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|---|---|---|
| Air Liquide | Operating Instructions for<br>**Gas Manifolds ECOGAZ**<br>And<br>**Gas Manifolds CLSA - CISA** | **OP 310 and 360**<br>Owner : NEC<br>Language : EN |

| | | |
|---|---|---|
| Air Liquide | Operating Instructions<br><br>**Manifolds & Panels** | OP 310 Ecogaz<br>Version : 1<br>Date : June 2022<br>Owner : NEC<br>Language : **EN** |

# Operating Instructions

## Gas Manifolds
## **ECOGAZ**

| Manifold semi-automatic | Panel |
|---|---|
| ECOGAZ SA | ECOGAZ P |
| ECOGAZ FLAMAL SA | ECOGAZ FLAMAL P |
| ECOGAZ BA SA | ECOGAZ BA P |
| ECOGAZ SA + M2D | ECOGAZ P FOOD |
| ECOGAZ SA FOOD | |

### Warning

To preserve the quality of our product throughout its usage in the best safety conditions, please read this manual carefully and strictly follow the instructions that it contains. Non-compliance with these instructions or modification of the product may result in serious accidents or bodily injuries. AIR LIQUIDE shall not be held responsible in case of non approved usage of the product. Air Liquide reserves the right to make all necessary modifications to the specifications described hereafter without notice.

# CONTENTS

# 1.GENERAL INFORMATIONS

## 1.1 Safety

First of all, it is ESSENTIAL to read and respect the safety instructions described in the document “General Safety Instructions” delivered with the product. NEVER dismantle a component of the regulator in the High Pressure part, especially the cylinder inlet fitting.

Know the properties and special handling requirements of the gas being used. Always refer to the "compatibility table" to install the appropriate Manifold model with the gas used.

Be sure that the assembly purchased is suitable for the gas and type of service intended. The system label provides the following information: model designation, maximum inlet pressure, serial number.

Refer to the Gas compatibility tables and the Product Data Sheet.

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

ECOGAZ, CLSA and CISA model are available in two versions:

- Gas Panel: for one inlet (one pressure reducer)
- Gas Manifold: for two cylinders sources inlet (two pressure reducers).

**Safety warning :**

The gas manifolds are fitted with a relief valve to protect the equipment itself.

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

It is the user's responsibility to protect its installation, taking into consideration the maximum pressure and flowrate in case of breakdown of the reducer.
To sizing a safety relief valve on the pipe network associated with a Calibrated Orifice (OC), refer to the theoretical flow rate in $Nm^3/h$ (for 200 bar $N_2$) given for each model in the product data sheet.

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### 1.2 Air Liquide commitments

AIR LIQUIDE certifies that this equipment is manufactured, tested and controlled, in accordance with the technical specifications described in the AIR LIQUIDE specifications.

In addition to technical specifications, a degreasing process consistent with oxygen service is applied.

It is the responsibility of the end user to ensure that such equipment is installed and used in accordance with the regulations.

**Directive 2014/68/EC: Pressurized equipment (PED)**

Technical requirements of Article 4§3 indicates that Pressure equipment and assemblies below or equal to the limits set out in points (a), (b) and (c) of paragraph 1 and in paragraph 2 respectively shall be designed and manufactured in accordance with the sound engineering practice of a Member State in order to ensure safe use.

Without prejudice to other applicable Union harmonisation legislation providing for its affixing, such equipment or assemblies shall not bear the CE marking referred to in Article 18.

By design, these equipment may integrate pressure relief valves or burst disks. In this case, those ones shall neither be CE marked according to paragraph 2 of annex II.

In all other cases, pressure relief valves and burst disks shall be CE marked.

**Directive 2014/34/UE ATEX** :

The equipment is not in the scope defined in points a), b) et c) of the article of the ATEX Directive : consequently, they shall not be near the CE marking.

The equipment are not capable of causing an explosion through their own potential sources of ignition: then, they can be installed in ATEX zone 1 or 2, as far as respecting up to date regulations, rules, operating instructions, in accordance with the sound engineering practice are followed during installation

and use.

**Reminder** : it belongs to the end user to define the ATEX zone.

**REACH regulation (EC) n°1907/2006 :**

The pressure reducers are made of brass parts, essentially the body, which is a copper alloy with a lead content between 1% and 4% w/w.
As requested by art.33 of REACH Regulation (Registration, Evaluation and Authorisation of Chemicals) and with reference to current list of SVHC (substances of very high concern) available on ECHA website, we inform that lead may be present in a concentration above 0,1% w/w in our products made of brass.
Lead inclusion in the SVHC list in June 2018 does not modify the use conditions described in operating instructions.
Lead will not be released to the surrounding environment or the gas used during normal use.
After product end of life, the pressure reducers must be scrapped by an authorized metal recycler.

**Cleaning :**

Equipment is subject to a grease removal and high quality cleaning for use with oxygen compatible equipment.
A suitable packaging protects the equipment against exterior pollutions during storage and transport.A suitable packaging protects the equipment against exterior pollutions during storage and transport.
Take care to avoid polluting the equipment during installation.

**Inspection :**

Equipment is inspected and has undergone a sealing test (with Helium) before packing.
A pressure test is performed with 200 bar or 300 bar helium gas.
The leakage measure must be blow $10^{-7}$ mbar.l/s hélium.

**Warranty :**

The warranty period of this equipment supplied by AIR LIQUIDE is one year, with spare parts and labor and does not include packing and transport fees.

Excluded from warranty: seals and relief valves. These components are subject to natural wear.

Warranty is not valid on deteriorations which result from wrong or poor use, from use of spare parts which are not marked AIR LIQUIDE, or if operating instructions are not respected.

For more information, refer to the general sales conditions of AIR LIQUIDE.

### 1.3 Marking

The system label provides the following information:
Model Change over manifold or Panel
AL Designation
SAP code
Maximum working pressure: P1
Maximum outlet pressure: P2
Maximum flowrate: Qmax= xx $Nm^3/h$
Date of manufacturing: week/year

# 2.FIELD OF USE AND CHARACTERISTICS

## 2.1 Functions

The gas Manifolds are used to:

- connect one or several cylinders or bundles to pipe network,
- reduce the pressure of a gas packaged under high pressure (200 or 300 bar at 15°C) in a cylinder or a bundle..

**Panels** aim at adjusting an outlet pressure with a single gas source**.**

**Semi-Automatic manifolds**

The principle of operating is based on an opposite mounting of two pressure reducers, adjusted at different outlet pressures in order for the stock cylinders to open once the service side is nearly empty.

The manifolds provide a fixed outlet pressure, with a slight gap between the two sides: these values are indicated in the manifold designation of each model.

As the outlet pipe is common, the reducer who delivers the flowrate corresponding to the one which has the higher outlet pressure, defined by the gear position (left or right)..

The user has only to operate for cylinders/bundles switch, after moving the gear toward the side with full cylinders/bundle.

If a stable stable is required on the customer application, this is necessary to install a second-stage on line regulator, just after the manifold.

### 2.2 Technical characteristics

Operating temperature : -20 °C to +50 °C.

Leakage rate (Int/Ext.):< 10-6 mbar.l/s helium.

Fittings :

| Connections on manifold | type of threads |
|---|---|
| HP inlet on valves-manifold: | M16x 1,336Sl F |
| Gas outlet toward user application | **G 3/8" F** |
| relief valve vent outlet | CF 6MM |
| vent on valves-manifold | G 3/8" F |
| pressure transmitter | M16x 1,336Sl F |

### 2.3 Gas compatibility

**IMPERATIVE** : check the gases compatibility of this equipment by referring to the "Gas Compatibility Table".

The ECOGAZ single-stage gas manifolds are mainly designed for the implementation of :

- air gases ($O_2$, $N_2$, Air, Ar, He...)
- carbon dioxyde and Ar/$CO_2$ mixtures
- Hydrogen ($H_2$),
- nitrous oxide ($N_2O$) and oxidizing mixtures.

If any doubt, AIR LIQUIDE representatives are trained to aid in the selection process.

## Panels

| Panels | material | $N_2$ | $CO_2$ | CO | Air* | $O_2$ | $N_2O$ | $H_2$ | $C_nH_m$* |
|---|---|---|---|---|---|---|---|---|---|
| Ecogaz P | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| Ecogaz P 300 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| ML1 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| ML2 | Cr-brass | Y | Y | N | Y | Y | N | Y | N |
| ML | Cr-brass | Y | N | N | Y | N | N | Y | N |
| MI | Stainless. steel | Y | N | N | Y | N | N | Y | N |

*Air: compressed air not breathable

**$C_nH_m$ : propane (6 bar), propylène (8bar), éthylène (70 bar), méthane (200 bar)

## Panels FLAMAL

| Panels | material | $C_3H_8$ (50 bar) | $C_3H_6$ (50 bar) | $CH_4$ (200 bar) | $C_2H_4$ (70 bar) |
|---|---|---|---|---|---|
| Ecogaz Flamal P 50-4-20 | Cr-brass | Y | Y | N | N |
| Ecogaz Flamal P 200-15-50 | Cr-brass | Y | Y | Y | Y |

* $C_3H_8$ (propane) - $C_3H_6$(propylene) - $CH_4$(methane) - $C_2H_4$ (ethylene)

## Panels B.A.

Ecogaz P BA 200-15-110 must be used exclusively for Breathable Air application.

## Manifolds semi-automatic:

| Manifolds | material | $N_2$ | $CO_2$ | CO | Air* | $O_2$ | $N_2O$ | $H_2$ | $C_nH_m$* |
|---|---|---|---|---|---|---|---|---|---|
| ECOGAZ 200-8/5-50 | Cr-brass | Y | N | N | Y | Y | N | Y | N |
| ECOGAZ 200-12/9-80 D | Cr-brass | Y | Y | N | N | N | N | N | N |
| ECOGAZ 200-15/11-80 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| ECOGAZ 200-30/21-110 | Cr-brass | Y | Y | N | Y | Y | N | Y | N |
| ECOGAZ 200-50/40-160 | Cr-brass | Y | N | N | Y | N | N | Y | N |
| ECOGAZ 300-15/12-70 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| ECOGAZ 300-50/40-160 | Cr-brass | Y | Y | N | Y | Y | N | Y | N |

| Manifolds HP | material | $N_2$ | $CO_2$ | CO | Air* | $O_2$ | $N_2O$ | $H_2$ | $C_nH_m$* |
|---|---|---|---|---|---|---|---|---|---|
| CLSA1 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| CLSA2 | Cr-brass | Y | Y | N | Y | Y | N | Y | N |
| CISA HP | Stainless steel | Y | N | N | Y | N | N | Y | N |

## Manifolds semi-automatic for liquified gases (low pressure) :

| Manifolds LP | material | $C_3H_8$* | $C_3H_6$ | $NH_3$ |
|---|---|---|---|---|
| CISA BP | Stainless. steel | Y | Y | N |
| CISA NH3 | Stainless. steel | N | N | Y |

*Air: compressed air not breathable

**$C_nH_m$ : propane (6 bar), propylène (8bar), éthylène (70 bar), méthane (200 bar)

**Manifolds FLAMAL**

| Manifolds FLAMAL | material | $C_3H_8$ (50 bar) | $C_3H_6$ (50 bar) | $CH_4$ (200 bar) | $C_2H_4$ (70 bar) |
|---|---|---|---|---|---|
| Ecogaz Flamal SA 50-4/3-20 | Cr-brass | Y | Y | N | N |
| Ecogaz Flamal SA200-15/12-50 | Cr-brass | Y | Y | Y | Y |

* $C_3H_8$ (propane) - $C_3H_6$(propylene) - $CH_4$(methane) - $C_2H_4$ (ethylene)

**Manifold B.A.**

Ecogaz SA BA 200-15/11 -110 must be used exclusively for Breathable Air application.

## 3.INSTALLATION

### 3.1 Precautions before assembly

The manifold system must only be used by skilled technicians.
After opening the packaging, check that the equipment is not damaged and that the contents correspond to the delivery notes accompanying the equipment.
During assembly, it is important to take extreme care to ensure cleanliness and avoid pollution.
To install the equipment, select a ventilated area, protected from the effects of bad weather.

### 3.2 Assembly

Set the manifold (see drawing)
The surface on which the manifold will be mounted, must be flat. Any deformation of the plate could affect the proper operation of the equipment.

Depending of the case, mount and connect the extension ramps (Options)
Fix the racks (in case of cylinder use).
Attach the panels "Cylinders/bundles change procedure" and the "Safety precautions" corresponding to the gas used. They have to be visible and in close range.
Mount the anti-flapping connectors. Warning! They must be imperatively mounted in a vertical position. Unused ports must be sealed with blind plugs provided for that purpose.
Place the cylinders in their racks with the safety chains.

Attach the safety cables. Use the holes for that purpose on the manifold. In case of bundles, attach the anchor cable to a solid anchor point.
In case of ECOGAZ SA used with hydrogen or Helium, install at the outlet the calibrated orifice adapted to the gas used and delivered with the equipment.

Connect the outlet of the manifold to the pipe network.

Install a shut-off valve between the manifold and the pipeline:
At a distance equal to 20 x internal diameter of the pipe when used with breathable air.
Check the compatibility of the seals.
EFP9 shut-off valve for oxygen (> 20 bar) and hydrogen use.
If necessary, collect the purges and the relief valve (particularly for the combustible gases) and connect them to exhaust pipes to secure the installation. Height > 2,5 m.
If continuous supply is required, even during the maintenance, install back up cross downstream the manifold
In case of combustible gases, connect the manifold to the ground and ensure the electrical continuity between the different components.

### 3.3 Assembly of a compression fitting

Check dimensions and respect material compatibility between connection and pipe : Connection and pipe must always be made from the same material, example: Stainless steel connection for stainless steel pipe <Rockwell hardness B90 (exception : brass connection with copper pipe).

Connector pre-assembled by hand.

- After cutting, de-burring and blowing on the tube (use preferably a tube cutter), pre-assemble the nut and the ferrules, following the order and the direction indicated in the figure.
- Clamp the nut completely by hand.
- Complete the clamping using a wrench by turning the nut a 1-1/4 turn.

# 4. ACTIVATION

## 4.1 Checking the tightness of the connection

Even though the different components of the equipment have been carefully checked in the factory, it is nevertheless necessary to make a verification of the sealing of the mounted assembly before commissioning .

Close the outlet valve.

Verify that the HP shut-off valves (2) and the purge valves (3) are closed.

Open and then close gradually all valves of cylinders or bundles (1). The cylinder pressure is read on the high pressure gauges (5).

Verify that the value indicated on the high pressure gauge does not vary over a sufficiently long period.

Otherwise, there is leakage on a connection. Identify it by using a leak detector such as the ”Mille Bulles” from AIR LIQUIDE.

After locating the leakage, purge the installation, check the state of seals and of the seats of seals, and retighten the connectors again.

Always turn valves GRADUALLY. Never re-tighten a fitting under gas pressure.

In the same way, during the pressurization of the installation, check also the tightness of the output connections.

## 4.2 Activation

Never use the purge valves to purge the pipeline connected downstream of the gas manifold (risk polluting the regulators).

**WARNING**:

- ➢ Purge the equipment with inert gas (never use compressed air).
- ➢ For the tightness check, use only products without any grease or lubricants.
- ➢ Never use the purge valves of the manifold to purge the pipe downstream the manifold: high risk of polluting the pressure reducers.

❑ **First stage: Flexible hoses purging.**

Initial state:

Closed HP shut-off valves (2) and purge valves (3).

Closed low-pressure outlet shut-off valve.

Purge all flexible hoses or pigtails, by at least of 3 compressions-reductions cycles, ie: open the cylinder/bundle valves (1) and close it before reaching the pressure of the cylinder (high pressure gauge (5)), wait 1 minute, slowly open the purge valve (3) and then close it before falling to atmospheric pressure.

❑ **Second stage: function control**

Initial state:

Closed cylinder/bundle valves

Closed HP shut-off valves (2) and purge valves (3).

Closed low-pressure outlet shut-off valve.

Indicate the main gas source to use first by using the lever (4).

On the right: lever downwards

On the left: lever upwards

Open slowly all cylinder/bundle valves (1).

Open slowly the HP shut-off valves (2) on the main gas source.

Note the outlet pressure of the low pressure gauge (6). Adjust the pressure with the handwheel (except Semi-Automatic manifolds: not adjustable).

Slowly open the HP shut-off valve on the 2nd gas source (In case of Semi-Automatic manifolds).

Open slowly the outlet shut-off valve.

Let the gas flow normally through the manifold and purge all pipes.

Limit the outlet flow during the filling of the pipe network to avoid vibrations. Respect the nominal flow.

If necessary, adjust the outlet pressure (except Semi-Automatic manifolds: not adjustable).

- ❑ **3rd stage: verification of the automatic switchover** (In case of Semi-Automatic manifolds only)

Close the cylinder/bundle valves of the main gas source in service, the high pressure gauge (5) decreases.

When the HP pressure falls below 2 times the working pressure, the gas source in reserve will enter gradually in service.

The LP pressure gauge (6) indicates the pressure of the gas source in reserve.

Change the position of the lever, the initial outlet pressure is now restored. The previous gas source in reserve becomes the “main” gas source in service.

Repeat in reverse the operation, to check that the automatic switchover works well in both directions.

Remark: if during the switchover, the pressure difference "deltaP" is too disturbing for the user, it is recommended to install one 2nd stage pressure regulator at the outlet.

- ❑ **4th stage: setting in flow**

The tested equipment is now ready to use.

Slowly open the shut-off valve at the outlet.

In the case of the ECOGAZ SA, when the gas source in service is empty, the switchover to the gas source in reserve will be automatic.

It will be sufficient to switch over the position of the lever so that the gas source initially in reserve will be in service, at the required working pressure.

Change the empty cylinders or bundles which will be automatically in reserve.

The gas source in service is indicated by the position of the lever.

The arrow on the lever indicates the “main” gas source.

→ Open always the cylinder (or bundle) valves slowly and gradually.

# 5.USAGE

## 5.1 Use

Adjust the outlet pressure according to your need with the handwheel (ECOGAZ Panels only).

### 5.5.1 Cylinders or Bundles change

Identify the empty cylinders or bundles.

1. Push the handle (4) (for semi-automatic gas manifold only):

   Downwards: if empty cylinders are on the left.

   Upwards: if empty cylinders are on the right.

   Change of empty cylinders or bundles.

2. Close the High Pressure shut off valve (2) (empty side) on the gas panel or on the connection point (in case of use of more than 2 bundles).

3. Close the cylinder or bundle valves (1).

4. Slowly open the purge valve (3) and release the pressure, then close the valve.The pressure gauge must indicate 0 bar.

5. Disconnect the flexible hoses or the pigtails from the cylinders or the bundles.

6. Replace the empty cylinders or bundles and safely store.

7. Verify the cleanliness of the cylinders' or bundles' valve outlet.

8. Connect the flexible hoses or the pigtails after change the seals. Do not forget to remount the safety cable.

9. Slowly open the cylinder or bundle valves (1) and close them again before to reach the maximum pressure.

10. Wait about 1 minute.

11. Slowly open the purge valve (3) and close it again before to reach the

atmospheric pressure.

12. Start twice this cycle from point (9) to (11). (4 to 6 times in case of pure gases).

13. Slowly open the cylinder or bundle valves (1) at least 2 turns.

14. Slowly open the High Pressure shut off valve (2).

- Do not allow a flexible hose to rub against the ground or a wall.
- Fix the chain holding the cylinders in the racks. In the case of bundles, make sure that they are on horizontal surface.
- All flexible hoses or pigtails must be connected and safety cables hooked up before opening the cylinders or bundles valves.
- In case of combustible gases, make sure that the bundles are connected to the ground, before to connect them to the gas manifold.
  * Different positions according to models

### 5.2 After use

Close all of shut-off valves and cylinder (or bundle) valves.
Open the purge valves, purge the installation and the flexible hoses (or pigtails). The pressure gauges shall indicate "0".
Close the purge valves again.
Dismantle and store carefully the flexible hoses or the pigtails. Store safely from dust and of moisture.
• Screw the blind plugs on the "High Pressure" inlet ports.

**Manifold system external cleaning**

Any equipment cleaning must be carried out without disassembling or operating the shut-off, measurement and adjustment devices. Neutral products must be used for cleaning, which must in no way interact with the equipment and with the materials with which it is made.

# 6.MAINTENANCE

## 6.1 Troubleshooting

| PROBLEM | CAUSE | REMEDY |
|---|---|---|
| Connection between hoses and manifold system impossible | The fittings do not match. | Ensure the fittings are compatible with the type of gas used, inlet and/or outlet. |
| | Damaged fittings. | Replace the fittings. |
| Insufficient gas flow rate | Limited flow section through a valve. | Open the valves completely. |
| | Cylinder discharged or empty. | Replace the cylinder |
| | Cylinder valve not operating. | Replace the cylinder. |
| | Undersized equipment. | Consult with the facility installer. |
| | Equipment in output not operational | Replace the equipment. |
| The gas source in reserve drains without being used (Change over only) | Excessive instant consumption. | Replace with a source capable of delivering a higher flow rate. |
| | Leak outwards. | Check the seals. |
| | Leakage at the main valve of the regulator | Replace the pressure reducer |
| At the same pressure and output entry, the outlet pressure is not the same which side you are using | Non-calibrated pressure regulators. | Adjust the regulators |
| Frosting | Too low working pressure | Close the cylinder valve. Increase the temperature of the equipment above 0°C |
| | The used gas is argon (Ar), carbon dioxide (CO2) or nitrous oxide (N2O) | Mount a 500W heater at the inlet |
| Gas comes out of the relief valve | Leakage at the flap of the regulator | Replace the flap or the regulator, or send for repair. |
| | Defective relief valve. | Replace the relief valve |
| The outlet pressure decreases | Excessively high flow rate. | Respect the regulator flow. Limit the flow by using a valve or a |

| | | |
|---|---|---|
| | | calibrated orifice. |
| Vibrations | Presence of a valve with rapid opening on the outlet pipe. | Limit the flow by using a valve or a calibrated orifice. |

### 6.2 Maintenance

Even though the equipment is reliable, it must be checked periodically. Since this task requires some precautions, it must be done exclusively by a qualified technician.
The periodicity of this verification depends essentially on the usage of the equipment (intensive, moderate, occasional). It can be performed annually by Air Liquide under a maintenance contract (SERVIGAZ).
We suggest the use of the following table to ensure an optimum usage of your equipment.

| **V** : to verify<br>**C**: to change | | Regularly | | | 1/year (1) | 5 years (1) |
|---|---|---|---|---|---|---|
| | operations: | a | b | c | d | e |
| | Purge valve | V | | V | | V |
| | Stop valve HP | V | | V | V | V |
| | Manometer HP | V | V | V | | note (2) |
| | Pressure reducer | V | V | V | V | V |
| | Manometer LP | V | V | V | | note (2) |
| | Pressure relief valve | V | | V | | C |

**Description of operations to be done:**

a) Check of gas leak outside
b) Correct operation
c) General appearance including marking
d) Internal seal check

e) Check for any clogging
f) complete replacement

**Notes:**
(1) The one shown is the maximum duration between one operation and the next, in case of heavy-duty use of the manifold system it may be necessary to reduce the time between two subsequent checks.
(2) Components to be replaced or overhauled only in the event of malfunction.
(3) If the inspection and/or replacement intervals envisaged by the manufacturer of the specific equipment differ from the ones indicated in the table, refer to the manufacturer's instructions.

### 6.3 Spare parts

The complete spare parts list is available on the online Product Data Sheet.

Use only original parts and do not modify the equipment.

Never dismantle any of the equipment's components.

Defective reassembly may cause bursting, malfunctioning and/or an increasing output pressure, which is dangerous for your safety.

### 6.4 Disassembly - Disposal

Operations to be carried out prior to decommissioning the manifold system

The following operations are to be carried out prior to decommissioning the manifold system:

- Ensure the valves of the cylinders or cylinder packs are closed.
- Completely open the main lock valve, stop valves and the purge valves.
- Open all the points of use in order to discharge the mains downstream of the manifold system.
- Ensure the HP high pressure gauge shows zero pressure.
- Slowly unscrew the fittings between the valves of the cylinders or cylinder pack and each connected hose.
- Insert inert gas into the network (usually nitrogen) and wash the network by bleeding each drawoff point from any residual traces of gas.

**Operations for decommissioning the manifold system**

The operations for decommissioning the manifold system are as follows :

- Disconnect the hoses from the inlet fittings of the manifold system.
- Disconnect the discharge pipe from the safety valve outlet..
- Disconnect the discharge pipe from the outlet of every bleed valve.
- Unscrew the swivel nut of the main lock valve inlet fitting
- Unscrew the nuts fastening the manifold system plate to the supporting wall taking care to support the manifold system.
- Once the manifold system is detached from the installation it must be disposed of in accordance with local laws in force.

**Disposal**

In accordance with Directive EU 2018/851 on waste, the equipment holder ensures that, where recovery in accordance with Article 10 is not undertaken, waste undergoes safe disposal operations which meet the provisions of Article 13 on the protection of human health and the environment.

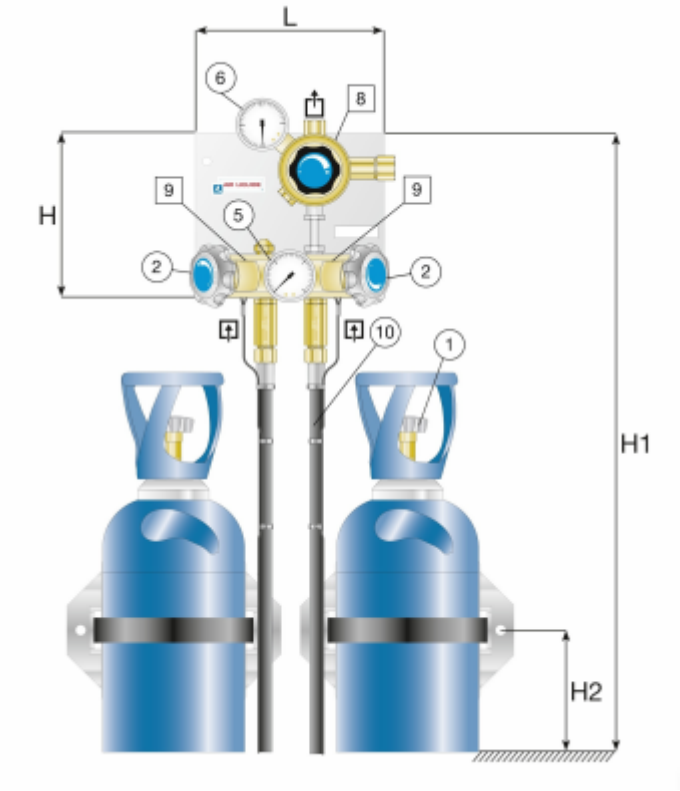
The holder shall take measures to promote high quality recycling and, to this end, shall set up separate collections of waste where technically, environmentally and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors.

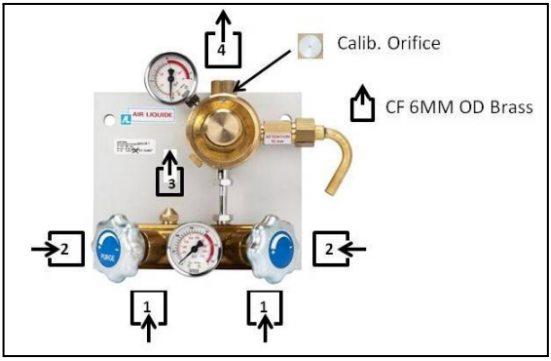
# 7.Drawings

## 7.1 Description of components

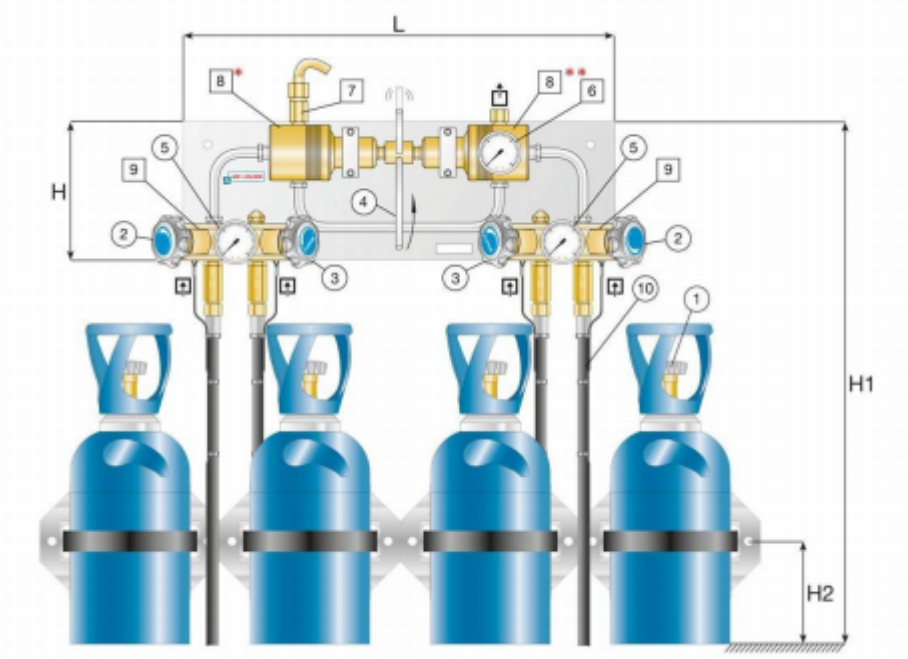
| Reference | Description of the components |
|---|---|
| 1 | Cylinder valve |
| 2 | High pressure valve |
| 3 | Purge valve |
| 4 | Handle |
| 5 | HP manometer |
| 6 | BP manometer |
| 7 | Pressure relief valve |
| 8 | Pressure reducers |
| 9 | Valves manifold |
| 10 | Flexible hoses |

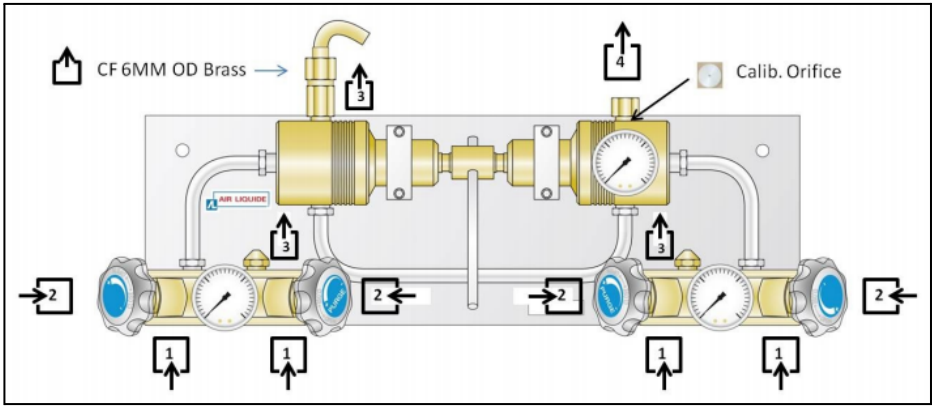
## 7.2 Drawing of gas panel



### 7.3 Drawing of gas manifold



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# Operating Instructions

## Gas Manifolds
## **CLSA - CISA**

| Manifold semi-automatic | Panel |
| --- | --- |
| CLSA1- CLSA2 | ML1-ML2 |
| CLSA-A | ML-A |
| CISA | MI |
| CLA | ML |

### Warning

To preserve the quality of our product throughout its usage in the best safety conditions, please read this manual carefully and strictly follow the instructions that it contains. Non-compliance with these instructions or modification of the product may result in serious accidents or bodily injuries. AIR LIQUIDE shall not be held responsible in case of non approved usage of the product. Air Liquide reserves the right to make all necessary modifications to the specifications described hereafter without notice

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# 1. GENERAL INFORMATIONS

## 1.1 Safety

First of all, it is ESSENTIAL to read and respect the safety instructions described in the document “General Safety Instructions” delivered with the product. NEVER dismantle a component of the regulator in the High Pressure part, especially the cylinder inlet fitting.

Know the properties and special handling requirements of the gas being used. Always refer to the "compatibility table" to install the appropriate Manifold model with the gas used.

Be sure that the assembly purchased is suitable for the gas and type of service intended. The system label provides the following information : model designation, maximum inlet pressure, batch number.

Refer to the Gas compatibility tables and the Product Data Sheet.

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

ECOGAZ, CLSA and CISA model are available in two versions:

- Gas Panel : for one inlet (one pressure reducer)
- Gas Manifold: for two cylinders sources inlet (two pressure reducers).

**Safety warning :**
The gas manifolds are fitted with a relief valve to protect the equipment itself.

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

It is the user's responsibility to protect its installation, taking into consideration the maximum pressure and flowrate in case of breakdown of the reducer.
To sizing a safety relief valve on the pipe network associated with a Calibrated Orifice (OC), refer to the theoretical flow rate in $Nm^3/h$ (for 200 bar $N_2$) given for each model in the product data sheet.

### 1.2 Air Liquide commitments

AIR LIQUIDE certifies that this equipment is manufactured, tested and controlled, in accordance with the technical specifications described in the AIR LIQUIDE specifications.

In addition to technical specifications, a degreasing process consistent with oxygen service is applied.

It is the responsibility of the end user to ensure that such equipment is installed and used in accordance with the regulations.

**Directive 2014/68/EC: Pressurized equipment (PED)**

Technical requirements of Article 4§3 indicates that Pressure equipment and assemblies below or equal to the limits set out in points (a), (b) and (c) of paragraph 1 and in paragraph 2 respectively shall be designed and manufactured in accordance with the sound engineering practice of a Member State in order to ensure safe use.

Without prejudice to other applicable Union harmonisation legislation providing for its affixing, such equipment or assemblies shall not bear the CE marking referred to in Article 18.

By design, these equipment may integrate pressure relief valves or burst disks. In this case, those ones shall neither be CE marked according to paragraph 2 of annex II.

In all other cases, pressure relief valves and burst disks shall be CE marked.

**Directive 2014/34/UE ATEX** :

The equipment is not in the scope defined in points a), b) et c) of the article of the ATEX Directive: consequently, they shall not be near the CE marking.

The equipment are not capable of causing an explosion through their own potential sources of ignition: then, they can be installed in ATEX zone 1 or 2, as far as respecting up to date regulations, rules, operating instructions, in accordance with the sound engineering practice are followed during installation and use.

Reminder: it belongs to the end user to define the ATEX zone.

**REACH regulation (EC) n°1907/2006 :**

The pressure reducers are made of brass parts, essentially the body, which is a copper alloy with a lead content between 1% and 4% w/w.
As requested by art.33 of REACH Regulation (Registration, Evaluation and Authorisation of Chemicals) and with reference to current list of SVHC (substances of very high concern) available on ECHA website, we inform that lead may be present in a concentration above 0,1% w/w in our products made of brass.
Lead inclusion in the SVHC list in June 2018 does not modify the use conditions described in operating instructions.
Lead will not be released to the surrounding environment or the gas used during normal use.
After product end of life, the pressure reducers must be scrapped by an authorized metal recycler.

**Cleaning :**

Equipment is subject to a grease removal and high quality cleaning for use with oxygen compatible equipment.
A suitable packaging protects the equipment against exterior pollutions during storage and transport.A suitable packaging protects the equipment against exterior pollutions during storage and transport.
Take care to avoid polluting the equipment during installation.

**Inspection:**

Equipment is inspected and has undergone a sealing test (with Helium) before packing.
A pressure test is performed with 200 bar or 300 bar helium gas.
The leakage measure must be blow $10^{-7}$ mbar.l/s hélium.

**Warranty :**

The warranty period of this equipment supplied by AIR LIQUIDE is one year, with spare parts and labor and does not include packing and transport fees.

Excluded from warranty: seals and relief valves. These components are subject to natural wear.

Warranty is not valid on deteriorations which result from wrong or poor use, from use of spare parts which are not marked AIR LIQUIDE, or if operating instructions are not respected.

For more information, refer to the general sales conditions of AIR LIQUIDE.

### 1.3 Marking

The system label provides the following information:
Model Change over manifold or Panel
AL Designation
SAP code
Maximum working pressure: P1
Maximum outlet pressure: P2
Maximum flowrate: Qmax= xx $Nm^3/h$
Date of manufacturing: week/year

# 2. FIELD OF USE AND CHARACTERISTICS

## 2.1 Functions

The gas Manifolds are used to:

- connect one or several cylinders or bundles to pipe network,
- reduce the pressure of a gas packaged under high pressure (200 or 300 bar at 15°C) in a cylinder or a bundle..

**Panels** aim at adjusting an outlet pressure with a single gas source**.**

**Semi-Automatic manifolds**

The principle of operating is based on an opposite mounting of two pressure reducers, adjusted at different outlet pressures in order for the stock cylinders to open once the service side is nearly empty.

The manifolds provide a fixed outlet pressure, with a slight gap between the two sides: these values are indicated in the manifold designation of each model.

As the outlet pipe is common, the reducer who delivers the flowrate corresponding to the one which has the higher outlet pressure, defined by the gear position (left or right)..

The user has only to operate for cylinders/bundles switch, after moving the gear toward the side with full cylinders/bundle.

If a stable stable is required on the customer application, this is necessary to install a second-stage on line regulator, just after the manifold.

### 2.2 Technical characteristics

Operating temperature: -20 °C to +50 °C

Leakage rate (Int/Ext.):< 10-6 mbar.l/s helium.

Fittings :

| Connections on manifold | type of threads |
|---|---|
| HP inlet on valves-manifold: | M16x 1,336SI F |
| Gas outlet toward user application | **G 3/8" F** |
| relief valve vent outlet | CF 6MM |
| vent on valves-manifold | G 3/8" F |
| pressure transmitter | M16x 1,336SI F |

### 2.3 Gas compatibility

IMPERATIVE : check the gases compatibility of this equipment by referring to the "Gas Compatibility Table".

The ECOGAZ single-stage gas manifolds are mainly designed for the implementation of:

- air gases ($O_2$, $N_2$, Air, Ar, He...)
- carbon dioxyde and Ar/$CO_2$ mixtures
- Hydrogen ($H_2$),
- nitrous oxide ($N_2O$) and oxidizing mixtures.

If any doubt, AIR LIQUIDE representatives are trained to aid in the selection process.

## Panels

| Panels | material | $N_2$ | $CO_2$ | CO | Air* | $O_2$ | $N_2O$ | $H_2$ | $C_nH_m$* |
|---|---|---|---|---|---|---|---|---|---|
| Ecogaz P | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| Ecogaz P 300 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| ML1 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| ML2 | Cr-brass | Y | Y | N | Y | Y | N | Y | N |
| ML | Cr-brass | Y | N | N | Y | N | N | Y | N |
| MI | Stainless. steel | Y | N | N | Y | N | N | Y | N |

*Air: compressed air not breathable

**$C_nH_m$ : propane (6 bar), propylène (8bar), éthylène (70 bar), méthane (200 bar)

## Panels FLAMAL

| Panels | material | $C_3H_8$ (50 bar) | $C_3H_6$ (50 bar) | $CH_4$ (200 bar) | $C_2H_4$ (70 bar) |
|---|---|---|---|---|---|
| Ecogaz Flamal P 50-4-20 | Cr-brass | Y | Y | N | N |
| Ecogaz Flamal P 200-15-50 | Cr-brass | Y | Y | Y | Y |

* $C_3H_8$ (propane) - $C_3H_6$(propylene) - $CH_4$(methane) - $C_2H_4$ (ethylene)

## Panels B.A.

Ecogaz P BA 200-15-110 must be used exclusively for Breathable Air application.

## Manifolds semi-automatic:

| Manifolds | material | $N_2$ | $CO_2$ | CO | Air* | $O_2$ | $N_2O$ | $H_2$ | $C_nH_m$* |
|---|---|---|---|---|---|---|---|---|---|
| ECOGAZ 200-8/5-50 | Cr-brass | Y | N | N | Y | Y | N | Y | N |
| ECOGAZ 200-12/9-80 D | Cr-brass | Y | Y | N | N | N | N | N | N |
| ECOGAZ 200-15/11-80 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| ECOGAZ 200-30/21-110 | Cr-brass | Y | Y | N | Y | Y | N | Y | N |
| ECOGAZ 200-50/40-160 | Cr-brass | Y | N | N | Y | N | N | Y | N |
| ECOGAZ 300-15/12-70 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| ECOGAZ 300-50/40-160 | Cr-brass | Y | Y | N | Y | Y | N | Y | N |

| Manifolds HP | material | $N_2$ | $CO_2$ | CO | Air* | $O_2$ | $N_2O$ | $H_2$ | $C_nH_m$* |
|---|---|---|---|---|---|---|---|---|---|
| CLSA1 | Cr-brass | Y | Y | N | Y | Y | Y | Y | N |
| CLSA2 | Cr-brass | Y | Y | N | Y | Y | N | Y | N |
| CISA HP | Stainless steel | Y | N | N | Y | N | N | Y | N |

## Manifolds semi-automatic for liquified gases (low pressure):

| Manifolds LP | material | $C_3H_8$* | $C_3H_6$ | $NH_3$ |
|---|---|---|---|---|
| CISA BP | Stainless. steel | Y | Y | N |
| CISA NH3 | Stainless. steel | N | N | Y |

*Air: compressed air not breathable

**$C_nH_m$ : propane (6 bar), propylène (8bar), éthylène (70 bar), méthane (200 bar)

**Manifolds FLAMAL**

| Manifolds FLAMAL | material | $C_3H_8$ (50 bar) | $C_3H_6$ (50 bar) | $CH_4$ (200 bar) | $C_2H_4$ (70 bar) |
|---|---|---|---|---|---|
| Ecogaz Flamal SA 50-4/3-20 | Cr-brass | Y | Y | N | N |
| Ecogaz Flamal SA200-15/12-50 | Cr-brass | Y | Y | Y | Y |

* $C_3H_8$ (propane) - $C_3H_6$(propylene) - $CH_4$(methane) - $C_2H_4$ (ethylene)

**Manifold B.A.**

Ecogaz SA BA 200-15/11 -110 must be used exclusively for Breathable Air application.

# 3.INSTALLATION

## 3.1 Precautions before assembly

The manifold system must only be used by skilled technicians.
After opening the packaging, check that the equipment is not damaged and that the contents correspond to the delivery notes accompanying the equipment.
During assembly, it is important to take extreme care to ensure cleanliness and avoid pollution.
To install the equipment, select a ventilated area, protected from the effects of bad weather.

## 3.2 Assembly

Set the manifold (see drawing)
The surface on which the manifold will be mounted, must be flat. Any deformation of the plate could affect the proper operation of the equipment.

Depending of the case, mount and connect the extension ramps (Options)
Fix the racks (in case of cylinder use).
Attach the panels "Cylinders/bundles change procedure" and the "Safety precautions" corresponding to the gas used. They have to be visible and in close range.
Mount the anti-flapping connectors. Warning! They must be imperatively mounted in a vertical position. Unused ports must be sealed with blind plugs provided for that purpose.
Place the cylinders in their racks with the safety chains.

Attach the safety cables. Use the holes for that purpose on the manifold. In case of bundles, attach the anchor cable to a solid anchor point.
In case of ECOGAZ SA used with hydrogen or Helium, install at the outlet the calibrated orifice adapted to the gas used and delivered with the equipment.

Connect the outlet of the manifold to the pipe network.

Install a shut-off valve between the manifold and the pipeline:
At a distance equal to 20 x internal diameter of the pipe when used with breathable air.
Check the compatibility of the seals.
EFP9 shut-off valve for oxygen (> 20 bar) and hydrogen use.
If necessary, collect the purges and the relief valve (particularly for the combustible gases) and connect them to exhaust pipes to secure the installation. Height > 2,5 m.
If continuous supply is required, even during the maintenance, install back up cross downstream the manifold
In case of combustible gases, connect the manifold to the ground and ensure the electrical continuity between the different components.

### 3.3 Assembly of a compression fitting

Check dimensions and respect material compatibility between connection and pipe : Connection and pipe must always be made from the same material, example: Stainless steel connection for stainless steel pipe <Rockwell hardness B90 (exception : brass connection with copper pipe).
Connector pre-assembled by hand.

- After cutting, de-burring and blowing on the tube (use preferably a tube cutter), pre-assemble the nut and the ferrules, following the order and the direction indicated in the figure.
- Clamp the nut completely by hand.
- Complete the clamping using a wrench by turning the nut a 1-1/4 turn.

# 4. ACTIVATION

## 4.1 Checking the tightness of the connection

Even though the different components of the equipment have been carefully checked in the factory, it is nevertheless necessary to make a verification of the sealing of the mounted assembly before commissioning .

Close the outlet valve.

Verify that the HP shut-off valves (2) and the purge valves (3) are closed.

Open and then close gradually all valves of cylinders or bundles (1). The cylinder pressure is read on the high pressure gauges (5).

Verify that the value indicated on the high pressure gauge does not vary over a sufficiently long period.

Otherwise, there is leakage on a connection. Identify it by using a leak detector such as the ”Mille Bulles” from AIR LIQUIDE.

After locating the leakage, purge the installation, check the state of seals and of the seats of seals, and retighten the connectors again.

Always turn valves GRADUALLY. Never re-tighten a fitting under gas pressure.

In the same way, during the pressurization of the installation, check also the tightness of the output connections.

## 4.2 Activation

Never use the purge valves to purge the pipeline connected downstream of the gas manifold (risk polluting the regulators).

**WARNING**:

- ➢ Purge the equipment with inert gas (never use compressed air).
- ➢ For the tightness check, use only products without any grease or lubricants.
- ➢ Never use the purge valves of the manifold to purge the pipe downstream the manifold: high risk of polluting the pressure reducers.

- **First stage: Flexible hoses purging.**

Initial state:

Closed HP shut-off valves (2) and purge valves (3).

Closed low-pressure outlet shut-off valve.

Purge all flexible hoses or pigtails, by at least of 3 compressions-reductions cycles, ie: open the cylinder/bundle valves (1) and close it before reaching the pressure of the cylinder (high pressure gauge (5)), wait 1 minute, slowly open the purge valve (3) and then close it before falling to atmospheric pressure.

- **Second stage: function control**

Initial state:

Closed cylinder/bundle valves

Closed HP shut-off valves (2) and purge valves (3).

Closed low-pressure outlet shut-off valve.

Indicate the main gas source to use first by using the lever (4).

On the right: lever downwards

On the left: lever upwards

Open slowly all cylinder/bundle valves (1).

Open slowly the HP shut-off valves (2) on the main gas source.

Note the outlet pressure of the low pressure gauge (6). Adjust the pressure with the handwheel (except Semi-Automatic manifolds: not adjustable).

Slowly open the HP shut-off valve on the 2nd gas source (In case of Semi-Automatic manifolds).

Open slowly the outlet shut-off valve.

Let the gas flow normally through the manifold and purge all pipes.

Limit the outlet flow during the filling of the pipe network to avoid vibrations. Respect the nominal flow.

If necessary, adjust the outlet pressure (except Semi-Automatic manifolds: not adjustable).

- ❑ **3rd stage: verification of the automatic switchover** (In case of Semi-Automatic manifolds only)

Close the cylinder/bundle valves of the main gas source in service, the high pressure gauge (5) decreases.

When the HP pressure falls below 2 times the working pressure, the gas source in reserve will enter gradually in service.

The LP pressure gauge (6) indicates the pressure of the gas source in reserve.

Change the position of the lever, the initial outlet pressure is now restored. The previous gas source in reserve becomes the “main” gas source in service.

Repeat in reverse the operation, to check that the automatic switchover works well in both directions.

Remark: if during the switchover, the pressure difference "deltaP" is too disturbing for the user, it is recommended to install one 2nd stage pressure regulator at the outlet.

- ❑ **4th stage: setting in flow**

The tested equipment is now ready to use.

Slowly open the shut-off valve at the outlet.

In the case of the ECOGAZ SA, when the gas source in service is empty, the switchover to the gas source in reserve will be automatic.

It will be sufficient to switch over the position of the lever so that the gas source initially in reserve will be in service, at the required working pressure.

Change the empty cylinders or bundles which will be automatically in reserve.

The gas source in service is indicated by the position of the lever.

The arrow on the lever indicates the “main” gas source.

→ Open always the cylinder (or bundle) valves slowly and gradually.

# 5. USAGE

## 5.1 Use

Adjust the outlet pressure according to your need with the handwheel (ECOGAZ Panels only).

**Cylinders or Bundles change**

Identify the empty cylinders or bundles.

1. Push the handle (4) (for semi-automatic gas manifold only):

   Downwards: if empty cylinders are on the left.

   Upwards: if empty cylinders are on the right.

   Change of empty cylinders or bundles.

2. Close the High Pressure shut off valve (2) (empty side) on the gas panel or on the connection point (in case of use of more than 2 bundles).

3. Close the cylinder or bundle valves (1).

4. Slowly open the purge valve (3) and release the pressure, then close the valve.The pressure gauge must indicate 0 bar.

5. Disconnect the flexible hoses or the pigtails from the cylinders or the bundles.

6. Replace the empty cylinders or bundles and safely store.

7. Verify the cleanliness of the cylinders' or bundles' valve outlet.

8. Connect the flexible hoses or the pigtails after change the seals. Do not forget to remount the safety cable.

9. Slowly open the cylinder or bundle valves (1) and close them again before to reach the maximum pressure.

10. Wait about 1 minute.

11. Slowly open the purge valve (3) and close it again before to reach the

atmospheric pressure.

12. Start twice this cycle from point (9) to (11). (4 to 6 times in case of pure gases).

13. Slowly open the cylinder or bundle valves (1) at least 2 turns.

14. Slowly open the High Pressure shut off valve (2).

- Do not allow a flexible hose to rub against the ground or a wall.
- Fix the chain holding the cylinders in the racks. In the case of bundles, make sure that they are on a horizontal surface.
- All flexible hoses or pigtails must be connected and safety cables hooked up before opening the cylinders or bundles valves.
- In case of combustible gases, make sure that the bundles are connected to the ground, before connecting them to the gas manifold.
  * Different positions according to models

### 5.2 After use

Close all of shut-off valves and cylinder (or bundle) valves.
Open the purge valves, purge the installation and the flexible hoses (or pigtails).
The pressure gauges shall indicate "0".
Close the purge valves again.
Dismantle and store carefully the flexible hoses or the pigtails. Store safely from dust and of moisture.

- Screw the blind plugs on the "High Pressure" inlet ports.

Manifold system external cleaning
Any equipment cleaning must be carried out without disassembling or operating the shut-off, measurement and adjustment devices. Neutral products must be used for cleaning, which must in no way interact with the equipment and with the materials with which it is made.

# 6. MAINTENANCE

## 6.1 Troubleshooting

| PROBLEM | CAUSE | REMEDY |
|---|---|---|
| Connection between hoses and manifold system impossible | The fittings do not match. | Ensure the fittings are compatible with the type of gas used, inlet and/or outlet. |
| | Damaged fittings. | Replace the fittings. |
| Insufficient gas flow rate | Limited flow section through a valve. | Open the valves completely. |
| | Cylinder discharged or empty. | Replace the cylinder |
| | Cylinder valve not operating. | Replace the cylinder. |
| | Undersized equipment. | Consult with the facility installer. |
| | Equipment in output not operational | Replace the equipment. |
| The gas source in reserve drains without being used (Change over only) | Excessive instant consumption. | Replace with a source capable of delivering a higher flow rate. |
| | Leak outwards. | Check the seals. |
| | Leakage at the main valve of the regulator | Replace the pressure reducer |
| At the same pressure and output entry, the outlet pressure is not the same which side you are using | Non-calibrated pressure regulators. | Adjust the regulators |
| Frosting | Too low working pressure | Close the cylinder valve. Increase the temperature of the equipment above 0°C |
| | The used gas is argon (Ar), carbon dioxide ($CO_2$) or nitrous oxide ($N_2O$) | Mount a 500W heater at the inlet |
| Gas comes out of the relief valve | Leakage at the flap of the regulator | Replace the flap or the regulator, or send for repair. |
| | Defective relief valve. | Replace the relief valve |

| | | |
|---|---|---|
| The outlet pressure decreases | Excessively high flow rate. | Respect the regulator flow. Limit the flow by using a valve or a calibrated orifice. |
| Vibrations | Presence of a valve with rapid opening on the outlet pipe. | Limit the flow by using a valve or a calibrated orifice. |

### 6.2 Maintenance

Even though the equipment is reliable, it must be checked periodically. Since this task requires some precautions, it must be done exclusively by a qualified technician.
The periodicity of this verification depends essentially on the usage of the equipment (intensive, moderate, occasional). It can be performed annually by Air Liquide under a maintenance contract (SERVIGAZ).
We suggest the use of the following table to ensure an optimum usage of your equipment.

| **V** : to verify<br>**C**: to change | | Regularly | | | 1/year (1) | 5 years (1) |
|---|---|---|---|---|---|---|
| | operations: | a | b | c | d | e |
| | Purge valve | V | | V | | V |
| | Stop valve HP | V | | V | V | V |
| | Manometer HP | V | V | V | | note (2) |
| | Pressure reducer | V | V | V | V | V |
| | Manometer LP | V | V | V | | note (2) |
| | Pressure relief valve | V | | V | | C |

**Description of operations to be done:**

a) Check of gas leak outside
b) Correct operation
c) General appearance including marking
d) Internal seal check
e) Check for any clogging
f) complete replacement

**Notes:**
(1) The one shown is the maximum duration between one operation and the next, in case of heavy-duty use of the manifold system it may be necessary to reduce the time between two subsequent checks.
(2) Components to be replaced or overhauled only in the event of malfunction.
(3) If the inspection and/or replacement intervals envisaged by the manufacturer of the specific equipment differ from the ones indicated in the table, refer to the manufacturer's instructions.

### 6.3 Spare parts

The complete spare parts list is available on the online Product Data Sheet.

Use only original parts and do not modify the equipment.

Never dismantle any of the equipment's components.

Defective reassembly may cause bursting, malfunctioning and/or an increasing output pressure, which is dangerous for your safety.

### 6.4 Disassembly - Disposal

<u>Operations to be carried out prior to decommissioning the manifold system</u>

The following operations are to be carried out prior to decommissioning the manifold system:

- Ensure the valves of the cylinders or cylinder packs are closed.
- Completely open the main lock valve, stop valves and the purge valves.
- Open all the points of use in order to discharge the mains downstream of the manifold system.
- Ensure the HP high pressure gauge shows zero pressure.
- Slowly unscrew the fittings between the valves of the cylinders or cylinder pack and each connected hose.
- Insert inert gas into the network (usually nitrogen) and wash the

network by bleeding each drawoff point from any residual traces of gas.

Operations for decommissioning the manifold system

The operations for decommissioning the manifold system are as follows :

- Disconnect the hoses from the inlet fittings of the manifold system.
- Disconnect the discharge pipe from the safety valve outlet..
- Disconnect the discharge pipe from the outlet of every bleed valve.
- Unscrew the swivel nut of the main lock valve inlet fitting
- Unscrew the nuts fastening the manifold system plate to the supporting wall taking care to support the manifold system.
- Once the manifold system is detached from the installation it must be disposed of in accordance with local laws in force.

**Disposal**

In accordance with Directive EU 2018/851 on waste, the equipment holder ensures that, where recovery in accordance with Article 10 is not undertaken, waste undergoes safe disposal operations which meet the provisions of Article 13 on the protection of human health and the environment.

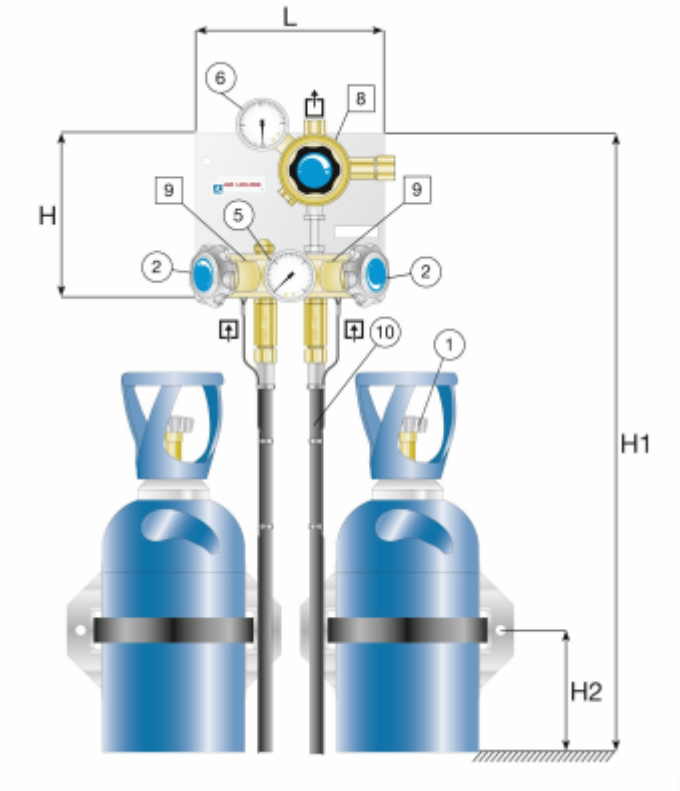
The holder shall take measures to promote high quality recycling and, to this end, shall set up separate collections of waste where technically, environmentally and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors.

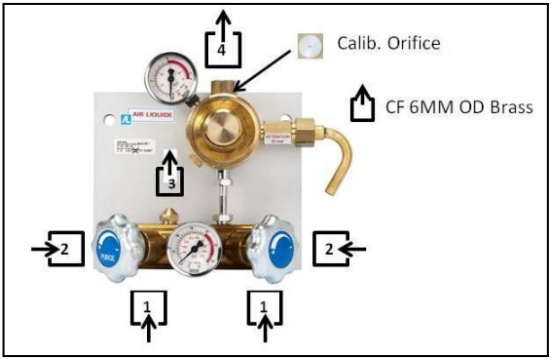
# 7. Drawings

## 7.1 Description of components

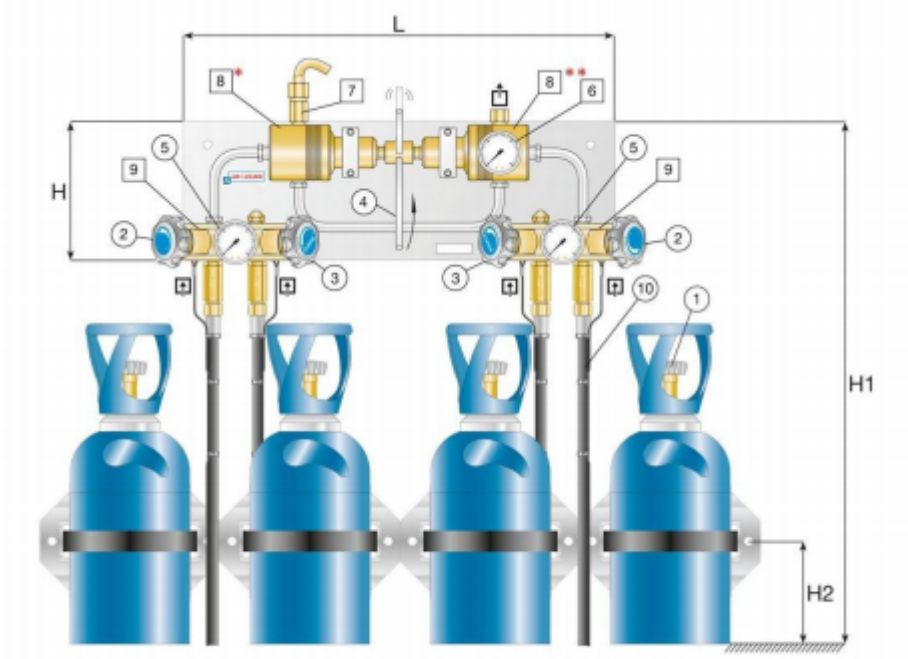
| Reference | Description of the components |
|---|---|
| 1 | Cylinder valve |
| 2 | High pressure valve |
| 3 | Purge valve |
| 4 | Handle |
| 5 | HP manometer |
| 6 | BP manometer |
| 7 | Pressure relief valve |
| 8 | Pressure reducers |
| 9 | Valves manifold |
| 10 | Flexible hoses |

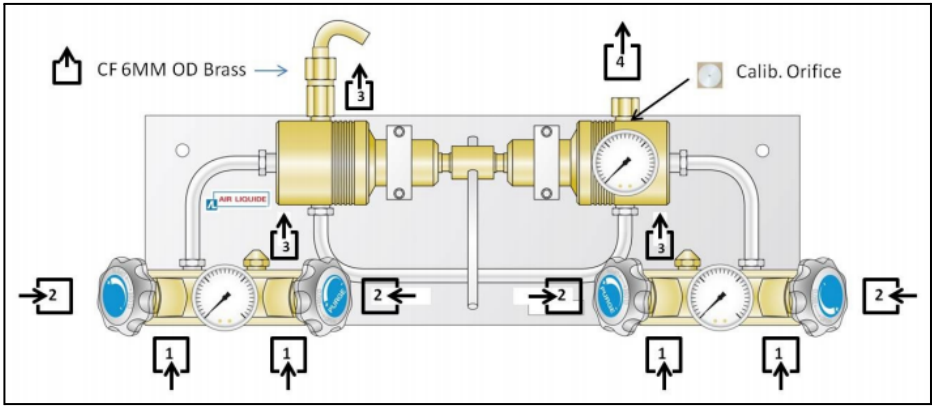
## 7.2 Drawing of gas panel



### 7.3 Drawing of gas manifold



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