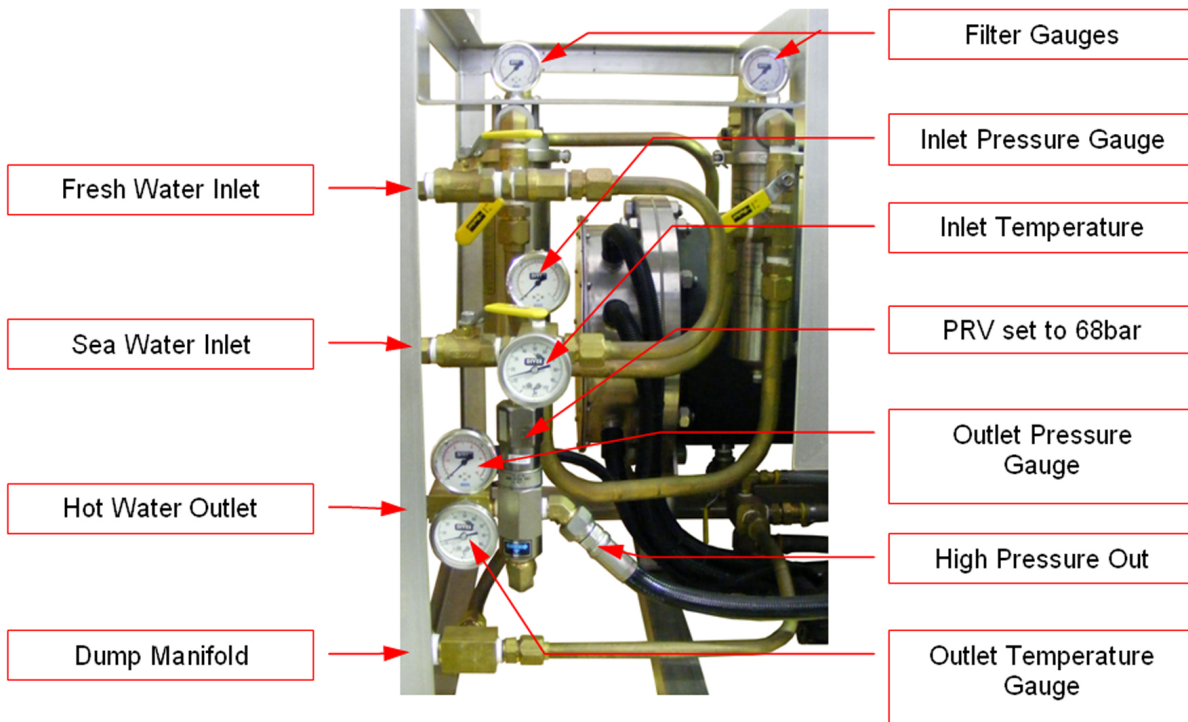
The fluid to be heated enters the unit at the chosen inlet and flows through a manifold and a quarter-turn hand valve. The manifold is equipped with analogue temperature and pressure gauges to provide operator feedback on the fluid supply. The fluid is then piped to the fresh water inlet tee and distributed to two separate inlet filters. The filters may be isolated using hand valves on the inlet and outlet of each filter. These filters clean input water of particulate matter down to 50 µm in order to protect the piston pump and umbilical coupling from being damaged and prevent clogging of the heating water tubes in the diver suits. The inlet filters are each fitted with pressure gauges in order to monitor pressure drop across the filter and indicate the condition of the filter cartridge. A pressure regulating valve fitted after each filter outlet ensures that fluid is supplied from filters to heater tank at a consistent and safe pressure, (Factory setting is 2 bar).

The fluid flows through the heater tank which houses immersion heater elements where fluid is heated. The heater tank is fitted with a pressure relief valve (PRV), set to 2.5 bar. A float switch housed in the level control tank mounted on top of the heater tank is used to ensure the heater elements and pump are not run without sufficient supply. If the level in the tank drops the level switch shuts down the system. From the level control tank, the fluid is distributed to the temperature control valve, manual temperature control valve and pump. The manual control valve controls the process in the same way as automatic control valve and is provided to control the outlet temperature if automatic control is inactive. The pump supply is directly coupled to the level control tank.

The pump is a positive displacement pump and provides consistent supply flow rate. An accumulator is fitted to reduce the effect of pulsation caused by the pump. The fluid from the pump flows through a flexible reinforced hose to a pressure relief valve which may be set between 7 - 70 bar and is sufficiently sized to allow full flow bypass if a downstream blockage occurs. During normal operation, the fluid flows to the outlet via the outlet manifold. The outlet manifold is fitted with both pressure and temperature gauges to provide operator feedback.

A complete flow diagram is provided in Appendix C.

Figure 1 WHE-3 Gauge identification



1.4 Electrical System Overview

The WHE-3 electrical system comprises a 380 or 440 VAC power circuit and a 24 VDC control circuit. The power circuit is the electrical supply for the heaters, pump motor and DC power supply unit. The control circuit provides power supply to all control, indication and safety circuits.

WARNING

HIGH VOLTAGE – HIGH CURRENT

THIS IS A HIGH VOLTAGE / HIGH CURRENT SYSTEM AND ONLY TRAINED, COMPETENT PERSONNEL SHOULD ATTEND TO INSTALLATION, SERVICE AND MAINTENANCE REQUIREMENTS. ALL RELEVANT SAFETY PROCEDURES MUST BE FOLLOWED.

The remote control panel requires cable connection to the WHE-3 unit and these connections are detailed in the electrical drawings provided in Appendix C.

The WHE-3 main panel and remote control panel are operated with a 24 VDC control system. Ideally this should be supplied directly from the WHE-3 unit, however it may utilize an independent supply if required. Terminals are provided on the remote panel and in the WHE-3 main panel to facilitate installation and faultfinding.

1.5 Heater System and Heater Selection

The heaters are arranged into heater banks comprised of groups of heater elements. Each heater bank is controlled by a switch mounted in the control panel. The switch supplies 24V to the coil of the contactor/s of the relevant bank. The following table shows the control structure of the heater banks and the composition of the heater groups.

Table 1 Heater Component Identification

| Bank No. | Switch No. | Element Grouping No. | Element Grouping Composition | Circuit Breaker ID | Contactor ID | Element Grouping kW | Total Bank kW |
|----------|------------|----------------------|------------------------------|--------------------|--------------|---------------------|---------------|
| 1 | 1 | Heater H1.1 | 3 x 4.5 kW Elements | MCB3 | C2 | 13.5 | 13.5 |
| 2 | 2 | Heater H2.1 | 3 x 4.5 kW Elements | MCB4 | C3 | 13.5 | 27.0 |
| | | Heater H2.2 | 3 x 4.5 kW Elements | MCB5 | C4 | 13.5 | |
| 3 | 3 | Heater H3.1 | 3 x 4.0 kW Elements | MCB6 | C5 | 25.5 | 39.0 |
| | | Heater H3.2 | 3 x 4.5 kW Elements | | | | |
| | | Heater H3.3 | 3 x 4.5 kW Elements | MCB7 | C6 | 13.5 | |
| 4 | 4 | Heater H4.1 | 3 x 4.0 kW Elements | MCB | C7 | 25.5 | 49.5 |
| | | Heater H4.2 | 3 x 4.5 kW Elements | | | | |
| | | Heater H4.3 | 3 x 4.0 kW Elements | MCB | C8 | 24.0 | |
| | | Heater H4.4 | 3 x 4.0 kW Elements | | | | |
| 5 | 5 | Heater H5.1 | 3 x 4.0 kW Elements | MCB10 | C9 | 24.0 | 48.0 |
| | | Heater H5.2 | 3 x 4.0 kW Elements | | | | |
| | | Heater H5.3 | 3 x 4.0 kW Elements | MCB11 | C10 | 24.0 | |
| | | Heater H5.4 | 3 x 4.0 kW Elements | | | | |

Note *The total heater bank capacity is the combined capacity of the related element grouping. (e.g. Heater bank 5 = Heaters H5.1, H5.2, H5.3 & H5.4 = 24 kW + 24 kW = 48 kW)*

The grouping of heater elements into banks allows the sequential switching of the banks, reducing the instantaneous load on the power supply. Additionally, as heater banks have separate control circuits and protection, the failure of any single bank of heaters will not affect the operation of the other banks.

1.6 Control System

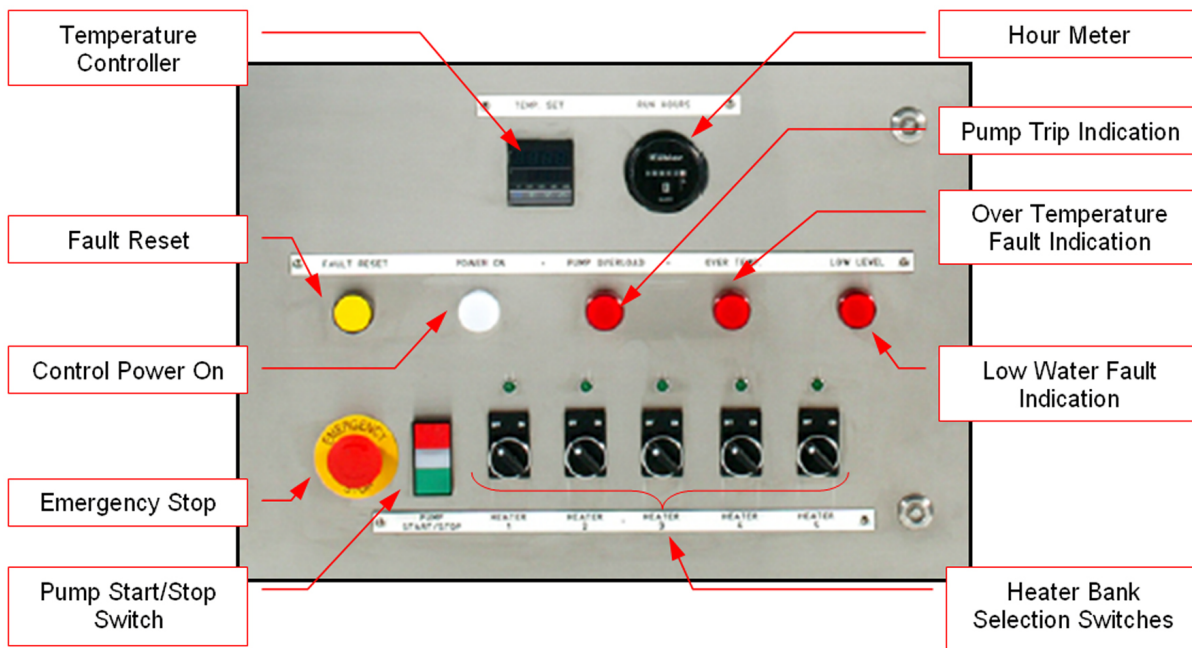
The 24 VDC control circuit is used to control the contactors, relays, timer and the safety circuits in the system. The contactors, controlled by switches mounted in the control panel door, switch the high voltage to the heaters and the pump.

The temperature of the output fluid is regulated by dumping excess capacity thereby increasing the flow rate of fluid through the heater tank and lowering the output temperature

of the fluid outlet. The amount of fluid dumped is controlled by an electronic controller that operates the actuator on the control valve. The amount to which the valve is opened is determined by the controller based on feedback received from the PT100 temperature probe mounted into the outlet manifold.

Several safety interlocks are incorporated into the control system which provide protection against low fluid level in the heater tank, over-temperature and motor overload. The control circuit also includes indication via LED's and the controller display for operator feedback. The power and control system wiring diagrams are detailed in the electrical schematics in Appendix C. Refer to Table 2 and Figure 2 below for the control panel layout and part identification.

Figure 2 Control Panel Layout



The following table identifies the major control components, and outlines their function within the control circuit. (Refer to wiring diagrams in Appendix C for full wiring details).

Table 2 Control component identification

| Component | Component ID | Function Description |
|-------------------------------|--------------|---|
| Contactors 1 | C1 | Pump contactor coil |
| Contactors 2-10 | C2-C10 | Heater contactor coils |
| Hour Meter | H1 | The hour meter records the running hours of the pump and is wired through the auxiliary contact on the pump contactor C1/1. |
| Run Light (Green) Motor On | L1 | Local indication that the pump motor contactor is operational and power is supplied to heater switches. Wired to the normally open contact of the start switch S2NO and the auxiliary C1/1 of the motor contactor C1. |

| Component | Component ID | Function Description |
|---|--------------|---|
| Run Light (Green) Motor On | L2 | Remote indication that the pump motor contactor is operational and power is supplied to heater switches. Wired to the normally open contact of the start switch S2NO and the auxiliary C1/1 of the motor contactor C1. |
| Run Light (Green) Heater Bank On | L3-L7 | Lamp indication of heater bank power on. |
| Fault Light (Red) Pump Overload | L8 | Lamp indicating pump fault/overload trip. Wired to contact R5/1 of relay R5. |
| Fault Light (Red) Over Temperature | L9 | Lamp indication of system over temperature fault wired to the relay contact R1/2 of relay R1. |
| Fault Light (Red) Low Level | L10 | Lamp indicating low water level fault. This fault is linked to the contact R2/2 of the low level relay R2. |
| Power On (White) Indication | L11 | Lamp indicating 24 VDC power to control circuit from the 24V power supply. |
| Fuse Transformer Supply | F1 & F2 | Fuses for short circuit protection or overload of the supply to the power supply unit. |
| Fuse Control Circuit | F3 & F4 | Fuse for short circuit protection or overload of the supply from the power supply unit to the control circuit. |
| Pump Overload | O/L1 | This overload trips if the pump draws excessive current. The normally open contact of the overload supplies the pump run indication. The normally closed contact of the overload is used in the safety circuit. |
| Fault Relay Over Temperature | R1 | Fault relay de-energizes during fault when the over temperature relay R3 or the thermostat contacts are open. The over temperature relay is interlocked with its normally open R1/3 contact. |
| Fault Relay Low Water Level | R2 | The fault relay de-energizes during fault when the normally closed contact on the float level de-bounce timer is open. The timer is triggered by the normally closed contact of the float switch. This arrangement is used to reduce nuisance faults attributed to level switch vibration or bouncing. The normally open contact R2/1 is used in the safety circuit to remove power from the pump and heaters during fault. The normally open contact R2/3 is used to interlock the relay. To reset the fault circuit, the fault reset push button must be pressed. |
| Fault Relay (controller) Over Temperature | R3 | This relay is activated by the controller output. The normally closed contact R3/1 of the relay is used in the over-temperature relay R1 circuit. |

| Component | Component ID | Function Description |
|--|--------------|--|
| Switch Push Button Motor Start/Stop | S2 | This switch is used to make and break the circuit to the motor contactor and the heater selection switches. This is the main start/stop switch for the unit. |
| Switch Rotary 2p Heater Selection | S3-S7 | The heater ON/OFF switches control the switching of power to the coils of the respective heater contactors |
| Switch Fault Reset | S8 | The fault reset switch unlatches the over-temperature and low level fault interlocks and allows normal function. |
| Switch Mushroom Emergency Stop | S9 | This switch contact de-energizes the motor and heater control circuits. The pump and heaters are switched off but the controller and safety circuits remain energized. |
| Switch Float | S10 | The float switch mounted in the level control tank is used to prevent the system function if the water level in the heater tank is low. The contact is used to activate the de-bounce timer. |
| Timer | T1 | The de-bounce timer is used to eliminate nuisance faults due to the bouncing of the float switch in the level control tank. The normally closed contact T1 is used to de-energize the low level relay R2. Timer is factory set to 2 seconds. |

2 Installation

2.1 General Mounting and Unit Placement

The Electric Powered Hot Water Heating Module, WHE-3, is built into a robust stainless steel frame, which ensures that all the required systems and controls can be securely mounted inside a single convenient assembly. The unit should be securely mounted in an area that is protected from environmental elements. The unit mounting should allow free access on three sides of at least 0.6 to 1 m for service and maintenance. The WHE-3 remote control panel is fabricated using 316 stainless steel and designed to fit into a standard 19" rack mounting arrangement. The remote control is to be connected to the WHE-3 via a multi-core shielded cable.

2.2 Fluid Connections

The WHE-3 requires both salt and fresh water supply with a minimum flow rate of 45 ltr/min at 3 bar. The recommended minimum tubing size is 1". The fluid input connections are made by attaching the 1" pipes to the relative 3/4" NPT penetrator of the unit. Flexible hoses with suitable connections may also be used to facilitate the integration of the unit into an installation. The maximum acceptable water inlet pressure is 10 bar.

The WHE-3 outlet is a 3/4" NPT stainless steel penetrator. This may supply a valve manifold or a single pipe connection depending on the installation requirements. The plumbing used should be capable of withstanding the maximum working pressure of 68 bar. All valves, fittings, tubing and manifolds connected to the hot water system must be capable of working at this pressure. If the system is not required to deliver this pressure, the internal relief valve may be set to a lower setting, and all the attached hot water delivery plumbing may be selected to suit this reduced pressure.

A 1" (minimum) pipe must be connected to the overboard dump fitting allowing unrestricted flow of bypass and dumped fluid from the unit.

WARNING

DUMP LINE BLOCKAGE
TO ENSURE SAFE OPERATION OF THE UNIT THE DUMP LINE MUST ALWAYS BE OPEN. SHUTTING OFF THE DUMP LINE WILL COMPROMISE THE SYSTEM SAFETY AND COULD LEAD TO SEVERE INJURY.

The 1" dump line may be connected to any water dump system that has minimal back pressure. The volume of water being dumped during manual and/or automatic control may vary from 0 to approximately 15 ltr/min. When the pump relief valve vents, this vented flow is added to the temperature control bypass flow that is flowing through the overboard dump. In the event of full restriction of the pump output line the total dumped flow through the dump line could reach 60 ltr/min.

CAUTION

DUMP LINE RESTRICTION

To ensure correct machine operation, the dump line should never restrict flow of dumped water.

2.3 Electrical Installation

The electrical requirements of the system are:

| Variant | Requirements |
|---------|------------------------------|
| AA, AC | 440 VAC \pm 20 V and 60 Hz |
| AB | 380 VAC \pm 20 V and 50 Hz |

CAUTION

ELECTRICAL SUPPLY FREQUENCY

A 380 V supply at 60 Hz may cause damage to the skid. A 440 V supply at 50 Hz whilst not causing damage, will reduce heating capacity.

The power supply cable installed should be capable of handling 315 A as the unit is fitted with a 315 A isolator. Supply cable should be a suitably rated armoured cable, to an approved marine standard specification.

The mains power input to the system should be fitted to the bottom right hand side of the stainless steel electrical enclosure. The mains power cable should be installed through a suitable gland and correctly grounded to the armour. Mains cable connections to the isolator terminals must be tightened and checked.

DANGER

POWER CONNECTION

ENSURE THAT THE POWER SUPPLY IS TURNED OFF BEFORE CONNECTING ANY WIRING

After the mains power cable is installed, check for acceptable grounding and continuity. Do not start up the system until these tests have been conducted.

2.4 Initial System Check

The following initial system checks should be conducted to ensure that the WHE-3 and remote control panel are in good working order and the unit is correctly set up for operation.

2.4.1 Fluid System Priming Procedure

After the electrical and pipe work installations have been completed, purge the piping system of air in order for the pumps to function properly and for the electric heater elements to be fully immersed.

CAUTION

LOW WATER LEVEL OPERATION

The equipment may be severely damaged if heaters are supplied with power when there is no water in the system.

Use the following procedure to correctly prime the system:

- 1 Open the salt or fresh water input valve slightly to allow water to flow into the system. Water supply should be at sufficient pressure (3 bar minimum).
- 2 Check that all the ball valves on the filters are open.
- 3 With the vent valve on top of the level control tank open, leave the water supply on until water flows out of the vent tube.
- 4 Close the vent valve and wait for water to flow through the pump and out of the HP water outlet fitting.
- 5 Allow the water to run for 5 to 10 minutes in this mode.
- 6 Confirm that the heater tank is full by opening the tank vent valve to purge any residual bubbles in the heater tank.
- 7 To complete priming shut the vent valve and supply valve(s).

2.5 Start Up and Function Check – Local Control

After installation is complete the WHE-3 must be thoroughly checked prior to being put into service. The following procedure outlines the steps used in conducting a comprehensive start-up and functional check. Ensure that the controller is set in local control mode and carry out all local control checks before commencing remote control checks. Refer to the temperature controller manual in Appendix B for detail on how to switch between remote and local operation switching.

- 1 Power Supply - Turn on the mains power to the unit. Input power must be as defined at Paragraph 2.3.

CAUTION

FAULT INDICATION

The system will be prevented from being started if faults are indicated. Press the fault reset button to clear any fault indication.

If fault indication is not reset or the fault recurs refer to troubleshooting for corrective action.

- 2 Pump Oil Level - Check the oil level in the pump crankcase (level with dot on sight glass).
- 3 Pump Rotation - To check the rotational direction of the motor push the start button and then stop button. This will momentarily power the pump motor. Confirm the correct rotation of the pump as indicated by the rotation arrows on the both sides of the pump. Pulley rotation should be anti-clockwise when viewed from the control panel side of the unit. Incorrect rotation may be solved by interchanging any two phases of the supply to the motor.
- 4 Controller Setup and check - To power up the controller ensure that the main isolator and all the circuit breakers are switched on. Check the controller settings before function testing. The controller display indicates the Measured Value (PV), Set Value (SV) and run indication for the Auto tuning (AT), Output 1 and 2 (OUT1, OUT2) and Alarm 1 and 2 (ALM1, ALM2). The display is used during setting to show parameters and functions.
- 5 Changing Set Point – In local mode the set point is changed using the controller interface by pressing the “Set” key to enter the SV Setting Mode and modify SV (set point) value. Change the controller set point, using the <R/S key to select the digit to be changed and the arrow keys to change the digit. (Determine the required outlet temperature from section 3.1).
- 6 Parameter Setting Mode - Refer to the controller manual in Appendix B for parameter detail, selection and operation.
- 7 Fill Umbilical – Connect umbilical to HP water outlet port and open the salt water inlet valve. Allow water to flow through the system until it flows out of the umbilical. Salt water or fresh water may be used depending upon which is available.
- 8 Pump Motor Start - Push the pump Start button, the pump will start running and system pressure will rise to balance the pressure drop down the length of umbilical. The flow rate will be approximately 45 lit/min.
- 9 Pump Flow Rate - The pump is a positive displacement type and the flow rate may only be limited by an under-supply of water to the pump. To check flow rate, use an inline flow meter on the outlet or collect the water from the output in a container of known volume and measure the time it takes to fill this know volume.
- 10 Heater Bank Selection - Determine the temperature rise required through the unit to provide the correct temperature of fluid at the user. Use the heater selection table, (see Table 3.1), mounted on the panel door to determine which heater banks should be used to achieve calculated temperature rise. Switch on the required heater bank switches sequentially. Refer to trouble shooting if any fault lights illuminate during this operation.
- 11 Monitor Performance - Monitor the unit inlet and outlet temperature and the differential temperature rise. The outlet temperature should rise until the set point is reached. As the outlet temperature approaches the set point the controller begins to govern the process by activating the automatic dump valve. The process should stabilize and accurately maintain the temperature differential provided that the inlet flow and temperature is sustained and consistent. The inlet water pressure should be a minimum of 3 bar and should be maintained during dumping of excess hot water.
- 12 Filter Check - Two water filters are provided to clean inlet water. One for operation and the other for stand-by. The pressure drop across each filter should be between 0.5 - 1 bar. Check the pressure drop after running the unit for a 4 to 5 hour settling-in period. The filter will trap all contaminants introduced into the system during installation

and should be regularly checked after set-up. Replace/rinse the filter elements when the pressure drop rises above 1.2 bar.

- 13 Current Drawn - Check input current and voltage to make sure acceptable limits are maintained.
- 14 Process Control - When the unit is set-up and operating properly with the correct heater selection and supplies it will deliver water heated to within $\pm 1^\circ\text{C}$ of the controller set point. Confirm that the unit controls the process as specified.

CAUTION

SYSTEM FLUSHING

When the system is not in use it should be thoroughly flushed with fresh water and completely drained according to the Shutdown Procedure detailed in section 3.5.

Note *When diving in dirty water it may be necessary to pre-filter the water supply to the water heater to 100 micron, or less to ensure satisfactory performance and manageable filter element changeovers.*

2.6 Start Up and Function Check – Remote Control

The function of the WHE-3 remote control must also be thoroughly checked prior to being put into service. This should be done after the start up and function checks on the WHE-3 unit have successfully been completed. The following procedure outlines the steps used in conducting remote control start-up and functional checks.

- 1 Remote Emergency Stop – Test the function of the remote emergency stop with the WHE-3. Activation of the remote emergency stop will remove power from the main control circuit, stop the pump motor and de-energize the heater banks. The heater banks will remain selected as the rotary selector switches are not reset. An alarm will be generated and the general fault on the remote panel will illuminate in addition to the indication on the local control panel.
- 2 Remote Pump Run Indication – Check that pump run indication illuminates when the pump motor is running and is extinguished when it is stopped normally.
- 3 Remote General Fault Indication – The general fault indication on the remote control panel will be illuminated when the pump trip, over-temperature or low level fault indication is present on the local control panel.
- 4 Remote Temperature Display – The remote temperature display is calibrated during factory testing. Calibration should be confirmed by comparison of the remote display indication against the local controller indication.
- 5 Remote Control Selection (Remote vs. Local) – Remote fine control is selected using the temperature controller in the WHE-3 electrical panel. Refer to the temperature controller manual for details on switching between local and remote set point input, Refer to the temperature controller manual in Appendix B.
- 6 Remote Set Point Potentiometer Calibration – The potentiometer is a 0 - 10 V output signal generator. The output bias and ratios are set so as to match the temperature set points and range indicated on the remote panel faceplate, i.e. 35 to 65°C.

3 Operations

3.1 General

The JFD Electric Powered Water Heating Module, WHE-3, has been designed to run with the minimum amount of operator input. The temperature controller governs the process based on the set point and feedback from the PT100 probe giving the measured output temperature (PV). The operator is required to input the set point to the controller and switch on the appropriate heater banks to provide the required capacity. When operating the WHE-3 from the remote control panel, remote fine temperature control of the outlet water is achieved by adjusting the temperature control knob. All other function and control will be selected and governed locally on the WHE-3 unit.

Note *Heater element selection and switching for temperature rise range must still take place locally at the machine control panel. If a temperature set-point is selected on the remote panel that is above the range of the heater element selection then the unit will close the temperature control valve in an effort to achieve the required set-point but will have insufficient heat input to achieve the set-point. Similarly if a set-point is selected that is below the range of the heater element selection then the unit will fully open the temperature control valve and may control temperature to some extent but massive energy losses will be incurred due to excessive dumping of heated water.*

3.2 Heating Requirement

Before running the unit the operator must determine the heating required for the divers. The following steps outline the procedure for calculating the heating required.

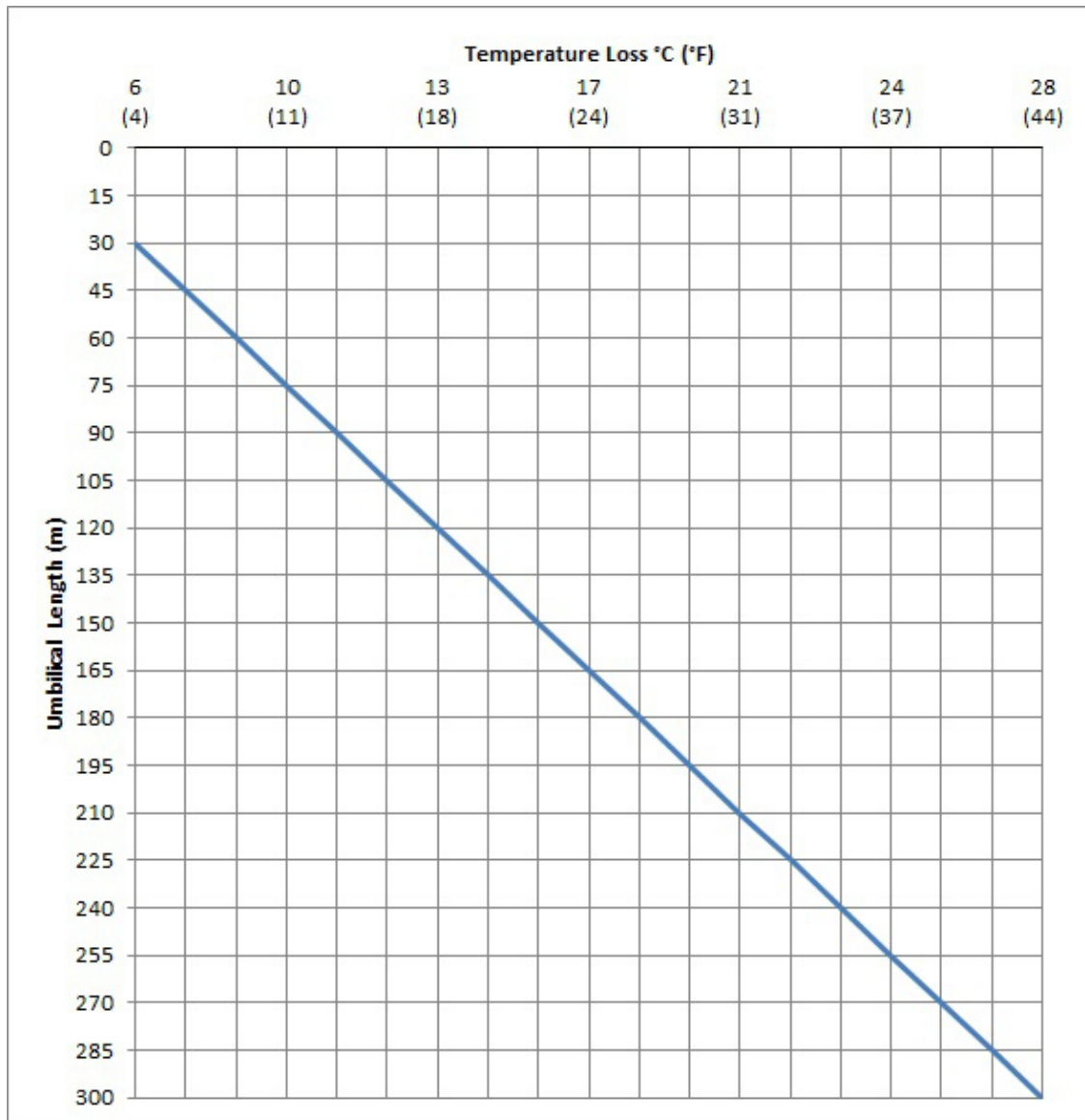
- 1 Obtain the following information:
 - Approximate length of umbilical in water
 - Approximate operating temperature of fluid desired at bottom (T_b)
 - Inlet water temperature (T_{in})
- 2 Determine the temperature loss along the umbilical (T_{loss})

Using the graph (Fig 3.1) to determine the temperature loss along the umbilical hose, select the length of the umbilical hose on the vertical y-axis and move horizontally to the right until the line is intersected then move vertically upward to the horizontal x-axis. The value on the x-axis will yield the approximate temperature loss (T_{loss}) through the specified length of umbilical.

- 3 Determine outlet temperature (T_{out}).

Add the temperature loss through the umbilical (T_{loss}) to the temperature required at the diver (T_b). This will give the total outlet temperature (T_{out}) required. This value must be entered into the controller as the control set point value (SV).

Figure 3 Graph of Temperature Loss vs. Umbilical Length



Note *The above graph is based on the approximate temperature loss through a 1/2" Synflex or equivalent, used in conditions with 2 - 5°C (35 - 45°F) water temperature.*

4 Determine temperature rise required (T_{rise}).

To determine the required temperature rise (T_{rise}) through the unit, subtract the inlet temperature (T_{in}) from the required total outlet temperature (T_{out}) calculated in step 3.

5 Heater bank selection.

After calculating T_{rise} use the table in Table 3 to determine the heater banks to be used. Locate the temperature rise in the left column. Read across to determine which heaters are required to achieve the temperature rise. A tick indicates that a heater bank should be switched on.

The above heater selection will supply the approximate heating capacity required to produce the specified temperature rise through the unit. The controller will accurately control the outlet temperature and keep this temperature at the set point.

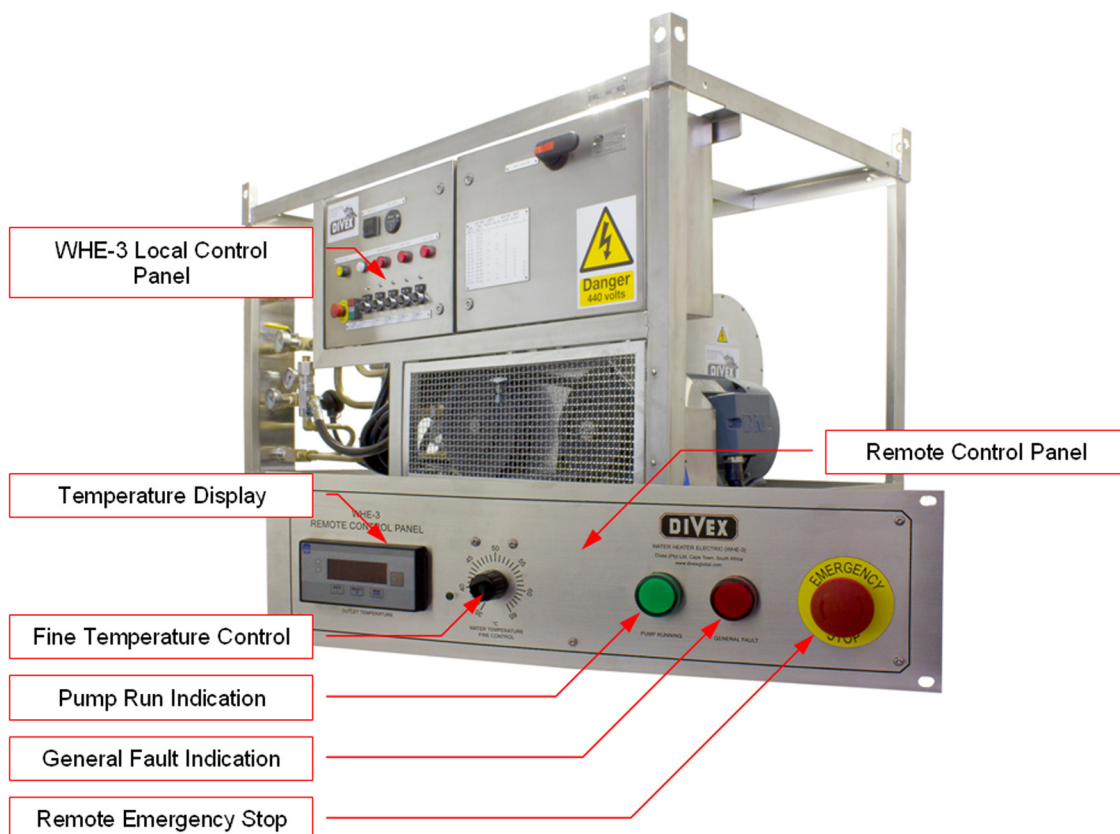
Note *Table 3 is intended as a guide. Due to variations in installations, operating conditions and working environments. It is important to monitor the function of the unit to ensure that the process is correctly controlled. If the control valve is constantly open this indicates over-heating and a lower heater selection may be used. If the control valve is constantly closed this indicates under-heating and if required a higher heater selection may be used.*

3.3 Operator Controls

Local operator control of the WHE-3 is achieved using the Temperature Controller keypad to change the set point and rotary switches for heater bank selection.

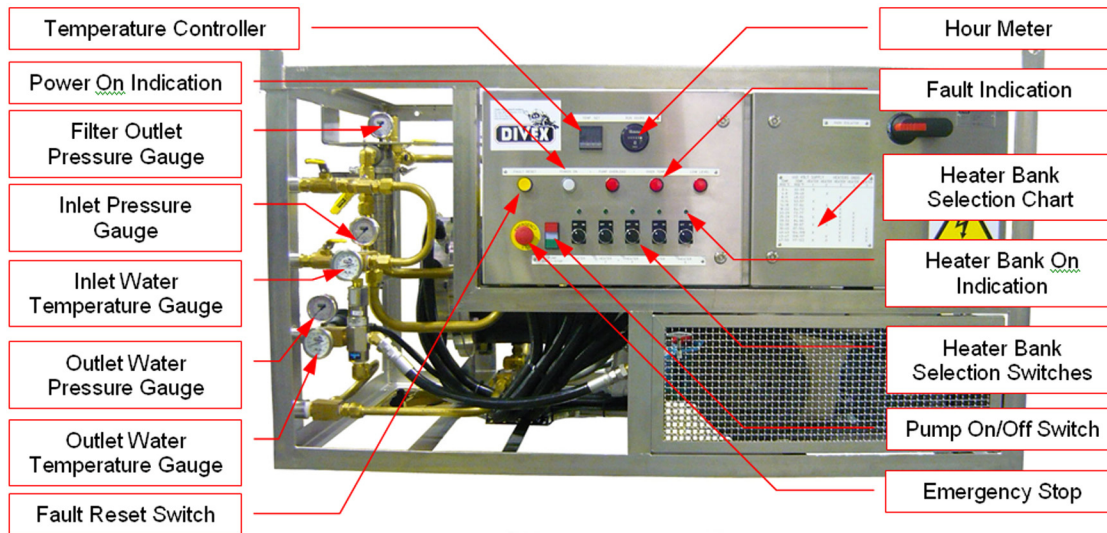
For remote control the WHE-3 operator will select the heater banks to be used and start the pump motor locally. Once the controller has been set to use the remote set-point input the remote control may be used for the fine control of the outlet temperature. The operator controls are shown below.

Figure 4 General Arrangement



Operator control of the WHE-3 is achieved using the Temperature Controller keypad to change the set point and switches for heater bank selection. The WHE-3 is also equipped with several analogue gauges displaying fluid temperature and pressure throughout the system. The layout of the operator interface is shown in Figure 4.

Figure 5 General Arrangement



3.4 Operating Start-Up Procedure

- 1 Carry out pre-operation checks on the following:
 - Machinery is secure – No damage to mountings, brackets, pipe connections etc.
 - Belt drive – In a good condition, belts correctly tensioned and belt guard secure.
 - Pipe work and valves – Secure with no leaks.
 - Filter units – Check that clean cartridges are fitted to the units
 - Water supply and drain – Drain line unrestricted and supply operating correctly.
 - Electrical connections – Electrical fittings and cables are secure and undamaged.
 - Switches – Electrical breakers and isolator are switched to the on position.
 - Emergency switch – Check that the switch is de-activated
- 2 Open the sea water supply valve and allow water to flow through the system.

Note *If the indicated pressure drop across the inlet filters exceeds 1 bar the filter cartridge may need to be changed to maintain optimum performance.*

- 3 Check the inlet water temperature and determine the required temperature rise as outlined in section 3.2.
- 4 Press the pump start button.

Note *The pump should start and no fault indicator lights should be illuminated. If any faults are present refer to Chapter 5 for troubleshooting.*

- 5 Enter the required outlet temperature into the controller as the control set point value (SV). (See 2.5 step 5.)
- 6 Turn on the appropriate heater banks as deduced in the procedure outlined in section 3.2.

The system should now be operating and all systems functioning correctly. Allow the outlet temperature to rise to the set point and monitor the control of the process to confirm correct heater bank selection and temperature output.

Note *The supply inlet pressure should be maintained above 3 bar with a sufficient flow rate to supply the unit with 45 lit/min. The positive displacement pump used generates an output pressure equivalent to the differential pressure drop through the hose or umbilical while maintaining a constant flow rate.*

3.5 Shutdown Procedure

- 1 Turn off all electric heaters.
- 2 Push Pump Stop Button.
- 3 Turn off main power switch.
- 4 Shut sea water valve and open fresh water valve to flush the entire system with fresh water for at least 15 to 20 minutes after each usage. This will flush out the heating system, plumbing, valves, umbilical and most important, the breathing gas heat exchanger and the hot water suit. If required, run the pump to ensure adequate flushing of the system pipework with fresh water.
- 5 During the flushing process ensure that the entire system is flushed out by momentarily opening the venting valve and both dump valves.
- 6 Shut the fresh water valve off. Open the drain valve and tank vent valve and allow the water to drain from the system.

3.6 Drain System

CAUTION

To prevent damage due to freezing of the water in the system it is important to drain all the water before storing the unit. In warmer climates draining the system may not be necessary. However, flushing the unit remains necessary prior to storage, especially to prevent corrosion of stainless steel components by stagnant seawater (MIC or Microbiologically Induced Corrosion).

4 Maintenance

4.1 Routine Maintenance

Good maintenance practices are essential to ensure satisfactory operation and extend the service life of the equipment. All steel and painted parts should be periodically cleaned and repainted where necessary.

4.2 Periodic Maintenance

Periodic maintenance of the unit should be conducted in order to identify and replace worn components. The following are components that must be inspected:

4.2.1 Belts

The drive belts should be checked for wear periodically depending on how often the machine is operated. Belts may need to be replaced due to wear after periods of high duty or due to deterioration after long periods spent out of service. Following periods where the unit has been out of service, the pulley grooves should be checked for corrosion and all moving parts should be thoroughly inspected. Belt tension should be checked regularly.

4.2.2 Inlet Filters

The inlet water filter elements should be checked following the first few hours of operation in a new installation and after long periods spent out of service. Under normal working conditions the filters should be changed when the pressure drop across the filter units rises about 1 bar. The pressure drop across the filters is deduced by subtracting the outlet pressure indicated on the filter gauge from the inlet pressure gauge. The two filters are arranged with valves to allow the isolation of each filter for service. The unit is designed to run using a single filter.

4.2.3 Anode Plugs

Four zinc anodes are mounted in the heater tank. These provide sacrificial corrosion protection to the system and will deteriorate. They should be inspected regularly and replaced when necessary.

4.2.4 Heater Elements

Heater element cover plates should be removed to check for leaks and, if necessary, check element insulation. To remove any elements use WHE-3 element socket, JFD part no. DO05547.

Note *Heated seawater is extremely corrosive and heater elements will not last indefinitely. Always keep sufficient spare elements available.*

4.3 Pump Maintenance

Helpful Information

(Refer to the Pump Specific Fault Diagnosis and Maintenance table in section 5.1. Refer to Appendix B for the detailed pump manual)

4.3.1 Interpreting Pressure Readings

Abnormal pressure readings that are out of the specified range during normal operation may indicate a fault or problem with the pump.

Note *Pressure irregularities are not a definitive diagnosis of pump faults and it is essential to carry out full fault finding in order to maintain the unit operation.*

Before servicing the pump it is prudent to carry out checks on the following:

- Inlet plumbing for size
- Restriction and/or air leaks
- Condition of the by-pass valve
- Condition of the pressure gauge
- Shut-off valves in the inlet or discharge plumbing to be sure they are fully open

4.3.2 Pump Service

JFD advises that the service of the CAT pump on the WHE-3 unit should be carried out by an approved CAT service agent or JFD regional office.

4.3.3 Ordering of Parts

When ordering parts, be sure to give the model and serial number of the pump in addition to the part number, description and quantity of the items required.

4.3.4 Material Returns

Should it become necessary to return a Cat Pump, please secure approval and shipping directions from JFD. Items authorised for return must be shipped with freight prepaid. A full description of the operating conditions, medium being used and full details of the problem with the pump.

4.3.5 Filter Inspection

The most common cause of low pump pressure is damage due to foreign matter carried in the fluid being pumped. Small abrasive particles in the fluid may damage the pump valves, valve seats, cylinder walls, cups and block the filter screens. It is essential to ensure that the fluid being pumped is properly filtered to increase the service life of the pump. The inline filter cartridges of the WHE-3 should be inspected and replaced at regular intervals as required. The unit should not be run with blocked or damaged filter cartridges or without filter cartridges in the filter housings as this may cause damage to the pump.

4.4 Pump Specifications

| | |
|---------------------------|--------------|
| Flow Rate | 45 l/min |
| Pressure Range | 7 to 155 bar |
| Inlet Pressure Range | 1.4 to 4 bar |
| Speed | 1150 rev/min |
| Maximum Fluid Temperature | 71°C |
| Crankcase Capacity | 1.26 ltr |
| Inlet Ports | 3/4" NPTF |
| Discharge Ports | 1/2" NPTF |
| Pulley Mounting | Either Side |
| Shaft Diameter | 30 mm |
| Weight | 19.9 kg |

5 Troubleshooting

The tables in this section are designed as a troubleshooting guide to aid in the identification of faults and outline possible corrective action.

5.1 Pump Specific Fault Diagnosis and Maintenance

| Problem | Possible Cause | Solution |
|---|--|--|
| Pulsation | Faulty Pulsation Damper | Check pre-charge of pulsation Damper; if low, recharge or install a replacement component. |
| Low Pressure | Belt slippage. | Tighten or replace; use correct belt. |
| | Air leak in inlet plumbing. | Disassemble, reseal and re-assemble. |
| | Pressure gauge inoperative or not registering accurately. | Check with new gauges, replace faulty gauge. |
| | Relief valve stuck, partially plugged or improperly adjusted, valve seat worn. | Clean and adjust relief valve; check for worn and dirty valve seats. Replace worn parts. |
| | Inlet filter clogged or improperly size. | Clean. Use 50 micron filter element. Check more frequently. |
| | Worn packing. Abrasives in pumped fluid or severe cavitation. Inadequate water supply. | Install proper filter. Check fluid supply available to the pump. |
| Low Pressure | Fouled or dirty inlet or discharge valves. | Clean inlet and discharge valve assemblies. |
| | Worn inlet or discharge valves. | Replace worn valves, valve seats and / or discharge hose. |
| | Leaking discharge hose. | |
| Pump runs extremely rough, pressure very low | Restricted inlet or air entering the inlet plumbing. | Size inlet plumbing correctly; check for air tight seals. |
| | Inlet restrictions or stuck inlet or discharge valve. | Clean out foreign material. |
| | Leaking HP seals. | Replace worn seals. |
| Water leakage from under the inlet manifold | Worn packing. | Install new packing. |
| | Worn male and female adaptor. | Install new male and female adaptor. |
| Oil leak between crankcase and pumping section. | Worn crankcase piston rod seals. | Replace crankcase piston rod seals. |

| Problem | Possible Cause | Solution |
|---|---|---|
| Oil leaking in the crankshaft area. | Worn crankshaft seal or improperly installed oil seal retainer o-ring. | Remove oil seal retainer and replace damaged o-ring and/or seals. |
| | Worn bearing. | Replace bearing. |
| Excessive play on the crank shaft pulley | Worn main bearing from excessive tension on drive belt. | Replace bearing. Properly tension belt. |
| Water in crankcase | May be caused by humid air condensing into water inside the crankcase. | Change oil at 3 month or 500 hour intervals using JFD part no. DO03764. |
| | Leakage of packing seals. Over-pressure or faulty pressure regulator. | Replace packing. Check pressure regulator. |
| Oil leaking from underside of crankcase. | Worn crankcase seals. | Replace seals. |
| Oil leaking at the rear portion of the crankcase. | Damaged or improperly installed oil gauge or crankcase rear cover o-ring and drain plug o-ring. | Replace oil gauge or cover o-ring and drain plug o-ring. |
| Oil leaking from drain plug. | Loose drain plug or worn drain plug o-ring. | Tighten drain plug or replace o-ring. |
| Loud knocking noise in pump. | Pulley loose on crankshaft. | Check key and tighten set screw. |
| | Broken or worn bearing. | Replacing bearings. |
| Frequent or premature failure of the inlet manifold seals. | Scored plungers. | Replace plungers. |
| | Over pressure to inlet manifold. | Reduce inlet pressure (2.5 bar). |
| | Damaged or worn plungers. | Replace the plungers. |
| | Abrasive material in the fluid being pumped. | Install proper filtration pump inlet plumbing. |
| | Excessive pressure and / or temperature of fluid being pumped. | Check pressures and fluid inlet temperature; be sure they are within specified range. |
| | Over pressure of pumps. | Reduce supply pressure. |
| | Running pump dry. | Do not run pump without water. |
| Strong surging at inlet and low pressure on discharge side. | Foreign particles in the inlet or discharge valve or worn inlet and / or discharge valves. | Check for smooth lap surfaces on inlet and discharge valve seals. Discharge valve seals and inlet valve seals may be lapped on a very fine oil stone. |

5.2 General Troubleshooting Chart

| Problem | Possible Cause | Solution |
|------------------------------|---|--|
| Low output pressure. | Leaking relief valve. | Check relief valve function, repair or replace. |
| | Water inlet to system low or turned off. | Turn inlet water on. Check water supply and hose sizing. |
| | Insufficient flow in water feed lines to system. | Check inlet hose diameter is sufficient and is not restricted or crushed. |
| | Low pressure in umbilical line or system. | This is expected. As the system's output depends upon the flow resistance, if there is low resistance the pressure will be low but the flow rate will be maintained. |
| Water will not heat. | Circuit breakers tripped in heating circuits. | Switch off - reset breaker(s). If breaker(s) trip again when switched on, investigate cause. (In an emergency faulty element may be switched off, leaving other banks operational). |
| | Manual over board dump valve open. | Close manual overboard dump valve. |
| | Temperature control valve is stuck in the fully open position due to valve or actuator failure. | Check the actuator function by manipulating the actuator manually. If the valve cannot be turned manually service or replace the control valve. If the actuator does not return when release from manual disturbance repair or replace the actuator. |
| Relief valve will not close. | Dirt lodged in seat of relief valve. | Clean set of relief valve, reset and test. |

| Problem | Possible Cause | Solution |
|---|---|--|
| Motor fault - will not run. | Fault in wiring to contractor, control circuit to main control circuit is broken. | Trace wiring; make sure there is no broken circuit to wiring. If there is, correct malfunction. If main power control circuit is open, it may be due to some other fault in system such as low water, over temperature relay created open circuit, or float switch indicating low water. If any of these fault indicators are on corrective action is required. |
| | Overload relay tripped. | Reset overload relay and make sure that relay is set in the "automatic" position. |
| | | Electrical supply greater than 2% below specified minimum. |
| | Defective pump motor contactor. | Remove and replace. |
| | Burned out motor. | Replace motor. |
| Pump chattering loudly. | Low inlet water pressure with restricted flow. | Increase inlet water pressure and flow rate to unit. |
| | Pump supply "pressure reducing" regulator malfunction. | Clean regulator and reassemble. If unit will not regulate pressure on pump to 2.5 bar, replace or repair regulator. Emergency Corrective Action Bypassing the regulator will allow operation in an emergency but this is not recommended as this will put increased load and water on pump as well as causing seals to leak and allow water into crankcase. Refer to Pump Troubleshooting, 5.1 and 0. |
| Sea water mixing with fresh water. | Faulty check valve in sea water circuit. | Remove, clean reassemble or replace. |
| Hot water output will not maintain control. | Too many or too few heaters on. | Check graphs and table to determine amount of heat necessary. |
| | Temperature Control valve faulty. | Clean and check or replace. Emergency Corrective Action Shut temperature control valve off by depressing the button on the side of the valve actuator housing and turn the lever fully clockwise. Then use the manual bypass valve to manually control output temperature. |
| Large flow in overboard dump line. | Leaking relief valve. | Clean relief valve and reset. If valve continues to leak, replace. |

| Problem | Possible Cause | Solution |
|--|--|--|
| Large flow in overboard dump line. | Manual bypass valve left open. | Close valve. |
| | Too many heaters on for load on system. | Refer to table to determine proper number of heaters on or shut one heater off and monitor temperature. |
| System will not run, fault light is on. | No water is coming to system. Float switch shut off. | Supply water to system and purge. Make sure that water is flowing out of system through umbilical hose. |
| | Faulty float switch. | Repair or replace float switch. |
| | Overheated water in the heater tank. | Make sure that water is flowing through the system. |
| | No water in heater tank. | Re-prime system, making sure that water is flowing through system. |
| | Over temperature control needs adjustment. | Readjust over temperature controls, whichever one is turning the system off if temperature of water is low. |
| | Fault over temperature switch. | Determine which over temperature switch is open circuited and replace. The over temperature switches in system are TC 1/1 and TC 1/2. |
| System will not run, pump overload fault light on. | Pump overload relay has tripped. | Possible low voltage, single phase of incorrect frequency. Check the input voltage and frequency. Measure the current on the pump motor to see if it's within rating. Reset overload and start system again. |
| | Faulty fault indicator relay, R1/R2. | Replace. |
| | Fault overload relay. | Replace. |
| Inlet pressure to pump is low. | Faulty pressure regulator. | Replace. |
| | Low pressure to system, below 3.5 bar. | Increase pressure and flow rate to the system. |
| Pump varies in speed. | Belts slipping. | Check tension on belts. If tension is loose, tighten belt by adjusting tension bolts on motor mount. |
| | | Check belts condition. If belts are torn, ragged, or in poor condition, replace. |
| Water temperature will not rise adequately. | Insufficient number of heaters on for load. | Turn on one additional heater. Check Heater Selection Table 3 |

| Problem | Possible Cause | Solution |
|---|---|---|
| Contactors buzzing. | Dirt, debris or rust on pole pieces of contactors. | Disassemble contactor and sand pole pieces and clean. |
| | Low frequency on system. | Check frequency. If frequency is below 60 Hz, see if frequency can be increased. |
| | Faulty contactor. | Replace. |
| Contactors will not close. | Open circuit in wiring to holding coil. | Check wiring and if required replace broken wire. |
| | Faulty holding coil. | Replace. |
| | Faulty contactor. | Replace. |
| System will not start. | Input power off. | Check input power. Check fault indicator lights to see if any lights are on. If any fault lights are on, remedy fault. Example: low water. Water to system shut off and float switch will open thus keeping system off. |
| | Main power switch not turned on. | Turn switch on. |
| | Control circuit breaker tripped. | Check, reset. If faulty replace. |
| | Faulty main power contactor. | Replace. |
| Pump turns on and off rapidly. | Faulty overload relay. | Replace. |
| | Motor shorted. | Replace. |
| Pump will not run for long periods of time without overloading. | Low voltage to system. | Check voltage. If voltage is not a minimum of 420 V, pump will overload. |
| | Pump is corroded or jammed inside and very difficult to turn. | Check pump to see if there are any mechanical problem with it. If there is, the pump must be repaired. See Pump Troubleshooting, section 5.1 |
| Heater shuts off with water less than 70°C (160°F). | Over temperature switch set incorrectly. | Reset over temperature switch to 70°C (160°F). |
| Contactors will not open. | Faulty contactor. | Replace. |
| | Shorted wire on holding coil. | Check out wiring for short and repair. |
| System inoperable, no fault indicator. | Burned out fault light. | Replace. |
| | Faulty fault relays, R1 and R2. | Replace. |

| Problem | Possible Cause | Solution |
|--|--|---|
| No 24 VDC control power. | Control power supply unit faulty. | Check output of power supply. If it is not 24 V on the feed with 440 V on the supply, replace power supply unit. |
| | Control power fuse F3 burned out. | Replace. |
| Fault lights will not come on. | Faulty fault relays. | Replace. |
| | Burned out fault lights. | Replace. |
| Remote and local temperature readings differ. | The remote display is not calibrated to the controller output. | Check the bias, ratio and offset setting on the controller and the remote display. Refer to the Appendix B section for the controller for manual and details on the controller parameter settings. |
| Remote analog dial not calibrated to controller. | If there is incorrect scaling between the remote potentiometer and the temperature controller, the pointer knob may be loose or incorrectly aligned. | Remove the pointer, re-align and refit. |
| | If the analogue range scale is incorrect the bias and / or ratio of the input on the local temperature controller may have been tampered with or the signal generator may be faulty. | Check that the controller settings have not been changed and that the output from the signal generator is within specification. |

6 Part Identification

Figure 6 General Arrangement Front View

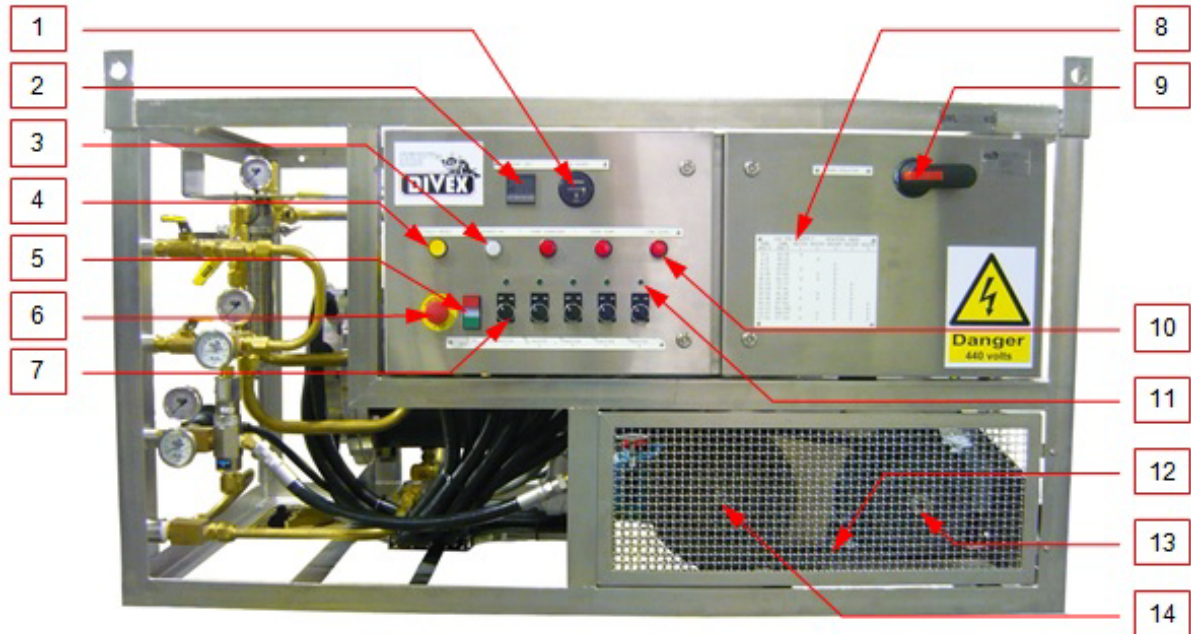
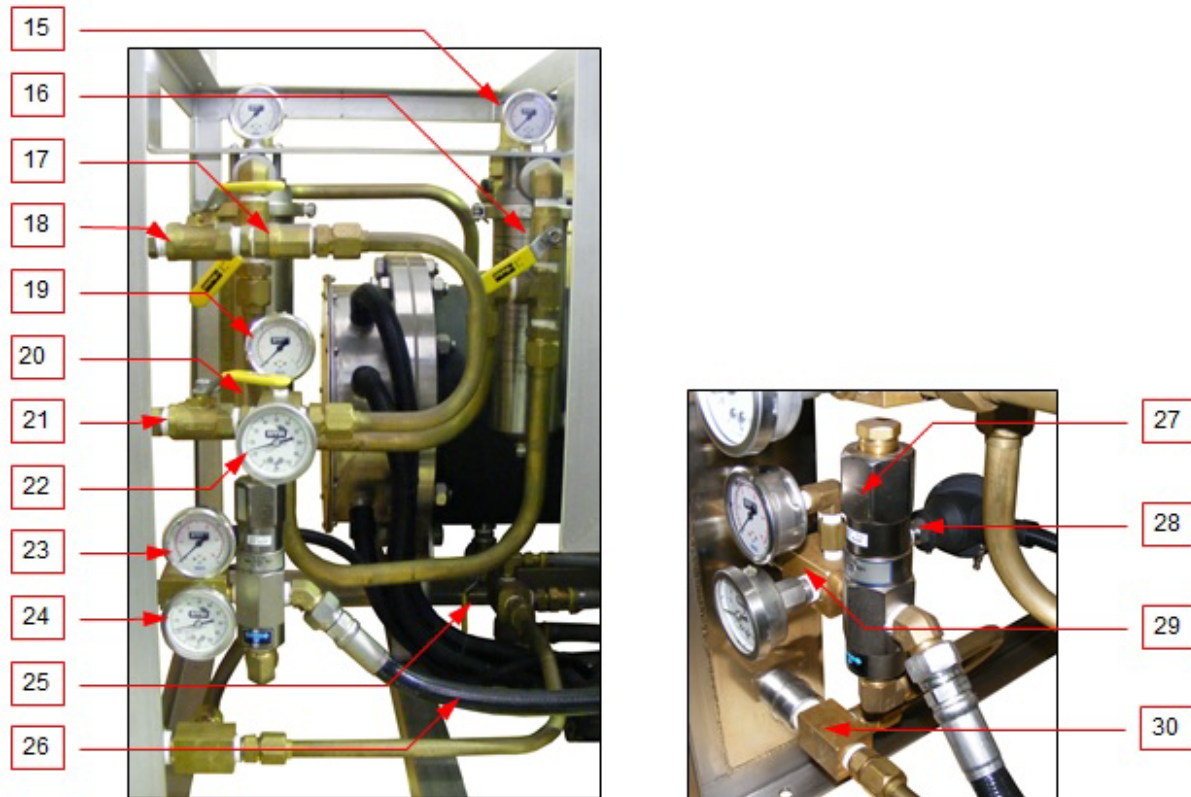


Figure 7 Inlet, Outlet and Pressure Relief Valve



| Item | Description | JFD Part No. |
|------|---|-------------------|
| 1 | Hour Meter | DO03903 |
| 2 | Temperature Controller | DO03900 |
| 3 | Power On Indication | DO04991 |
| 4 | Fault Reset Button | DO04838 |
| 5 | Pump On / Off Push Button with indication | DO04823 |
| 6 | Emergency Stop Button | DO03260 |
| 7 | Heater On / Off Rotary Switch | DO02937 |
| 8 | Heater Selection table (AA and AC) | DO03009 |
| | Heater Selection table (AB) | DO05132 |
| 9 | Main Isolator | DO05796 |
| 10 | Fault indication (Red) | DO04992 |
| 11 | Heater Run Indication (Green) | DO04835 |
| 12 | Belts (Matched pair) (AA and AC) | DO03077 |
| | Belts (Matched pair) (AB) | DO04356 |
| 13 | Motor Pulley (Taper Lock Bush Part No. DO02831) | DO02830 |
| 14 | Pump Pulley (Taper Lock Bush Part No. DO02829) | DO02828 |
| 15 | Filter Gauge | DOPBBA63BB02QJ2A |
| 16 | Filter Inlet Valve 3/4" | VB36265 |
| 17 | Check Valve | DO02780 |
| 18 | Fresh Water Inlet Valve 3/4" | VB36265 |
| 19 | Inlet Pressure Gauge | DOPBBA63BB02QJ2A |
| 20 | Inlet Manifold Block | DO05902 |
| 21 | Salt Water Inlet Valve 3/4" | VB36265 |
| 22 | Inlet Temperature Gauge | DO05836 |
| 23 | Outlet Pressure Gauge | DOPSBA63BB02 QJ3A |
| 24 | Outlet Temperature Gauge | DO05836 |
| 25 | Water Dump Manifold | DO05668 |
| 26 | Pump Outlet Hose | DO06069 |
| 27 | Relief Valve (Set to 68 Bar) | DO02723 |
| 28 | PT100 Temperature Probe | DO04564 |
| 29 | Outlet Manifold Black | DO05901 |

| Item | Description | JFD Part No. |
|------|---------------------|--------------|
| 30 | Front Dump Manifold | DO05900 |

Figure 8 General Assembly Rear Side View

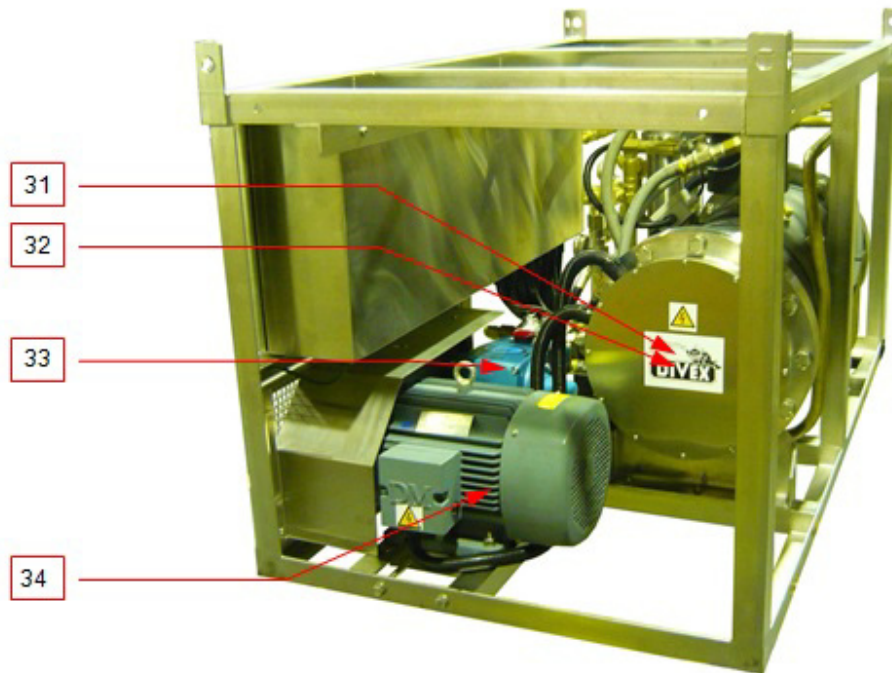
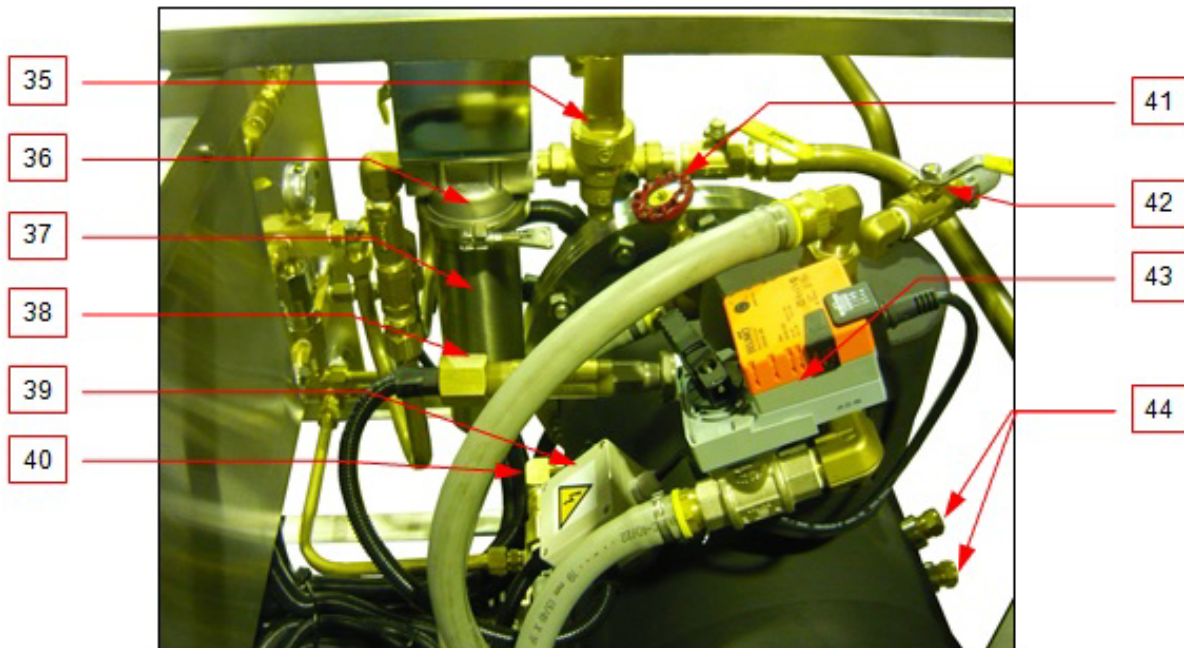


Figure 9 Control Valve, Thermostat and Filter Arrangement



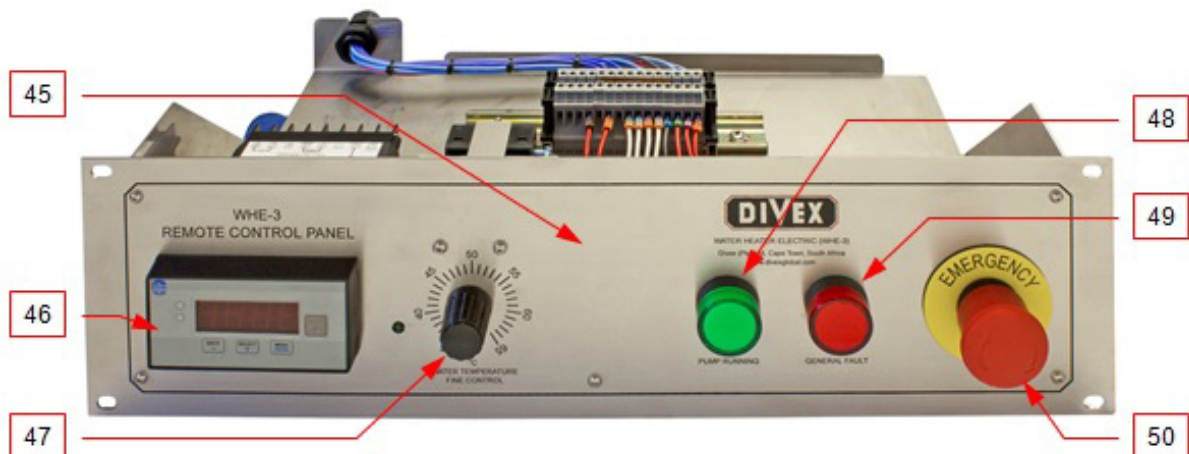
| Item | Description | JFD Part No. |
|------|--|---------------|
| 31 | Heater Element (Inside Heater Tank) 4.0 kW (AA and AC) | DO02798-SPARE |
| | Heater Element (Inside Heater Tank) 4.0 kW (AB) | DO39912 |
| 32 | Heater Element (Inside Heater Tank) 4.5 kW (AA and AC) | DO02776-SPARE |
| | Heater Element (Inside Heater Tank) 4.5 kW (AB) | DO39113 |
| 33 | Pump CAT 1057 | DO02722 |
| 34 | Motor | DO02777 |
| 35 | Pressure Reducing Valve (Set to 2 bar) | DO02359 |
| 36 | Filter Housing | DO04768 |
| 37 | Filter Element (Inside Housing, 10" 50 µm) | DO04793 |
| 38 | Level Float Switch | DO02779 |
| 39 | Mechanical Safety Thermostat | DO02374 |
| 40 | Relief Valve, Tank (Set to 2.5 bar) | DO02304 |

| Item | Description | JFD Part No. |
|------|----------------------------------|--------------|
| 41 | Manual Temperature Control Valve | DO03326 |
| 42 | Bleed Valve | VB36264 |
| 43 | Temperature Control Valve | DO02788 |
| 44 | Zinc Anode 1/2" NPT, 100 mm | DO02369 |

6.1 Hoses

| Service | JFD Part No. | |
|--|--------------|----------|
| | 3.1 Cert | 3.2 Cert |
| Heater Tank Relief Valve to Dump Manifold | HP621 | HM047 |
| Manual Temperature Control Valve to Dump Manifold | DO801-3/4 | HM045 |
| Motorised Temperature Control Valve to Dump Manifold | DO801-3/4 | HM045 |
| Heater Tank to Pump | DO801-3/4 | HM048 |
| Heater Tank Outlet (open end) | HP621 | HM049 |
| Pump Discharge to Hot Water Outlet | KI6069 | DO06069 |

Figure 10 Remote Control Panel Arrangement



| Item | Description | JFD Part No. |
|------|----------------------------|--------------|
| 45 | Remote Panel Face Plate | DO06499 |
| 46 | Remote Temperature Display | DO06034 |

| Item | Description | JFD Part No. |
|------|-----------------------------------|--------------|
| 47 | Remote Set Point Signal Generator | DO04798 |
| 48 | Remote Pump Running Indication | DO04990 |
| 49 | Remote General Fault Indication | DO04992 |
| 50 | Remote Emergency Stop Button | DO03260 |

6.2 Spare Parts List

| Description | JFD Part No. |
|---|-------------------|
| Hour Meter | DO03903 |
| Temperature Controller | DO03900 |
| Power On Indication | DO04991 |
| Fault Reset Button | DO04838 |
| Pump On / Off Push Button with indication | DO04823 |
| Emergency Stop Button | DO03260 |
| Heater On / Off Rotary Switch | DO02937 |
| Fault indication (Red) | DO04992 |
| Heater Run Indication (Green) | DO04835 |
| Belts (Matched pair) (AA and AC) | DO03077 |
| Belts (Matched pair) (AB) | DO04356 |
| Filter Gauge | DOPBBA63BB02QJ2A |
| Filter Inlet Valve 3/4" NPT | VB36265 |
| Check Valve 3/4" BSP | DO02780 |
| Fresh Water Inlet Valve 3/4" NPT | VB36265 |
| Salt Water Inlet Valve 3/4" NPT | VB36265 |
| Inlet Temperature Gauge | DO05836 |
| Outlet Pressure Gauge | DOPPSBA63BB02QJ3A |
| Outlet Temperature Gauge | DO05836 |
| Pump Outlet Hose | DO06069 |
| Filter Housing | DO04768 |
| Filter Element (In Filter Housing), (10" 50 µm) | DO04793 |
| Level Float Switch | DO02779 |
| Mechanical Safety Thermostat | DO02374 |
| Manual Dump Control Valve | DO03326 |
| Bleed Valve 1/2" NPT | VB36264 |
| Valve, Actuated, 24 Vdc | DO02788 |
| Zinc Anode 1/2" NPT, 100 mm | DO02369 |
| Cartridge, Pressure Reducing Valve, 3/4" | DO02359-C |

| Description | JFD Part No. |
|---|-------------------|
| Circuit Breaker Miniature 20 A 10 kA 3 pole | DO02880 |
| Circuit Breaker Miniature 32 A 10 kA 3 pole | DO04005 |
| Circuit Breaker Miniature 50 A 10 kA 3 pole | DO04828 |
| Contact Block Support for Switch S120 | DO03897 & DO04923 |
| Contact Element N/C Contact Block | DO02891 |
| Contact Element N/O Contact Block | DO02889 |
| Contactor 11 kW 3-pole 24 V | DO05936 |
| Contactor 7.5 kW 3-pole 24 V | DO03905 |
| Diode Safety Back EMF 24-48V | DO04924 |
| Spare Element, 4.5 kW 1-1/4" BSPT 400 mm | DO02776-SPARE |
| Fuse Glass 5 x 20 1 Amp | DO03913 |
| Fuse Glass 5 x 20 5 Amp | DO03914 |
| Gasket Flange WHE-3 | DO04692 |
| Lamp Filament BA9s 24 Vdc 2 W | DO03912 |
| Lamp Holder (for Start/Stop Switch DO04823) | DO04921 |
| Module Diode Plug-In 6 - 220 Vdc | DO03910 |
| Neoprene Gasket (2 mm thick, 364 mm Diameter) | DO02760 |
| Oil JFD Cat Pump Lube SAE 40 | DO03764 |
| Overload Thermal 3 Pole, 9-14 A | DO02904 |
| Pocket Thermostat 1-1/4 BSP brass Boss | DO03961 |
| Power Supply 340-550 V 24 Vdc 5 A | DO03904 |
| Relay Base Socket Din Rail Mount | DO04173 |
| Relay Miniature 24 VDC Coil 4 C/O | DO04171 |
| Terminal Din Rail 0.5 - 4.0 mm | DO02901 |
| Terminal Fuse 5 x 20 mm | DO03902 |
| Thermo pocket 316 SS 20 mm PKT x 75 mm O/A | DO04564-PKT |
| Timer On-Delay 24 Vdc | DO04840 |
| Valve Relief 1/2 MNPT 2 Psi Brass | DO02304-SPARE |
| Kit Valve Relief 1/2 MNPT 3-50 Psi | DO02304-KIT |
| Kit Service Pump CAT 1057 NAB | DO02722-KIT |

| Description | JFD Part No. |
|---|---------------|
| Kit Seal for CAT 7012.1 SS Relief Valve | DO02723-KIT |
| Spare Element WHE-3 for DO02798 | DO02798-SPARE |
| Heater Selection Table | DO03009 |
| Main Isolator | DO05796 |
| Motor Pulley (Using Taper Lock Bushing, Part No. DO02831) | DO02830 |
| Pump Pulley (Using Taper Lock Bushing, Part No. DO02829) | DO02828 |
| Inlet Manifold Black | DO05902 |
| Water Dump Manifold | DO05668 |
| Relief Valve | DO02723 |
| PT100 Temperature Probe | DO04564 |
| Outlet Manifold Block | DO05901 |
| Front Dump Manifold | DO05900 |
| Pump CAT 1057, NAB Head | DO02722 |
| Motor | DO02777 |
| Pressure Reducing Valve | DO02359 |
| Accumulator CAT S/S 6031 70 bar M.O.P | DO02724 |
| Valve Relief 1/2 MNPT 3-50 psi Brass | DO02304 |
| Remote Set Point Signal Generator | DO04798 |
| Remote Temperature Display | DO06034 |
| Heater Element (In Heater Tank) 4.0 kW 440 Vac | DO02798-SPARE |
| Heater Element (In Heater Tank) 4.5 kW 440 Vac | DO02776-SPARE |
| Heater Element (In Heater Tank) 4.0 kW 380 Vac | DO39912 |
| Heater Element (In Heater Tank) 4.5 kW 380 Vac | DO39113 |

Intentionally blank

APPENDIX A TEMPERATURE CONTROLLER PARAMETER SETTINGS

To set the parameters of the display press the SET key for 2 seconds. Use the SET key to page through the function blocks. Use the shift (<) key to select the parameter to change. Change the setting using the arrow keys. Press the SET key to store the new value and move to the next function block.

Table 1 Parameter Setting Mode

| Temperature Controller | | Parameter Set Mode | | |
|------------------------|-----------|------------------------------------|-------------|-----------------------------|
| Function Block | Parameter | | Spec. Value | Description |
| | Code | Description | | |
| | EV1 | Event 1 set value | 50 | Value at which event occurs |
| | EV2 | Event 2 set value | 50 | Value at which event occurs |
| | EV3 | Event 3 set value | 50 | Unused |
| | EV4 | Event 4 set value | 50 | Unused |
| | LbA | Control loop break alarm | 210 | Unused |
| | Ldb | LBA deadband | 0.0 | Unused |
| | P | Proportional band (heat-side) | 32 | Set during AT |
| | I | Integral time (heat-side) | 105 | Set during AT |
| | d | Derivative time (heat-side) | 26 | Set during AT |
| | rPT | Control response parameter | 2 | |
| | Pc | Proportional band (cool-side) | 30 | Set during AT |
| | Ic | Integral time (cool-side) | 240 | Set during AT |
| | de | Derivative time (cool-side) | 60 | Set during AT |
| | db | Overlap/Dead band | 0.0 | Overlap of hot/cold control |
| | Mr | Manual reset | 0.0 | Unused |
| | SVrU | Setting change rate limiter (up) | 0 (off) | |
| | SVrd | Setting change rate limiter (down) | 0 (off) | |
| | AST | Area soak time | 0.00 | |
| | LnKA | Link area number | 0 (off) | |

To enter the Setup Setting Mode, press the Shift (MODE) key while pressing the SET key. Move through the parameters by pressing the SET key. Use the mode key to highlight a digit and use the arrow keys to change the highlighted digit.

Table 2 Setup Setting Mode

| Temperature Controller | | Setup Setting Mode | | |
|------------------------|-----------|--|-------------|--|
| Function Block | Parameter | | Spec. Value | Description |
| | Code | Description | | |
| | HbA1 | Heater break alarm 1 set point | 0 (off) | Unused |
| | Hbl1 | Heater break alarm determination point 1 | 30 | Unused |
| | HbH1 | Heater melting determination point 1 | 30 | Unused |
| | HbA2 | Heater break alarm 2 set point | 0 (off) | Unused |
| | Hbl2 | Heater break alarm determination point 2 | 30 | Unused |
| | HbH2 | Heater melting determination point 2 | 30 | Unused |
| | Pb | PV Bias | 0 | Range/Sensitivity of PV scale |
| | dF | PV Digital filter | 0(off) | |
| | Pr | PV Ratio | 1 | Rotation of PV scale |
| | PLC | PV Low input cut-off | 0 | Unused |
| | rb | RS Bias | 30.0 | Range/Sensitivity of RS scale (Increase=Increase of range) |
| | dF2 | RS Digital filter | 0 (off) | |
| | rr | RS Ratio | 0.330 | Rotation of RS scale (increase=anticlock) |
| | T | Proportional cycle time (heat-side) | 20 | Unused |
| | t | Proportional cycle time (cool-side) | 20 | Unused |
| | Add1 | Device address 1 | 0 | Unused |
| | bPS1 | Communication Speed 1 | 19.2 | Unused |
| | b1T1 | Data bit configuration 1 | 8n1 | Unused |
| | InT1 | Interval time 1 | 10 | Unused |
| | Add2 | Device address 2 | 0 | Unused |
| | bPS2 | Communication Speed 2 | 19.2 | Unused |
| | b1T2 | Data bit configuration 2 | 8n1 | Unused |
| | InT2 | Interval time 2 | 10 | Unused |
| | LCK | Set lock level | 0000 | To lock functionality of keypad |

To enter the Engineering Mode, press the Shift (MODE) key for 2 seconds while pressing the SET key. Move to the required function block using the arrow keys. To page through the selected function block press the SET key. When at the correct parameter highlight the digit to be changed using the MODE key and use the arrow keys to change the highlighted digit.

Engineering Mode Settings require the RUN/STOP transfer function to be set to STOP. When in PV/SV display, press the SET key for 1 second to show the operation mode. Press the MODE key several times to display the RUN/STOP screen. Use the arrow keys to change to STOP mode.

Table 3 Engineering Mode

| Temperature Controller | | Engineering Mode | | |
|------------------------|----------------|--|-------------|---|
| Function Block | Parameter | | Spec. Value | Description |
| | Code | Description | | |
| F10 | SPCH | Stop display | 1 | |
| | dE | Bar graph display | 1 | |
| | dEUT | Bar graph display resolution | 100 | |
| | dSoP | PV Flashing display at input error | 1 | |
| F11 | Fn1 | Direct key 1 | 1 | AIM Transfer Type 1 and 2 |
| | Fn2 | Direct key 2 | 1 | Type 1 = MON I, Type 2 = RIL Transfer |
| | Fn3 | Direct key 3 | 1 | Type 1 =AREA, Type 2 = RIL RUN/STOP |
| | Fn | Direct key type | 1 | Selects the type of action of direct keys |
| F21 | InP | Input type | 12 | Type of input device (transmitter) used |
| | UniT | Display Unit | 0 | |
| | PGdP | Decimal point position | 1 | |
| | PGSH | Input scale high | 100 | High scale of input device |
| | PGSL | Input scale low | 0 | Low scale of input device |
| | PoV | Input error determination point (high) | 105 | |
| | PUn | Input error determination (low) | -5 | |
| | boS | Burnout direction | 0 | |
| | Sqr | Square root extraction | 0 | |
| | PFrq | Power supply frequency | 0 | |
| SmP | Sampling cycle | 1 | | |
| F22 | R1nP | Remote setting input type | 16 | 0 to 1 OV DC (Signal Generator) |
| F23 | diSL | Digital input (DI) assignment | 1 | |

Table 3 Engineering Mode (Continued)

| Temperature Controller | | Engineering Mode | | | |
|------------------------|-----------|---------------------------------------|-------------|---|--|
| Function Block | Parameter | | Spec. Value | Description | |
| | Code | Description | | | |
| F30 | LoGC | Output assignment | 1 | | |
| | oTT1 | Timer 1 | 0.0 | | |
| | oTT2 | Timer 2 | 0.0 | | |
| | oTT3 | Timer 3 | 0.0 | | |
| oTT4 | Timer 4 | 0.0 | | | |
| | EXC | Energized/De-energized | 0011 | Status of DO 1-4 | |
| | ALC1 | Alarm (ALM) lamp lighting condition 1 | 0001 | Lamp status of EV1-4 | |
| | ALC2 | Alarm (ALM) lamp lighting condition 2 | 0000 | Lamp status of HBA1 & 2 | |
| | ss | Output status at STOP mode | 0010 | | |
| F33 | Ao | Transmission output type | 1 | Selection of output to display (PV, MV, etc.) | |
| | AHS | Transmission output scale high | 100.0 | High limit of output to display | |
| | ALS | Transmission output scale low | 0.0 | Low limit of output to display | |
| F41 | ES1 | Event 1 type | 0 | MV1 High (Heat Side) | |
| | Eho1 | Event 1 hold action | 0 | Off | |
| | EIL1 | Event 1 interlock | 0 | Unused | |
| | EH1 | Event 1 differential gap | 2 | Prevents chattering of event output | |
| | EVT | Event 1 delay timer | 0 | Delay of action of event after trigger | |
| | EEo1 | Event 1 action at input error | 0000 | | |
| F42 | ES2 | Event 2 type | 0 | MV1 High (Cool Side) | |
| | Eho2 | Event 2 hold action | 0 | Off | |
| | EIL2 | Event 2 interlock | 0 | Unused | |
| | EH2 | Event 2 differential gap | 2 | Prevents chattering of event output | |
| | EVT2 | Event 2 delay timer | 0 | Delay of action of event after trigger | |
| | EEo2 | Event 2 action at input error | 0000 | | |

Table 3 Engineering Mode (Continued)

| Temperature Controller | | Engineering Mode | | |
|------------------------|-----------|---|-------------|--|
| Function Block | Parameter | | Spec. Value | Description |
| | Code | Description | | |
| F43 | ES3 | Event 3 type | 0 | Type of input used to trigger this event |
| | Eho3 | Event 3 hold action | 0 | |
| | EIL3 | Event 3 interlock | 0 | |
| | EH3 | Event 3 differential gap | 2 | Prevents chattering of event output |
| | EVT3 | Event 3 delay timer | 0 | Delay of action of event after trigger |
| | EEo3 | Event 3 action at input error | 0000 | |
| F44 | ES4 | Event 4 type | 0 | Type of input used to trigger this event |
| | Eho4 | Event 4 hold action | 0 | |
| | EIL4 | Event 4 interlock | 0 | |
| | EH4 | Event 4 differential gap | 2 | Prevents chattering of event output |
| | EVT4 | Event 4 delay timer | 0 | Delay of action of event after trigger |
| | EEo4 | Event 4 action at input error | 0000 | |
| F45 | CTr1 | CT1 ratio | 800 | |
| | CTA1 | CT1 assignment | 1 | |
| | HbS1 | Heater break alarm 1 (HBA1) type | 1 | |
| | HbC1 | Number of heater break alarm 1 (HBA1) delay times | 5 | |
| F46 | CTr2 | CT2 ratio | 800 | |
| | CTA2 | CT2 assignment | 0 | |
| | HbS2 | Heater break alarm 2 (HBA2) type | 0 | |
| | HbC2 | Number of heater break alarm 2 (HBA2) delay times | 5 | |
| F50 | Pd | Hot/Cold start | 0 | Hot start 1 |
| | PdA | Start determination point | 3 | |
| | CAM | External input type | 0 | |
| | MCH | Master channel selection | 0 | |
| | TrK | SV tracking | 1 | Used |
| | MVTS | MV Transfer function | 0 | |
| | PVTS | PV Transfer function | 0 | Unused |

Table 3 Engineering Mode (Continued)

| Temperature Controller | | Engineering Mode | | |
|------------------------|-----------|---|-------------|---|
| Function Block | Parameter | | Spec. Value | Description |
| | Code | Description | | |
| F51 | oS | Control action | 0 | Direct, reverse, heat/cool water, air etc. |
| | lddP | Integral/derivative time decimal point position | 0 | |
| | dGA | Derivative gain 6.0 | | |
| | oHH | ON/OFF action differential gap (upper) | 1.0 | |
| | oHL | ON/OFF action differential gap (lower) | 1.0 | |
| | AoVE | Action (high) at input error | 0 | |
| | AUnE | Action (low) at input error | 0 | |
| | PSM | Manipulated output value at input error | 0.0 | |
| | rMV1 | Manipulated output value (MV1) at STOP mode | -5.0 | |
| | rMV2 | Manipulated output value (MV2) at STOP mode | -5.0 | |
| | orU | Output change rate limiter (up) [MV1] | 0.0 | |
| | ord | Output change rate limiter (down) [MV1] | 0.0 | |
| | oLH | Output limiter (high) [MV1] | 105.0 | Limits the max. opening angle of actuator 1 |
| | oLL | Output limiter (low) [MV1] | -5.0 | Limits the min. opening angle of actuator 1 |
| | orU2 | Output change rate limiter (up) [MV2] | 0.0 | |
| | ord2 | Output change rate limiter (down) [MV2] | 0.0 | |
| | oLH2 | Output limiter (high) [MV2] | 105.0 | Limits the max. opening angle of actuator 2 |
| | oLL2 | Output limiter (low) [MV2] | -5.0 | Limits the min. opening angle of actuator 2 |
| | dTP | Derivative term operating factor | 0 | Measured value Derivative |
| | us | Undershot suppression factor | 1 | Set offset AT point from SV to stop overshoot during AT |

Table 3 Engineering Mode (Continued)

| Temperature Controller | | Engineering Mode | | |
|------------------------|--|---|-------------|--------------------------------|
| Function Block | Parameter | | Spec. Value | Description |
| | Code | Description | | |
| F52 | ATb | AT Bias | 0.0 | Offset |
| | ATC | AT cycles | 1 | 0=1.5, 1 =2, 2=2.5, 3=3 cycles |
| | ATH | AT differential gap time | 10.0 | |
| | Aton | Output value with AT turned on | 105.0 | |
| | AToF | Output value with AT turned off | -105.0 | |
| | PLH | Proportional band limiter (high) [heat-side] | 100 | |
| | PLL | Proportional band limiter (low) [heat-side] | 0 | |
| | ILH | Integral time limiter (high) [heat-side] | 3600 | |
| | ILL | Integral time limiter (low) [heat-side] | 0 | |
| | DLH | Derivative time limiter (high) [heat-side] | 3600 | |
| | DLL | Derivative time limiter (low) [heat-side] | 0 | |
| | PcLH | Proportional band limiter (high) [cool-side] | 100 | |
| | PcLL | Proportional band limiter (low) [cool-side] | 0 | |
| | IcLH | Integral time limiter (high) [cool-side] | 3600 | |
| | IcLL | Integral time limiter (low) [cool-side] | 0 | |
| | DcLH | Derivative time limiter (high) [cool-side] | 3600 | |
| | DcLL | Derivative time limiter (low) [cool-side] | 0 | |
| | PAJ | Proportional band adjustment factor [heat-side] | 1.00 | |
| | IAJ | Integral time adjusting factor [heat-side] | 1.00 | |
| | dAJ | Derivative time limiter (low) [cool-side] | 1.00 | |
| PcAJ | Proportional band adjusting factor [cool-side] | 1.00 | | |
| IcAJ | Integral time adjusting factor [cool-side] | 1.00 | | |
| dcAJ | Derivative time adjusting factor [cool-side] | 1.00 | | |

Table 3 Engineering Mode (Continued)

| Temperature Controller | | Engineering Mode | | |
|------------------------|-----------|---|-------------|---|
| Function Block | Parameter | | Spec. Value | Description |
| | Code | Description | | |
| F53 | Ydb | Open/Close output neutral zone | 2.0 | |
| | YHS | Open/Close output differential gap | 1.0 | |
| | Ybr | Action at feedback resistance (FBR) input error | 0 | |
| | PoS | Feedback adjustment preparation | Adj | |
| | MoT | Control motor time | 10 | |
| | oLA | Integrated output limiter | 150.0 | |
| | VAL | Valve action at STOP | 0 | |
| F54 | STS | ST Start condition | 0 | |
| | STPK | ST Proportional band adjusting factor | 1 | |
| | STIK | ST Integral time adjusting factor | 1 | |
| | STdK | ST Derivative time adjusting factor | 1 | |
| F55 | CHcG | Automatic temperature rise group | 0 | |
| | rSG | RUN/STOP group | 0 | |
| | CHrd | Automatic temperature rise dead time | 10.0 | |
| | CHrT | Automatic temperature rise gradient data | 1.0 | |
| F60 | CMP1 | Communication protocol1 | 0 | |
| | CMP2 | Communication protocol2 | 2 | |
| F70 | SVrT | Setting change rate limiter unit time | 60 | |
| | STdP | Soak time unit | 1 | |
| F71 | SLH | Setting limiter (high) | 100 | Sets the value at max input from signal generator |
| | SLL | Setting limiter (low) | 0 | Sets the value at min input from signal generator |
| F91 | C277 | ROM version monitor | | |
| | WT | Integrated operating time monitor | 6 | |
| | TCJ | Holding peak value ambient temperature monitor | 39.5 | |

APPENDIX B MANUFACTURER RELATED DOCUMENTS

The following details web links where manufacturers' operating, service and maintenance information for the major components of the WHE-3 may be sourced.

RKC FB100 Digital Controller Manual

https://www.rkcinst.co.jp/english/pdf_manual/imcb25e3.pdf

BELIMO Control Valve (Belimoseoul Part Number R2020-6P3-S2+LR24A-SR)

<http://belimoseoul.com/data/medium/3c6db9b8997c2f27dd43695fc64656db.pdf>

Water Pressure Reducing Valve (Caleffi part number 5360)

http://www.caleffi.com/sites/default/files/file/01026_05en.pdf

CAT Triplex Pump Manual (Model 1057)

[http://www.catpumps.co.uk/products/pdfs/1050\(1\).pdf](http://www.catpumps.co.uk/products/pdfs/1050(1).pdf)

CAT Pulsation Dampener (Model 6031)

[http://www.catpumps.co.uk/products/pdfs/1050\(1\).pdf](http://www.catpumps.co.uk/products/pdfs/1050(1).pdf)

CAT Pressure Regulator (Model 7012.1)

[http://www.catpumps.co.uk/products/pdfs/1050\(1\).pdf](http://www.catpumps.co.uk/products/pdfs/1050(1).pdf)

Float Switch (Dwyer part Number L6EPS-S-S-3A)

<http://www.dwyer-inst.co.uk/Product/Level/LevelSwitches/Float/SeriesL6#model-chart>

Note *Should you not be able to locate the relevant data sheets please contact you nearest JFD office for assistance.*

Intentionally blank

APPENDIX C SYSTEM DRAWINGS

General Arrangement, Water Heater Electric, WHE-3 KI40018 (All Variants)
Sheet 1 of 2 C.2
Sheet 2 of 2 C.3

WWHE-3 Electrical Schematic 24 VDC Control Circuit - With Remote
Sheet 1 of 2 C.4
Sheet 2 of 2 C.5

WHE-3 Electrical Schematic (440 V) Heater Circuit (With Remote) C.6

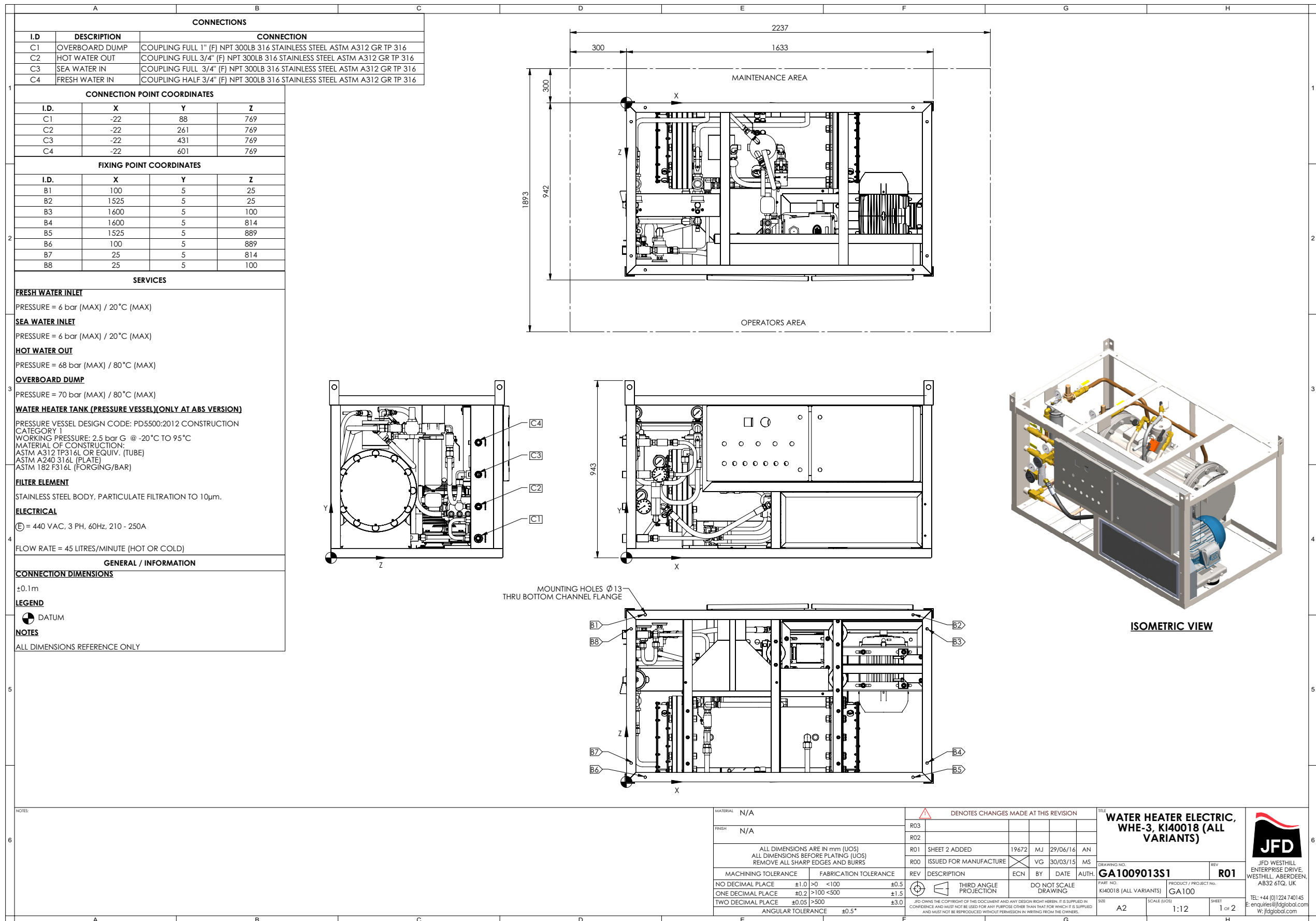
WHE-3 Electrical Schematic - With Remote Busbar Manufacturing Detail C.7

Schematic, Water, Heater Electric, WHE-3 Upgrade, With PV'S 3.1 Cert
Sheet 1 of 2 C.8
Sheet 2 of 2 C.9

Schematic, Water, Heater Electric, WHE-3 Upgrade, With PV'S 3.2 Cert
Sheet 1 of 2 C.10
Sheet 2 of 2 C.11

General Arrangement, Water Heater Electric, WHE-3 KI40018 (All Variants)

Sheet 1 of 2



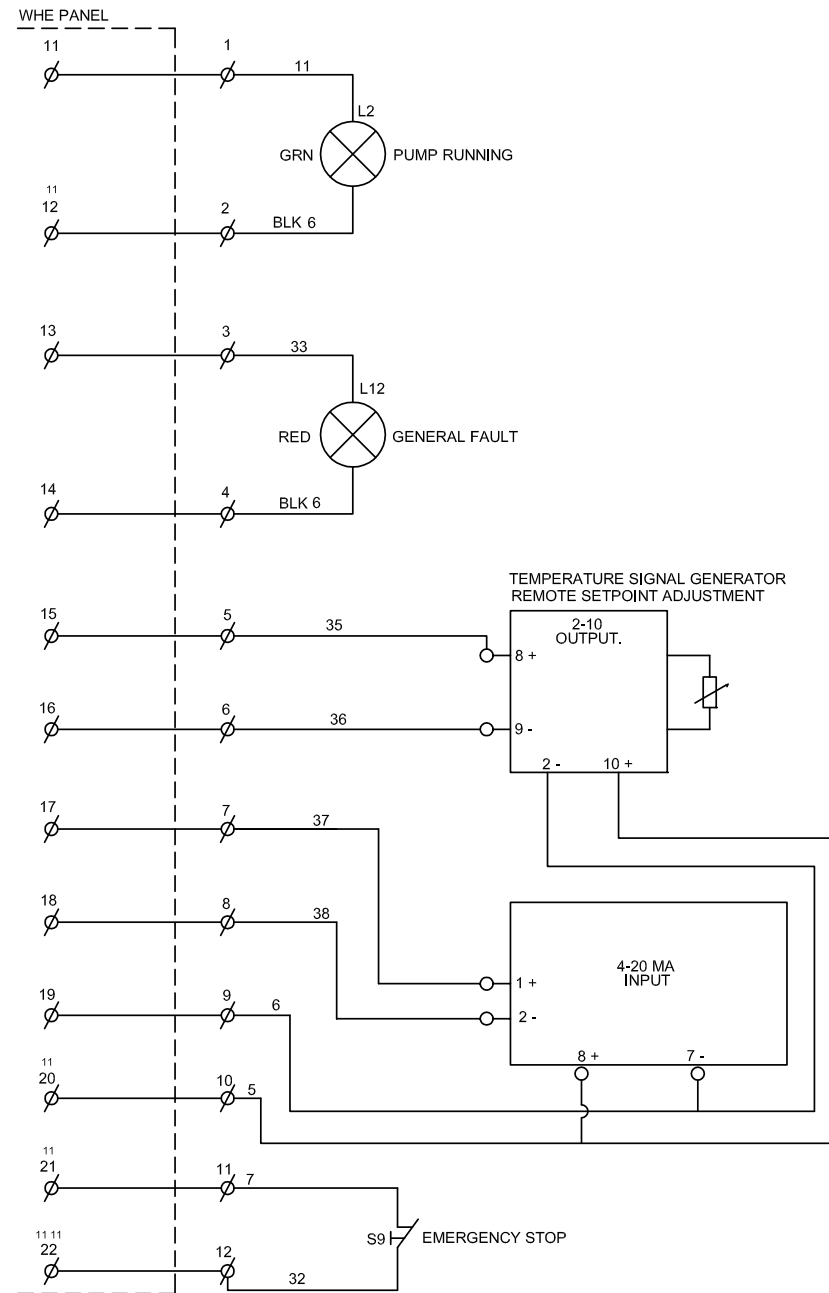
| CENTRE OF GRAVITY COORDINATES | | | |
|-------------------------------|-----|-----|-----|
| I.D. | X | Y | Z |
| COG | 810 | 440 | 455 |

| GENERAL / INFORMATION | |
|--------------------------|--|
| UNIT WEIGHT (DRY) | 460kg (1014lbs) |
| LEGEND | <ul style="list-style-type: none"> DATUM CENTRE OF GRAVITY (COG) LIFT POINTS LOCAL DEDICATED LIFT POINTS |

LIFTING ARRANGEMENT

| MATERIAL | | DENOTES CHANGES MADE AT THIS REVISION | | | | TITLE | |
|---|-----|---|------------------------|------------------------|----|---|-------|
| MATERIAL | N/A | R03 | | | | WATER HEATER ELECTRIC, WHE-3, KI40018 (ALL VARIANTS) | |
| FINISH | N/A | R02 | | | | | |
| ALL DIMENSIONS ARE IN mm (UOS) ALL DIMENSIONS BEFORE PLATING (UOS) REMOVE ALL SHARP EDGES AND BURRS | | R01 | SHEET 2 ADDED | 19672 | MJ | 29/06/16 | AN |
| | | R00 | ISSUED FOR MANUFACTURE | | VG | 30/03/15 | MS |
| | | REV | DESCRIPTION | ECN | BY | DATE | AUTH. |
| MACHINING TOLERANCE | | FABRICATION TOLERANCE | | | | | |
| NO DECIMAL PLACE ±1.0 >0 <100 ±0.5 | | ONE DECIMAL PLACE ±0.2 >100 <500 ±1.5 | | | | | |
| TWO DECIMAL PLACE ±0.05 >500 ±3.0 | | ANGULAR TOLERANCE ±0.5° | | | | | |
| | | THIRD ANGLE PROJECTION | | DO NOT SCALE DRAWING | | | |
| | | JFD OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS. | | | | | |
| | | DRAWING NO. | | PART NO. | | REV | |
| | | GA1009013S2 | | KI40018 (ALL VARIANTS) | | R01 | |
| | | SCALE (UOS) | | SHEET | | 2 OF 2 | |
| | | A2 | | 1:10 | | | |

| | | | |
|--|--|---|--|
| | | JFD WESTHILL ENTERPRISE DRIVE, WESTHILL, ABERDEEN, AB32 6TQ, UK TEL: +44 (0)1224 740145 E: enquiries@jfdglobal.com W: jfdglobal.com | |
|--|--|---|--|



DIVEX OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS

NOTES

ALL DIMENSIONS SHOWN ARE IN MM (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

DIMENSIONAL TOLERANCES

| MACHINING | | FABRICATION | |
|-------------------|-------|-------------------|-------|
| NO DECIMAL PLACES | ±1.0 | SIZE >0 <100 | ±0.5 |
| ONE DECIMAL PLACE | ±0.2 | SIZE >100 <500 | ±1.5 |
| TWO DECIMAL PLACE | ±0.05 | SIZE >500 | ±3.0 |
| ANGULAR TOLERANCE | ±0.5° | ANGULAR TOLERANCE | ±0.5° |

MATERIAL
N/A

FINISH
N/A

THIRD ANGLE PROJECTION

| REV | DESCRIPTION | ECN No. | BY | DATE | AUTH. BY |
|-----|---------------------------------------|---------|----|----------|----------|
| R03 | DRAWING No. UPDATED AND SHEET 2 ADDED | 17816 | MJ | 21/05/15 | SC |
| R02 | NOT ISSUED AT THIS REVISION | | | | |
| R01 | NOT ISSUED AT THIS REVISION | | | | |
| R00 | NOT ISSUED AS THIS REVISION | | | | |

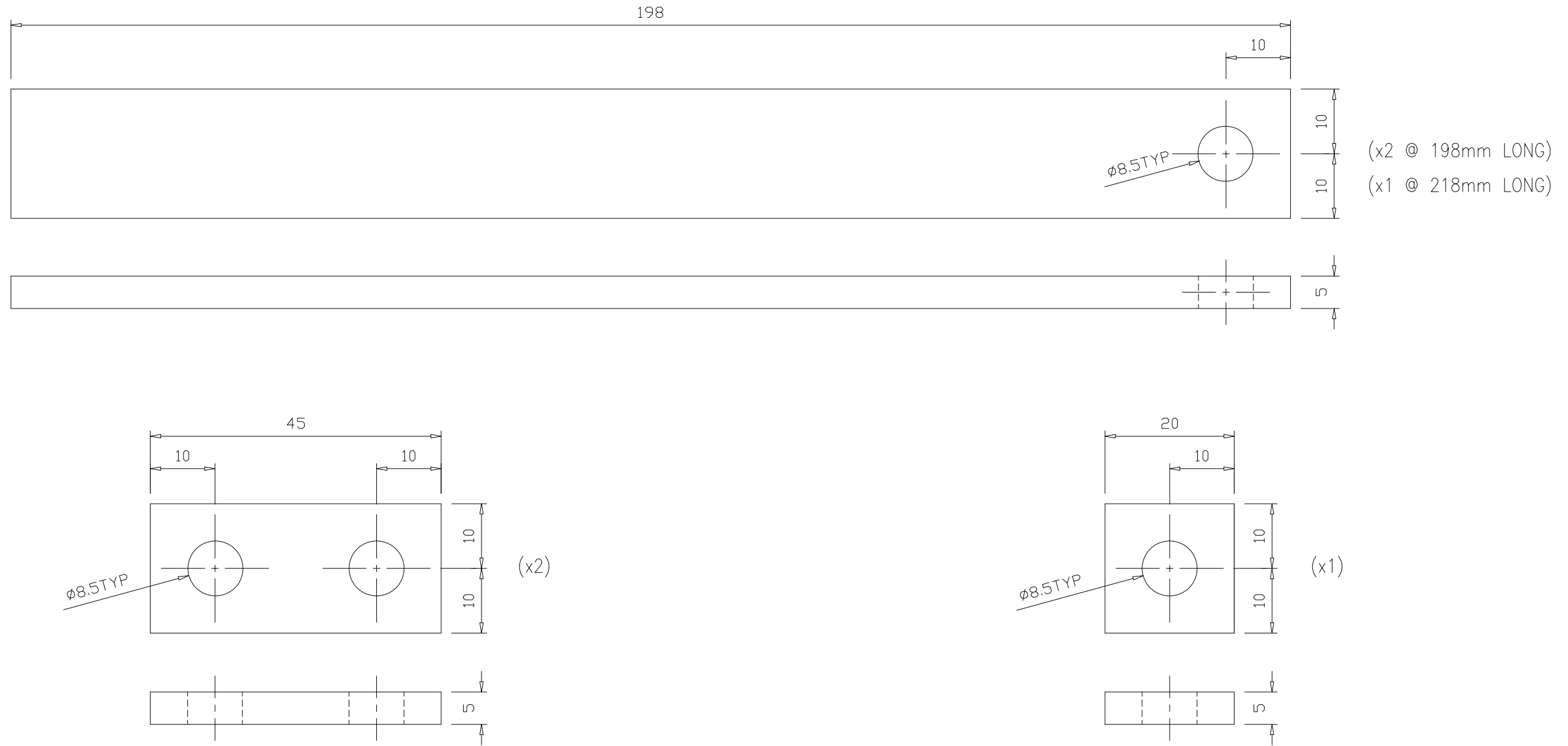
DO NOT SCALE DRAWING

| | |
|---|------------------------------------|
| TITLE WHE-3 ELECTRICAL SCHEMATIC, 24VDC CONTROL CIRCUIT WITH REMOTE | |
| DRAWING No. DO66911S2 | REV R03 |
| PART No. KI40018 (VARIANTS) | PRODUCT / PROJECT No. KI |
| SIZE A3 | SCALE NTS |
| SHT 2 | OF 2 |

DIVEX LIMITED
ENTERPRISE DRIVE
WESTHILL
ABERDEEN
AB32 6TQ
UNITED KINGDOM

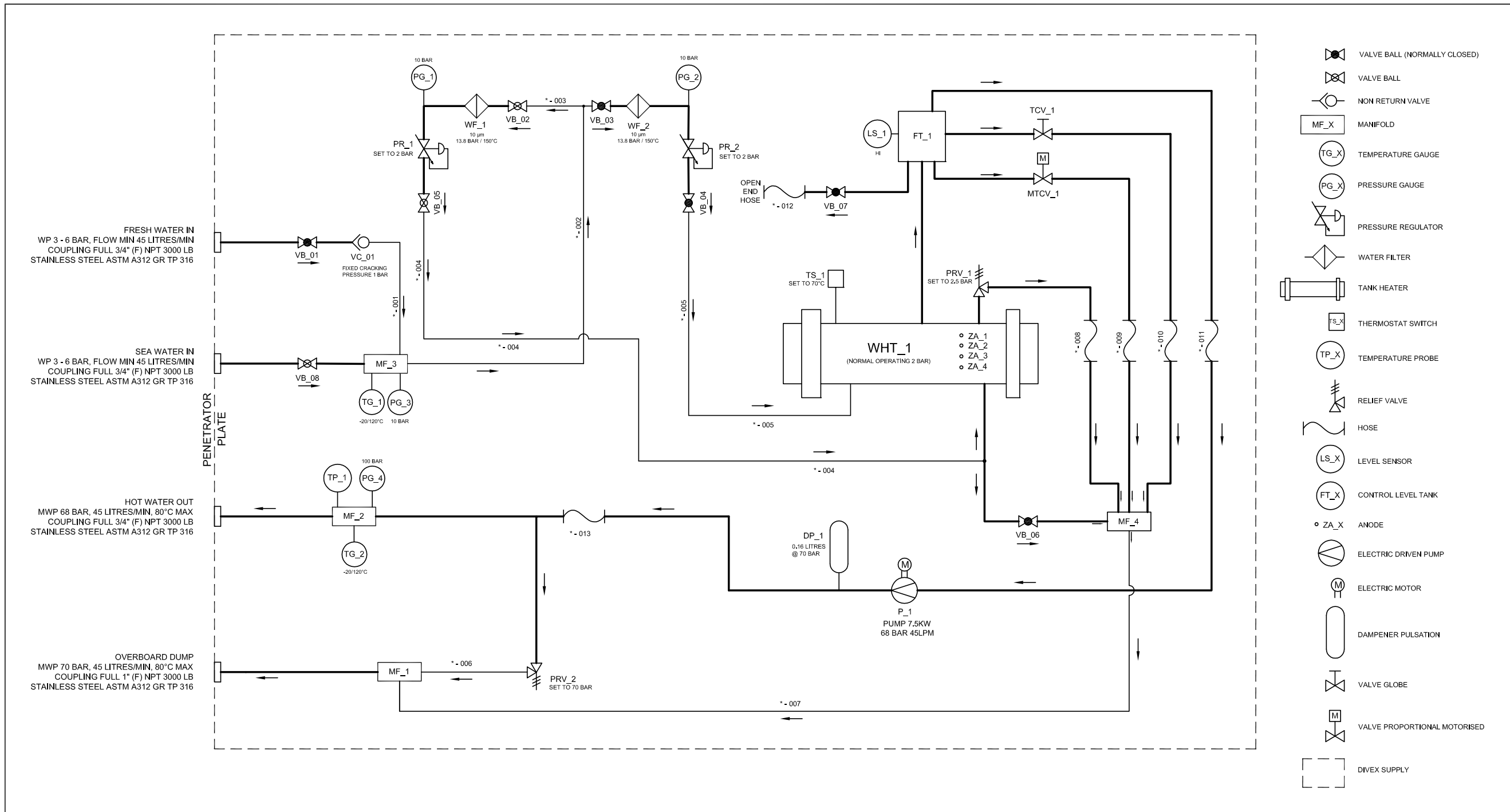
Tel: +44(0)1224 740145
Fax: +44(0)1224 740172
email: info@divexglobal.com
www.divexglobal.com

WHE-3 Electrical Schematic - With Remote Busbar Manufacturing Detail



| THIRD ANGLE PROJECTION | | MATERIAL: | | | | | FINISH: | | MASS: (kg) | | COPYRIGHT EXISTS IN THIS DRAWING AND ALL INFORMATION THEREIN IN TERMS OF COPYRIGHT LAW. THIS DRAWING IS ONLY TO BE USED FOR THE PURPOSE FOR WHICH IT WAS SUPPLIED TO THE SECOND PARTY AND MAY NOT BE REPRODUCED IN WHOLE OR IN PART BY ANY MEANS WHATSOEVER AND ITS CONTENTS MAY NOT BE DISCLOSED TO ANY OTHER PARTY WITHOUT THE CONSENT OF DIVEX (PTY) LTD. NO LICENCE OR RIGHTS TO MANUFACTURE THE EQUIPMENT IS GIVEN OR IMPLIED. | | | | DIVEX | | TEL : +27 (0)21 551-2233 CAPE TOWN, SOUTH AFRICA P.O. BOX 36541, CHEMPET, 7442 | | FAX : +27 (0)21 552-3547 www.divexglobal.com | | DRAWING No/PART No | |
|------------------------|-------------------------|-------------------------|-------|----------|-------------------|----------|-------------------|----------|-------------|----------|---|-------|------|-----|-------------------------------------|--|--|----------|---|-----------------|--------------------|----|
| | | COPPER BAR PT No: 02940 | | | | | | | | | | | | | | | | | | | A3 | |
| REV | DESCRIPTION OF REVISION | ECN | DRAWN | DATE | DRAFTING CHECK BY | DATE | ENGINEER CHECK BY | DATE | APPROVAL BY | DATE | OVER-TO | ± | ± | ± | SCALE | PRODUCT/PROJECT | TITLE | PART No. | REV | CAD REF/DRG No. | SHT | OF |
| R02 | UPDATED AS PER ECN | CT00312 | R.C | 12/07/11 | G.D | 12/07/11 | N.M | 12/07/11 | N.M | 12/07/11 | 0-6 | 0.1 | 0.2 | 0.5 | WHE-3 | WHE-3 ELECTRICAL SCHEMATIC - WITH REMOTE BUSBAR MANUFACTURING DETAIL | 06691-3 | R02 | 06691-3 | 1 | OF | 1 |
| R01 | UPDATED AS PER ECN | CT00306 | R.C | 24/02/11 | G.D | 30/03/11 | N.M | 30/03/11 | N.M | 30/03/11 | 6-30 | 0.2 | 0.5 | 1.0 | | | | | | | | |
| R00 | FIRST ISSUE | - | R.C | 03/11/10 | G.D | 03/11/10 | N.M | 03/11/10 | N.M | 03/11/10 | 30-100 | 0.3 | 0.8 | 1.5 | ALL DIMENSIONS BEFORE PLATING (UOS) | | | | | | | |
| | | | | | | | | | | | 100-300 | 0.5 | 1.2 | 2.0 | REMOVE SHARP EDGES & BURRS | | | | | | | |
| | | | | | | | | | | | 300-1000 | 0.8 | 2.0 | 3.0 | | | | | | | | |
| | | | | | | | | | | | 1000-3000 | 1.2 | 3.0 | 5.0 | | | | | | | | |
| | | | | | | | | | | | 3000-PLUS | 2.0 | 4.0 | 8.0 | | | | | | | | |
| | | | | | | | | | | | ANGLE | 0.25° | 0.5° | 1° | | | | | | | | |

Schematic, Water, Heater Electric, WHE-3 Upgrade, With PV'S 3.1 Cert
Sheet 1 of 2



DIVEX OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS

| NOTES — ILLUSTRATES CONNECTIONS BY FITTINGS. | ALL DIMENSIONS SHOWN ARE IN MM (UOS) ALL DIMENSIONS BEFORE PLATING (UOS) REMOVE ALL SHARP EDGES AND BURRS | MATERIAL SEE SHEET 2 | R08 SEE SHEET 2 19108 MJ 18/03/16 PB R07 LEGEND KEY UPDATED 18985 JR 19/01/16 PB R06 CHECK VALVE REMOVED 18562 JR 10/09/15 PB R05 CHECK VALVE ADDED 18461 JR 28/08/15 AN R04 SYMBOL LEGEND ADDED 17898 MJ 05/05/15 SC R03 SHT 1. REDRAWN & SHT 2. ADDED 17323 VG 02/02/15 MS | TITLE SCHEMATIC, WATER HEATER ELECTRIC, WHE-3 | | | | | | | | | | |
|--|---|--------------------------------|---|---|---------------------------------------|------------------------|---------------------|-------------------------|----------------|-------------------------|-------------------------|----------------------|---|--------------------------------|
| | DIMENSIONAL TOLERANCES <table border="1"> <tr> <th>MACHINING</th> <th>FABRICATION</th> </tr> <tr> <td>NO DECIMAL PLACES ±1.0</td> <td>SIZE >0 <100 ±0.5</td> </tr> <tr> <td>ONE DECIMAL PLACE ±0.2</td> <td>SIZE >100 <500 ±1.5</td> </tr> <tr> <td>TWO DECIMAL PLACE ±0.05</td> <td>SIZE >500 ±3.0</td> </tr> <tr> <td>ANGULAR TOLERANCE ±0.5°</td> <td>ANGULAR TOLERANCE ±0.5°</td> </tr> </table> | MACHINING | FABRICATION | NO DECIMAL PLACES ±1.0 | SIZE >0 <100 ±0.5 | ONE DECIMAL PLACE ±0.2 | SIZE >100 <500 ±1.5 | TWO DECIMAL PLACE ±0.05 | SIZE >500 ±3.0 | ANGULAR TOLERANCE ±0.5° | ANGULAR TOLERANCE ±0.5° | FINISH N/A | REV R00 FIRST ISSUE JJ 17/07/09 NM DESCRIPTION ECN No BY DATE AUTH. BY | DRAWING No. DO5993S1 |
| MACHINING | FABRICATION | | | | | | | | | | | | | |
| NO DECIMAL PLACES ±1.0 | SIZE >0 <100 ±0.5 | | | | | | | | | | | | | |
| ONE DECIMAL PLACE ±0.2 | SIZE >100 <500 ±1.5 | | | | | | | | | | | | | |
| TWO DECIMAL PLACE ±0.05 | SIZE >500 ±3.0 | | | | | | | | | | | | | |
| ANGULAR TOLERANCE ±0.5° | ANGULAR TOLERANCE ±0.5° | | | | | | | | | | | | | |
| | | THIRD ANGLE PROJECTION | DO NOT SCALE DRAWING | PART No. KI40018 AA/AB/AC | PRODUCT / PROJECT No. WHE-3 | | | | | | | | | |
| | | | SIZE A3 | SCALE NTS | SHT 1 OF 2 | | | | | | | | | |

DIVEX LIMITED
 ENTERPRISE DRIVE
 WESTHILL
 ABERDEEN
 AB32 6TQ
 UNITED KINGDOM
 Tel: +44(0)1224 740145
 Fax: +44(0)1224 740172
 email: info@divexglobal.com
 www.divexglobal.com

| Line Table | | | | | | | |
|------------|------|--------------|--|-----------------------|----------|------------------|--|
| Line No. | Size | Wall THK/SWG | Material | Media | WP (bar) | Hydro Test (Bar) | Process Description |
| *-001 | 3/4" | 1.22/18 | TUBE TUNGUM | Fresh Water | 6 | 9 | Piping Water in to Pressure Regulator |
| *-002 | 1" | 1.63/16 | TUBE TUNGUM | Fresh Water/Sea Water | 6 | 9 | Piping Water in to Pressure Regulator |
| *-003 | 1" | 1.36/16 | TUBE TUNGUM | Fresh Water/Sea Water | 6 | 9 | Piping Water in to Pressure Regulator |
| *-004 | 1" | 1.63/16 | TUBE TUNGUM | Fresh Water/Sea Water | 2 | 3 | Piping Pressure Regulator to Heater Tank |
| *-005 | 1" | 1.63/16 | TUBE TUNGUM | Fresh Water/Sea Water | 2 | 3 | Piping Pressure Regulator to Heater Tank |
| *-006 | 3/4" | 1.22/18 | TUBE TUNGUM | Fresh Water/Sea Water | 68 | 102 | Piping Heater to Outlet |
| *-007 | 3/4" | 1.22/18 | TUBE TUNGUM | Fresh Water/Sea Water | 68 | 102 | Piping Heater to Dump |
| *-008 | 1/2" | N/A | HOSE, HYDRAULIC, 1/2", PARKER, 801-8-GRA-RL | Fresh Water/Sea Water | 2 | 3 | Piping Heater Tank to Dum Manifold |
| *-009 | 3/4" | N/A | HOSE, PUSH-LOK, 3/4", PARKER, 801-3/4 | Fresh Water/Sea Water | 2 | 3 | Piping Heater Tank to Dum Manifold |
| *-010 | 3/4" | N/A | HOSE, PUSH-LOK, 3/4", PARKER, 801-3/4 | Fresh Water/Sea Water | 2 | 3 | Piping Heater Tank to Dum Manifold |
| *-011 | 3/4" | N/A | HOSE, PUSH-LOK, 3/4", PARKER, 801-3/4 | Fresh Water/Sea Water | 2 | 3 | Piping Heater Tank to Pump |
| *-012 | 3/4" | N/A | HOSE, PUSH-LOK, 3/4", PARKER, 801-3/4 | Fresh Water/Sea Water | 2 | 3 | Piping Tank to Outlet |
| *-013 | 3/4" | N/A | HOSE, HIGH PRESSURE, 3/4", HYDRASUN, 540N-12 | Fresh Water/Sea Water | 68 | 102 | Piping Pump to Outlet |

| Component Table | | | | |
|-----------------|--|---------------------|--|------------------------------------|
| Equip. Tag | Description | Reference DIVEX P/N | Material | Pressure/Temp. Rating |
| VB_01 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 Bar (max) - 204°C (max) |
| VB_02 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 Bar (max) - 204°C (max) |
| VB_03 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 Bar (max) - 204°C (max) |
| VB_04 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 Bar (max) - 204°C (max) |
| VB_05 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 Bar (max) - 204°C (max) |
| VB_06 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 Bar (max) - 204°C (max) |
| VB_07 | VALVE, BALL, PARKER, 1/2"NPT | VB36264 | BRASS | 10.34 Bar (max) - 204°C (max) |
| VB_08 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 Bar (max) - 204°C (max) |
| TCV_1 | VALVE, GLOBE, 3/4"BSP(F), BRONZE CRANE, P/N: 3326 | DC03326 | BRONZE CRANE | TBC |
| MTCV_1 | VALVE, CONTROL, PROP. 2-WAY, DN20, RP 3/4" KVS 6.3 | DC02782 | HOUSING NICKEL-PLATED, HOT-PRESSED BRASS | 16 Bar (max) -10 to 120 °C (max) |
| PRV_1 | VALVE, RELIEF, 1/2" MNPT,3-50 PSI | DC02304 | BRASS | Set to 2.5 Bar |
| PRV_2 | VALVE, RELIEF, CAT 7012.1, SS | DC02723 | 316SS | Set to 70 Bar |
| PG_1 | GAUGE,PRESSURE,BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 Bar |
| PG_2 | GAUGE,PRESSURE,BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 Bar |
| PG_3 | GAUGE,PRESSURE,BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 Bar |
| PG_4 | GAUGE, PRESSURE, 0-100 BAR,BOTM ENTRY, GL | DOPBBA63BB02QJ3A | 316SS | 100 Bar |
| TG_1 | GAUGE, 0/100°C, PROBE 20MM L X 6MM OD, 1/2"NPT | DC05836 | 316SS | -20/120°C |
| TG_2 | GAUGE, 0/100°C, PROBE 20MM L X 6MM OD, 1/2"NPT | DC05836 | 316SS | -20/120°C |
| TP_1 | PROBE, T100, 1/2"NPT X 75MM, 6MM OD, 3 WIRE SYSTEM | DC04419 | TBC | TBC |
| TS_1 | THERMOSTAT, 70DEG C, 220V, 10A, BI METAL | DC03657 | PHENOLIC BODY WITH STAINLESS STEEL END CAP | 0/+150°C (MAX) SET TO 70°C |
| MF_1 | MANIFOLD, FRONT DUMP, WHE-3 UPGRADE | DC05900 | BRASS (CZ121) | TBC |
| MF_2 | MANIFOLD, DELIVERY, WHE-3 UPGRADE | DC05901 | BRASS (CZ121) | TBC |
| MF_3 | MANIFOLD, COLD WATER SUPPLY, WHE-3 UPGRADE | DC05902 | BRASS (CZ121) | TBC |
| MF_4 | MANIFOLD, WATER DUMP, WHE-3 UPGRADE | DC05668 | BRASS (CZ121) | TBC |
| LS_1 | SWITCH, LEVEL, DIVEX HOT WATER MACHINE | DC02779 | BODY BRASS | 13.8 Bar (max) / -20 + 105°C (max) |
| FT_1 | CONTROL, LEVEL TANK, WHE-3 UPGRADE | DC05669 | 316SS | TBC |
| PR_1 | VALVE, PRESSURE REDUCING., DIVEX HOT WATER MACHINE | DC02359 | SEE DATA SHEET | 0.5 - 6 Bar/80°C (max) |
| PR_2 | VALVE, PRESSURE REDUCING., DIVEX HOT WATER MACHINE | DC02359 | SEE DATA SHEET | 0.5 - 6 Bar/80°C (max) |
| VC_01 | VALVE, CHECK, 3/4" BSP(FEM), BRASS, H/WATER | DC02780 | BODY BRASS | 12 Bar (max)/-30+100°C (max) |
| ZA_1 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02369 | DC02369 | ZINC/BRASS | TBC |
| ZA_2 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02370 | DC02369 | ZINC/BRASS | TBC |
| ZA_3 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02371 | DC02369 | ZINC/BRASS | TBC |
| ZA_4 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02372 | DC02369 | ZINC/BRASS | TBC |
| P_1 | PUMP, CAT,1057, 45LTR@70 BAR,C/W, NAB HEAD | DC02722 | STAINLESS STEEL | 155 Bar (max) |
| DP_1 | DAMPENER, PULSATION, SS, 1621SS180, ACCUMULATOR | DC02724 | STAINLESS STEEL | 168 Bar (max) / -20 +82°C (max) |
| WHT_1 | ASSEMBLY, TANK, WHE-3 UPGRADE | DC05720 | STAINLESS STEEL | TBC |
| WF_1 | FILTER, HOUSING, 3/4" NPT, ST/ST 315 10", 04768 | DC04768 | STAINLESS STEEL | 13.8 Bar (max) 150°C (max) |
| WF_2 | FILTER, HOUSING, 3/4" NPT, ST/ST 315 10", 04769 | DC04769 | STAINLESS STEEL | 13.8 Bar (max) 150°C (max) |



DIVEX OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS

NOTES

ALL DIMENSIONS SHOWN ARE IN MM (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

DIMENSIONAL TOLERANCES

| MACHINING | FABRICATION |
|-------------------------|-------------------------|
| NO DECIMAL PLACES ±1.0 | SIZE >0 <100 ±0.5 |
| ONE DECIMAL PLACE ±0.2 | SIZE >100 <500 ±1.5 |
| TWO DECIMAL PLACE ±0.05 | SIZE >500 ±3.0 |
| ANGULAR TOLERANCE ±0.5° | ANGULAR TOLERANCE ±0.5° |

⚠ DENOTES CHANGES MADE AT THIS REVISION

| | |
|-------------------------------|-----|
| MATERIAL | N/A |
| FINISH | N/A |
| THIRD ANGLE PROJECTION | |

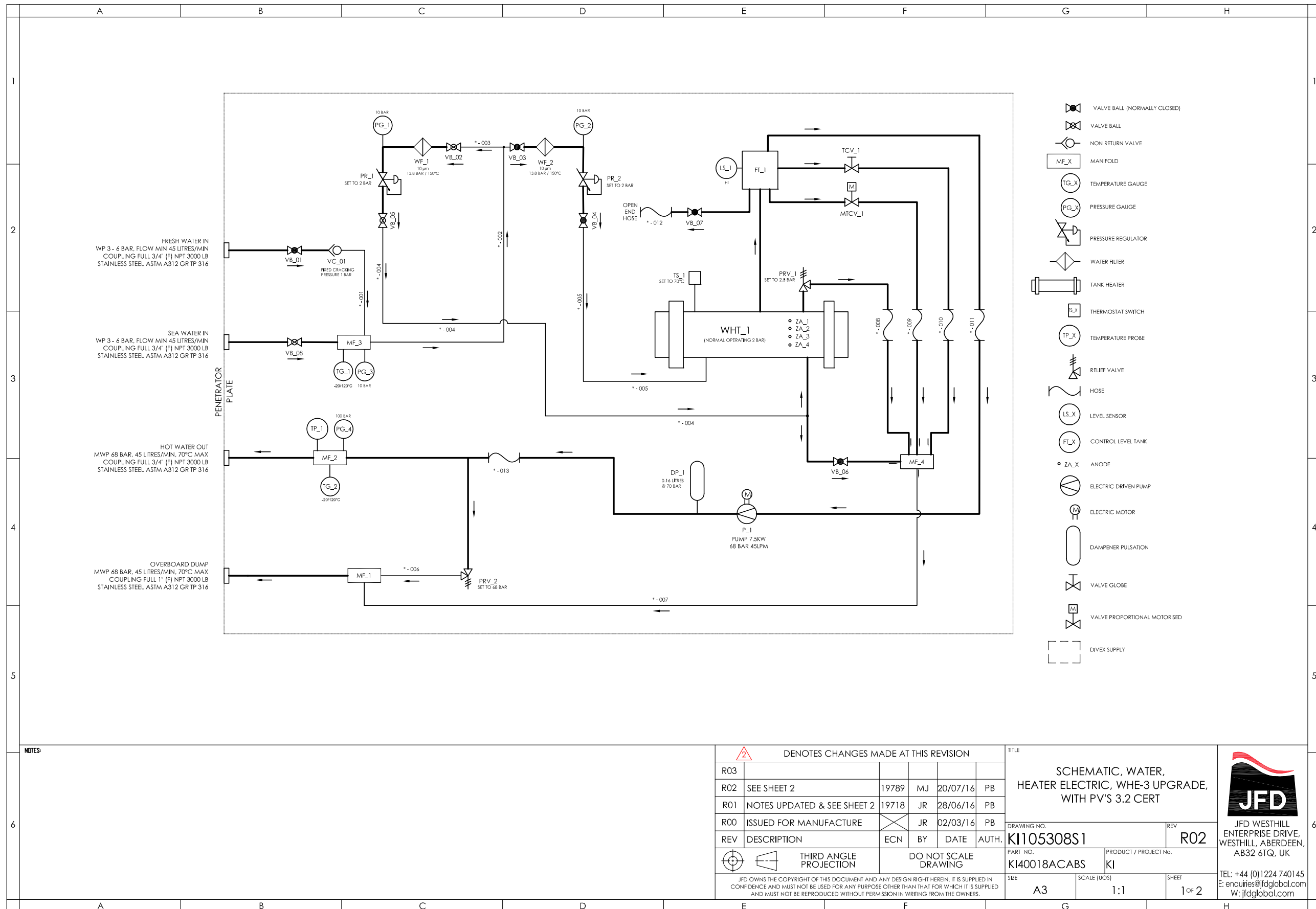
| | | | | | |
|-----|------------------------|--------|----|----------|----------|
| R08 | WHT_1 CORRECTED | 19108 | MJ | 18/03/16 | PB |
| R07 | TS_1 CORRECTED | 18985 | JR | 19/01/16 | PB |
| R06 | CHECK VALVE REMOVED | 18562 | JR | 10/09/15 | PB |
| R05 | CHECK VALVE ADDED | 18461 | JR | 28/08/15 | AN |
| R04 | SEE SHEET 1 | 17898 | MJ | 05/05/15 | SC |
| R03 | FIRST ISSUE | 17323 | VG | 02/02/15 | MS |
| R00 | ISSUED FOR MANUFACTURE | | | | |
| REV | DESCRIPTION | ECN No | BY | DATE | AUTH. BY |

| | | | |
|-------------|-----------------------|---|----|
| TITLE | | SCHEMATIC, WATER HEATER ELECTRIC, WHE-3 | |
| DRAWING No. | REV | DO5993S2 R08 | |
| PART No. | PRODUCT / PROJECT No. | KI40018 AA/AB/AC WHE-3 | |
| SIZE | SCALE | SHT | OF |
| A3 | NTS | 2 | 2 |

DIVEX LIMITED
ENTERPRISE DRIVE
WESTHILL
ABERDEEN
AB32 6TQ
UNITED KINGDOM

Tel: +44(0)1224 740145
Fax: +44(0)1224 740172
email: info@divexglobal.com
www.divexglobal.com

Schematic, Water, Heater Electric, WHE-3 Upgrade, With PV'S 3.2 Cert
Sheet 1 of 2



NOTES:

| DENOTES CHANGES MADE AT THIS REVISION | | | | | TITLE | |
|---|-----------------------------|---------------------------------|----|------------------------------------|--|-------------------|
| R03 | | | | | SCHEMATIC, WATER, HEATER ELECTRIC, WHE-3 UPGRADE, WITH PV'S 3.2 CERT | |
| R02 | SEE SHEET 2 | 19789 | MJ | 20/07/16 | PB | REV R02 |
| R01 | NOTES UPDATED & SEE SHEET 2 | 19718 | JR | 28/06/16 | PB | |
| R00 | ISSUED FOR MANUFACTURE | | JR | 02/03/16 | PB | |
| REV | DESCRIPTION | ECN | BY | DATE | AUTH. | |
| THIRD ANGLE PROJECTION | | DO NOT SCALE DRAWING | | DRAWING NO. KI105308S1 | | |
| JFD OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS. | | PART NO. KI40018ACABS | | PRODUCT / PROJECT No. KI | | |
| SIZE A3 | | SCALE (UOS) 1:1 | | SHEET 1 OF 2 | | |

JFD WESTHILL
 ENTERPRISE DRIVE,
 WESTHILL, ABERDEEN,
 AB32 6TQ, UK
 TEL: +44 (0)1224 740145
 E: enquiries@jfdglobal.com
 W: jfdglobal.com

| A | B | C | D | E | F | G | H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---------------------|--|------------------------------------|----------|--|--|---------------------------------------|--|--|--|--|------------|-------------|---------------------|----------|----------------------|--------------|-------------------------|---------|----------|--|---------------------|-------------------------|--------------------------|---------|-------------------------------|-------------|-------------------------|---------|--------------------------------------|-------------------------------|-------|-------------------------|-------------|-----------------------|-------------------------------|-------|--------------------------------------|----------|-------|-------------------------------|-------------|-------------------------|---------|-------|--------------------------------------|-------------|------------------------------|---------|-------------|-------------------------------|-------|-------------------------|--|------------|-------------------------------|------------------------|---|-----------------------|--------------|-----|--|--|---------|---|----------------------------------|-----------------------|------------------------------------|---------|-------------------------|----------------|-------|-------------------------------|-------------|-----------------------|---------------|------|---|------------------|--------|--------|---------------------------------|---|------------------|-------|-------------------------------------|-------|---|------------------|---------------------------------|-----------------------|------|--|-------------------------------------|-------|---------|------|--|-----------------------|-------|-----------|-------------------------------------|--|---------|-------|---------------------------------|-----------------------|--|---------|----------------------------|-------|------|--|---------------------------------|--|----------------------------|------|-------------------------------------|---------|---------------|-----|--------------------------------|-----------------------------------|---------|---------------|-----------------------|------|--|---------|---------------|-----|------|-------------------------------------|---------|---------------|-----|------|--|---------|------------|------------------------------------|------|------------------------------------|---------|-----------------|--------------------------------|------|--|---------|----------------|------------------------|------|--|---------|----------------|------------------------|-------|---|---------|------------|--------------------------------|------|--|---------|------------|-----|------|--|---------|------------|-----|------|--|---------|------------|-----|------|--|---------|------------|-----|-----|--|---------|-----------------|---------------|------|---|---------|-----------------|---------------------------------|-------|-------------------------------|---------|-----------------|--------------------------------|------|---|---------|-----------------|----------------------------|------|---|---------|-----------------|----------------------------|
| <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="8">LINE TABLE</th> </tr> <tr> <th>LINE No.</th> <th>SIZE</th> <th>WALL THK/SWG</th> <th>MATERIAL</th> <th>MEDIA</th> <th>WP (bar)</th> <th>HYDRO TEST (bar)</th> <th>PROCESS DESCRIPTION</th> </tr> </thead> <tbody> <tr><td>*-001</td><td>3/4"</td><td>1.22/18</td><td>TUBE TUNGUM</td><td>FRESH WATER</td><td>6</td><td>9</td><td>PIPING WATER INTO PRESSURE REGULATOR</td></tr> <tr><td>*-002</td><td>1"</td><td>1.63/16</td><td>TUBE TUNGUM</td><td>FRESH WATER/SEA WATER</td><td>6</td><td>9</td><td>PIPING WATER INTO PRESSURE REGULATOR</td></tr> <tr><td>*-003</td><td>1"</td><td>1.36/16</td><td>TUBE TUNGUM</td><td>FRESH WATER/SEA WATER</td><td>6</td><td>9</td><td>PIPING WATER INTO PRESSURE REGULATOR</td></tr> <tr><td>*-004</td><td>1"</td><td>1.63/16</td><td>TUBE TUNGUM</td><td>FRESH WATER/SEA WATER</td><td>2</td><td>3</td><td>PIPING PRESSURE REGULATOR TO HEATER TANK</td></tr> <tr><td>*-005</td><td>1"</td><td>1.63/16</td><td>TUBE TUNGUM</td><td>FRESH WATER/SEA WATER</td><td>2</td><td>3</td><td>PIPING PRESSURE REGULATOR TO HEATER TANK</td></tr> <tr><td>*-006</td><td>3/4"</td><td>1.22/18</td><td>TUBE TUNGUM</td><td>FRESH WATER/SEA WATER</td><td>68</td><td>102</td><td>PIPING HEATER TO OUTLET</td></tr> <tr><td>*-007</td><td>3/4"</td><td>1.22/18</td><td>TUBE TUNGUM</td><td>FRESH WATER/SEA WATER</td><td>68</td><td>102</td><td>PIPING HEATER TO DUMP</td></tr> <tr><td>*-008</td><td>1/2"</td><td>N/A</td><td>HOSE, 1/2" MANULI TRACTOR / 1SN</td><td>FRESH WATER/SEA WATER</td><td>2</td><td>3</td><td>PIPING HEATER TANK TO DUMP MANIFOLD</td></tr> <tr><td>*-009</td><td>3/4"</td><td>N/A</td><td>HOSE, 3/4" MANULI TRACTOR / 1SN</td><td>FRESH WATER/SEA WATER</td><td>2</td><td>3</td><td>PIPING HEATER TANK TO DUMP MANIFOLD</td></tr> <tr><td>*-010</td><td>3/4"</td><td>N/A</td><td>HOSE, 3/4" MANULI TRACTOR / 1SN</td><td>FRESH WATER/SEA WATER</td><td>2</td><td>3</td><td>PIPING HEATER TANK TO DUMP MANIFOLD</td></tr> <tr><td>*-011</td><td>3/4"</td><td>N/A</td><td>HOSE, 3/4" MANULI TRACTOR / 1SN</td><td>FRESH WATER/SEA WATER</td><td>2</td><td>3</td><td>PIPING HEATER TANK TO PUMP</td></tr> <tr><td>*-012</td><td>1/2"</td><td>N/A</td><td>HOSE, 1/2" MANULI TRACTOR / 1SN</td><td>FRESH WATER/SEA WATER</td><td>2</td><td>3</td><td>PIPING TANK TO OUTLET</td></tr> <tr><td>*-013</td><td>3/4"</td><td>N/A</td><td>HOSE, 3/4" PIRTEK SAE 100R 1AT</td><td>FRESH WATER/SEA WATER</td><td>68</td><td>102</td><td>PIPING PUMP TO OUTLET</td></tr> </tbody> </table> | | | | | | | | LINE TABLE | | | | | | | | LINE No. | SIZE | WALL THK/SWG | MATERIAL | MEDIA | WP (bar) | HYDRO TEST (bar) | PROCESS DESCRIPTION | *-001 | 3/4" | 1.22/18 | TUBE TUNGUM | FRESH WATER | 6 | 9 | PIPING WATER INTO PRESSURE REGULATOR | *-002 | 1" | 1.63/16 | TUBE TUNGUM | FRESH WATER/SEA WATER | 6 | 9 | PIPING WATER INTO PRESSURE REGULATOR | *-003 | 1" | 1.36/16 | TUBE TUNGUM | FRESH WATER/SEA WATER | 6 | 9 | PIPING WATER INTO PRESSURE REGULATOR | *-004 | 1" | 1.63/16 | TUBE TUNGUM | FRESH WATER/SEA WATER | 2 | 3 | PIPING PRESSURE REGULATOR TO HEATER TANK | *-005 | 1" | 1.63/16 | TUBE TUNGUM | FRESH WATER/SEA WATER | 2 | 3 | PIPING PRESSURE REGULATOR TO HEATER TANK | *-006 | 3/4" | 1.22/18 | TUBE TUNGUM | FRESH WATER/SEA WATER | 68 | 102 | PIPING HEATER TO OUTLET | *-007 | 3/4" | 1.22/18 | TUBE TUNGUM | FRESH WATER/SEA WATER | 68 | 102 | PIPING HEATER TO DUMP | *-008 | 1/2" | N/A | HOSE, 1/2" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING HEATER TANK TO DUMP MANIFOLD | *-009 | 3/4" | N/A | HOSE, 3/4" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING HEATER TANK TO DUMP MANIFOLD | *-010 | 3/4" | N/A | HOSE, 3/4" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING HEATER TANK TO DUMP MANIFOLD | *-011 | 3/4" | N/A | HOSE, 3/4" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING HEATER TANK TO PUMP | *-012 | 1/2" | N/A | HOSE, 1/2" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING TANK TO OUTLET | *-013 | 3/4" | N/A | HOSE, 3/4" PIRTEK SAE 100R 1AT | FRESH WATER/SEA WATER | 68 | 102 | PIPING PUMP TO OUTLET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LINE TABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LINE No. | SIZE | WALL THK/SWG | MATERIAL | MEDIA | WP (bar) | HYDRO TEST (bar) | PROCESS DESCRIPTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-001 | 3/4" | 1.22/18 | TUBE TUNGUM | FRESH WATER | 6 | 9 | PIPING WATER INTO PRESSURE REGULATOR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-002 | 1" | 1.63/16 | TUBE TUNGUM | FRESH WATER/SEA WATER | 6 | 9 | PIPING WATER INTO PRESSURE REGULATOR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-003 | 1" | 1.36/16 | TUBE TUNGUM | FRESH WATER/SEA WATER | 6 | 9 | PIPING WATER INTO PRESSURE REGULATOR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-004 | 1" | 1.63/16 | TUBE TUNGUM | FRESH WATER/SEA WATER | 2 | 3 | PIPING PRESSURE REGULATOR TO HEATER TANK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-005 | 1" | 1.63/16 | TUBE TUNGUM | FRESH WATER/SEA WATER | 2 | 3 | PIPING PRESSURE REGULATOR TO HEATER TANK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-006 | 3/4" | 1.22/18 | TUBE TUNGUM | FRESH WATER/SEA WATER | 68 | 102 | PIPING HEATER TO OUTLET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-007 | 3/4" | 1.22/18 | TUBE TUNGUM | FRESH WATER/SEA WATER | 68 | 102 | PIPING HEATER TO DUMP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-008 | 1/2" | N/A | HOSE, 1/2" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING HEATER TANK TO DUMP MANIFOLD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-009 | 3/4" | N/A | HOSE, 3/4" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING HEATER TANK TO DUMP MANIFOLD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-010 | 3/4" | N/A | HOSE, 3/4" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING HEATER TANK TO DUMP MANIFOLD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-011 | 3/4" | N/A | HOSE, 3/4" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING HEATER TANK TO PUMP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-012 | 1/2" | N/A | HOSE, 1/2" MANULI TRACTOR / 1SN | FRESH WATER/SEA WATER | 2 | 3 | PIPING TANK TO OUTLET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *-013 | 3/4" | N/A | HOSE, 3/4" PIRTEK SAE 100R 1AT | FRESH WATER/SEA WATER | 68 | 102 | PIPING PUMP TO OUTLET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="5">COMPONENT TABLE</th> </tr> <tr> <th>EQUIP. TAG</th> <th>DESCRIPTION</th> <th>REFERENCE DIVEX P/N</th> <th>MATERIAL</th> <th>PRESSURE/TEMP RATING</th> </tr> </thead> <tbody> <tr><td>VB_01</td><td>VALVE, BALL, 3/4"NPT(F)</td><td>VB36265</td><td>BRASS</td><td>10.34 bar (max) - 204°C (max)</td></tr> <tr><td>VB_02</td><td>VALVE, BALL, 3/4"NPT(F)</td><td>VB36265</td><td>BRASS</td><td>10.34 bar (max) - 204°C (max)</td></tr> <tr><td>VB_03</td><td>VALVE, BALL, 3/4"NPT(F)</td><td>VB36265</td><td>BRASS</td><td>10.34 bar (max) - 204°C (max)</td></tr> <tr><td>VB_04</td><td>VALVE, BALL, 3/4"NPT(F)</td><td>VB36265</td><td>BRASS</td><td>10.34 bar (max) - 204°C (max)</td></tr> <tr><td>VB_05</td><td>VALVE, BALL, 3/4"NPT(F)</td><td>VB36265</td><td>BRASS</td><td>10.34 bar (max) - 204°C (max)</td></tr> <tr><td>VB_06</td><td>VALVE, BALL, 3/4"NPT(F)</td><td>VB36265</td><td>BRASS</td><td>10.34 bar (max) - 204°C (max)</td></tr> <tr><td>VB_07</td><td>VALVE, BALL, PARKER, 1/2"NPT</td><td>VB36264</td><td>BRASS</td><td>10.34 bar (max) - 204°C (max)</td></tr> <tr><td>VB_08</td><td>VALVE, BALL, 3/4"NPT(F)</td><td>VB36265</td><td>BRASS</td><td>10.34 bar (max) - 204°C (max)</td></tr> <tr><td>TCV_1</td><td>VALVE, GLOBE, 3/4"BSP(F), BRONZE CRANE, P/N: 3326</td><td>DO03326</td><td>BRONZE CRANE</td><td>TBC</td></tr> <tr><td>MTCV_1</td><td>VALVE, CONTROL, PROP. 2-WAY, DN20, RP 3/4" KVS 6.3</td><td>DO02782</td><td>HOUSING NICKEL-PLATED, HOT-PRESSED BRASS</td><td>16 bar (max) -10 to 120 °C (max)</td></tr> <tr><td>PRV_1</td><td>VALVE, RELIEF, 1/2" MNPT, 3-50 PSI</td><td>DO02304</td><td>BRASS</td><td>SET TO 2.5 bar</td></tr> <tr><td>PRV_2</td><td>VALVE, RELIEF, CAT 7012.1, SS</td><td>DO02723</td><td>316SS</td><td>SET TO 68 bar</td></tr> <tr><td>PG_1</td><td>GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR</td><td>DOPBBA63BB02QJ2A</td><td>316SS</td><td>10 bar</td></tr> <tr><td>PG_2</td><td>GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR</td><td>DOPBBA63BB02QJ2A</td><td>316SS</td><td>10 bar</td></tr> <tr><td>PG_3</td><td>GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR</td><td>DOPBBA63BB02QJ2A</td><td>316SS</td><td>10 bar</td></tr> <tr><td>PG_4</td><td>GAUGE, PRESSURE, 0-100 BAR, BCTM ENTRY, GL</td><td>DOPBBA63BB02QJ3A</td><td>316SS</td><td>100 bar</td></tr> <tr><td>TG_1</td><td>GAUGE, 0/100°C, PROBE 20MM L X 6MM OD, 1/2"NPT</td><td>DO05836</td><td>316SS</td><td>-20/120°C</td></tr> <tr><td>TG_2</td><td>GAUGE, 0/100°C, PROBE 20MM L X 6MM OD, 1/2"NPT</td><td>DO05836</td><td>316SS</td><td>-20/120°C</td></tr> <tr><td>TP_1</td><td>PROBE, T100, 1/2"NPT X 75MM, 6MM OD, 3 WIRE SYSTEM</td><td>DO04419</td><td>TBC</td><td>TBC</td></tr> <tr><td>TS_1</td><td>THERMOSTAT, 70DEG C, 220V, 10A, BI METAL</td><td>DO03657</td><td>PHENOLIC BODY WITH STAINLESS STEEL END CAP</td><td>+150°C (max) / SET TO 70°C</td></tr> <tr><td>MF_1</td><td>MANIFOLD, FRONT DUMP, WHE-3 UPGRADE</td><td>DO05900</td><td>BRASS (CZ121)</td><td>TBC</td></tr> <tr><td>MF_2</td><td>MANIFOLD, DELIVERY, WHE-3 UPGRADE</td><td>DO05901</td><td>BRASS (CZ121)</td><td>TBC</td></tr> <tr><td>MF_3</td><td>MANIFOLD, COLD WATER SUPPLY, WHE-3 UPGRADE</td><td>DO05902</td><td>BRASS (CZ121)</td><td>TBC</td></tr> <tr><td>MF_4</td><td>MANIFOLD, WATER DUMP, WHE-3 UPGRADE</td><td>DO05668</td><td>BRASS (CZ121)</td><td>TBC</td></tr> <tr><td>LS_1</td><td>SWITCH, LEVEL, DIVEX HOT WATER MACHINE</td><td>DO02779</td><td>BODY BRASS</td><td>13.8 bar (max) / -20 + 105°C (max)</td></tr> <tr><td>FT_1</td><td>CONTROL, LEVEL TANK, WHE-3 UPGRADE</td><td>KI05669</td><td>STAINLESS STEEL</td><td>2.5 bar (max) / -20+85°C (max)</td></tr> <tr><td>PR_1</td><td>VALVE, PRESSURE REDUCING., DIVEX HOT WATER MACHINE</td><td>DO02359</td><td>SEE DATA SHEET</td><td>0.5 - 6 bar/80°C (max)</td></tr> <tr><td>PR_2</td><td>VALVE, PRESSURE REDUCING., DIVEX HOT WATER MACHINE</td><td>DO02359</td><td>SEE DATA SHEET</td><td>0.5 - 6 bar/80°C (max)</td></tr> <tr><td>VC_01</td><td>VALVE, CHECK, 3/4" BSP(FEM), BRASS, H/WATER</td><td>DO02780</td><td>BODY BRASS</td><td>12 bar (max) / -30+100°C (max)</td></tr> <tr><td>ZA_1</td><td>ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02369</td><td>DO02369</td><td>ZINC/BRASS</td><td>TBC</td></tr> <tr><td>ZA_2</td><td>ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02370</td><td>DO02369</td><td>ZINC/BRASS</td><td>TBC</td></tr> <tr><td>ZA_3</td><td>ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02371</td><td>DO02369</td><td>ZINC/BRASS</td><td>TBC</td></tr> <tr><td>ZA_4</td><td>ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02372</td><td>DO02369</td><td>ZINC/BRASS</td><td>TBC</td></tr> <tr><td>P_1</td><td>PUMP, CAT, 1057, 45LTR@70 BAR, C/W, NAB HEAD</td><td>DO02722</td><td>STAINLESS STEEL</td><td>155 bar (max)</td></tr> <tr><td>DP_1</td><td>DAMPENER, PULSATION, SS, 1621SS180, ACCUMULATOR</td><td>DO02724</td><td>STAINLESS STEEL</td><td>168 bar (max) / -20 +82°C (max)</td></tr> <tr><td>WHT_1</td><td>ASSEMBLY, TANK, WHE-3 UPGRADE</td><td>KI05720</td><td>STAINLESS STEEL</td><td>2.5 bar (max) / -20+85°C (max)</td></tr> <tr><td>WF_1</td><td>FILTER, HOUSING, 3/4" NPT, ST/ST 316 10", 04768</td><td>DO04768</td><td>STAINLESS STEEL</td><td>13.8 bar (max) 150°C (max)</td></tr> <tr><td>WF_2</td><td>FILTER, HOUSING, 3/4" NPT, ST/ST 316 10", 04769</td><td>DO04769</td><td>STAINLESS STEEL</td><td>13.8 bar (max) 150°C (max)</td></tr> </tbody> </table> | | | | | | | | COMPONENT TABLE | | | | | EQUIP. TAG | DESCRIPTION | REFERENCE DIVEX P/N | MATERIAL | PRESSURE/TEMP RATING | VB_01 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | VB_02 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | VB_03 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | VB_04 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | VB_05 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | VB_06 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | VB_07 | VALVE, BALL, PARKER, 1/2"NPT | VB36264 | BRASS | 10.34 bar (max) - 204°C (max) | VB_08 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | TCV_1 | VALVE, GLOBE, 3/4"BSP(F), BRONZE CRANE, P/N: 3326 | DO03326 | BRONZE CRANE | TBC | MTCV_1 | VALVE, CONTROL, PROP. 2-WAY, DN20, RP 3/4" KVS 6.3 | DO02782 | HOUSING NICKEL-PLATED, HOT-PRESSED BRASS | 16 bar (max) -10 to 120 °C (max) | PRV_1 | VALVE, RELIEF, 1/2" MNPT, 3-50 PSI | DO02304 | BRASS | SET TO 2.5 bar | PRV_2 | VALVE, RELIEF, CAT 7012.1, SS | DO02723 | 316SS | SET TO 68 bar | PG_1 | GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 bar | PG_2 | GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 bar | PG_3 | GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 bar | PG_4 | GAUGE, PRESSURE, 0-100 BAR, BCTM ENTRY, GL | DOPBBA63BB02QJ3A | 316SS | 100 bar | TG_1 | GAUGE, 0/100°C, PROBE 20MM L X 6MM OD, 1/2"NPT | DO05836 | 316SS | -20/120°C | TG_2 | GAUGE, 0/100°C, PROBE 20MM L X 6MM OD, 1/2"NPT | DO05836 | 316SS | -20/120°C | TP_1 | PROBE, T100, 1/2"NPT X 75MM, 6MM OD, 3 WIRE SYSTEM | DO04419 | TBC | TBC | TS_1 | THERMOSTAT, 70DEG C, 220V, 10A, BI METAL | DO03657 | PHENOLIC BODY WITH STAINLESS STEEL END CAP | +150°C (max) / SET TO 70°C | MF_1 | MANIFOLD, FRONT DUMP, WHE-3 UPGRADE | DO05900 | BRASS (CZ121) | TBC | MF_2 | MANIFOLD, DELIVERY, WHE-3 UPGRADE | DO05901 | BRASS (CZ121) | TBC | MF_3 | MANIFOLD, COLD WATER SUPPLY, WHE-3 UPGRADE | DO05902 | BRASS (CZ121) | TBC | MF_4 | MANIFOLD, WATER DUMP, WHE-3 UPGRADE | DO05668 | BRASS (CZ121) | TBC | LS_1 | SWITCH, LEVEL, DIVEX HOT WATER MACHINE | DO02779 | BODY BRASS | 13.8 bar (max) / -20 + 105°C (max) | FT_1 | CONTROL, LEVEL TANK, WHE-3 UPGRADE | KI05669 | STAINLESS STEEL | 2.5 bar (max) / -20+85°C (max) | PR_1 | VALVE, PRESSURE REDUCING., DIVEX HOT WATER MACHINE | DO02359 | SEE DATA SHEET | 0.5 - 6 bar/80°C (max) | PR_2 | VALVE, PRESSURE REDUCING., DIVEX HOT WATER MACHINE | DO02359 | SEE DATA SHEET | 0.5 - 6 bar/80°C (max) | VC_01 | VALVE, CHECK, 3/4" BSP(FEM), BRASS, H/WATER | DO02780 | BODY BRASS | 12 bar (max) / -30+100°C (max) | ZA_1 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02369 | DO02369 | ZINC/BRASS | TBC | ZA_2 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02370 | DO02369 | ZINC/BRASS | TBC | ZA_3 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02371 | DO02369 | ZINC/BRASS | TBC | ZA_4 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02372 | DO02369 | ZINC/BRASS | TBC | P_1 | PUMP, CAT, 1057, 45LTR@70 BAR, C/W, NAB HEAD | DO02722 | STAINLESS STEEL | 155 bar (max) | DP_1 | DAMPENER, PULSATION, SS, 1621SS180, ACCUMULATOR | DO02724 | STAINLESS STEEL | 168 bar (max) / -20 +82°C (max) | WHT_1 | ASSEMBLY, TANK, WHE-3 UPGRADE | KI05720 | STAINLESS STEEL | 2.5 bar (max) / -20+85°C (max) | WF_1 | FILTER, HOUSING, 3/4" NPT, ST/ST 316 10", 04768 | DO04768 | STAINLESS STEEL | 13.8 bar (max) 150°C (max) | WF_2 | FILTER, HOUSING, 3/4" NPT, ST/ST 316 10", 04769 | DO04769 | STAINLESS STEEL | 13.8 bar (max) 150°C (max) |
| COMPONENT TABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EQUIP. TAG | DESCRIPTION | REFERENCE DIVEX P/N | MATERIAL | PRESSURE/TEMP RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VB_01 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VB_02 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VB_03 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VB_04 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VB_05 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VB_06 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VB_07 | VALVE, BALL, PARKER, 1/2"NPT | VB36264 | BRASS | 10.34 bar (max) - 204°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VB_08 | VALVE, BALL, 3/4"NPT(F) | VB36265 | BRASS | 10.34 bar (max) - 204°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TCV_1 | VALVE, GLOBE, 3/4"BSP(F), BRONZE CRANE, P/N: 3326 | DO03326 | BRONZE CRANE | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MTCV_1 | VALVE, CONTROL, PROP. 2-WAY, DN20, RP 3/4" KVS 6.3 | DO02782 | HOUSING NICKEL-PLATED, HOT-PRESSED BRASS | 16 bar (max) -10 to 120 °C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRV_1 | VALVE, RELIEF, 1/2" MNPT, 3-50 PSI | DO02304 | BRASS | SET TO 2.5 bar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRV_2 | VALVE, RELIEF, CAT 7012.1, SS | DO02723 | 316SS | SET TO 68 bar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PG_1 | GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 bar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PG_2 | GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 bar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PG_3 | GAUGE, PRESSURE, BOTTOM ENTRY, 0-10 BAR | DOPBBA63BB02QJ2A | 316SS | 10 bar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PG_4 | GAUGE, PRESSURE, 0-100 BAR, BCTM ENTRY, GL | DOPBBA63BB02QJ3A | 316SS | 100 bar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TG_1 | GAUGE, 0/100°C, PROBE 20MM L X 6MM OD, 1/2"NPT | DO05836 | 316SS | -20/120°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TG_2 | GAUGE, 0/100°C, PROBE 20MM L X 6MM OD, 1/2"NPT | DO05836 | 316SS | -20/120°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP_1 | PROBE, T100, 1/2"NPT X 75MM, 6MM OD, 3 WIRE SYSTEM | DO04419 | TBC | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TS_1 | THERMOSTAT, 70DEG C, 220V, 10A, BI METAL | DO03657 | PHENOLIC BODY WITH STAINLESS STEEL END CAP | +150°C (max) / SET TO 70°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MF_1 | MANIFOLD, FRONT DUMP, WHE-3 UPGRADE | DO05900 | BRASS (CZ121) | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MF_2 | MANIFOLD, DELIVERY, WHE-3 UPGRADE | DO05901 | BRASS (CZ121) | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MF_3 | MANIFOLD, COLD WATER SUPPLY, WHE-3 UPGRADE | DO05902 | BRASS (CZ121) | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MF_4 | MANIFOLD, WATER DUMP, WHE-3 UPGRADE | DO05668 | BRASS (CZ121) | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LS_1 | SWITCH, LEVEL, DIVEX HOT WATER MACHINE | DO02779 | BODY BRASS | 13.8 bar (max) / -20 + 105°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FT_1 | CONTROL, LEVEL TANK, WHE-3 UPGRADE | KI05669 | STAINLESS STEEL | 2.5 bar (max) / -20+85°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PR_1 | VALVE, PRESSURE REDUCING., DIVEX HOT WATER MACHINE | DO02359 | SEE DATA SHEET | 0.5 - 6 bar/80°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PR_2 | VALVE, PRESSURE REDUCING., DIVEX HOT WATER MACHINE | DO02359 | SEE DATA SHEET | 0.5 - 6 bar/80°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VC_01 | VALVE, CHECK, 3/4" BSP(FEM), BRASS, H/WATER | DO02780 | BODY BRASS | 12 bar (max) / -30+100°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ZA_1 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02369 | DO02369 | ZINC/BRASS | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ZA_2 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02370 | DO02369 | ZINC/BRASS | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ZA_3 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02371 | DO02369 | ZINC/BRASS | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ZA_4 | ANODE, WHE-3, 1/2"NPT BRASS PLUG & ZINC ROD, 02372 | DO02369 | ZINC/BRASS | TBC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P_1 | PUMP, CAT, 1057, 45LTR@70 BAR, C/W, NAB HEAD | DO02722 | STAINLESS STEEL | 155 bar (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DP_1 | DAMPENER, PULSATION, SS, 1621SS180, ACCUMULATOR | DO02724 | STAINLESS STEEL | 168 bar (max) / -20 +82°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WHT_1 | ASSEMBLY, TANK, WHE-3 UPGRADE | KI05720 | STAINLESS STEEL | 2.5 bar (max) / -20+85°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WF_1 | FILTER, HOUSING, 3/4" NPT, ST/ST 316 10", 04768 | DO04768 | STAINLESS STEEL | 13.8 bar (max) 150°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WF_2 | FILTER, HOUSING, 3/4" NPT, ST/ST 316 10", 04769 | DO04769 | STAINLESS STEEL | 13.8 bar (max) 150°C (max) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>NOTES</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="6">DENOTES CHANGES MADE AT THIS REVISION</th> <th colspan="2">TITLE</th> </tr> </thead> <tbody> <tr> <td>R03</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="2" rowspan="4" style="text-align: center;"> SCHEMATIC, WATER, HEATER ELECTRIC, WHE-3 UPGRADE, WITH PV'S 3.2 CERT </td> </tr> <tr> <td>R02</td> <td>LINES 008 TO 013 UPDATED</td> <td>19789</td> <td>MJ</td> <td>20/07/16</td> <td>PB</td> </tr> <tr> <td>R01</td> <td>SEE SHEET 1 & TABLES UPDATED</td> <td>19718</td> <td>JR</td> <td>28/06/16</td> <td>PB</td> </tr> <tr> <td>R00</td> <td>ISSUED FOR MANUFACTURE</td> <td></td> <td>JR</td> <td>02/03/16</td> <td>PB</td> </tr> <tr> <td>REV</td> <td>DESCRIPTION</td> <td>ECN</td> <td>BY</td> <td>DATE</td> <td>AUTH.</td> <td>DRAWING NO.</td> <td>REV</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>KI105308S2</td> <td>R02</td> </tr> <tr> <td colspan="6" style="text-align: center;"> THIRD ANGLE PROJECTION </td> <td colspan="2" style="text-align: center;"> DO NOT SCALE DRAWING </td> </tr> <tr> <td colspan="6" style="font-size: small;"> JFD OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS. </td> <td>SIZE</td> <td>SHEET</td> </tr> <tr> <td colspan="6"></td> <td>A3</td> <td>2 OF 2</td> </tr> </tbody> </table> | | | | | | | | DENOTES CHANGES MADE AT THIS REVISION | | | | | | TITLE | | R03 | | | | | | SCHEMATIC, WATER, HEATER ELECTRIC, WHE-3 UPGRADE, WITH PV'S 3.2 CERT | | R02 | LINES 008 TO 013 UPDATED | 19789 | MJ | 20/07/16 | PB | R01 | SEE SHEET 1 & TABLES UPDATED | 19718 | JR | 28/06/16 | PB | R00 | ISSUED FOR MANUFACTURE | | JR | 02/03/16 | PB | REV | DESCRIPTION | ECN | BY | DATE | AUTH. | DRAWING NO. | REV | | | | | | | KI105308S2 | R02 | THIRD ANGLE PROJECTION | | | | | | DO NOT SCALE DRAWING | | JFD OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS. | | | | | | SIZE | SHEET | | | | | | | A3 | 2 OF 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DENOTES CHANGES MADE AT THIS REVISION | | | | | | TITLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R03 | | | | | | SCHEMATIC, WATER, HEATER ELECTRIC, WHE-3 UPGRADE, WITH PV'S 3.2 CERT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R02 | LINES 008 TO 013 UPDATED | 19789 | MJ | 20/07/16 | PB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R01 | SEE SHEET 1 & TABLES UPDATED | 19718 | JR | 28/06/16 | PB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R00 | ISSUED FOR MANUFACTURE | | JR | 02/03/16 | PB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REV | DESCRIPTION | ECN | BY | DATE | AUTH. | DRAWING NO. | REV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | KI105308S2 | R02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| THIRD ANGLE PROJECTION | | | | | | DO NOT SCALE DRAWING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JFD OWNS THE COPYRIGHT OF THIS DOCUMENT AND ANY DESIGN RIGHT HEREIN. IT IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED AND MUST NOT BE REPRODUCED WITHOUT PERMISSION IN WRITING FROM THE OWNERS. | | | | | | SIZE | SHEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | A3 | 2 OF 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>JFD WESTHILL ENTERPRISE DRIVE, WESTHILL, ABERDEEN, AB32 6TQ, UK</p> <p>TEL: +44 (0) 1224 740145 E: enquiries@jfdglobal.com W: jfdglobal.com</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Intentionally blank