

## Lab-Master Manual Changeover Manifolds - (Excluding Acetylene)

### System Description

**Gas-Arc products are designed to supply and/or protect piping of a nominal diameter of less than 25mm and therefore meet the PED criteria "Sound Engineering Practice" and will not be CE marked.**

Manually operated manifolds of all sizes have a common design as illustrated in our recommended spares section and are supplied in both wall and floor mounted options.

The manifold is mounted on a support frame which, when wall mounted, is bolted directly on to the wall through the fixing plates. When floor mounted, the manifold is supported at each end on legs, which are bolted down to the floor.

The manifold consists of regulator mounting block, HP bank isolation valves, header rails with integral non return valves, cylinder support 'restraint' chains. The pressure reduction package comprises of multi-stage regulator, pipeline pressure safety relief valve, LP purge/sample valve, line isolation valve and pipeline connection.

**Note!** Carbon dioxide manifolds using liquid withdrawal cylinders require a vaporiser installed before the manifold tailpipe and header rail.

With cylinder valves open, gas at high pressure (up to 300 bar g) discharges from the gas cylinders through tailpipes or hoses which are connected to the gas cylinder by bullnose connectors and to the manifold header blocks. Where the installation is larger than 2 x 1, additional tailpipes are connected to intermediate blocks mounted in the header pipework at appropriate centres. Both end blocks and intermediate blocks incorporate a non-return valve to prevent backflow into any cylinder.

The gas is then regulated to the desired outlet pressure by the multi-stage regulator with the pipeline pressure protected by the pipeline pressure safety relief valve, LP sample/purge valve and line isolation valve.

### Installation & Commissioning Instructions

Manifolds when shipped from the factory are partially disassembled for ease of carriage and to prevent damage.

The manifold header pipework complete with all end, intermediate and regulator mounting blocks, as well as all other fittings, is mounted in position on the manifold frame. The tailpipes (flexible hoses or copper pipework) and pressure reduction package are supplied, but not attached to the manifold.

Orifices of all pipework, blocks and tailpipes are protected by plugging or capping with plastic seals or similar blanks, which protect the threads from damage and prevent contamination by ingress of any foreign material. **These plugs and caps** must be left in position until a permanent connection is made to the plugged/capped component.

Wall mounted manifolds should be secured to soundly constructed square walls with fixing bolts BEFORE the pressure reduction package and tailpipes are assembled into position. The height to the underside of the manifold rail shall be 1200 mm.

The manifold is usually commissioned in conjunction with the distribution pipeline by a responsible engineer, who will ensure that:

- the manifold area is clear of all foreign material
- relevant instruction cards and warning notices are displayed
- the manifold has been tested satisfactorily.

The following instructions for commissioning the manifold should be read in conjunction with BCGA Code of Practice CP4, HSE Guidance Note CS4 and The Highly Flammable Liquids & Liquid Petroleum Gases Regulations 1972.

- 1 Stand a full cylinder in place in each position on the manifold and fasten with the securing chain. Momentarily open each cylinder valve slightly, releasing a puff of gas (with the exception of Fuel Gases) to remove residual moisture and dirt from the outlet connection.
  - 2 Screw the bull nose connector of each tailpipe into the cylinder valve of the adjacent cylinder and tighten firmly using the spanner provided.
  - 3 Check that all tail pipes are connected and tightened.
  - 3 Check that both high pressure isolating valves LH and RH are closed.
- Note!** Earth yourself in close proximity to the installation before proceeding with fuel gas systems.
- 5 Open the cylinder valves one at a time very slowly.
  - 6 As each valve is opened, check the bull nose connection for any sign of leakage, with an approved leak test solution. If bubbles form, tighten further but not beyond 50 lbs/ft when leakage should be cured.
  - 7 Check that:
    - (i) Low pressure distribution pipework is connected to the outlet of the pressure reduction package.
    - (ii) All outlet point valves are closed.
    - (iii) All connections and joints are leaktight, using an approved leak test solution.
  - 8 Open one valve in the distribution pipe work system, ensuring that any gas discharge will be safe and create no hazards.
  - 9 Screw the high pressure regulator adjusting screw fully out (anti clockwise).
  - 10 Open the LH manifold high pressure isolation valve slowly. The whole of the LH system and the regulator are now fully pressurised.
  - 11 Screw in the regulator adjusting knob very slowly and monitor the regulator low pressure gauge. The low pressure will slowly increase and when the desired controlled low pressure has been achieved, make no further adjustment to the adjusting knob.

**Note!** Where a dome-headed nut is fitted in place of the adjusting knob, the regulator has been pre-set and should not be altered.



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- 12 Close LH cylinder valve and close LH manifold isolation valve.
- 13 Repeat this procedure from 5 for RH side of system.
- 14 The controlled low pressure at the regulator gauge should be the same as when the LH bank was working.
- 15 Close the outlet point valve which was opened at step 8.
- 16 Open each outlet point in turn to ensure that the pipeline is thoroughly purged. Appropriate safety precautions must be taken to avoid dangerous concentrations of gas in the atmosphere. The system is now ready for operation.  
Purging - It is critical that all high purity equipment be thoroughly purged before use to ensure that any residual moisture is removed from the system. The following procedure should be carried out:
- Pressurise the manifold/regulator assembly to its maximum outlet operating pressure and then with the inlet pressure isolated, reduce the outlet pressure to 1 bar. Repeat this process 3 times.
  - Finally at a minimum operating pressure of approximately 1 bar, purge the regulator until the operating pressure falls to 0.5 bar and hold for a period of 2/3 minutes.
- Note!** To avoid Oxygen depletion or enrichment of the local environment, ensure all purging gases are safely vented.
- 17 Prepare two notices marked 'WORKING' and 'STANDBY', which can be hung over the cylinder banks, ensuring that they are correctly positioned and changed whenever the banks are changed over. Suitable instruction cards, explaining correct operation of valves and controls, are also recommended.
- The installation must generally conform to the minimum requirements of BCGA Code of Practice CP4, including:
  - The following also give guidance and instructions for keeping of LPG in cylinders:
    - The Highly Flammable Liquids and LPG Regulations 1972 (Statutory Instrument 917)
    - Home Office Code of Practice for keeping LPG in cylinders and similar containers
    - LPG ITA Code of Practice CP7 and CP22
    - HSE Guidance Note CS4
  - Siting of manifold and routing of pipework in a safe area.
  - Correct identification of gas service in accordance with BS1710.
  - Anti-confusion check, if cross-connection of gas service is possible.
  - Purging into service with an inert gas.
  - Testing for leaks, strength and pressure variation by pneumatic or hydraulic means.
  - Checking stop valves, non-return valves, changeover valves and cut-off devices for leak-tightness, security of attachment and correct operation.

Now refer to the Operating Instructions.

### Operating & Maintenance Instructions

The manifold should be operated in accordance with the following instructions and the requirements of BCGA Code of Practice CP4.

The manifold should preferably be put into operation immediately after commissioning.

- 1 The manifold after commissioning was left with one bank of cylinders, with valves open, as the working bank. The other bank was left on standby with cylinder valves closed.
- 2 Operations can now commence at all outlet points.
- 3 At the end of each working period check that all outlet point valves are fully closed.
- 4 Monitor the high pressure gauges if fitted, to establish the rate of pressure fall.
- 5 When the pressure falls to within 2 bar of the regulated low pressure, open all cylinder valves on the standby bank slowly (ease the valve gently until you hear gas begin to flow, do not open further until audible flow has ceased then continue to open the valve slowly to a minimum of 1½ turns).
- 6 Open the standby bank high pressure isolation valve slowly (ease the valve off its seat [anti-clockwise] until gas begins to flow, do not open further until audible flow has ceased, then continue to open the valve slowly until fully open, now close a ¼ turn). Back flow into the empty bank of cylinders is prevented by the non-return valve.
- 7 Close the high pressure isolating valve on the empty bank of cylinders.
- 8 Change the 'WORKING' label to the full bank of cylinders, then change the empty cylinders.
- 9 Close the cylinder valves of all cylinders on the empty bank.
- 10 Disconnect all tailpipes from the empty cylinders by unscrewing bull nose connectors.  
**Note!** Use a spark proof spanner for all fuel gases, these connections have a LH thread.
- 11 Mark all cylinders on the empty bank with chalk to show that they are 'EMPTY'.
- 12 Remove one cylinder at a time, by unhooking the chain, and transfer to the empty cylinder storage position.
- 13 Place a full cylinder in each empty position on the manifold, correctly orientated to connect to the tailpipe, and fasten the retaining chain as tightly as is practicable.

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- 14 With all cylinders in position, remove the cylinder valve caps and sniff (crack open the cylinder valve momentarily with the exception of fuel gases) each cylinder. This removes any residual water and dirt from the outlet connection.
- 15 Connect each tailpipe to the adjacent cylinder by tightening the bull nose connector into the cylinder valve, with the spanner provided.
- 16 When all connections have been made, open each cylinder valve slowly.
- 17 As each valve is opened, check the bull nose connection for leakage, using an approved leak test solution. If bubbles form, tighten further but not beyond 50 lbs/ft when leakage should be cured.
- 18 Check the high pressure gauge to ensure the reading is in accordance with the pressure shown on the gas cylinder label.
- 19 Close all cylinder valves and leave closed until the next cylinder bank changeover.

### Maintenance

Weekly checks may be done by an operator instructed in the tasks. Six-monthly and annual maintenance should be performed by a competent person, who fully understands the operation of the cylinder manifold and the hazards involved.

A record of all maintenance should be kept.

When maintaining fuel gas systems, always earth yourself in close proximity to the installation before commencing work, by touching the manifold.

Periodic Checks:-

#### Weekly Inspection (by the user)

Check that:

- i) visually, equipment is in good order, is being correctly used and all the required equipment is fitted.
- ii) manifold, framework and chains are in good condition.
- iii) pigtails and flexible hoses are not corroded or damaged.
- iv) valves shut off and open correctly.
- v) regulators are identified as being suitable for the gas and pressures and are not damaged.
- vi) the system is operating normally, i.e. report if the system is using more gas than normal, if there is an unusual drop in pressure or if there is a smell of gas which could indicate a malfunction or leak.
- vii) the manifold house is free from oil and combustible materials and is not used as a store room.

#### Annual Inspection (by a person with appropriate experience and knowledge)

Check that:

- i) all repairs and modifications (including removals and additions of components) and extensions carried out conform to this Code of Practice.
- ii) changes in the vicinity of the installation do not affect its operation or safety.  
Examples are location of heat sources or burners, moving of machines or work places, occurrence of vibrations, use of a pipeline as an electrical earth or as a support for other items, proximity to electrical installations and to other piping systems.
- iii) there is adequate identification of above ground pipework/pipelines and route markers for buried pipework/pipelines.
- iv) the system is free from leaks by testing at the designated operating pressure.
- v) buried pipelines are in ground which is free from encroachment by other services, buildings or civil structures.
- vi) filters are in good condition and are not blocked. Clean or replace them where necessary.

**Note!** For replacement component parts refer to Recommended Spares Section.

<b>OXYGEN</b>	) <b>USE NO OIL OR GREASE</b> ) <b>ENSURE ADEQUATE VENTILATION</b>
<b>FLAMMABLE GAS</b>	) <b>CONTROL IGNITION SOURCES</b> ) <b>ENSURE ADEQUATE VENTILATION</b>
<b>INERT GAS</b>	) <b>ENSURE ADEQUATE VENTILATION</b>