

CHEM-MASTER MANIFOLD INSTALLATION & OPERATING INSTRUCTIONS

Warning : An appropriately sized pressure relief device downstream of the regulator should be installed in your system to prevent damage to equipment and/or injury to personnel should an internal failure of the regulator occur.

Warning : For regulators with tube fittings, select the appropriate tubing. Use seamless tubing with the proper consideration given to wall thickness and material. Please contact your gas supplier for more information.

This instruction sheet is to be read in conjunction with the Chem-Master regulator installation and operating instructions (LAB11055) and the Chem-Master purge valves installation and operating instructions (LAB11056).

USER RESPONSIBILITY

This equipment will perform in conformity with the description contained in this manual and accompanying marking, labels and/or inserts when installed, operated and maintained in accordance with the instructions provided. This product is 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. It is the users responsibility to ensure that the manifold is suitable for the gas being used. This equipment must be checked periodically. Improperly working equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. Gas-Arc recommends that a telephone or written request for service advice be made to Gas-Arc Customer Service, Vinces Road, Diss Norfolk, IP22 4WW UK Telephone + 44 1379 652263.
E-Mail enquiries@gas-arc.co.uk

This equipment or any of its parts should not be altered without prior written approval by Gas-Arc. The user of this equipment shall have the sole responsibility for any malfunction that results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than Gas-Arc or a service facility designated by Gas-Arc.

CUSTOMER SERVICE

In the event of equipment failure, call Gas-Arc Customer Service. Please be prepared to provide the model number of the equipment involved, in addition to some details regarding its application.

Things to consider before removing the manifold from the box....

1. Know the properties and special handling requirements of the gas being used. Many gases are quite dangerous (flammable, toxic, corrosive, simple asphyxiant or oxidisers). Equipment failure or misuse may lead to problems such as a release of gas through the relief valve or regulator diaphragm. Proper safety measures should be established to handle these and other component failures.

Be sure that the assembly purchased is suitable for the gas and type of service intended. The regulator marking and labelling provides information on the product type and the maximum inlet pressure.

Be sure that the equipment received conforms to the order specifications. The user is responsible for selecting equipment compatible with the gas in use, and conditions of pressure, temperature, flow etc. Selection information can be found in Gas-Arc technical data sheets. In addition, Gas-Arc representatives are trained to aid in the selection process.

2. Inspect the assembly upon receipt to be sure that there is no damage or contamination. Pay particular attention to connecting threads. While Gas-Arc assembles system components to exacting leak tight standards, the customer should also inspect for any loosening of parts that may occur in shipping or installation. Loose parts may be dangerously propelled from an assembly. If there are adverse signs (leakage or other malfunction), return the assembly to the supplier.
3. Before system start-up, it is recommended that all systems be pressure tested, leak tested and purged with an inert gas such as nitrogen.

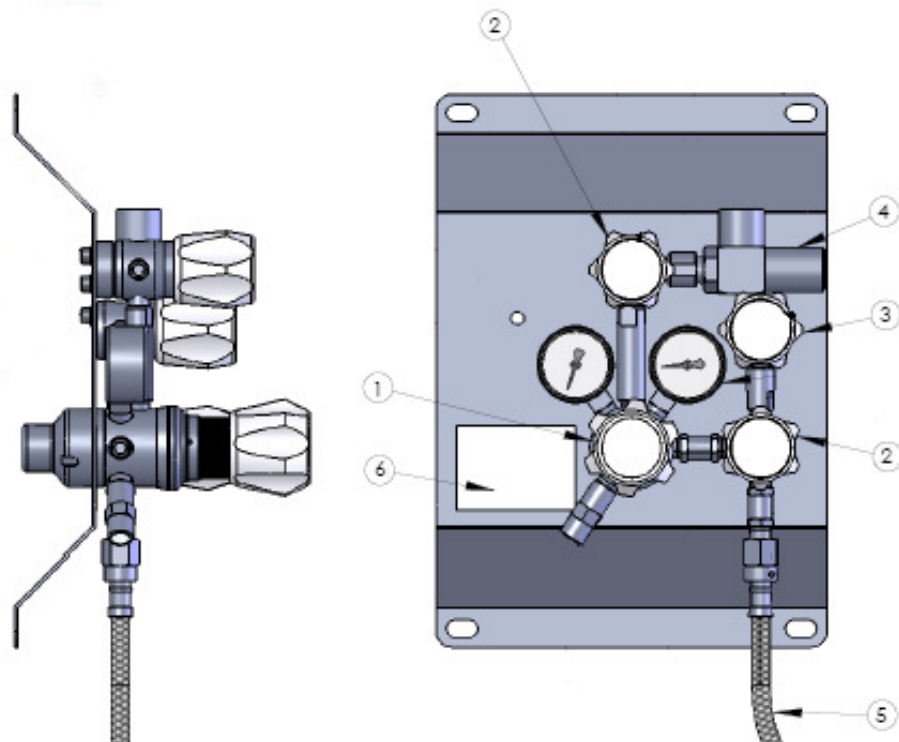
If the regulator or cylinder connection hose includes gas specific inlet connections, their purpose is to prevent usage on the wrong gases. Adaptation or alteration for use on gases can be dangerous, and is not recommended.

GENERAL SAFETY PRACTICES

1. Comply with precautions listed in B.C.G.A Codes of Practice
2. Consult the gas/cylinder supplier for the proper use of cylinders and for any restrictions on their use (such as flow rate and temperature requirements).
3. Never use an open flame when leak testing.
4. Always open valves slowly when high-pressure gases are being used.
5. Always be sure that a cylinder contains the correct gas before connecting to any regulator.
6. Always leak-test any manifold or distribution pipeline before using.
7. Always be sure that the gas in the system is the correct gas for the intended use.

TYPICAL MANIFOLD LAYOUT

Version shown is a single cylinder multistage manifold, depending on specification, manifolds may have different features to those shown.



- 1 Regulator
- 2 Pipeline Isolation Valve
- 3 HP Purge Valve
- 4 Pipeline Safety Relief Valve
- 5 Cylinder Connection Hose (not attached for ease of shipping)
- 6 Service Pressure Identification Plate

INSTALLATION & COMMISSIONING INSTRUCTIONS

It is the installer's responsibility to label the installation with the correct gas service name.

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 Codes of Practice CP4 & CP18, 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.
2. Screw the bull nose connector of each tailpipe into the cylinder valve of the adjacent cylinder and tighten firmly using a spanner.
3. Check that all tail pipes are connected and tightened.
4. 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 70 N.m (50 lb.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.
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.
17. 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.

18. 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 Codes of Practice CP4 & CP18.

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

The manifold should be operated in accordance with the following instructions and the requirements of BCGA Codes of Practice CP4 & CP18.

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.
14. Connect each tailpipe to the adjacent cylinder by tightening the bull nose connector into the cylinder valve, with a spanner.
15. When all connections have been made, open each cylinder valve slowly.
16. 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 70Nm (50 lbf) when leakage should be cured.
17. Check the high pressure gauge to ensure the reading is in accordance with the pressure shown on the gas cylinder label.
18. 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.

Weekly Inspection (by the user)

Check that:

1. visually, equipment is in good order, is being correctly used and all the required equipment is fitted.
2. manifold, framework and chains are in good condition.
3. pigtailed and flexible hoses are not corroded or damaged.
4. valves shut off and open correctly.
5. regulators are identified as being suitable for the gas and pressures and are not damaged.
6. 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.
7. 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:

1. all repairs and modifications (including removals and additions of components) and extensions carried out conform to this Code of Practice.
2. 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.

3. there is adequate identification of above ground pipework/pipelines and route markers for buried pipework/pipelines.
4. the system is free from leaks by testing at the designated operating pressure.
5. buried pipelines are in ground which is free from encroachment by other services, buildings or civil structures.
6. filters are in good condition and are not blocked. Clean or replace them where necessary.

GAS SAFETY

TOXIC & CORROSIVE GASES: PIPE ALL VENTS TO A SAFE AREA, ENSURE ADEQUATE VENTILATION

OXYGEN: USE NO OIL OR GREASE, ENSURE ADEQUATE VENTILATION

FLAMMABLE GAS: CONTROL IGNITION SOURCES, ENSURE ADEQUATE VENTILATION

INERT GAS: ENSURE ADEQUATE VENTILATION

SERVICE

A unit, which is not functioning properly, should not be used until all required repairs have been completed and the unit has been tested to ascertain that it is in proper operating order.

Gas-Arc Chem-Master products are designed to work with corrosive and toxic gases. To protect our staff and to comply with the Control of Substance Hazardous to Health regulations (COSHH), we must be fully informed of all gases and substances that have been in contact with the product. If you wish to return product to us, for any reason, you must contact Gas-Arc to obtain a "Chem-Master Request for Authorisation to Return Product" form (QC23). Once the completed form has been returned to us we will consider your request. Where gases and substance that have been in contact with the product are unknown to us, we will require you to supply us with the appropriate safety data before we can decide if we can grant authorisation for you to return the product. If authorisation is granted for the product to be returned to us, we will supply you with a returns number and instructions on how to send it back to us.

We will not accept any Chem-Master products returned to us without prior authorisation

Test regulator for leaks on a routine schedule.

TROUBLE SHOOTING

Symptoms	Probable Causes
Gas leakage at the regulator outlet when the adjusting screw is turned fully anti clockwise.	Seat leak or creep, have regulator repaired.
With no flow through the system (downstream valve closed), outlet pressure increases steadily above the set pressure.	Seat leak or creep, have regulator repaired.
Gas leakage from ring assembly or bonnet	Diaphragm failure, have regulator repaired.
Excess drop in outlet pressure with regulator flow open.	Blockage in seat assembly or inlet filter. Have regulator repaired.
Gas leakage from any pipe thread joint.	Loose fitting - remove connection, clean, re-apply PTFE tape and re-tighten.
Gas leakage from relief valve.	Possible faulty relief valve, replace. Possible seat leak or creep, have regulator repaired.
Inconsistent repeat reading.	Seat sticking, have regulator repaired. Possible bad pressure gauge.
Inlet or outlet pressure gauge does not return to zero with no pressure applied to the regulator.	Gauge has suffered physical damage, replace gauge.

WARRANTY INFORMATION

Gas-Arc Group Ltd sells this equipment under the warranties set forth in our Standard Terms & Conditions of Sale (available on request).

With the following exception:

In regard to equipment in corrosive service for a period of 90 days to buyer or to buyer's order, this equipment is warranted to be free from functional defects in materials and workmanship and to conform to the description of this equipment contained in this manual and any accompanying marking, labels and/or inserts, provided that the same is properly operated under conditions of normal use and that regular periodic maintenance and service is performed or replacements made in accordance with the instructions provided. The foregoing warranties shall not apply if the equipment has been repaired: other than by Gas-Arc Group Ltd or a designated service facility or in accordance with written instructions provided by Gas-Arc Group Ltd, or altered by anyone other than Gas-Arc Group Ltd or if the equipment has been subject to abuse, misuse, negligence or accident.

Gas-Arc Group Ltd's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing free of charge, at Gas-Arc Groups option, the equipment or part, which is reported to its Authorised Distributor from whom purchased, and which if so advised, is returned with a statement of the observed deficiency, and proof of purchase of equipment or part not later than seven (7) days after the expiration date of the applicable warranty, to the nearest designated service facility during normal business hours, transportation charges pre-paid, and which upon examination, is found not to comply with the above warranties. The Buyer shall pay return trip transportation charges for the equipment or part.

GAS-ARC GROUP LTD SHALL NOT BE OTHERWISE LIABLE FOR ANY DAMAGES INCLUDING BUT NOT LIMITED TO: INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES OR SPECIAL DAMAGES, WHETHER SUCH DAMAGES RESULT FROM NEGLIGENCE, BREACH OF WARRANTY OR OTHERWISE.

THERE ARE NO EXPRESS OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN ABOVE SET FORTH. GAS-ARC GROUP LTD MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE EQUIPMENT OR PARTS THEREOF.

CHEM-MASTER REGULATORS INSTALLATION & OPERATING INSTRUCTIONS

Warning : An appropriately sized pressure relief device downstream of the regulator should be installed in your system to prevent damage to equipment and/or injury to personnel should an internal failure of the regulator occur.

Warning : Maximum allowable working pressure indicated on product marking is for the regulator only. Ratings for peripherals/accessories may be less than the pressure indicated on the product marking. Do not exceed the pressure ratings of the attached peripherals/accessories and the regulator's maximum allowable working pressure. Please contact your gas supplier for more information.

Warning : For regulators with tube fittings, select the appropriate tubing. Use seamless tubing with the proper consideration given to wall thickness and material. Please contact your gas supplier for more information.

USER RESPONSIBILITY

This equipment will perform in conformity with the description contained in this manual and accompanying marking, labels and/or inserts when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Improperly working equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. Gas-Arc recommends that a telephone or written request for service advice be made to Gas-Arc Customer Service, Vinces Road, Diss Norfolk, IP22 4WW UK Telephone + 44 1379 652263.
E-Mail enquiries@gas-arc.co.uk

This equipment or any of its parts should not be altered without prior written approval by Gas-Arc. The user of this equipment shall have the sole responsibility for any malfunction that results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than Gas-Arc or a service facility designated by Gas-Arc.

CUSTOMER SERVICE

In the event of equipment failure, call Gas-Arc Customer Service. Please be prepared to provide the model number of the equipment involved, in addition to some details regarding its application.

Things to consider before removing the regulator from the box....

1 Know the properties and special handling requirements of the gas being used. Many gases are quite dangerous (flammable, toxic, corrosive, simple asphyxiant or oxidisers). Equipment failure or misuse may lead to problems such as a release of gas through the relief valve or regulator diaphragm. Proper safety measures should be established to handle these and other component failures.

Be sure that the assembly purchased is suitable for the gas and type of service intended. The regulator marking and labelling provides information on the product type and the maximum inlet pressure.

Be sure that the equipment received conforms to the order specifications. The user is responsible for selecting equipment compatible with the gas in use, and conditions of pressure, temperature, flow etc. Selection information can be found in Gas-Arc technical data sheets. In addition, Gas-Arc representatives are trained to aid in the selection process.

2 Inspect the assembly upon receipt to be sure that there is no damage or contamination. Pay particular attention to connecting threads. While Gas-Arc assembles system components to exacting leak tight standards, the customer should also inspect for any loosening of parts that may occur in shipping or installation. Loose parts may be dangerously propelled from an assembly. If there are adverse signs (leakage or other malfunction), return the assembly to the supplier.

3 Before system start-up, it is recommended that all systems be pressure tested, leak tested and purged with an inert gas such as nitrogen.

If the regulator includes gas specific inlet connections, their purpose is to prevent usage on the wrong gases. Adaptation or alteration for use on gases can be dangerous, and is not recommended.

GENERAL SAFETY PRACTICES

Comply with precautions listed in B.C.G.A Codes of Practice

Consult the gas/cylinder supplier for the proper use of cylinders and for any restrictions on their use (such as flow rate and temperature requirements).

Never use an open flame when leak testing.

Always open valves slowly when high-pressure gases are being used.

Always be sure that a cylinder contains the correct gas before connecting to any regulator.

Always leak-test any manifold or distribution pipeline before using.

Always be sure that the gas in the system is the correct gas for the intended use.

INSTALLATION

Please observe the previously mentioned safety precautions before actual installation.

- 1.1 Before removing the cylinder cap/plug move the cylinder of gas to the work site:
 - a. Secure cylinder to floor, wall or bench with appropriate chain or stand to prevent toppling.
 - b. Remove the cylinder cap/plug
 - c. Be sure the cylinder valve is tightly closed (clockwise)
 - d. Remove the cylinder valve plug, if any
 - e. Inspect the cylinder valve and threads for damage or contamination
- 1.2 Following procedures below, secure the regulator inlet connector to the outlet connector on the cylinder.
 - a. The connection should be easily threaded. Do not force. If it is not easy, you may have the wrong regulator for the gas you are using.
 - b. LEFT HAND THREADS are used on some inlet connectors and are indicated by a notch in the middle of the hex nut.
 - c. GASKETS are used on some inlet connectors. If so, it will be provided with the regulator. Be sure the gasket is in good shape. Do not over tighten to avoid squashing the gasket into the gas line. You may want to order an extra supply of these gaskets from your supplier.
 - d. Never use oil or grease on regulator or cylinder fittings, as you may contaminate pure gases or create a fire hazard.
- 1.3 Close the regulator by turning the pressure control knob or handle anti clockwise. As the control knob is closed, turning should become easier.
- 1.4 Shut the regulator outlet valve (if supplied) by turning the knob on the valve clockwise.
- 1.5 Observing the following procedures; make connections from the regulator outlet to your downstream equipment;
 - a. BE SURE TO CONSIDER ALL FACTORS WHEN SELECTING MATERIALS. For example, if you have both high pressure and corrosive service, select material that is suitable for both.
 - b. Do not use oil or grease on fittings, especially not on oxidising gas service equipment.
 - c. Be sure that all fittings are secure and leak tight. PTFE tape should be used on pipe fittings, but avoid impinging on the gas stream. Before applying PTFE tape, inspect the NPT threads and if necessary clean the fitting to remove any dirt or thread sealant that remains on the threads. Start the PTFE tape on the second thread and make sure the tape does not overlap the end of the fitting. As the tape is wrapped in the direction of the thread spiral, pull tightly on the end of the tape so that the tape conforms to the threads. Apply two overlapping layers of PTFE tape. Cut off the excess tape and press the end firmly into the threads.
 - d. CAPTURED VENT RING ASSEMBLY. Some regulators have captured vent ring assembly. If you are using corrosive, toxic or flammable gases, be sure to connect suitable tubing from the vent fitting to a safe discharge area. Consult instructions for captured vent kit for installation.
 - e. RELIEF VALVE. Some regulators are equipped with a relief valve. The purpose of a relief valve is to protect the regulator and its components. If there is pressure sensitive equipment downstream of the regulator it is recommended that a relief valve be installed in the line to protect this equipment. If you are using toxic, corrosive or flammable gases, it is recommended that the exhaust from the valve be piped to a safe discharge area.
 - f. PURGE DEVICES (Optional). If your regulator includes a purge, review the safety operation in the specific instruction manual for your regulator. Purge devices are highly recommended when using toxic or corrosive gases.

OPERATION

Read the "Safety" and "Installation" sections before operating your equipment.

- 2.1 It is advised that high purity, toxic and corrosive systems be thoroughly purged before use.
- 2.2 The regulator-adjusting knob should be turned fully anti-clockwise (see 1.3) and the outlet valve should be closed (see 1.4).
- 2.3 Put on safety glasses and gloves.
- 2.4 Position yourself with the cylinder between you and the regulator. Keep hands off the regulator while opening the cylinder valve.
- 2.5 To avoid damage to regulator parts, slowly open the cylinder valve. Observe the high pressure gauge for a rise in pressure up to full cylinder pressure.
- 2.6 Observe all connections for leaks

- 2.7
- A suitable leak detection solution may be applied to the connections, if **compatible to your usage**. Bubbling indicates leaks.
 - To further check for leaks, or if you cannot use the leak detection solution, close the cylinder valve for five minutes, and observe the high pressure gauge for a drop in pressure. If so indicated, re-check the inlet connection and all other high-pressure port connections.
- 2.8 (Open the cylinder valve fully in order to form a good seal at the cylinder valve packing). Keep the valve hand wheel or spanner on the open cylinder valve at all times to allow prompt emergency shut off.
- 2.9 Adjust to the desired working pressure by turning the pressure control knob or handle clockwise, while observing the delivery pressure gauge for the approximate desired setting.

- Do not exceed the maximum delivery pressure indicated on the regulator
- Again check for leaks on the low pressure ports
- Check the delivery pressure gauge for any drop in pressure. If a drop is indicated, check all low-pressure ports for leakage.

- 2.9 Again set the delivery pressure, open the outlet valve if any, and check your system for leaks and otherwise proper functioning.
- With gas flowing through your system, some adjustment to delivery pressure may be required.
 - TWO-STAGE REGULATORS.** After the above final setting of delivery pressure, no further adjustment should be required as the cylinder depletes.
 - SINGLE-STAGE REGULATORS.** After the above final setting of delivery pressure, you may have to periodically adjust delivery pressure as the cylinder depletes.
 - As a general rule, a cylinder should be considered EMPTY when the cylinder pressure drops to a value of two (2) times the delivery pressure or less. This avoids the possibility of dangerous suck-back conditions. However, particular system requirements may indicate greater or less margin than the recommendation. Contact your Gas-Arc representative if you have any questions.

SHUTDOWN AND DISASSEMBLY

As indicated in the "Operation" section, a cylinder should be regarded as empty when the cylinder pressure has dropped to twice the delivery pressure or less. This will avoid the possibility of dangerous suck-back conditions, where other system gases are pulled back into the regulator and cylinder.

- 3.1 **BRIEF SHUTDOWN** (less than 30 minutes). Simply close the regulator outlet valve (if supplied). If the regulator does not have an outlet valve use procedure 3.2.

- 3.2 **EXTENDED SHUTDOWN** (beyond 30 minutes).

- NORMALLY OPEN SYSTEM** or **COMPLETE SYSTEM DIS-ASSEMBLY.** This section applies when there is no concern about entry of atmospheric gases into the system.

- Close the gas cylinder valve
- Shut down any other gas supplies which may be connected to your system
- Turn the adjusting knob clockwise and open the outlet valve to drain the line through your usage points ensuring that **HAZARDOUS GASES** are safely vented to atmosphere. Both regulator gauges should descend to zero.
- With **HAZARDOUS GASES** run an inert purging gas through the regulator and system before disassembly.
- After venting (and purging when applicable), turn the adjusting knob fully anti clockwise and close the outlet valve.
- Disconnect downstream equipment
- In disassembling, slowly loosen the cylinder valve connection, while listening for gas seepage. If leaking is evident, re-tighten the connection and check for effective closing of the cylinder valve.
- Cap/plug the cylinder after disconnecting the regulator. Mark the cylinder "EMPTY" if this is the case, and move it to the storage area for return cylinders.
- If **HAZARDOUS GASES** have been used, and there has not been a purging procedure as recommended, some benefit can be gained by directing a stream of Oxygen Free Nitrogen through the fully opened regulator. When using **HAZARDOUS GASES** or when in a **CONFINED AREA**, be sure to provide a safe discharge area when clearing the regulator.
- Install a new cylinder, if called for.
- When a regulator is out of service, close the pressure control knob by turning anti clockwise until the spring tension relieves and close the outlet valve. Also cap open ends of the regulator, or if removed, store it in a plastic bag to prevent contamination, especially by unobserved particulate build up inside the regulator.

- ISOLATED GAS SYSTEMS.** Some practices (especially on high purity systems), demand that ambient air be excluded from the system. There are several methods in use:-

- Seal the usage gas in the system*
 - Exert a vacuum on the system after shut down
 - Replace the system gas with an inert gas
- *This method should not be used with hazardous gases for more than a brief time.

- 3.3 **CYLINDER CHANGE – ISOLATED GAS SYSTEMS.** For cylinder change on **ISOLATED GAS SYSTEMS**, a valve upstream of the regulator is required and is provided when an upstream purge device such as the Gas-Arc Deep Purge is used.

- Tightly close the gas cylinder valve
- Close the valve upstream of the regulator (the centre or master valve on the Deep Purge

- With hazardous gases, purge the cylinder valve cavity using procedures contained in the specific instruction manual for your purge assembly
- Under section 3.2a: Follow steps 7, 8 and 9.
- Under section 3.2b, step 2, maintaining a vacuum after shut down, requires that the system be well sealed, as any leaks will pull impurities into the system.
- Under section 3.2b step 3, filling the system with an inert gas, provides the advantage of maintaining positive pressure on the system, greatly reducing the probability of entry of impurities.

GENERAL

A unit, which is not functioning properly, should not be used until all required repairs have been completed and the unit has been tested to ascertain that it is in proper operating order.

SERVICE

Gas-Arc Chem-Master products are designed to work with corrosive and toxic gases. To protect our staff and to comply with the Control of Substance Hazardous to Health regulations (COSHH), we must be fully informed of all gases and substances that have been in contact with the product. If you wish to return product to us, for any reason, you must contact Gas-Arc to obtain a "Chem-Master Request for Authorisation to Return Product" form (QC23). Once the completed form has been returned to us we will consider your request. Where gases and substance that have been in contact with the product are unknown to us, we will require you to supply us with the appropriate safety data before we can decide if we can grant authorisation for you to return the product. If authorisation is granted for the product to be returned to us, we will supply you with a returns number and instructions on how to send it back to us.

We will not accept any Chem-Master products returned to us without prior authorisation

Test regulator for leaks on a routine schedule.

TROUBLE SHOOTING

Symptoms	Probable Causes
Gas leakage at the regulator outlet when the adjusting screw is turned fully anti clockwise.	Seat leak or creep, have regulator repaired.
With no flow through the system (downstream valve closed), outlet pressure increases steadily above the set pressure.	Seat leak or creep, have regulator repaired.
Gas leakage from ring assembly or bonnet	Diaphragm failure, have regulator repaired.
Excess drop in outlet pressure with regulator flow open.	Blockage in seat assembly or inlet filter. Have regulator repaired.
Gas leakage from any pipe thread joint.	Loose fitting - remove connection, clean, re-apply PTFE tape and re-tighten.
Gas leakage from relief valve.	Possible faulty relief valve, replace. Possible seat leak or creep, have regulator repaired.
Inconsistent repeat reading.	Seat sticking, have regulator repaired. Possible bad pressure gauge.
Inlet or outlet pressure gauge does not return to zero with no pressure applied to the regulator.	Gauge has suffered physical damage, replace gauge.

WARRANTY INFORMATION

Gas-Arc Group Ltd sells this equipment under the warranties set forth in our Standard Terms & Conditions of Sale (available on request).

With the following exception:

In regard to equipment in corrosive service for a period of 90 days to buyer or to buyer's order, this equipment is warranted to be free from functional defects in materials and workmanship and to conform to the description of this equipment contained in this manual and any accompanying marking, labels and/or inserts, provided that the same is properly operated under conditions of normal use and that regular periodic maintenance and service is performed or replacements made in accordance with the instructions provided. The foregoing warranties shall not apply if the equipment has been repaired: other than by Gas-Arc Group Ltd or a designated service facility or in accordance with written instructions provided by Gas-Arc Group Ltd, or altered by anyone other than Gas-Arc Group Ltd or if the equipment has been subject to abuse, misuse, negligence or accident.

Gas-Arc Group Ltd's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing free of charge, at Gas-Arc Groups option, the equipment or part, which is reported to its Authorised Distributor from whom purchased, and which if so advised, is returned with a statement of the observed deficiency, and proof of purchase of equipment or part not later than seven (7) days after the expiration date of the applicable warranty, to the nearest designated service facility during normal business hours, transportation charges prepaid, and which upon examination, is found not to comply with the above warranties. The Buyer shall pay return trip transportation charges for the equipment or part.

GAS-ARC GROUP LTD SHALL NOT BE OTHERWISE LIABLE FOR ANY DAMAGES INCLUDING BUT NOT LIMITED TO: INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES OR SPECIAL DAMAGES, WHETHER SUCH DAMAGES RESULT FROM NEGLIGENCE, BREACH OF WARRANTY OR OTHERWISE.

THERE ARE NO EXPRESS OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN ABOVE SET FORTH. GAS-ARC GROUP LTD MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE EQUIPMENT OR PARTS THEREOF.

CHEM-MASTER PURGE VALVES INSTALLATION & OPERATING INSTRUCTIONS

Before installing or operating, read and comply with these instructions

USER RESPONSIBILITY

This equipment will perform in conformity with the description contained in this manual and accompanying labels and/or inserts when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Improperly working equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. GAS-ARC GROUP LTD recommends that a telephone or written request for service advice be made to GAS-ARC GROUP LTD Customer Service Phone : 01379 652263, Fax : 01379 644235 or E-mail : mail@gas-arc.co.uk.

This equipment or any of its parts should not be altered without prior written approval by GAS-ARC GROUP LTD. The user of this equipment shall have the sole responsibility for any malfunction that results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than GAS-ARC GROUP LTD or a service facility designated by GAS-ARC GROUP LTD.

CUSTOMER SERVICE

In the event of equipment failure, call GAS-ARC GROUP LTD Customer Service. Please be prepared to provide the model number and serial number of the equipment involved, in addition to some details regarding its application.

GENERAL SAFETY PRACTICES

1. Comply with precautions listed in B.C.G.A Codes of Practice.
2. Consult the cylinder distributor for the proper use of cylinders and for any restrictions on their use (such as flow rate and temperature requirements).
3. Never use an open flame when leak testing.
4. Always open valves slowly when high-pressure gases are being used.
5. Always be sure that a cylinder contains the correct gas before connecting it to any regulator.
6. Always leak-test any manifold or distribution pipeline before using.
7. Always be sure that the gas in the system is the correct gas for the intended use.

PURGING

Purges allow users to connect a purge gas to their system. Purging has the following benefits:

1. To start with and maintain a high purity gas stream – Purging allows the user to remove unwanted gases and water vapour contamination from their system. Purging has applicable benefits in processes such as pollution control calibration, doping modules and chromatography.
2. To prevent dangerous gases (toxic, corrosive or flammable) from getting into a workplace area.
3. To prevent the mixing of reactive gases – Example: air, moisture and intense acid formers may mix after cylinder changes without purging. The resultant acids formed from the mixture may react with the system equipment. Reactions with the equipment may shorten the life of equipment components.
4. To avoid the waste of valuable system gases that might have originally been used for purging.

Note : Be sure that your purge gas is compatible with your application and processes.

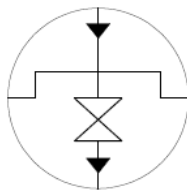
TYPES OF PURGES

GAS-ARC GROUP LTD has three types of purges:

1. Deep Purge (used with the positive displacement purging) – The deep purge is the most effective and versatile group. This unit has a snorkel design, which forces purge gas into the cylinder valve cavity. This purge is capable of purging the inlet side of a regulator without having to purge through the regulator and system; this method will use less purge gas.
2. Tee Purge (used with pressure cycle purging) – This purge is more economical at purchase than the deep purge. This unit provides effective purging of both cavities upstream and downstream of the regulator. This purge exhausts through the regulator and system.
3. Straight Purge (used with pressure cycle purging) – This purge is connected directly to regulators equipped with an extra high-pressure port. This purge exhausts through the regulator system.

INSTALLATION

Please refer to the schematic below (as marked on the rear of the valve) and observe the previously mentioned safety precautions before actual installation.



When installing NPT connections, use an open-end spanner not a pipe spanner to install fittings. 1/4 NPT connections require the use of PTFE tape on the threads to make a gas tight seal. On stainless steel connections, the thread sealant helps prevent the connections from galling together when tightening or loosening.

Inspect the NPT threads and if necessary clean the fitting to remove any dirt or thread sealant that remains on the threads. Start the PTFE tape on the second thread as shown above; make sure the tape does not overlap the end of the fitting. As the tape is wrapped in the direction of the thread spiral, pull tightly on the end of the tape so that the tape conforms to the threads. Wrap the tape around the threads twice. Cut off the excess tape and press the end firmly into the threads.

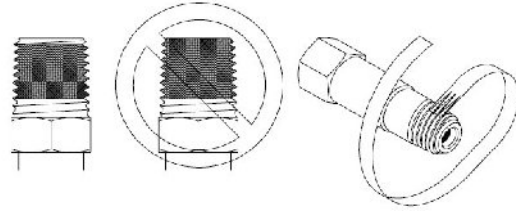


Figure 1. Tape Installation procedures.

INSTALLING DEEP AND TEE PURGES

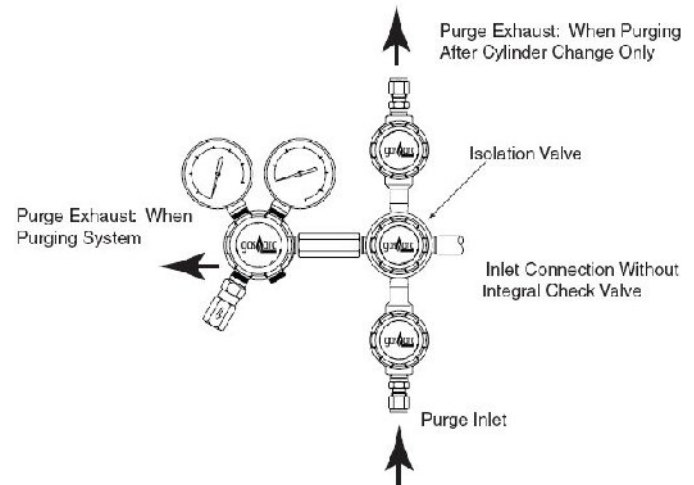


Figure 2. Deep Purge.

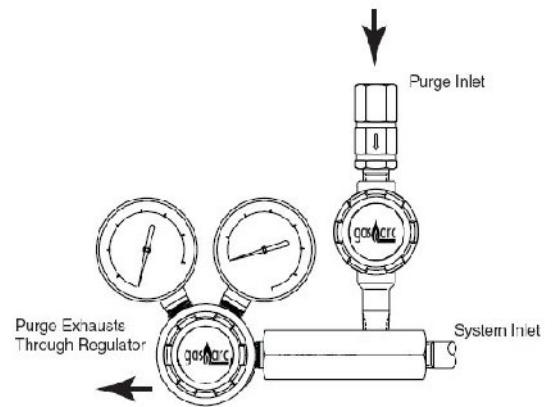


Figure 3. Tee Purge.

1. **Deep Purge:** If necessary, remove the regulator's inlet fitting and carefully remove the brass protector piece from the inlet of the purge. Install the inlet fitting into the purge's system inlet connection (1/4 female NPT port). Do not damage the snorkel tube when installing the inlet connection.
Tee Purge: If necessary, remove the regulator's inlet fitting. Install the inlet fitting into the purge's system inlet connection (1/4 female NPT port).
Note: Glands without spanner flats on the gland stem should be removed with a 6 point hex socket to prevent damage to the seating surface of the gland. Otherwise remove and install the gland using an open-ended spanner; do not use a pipe wrench.
2. Install the Deep Purge or Tee Purge into the regulators female 1/4 NPT inlet port (marked HP) as shown below.
3. **Deep Purge:** The purge inlet is located on the bottom of the Deep Purge: it is a 1/4" compressed tube fitting. Using 1/4" tubing, connect the Deep Purge to a high purity purge gas regulator.
4. Pipe the purge exhaust (1/4" compression tube fitting) to a safe discharge area.

Tee Purge: The purge inlet (1/4" female NPT) is located at the top of the Tee Purge. Connect the Tee Purge to your high purity purge gas regulator or flowmeter as described in the paragraph above.

- Using an inert gas, leak test all connections before use. Note that even inert gases can build up in a confined area to reach hazardous levels when the oxygen in the air is reduced to less than 19%.

INSTALLING STRAIGHT PURGES

- If necessary, remove the pipe plug from the high pressure port (typically marked HP) on the regulator. Install the straight purge into the open port.
- The purge inlet is located at the end of the Straight Purge; the connection is female, 1/4" NPT port. Connect the Straight Purge to a high purity gas regulator.
- Using an inert gas, leak test all connections before use. Note that even inert gases can build up in a confined area to reach hazardous levels when the oxygen in the air is reduced to less than 19%.

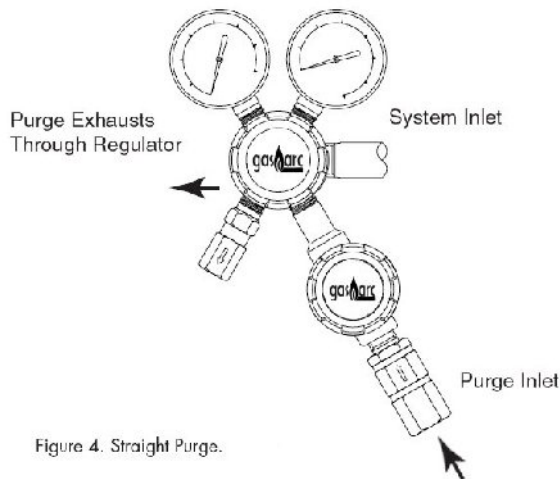


Figure 4. Straight Purge.

PURGE OPERATION

These instructions cover methods commonly used with GAS-ARC GROUP LTD speciality equipment. The next section provides a general guideline of the methods and procedures to follow when venting and purging the gas in a simple system to a safe discharge area. Note: complex systems may require different procedures to remove the unwanted gas, and the procedures need to be evaluated on an individual basis. For higher purity systems and corrosive gases use a pure dry inert gas such as grade 4.5 nitrogen. Do not unnecessarily leave the system open to the atmosphere after purging. Otherwise, additional purging may be required to remove the atmospheric contamination.

POSITIVE DISPLACEMENT PURGING (deep purge only) – Positive displacement purging removes unwanted gases and contaminants from the system by physically pushing the gases out the purge exhaust. This method is suitable for systems with long runs of tubing and little or no dead space. Purge gas flow should be slow to avoid mixing with the system gases to be removed. Positive displacement purging requires the Deep Purge.

Cylinder change purging:

- Close the cylinder valve on the supply cylinder.
- Close the centre isolation valve on the Deep Purge. This will shut off the gas supply from the purge to the regulator.
- Slowly open the purge gas outlet valve. Vent the gas in the system to a safe discharge area.
- Open the purge gas inlet valve. Allow the purge gas to flow for 2 to 5 minutes to reach the desired system purity.
- Close the purge gas inlet valve and vent the purge gas. Close the purge gas outlet valve after venting the purge gas.
- Change the process gas cylinder.
- Repeat steps 2-5 to remove the air trapped in the system after changing the cylinder.
- If it is necessary to purge the purge gas, open the purge exhaust valve and then open the process gas cylinder valve a small amount. This will allow the process gas to push the purge gas from the system. Close the purge exhaust valve when purging is complete.
- After all purging has been accomplished; open the isolation valve on the Deep Purge.

Complete system purging:

For extended periods of shut down, it is recommended that the complete system be purged. The downstream vent valve must be placed so the system can be fully swept with the purge gas. Do not install the vent valve so a dead volume is created when purging. Use the following procedure to perform a positive displacement purge on the entire system with the Deep Purge assembly.

- Close the cylinder valve on the supply cylinder.
- Turn the adjusting knob on the regulator clockwise to open the regulator seat.
- Keep the centre isolation valve on the Deep Purge open.
- Open the downstream vent valve and vent the system gas to a safe location.
- After venting the gas in the system, carefully open the purge gas inlet valve. Allow the gas to flow for 2 to 5 minutes to reach the desired level of purity.
- Upon completion of the purge, close the downstream vent valve, the Deep Purge isolation valve and the purge gas inlet valve. Closing the valves in this order will maintain a positive pressure in the system and prevent back flow of air into the system. This procedure will maintain an inert atmosphere within the system.

PRESSURE CYCLE PURGING (tee purge and straight purge only) – Pressure cycle purging is used on complex systems with dead end passages where a steady flow of gas cannot flush all areas of the system. This method of purging on a regulator is best suited for a Straight or Tee Purge. When these two purges are connected to a regulator with a cylinder connection, the cylinder connection is a dead end passage that can only be purged by pressure cycle purging. A typical system designed for pressure cycle purging will include either a Straight or Tee Purge upstream of the regulator and a block valve and bleed valve downstream from the regulator.

- Close the cylinder valve on the process gas cylinder.
- Turn the adjusting knob on the regulator clockwise to open the regulator seat.
- Close the downstream block valve and carefully open the bleed valve to vent the gas from the system to a safe discharge area.
- Close the bleed valve and open the purge gas valve on the Straight or Tee Purge. Allow gas pressure to equalise in the system. This may take 15 seconds or more. Once the pressure has equalised close the purge gas valve on the Straight or Tee Purge. Wait an additional 15 seconds to allow the gases in the system to completely mix.
- Open the bleed valve to exhaust the gases from the system to a safe discharge area.
- Repeat steps 3-5 as many times as needed to reach the desired gas purity.

Vacuum assisted exhaust purging may be done at the end of each purge cycle to improve the efficiency of the purge process. If a cylinder change is made following the purge cycle, repeat steps 1-6 to remove the atmospheric contamination that has entered the system. Additional purging with the process gas may be required if removal of the purge gas from the system is desired.

MAINTENANCE

At regular intervals, the purge assembly should be checked for leaks and proper function (see TROUBLE SHOOTING). Any leaks in the system should be corrected immediately.

A unit which is not functioning properly should not be used until all required repairs have been completed and the unit has been tested to ascertain that it is in proper operating order.

SERVICE

Gas-Arc Chem-Master products are designed to work with corrosive and toxic gases. To protect our staff and to comply with the Control of Substance Hazardous to Health regulations (COSHH), we must be fully informed of all gases and substances that have been in contact with the product. If you wish to return a product to us, for any reason, you must contact Gas-Arc to obtain a "Chem-Master Range Request for Authorisation to Return Product" form (QC23). Once the completed form has been returned to us we will consider your request. Where gases and substance that have been in contact with the product are unknown to us, we will require you to supply us with the appropriate safety data before we can decide if we can grant authorisation for you to return the product. If authorisation is granted for the product to be returned to us, we will supply you with a returns number and instructions on how to send it back to us.

We will not accept any Chem-Master products returned to us without prior authorisation

TROUBLE SHOOTING

Typical symptoms listed below indicate malfunctions needing rectification. Replace system components immediately.

- Gas leakage from any joint.
- Diaphragm valve(s) fail to cut off gas supply when closed.
- The system makes a noise or hums

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