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Pneumatic switch cabinet „PNEUMAT”

Complies with EN ISO 7396-1

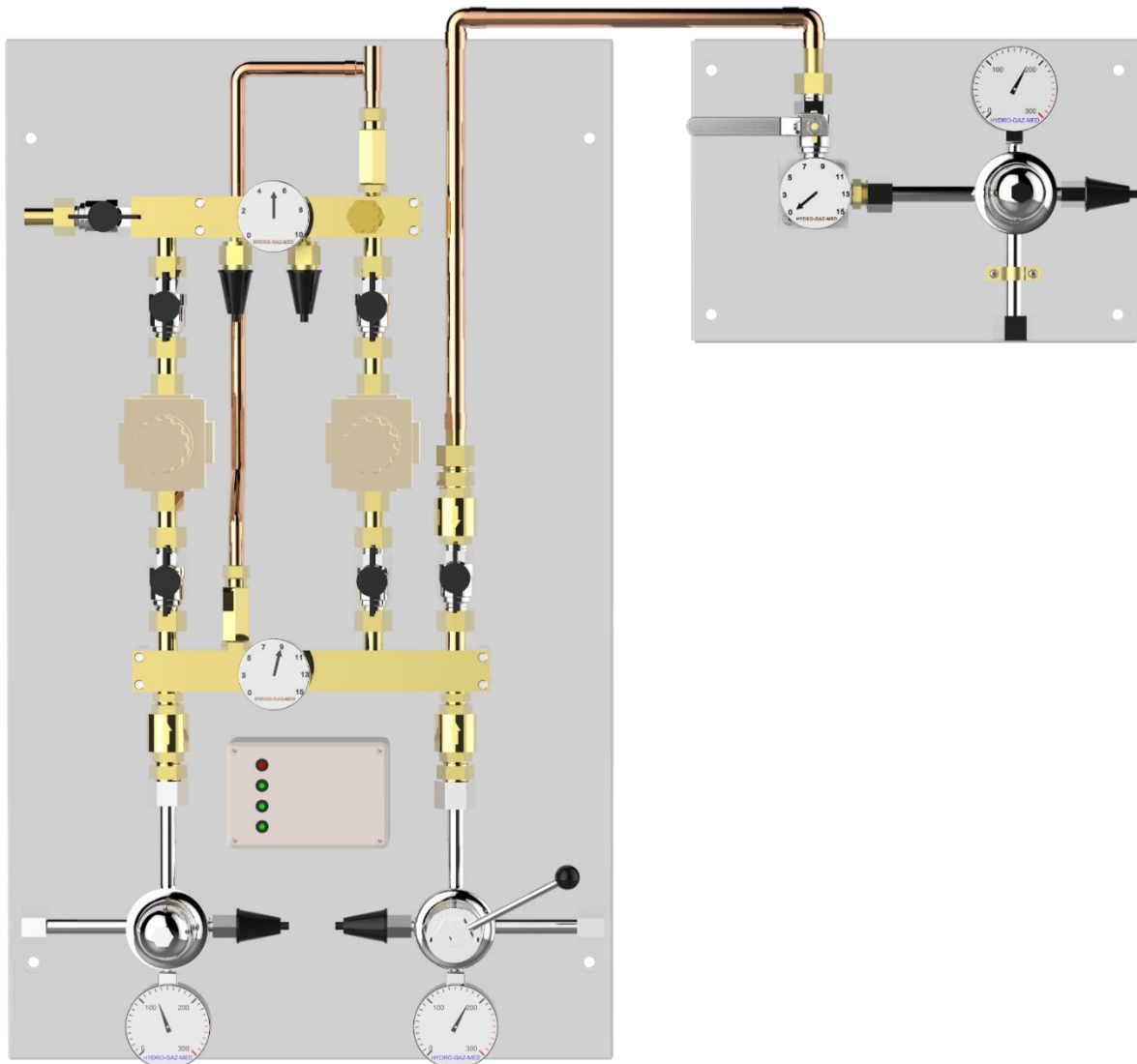


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1. Application

The device is designed to supply the compressed medical gases to central pipeline system and is a medical device of class IIb.

PNEUMAT central supply panel ensures a continuous supply of medical gases (oxygen, nitrous oxide, compressed air, carbon dioxide and other compressed medical gases). According to PN-EN ISO 7396-1 standard, the system is designed for two sources of supply + back-up supply. It consists of two components:

- PNEUMAT central supply panel,
- PNEUMAT back-up panel

Pneumatic switching system controls and monitors the supply of gas to the distribution system, while reducing the pressure of cylinder batteries.

2. Technical specification

Construction: double, two-stage pressure reduction with pneumatic switching system, pressure relief valves for primary medium pressure of I grade and secondary working pressure, NIST emergency supply point.

The possibility of adding third reserve bank.

Dimensions: PNEUMAT Reduction Plate	700x400x150 (WxHxD)
Weight:	ca. 15 kg
Dimensions of PNEUMAT back-up panel:	350x280x150
Weight of back-up panel:	2 kg
Capacity:	30 Nm ³ /h
Inlet:	G1/2"
Inlet pressure:	max. 200 bar
Outlet pressure:	4.5 – 5.5 bar
Outlet:	copper pipe Ø 15 mm
Relief valves:	copper pipe Ø 12 mm
Signalisation in the box on the panel	12 V DC,
Cross-section of the power cord:	2 x 0.75 mm ²
Cord to remote alarm unit (optional):	4-pair UTP or FTP wire coil

Working pressure of the reducers

Right high pressure reducing valve:	10 bar
Left high pressure reducing valve:	9 bar

High pressure reducing valve on back-up panel:	7.0 bar
Network reducers:	4.5 to 5.5 bar

Media

Oxygen

Nitrous oxide

Carbon dioxide

Compressed air

Nitrogen

Argon

3. Work description

PNEUMAT central supply panel has been designed to ensure the continuity of supply of gas delivered in steel or aluminium cylinders under high pressure.

Gas is supplied from the cylinder through the high pressure collector to the change-over system. High pressure in the cylinder is reduced in two stages. Two high pressure reducers, reduce the high pressure from the cylinder to a medium pressure. The reducer from the left side is set to a pressure of 9 bars, and the right one to 10 bars. Primary pressure section is equipped with a relief valve which opens at a pressure of 11 bars.

The average pressure is reduced by two low pressure reducers to the network pressure. Each reducer has a capacity that corresponds to the rated output of the system, e.g. if one of the reducers is removed or being serviced, the system continues to work with the nominal capacity. When the pressure in the network exceeds 7 bars, the relief valve opens.

Maintenance Connection Point (NIST) allows supplying the network from a cylinder fitted with a pressure regulator and the hose with a NIST-connector in the event of failure or maintenance.

During the emergency supply the relevant shut-off valves are closed, and when the failure is removed or maintenance work is completed the system must be restarted as per "First start-up" section.

During normal operation, a switching system is powered by one battery, while the other is available as a back-up supply. The automatic switching system is based on the differential pressure at the left side and the right side. Changing the sequence of operation takes place at differential pressure of minimum 1 bar. Differential pressure closes the non-return valve from the opposite side and the system is automatically supplied by other battery.

NOTE: The system operates at the proper pressure setting of high pressure reducers, differential pressure of minimum 1 bar with the primacy of work of the right side.

No gas collection within 48 hours may result in an increase of pressure in the network.

4. Installation

The installation can be performed only by trained personnel.

Only copper tubes for medical gases can be used for installation.

Tests and acceptance protocols for the system must be kept.

All pipes and connections must be free of oil and grease!

Checklist:

1. Securing the plate to the wall
2. Securing of cylinder batteries to the wall
3. Connection of the cylinder batteries to reduction plate
4. Pulling out of ventilation tubes from the relief valves (*does not apply to compressed air*) and cylinder batteries outside, air pipes de-pressurizing cylinder batteries and relieving pressure from the panel must be run separately
5. After completion of installation, blow the whole system.

5. Signalization

5.1 Information on the panel.

Supply should be connected to the junction box on the panel with a 2 x 0.75 mm² 12V DC cord.

NOTE!

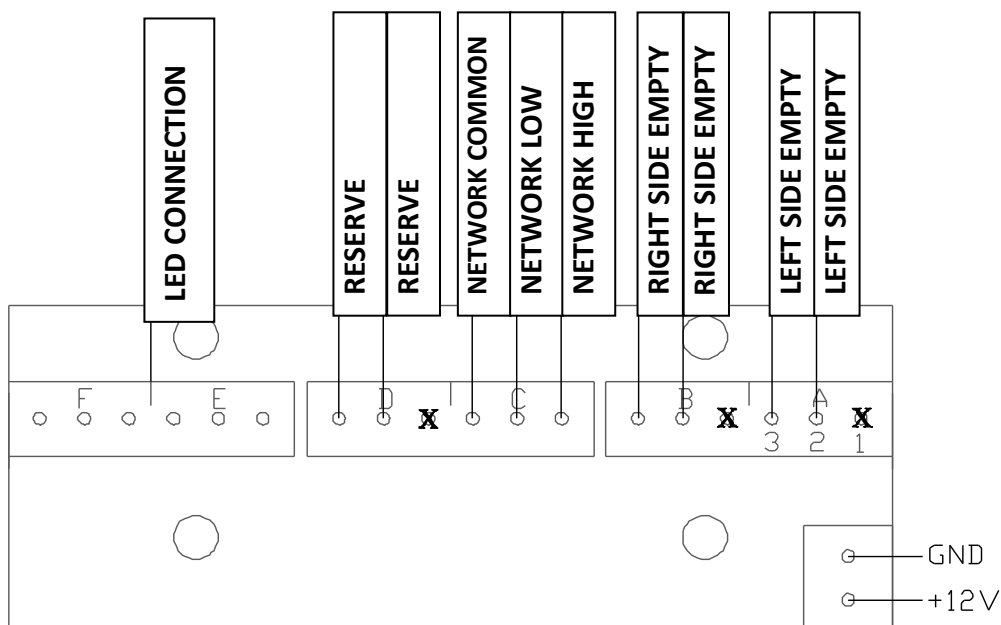
Improper polarity may result in damage to the electronics!

The panel is equipped with a simple visual system to indicate the status of gas in cylinders by using LEDs. If the green LED lights, everything is normal. If any of the LED goes out, red LED automatically starts flashing to indicate an emergency situation.

2 x 0.75 mm² cable from the pressure sensor on the back-up panel should be supplied to the junction box and connected according to the scheme.

If all green LEDs light up and red LED flashes, it indicates improper pressure on the network.

5.2 Description of the connection of wires from the sensors



5.3 Remote alarm unit

5.3.1 Description of on-plaster alarm unit

Remote alarm unit is equipped with LCD touch screen on which TEST button is placed, used for periodical check of the correct operation of the audio and visual signal.

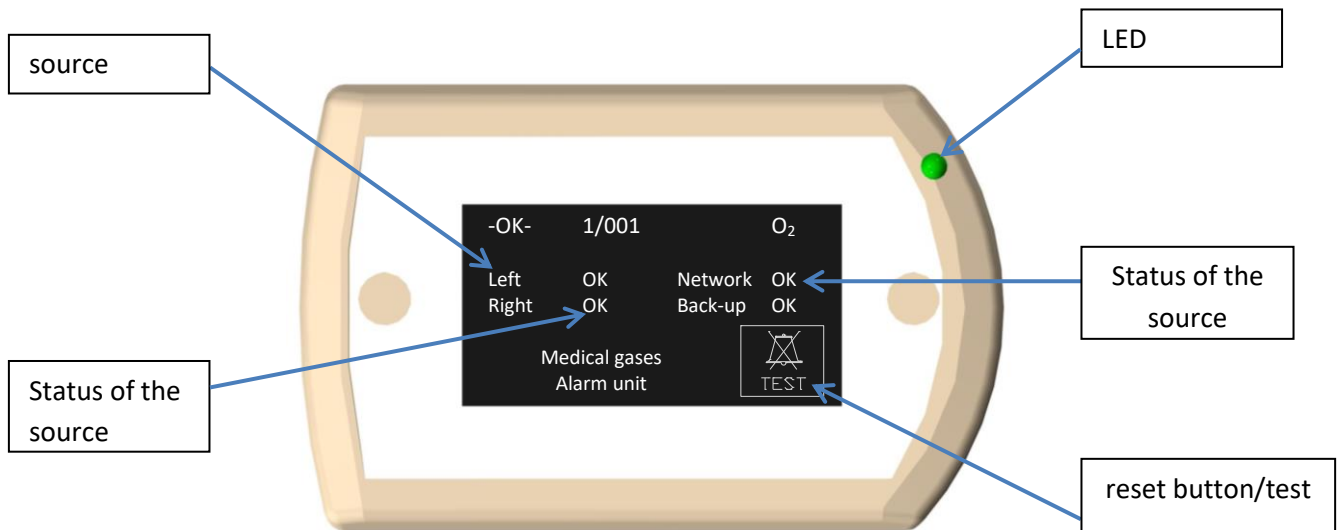
On the cover there is a two-colour LED from the visual signal. In the event of a low-pressure alarm of any of the gases, LED is blinking red, in the event of a high-pressure alarm, the diode is blinking green.

In case of any alarm, also audio signal may be heard.

To silence the audible alarm it is required to touch the bell icon, after a period of 15 minutes an audible signal returns. Alarm disappears intrinsically when the pressure is back to normal.

During normal operation green LED is permanently lit.

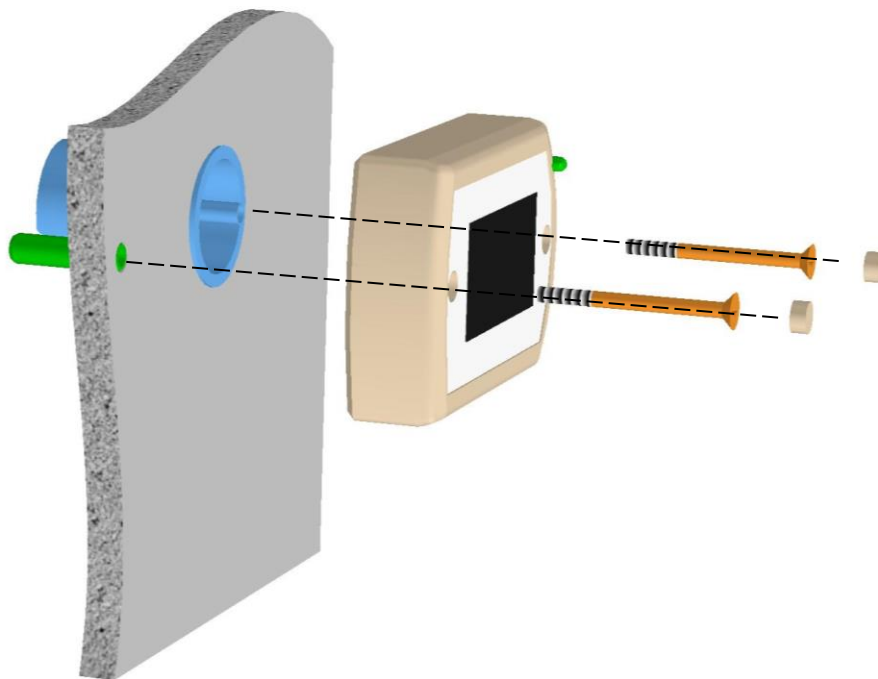
5.3.2 Description of the display of alarm unit



5.3.3 Installation of remote alarm unit

Along with the alarm unit, the following is supplied:

- Flush-mounted junction box
- Screws + dowel
- Hole plugs for the mounting holes



5.3.3.1 Installation Procedure

1. Install a junction box
2. Screw the alarm unit using the supplied screws into the hole in the junction box
3. Mark the position of the second hole
4. Drill a hole and insert the dowel
5. Prepare the signalling cable (*see point 9.3.2*)
6. Cable to protrude max. 5-8 cm from the wall
7. Put the plug into alarm unit
8. Affix the alarm unit with supplied screws
9. Insert the supplied hole plugs in the holes for the screws

5.4 Remote alarm unit flush-mounted version

Features: displays information about the status of the monitored gases and visual and acoustic signalisation of the alarm conditions. Remote alarm unit operates in the same way as the alarm unit installed in the box.

Power consumption: < 250 mA

Length: 180 mm

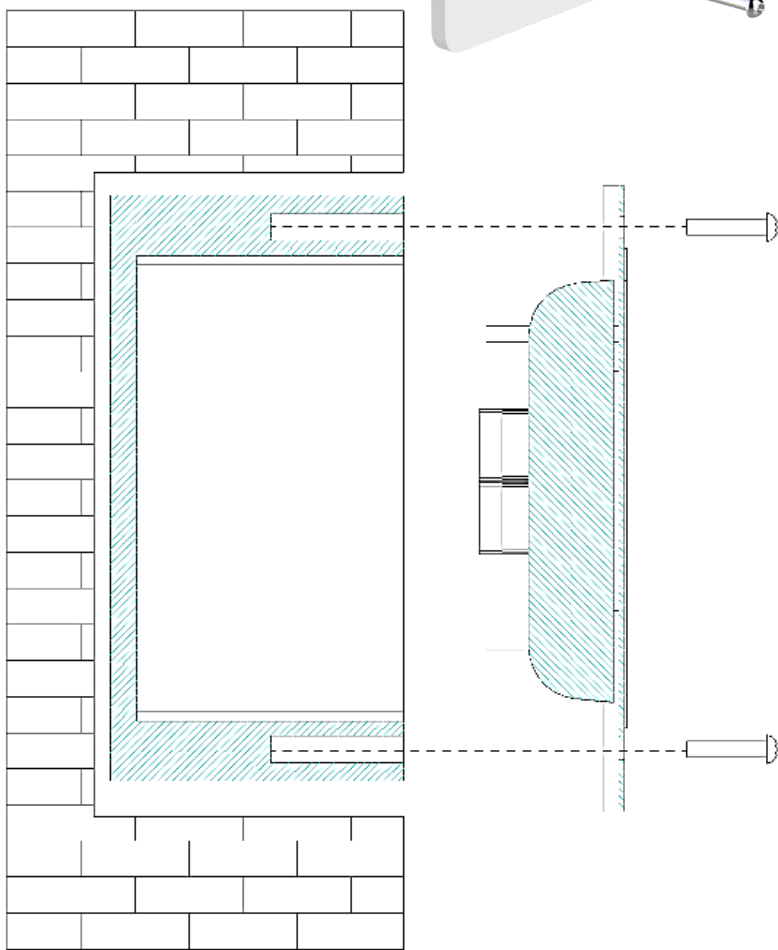
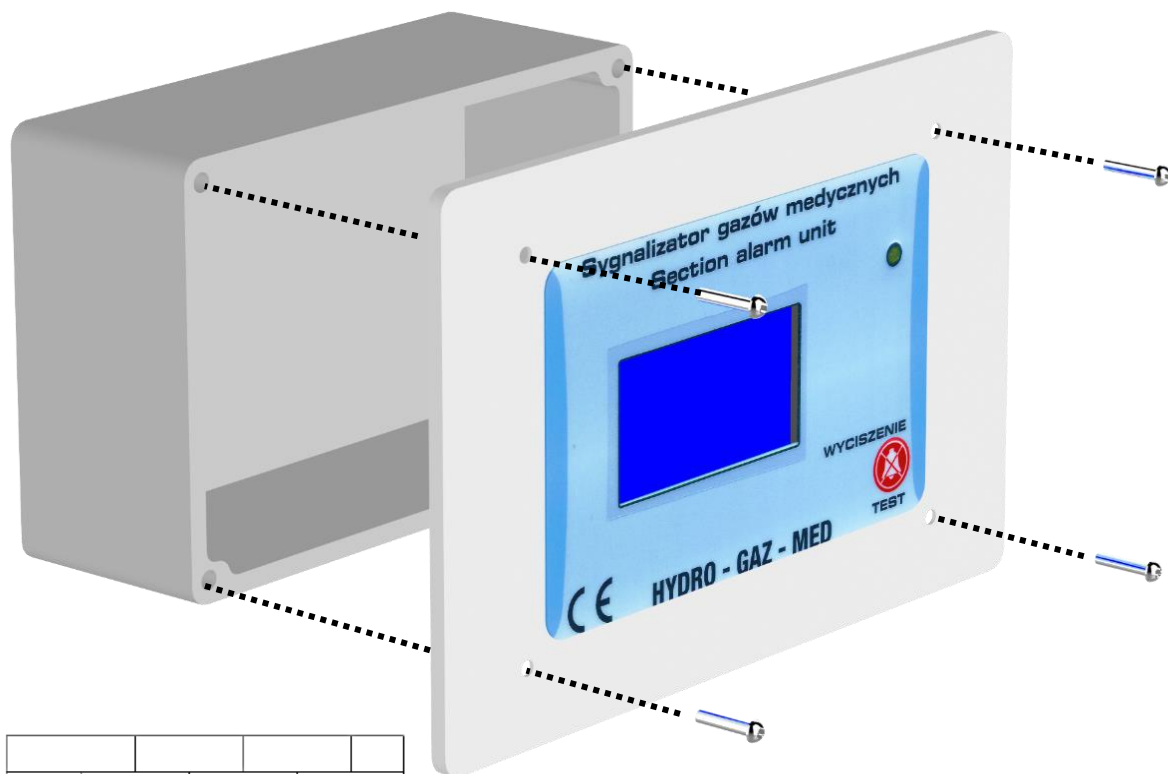
Width: 90 mm

Height: 42 mm

Weight: ca. 200 g



5.4.1 Installation of flush-mounted remote alarm unit



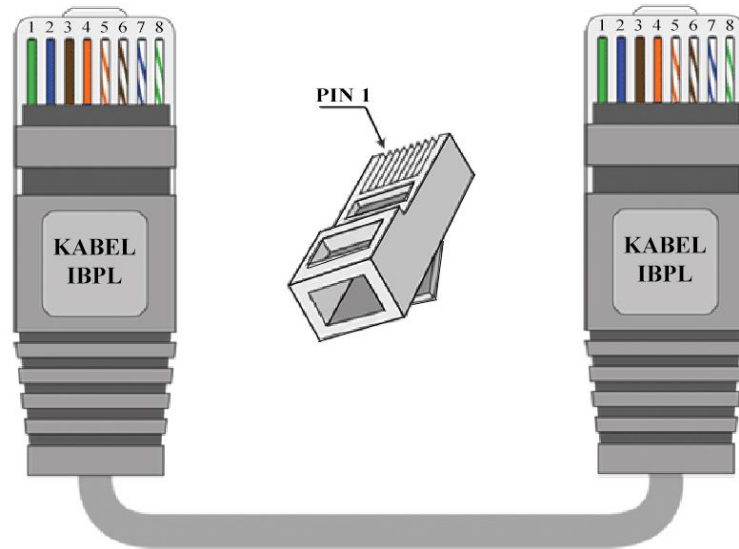
5.5 Connecting cables

In order to connect the remote alarm unit (mounted in the operating room or ICU, etc.), use a standard UTP or FTP cable (twisted-4-pair wire Category 5 or higher). All transmission cables must be terminated with the typical RJ-45 connectors. Connecting cables do not have interlaces.

Junction box on PNEUMAT panel contains four RJ-45 slots for connecting transmission cables. The cable connected to the remote alarm unit or BMS system should be affixed to slots closer to the edge of the housing. The cable that is connected to a computer with BMS/SCADA or similar system, and/or transmission cable to another valve and meter box should be affixed to slots closer to the center of the housing. If the slots are not used to connect the transmission cable, **IBPL-T1** terminator must be placed in them.

Diagram of the cable and recommended wire colours:

- | | | | | |
|---|--------------|-------|--------------|----------------|
| • | PIN 1 | ————— | PIN 1 | - green |
| • | PIN 2 | ————— | PIN 2 | - blue |
| • | PIN 3 | ————— | PIN 3 | - brown |
| • | PIN 4 | ————— | PIN 4 | - orange |
| • | PIN 5 | ————— | PIN 5 | - orange-white |
| • | PIN 6 | ————— | PIN 6 | - brown-white |
| • | PIN 7 | ————— | PIN 7 | - blue-white |
| • | PIN 8 | ————— | PIN 8 | - green-white |



Too short transmission cables can be extended by combining them with a use of **adapters**, and in each empty slot of the **adapter** there must be a terminator.

The plug is placed in the rear panel of the alarm unit.

Information messages on a remote alarm unit:

- Left OK - correct status
Left MIN - left battery empty (*below 10 bars*)
- Right OK - correct status
Right MIN - *right battery empty (below 10 bars)*
- Network OK - correct status
Network MIN - too low pressures in the network (*below 4 bars*)
Network MAX - too high pressures in the network (*over 6 bars*)
- Back-up OK - correct status
Back-up MIN - back-up empty (*cylinders pressure below 10 bars*)

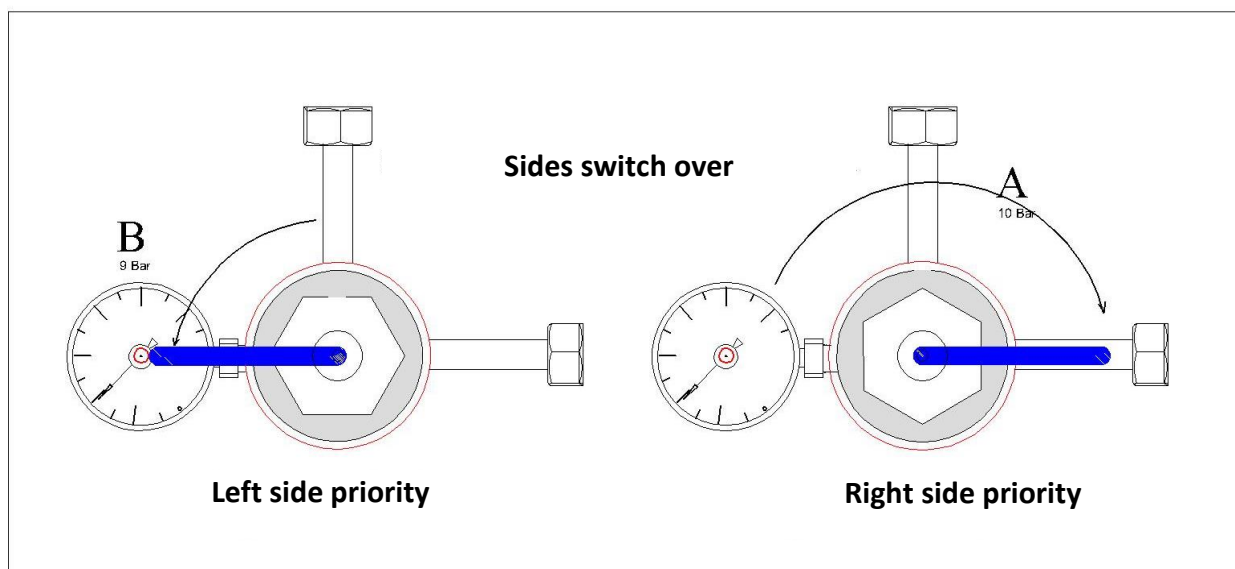
6. First start-up

Prior to commissioning, the system must be vented, all shut-off valves must be closed.

Installation must be finished completely!

Slowly open the main valves on the cylinder batteries.

1. Move the lever that indicates the priority of sides to the right until the end;



2. Slowly open the cylinder valves.
3. Observe the pressure on the I degree pressure gauge, it must be constant and equal to 10 bars.
4. Wait about one minute, if the pressure is correct;
5. Close the valve on the cylinder and de-pressurize the collector;
6. Switch the lever to the left;
7. Open the valve on the left side of the cylinder
8. The pressure on the I degree pressure gauge should be about 1 bar lower and equal to 9 bar.
9. If after 1 minute the pressure does not change, perform steps 1-3.

NOTE: In case of a too-small differential pressure, it is possible to de-pressurize both sides.

10. If the pressure increases slowly, the reducer must be checked.
11. Open the low-pressure valves (the lines operate independently)
12. Observe the pressure on the II degree pressure gauge, it must adjust to the network pressure and remain constant.

NOTE: If the pressure increases slowly, check the reducer

13. Slowly open the valve to let the gas into the installation.
14. Observe the pressure on the II degree pressure gauge; it must adjust to the network pressure.
15. The pressure in the network is controlled by the setting knobs on the network reducers.

7. Maintenance/emergency terminal.

NIST connection has been used; in the event of use, the back-up cylinder with reducer set to working pressure should be connected.

The valves of II degree reducers must be closed.

8. Maintenance / Inspection

8.1 Inspection

The whole gas distribution system should be subjected to a visual inspection at regular intervals; the inspection should be carried out by qualified personnel checking the functions and pressure conditions.

8.2 Maintenance

System maintenance is recommended every 12 months and may be carried out only by qualified technical personnel. It includes among others: checking pressure conditions, leak tightness of screwed connections, and leak tightness of valves. All service parts should be replaced every 5 years.

If any parts need to be removed for repair or maintenance, appropriate shut-off valves before and after the part should be closed. Doubled construction of the reduction plate will ensure continuous supply of gas to the network, without the need for additional adjustment of the reducers.

If the system must be dismantled for a short time (repair, periodic replacement of the parts), it is possible to feed the system by the emergency supply point. During the emergency supply, the supply network valve remains open. To restart the system, please follow the installation instructions.

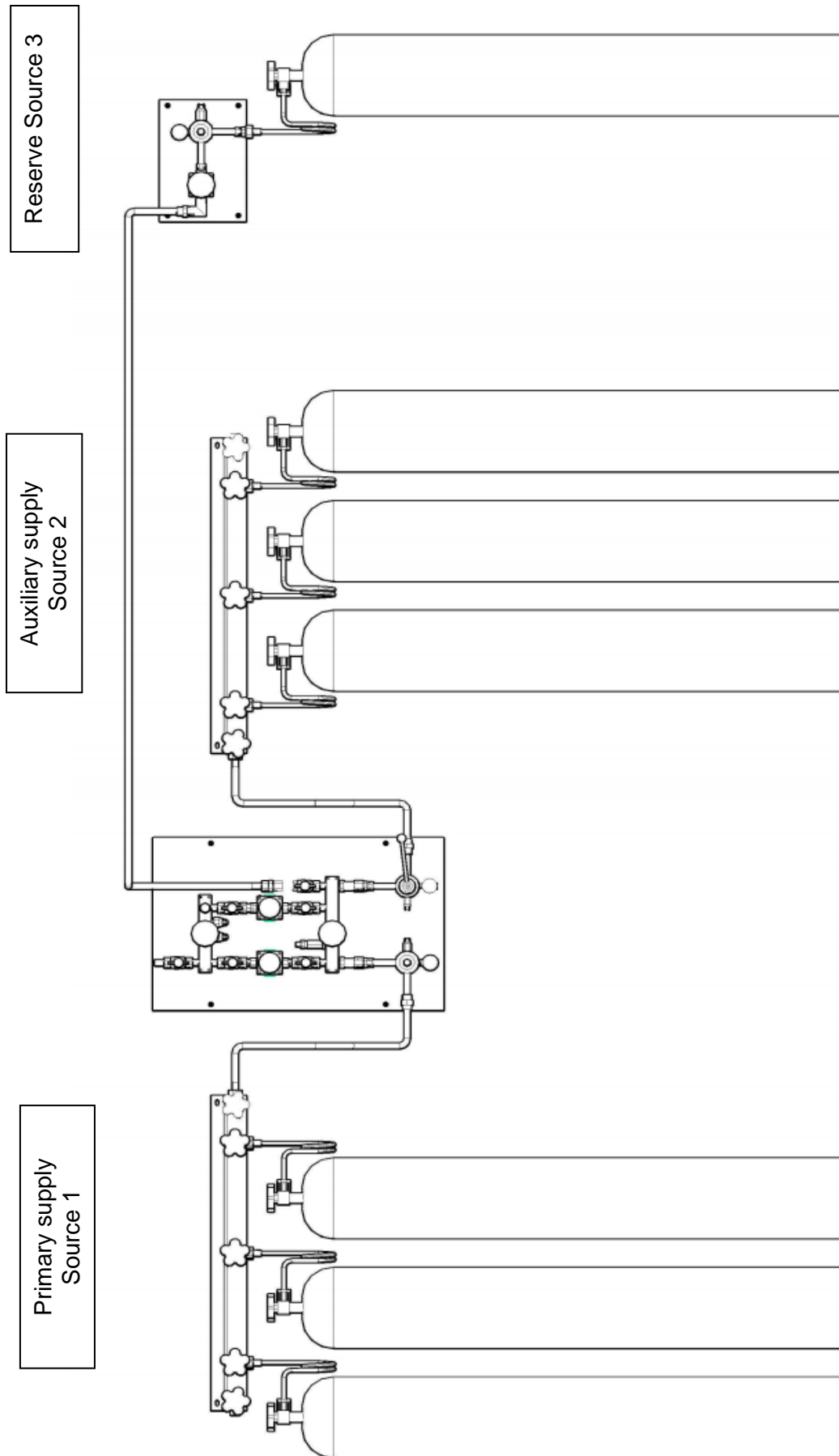
8.3 List of spare parts:

- | | |
|---|---------------------|
| 1. Maintenance kit for high pressure reducer - | cat. no.: ZNRB12 |
| 2. Maintenance kit for the network reducer - | cat. no.: ZNRS12 |
| 3. The relief valve 11 bars - | cat. no.: ZNAD11B |
| 4. The relief valve 7 bars - | cat. no.: ZNAD7B |
| 5. NIST connection – | cat. no.: NIST- (x) |
| (in place of (x), enter the symbol of gas: O2 - Oxygen, AIR-air, N2O - nitrous oxide, CO2 - carbon dioxide, N - nitrogen, AR - argon) | |
| 6. Left side high pressure contact sensor- | cat. no.: CZK200BL |
| 7. Right side high pressure contact sensor- | cat. no.: CZK200BP |

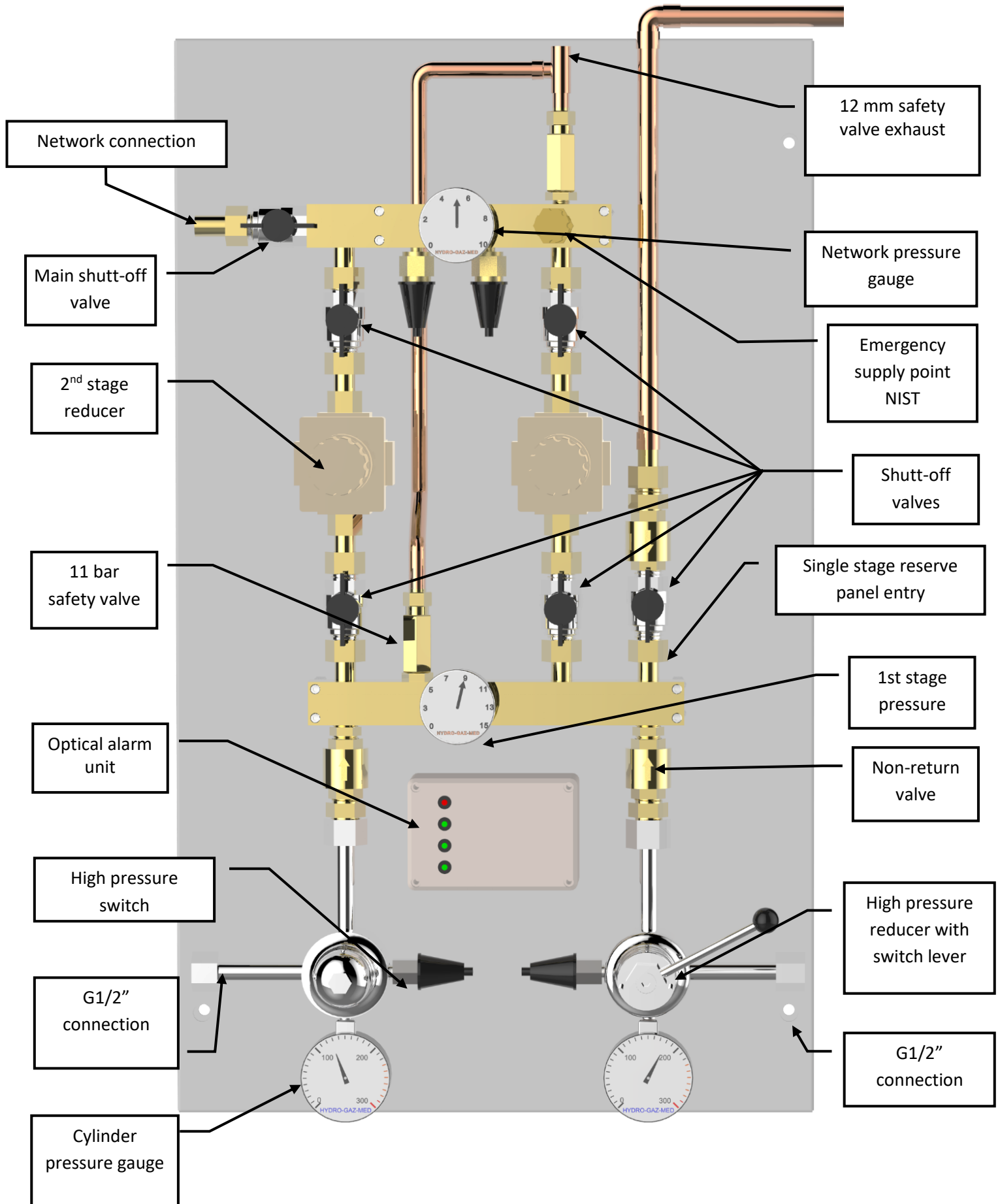
8.4 A list of service points

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9. Diagram of "PNEUMAT" supply system

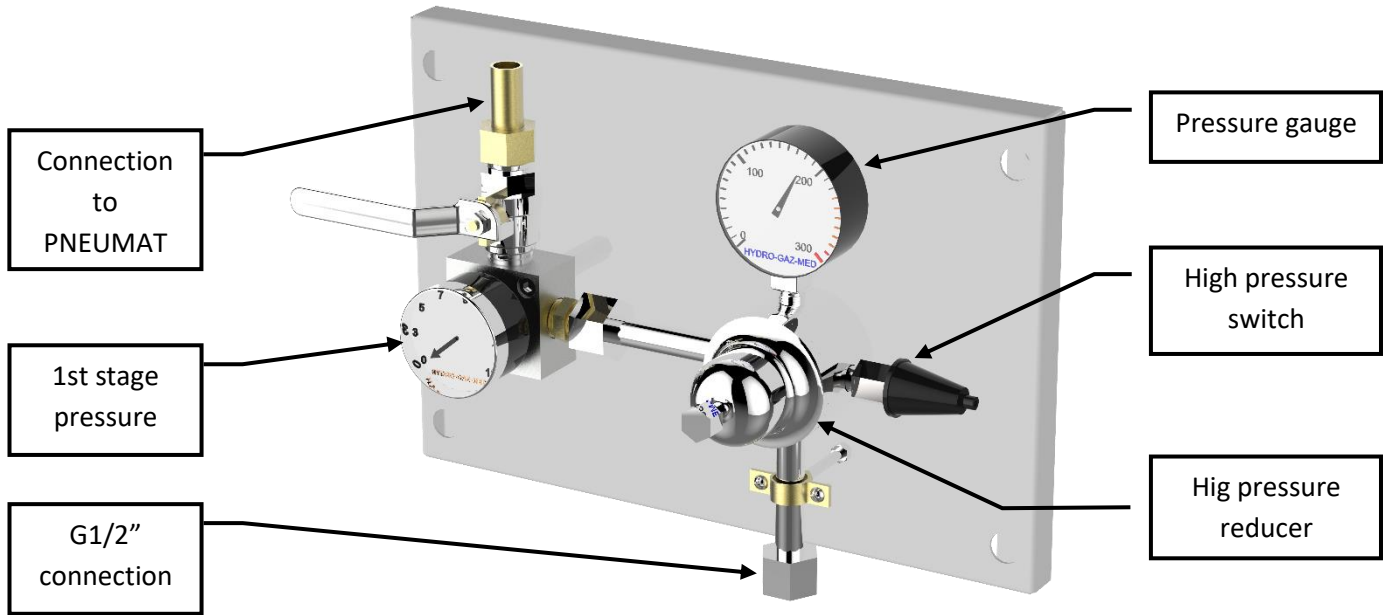


10. CONSTRUCTION DRAWING



11. Single stage reserve panel

Meant to reduce pressure from high pressure cylinder reserve and supply pipeline network. It is meant to be connected to PNEUMAT switch cabinet which serves as second stage reduction.



12. Double stage reserve panel.

Meant to reduce pressure from reserve cylinders and can be connected directly to hospital network bypassing PNEUMAT.

This panel can be used ie: to reduce pressure from back-up cylinders in compressed air system.

