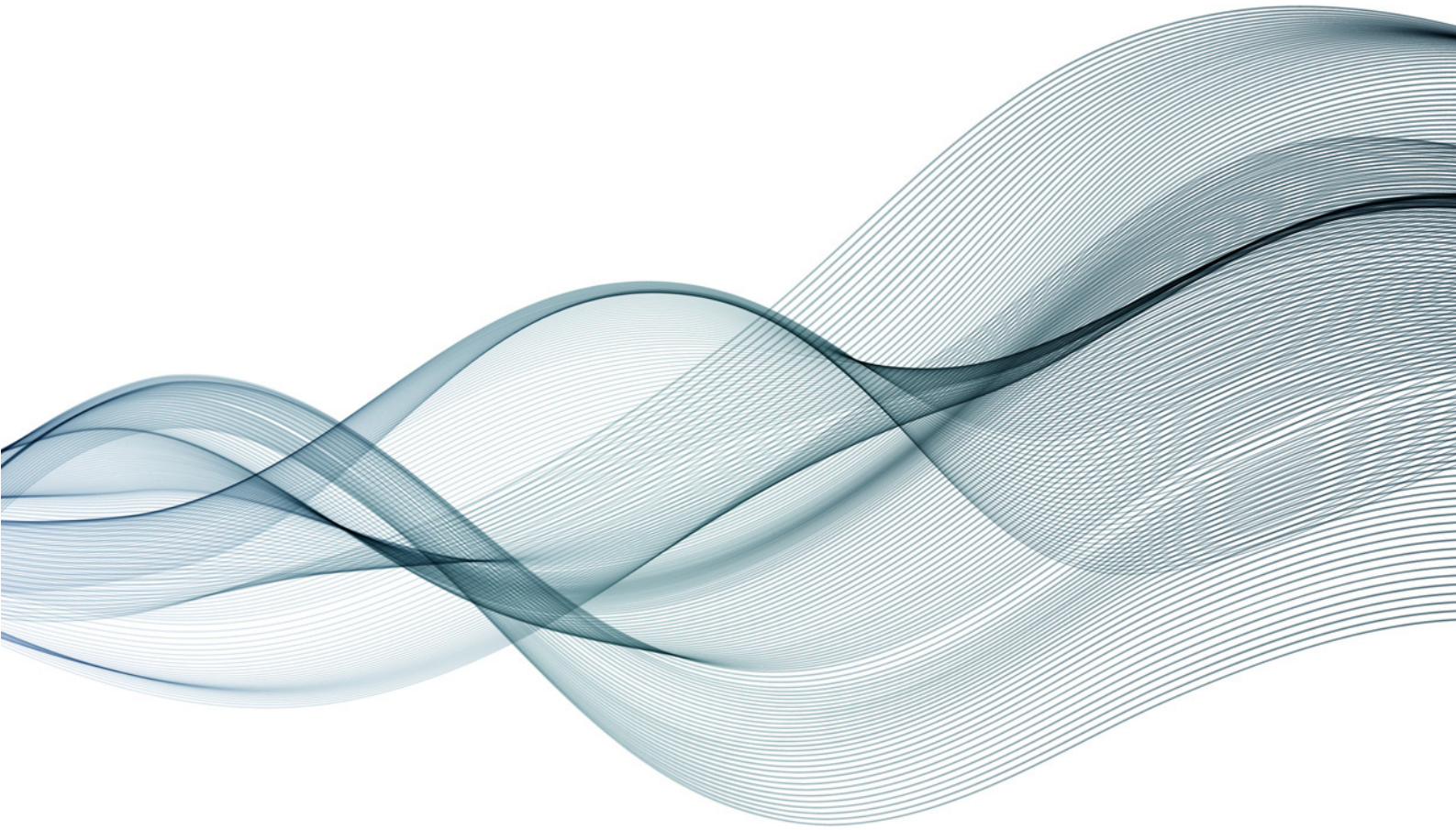

# Operation and Maintenance Manual
# Chamber Conditioning Unit, CCU-06

| | |
|---|---|
| Part Number: | KI40053 |
| Document Number: | EC-OM-6847 |
| Revision: | 3 |

## TABLE OF CONTENTS

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## APPROVAL SHEET

| Document Information | | |
|---|---|---|
| **Advitium No** | **Title** | **Classification** |
| EC-OM-6847 | Operating & Maintenance Manual<br>Chamber Conditioning Unit, CCU-06 | Commercial in confidence |

| Revision History | | | | | |
|---|---|---|---|---|---|
| **Rev** | **Date** | **BY** | **CHK** | **APP** | **Comments** |
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| 1 | 12/12/2016 | B. Jackson | P. Davies | P. Black | ECN: 20305 |
| 2 | 11/08/2017 | J. Cusson | P. Davies | A. Naylor | ECN: 21324 |
| 3 | 13/03/18 | J. Cusson | E. Thomson | A. Naylor | ECN: 22124 |
| 4 | | | | | |
| 5 | | | | | |

| Revision 3 Implemented | | |
|---|---|---|
| **Responsibility** | **Name** | **Position** |
| By | J. Cusson | Technical Author |
| Checked | E. Thomson | Graduate Mechanical Engineer |
| Approved | A. Naylor | Senior Mechanical Engineer |



### 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.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| A | Ampere |
| Bar | 100000 Pascal pressure |
| HSE | Health and Safety Executive |
| ISO | International Standards Organisation |
| lpm | litres per minute |
| m | meter |
| $m^3$/min | Cubic meter per minute |
| mm | millimetre |
| MSW | Meter Sea Water |
| N/A | Not Applicable |
| No. | number |
| NPT | National Pipe Thread |
| OSHA | Occupational Safety and Health Administration |
| RPM | Revolutions per minute |
| PPE | Personal Protective Equipment |
| S/S | Stainless steel |
| VDC | Volts Direct Current |
| W | Watt |

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## DANGER, WARNING AND CAUTION

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


**CAUTION**
**Informs the reader of an operation or state with potential for damage to equipment.**


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

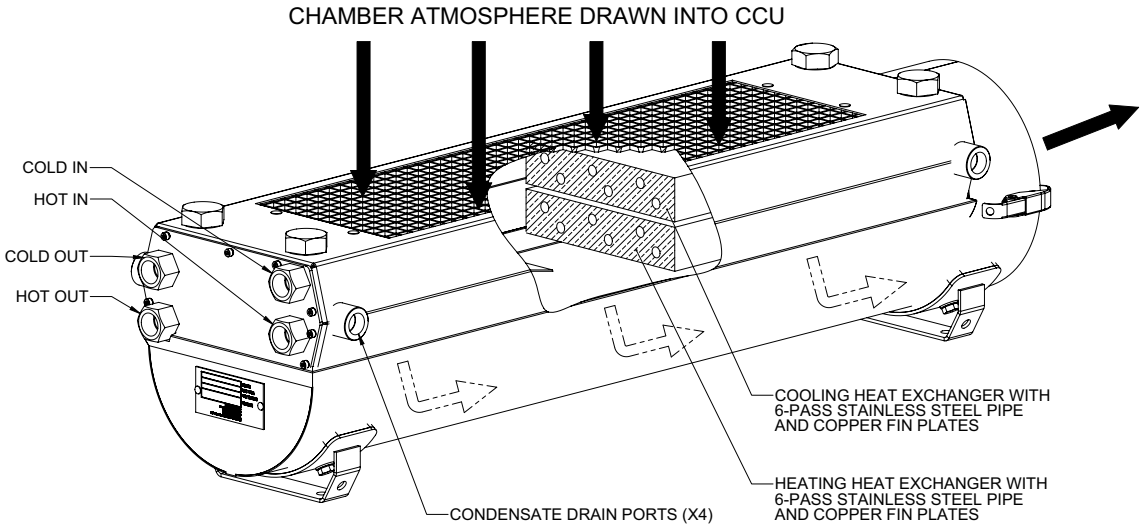

**DANGER**
**INFORMS THE READER OF AN OPERATION OR CONDITION WHICH MAY INVOLVE RISK TO LIFE.**

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

# 1 Introduction

The JFD Chamber Conditioning Unit, CCU-06, is designed for use in hyperbaric environments, both air and heliox, for temperature and humidity control. They are rated to a depth of 500 MSW and form part of the extensive range of JFD hyperbaric environment conditioning equipment. The CCU-06 has been specifically designed for heating, cooling and dehumidification.

**Figure 1 CCU-06 – General Arrangement**



# 2 General Description

The CCU-06 may be mounted in any convenient space within the chamber where an even flow of circulating gas can be ensured, usually below chamber bunks. Flexible ducting may be added to the blower outlet to ensure adequate circulation or to direct circulation into a required area.

The CCU operates by drawing gas over its heat exchange coils; first cooling/dehumidifying then reheating as needed, see flow schematic in the appendix. The conditioned gas is then collected in the plenum and exhausted via the fan back to the chamber environment. Condensed moisture that forms on the coils is collected in the sump on either side of the coil and piped to an appropriate point of disposal. The flow rate control of liquids to achieve the desired cooling or heating is conducted by a separate system and is not within the scope of a CCU-06.

Interconnecting fluid supply pipe work, shell stop valves, chamber temperature/humidity monitoring equipment and fluid temperature control systems are not specified, as these will be unique for each application/requirement. The end-user should ensure these items are provided and installed to acceptable standards.

## 2.1 Environmental Control

Chamber gas is drawn into the CCU through the carbon filter, passes through the heat transfer coil, then through the blower to be circulated back to the chamber.

The amount of heating achieved by the CCU is a function of the temperature of the heating fluid, the flow of that fluid and pressure of chamber. Flow and temperature control of fluids to the CCU may be automatic or manual.

When heating is required, fluid, recommended to be at 60°C, is directed through the CCU coil. When heated fluid passes through the heater coil, heat is transferred to the chamber gas as it flows through the heat exchanger. The volume and temperature of fluid flow will determine the amount of heating achieved.

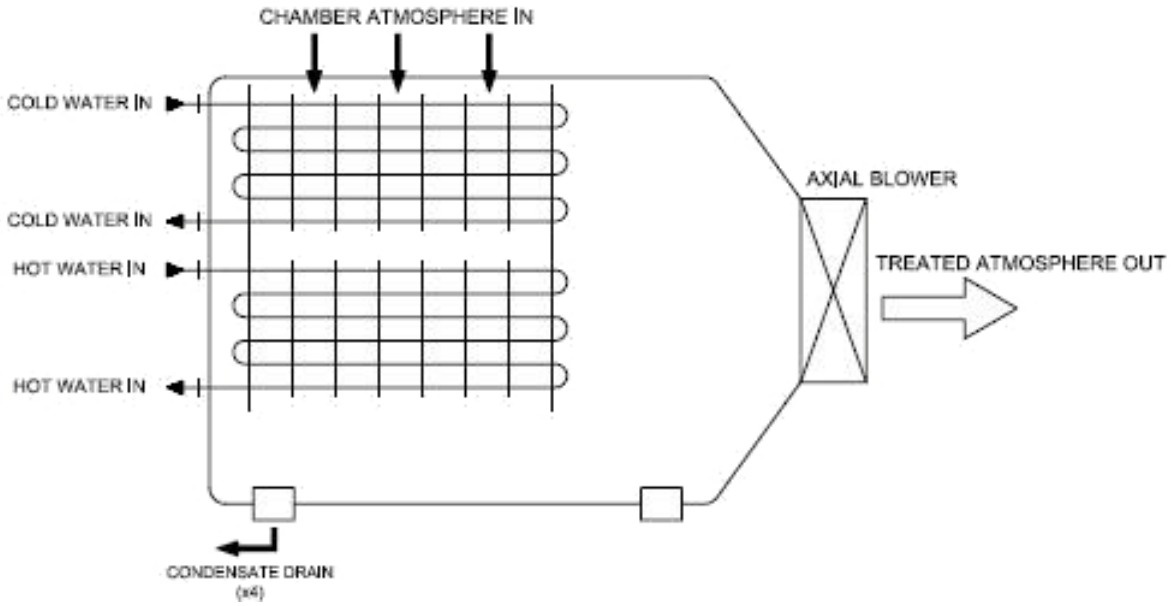
When cooling is required, fluid, recommended to be at 2°C, is directed through the CCU coil. The volume and temperature of the fluid flow will determine the amount of cooling achieved.

## 2.2 Main Components

### 2.2.1 Coil Assembly

Heating and cooling coils are fitted to common end plates forming a single coil assembly, mounted inside the heat exchanger box. The chamber atmosphere first passes through the cooling coil and then through the heating coil. See Figure 2 for basic detail on the heat exchanger coil assembly.

**Figure 2 CCU-06 Flow Schematic**




### 2.2.2 Heat Exchanger Box

The Heat Exchanger Box contains the Heat Exchanger Assembly which includes hot and cold water connection ports and condensation drain ports for the CCU-06. It is mounted onto a Plenum or a Duct Assembly.

### 2.2.3 Plenum or Air Duct Assembly

It is positioned between the Heat Exchanger Assembly and the Blower Assembly and includes Mounting Brackets.

### 2.2.4 Blower

It produces the flow of breathing gas and includes electric motor with fan.

## 2.3 Services

- 25 litres/min: Cold @ 2ºC, Hot @ 60ºC.
- 24 V ± 4 V AC or DC and 1.2 A max.

## 2.4 Electrical Connector Details

| | |
|---|---|
| Make | Groove |
| Connector | Male Bulkhead Receptacle |
| Material | Ncikle Aluminium Bronze and Neoprene Rubber |
| Contacts | 2 x 18 AWG (6.1 A rated) |
| Pin No. 1 | +24 V (1 Amp) |
| Pin No. 2 | 0 V (1 Amp) |

## 2.5 Environmental Control

### 2.5.1 Cooling and Dehumidification

When cooling or dehumidification is required, fluid, recommended to be about 2°C, is directed through the CCU Chiller Coil. The volume and temperature of fluid flow will determine the amount of cooling or dehumidification achieved.

Heat is transferred to the cooled fluid from the breathing gas as it flows through the heat exchanger. Moisture in the breathing gas will condense on the cooling coil fins and drain from the Coil Housing Assembly.

To ensure adequate drainage of condensate off the heat exchanger fin plates, the CCU-06 unit must be mounted in the horizontal plane with the condensate ports vertical . In this position, condensate on the fins will flow down, drip off the fins into the heat exchanger box and out through the lowest of the 4 condensate drain ports.

### 2.5.2 Heating

When heating is required, fluid, recommended to be about 60°C, is directed through the CCU Heater Coil. When heated fluid passes through the heater coil, heat is transferred to the breathing gas as it flows through the Heat Exchanger. Additionally, breathing gas that has been cooled to remove humidity can be re-heated to the required temperature as it passes through the heater coil. Again, hot and cold fluid flow rates must be controlled to achieve this.

# 3 Operating Instructions

## 3.1 Installation

With reference to the unit description details in section 2, the procedure for installing the CCU-06 is as follows:

1 Prior to removing any protective packaging or caps/plugs and the electrical connection points, ensure the installation environment and the system lines intended for connection are compatible and compliant with maintaining the clean conditions required for installations of life support equipment.

2 This manual assumes that a suitable location has been established for the unit installation and that a supporting structure for mounting has been prepared

***Note*** ***A clearance area, in front of the fan intake to the coils of 50mm is required, and 200mm is required on the blower outlet in order for the fan to deliver optimum performance.***

3 Once unpacked, visually inspect the unit to ensure that it is clean and there is no damage present. Check the clamp fasteners on the duct are not broken and will function.

4 Use four M12 fixing sets (bolt, washer and nut) through the four 13.5 mm diameter holes in the motor/housing mounting bracket and four M8 fixing sets to the brackets on the heat exchanger sub assembly to secure the unit.

**WARNING**

**ELECTRICAL SAFETY**
**ENSURE THE ELECTRICAL SUPPLY IS ISOLATED PRIOR TO MAKING ANY CONNECTIONS.**

**CAUTION**

**ELECTRICAL CONNECTION**
**This equipment is not fitted with reverse polarity protection, ensure the supply cable is correctly connected.**

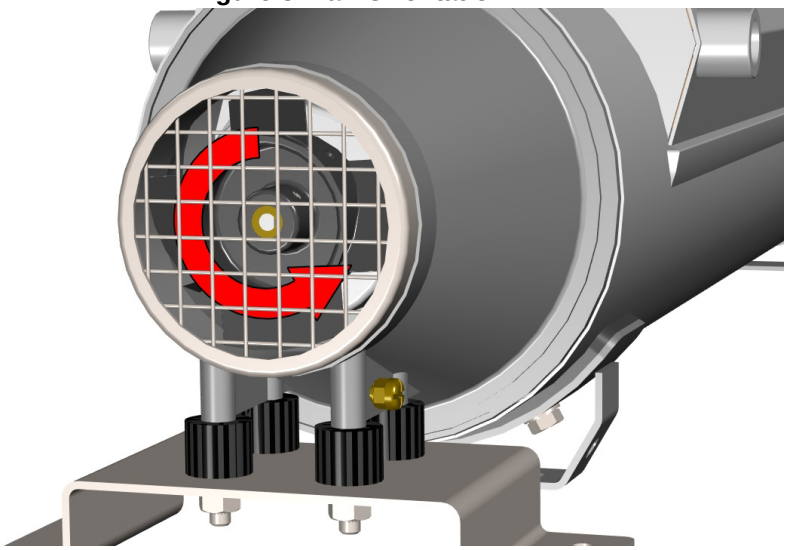
5 Connect the electrical supply cable to a suitable 24 DC, 6 Amp rated supply.

6 Ensure power to the supply cable is isolated prior to connecting the supply cable to the electrical connector of the unit. Connect the supply cable.

7 Check the impeller guard is in place and secure. Apply electrical power and observe the rotation of the fan through the mesh guard, confirm the fan rotation is correct, see Figure 3, and that the fan RPM is constant.

8 Isolate the power to the unit once the motor has been confirmed as functioning.

**Figure 3 Fan Orientation**



**CAUTION**

**PIPE WORK DAMAGE**
**Care must be taken to avoid "lock in" of fluid in the coil, particularly cooling fluid as this may expand when it warms and potentially cause damage. An expansion path must be left whenever possible.**

9 Install suitable tubes and isolation valves for the fluid service and external pressure expected/required.

## 3.2 Before Use Routine

1 Visually inspect the motor/housing and ducting assembly to ensure that it is clean and there is no damage present or that there are no objects covering the inlet to the coils and outlet from the blower.

2 Ensure that the fluid isolation valves are open for the heating and cooling circuits.

3 Ensure that the condensate is drained off and the sump is ready to receive condensate.

## 3.3 Operating Procedures

1 Start the blower and supply of controlled heat transfer fluid.

**CAUTION**

**PIPE WORK DAMAGE**
**Care must be taken to avoid "lock in" of fluid in the coil, particularly cooling fluid as this may expand when it warms and potentially cause damage. An expansion path must be left whenever possible.**

2 Periodically drain condensate if continuous drain not provided.

3 Stop blower and supply of heating and cooling fluid.

## 3.4 After Use Routine

1 Ensure the electrical power has been isolated from the unit.

2 Drain the unit of condensate and flush the sump with suitable hygienic solution to reduce potential for unwanted organic growth. Depending on the duration between uses, decide if the heating and cooling fluids need to be drained/blown clear

**CAUTION**

**PIPE WORK DAMAGE**
**Blowdown of the CCU pipe work must be limited to 6 bar.**

***Note*** ***When preparing for storage, the CCU heat transfer fluid pipe work must be purged.***

3 Visually inspect the unit and check there is no fouling of the inlet surface or heat exchange surfaces (fins).

4 Ensure the gaskets are in place and in good order between the motor/housing flange and duct, and between coils and duct.

5 Clean the unit externally with a recognised surface cleaner suitable for breathing gas environments and stainless steel and copper.

6 Visually check the unit is secure to the mounting support and that the electrical connection is secure.

# 4 Preventative Maintenance

The CCU preventative maintenance schedule shown below is to be adhered to in order for the unit to remain in good working order.

## 4.1 6 Monthly Maintenance

1 Clean the CCU-06 externally with a recognised surface cleaner suitable for breathing gas environments.

2 Visually inspect the motor/housing assembly to ensure that it is clean and there is no damage present. Check the clips are holding the blower and heat exchanger together securely.

3 Ensure the unit power cable is attached to the motor assembly. Check the fan guard is in place and secure. Apply power from the supply source and observe the rotation of the fan, confirm against Figure 3. The fan RPM should be constant. Isolate the power to the unit once the motor has been confirmed as functioning.

4 Visually inspect the fan gasket and sponge seal is in place between; the blower and flange face, and air duct and heat exchanger box.

5 Inspect all visible fluid connections for leaks and damage.

## 4.2 2 Yearly Maintenance

**WARNING**

**ELECTRICAL SAFETY**
**ENSURE POWER TO THE UNIT IS ISOLATED PRIOR TO DISCONNECTING THE SUPPLY CABLE.**

1 Disconnect the electrical supply cable connector at the unit.

2 Unclip the blower from the air duct.

***Note*** ***Ensure a lay down area is available prior to removing the blower from the secured fixing point location.***

3 Using an 18 mm AF spanner, undo and remove the 4-off quantity M12 fixing sets (bolt, washer and nut) at the blower mounting points. Remove the blower from the installation supporting structure.

4 Visually inspect the motor/housing assembly to ensure that it is clean and there is no damage present and the electrical connections are secure.

5 Carefully prise off the fan guard using a flat head tool. The guard has 3-off quantity inward dimples which provide the fitment grip. Care should be taken not to damage the o-ring seal during the guard removal. Examine the o-ring after removal of the guard. If the o-ring requires replacing refer to section 6 for spares.

6 Check the fitment of the fan to the motor shaft by checking the security of the retaining grub screw. Hand-turn the fan (anti-clock wise) to check the fan attachment is secure to the shaft.

7 Re-attach the fan guard to the motor housing ensuring the o-ring seal is in place.

8 Connect an electrical test cable to the motor assembly. Apply power from a test supply source attached to the electrical connection. Observe the rotation of the fan. The fan RPM should be constant. Isolate the power to the unit once the motor has been confirmed as functioning. Disconnect the electrical test cable.

9 Clean the air duct and blower, internally and externally with a recognised surface cleaner suitable for breathing gas environments.

10 Prepare the blower and air duct for returning to the installed location. See section 3.1 for installation instructions.

## 4.3 5 Yearly Maintenance

**WARNING**

**ELECTRICAL SAFETY**
**ENSURE POWER TO THE UNIT IS ISOLATED PRIOR TO DISCONNECTING THE SUPPLY CABLE.**

1 Disconnect the electrical supply cable connector at the unit.

**CAUTION**

**PIPE WORK DAMAGE**
**Blowdown of the CCU pipe work must be limited to 6 bar.**

2 Blowdown the heat transfer pipe work.

3 Disconnect the heat transfer fluid supply and return pipes.

4 Disconnect the drain, hot and cold fluid supply and returns and release the blower by releasing the 2-off quantity quick release fasteners.

***Note*** ***Ensure a lay down area is available prior to removing the unit from the secured fixing point location.***

**CAUTION**

**MANUAL HANDLING**
**Remove the unit in two sections, blower then air duct, from the installation supporting structure as this reduces the manual handling weight.**

5 Using an 18 mm AF spanner, undo and remove the 4-off quantity M12 fixing sets (bolt, washer and nut) at the blower mounting points. Remove the blower from the installation supporting structure.

6 Visually inspect the air duct and heat exchanger box for damage and corrosion. Repair and replace parts as required.

7 Separate the heat exchanger box and hydraulically pressure test the heat exchanger in accordance with certification requirements. Inspect that the heat exchanger coil is securely attached.

8 Clean the air duct and heat exchange box with a suitable cleaner for use in breathing air service.

9 Reassemble the heat exchange box to the duct and install new sponge seal. See section 6 for part details.

10 Visually inspect the motor/housing assembly to ensure that it is clean and there is no damage present and the electrical connections are secure. Check the motor fixing to the housing is secure and also the 4-off quantity mounting bracket bolts to the housing are in place and secure.

11 Carefully prise off the fan guard using a flat head tool. The guard has 3-off quantity inward dimples which provide the fitment grip. Replace the o-ring from the spares list in section 6.

12 Check the fitment of the fan to the motor shaft by checking the security of the retaining grub screw. Hand-turn the fan (anti-clock wise) to check the fan attachment is secure to the shaft.

13 Re-attach the fan guard to the motor housing ensuring the o-ring seal is in place.

14 Remove the 2-off quantity grommets on the housing and replace with parts as per section 6.

15 Remove the 1-off quantity fan gasket at the large diameter end of the housing and replace as per section 6.

16 Connect an electrical test cable to the motor assembly. Apply power from a test supply source attached to the electrical connection. Observe the rotation of the fan, confirm against Figure 3. The fan RPM should be constant. Isolate the power to the unit once the motor has been confirmed as functioning. Disconnect the electrical test cable.

17 Clean the blower, internally and externally with a recognised surface cleaner suitable for breathing gas environments.

18 Prepare the unit (motor/housing and air duct assembly) for returning to the installed location. See section 3 for installation instructions.

# 5 Fault Finding

Table 1 provides a schedule of fault symptoms and possible causes for faults that may arise with the CCU-06. The schedule also includes recommended fault finding procedures and corrective actions. Upon completion of any repair as a result of a corrective action, it is essential that all parts of the unit that have been disturbed are fully tested for functionality and that all safety aspects are addressed.

**Table 1 Fault Finding**

| Problem | Probable Cause | Fault Finding Procedure | Suggested Solution |
|---|---|---|---|
| Failure to operate. | Electrical fault. | Check the power supply to the unit and electrical connections. | If the fault cannot be identified / rectified, return the unit to JFD for repair. |
| Damaged quick release fasteners. | Wear and tear. | Visual examination. | Return the unit to JFD for repair. |
| Thermal fluid leak / gas leak into thermal fluid. | Wear and tear, corrosion, loose connection. | Visual examination. | Repair or replacement of the affected part or assembly. |
| Condensate leaking from unit. | No drainage. | Inspect drain. Ensure it is open and not damaged. | Clear Drain or repair. |

# 6 Spares List

***Note*** ***For unit part numbers and locations please see Appendix A, System Drawings.***

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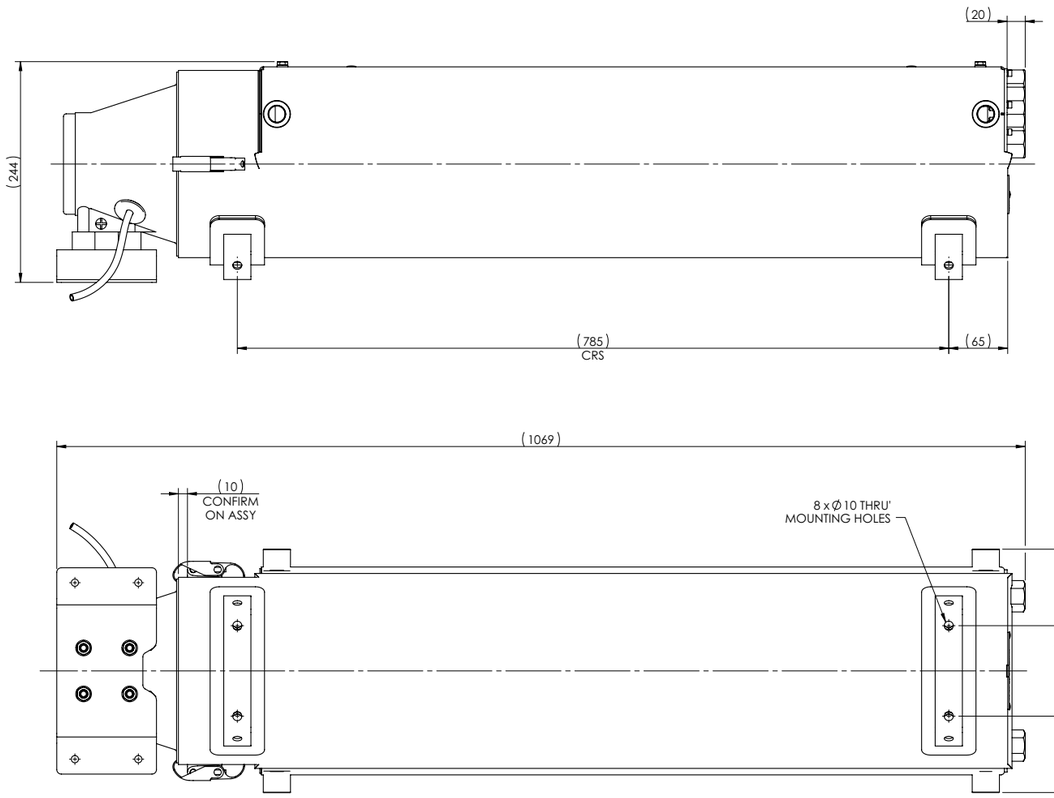
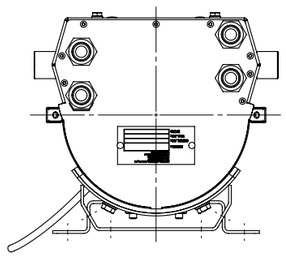
## APPENDIX A SYSTEM DRAWINGS

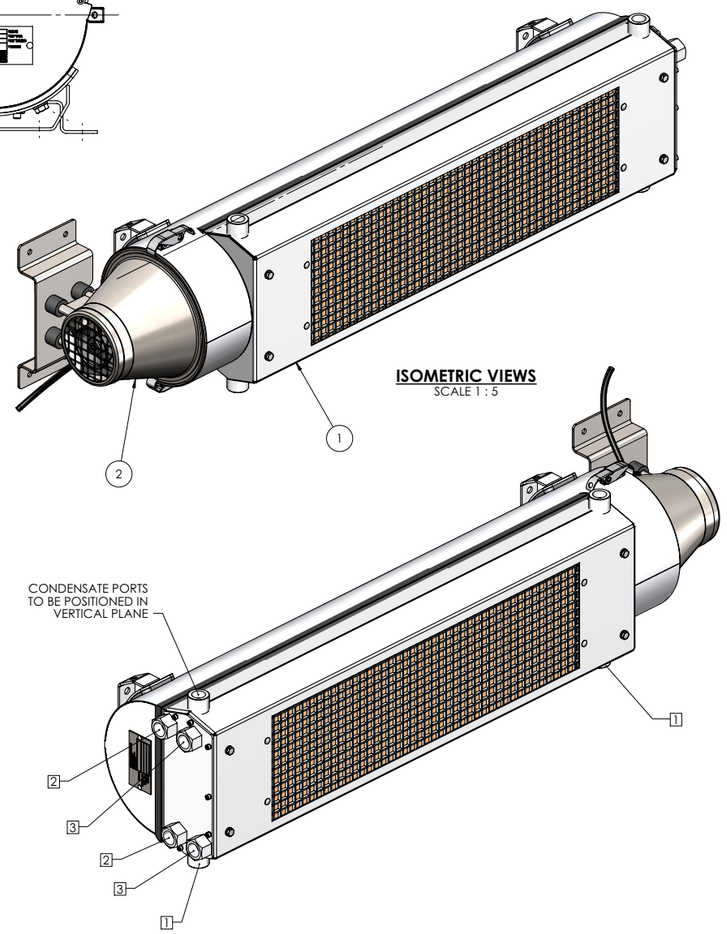
# CCU-06, Chamber, Axial Blower KI40053S1

| ITEM | PART No. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | KI40053102 | CCU-06 HEAT EXCHANGER SUB ASSEMBLY | 1 |
| 2 | KI40051101 | BLOWER HOUSING ASSY, CHAMBER CU, DH21 SERIES MOTOR | 1 |

| INTERFACES | |
|---|---|
| 1 | CONDENSATE DRAIN PORT |
| 2 | HEATER COIL SUPPLY & RETURN PORTS |
| 3 | CHILLER COIL SUPPLY & RETURN PORTS |






| HEATER/CHILLER UNIT CCU-06 SPECIFICATION | |
|---|---|
| MAXIMUM WORKING DEPTH | 500 MSW |
| ELECTRICAL REQUIREMENTS | 24 VDC, 2A |
| AIR VOLUME MOVED | UP TO 2m³/MIN |
| CALCULATED CHILLING/HEATING CAPACITY | 500W @ 0 MSW, 4000W @ 100 MSW, 8000W @ 300 MSW HELIOX |
| CALCULATED CONDENSATION FLOW RATE | 0.2 LTRS/MIN |
| COOLING/HEATING LIQUID REQUIREMENTS | 25 LTRS/MIN, COLD @ 2°C, HOT @ 60°C |
| COIL CONSTRUCTION | CU FINS, S/S TUBES & END PLATES |
| HOUSING & BLOWER ASSEMBLY | S/S 316 |
| HEATING/CHILLING FLUID PORTS | 1/2" NPT (F) |
| CONDENSATE DRAIN PORTS | 1/2" NPT (F) x 4 OFF |
| COIL EXTERNAL PRESSURE TEST | 65 BAR (HYDRO) |
| ASSEMBLY LEAK TEST | 50 BAR (HELIUM) |
| REQUIRED MOUNTING ORIENTATION | RADIATOR FIN PLATES IN VERTICAL PLANE FOR CONDENSATE DRAINAGE |
| BLOWER | AXIAL BLOWER |

NOTES:

MATERIAL: SEE PARTS LIST
FINISH: N/A

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

| 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

DENOTES CHANGES MADE AT THIS REVISION

| REV | DESCRIPTION | ECN | BY | DATE | AUTH. |
|---|---|---|---|---|---|
| R02 | LINE ADDED, FIGURES AND TITLE UPDATED. | 21324 | DR | 03/08/17 | AN |
| R01 | DRAWING UPDATED | 18210 | MJ | 08/07/15 | AN |
| R00 | ISSUED FOR MANUFACTURE | | DR | 15/05/10 | GMc |

DO NOT SCALE DRAWING



TITLE: CCU-06, CHAMBER, AXIAL BLOWER

DRAWING NO: KI40053S1
REV: R02
PART NO.: KI40053
PRODUCT / PROJECT No.: CCU-06
SIZE: A2
SCALE (UOS): 1:4
SHEET: 1 OF 1

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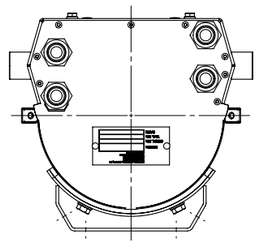
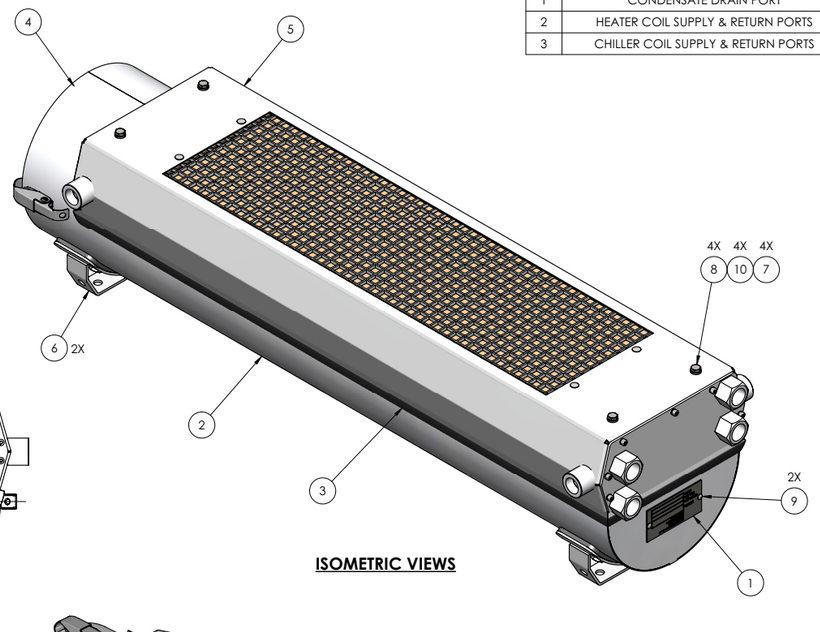
W: jfdglobal.com

# CCU-06 Heat Exchanger Sub Assembly KI40053102S1

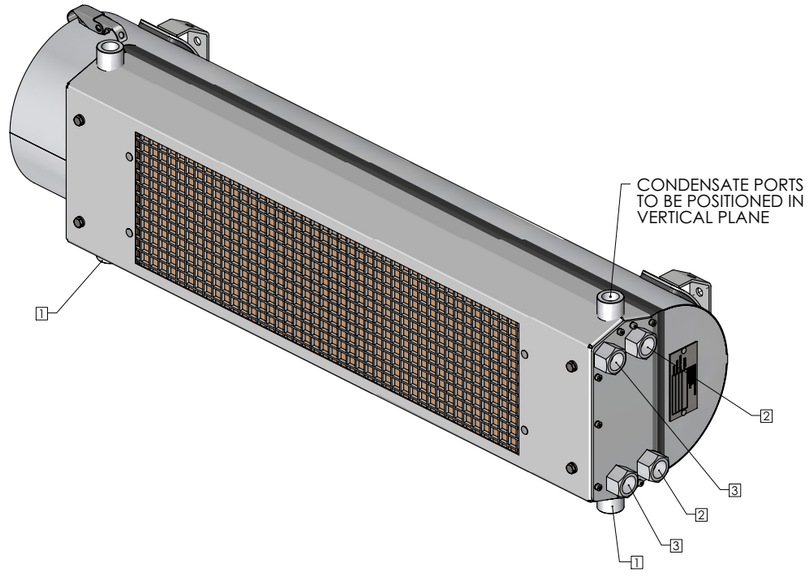
| ITEM | PART No. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | DO02320 | NAMEPLATE, PRODUCT DETAILS, SMALL | 1 |
| 2 | DO03332-07 | AIR DUCT, CCU-06 AND CCU-07, 316 SS | 1 |
| 3 | DO03673 | SEAL, SPONGE, CCU | 1 |
| 4 | DO03680 | GASKET, FAN CCU-06 | 1 |
| 5 | DO05353-06 | HEAT EXCHANGER BOX ASSY. | 1 |
| 6 | DO05433 | BRACKET, SUPPORT, ASSEMBLY, CCU-06, CCU-07 | 2 |
| 7 | DO05441 | FRONT PANEL SPACER | 4 |
| 8 | DO06180 | BOLT, HEXAGON, M6 X 120MM, 316 ST/ST | 4 |
| 9 | FC161 | FSTR, RIVET, POP, 3.2MM X 13.6MM | 2 |
| 10 | FW083 | WASHER,PLAIN, SS, M6 | 4 |

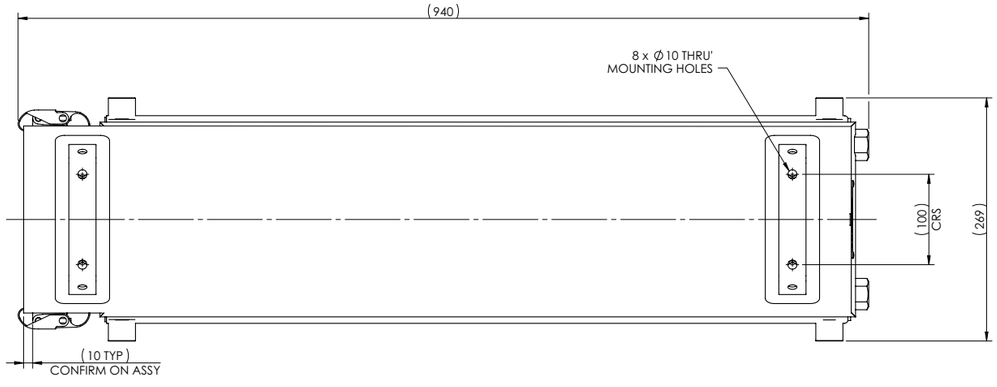
| INTERFACES | |
|---|---|
| 1 | CONDENSATE DRAIN PORT |
| 2 | HEATER COIL SUPPLY & RETURN PORTS |
| 3 | CHILLER COIL SUPPLY & RETURN PORTS |




ISOMETRIC VIEWS




NOTES:
ELECTRO POLISH DUCT ASSEMBLY AFTER ALL FASTENERS ARE WELDED INTO POSITION.

MATERIAL: SEE PARTS LIST
FINISH: N/A
ALL DIMENSIONS ARE IN mm (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

| 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

DENOTES CHANGES MADE AT THIS REVISION

| REV | DESCRIPTION | ECN | BY | DATE | AUTH. |
|---|---|---|---|---|---|
| R04 | TITLE UPDATED | 21324 | DR | 01/08/17 | AN |
| R03 | DRAWING UPDATED | 18210 | MJ | 03/07/15 | AN |
| R02 | ADDED BOLT PART NO. | CT00272 | RH | 02/06/10 | NM |
| R00 | ISSUED FOR MANUFACTURE | X | RH | 19/05/08 | NM |

DO NOT SCALE DRAWING



TITLE: CCU-06 HEAT EXCHANGER SUB ASSEMBLY

DRAWING NO: KI40053102S1
REV: R04
PART NO.: KI40053102
PRODUCT / PROJECT No.: CCU-06
SIZE: A2
SCALE (UOS): 1:4
SHEET: 1 OF 1

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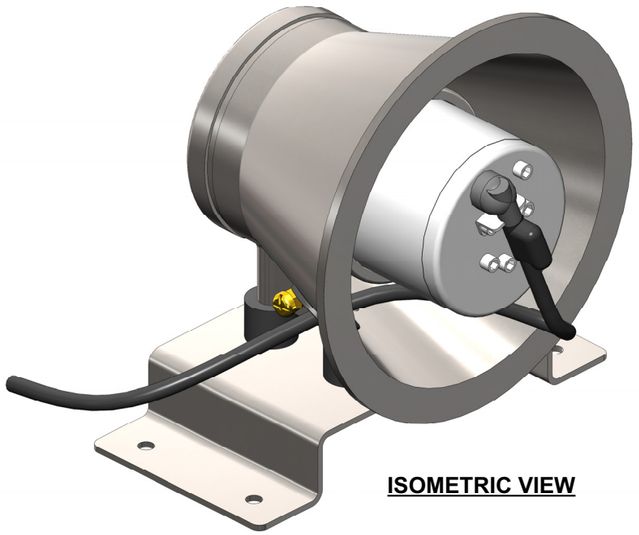
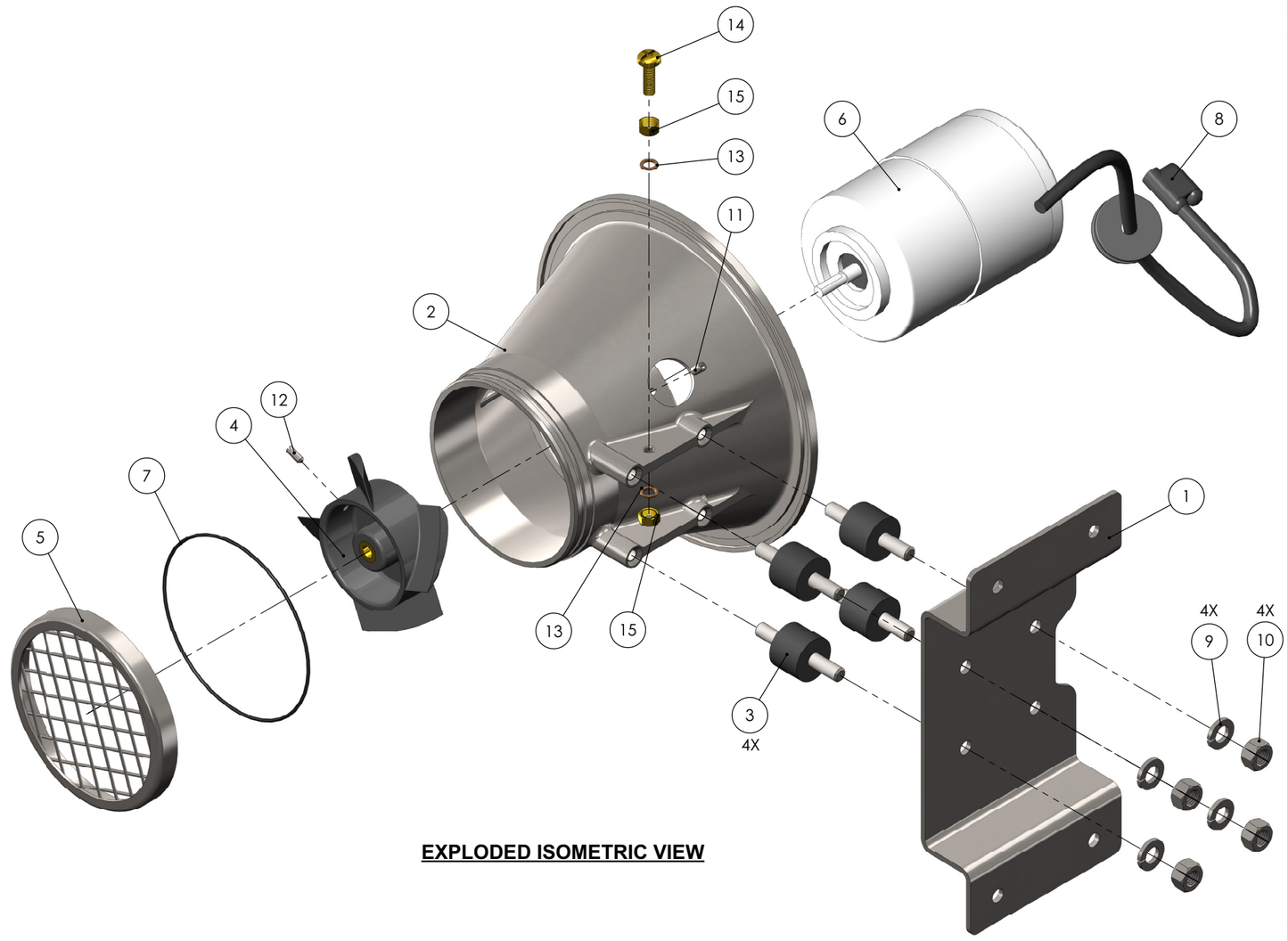
## Blower Assembly, Chambers CU, DH21 Series Motor P2178101S1

| ITEM | PART No. | DESCRIPTION | QTY |
|---|---|---|---|
| 1 | KI40051300 | MOUNTING, DH 21 FOOT, CCU 04, S/S | 1 |
| 2 | KI14742 | DH21, HTR/SCRUBBER FRAME | 1 |
| 3 | KI13226 | MOUNTING,SHOCK,DH21 MOTOR | 4 |
| 4 | KI14749 | BLADE, FAN, 3.75" O.D. | 1 |
| 5 | KI14783 | GUARD,ASSY,FAN | 1 |
| 6 | KI14904 | MOTOR,DC BRUSHLESS,ANTI-CLOCKWISE,DH21 SERIES | 1 |
| 7 | KI12300 | O-RING | 1 |
| 8 | KI14754 | CONNECTOR, FEM, HALOGEN FREE, 3 METRE TAIL | 1 |
| 9 | KI10304 | WASHER,SPRING, 5/16",A2-70 SS | 4 |
| 10 | KI13821 | NUT,5/16"-18 TPI,ST.ST.A2-70 | 4 |
| 11 | KI11071 | SCREW,SOCKET SET, 10-32 X 3/8" LG. | 1 |
| 12 | FB275 | SCREW,GRUB, M4 X 10 MM LONG | 1 |
| 13 | E11865 | WASHER, SPRING, M6, PHOS. BRONZE | 2 |
| 14 | E11887 | SCREW, M/C, PAN HD, M6 X 1 X 15, BRASS | 1 |
| 15 | E11889 | NUT,HEX, M6 X 1, BRASS | 2 |



**ISOMETRIC VIEW**




**EXPLODED ISOMETRIC VIEW**



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: SEE PARTS LIST

FINISH: N/A

THIRD ANGLE PROJECTION

| REV | DESCRIPTION | ECN No. | BY | DATE | AUTH. BY |
|---|---|---|---|---|---|
| R06 | | | | | |
| R05 | KI14792 REMOVED | 19360 | MJ | 27/04/16 | AN |
| R04 | FAN ROTATED & ITEM 1 & 6 UPDATED | 18416 | JR | 02/10/15 | AN |
| R03 | GASKET REMOVED | 13239 | SJ | 10/02/10 | GMcC |
| R02 | KI12514 REPLACED WITH FB275 | 13179 | SJ | 25/01/10 | GMcC |
| R01 | PARTS LIST AMENDED | 11962 | LS | 04/02/09 | RTW |
| R00 | ISSUED FOR MANUFACTURE | | KB | 16/04/2008 | RTW |

**DO NOT SCALE DRAWING**

TITLE: **BLOWER ASSEMBLY, CHAMBERS CU, DH21 SERIES MOTOR**

DRAWING No. **P2178101S1** REV **R05**

PART No. KI40051101 PRODUCT / PROJECT No. CCU BLOWERS

SIZE A3 SCALE NTS SHEET 1 OF 1

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