# GASCON SYSTEMS AUTO CHANGE-OVER MANIFOLD INSTALLATION INSTRUCTIONS

# 1.0 INTRODUCTION

These instructions give guidelines for installing a Gascon Systems auto change-over manifold. They include some suggestions on pipeline system design, key mounting dimensions for the manifold, as well as the recommended commissioning tests.

Any installer of manifold systems should be familiar with the following documents:

AS2896 – Medical Gas Systems (Installation and testing of non-flammable medical gas pipeline systems),
AS4289 – Oxygen and Acetylene Gas Reticulation Systems

# 2.0 PIPELINE SYSTEM DESIGN

Due consideration must be given to many issues when designing and installing a pipeline system. Some of the main issues are:

- locating the manifold and cylinders,
- materials of construction,
- ease of maintenance,
- system safety features and devices.

Brief comments about these topics follow.

## 2.1 LOCATING MANIFOLD SYSTEMS

The physical location that a manifold system is to be located must be considered carefully. Issues such as, ventilation, ease of access, materials of construction and system security should be carefully planned. Guidelines for installation can be found in Clause 2.11 and 2.12 of AS2896 for medical manifold systems, and Section 5 of AS4289 for industrial manifold systems.

## 2.2 DOWNSTREAM ISOLATION VALVES

It is recommend that a valve be fitted immediately downstream of all manifold installations. This valve will allow the manifold to be isolated from the pipeline system for servicing/maintenance and testing. The valve will also assist in the controlled initial pressurisation of the pipeline.

To comply with the requirements of AS2896 it is recommended that medical manifold/pipeline systems be fitted with a three way service facility, (refer G1135 data sheet). This assembly contains a valve that allows the manifold to be isolated from the pipeline system for service/maintenance. The valve also allows an auxiliary/emergency gas supply to connected so that the pipeline system can still operate once the manifold has been dis-connected. In a medical manifold system with a three way service facility it is recommended that a standby regulator/cylinder and gas specific supply hose also be installed adjacent to the manifold. Figures showing the operation of this three way service facility are shown below.

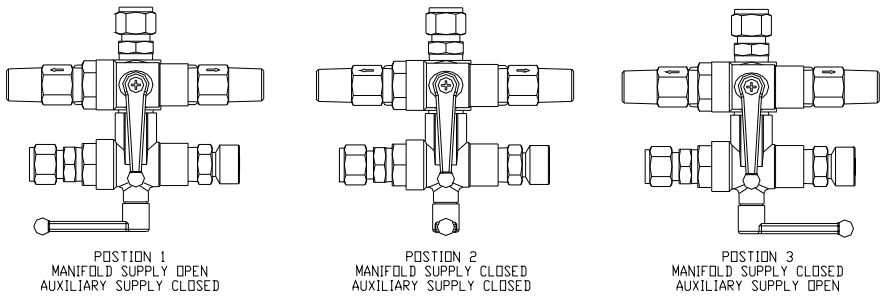



**Fig 1**

Where the manifold forms part of a critical process (ie. any interruptions to the gas supply are undesirable), it is recommended that a simple 3 way valve be fitted downstream of the manifold. This valve will allow the manifold to be isolated and an auxiliary supply source to be used when the manifold requires servicing/ maintenance or in the unlikely event of a manifold failure. In these applications it is recommended that a standby regulator/cylinder and supply hose also be installed adjacent to the manifold.

## 2.3 PIPELINE PRESSURE RELIEF VALVES

The pressure relief valve(s) fitted to the standard manifold pressure control assembly are only designed to protect the first stage assembly of the manifold. They are not design to protect the pipeline system from over pressurisation due to a "creeping" outlet regulator or system tampering. If the downstream pipeline system and it associated equipment requires protection from over pressurization, an extra pressure relief valve should be fitted downstream of the system isolation valve.

For medical gas systems, the G1135 three way service facility contains two pipeline pressure relief valves. These pressure relief valves are fitted to an isolation valve, which allows each pressure relief valve, (one at a time), to be removed and tested without interrupting gas flow.

For acetylene systems, specific isolation valve/pressure relief valve and flashback arrestor assemblies are available to meet the requirements of AS4289.

For fuel gas systems it is recommended that the exhaust of pressure relief valves be vented to an outside area away from any sources of ignition, air conditioning inlet or other ventilation systems.

## 2.4 FLASHBACK ARRESTORS

For acetylene and other fuel gases it is recommended that a flashback arrestor being fitted downstream of the manifold. A range of standard pipeline safety assemblies, that meet the requirements of AS4289 (ie. contain isolation valve, pressure valve and flashback arrestor), are readily available.

Flashback arrestors for non-fuel gases only need to be used where the gases will be mixed with fuel gases in a downstream process.

## 2.5 CYLINDER FLEXIBLE LEADS AND PIGTAILS

The use of Teflon/Tefzel lined stainless steel braided leads are not recommended for use with oxygen manifold systems, (neither medical or industrial). The preferred leads are copper pigtails, or stainless steel convoluted leads if greater flexibility is required.

It is recommended that Tefzel lined stainless steel braided leads be used with hydrogen and helium (and mixtures containing these gases). Tefzel has a significantly reduced emissivity rate than that of Teflon, which becomes important for gases with very low molecular weights.

## 2.6 PRESSURE SWITCHES AND ALARMS SYSTEMS

Where cylinder bank change-over, or line pressures are required to be monitored, an alarm system utilizing pressure switches or contact gauges should be used. Further details on the operation of alarm systems/pressure switches are in the Gascon Systems Auto-Change-over Manifold Maintenance Instructions.

The choice of using either Normally Open or Normally Closed pressure switches is controlled by what signal the alarm system requires. Check with the manufacturer of the alarm system what type of signal is required.

For fuel gases, pressure switches either need to be of an intrinsically safe design, or the signals need to be run through a Zener barrier, or a transformer isolated barrier to protect against potential explosions.

## 2.7 HIGH PRESSURE INLET PURGE VALVES

Where purge valves are used on the inlet to the manifolds, (mostly high purity models), the outlet of the purge valves should be vented safe location away from the manifold.

## 3.0 INSTALLATION DIMENSIONS

The manifold pressure control assembly is secured to the mounting surface by four M10 (or 3/8") bolts. The mounting hole centers are as shown on the diagram below. The manifold center height is the dimensions shown in the installation drawings, figure 3 and 4.

The two mounting holes centres for a G1135 three way service facility are 58mm (M10 or 3/8" bolts).

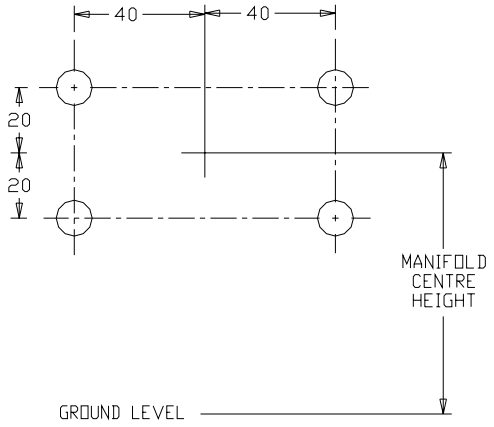



**Fig 2**

Copper pigtails have limited flexibility. The maximum recommend amount that a copper pigtail can be stretched is 100mm, while the minimum amount it can be compressed is 50mm. When installing manifolds that use them, the installer should loosely fit the pigtail to the manifold. Inlet. The pigtail should be rotated so that the cylinder can be directly under the pigtail without the need for excessive flexing of the pigtail.

## 3.1 SINGLE CYLINDER PER BANK INSTALLATION

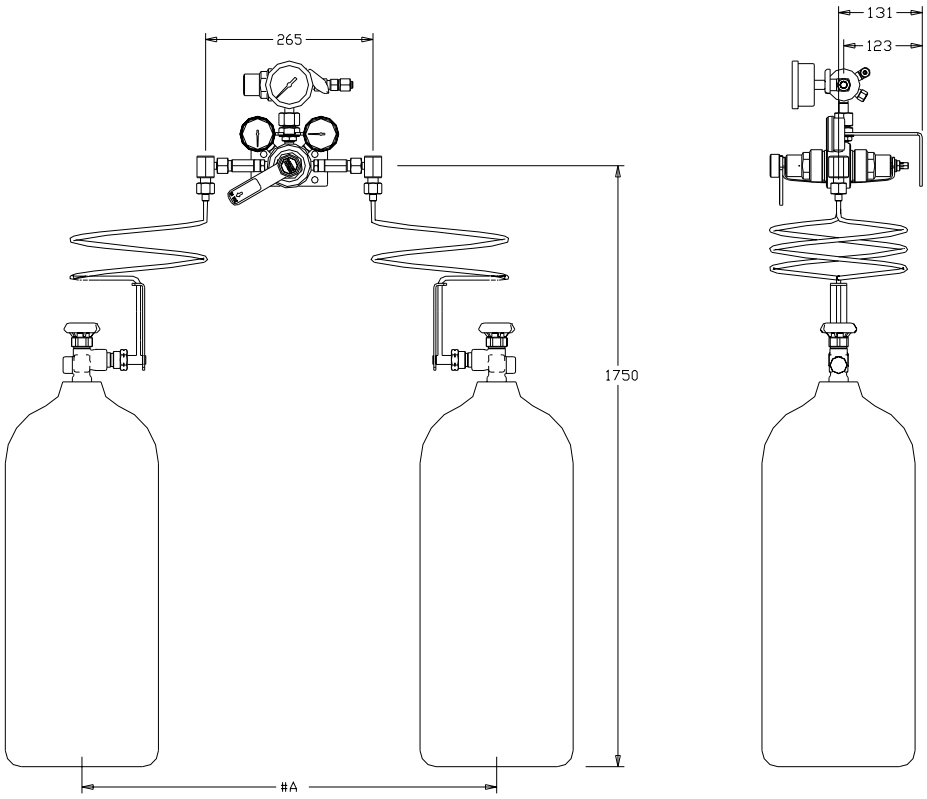



**Fig 3**

Mounting surface to outlet centreline = 123mm
Mounting surface to inlet centreline = 131mm

Ground level to manifold center = 1750mm
**Note:**
This dimension is based on Australian "G" sized cylinders. These cylinders have a nominal height of 1365mm. If the cylinders being used vary significantly from this, the mounting height of the manifold should be adjusting accordingly.

Cylinder centreline to centreline = refer notes

**Notes**:

- for industrial copper pigtails with vertical cylinder valve connection, dimension A is 450mm,
- for industrial copper pigtails with side outlet cylinder valve connection, dimension A is 500mm,
- for medical copper pigtails with side outlet cylinder valve connection, dimension A is 500mm,
- for medical copper pigtails with pin indexed yoke cylinder valve connections, dimension A is 525mm, for Teflon/Tefzel lined stainless steel braided leads, dimension A can be between 300mm and 1400mm (based on a lead length of 800mm).

All dimensions listed are only nominal dimensions.

## 3.2 MULTIPLE CYLINDERS PER BANK INSTALLATION

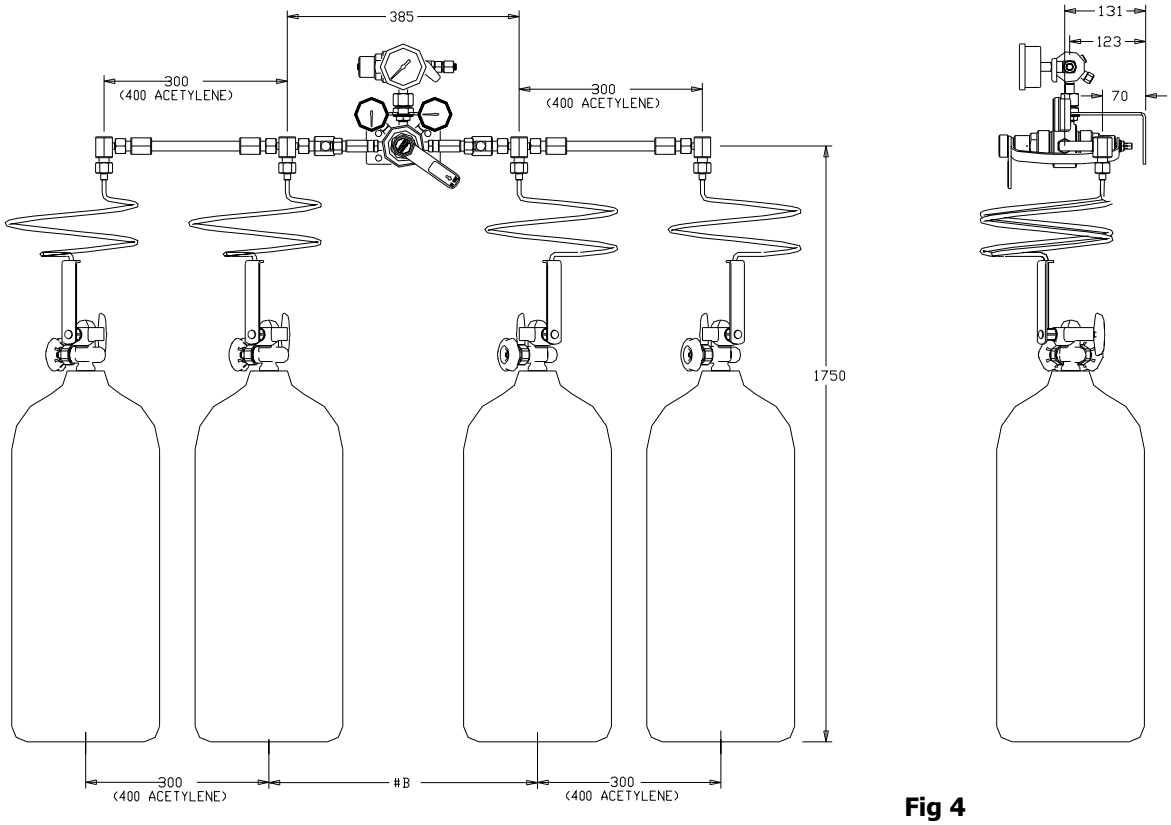



**Fig 4**

Mounting surface to outlet centreline = 123mm
Mounting surface to inlet centreline = 131mm

Ground level to manifold center = 1750mm
**Note:**
This dimension is based on Australian "G" sized cylinders. These cylinders have a nominal height of 1365mm. If the cylinders being used vary significantly from this, the mounting height of the manifold should be adjusting accordingly.

Cylinder centreline to centreline = refer notes
**Notes**:

- for industrial copper pigtails with vertical cylinder valve connection, dimension A is 450mm,
- for industrial copper pigtails with side outlet cylinder valve connection, dimension A is 475mm,
- for medical copper pigtails with side outlet cylinder valve connection, dimension A is 475mm,
- for medical copper pigtails with pin indexed yoke cylinder valve connections, dimension B is 500mm, for Teflon/Tefzel lined stainless steel braided leads, dimension A can be between 300mm and 1400mm (based on a lead length of 800mm).

All dimensions listed are only nominal dimensions.

**Note**:
If the manifold required is a 2x2 (ie. two cylinders per bank) a simpler Dual Inlet Adaptor is available. This connection to the manifold inlet connection and has two thread connections with non-returns to connect the leads to. The cylinder closest to the manifold can be connected using a short flexible lead (eg. 800mm), and the cylinder furthest from the manifold can be connected using a longer flexible lead (eg. 1200mm or 1500mm). These adaptors cannot be used with copper pigtail leads.

## 4.0 SECURING MANIFOLD ASSEMBLBY TO THE WALL

Remove the manifold pressure control assembly from its stainless steel mounting bracket using a 7/8" A/F spanner, (ground back, available as part number G0358).

Secure mounting bracket to the mounting surface using four M10 (3/8") bolts as per mounting dimensions shown in figure 3 and 4.

Re-fit the manifold assembly to the mounting bracket. Do not fully tighten the securing nut at this stage.

If the manifold system contains two or more cylinders per bank, fit the inlet extensions, but only hand tighten them at this stage. Secure the inlet extension brackets to the wall, using two 6mm (1/4" bolts).

**Note:**
Depending on how the inlet extensions are fitted, (eg. directly to the wall, on a length of uni-strut or timber), the inlet extension arms may need to be rotated slightly to ensure that the correct stand-off distance is achieved, (refer figure 5). The inlet extension arms are designed to be placed horizontally if the extension brackets are fitted directly to the wall. If the arms require rotating because their mounting method, the mounting height of the manifold from the ground level may need to be adjusted accordingly.

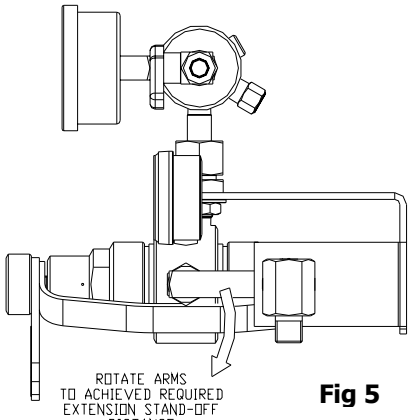



**Fig 5**

To allow for any variations in the mounting surface the manifold assembly may need to be rotated slightly in its mounting bracket, (refer fig 6). The manifold pressure control assembly stand-off distance can also be adjusted by sliding it in and out its mounting bracket. Once the entire assembly is aligned commence final tightening of the inlet extensions. Tighten the nut that secures the manifold to its mounting bracket last.

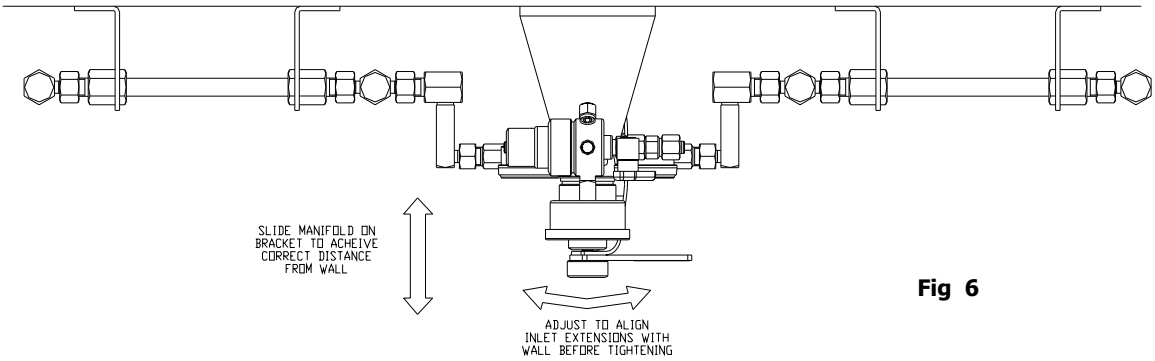



**Fig 6**

Fit the cylinder leads to the inlet extensions headers Place the cylinders under the cylinders leads. Rotate both he cylinders and cylinder leads so they can be connected with the minimum of flexing of the leads. The best position for the cylinder restraining brackets is now known. Secure the brackets to the wall and re-fit the cylinders.

Fit the downstream pipe work to the manifold outlet.

Fit any alarm systems or accessories to the manifold.

Fit the laminated manifold operating instruction on the wall near the manifold.

The manifold system is now ready for pressuring and leak testing.

## 5.0 LEAK TESTING THE MANIFOLD ASSEMBLY

Once all the manifold installation connections have been tightened and the cylinders fitted, the assembly can be leak tested.

Close the isolation valve downstream of the manifold.

Very SLOWLY open one of the cylinder valves on either cylinder bank. Allow the pressure, as indicated on the cylinder contents gauge, to slowly increase until the gauge shows full cylinder pressure. Listen for any obvious leaks. If any are heard, immediately close the cylinder valves and remedy the leak. If no leaks are heard, open the rest of the cylinder valves on that bank.

SLOWLY open one of the cylinder valves on the other cylinder bank. Allow the pressure, as indicated on the cylinder contents gauge, to slowly increase until the gauge shows full cylinder pressure. Listen for any obvious leaks. If any are heard, immediately close the cylinder valves and remedy the leak. If no leaks are heard, open the rest of the cylinder valves on that bank.

All the installation connections, including cylinder valve connections, should be tested for leaks using a suitable leak detection solution. This is the preferred method for leak testing.

### PRESSURE DROP LEAK TEST

Testing for leaks can also be carried out using a pressure drop test, but care must be taken when using this method. The non-return valves in both the pressure control assembly and inlet extensions can hide the presence of a small leak if not tested correctly.

Pressurise both cylinder banks. Mark the pressures on the cylinder pressure contents gauge. Wait an appropriate period of time and review the cylinder pressures. Any pressure drop indicates a leak downstream of the manifold inlet.

Close all the cylinders valves on both banks.

While monitoring the "*in-use*" bank cylinder contents gauge, SLOWLY open the downstream isolation valve until a very small bleed flow in created. The contents gauge pressure should gradually begin to slowly drop. If there is a sudden rapid drop in pressure, it may indicate a leak upstream of the pressure control assembly on the "*in-use*" bank. Re-pressurise the manifold a check with a suitable leak detection solution.

Move the lever to other side, and repeat the above test to check the other side for leaks.

**Notes**:
Variations due to temperature changes have not been taken into account for the leak test procedures.

Guidelines for appropriate leaks test times are detailed in AS4289 and AS2896.

## 6.0 PRESSURISING THE PIPELINE SYSTEM

Considerable damage can be done to the internal components of the pressure control assembly if the correct procedure for pressurising the manifold and downstream pipeline system is not followed. Allowing the manifold to free flow to atmosphere, (or near atmosphere) can create excessive vibrations that may damage the seats. If damaged in this way the seats will not shut-off correctly resulting in the outlet pressure of the first stage increasing until it opens the pressure relief valve.

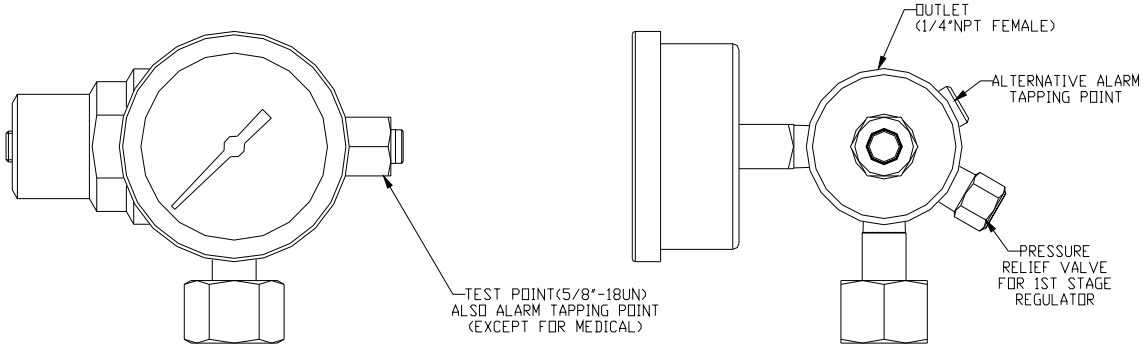
The correct way to pressurise the system is to first FULLY close the isolation valve immediately downstream of the manifold.

Very SLOWLY open one cylinder valve on either cylinder bank. Allow the pressure to rise slowly to the full cylinder pressure. Open the remaining cylinders on that bank.

SLOWLY open one cylinder valve on the other bank. Allow the pressure to rise slowly to the full cylinder pressure. Open the remaining cylinders on that bank.

Very SLOWLY partially open the downstream isolation valve to bleed the gas into the pipeline. **Do not** fully open this valve, allow the gas to fill the pipeline slowly. When the pipeline is fully pressurised to the required line pressure, fully open the isolation valve.

**Note:**
As the pipeline is being pressurised, the gas flow should be clearly audible. When the pipeline is fully pressurised the sound should have ceased.




KEY SECOND STAGE REGULATOR FEATURES **Fig 7**