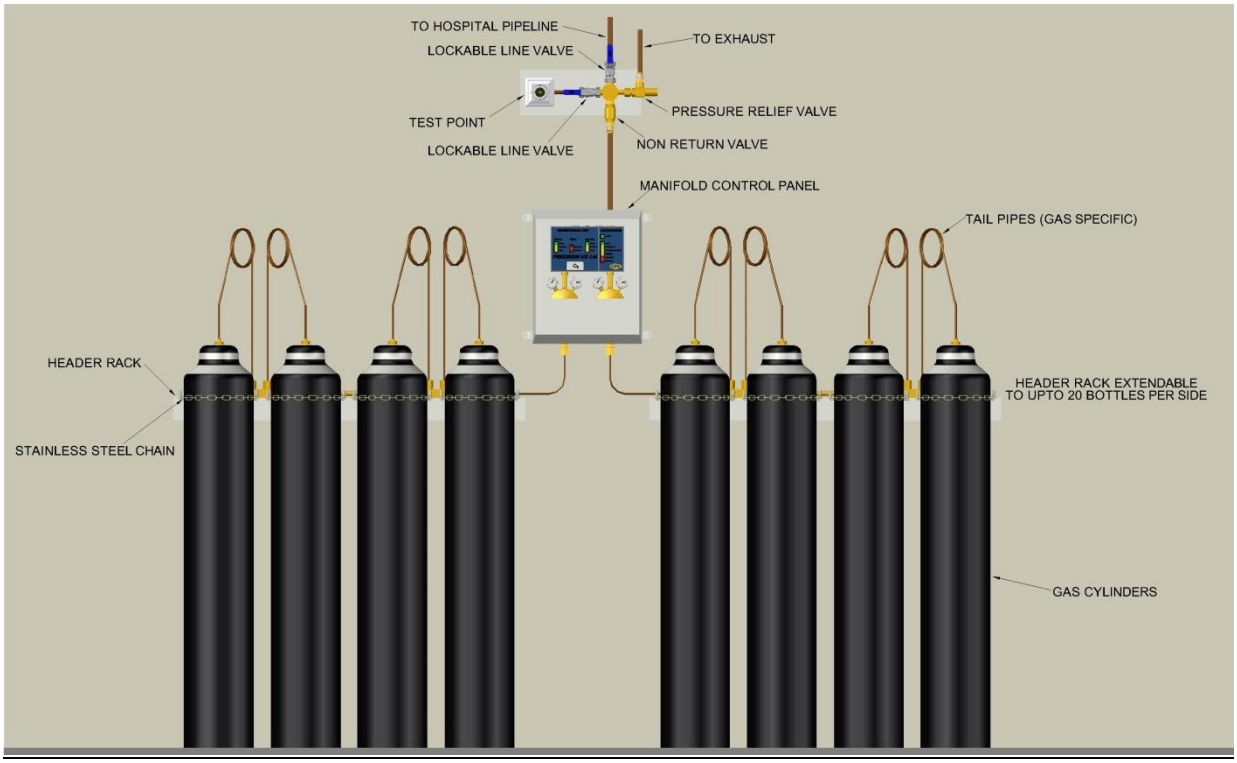
Technical Specification

Automatic Gas Manifolds



Product Description

The CPX automatic manifold provides a continuous supply of gas from two banks of cylinders to the medical gas pipeline system by changing from the duty bank to the standby bank automatically when the duty bank has become depleted. The CPX automatic medical gas manifold plant is supplied as a packaged product ready for immediate installation, tested and prepared at the factory for the specific gas indicated.

The manifold control panel shall be type tested for electrical safety to BS EN 60601-1, EMC tested for emission to BS EN 55011 and for immunity to BS EN 60601-1-2, full certification shall be provided with each manifold control panel. The manifold control panel shall fully comply and meets with the requirements of the UK NHS Health Technical Memorandum 2022 (HTM2022) and 02-01 (HTM02-01) and is designed to meet the requirements of ISO 7396-1. The manifold control panel shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review. The CPX Precision UK manifold is CE marked as a medical device to 93/42/EEC Annex II directive.

Automatic Control Panel

Each manifold control panel should be designed and certified for use with oxygen at 300 bars and 60°C and shall provide an uninterrupted supply of medical oxygen from equally sized high pressure cylinder banks via a suitable arrangement of pressure regulators, providing a constant downstream

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nominal pipeline gauge pressure of 400 kPa, 700kPa or 10000kPa.

The manifold control panel shall provide a minimum flow of 1000 l/min to the nominal 400 kPa medical oxygen pipeline system. Higher flow options are available up to 5000l/min. The manifold control panel shall be powder coated in the appropriate color for the gas e.g. N2O= Blue, no wider than 500 mm to ensure optimal use of wall space within the facility.

Automatic control panel indicates which bank of cylinders is running, which is empty and which is running low if the other bank is empty. The panel will also indicate if the distribution pipeline pressure has risen or fallen beyond acceptable limits. The display incorporates an alarm status indicator and includes volt free contacts for connection to the central alarm system and BMS outputs included as standard.

Automatic changeover of 'duty bank' to 'reserve bank' shall occur at a cylinder gauge pressure of 14 bars, actuated by a dual output piston pressure switch. Line pressure shall be continuously monitored by an electronic pressure switch; mechanically actuated pressure switches are not acceptable. The supply of gas shall not be affected due to power failure.

The empty LED will show a depleted bank by turning yellow, when the system is reset by replacing the depleted cylinders with full cylinders the indicator will turn green. If the manifold is connected to the central alarm system that will also indicate the bank is depleted and, in turn reset.
All critical connections of the automatic medical gas manifold are gas specific to the gas indicated.

The Auto panel incorporates a PCB/Microprocessor and digitally controls gas valves. A LCD panel display's pressure in cylinders and outlet pressure. Regulators will regulate the pressure in 2 stages to enable high peak flow rates without a reduction in line pressure. Single stage and line regulators combined are not acceptable; Pressure regulators shall comply with EN ISO 2503, and have a documented test report confirming completion of the oxygen ignition tests stated in ISO 7291 and BS EN 10524-2.

Each control panel shall be powered by an internal 24 VDC power supply. Higher voltages are intrinsically unsafe and should not be permitted. There shall be manual changeover button to provide simple selection of duty bank. The automatic control panel shall be supplied fully assembled and tested.

The system shall be duplexed such that component failure will not affect the integrity of the medical gas supply. The manifold shall employ be a fail-safe system in the event of power failure so that both bank isolation solenoid valves open and continuity of supply is assured. Upon restoration of the electrical supply, the original running bank shall return on line. All pressure regulators shall be protected from over-pressurization by relief valves that are vented to atmosphere. The line pressure relief valve shall be provided with easing gear.
Two non-return valves, one for each bank, shall be provided within a line pressure manifold block and shall provide gas tight isolation and continuity of service in the event of any upstream component failure.

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The manifold control panel outlet shall be provided with on-site copper to copper joint installation; lockable isolation valve and non-return valve assembly shall be included to enable positive tamperproof isolation for maintenance. Piped exit pressure relief valve assembly is provided to the hospital exhaust pipeline.

Header Racks and Gas Specific Tailpipe Connections
The CPX Precision UK Cylinder header racks for oxygen service shall be provided with connections for bull nose cylinder or pin index connections.
Cylinder racks shall be manufactured from steel double primed painted epoxy powder coating and shall be designed to securely support cylinders of varying diameters using stainless steel chains. Manifold header racks shall be high-pressure rated >250bar with gas specific tailpipe connections.

Mechanical seals only shall be used for gas tightness. No O-Rings should be used within the header rack and tailpipes design to avoid impregnation of gases and subsequent failure/leakage at high pressure. Manifold header racks shall incorporate hard-seat, 100% non-return valves integral with each cylinder connection point to maintain system in the event of tailpipe fracture and prevent backflow of gas into the high pressure cylinders.

Heaters designed to the flow rate required shall prevent any icing of the manifold, these shall be powered by an external 13amp 240v fuse spur supply.

Tailpipes shall have gas specific connections to the manifold header with threaded connections as specified in HTM2022 and the cylinder .Each tailpipe shall be manufactured from flexible degreased copper tube and be tested to >250 bar and certified, supplied with the bottle connector Bull nose, CGA or Pin Index, stamped with the appropriate gas type for supply in a polythene sealed bag detailing the gas type and relevant standards each tailpipe confirms too. Stainless steel flexible connections without anti-whip connections are not acceptable.

A cylinder rack of capacity equal to one bank shall be provided for the storage of spare cylinders for immediate replenishment of a depleted bank.

Manifold System Design
All regulators shall be protected from over-pressurisation by relief valve that are vented to atmosphere. A gas outlet test point (supplied separately) shall be isolated from the supply with a 15mm ball valve.

The control panel enclosure shall be housed in a single panel having a solid construction using a steel box and reinforced glass; access shall be only by available by using specialist tools. The enclosure shall be able to be fully removable to allow access for maintenance. To aid maintenance the connections within the panel shall use “O” rings sealing against flat face connectors to allow easy removal and replacement of components, threadlock or ptfe tape shall not be permitted within the construction of the panel. The manifold control PCB and digital display shall be mounted on a hinged unit inside the control enclosure to enable maintenance.

Manifold Control System Operation

The monitoring & status panel incorporates two sections, one labelled “Manifold Indicator Unit” and one labelled “Alarm Signal Status Unit”. The manifold indicator unit displays the status of the cylinder banks and the distribution pipeline pressure, whilst the alarm signal status unit displays the main central alarm system conditions.

The Manifold Status Unit includes the following indicators.

(a) For each bank, a green LED indicator (RUNNING) illuminates to display which bank is currently running.

(b) For each bank, a yellow LED indicator (LOW PRESSURE) illuminates to display that the bank that is running has fallen to the low pressure setting and the standby bank is still empty.

(c) For each bank, a yellow LED indicator (EMPTY) illuminates to display that a bank of cylinders is empty and changeover to the standby bank has occurred.

(d) A red LED indicator (HIGH PRESSURE) illuminates to display when the distribution pipeline pressure has risen above the pressure sensor setting.

(e) A red LED indicator (LOW PRESSURE) illuminates to display when the distribution pipeline pressure has fallen below the pressure sensor setting.

The Alarm Signal Status Unit includes the following indicators.

(a) A green LED indicator (POWER ON) illuminates to show that the power to the manifold is on.

(b) A green LED indictor (NORMAL) that illuminates when the manifold is operating correctly and no faults exist.

(c) A yellow LED indicator (CHANGE CYLINDERS) which illuminates when changeover from the duty to the standby bank has occurred.

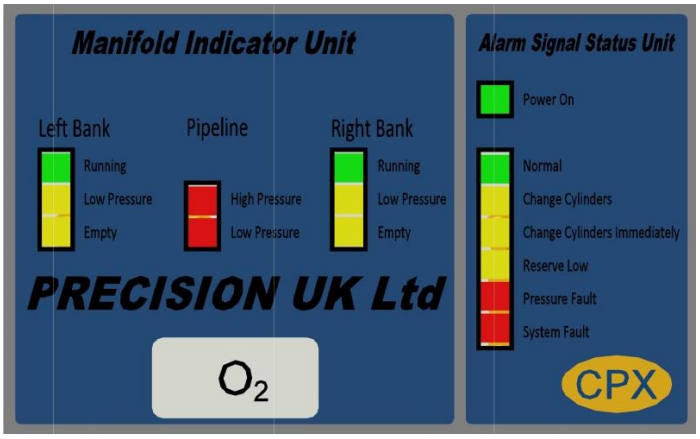
(d) A yellow LED indicator (CHANGE CYLINDERS IMMEDIATELY) which illuminates when the bank that is running has fallen below the pressure sensor setting and the standby bank is empty.

(e) A red LED indicator (RESERVE LOW) which illuminates when the duty bank of the emergency reserve manifold (ESM) has fallen below the low pressure setting.

(f) A red LED indicator (PRESSURE FAULT) which illuminates when the distribution pipeline pressure has risen or fallen beyond the respective pressure sensor settings.

(g) A red LED indicator (SYSTEM FAULT) which illuminates in the event of a cabling fault.

Manifold Indicator and Alarm Signal Status Unit.



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Automatic Manifold Variants:
Manifolds are available for oxygen, nitrous oxide, 50% oxygen/50% nitrous oxide mixture and compressed air, carbon dioxide and other inert gases.

Automatic Medical Gas Manifold	
Type	Product Code
Oxygen	MANIFOLD-AUTO-O2
Nitrous Oxide	MANIFOLD-AUTO-N2O
Entonox	MANIFOLD-AUTO-O2N2O
Medical Air 4	MANIFIOLD-AUTO-MA4
Surgical Air 7	MANIFOLD-AUTO-SA7

Quality
The manifold control panel shall fully comply and meets with the requirements of the UK DOH Health Technical Memorandum HTM2022. The manifold control panel, header racks and tailpipes shall be manufactured under an ISO 13485:2003 quality management system. A copy of the certificate of registration shall be provided for review.

CE Marking
Precision UK Manifolds are CE marked as a Class IIb Medical Device 93/42/EEC with notified body BSI British Standards Institute and stamped CE 0086.

Product Cleanliness
The automatic manifold is cleaned and degreased for oxygen service and free from all particulate matter and toxic residues and has a maximum carbon level of 0.2mg/dm².
Each assembly is individually end capped and sealed in polythene bags to maintain cleanliness.

Installation Guidelines
The automatic control panel is supplied with all internal electrical connections pre-wired. The only external wiring required for the installation is the connection of the mains power supply, the connection of the ESM pressure switch (if required) and the connection of the central alarm system and BMS wiring (if required).
All regulators and pressure sensors are pre-set and no further adjustment of these settings should be required.

Mechanical

(a) Remove the Backplate assembly from the automatic control panel enclosure and store in a safe place. The enclosure will be easier to handle and fix.
(b) Secure the automatic control panel enclosure to the wall using suitable fixings at a suitable height shown in fig. 2. Ensure that there is sufficient space either side of the control panel to install the manifold headers.
(c) Replace the Backplate assembly and secure with the retaining screws.
(d) Secure the manifold headers at an appropriate height and position using suitable fixings. Use the header connecting pipes to assist in the accurate alignment of the racks.
(e) Install the outlet stub pipe, pressure relief valve and isolation valve.
(f) Install the exhaust pipeline from the pressure relief valve to a safe external location.

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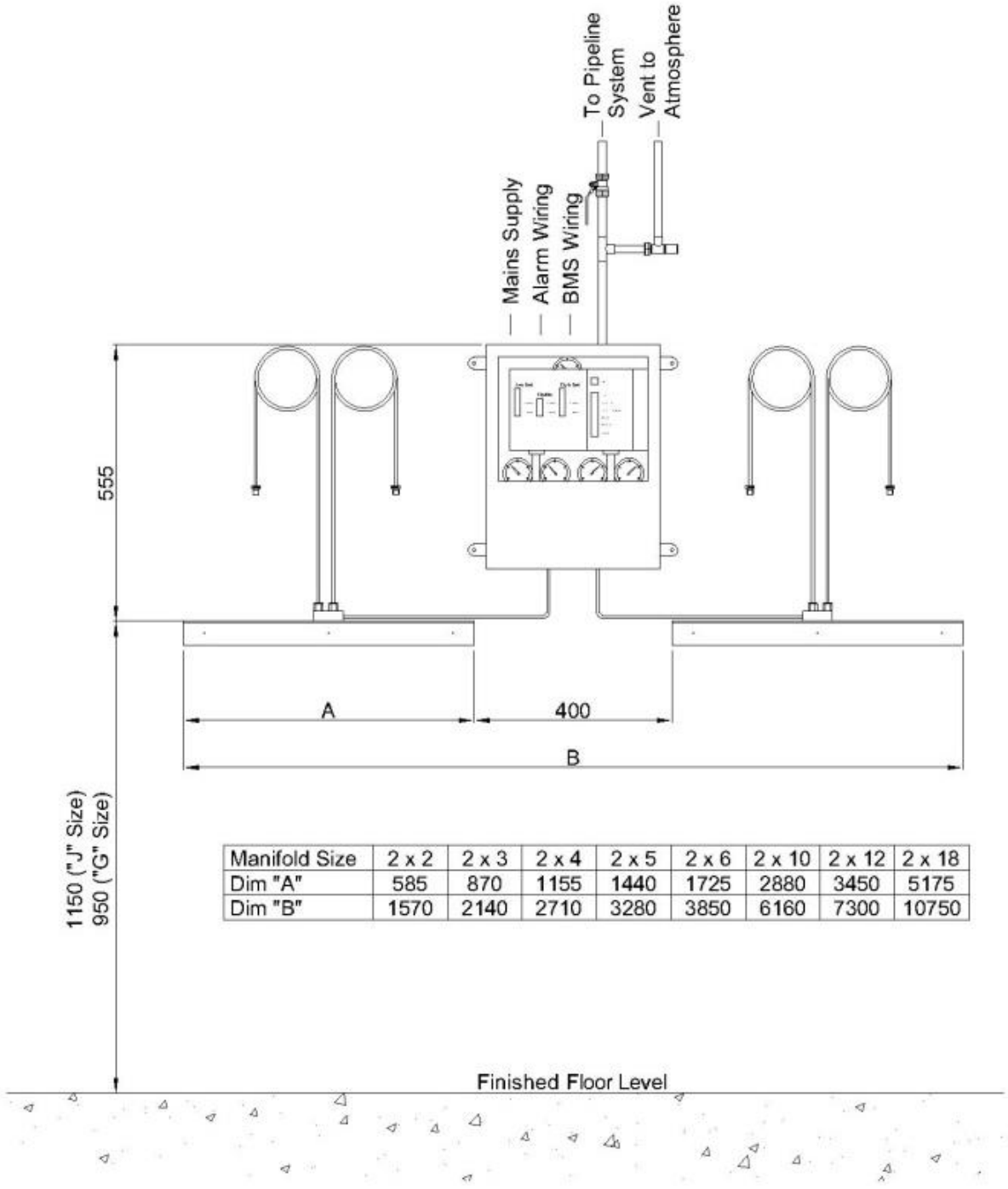
(g) Install all tailpipes onto the manifold headers.
(h) Check and tighten all mechanical joints.
(i) Connect cylinders, pressurise the manifold and check for leaks. Make sure that the isolation valve is closed if the connection to the distribution pipeline has been made.



Manifold Size	2 x 2	2 x 3	2 x 4	2 x 5	2 x 6	2 x 10	2 x 12	2 x 18
Dim "A"	585	870	1155	1440	1725	2880	3450	5175
Dim "B"	1570	2140	2710	3280	3850	6160	7300	10750

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Electrical

(a) Connect the mains power supply to the connector mounted on the Backplate.
Red or Brown wire to the LIVE (S+) terminal.
Blue or Black wire to the NEUTRAL (N) terminal.
Green/Yellow wire to the EARTH terminal.

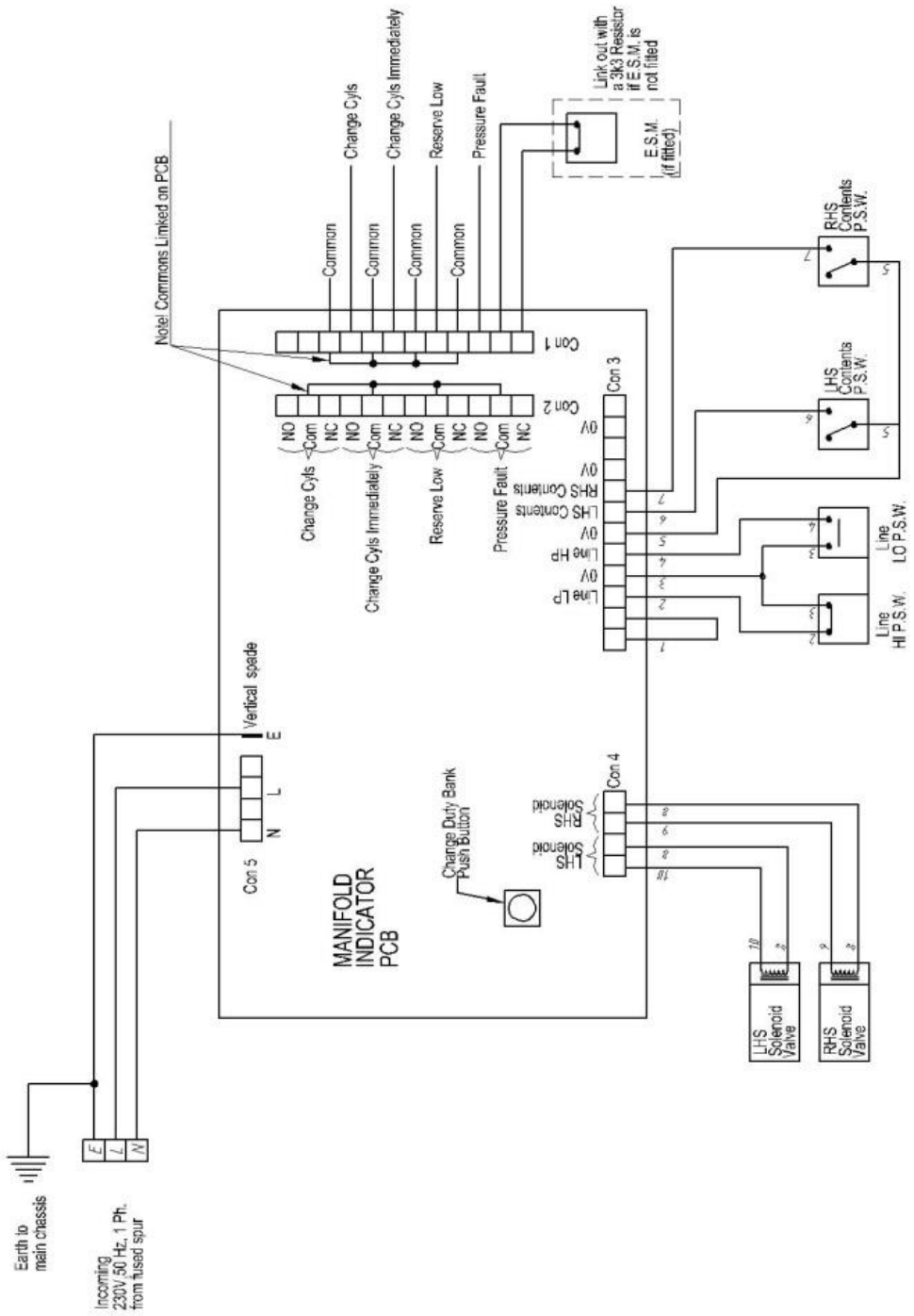
The single phase mains power supply should be via an un-switched fused spur rated at 5 amps.

(b) Connect the emergency standby manifold (ESM) pressure switch into terminals 1 and 2 of CON1 on the monitoring and status panel PCB. Refer to figure 4.5. If no ESM is available, ensure that a 3K3 resistor (supplied) is fitted into these terminals to prevent a system fault from illuminating.

(c) Connect the alarm conditions displayed on the alarm signal status unit to the central alarm system by connecting to CON1. Refer to figure 4.5 for details of each alarm conditions position in the 12-way connector.

(d) Connect the alarm conditions to the building management system (BMS) by connecting to CON2. All alarm conditions have one common (COM) terminal, a normally closed (NC) terminal and a normally open (NO) terminal. Refer to figure 4.5 for details of each alarm conditions position in the 12-way connector.

Electrical Schematic Diagram



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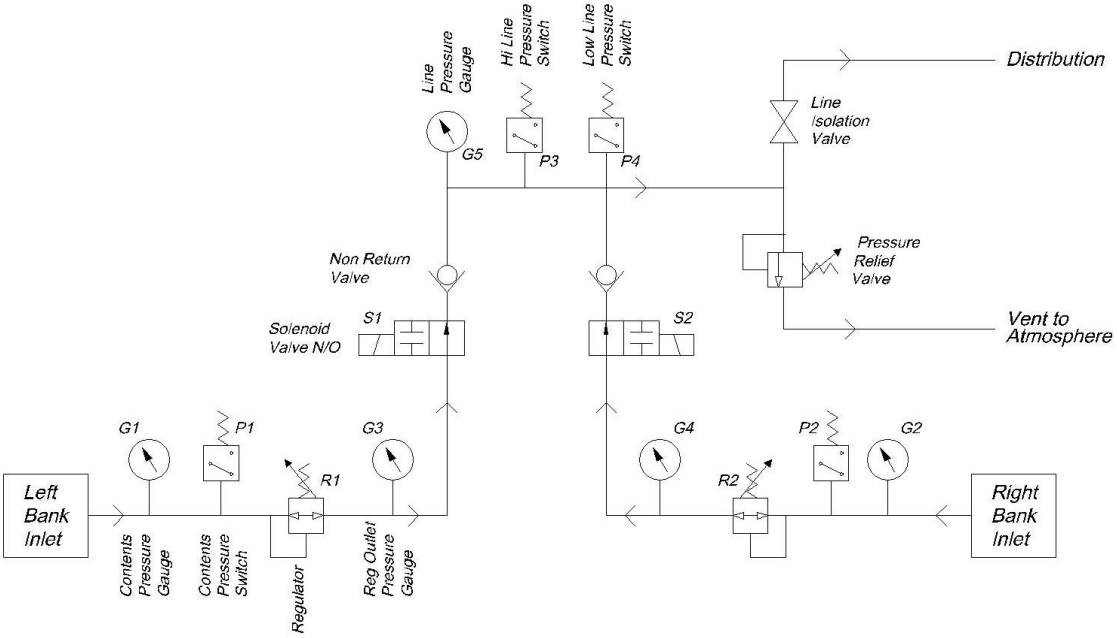
Pipeline Jointing

The automatic manifold copper stub pipe is manufactured to BS13348 for connection to the pipeline system and joints shall be made on site using copper, phosphorus and silver brazing alloy CuP282 to BS EN 17672:2010. Brazing should be carried out using oxygen free nitrogen as an inert gas shield to prevent the formation of oxides on the inside of the pipe. Copper pipes shall be cut square with the pipe axis using a sharp wheel cutter wherever possible, and be cleaned to get rid of any cuttings or burrs.

Schematic Diagram



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