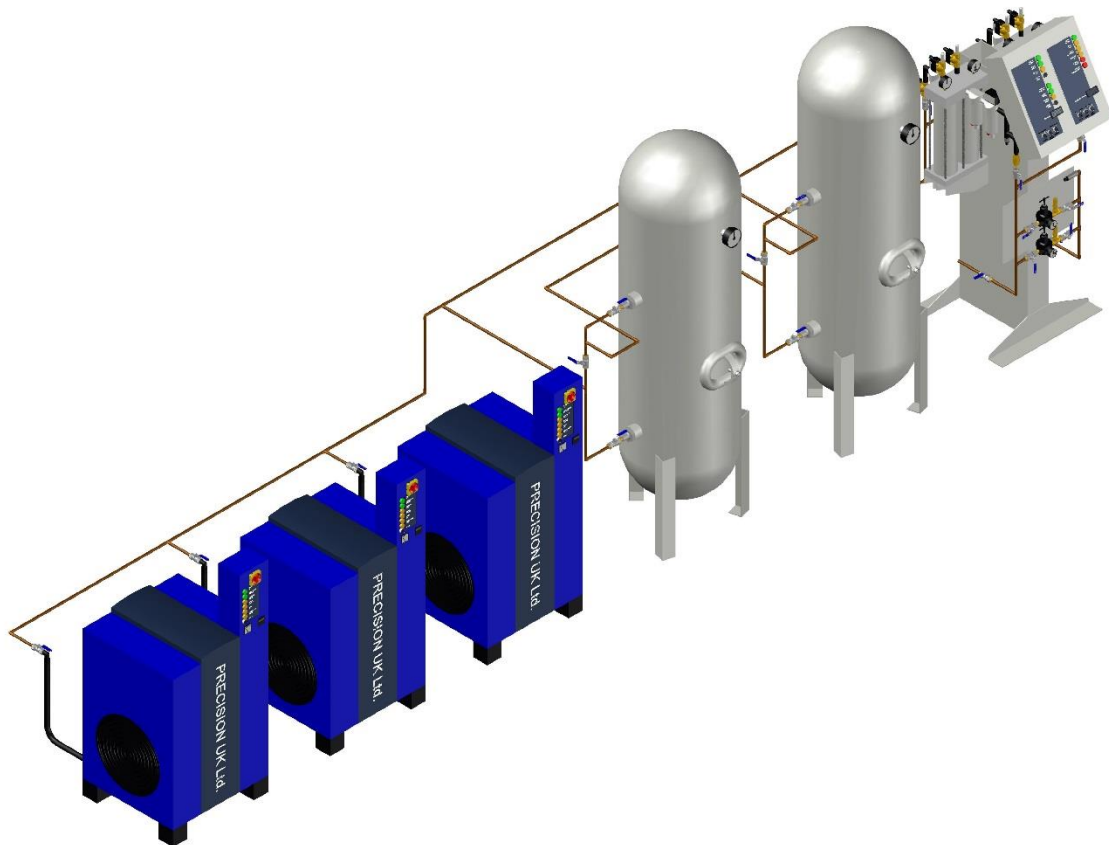


# ***CPX MEDICAL AIR PLANT***

## **INSTALLATION, OPERATIONS & MAINTENANCE MANUAL**

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## VERSION HISTORY

Version #	Implemented By	Revision Date	Approved By	Approval Date	Reason
1.0	David Evans	17/07/2014			

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## PRODUCT DESCRIPTION

### General

The Plant consists of;

A vertical Air Receiver fitted with an Automatic and Manual Drain Valve, a Pressure Gauge and a Pressure Relief Valve.

Duplex oil flooded Rotary Screw Compressors each fitted with After Coolers, Flexible Hoses and Anti – Vibration Mountings.

Duplex 1 micron oil/water Separation Filters each fitted with Differential Pressure Gauge and Automatic Float Type Drain Valve.

Duplex Desiccant Regenerating Dryers with Pressure Gauges fitted to each column.

Duplex activated Carbon filters for odour and dust removal each fitted with Manual Drain Valve.

Duplex 0.1 micron Medical Sterile filters each fitted with Differential Pressure Gauge and Manual Drain Valve.

Duplex Pressure Reducing Regulator set, and Line Pressure Relief Valve Assemblies.

Duplex Compressor Starter Panels incorporating Isolators, Motor Breakers, Contactors, Hand/Auto Switches, Indicators for; Mains On, Compressor Running, Control Circuit Failed, Motor Tripped, Over Temperature and Compressor Failed. Each Compressor has a Reset Button.

A Plant Control Unit incorporating a Pressure Gauge, a Duty Selector Switch with auto selection, and a Plant Emergency Run Pressure Switch. Status Indicators for Normal, Plant Fault, Plant Emergency, Reserve Low system fault, Pipeline Pressure Fault 4 bar, and Pipeline Pressure Fault 7 bar.

All Alarm Contacts are duplicate allowing complete dual Alarm System or BMS/Alarm Connection.

A Dryer Control Unit incorporating Duplex PLC's for Cycle Timing, Hand/Auto Switches, a Dew Point Sensing Circuit to detect moisture after the Dryers and Line Pressure Sensors for high and low Pressure in the Line.

### Motor Protection

Each Compressor Motor has a Manual Motor Breaker and Contactor. They operate when the motor connected draws excessive current or if a phase is lost.

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The trip current is set on the disc on the front of the breaker at the factory and should not need adjustment. There is a Manual Switch that allows testing of the unit.

GENERAL NOTE; it is recommended that all electrical work be carried out by a qualified electrician.

## OPERATION

### General

Once powered up, the Duty Compressor starts immediately followed by the Standby Compressor, the Compressor Failed Lamps and the Dryer Pressure Fault Lamps may be on.

Once the Duty and Standby Compressors have stopped then press both Compressor and the Dryer Reset Switches and, if the dryer will not reset to normal the dryers may be wet. Try running both dryers on "Continuous" for 30 minutes while also leaking a little air from the test point to allow a flow of dry air over the dew-point transmitter. The dryer should now reset to normal.

At 10 bar the Duty and the Standby Compressor will Stop. The Duty Compressor Maintains pressure in the receiver between 9 and 10 bar, if the Duty Compressor fails or cannot cope with the System demand, the Standby Compressor is activated at 8.5 bar.

In the event of both Compressors failing the Plant Emergency Switch will Activate at 8 bar, the Dryer Fail Pressure Switch will operate at 6.5 bar followed by the Line Pressure transducer.

### Initial Powering up

Check direction of rotation of Compressors, if incorrect reverse polarity by changing two phases around.

***Check oil levels are O.K.***

### Dryer Operation

The Dryer operates automatically in synchronization with the Compressors. Both Dryers are fitted with Economy/Continuous Switches, which allow manual operation for maintenance purposes.

In Auto Mode the Dryer can be seen to operate only when the Compressors run. This uses air to regenerate only when a demand exists (Economy Mode).

The operation time is a 12-minute cycle, each tower being on stream for 6 minutes. During the last minute of each towers cycle, the Dump Solenoid Valves close to allow pressure to equalise in both

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columns ready for changeover. This time stops and starts with the Compressors in Auto Mode but can best be time checked in hand.

### Duty Compressor Selection

The duty Selector Switch on the Control Panel indicates the Duty Compressor.

### Duty Filter/Dryer Selection

The Dryer Control Panel has a Duty Selector Switch for Manual Selection of the Dryer/ Filter Set, however, in the event of a Dryer fault the selected (failed) Dryer is isolated and the Standby Dryer automatically put on stream.

Both Dryers have Manual Isolation Ball Valves on Inlet and Outlet sides all should be left open to allow auto changeover. These Valves are only for servicing and maintenance use.

## **SAFETY**

### General

This equipment should be installed, operated and maintained by personnel who are suitably trained, are fully conversant with HTM 2022 and are familiar with this product.

No attempt should be made to use or modify this equipment for use with a gas other than as identified.

This equipment should not be operated at pressures exceeding those stated in HTM 2022 and this manual.

## INSTALLATION

### Mechanical

The Plant is designed to be floor mounted. The Compressor Unit should be mounted on the pads provided, the legs of the receiver and the Dryer Frame should be fastened direct to the floor through the frame Mounting Brackets. The mounting holes in the Receiver and Dryer are 10 mm diameter.

### Siting

*Plant room ambient temperature should be between 10°C and 40°C. Oil flooded machines suffer from oil emulsification at low temperatures due to heated gases being drawn into the pumps via the intake, which condense and mix with the oil. Therefore the plant room may need to be heated.*

### Pipe work Connections

Once sited connect the flexible pipe from the Compressors to the Vessel Pipe work and the Vessel to the Dryer Pipe work at the rear 15mm dryer Inlet Port.

The pipeline connection to the Plant is provided by a Union Stub on the right hand side of the Control Panels connections are 22mm copper.

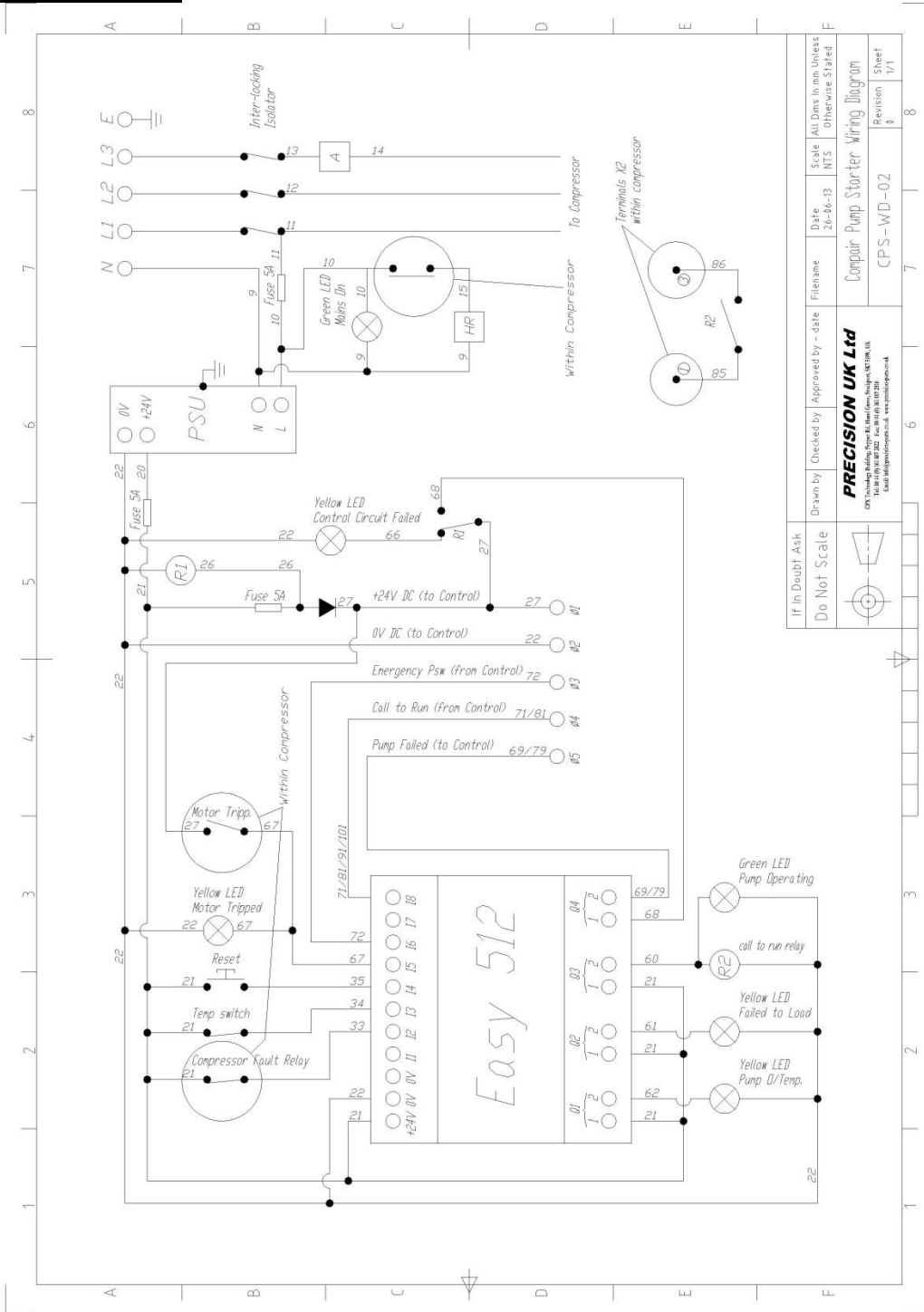
All connections should be made in accordance with the connection diagram overleaf.

### Electrical

Electrical power supply should be provided via two, three phase + neutral + earth supplies and fused to the compressor starter panels. Plus a single phase+ neutral + earth supply fused at 5 amps to the dryer panel.

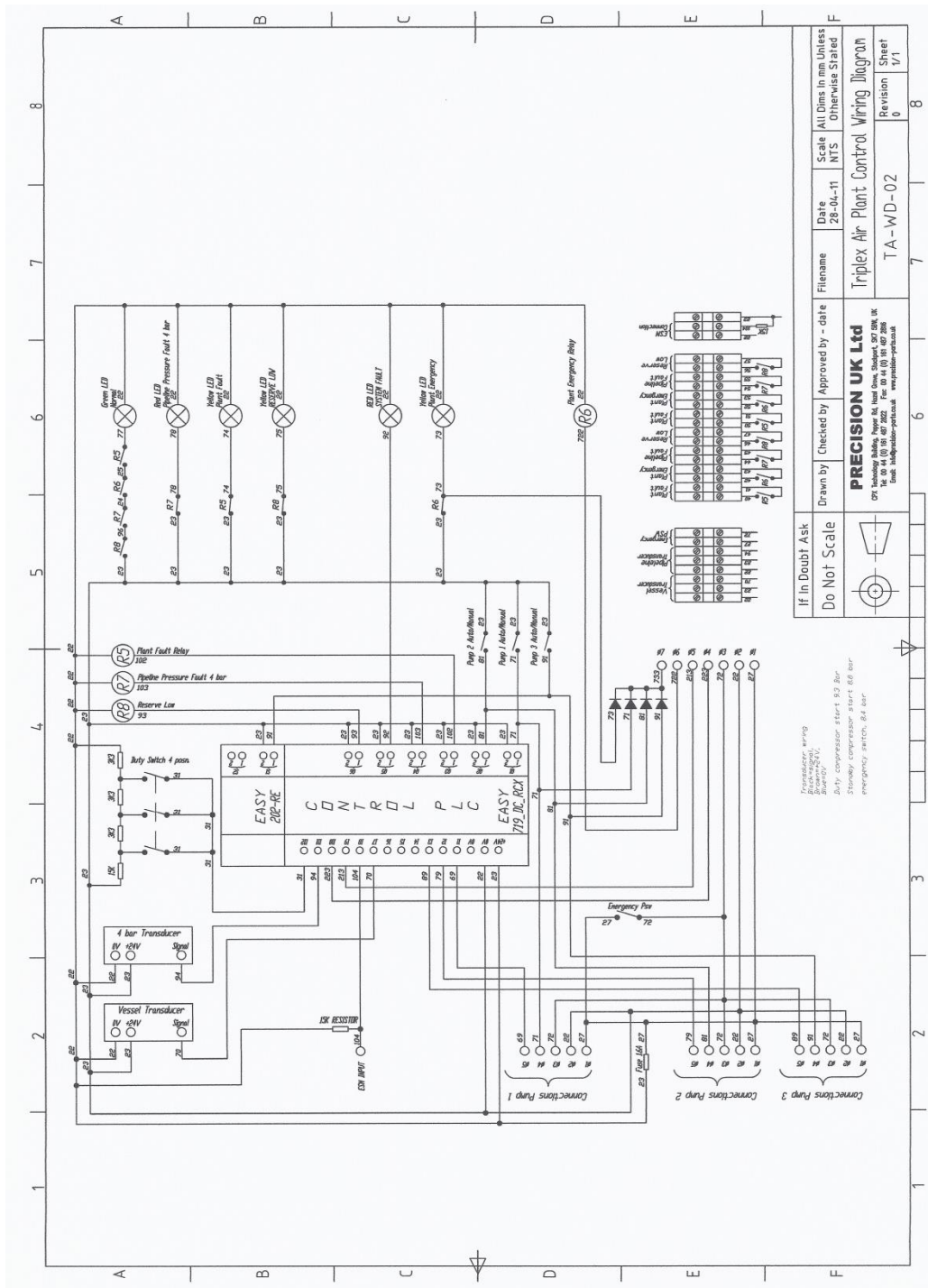
**ELECTRICAL SCHEMATICS**

**Compressor Starter Unit**

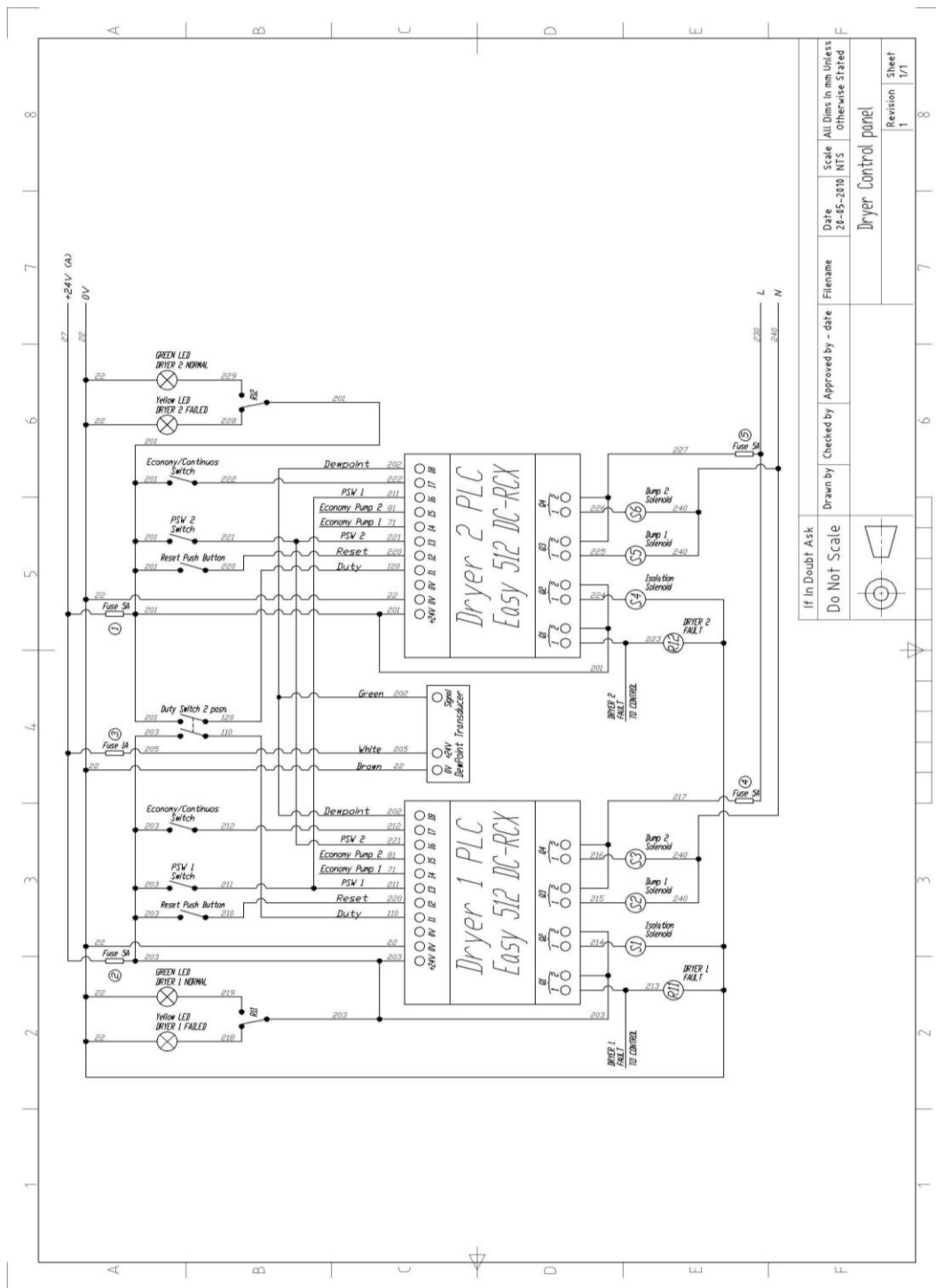





Medical Air 3 Pump Control Unit



Duplex Dryer Control Panel



If in Doubt Ask	Drawn by	Checked by	Approved by - date	Filename	Date	Scale	All Dim in mm Unless Otherwise Stated
Do Not Scale					28-15-2010	NTS	
				Dryer Control panel			
							Revision Sheet 1 1/1

## MAINTENANCE

### General

- The two most important items to consider are oil and filters.
- Oil should be changed every 6 months or 1000 hours whichever comes first.
- Pre and activated Carbon Filters should be replaced at 12-month intervals but Sterile filters every 6 months.

### Routine Maintenance

#### WEEKLY;

- Check Vessel Drain operation.
- Check oil levels, top up if necessary.
- Check Compressor hours
- Select Duty Compressors based on hours run. If even set to auto.
- Change Duty Dryer.

#### MONTHLY;

- Check Drain on Receiver using Manual Valve.
- Check each Compressor runs O.K. using Manual/Auto Switches (run for no less than 10 minutes each Compressor).

#### EVERY 6 MONTHS;

- Change Sterile Filter Elements.

#### EVERY 12 MONTHS;

- Check all Pressure relief valves
- Send Pressure transducers for calibration.
- Send dew-point transducer for calibration.
- Change oil in Compressors.
- Any other maintenance to the compressors as recommended by the manufacturer
- Tighten Electrical Connections.
- Check all Switch settings.
- Change Pre and Active Carbon Filter Elements.

Vessel Maintenance

Periodic insurance inspection will be required on the Pressure Vessel. The Vessel is provided with two inspection ports, one on each end.

Fault Diagnosis

SYMPTOM.	FAULT.	ACTION
<b>Motor will not start.</b>	<b>Circuit breaker tripped/blown.</b>	<b>Check all Electrical Switchgear, Cables and Motor.</b>
	<b>Motor burnt out.</b>	<b>Return Compressor for repair.</b>
	<b>Overload tripped</b>	<b>Isolate Supply Power, reset Overload Trip.</b>
	<b>Motor or Air temp is high</b>	<b>Ensure Inlet to Motor Fan or After Cooler is not obstructed.</b>
<b>Standby Compressor Running.</b>	<b>Duty Compressor failed.</b>	<b>Check Motor is running.</b>
	<b>Plant overuse.</b>	<b>Check sizing.</b>
<b>Dryer Pressure fault.</b>	<b>Filter element blocked.</b>	<b>Replace filter.</b>
	<b>Pressure Switch faulty.</b>	<b>Reset set Point.</b>
	<b>Dryer hang up.</b>	<b>Check solenoids.</b>
<b>Dryer Dew point fault.</b>	<b>Desiccant Saturated</b>	<b>Change Desiccant, dry for 30mins by running on manual Then Reset.</b>
	<b>Dew-point Sensor needs calibrating</b>	<b>Calibrate Dew-point sensor</b>
<b>Reserve Lamp on.</b>	<b>E.S.M. empty.</b>	<b>Check ESM.</b>

<b>System Fault.</b>	<b>Fault in ESM Wiring.</b>	<b>Check ESM Wiring</b>
<b>Line Pressure fault.</b>	<b>Regulator set point low or high.</b>	<b>Check setting.</b>
	<b>Line Pressure Transducers Need Calibrating.</b>	<b>Calibrate Transducers.</b>

## SPARE PARTS

- 2 x Compressor Air Intake Filter Elements.
- 15L Compressor Oil
- 2 x n/o Pressure Switch.
- 1 x 0-10bar, 0-10V Pressure transducer.
- 2 x Pre – Filter Elements.
- 2 x Activated Carbon Filter Elements.
- 2 x Sterile Filter Elements.
- 1 x Filter Auto Drain Unit (float type).
- 1 x Regulator Repair Kit.

## **WARRANTY**

The CPX automatic manifolds comes with a 12 month warranty from day of shipment. Within this period Precision UK will repair, replace any part on site, or at the factory, which is proven defective at Precision UK's cost.

Furthermore, Precision UK will warrant its materials to be free from defects for an additional period of four (4) years (five (5) in total from date of shipment). Within this period Precision UK will replace any part, at no charge, which is proven to be defective. Shipping cost after the first twelve (12) months will be borne by the customer.

This warranty is valid when the product has been properly installed according to Precision UK's specifications, used in a normal manner and serviced according to the factory recommendations. It does not cover failure due to damage which occurs in shipments or failures which resulted from accidents, misuse, abuse, neglect, mishandling, alteration, misapplication or damage that may be attributable to acts of god.

Precision UK shall not be liable for incidental or consequential damages resulting from the use of this equipment.

## CONTACT US

CPX Technology Building, Pepper Road, Hazel Grove,  
Stockport, Cheshire, SK7 5BW, UK

Tel: +44 (0) 161 487 2822

Fax: +44 (0) 161 487 2816

Email: [info@precisionuk.co.uk](mailto:info@precisionuk.co.uk)



**REGULATORY REQUIREMENTS**

The following British, European and International Standards have been consulted during the design, manufacture and testing of the CPX Medical Air Plant.

√ BS EN 737-3:2000	Medical gas pipeline systems – Part 3: Pipelines for compressed medical gases and vacuum.
√ BSEN 14971:2012	Medical Devices. Risk Analysis.
√ BSEN 10524:2006	Pressure regulators for use with medical gases.
√ BS EN 13348:2001	Copper and copper alloys. Seamless round copper tubes for medical gases or vacuum.
√ BS EN ISO 17672	Brazing. Filler metals.
√ BS EN 980:1997	Graphical symbols for use in the labelling of medical devices.
√ ISO 7396-1	Medical gas pipeline systems. Pipeline systems for compressed medical gases and vacuum.
√ ISO 554	Standard atmospheres for conditioning and/or testing. Specifications.
√ SS 01 91 02	Colour atlas.
√ BS EN 60601-1	Medical electrical equipment. General requirements for basic safety.
√ HTM 2022	Medical gas pipeline systems. Design, installation, validation and verification.
√ HTM 02-01	Medical gas pipeline systems. Design, installation, validation and verification.
√ C11	NHS model engineering specification – medical gases.
√ BS EN 286:1991	Simple unfired pressure vessels designed to contain air or nitrogen. Design, manufacture and testing.
√ BS 5169:1992	Specification for fusion welded steel air receivers.



**APPENDIX A: O&M MANUAL TEMPLATE APPROVAL**

The undersigned acknowledge they have reviewed the automatic manifold **Installation, Operations & Maintenance Manual** and agree with the approach it presents. Changes to this **Operations & Maintenance Manual** will be coordinated with and approved by the undersigned or their designated representatives.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Print Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Role: \_\_\_\_\_

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