



AIR LIQUIDE
INGENIERIE

57, Ave Carnot - B.P. 313
94503 Champigny Cedex
(FRANCE)

STANDARD D.I.

GR.241.31 - j

OXYGEN STATION

Design Rules

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Rev.	Date	Supervis.	Appr.	Modifications
0	25.06.80	Hézard		Original Issue
a	14.10.80	Raphael		Revision of page 4
b	11.03.81	Hézard		§ 5.4
c	02.06.81	Vancau		Ch. 4, § 4.9
d	15.10.81	Vancau		Page 2
e	14.06.82	Raphael		Revision of pages 5 and 6 2.11
f	22.10.84	Pelle		§ 4.6
g	24.01.89	Orliac		Revision of the document and adaptation to comply with IGC-13/82
h	15.04.92	Dumont		Recording under VM
i	08.06.95	R-Mathé		Re-edition under Amipro and notification of § 4.1
j	20.02.98	R-Mathé		Reaffirmed in Microsoft® WORD
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1 SCOPE

The following rules apply to oxygen pressure-reducing stations, which are part of an oxygen production unit and which are designed for the supply of a network branch at a pressure, which is lower than the pressure of the production system, generally, without metering.

Note : In all the other cases, the instructions of the Technical Direction (AL-DTEC), in particular the technical notice n° 34, shall be applied.

2 DOCUMENTS TO BE CONSULTED

2.1 General documents

IGC-13/82 : Pipeline transport system for oxygen.
Technical notice n° 34 : Design of the installations.

2.2 DI standards

AL-GR.204.41 : Insulation spaces around an oxygen station.
AL-GR.318.10 : Fire protection walls for oxygen piping.

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3 CHOICE OF THE MATERIAL

Considering their utilization with oxygen under high pressure, the materials and valves must be subject to a particularly careful selection. The recommendations of document IGC-13/82, specifically those of chapter 3, are to be considered as minimum requirements.

The by-pass valves (ND 20) in particular, shall be made of bronze, as well as the decompression valve of the filter.

Within the Engineering Department, only the Technical Service (AL-ST) shall be entitled to select new products for oxygen service. It must be consulted for each new question arising.

4 CONCEPTION RULES

4.1 Insulation of the station

- The inlet of the station shall be fitted with an automatic leaktight shutoff valve. This valve must be designed as to that opening shall only be possible after balancing of its upstream and downstream pressures. To this end, a mandatory system shall be installed, achieved by a slow pressure buildup device at the opening for ND ≥ 150 (balancing by-pass or needle valve).

During the closing phase, the valve and its by-pass must close simultaneously.

Any malfunction, lack of operative fluid or power loss, must activate shutdown of the valve. Direct oxygen supply from the network is authorized under the condition that the rules for oxygen pipelines shall be applied to the control systems and devices, and that sufficient tank capacity shall be provided, which must be isolated from the network by means of a check valve.

Operation of the shutoff valve shall be controlled by the pressure downstream of the pressure reduction valve (refer to attached drawings).

- After pressure reduction, the shutoff valve shall be operated manually.

4.2 Safety valves

Even if the piping downstream of the pressure reduction valve has been calculated for the upstream pressure, it must be made sure that no pressure buildup exceeding this design value shall occur from the external network.

The station shall be protected by a check valve against gas reflux from the network.

If necessary, pressure relief valves shall be installed in the station. In this case, two or several relief valves shall be mounted, according to the following criteria :

- one (or several) main pressure relief valve(s) (PSVA) designed to evacuate the total flow of the pressure reduction valve in case of malfunctioning of this valve, and to limit the pressure to a defined safety value;
- a secondary, smaller pressure relief valve (PSVB), designed to evacuate possible flow due to leakage of the pressure reduction valve.

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4.3 Double-line stations

In this case, 3 types of dimensioning are possible, according to the degree of supply reliability intended :

- maximum supply reliability: each line may ensure the total output. One line shall be in operation, the other line serve as backup,
- average supply reliability : the 2 lines operate at the same time, whereby each one ensures 50 % of the output. In case of an incident on one line, the available output shall only be 50 % of the normal output,
- minimum supply reliability : one main line ensures the total output. In case of an incident, a line with a small diameter shall supply the absolutely necessary minimum output.

In all cases, a single check valve, located downstream of the junction of the 2 lines, shall be sufficient.

4.4 Schematic diagram

Two examples are illustrated in the annex:

4.4.1 Diagram 1

Single line with "spheraxial" pressure reducing valve

After adjustment of the set point pressure, startup shall be carried out according to the following procedure.


- A is closed. Section A-B is out of pressure : open progressively valve B,
- Put under pressure the section located upstream of the pressure reducing valve with the by-pass of valve A,
- Activate the manual actuator of the solenoid valves S until the downstream pressure shall have exceeded the low trip set point.

4.4.2 Diagram 2

Single line with pressure reducing valve.

After adjustment of the set point pressure, startup shall be carried out according to the following procedure

- A is closed. Section A-B is out of pressure : open progressively valve B,
- Put under pressure the section located upstream of the pressure reducing valve with the by-pass of valve A,
- Activate simultaneously the manual actuator of the solenoid valves and the manual control of the PIC to open progressively valve D,
- Continue to activate the solenoid valves, until the downstream pressure shall have exceeded the low trip set point.

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5 INSTALLATION RULES

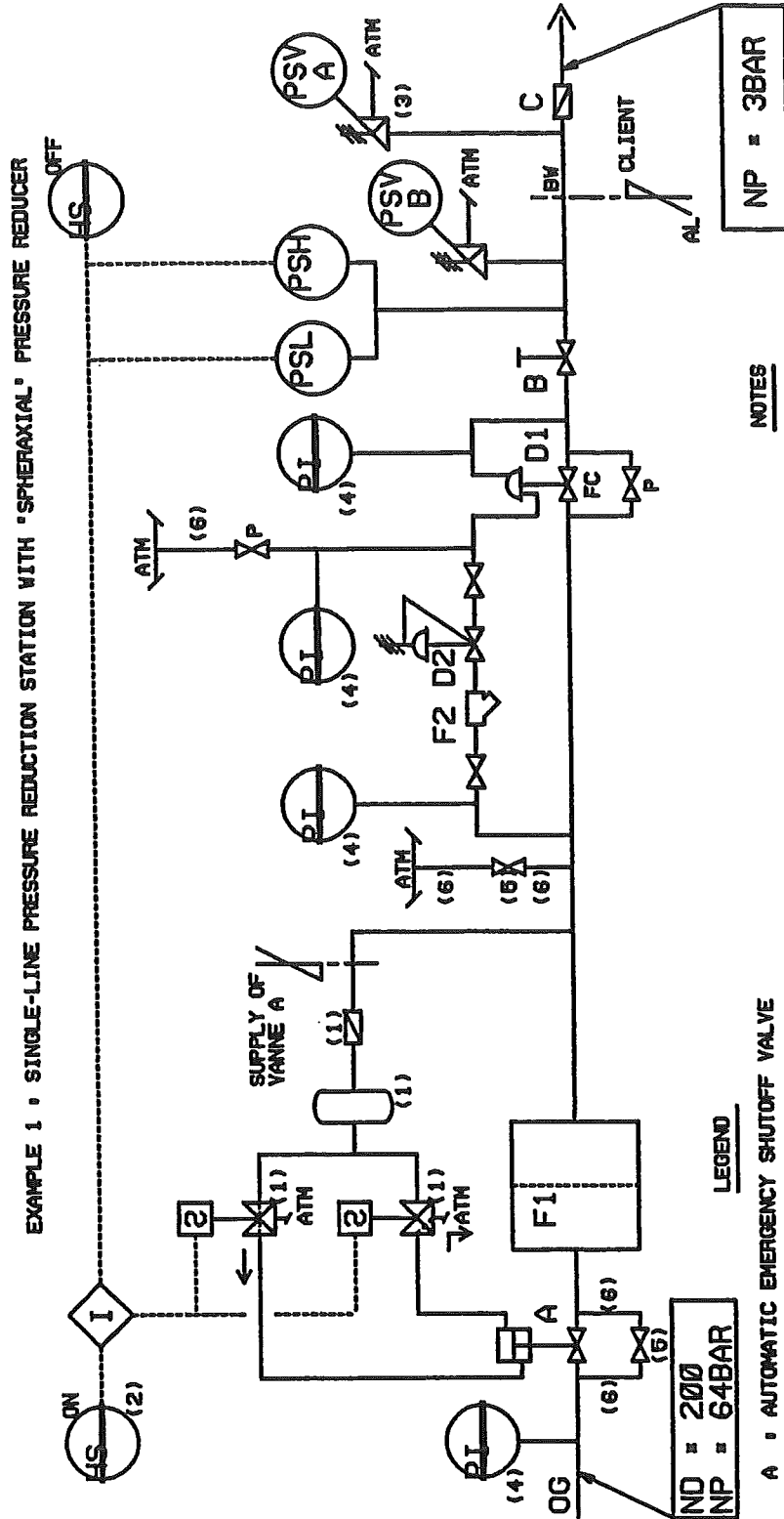
- In a production unit, even if it is possible to respect the insulation spaces as defined in standard AL-GR.204.41, safety requirements of the operating staff necessitate the erection of fire protection walls, which shall be arranged according to the hazards that may be encountered (refer to practical dispositions in standard AL-GR.318.10).
- Access doors, if any, shall be of the "anti-panic" type, which may easily be opened from inside and which cannot be locked when the operators are inside the station enclosure.
- The station shall be connected to a track suitable for vehicles and access shall lead on to areas which are totally cleared of any obstacle. The fire-fighting devices shall be in conformity with the general safety regulations of L'AIR LIQUIDE.
- Principal installations (three installation models shall be illustrated in the annex) :
 - Installation 1 : Single-line station with anti-panic doors,
 - Installation 2 : Double-line station with anti-panic doors,
 - Installation 3 : Double-line station with access baffles.

Other examples of a similar type are described in document IGC-13/82, fig 27.

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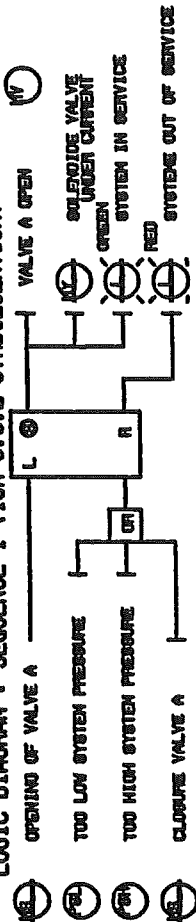
NOTES

- (1) SOLENOID VALVES CAPACITY AND CHECK VALVE ALLOWING HANDLING OF THE VALVE IN CASE OF PRESSURE LOSS
- (2) RESET FROM CONTROL PANEL
- (3) POSITIONING AND DIMENSIONING ACCORDING TO UP AND DOWNSTREAM CONDITIONS
- (4) THE MANDRETS MUST BE REGROUPED ON THE CONTROL PANEL
- (5) ALL-BRONZE VALVE
- (6) STAINLESS STEEL OR COPPER PIPE

LEGEND

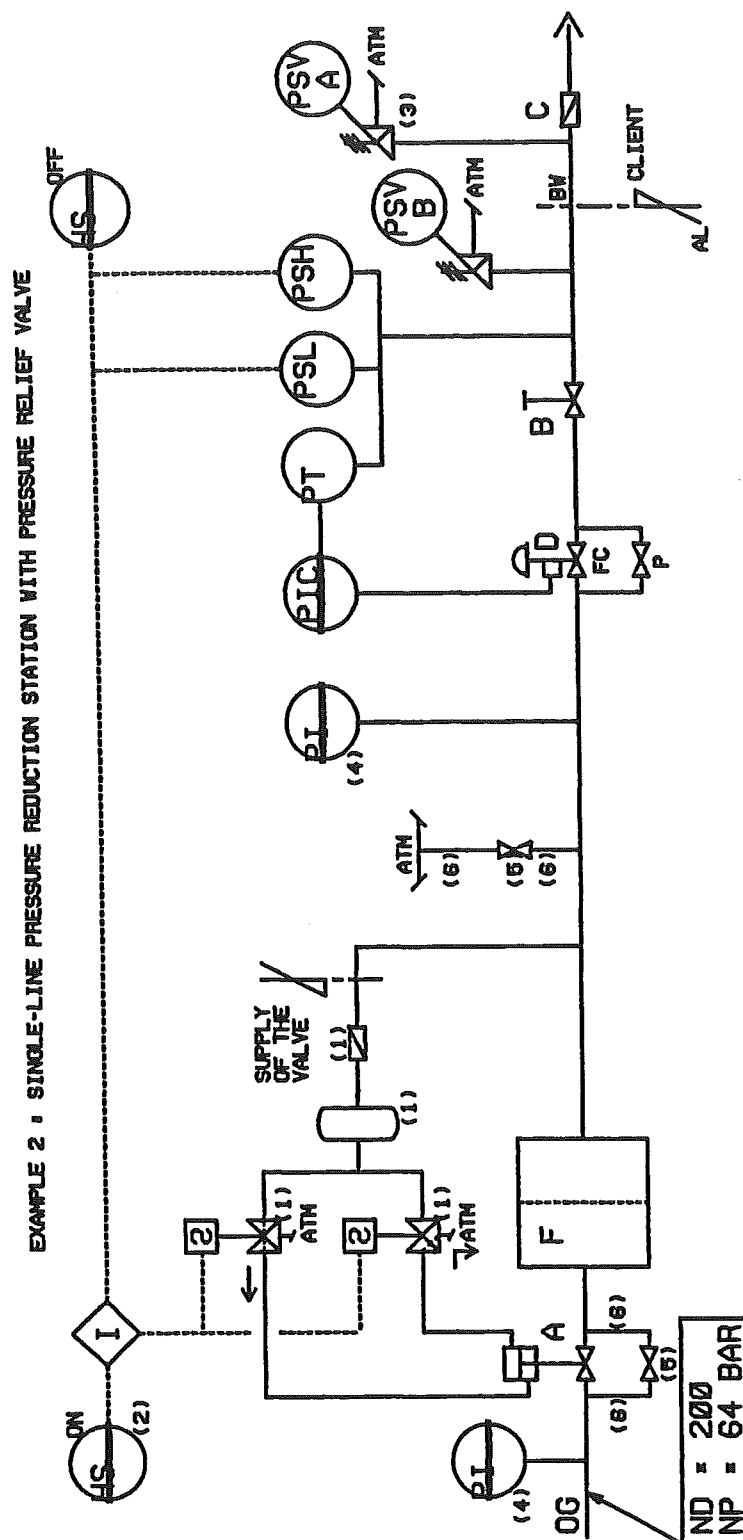
- A - AUTOMATIC EMERGENCY SHUTOFF VALVE
- B - MANUAL SHUTOFF VALVE
- C - CHECK VALVE
- D1 - 'SPHERAXIAL' PRESSURE REDUCER-REGULATOR TYPE 70-40 WITHOUT FLOW RATE
- D2 - SAFETY SHUTOFF DEVICE (MODEL 1" OR 2" 1/2" ACCORDING TO FLOW RATE)
- F1 - PILOT PRESSURE REDUCER-BACKPRESSURE REGULATOR TYPE D.79-LM/HP/OX
- F2 - CANDLE FILTER

LOGIC DIAGRAM - SEQUENCE 1 (ISA-S.5.2 SYMBOLIZATION)



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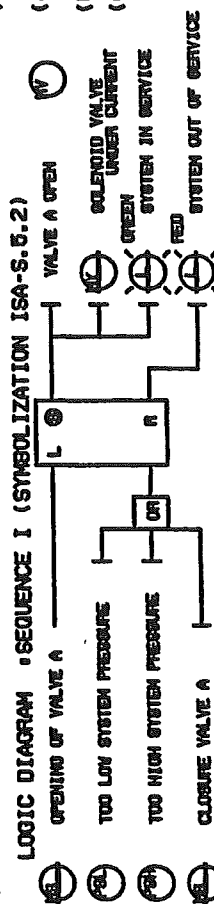


NOTES

- (1) SOLENOID VALVES, CAPACITY AND CHECK VALVE ALLOWING HANDLING OF THE VALVE IN CASE OF PRESSURE LOSS
- (2) RESET FROM CONTROL PANEL NEAR PIC CONTROLLER
- (3) POSITIONING AND DIMENSIONING ACCORDING TO UP AND DOWNSTREAM CONDITIONS
- (4) THE MANDRETS MUST BE REGROUPED ON THE CONTROL PANEL
- (5) ALL-BRONZE VALVE
- (6) STAINLESS STEEL OR COPPER PIPE

LEGEND

- A ■ AUTOMATIC EMERGENCY SHUTOFF VALVE
(WITH AUTOMATIC BY-PASS FOR PRESSURE EXCEEDING 15 BAR)
- B ■ MANUAL SHUTOFF VALVE
- C ■ CHECK VALVE
- D ■ PRESSURE REDUCING CONTROL VALVE
- F ■ CANDLE FILTER

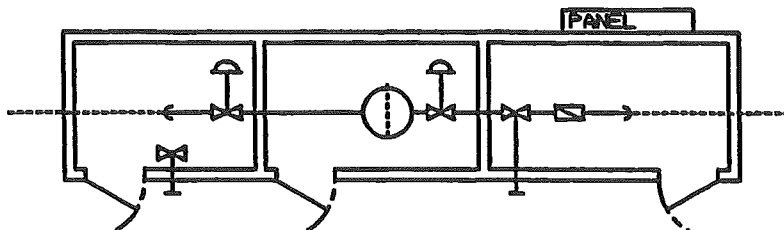




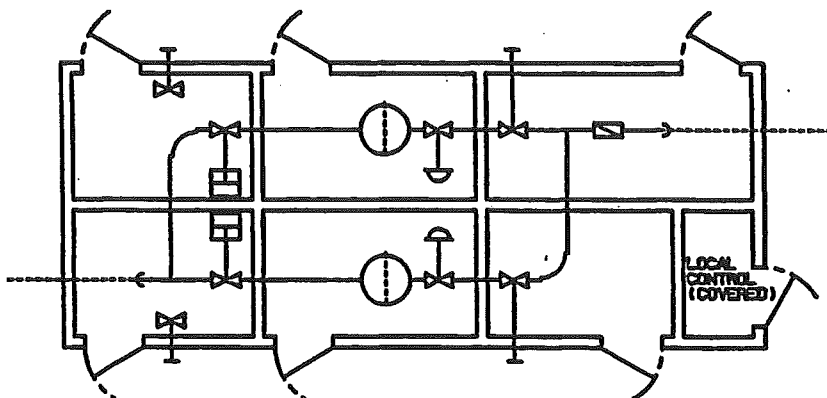
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1 - SINGLE-LINE STATION WITH ANTI-PANIC DOORS



2 - DOUBLE-LINE STATION WITH ANTI-PANIC DOORS



3 - DOUBLE-LINE STATION WITH ACCESS Baffles

