



G.Samaras S.A.
medical gas systems

**MEDICAL GAS SYSTEMS
SPECIFICATIONS**





MEDICAL GAS SYSTEMS REQUIREMENTS

The installation operations should be executed by specialized personnel, that holds a license for implementing medical gas systems and corresponding electricians for the electrical connections, under the supervision of electrical - mechanical engineers, ensuring the right installation in compliance to the following regulations:

- **ISO 7396-1:2002 (replacing EN 737 - 3)**
- **ISO 7693/87**
- **HTM 02.01 (replacing HTM 2022)**
- **Directives of National Pharmaceutical Organization**

The required testing of the network and the rest of the installation facilities will be executed according to these regulations and standards.

The materials that are listed below are suitable for medical gases installations and comply with the corresponding International regulations which are accompanied by conformance certificates CE. The CE marking certifies the following products' conformity with essential requirements set out in European Directives.

The materials are accompanied by the following certificates:

1. Certificate ISO 9001/2000 for "**Design, production, quality control and installation of medical gas and vacuum supply systems and hospital equipment**".
2. Certificate ISO EN 13485/2003 for "**Design, production, quality control and installation of medical gas and vacuum supply systems and hospital equipment**".
3. Certificate of conformity CE, transposing annex II of Directive 93/42/EEC for medical devices

For all the devices listed below, there is permanent deposit and availability of spare parts for maintenance and repair.

The operation control and the installations maintenance will be applied based on written directives and tables in English, which will be delivered to the maintenance team of nursing unit after the completion of installations. Finally, there will be training for maintenance personnel of the nursing unit.

**COPPER NETWORK**

Copper pipes will be in accordance with the EN13348 standard and with DIN 1786 and DIN 17671, type R290 (SF Cu / F37), arsenic free, oil free, protected to their ends, characterized according to the regulations for use in medical gases installations using silver welding of 40% content in silver, in neutral gas (N₂) environment.

The pipe flexions are permitted up to diameter of 18mm according to the standard EN13348 and regulations DIN 1786 by using a special tool.

The copper fittings will be oil free, suitable for medical gases installations and according to DIN 2856 and ISO 2016.

The characterization of networks becomes with special self-adhesive stripes of various colors and signs that are indicated by EN 737-3 standard.

The network testing will be in accordance to EN 737-3 standard.

	Copper pipe
1	Copper pipe Ø10x1mm
2	Copper pipe Ø12x1mm
3	Copper pipe Ø15x1mm
4	Copper pipe Ø18x1mm
5	Copper pipe Ø22x1mm
6	Copper pipe Ø28x1mm
7	Copper pipe Ø35x1,5mm
8	Copper pipe Ø42x1,5mm
9	Copper pipe Ø54x2,0mm
10	Copper pipe Ø64x2,0mm
11	Copper pipe Ø76x2,0mm
12	Copper pipe Ø89x2,0mm
13	Copper pipe Ø108x2,5mm

**ANTISTATIC TUBES**

The antistatic tubes are used, according to ISO 7396-1, in specific departments (MRI where there is a demand for non magnetized materials), as flexible connection between pendants (surgeon, anesthesiologist, ICU) and suspended BHU and the medical gases network. Normally installed using hose clamps on stainless or brass fittings and shut-off valves to the end of the copper pipe.

The antistatic tubes are manufactured according to **EN 739:1998** by PVC materials free of cadmium.

There is different color for every antistatic tube according to the medical gas that is used for.

no	Gas	Color	Dimension	Operating pressure	Testing pressure	Operation temperature	Weight (gr/m)
1	Oxygen	White	Ø13,4x6,4mm	10bar	45bar	-10°C to +60°C	130
2	Air 4bar, Air 8bar	Black	Ø13,4x6,4mm	10bar	45bar	-10°C to +60°C	130
3	Vacuum	Yellow	Ø13,4x6,4mm	10bar	45bar	-10°C to +60°C	130
4	Nitrous Oxide	Blue	Ø11,5x5mm	10bar	45bar	-10°C to +60°C	130

Manufacturing standards:

BS 2050 : 1978 (1996) specification for electrical resistance of conducting and antistatic products made from flexible polymeric material.

BS 5682 : 1984 (1992) specification for terminal units, hose assemblies and their connectors for use with medical gas pipeline systems.

EN 739 : 1998 Low pressure hose assemblies for use with medical gases and the latest specification EN ISO 5359:2008.

Testing procedures:

BS EN ISO 7751 : 1997 Rubber and plastic hoses and hose assemblies. Ratios of proof and burst pressure to design working pressure.

BS EN 24671 : 1993 Rubber and plastic hose and hose assemblies. Methods of measurement of dimensions.

ISO 2883 : 1991 Rubber vulcanized antistatic and conductive products for industrial use. Electrical resistance limits.



TWO-PART OUTLETS
FOR O2 - N2O - AIR - VACUUM – COMPRESSED AIR ACCORDING TO EN 737-6:2003

Outlets are installed at the final delivery points in a medical gas pipeline system. They are used by personnel to supply the various different gases using special quick-action connection fittings. Installation must be performed according to the following descriptions. Rigorous inspection prior to start-up must make sure that each outlet delivers the gas for which it has been built and installed. These outlets are used at 3.5 bar Pressures.

TECHNICAL DESCRIPTION

Two-part outlets are composed of the base part and the finishing part

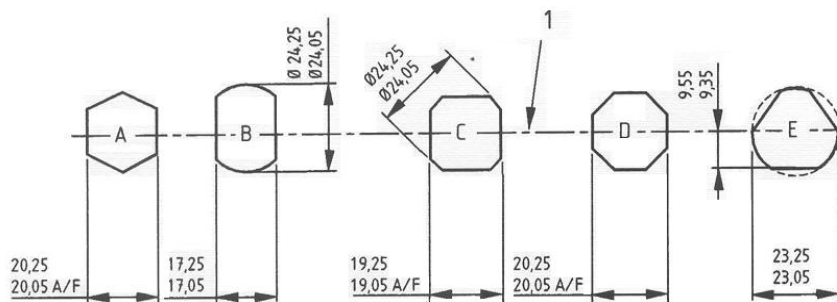
The base part made of chrome-plated brass, is consisted of:

- Automatic shut-off valve for maintenance to permit replacement of the finishing part without having to interrupt gas delivery to other outlets
- Threaded inlet connection, specific for each type of gas, complete with nut, mouthpiece and copper tube suited for braze-welding to the pipeline system
- Threaded outlet connection, specific for each type of gas, for connection to the finishing part

The finishing part made of chrome-plated steel, equipped with:

- Threaded inlet connection, different for each type of gas, complete with OR seal ring
- Automatic spring-operated valve and filter;
- Outlet connection with different connection fitting for each type of gas.

PROFIL	A	B	C	D	E
Probe and gas-specific connection point number					
1	NFU	Nitrous oxide	NFU	Carbon dioxide	NFU
2	Not assigned	NFU	O ₂ / N ₂ O 50/50 % (V/V)	NFU	Nitrogen (tool drive)
3	NFU	NFU	NFU	Vacuum	NFU
4	Oxygen	NFU	Medical Air	NFU	Air (tool drive)
5	NFU	NFU	NFU	Not assigned	NFU





TWO-PART OUTLETS

FOR O2 - N2O - AIR - VACUUM – COMPRESSED AIR ACCORDING TO DIN 13260-2 STANDARDS

Outlets are installed at the final delivery points in a medical gas pipeline system. They are used by personnel to supply the various different gases using special quick-action connection fittings. Installation must be performed according to the following descriptions. Rigorous inspection prior to start-up must make sure that each outlet delivers the gas for which it has been built and installed. These outlets are used at 3.5 bar Pressures.

TECHNICAL DESCRIPTION

Two-part outlets are composed of the base part and the finishing part

The base part made of chrome-plated brass, is composed of:

- Automatic shut-off valve for maintenance to permit replacement of the finishing part without having to interrupt gas delivery to other outlets;
- Threaded inlet connection, specific for each type of gas, complete with nut, mouthpiece and copper tube suited for braze-welding to the pipeline system;
- Threaded outlet connection, specific for each type of gas, for connection to the finishing part;

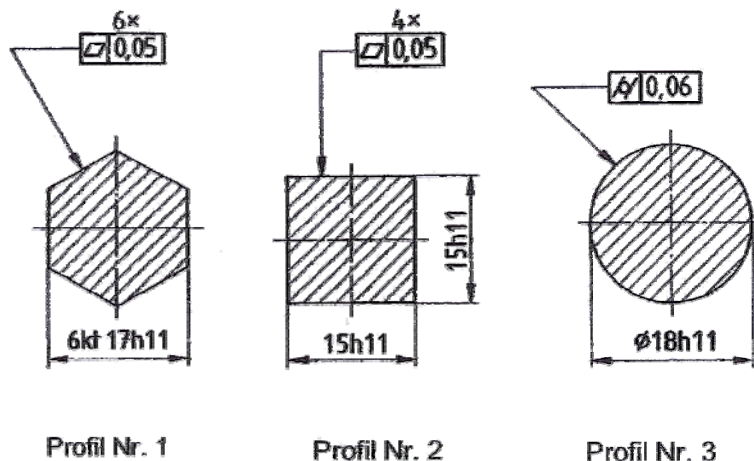
Disposable closing plug,

- Terminal for connection to the equipotential system;
- Screws for fastening the base part to the frame or to a technical panel.
- Base part is installed inside a: plastic frame, for installation embedded in wall masonry, complete with protective cover.

The finishing part made of chrome-plated steel, equipped with:

- Threaded inlet connection, different for each type of gas, complete with OR seal ring;
- Automatic spring-operated valve and filter;
- Outlet connection with different connection fitting for each type of gas.

Gas	P/N	A	Color	P	D4
Air	VGTD-A4	M20x1,5S	black-white	15 square	14
Oxygen	VGTD-O	M22x1,5D	white	17 hexagon	14
Nitrous oxide	VGTD-P	M16x1,5D	blue	Ø18 circle	12
Vacuum	VGTD-V	M24x1,5D	yellow	15 square	12



TWO-PART OUTLETS



FOR O2 - N2O - AIR - VACUUM ACCORDING TO AFNOR NF 90-116 STANDARDS

Outlets are installed at the final delivery points in a medical gas pipeline system. They are used by personnel to supply the various different gases using special quick-action connection fittings. Installation must be performed according to the following descriptions. Rigorous inspection prior to start-up must make sure that each outlet delivers the gas for which it has been built and installed. These outlets are used at 3.5 bar Pressures.

TECHNICAL DESCRIPTION

Two-part outlets are composed of the base part and the finishing part

The base part made of chrome-plated brass, is composed of:

- Automatic shut-off valve for maintenance to permit replacement of the finishing part without having to interrupt gas delivery to other outlets;
- Threaded inlet connection, specific for each type of gas, complete with nut, mouthpiece and copper tube suited for braze-welding to the pipeline system;
- Threaded outlet connection, specific for each type of gas, for connection to the finishing part;
- Disposable closing plug,
- Terminal for connection to the equipotential system;
- Screws for fastening the base part to the frame or to a technical panel.
- Base part is installed inside a: plastic frame, for installation embedded in wall masonry, complete with protective cover.

The finishing part made of chrome-plated steel, equipped with:

- Threaded inlet connection, different for each type of gas, complete with OR seal ring;
- Automatic spring-operated valve and filter;
- Outlet connection with different connection fitting for each type of gas.

2 CONNECTIONS

Vacuum	A=8,1 B=7,1
Compressed air	A=7,1 B=8,0

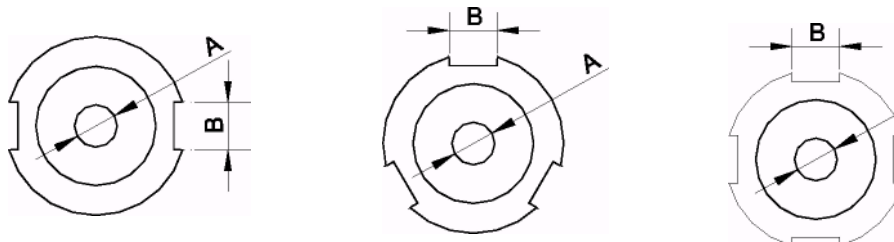
OUTLET WITH

3 CONNECTIONS

Oxygen	A=7,1 B=7,0
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4 CONNECTIONS

Nitrous oxide	A=7,1 B=7,0
Nitrogen	A=8,1 B=5,5



SHUT- OFF VALVES



General

The range of Medical gas line ball valve assemblies is supplied for use in plant rooms and for isolating areas. For example:

- Entry of Medical gas/vacuum main distribution systems into buildings
- ASVU boxes
- Industrial air outlets

Medical gas line ball valve assemblies provide a full bore flow and are operated by a manual operating lever selected through 90 deg. A full range of sizes is available and their design ensures ease of installation and negates the use of PTFE tape or any other thread sealing medium.



The ball valves CIM312 G are certified by BG Technology in accordance with the European standard EN 331:1998 (Ec. Product Ident. N_i C87AR105). They are approved in accordance with the European standard for gas appliances (90/396/EEC). Manufactured in accordance with EN 29000 - ISO 9000 are suitable for gas at low pressure. Available in the following sizes: 15mm, 22mm, 28mm, 35mm 42mm, 54mm and 76mm and 108mm sizes

Figure 1: Medical gas line ball valve

Standards

Medical gas line ball valve assemblies provide a full bore flow and fully satisfy the pressure drop requirements of the United Kingdom Health Technical Memorandum No.22 (HTM 22). Each assembly is cleaned for oxygen service, fully tested prior to despatch and is individually packaged to provide maximum protection during transit and storage.

Valve assemblies

Valve assemblies incorporate a bright nickel plated brass body, manufactured in two strong well proportioned halves to provide an effective seal under pressure. The ball is manufactured from brass with a chrome plated mirror finish. PTFE is used as a sealing medium for both the ball and control pin gland. The thermal insulated stainless steel handle is both vibration and shock resistant. The valve body is especially finished to incorporate parallel threads which accommodate matching adaptors. Stainless steel bonded seals are fitted between each adaptor and the valve body to form an effective seal. Copper stub pipes with fittings complete the assembly which is brazed direct into the distribution system using pipeline connectors supplied.

Type locking devices



The locking device for use with a Medical gas line ball valve assembly consists of a brass locking cap, locking pin and a lock with keys. The locking cap is positioned over the handle control pin with the valve selected either fully open or fully closed. The locking pin is passed through the locking cap underneath the operating handle, securing the handle in the selected position. Fitting the lock prevents unauthorized valve selection.

Performance

Medical gas line ball valves provide a full bore flow, which fully satisfies the pressure drop criteria detailed in HTM 22. Performance specifications are detailed at Table 1.

Table 1: Line Ball Valve Specifications

Pipe Size (mm)	Ball bore (mm)	KVfactor
15	15	35
22	20	47
28	25	54
35	32	82
42	40	160
54	63	388
76	78	600
108	98	950

Note: The KV factor is the capacity in m3/hr at a pressure drop of 100 kPa (1 bar).

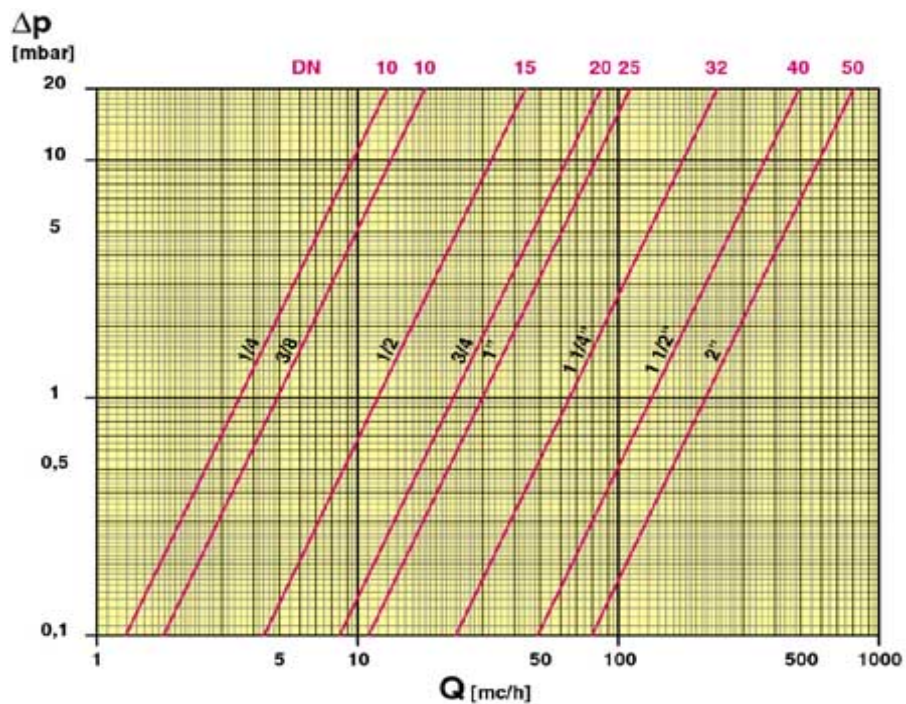


Figure 2: Flow – Pressure drop
(1 l/min = 0,06 m3/h, 1 m3/h = 16,67 l/min)

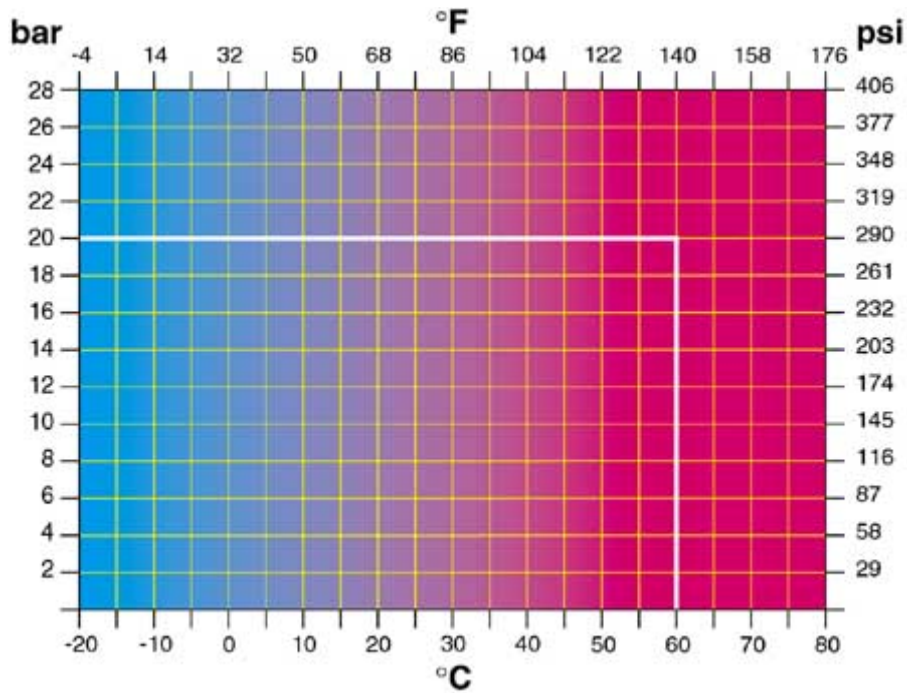


Figure 3: Flow – Pressure / temperature ratings
(1 bar = 14,5 p.s.i., °C = 5/9 (°F-32), °F = 32+9/5 °C)

Operational Data

Operation

When installed and selected to the correct position, the line valve is only operated when it is necessary to isolate that part of the distribution system. The locking device, fitted as necessary, actively supports the "Permit to work" system.

Installation

Medical gas line ball valve assemblies are brazed directly into the distribution system using the approved flux less brazing technique with CO₂ purge. Installation must only be carried out by competent and qualified personnel who are fully conversant with the standards required for Medical gas installations. The valve must be adequately supported and a typical installation drawing is available on request. Installation instructions are included with each assembly.

Testing and commissioning

Although the Medical gas line ball valve is fully tested prior to dispatch, the valve assembly must be tested and commissioned in accordance with HTM 22 as part of the pipeline system, before the system is brought into use.

Maintenance

Medical gas line ball valves require no specific maintenance and are inspected as part of the pipeline system. Maintenance should be carried out by a "Competent" person.

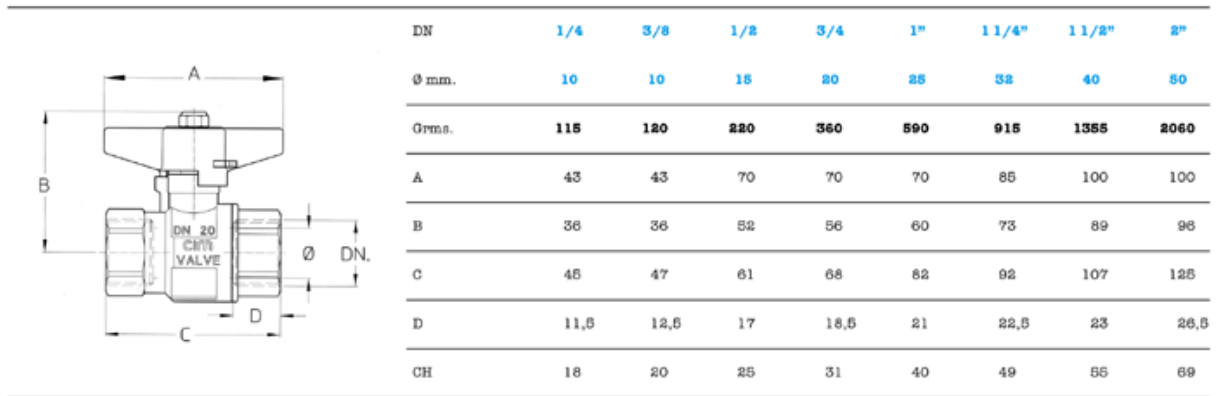


Figure 4: Technical drawing



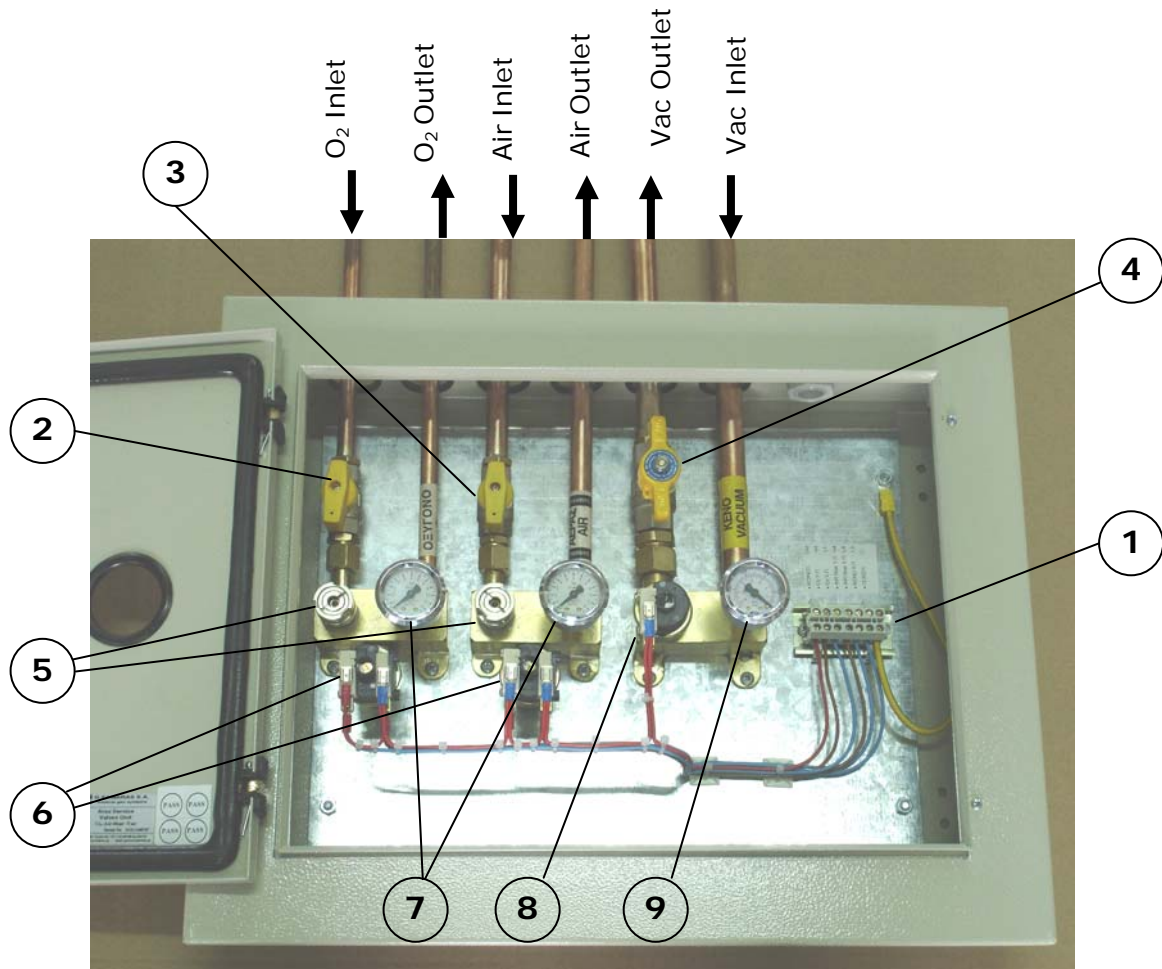
AREA SERVICE-ZONE VALVES UNIT 3 GASES(O₂, AIR, VACUUM)

The ASVU are fitted to all medical gas and vacuum services in a prominent and accessible position at the entry to wards, theatres, intensive care, recovery rooms, etc.

Complies with **EN 737-3** and HTM-2022 standards.

The ASV units are composed of:

- Partially wall embedded box made of 1.5mm painted sheet.
- Finishing door with painted sheet frame, with key operated lock and window for reading pressure gauges and vacuum meters.
- Internal painted sheet panel with connections to the box and spacers for supporting internal copper pipelines.
- Threaded inlet/outlet connections with nut and nozzle to be brazed.
- Polycarbonate name and color plate for the gas.
 1. Electrical connections coupling (one FTP, UTP or LYCII cable – 6contacts)
 2. Line ball valves, quarter turn, with brass body/ball and PTFE seals and seats.
 3. Line ball valves, quarter turn, with brass body/ball and PTFE seals and seats.
 4. Line ball valves, quarter turn, with brass body/ball and PTFE seals and seats.
 5. Service gas outlet-emergency inlet point for Oxygen and Air (AFNOR type).
 6. Pressure switch (low 3,2bar – high 4,8bar) for Oxygen and Air down stream from the ball valves.
 7. Pressure gauge (0÷10bar) down stream from the ball valves.
 8. Pressure switch (low 360mmHg=0,48bar) for Vacuum down stream from the ball valves.
 9. Pressure gauge (-1÷0bar) down stream from the ball valves.





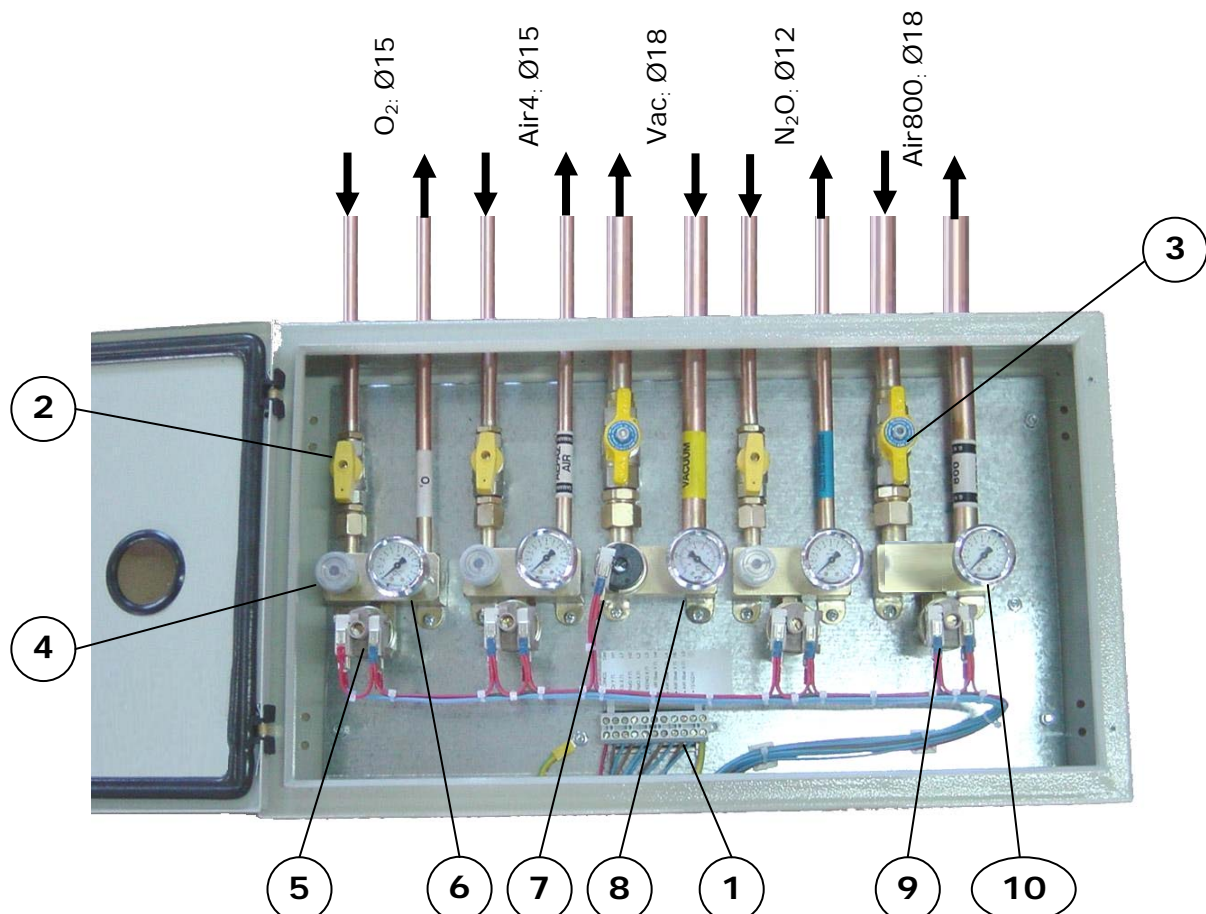
AREA SERVICE-ZONE VALVES UNIT 5 GASES(O₂, AIR₄, VACUUM, N₂O, AIR₈₀₀)

The ASVU are fitted to all medical gas and vacuum services in a prominent and accessible position at the entry to wards, theatres, intensive care, recovery rooms, etc.

Complies with **EN 737-3** and HTM-2022 standards.

The ASV units are composed of:

- Partially wall embedded box made of 1.5mm painted sheet.
- Finishing door with painted sheet frame, with key operated lock and window for reading pressure gauges and vacuum meters.
- Internal painted sheet panel with connections to the box and spacers for supporting internal copper pipelines.
- Threaded inlet/outlet connections with nut and nozzle to be brazed.
- Polycarbonate name and color plate for the gas.
 1. Electrical connections coupling (one FTP, UTP or LYCII cable – 6contacts)
 2. Line ball valves 3/8", quarter turn, with brass body/ball and PTFE seals and seats.
 3. Line ball valves 1/2", quarter turn, with brass body/ball and PTFE seals and seats.
 4. Service gas outlet-emergency inlet point for O₂, Air₄ and N₂O (AFNOR type).
 5. Pressure switch (2÷6bar) for O₂, Air₄ and N₂O down stream from the ball valves.
 6. Pressure gauge (0÷10bar) down stream from the ball valves.
 7. Pressure switch (low 360mmHg=0,48bar) for Vacuum down stream from the ball valves.
 8. Pressure gauge (-1÷0bar) down stream from the ball valves.
 9. Pressure switch (9÷15bar) for Air₈₀₀ down stream from the ball valves.
 10. Pressure gauge (0÷16bar) down stream from the ball valves.





2ND STAGE PRESSURE REDUCERS PANEL

The pressure regulators are placed in the second stage networks of oxygen, nitrous oxide, compressed medical air 4bar and compressed medical air 8bar. The pressure regulators are provided with certificate of conformity CE.

The pressure regulators are suitable for the reduction and stabilization of second stage pressure and are conforming to **EN 737-3** and **EN 738 – 2 standards**.

The technical characteristics of each regulator are:

- Inlet pressure P 1 = 8 bar , P1 = 10 bar for surgical air
- Outlet pressure P2 = 4,5 bar, P2 = 8 bar for surgical air
- Flow Q1 = 28,5 m³/h, Q 1 = 34,5 m³/h for surgical air

The regulator's flow is measured with maximum outlet pressure drop equal to 10% of initial regulated static pressure in normal air temperature and pressure conditions.

Each one of these pressure reduction systems is installed in metallic box, with opening door for reading the manometers and includes the devices below:

- one or two (in parallel connection) pressure regulators. The second stage pressure can be regulated at will in the limits that are mentioned before using a special key.
- an inlet bronze filter for each regulator
- a low pressure manometer for controlling the second stage pressure.
- two inlet valves for each regulator
- auxiliary inlet point via mobile cylinder to the exit (terminal unit EN 737-6 adapted at the box)
- a polycarbonate plate with discreet color, the chemical symbol and the name of corresponding gas
- ground outlet
- one pressure sensor, that transmits signals at the local alarm panel according to EN 737-3 standard

Sensor will be an analog transducer 4-20 mA stainless, oil free suitable for use in oxygen environment (alternative digital on/off sensor)

The reading of manometers and the auxiliary supply unit use are possible without opening the box's door.

The isolation and control box of medical gas and vacuum network includes:

- Metal box for wall mounted installation.
- A polycarbonate plate with discreet color, the chemical symbol and the name of corresponding gas
- Ball valve
- Vacuum meter
- Pressure sensor, analogue **transducer 4-20 mA**

TECHNICAL DATA

The 2nd stage pressure regulator unit shuts-off and controls the medical gas that ends to outlets and it is suitable for external or chased distribution networks.

This product complies with 93/42/EEC medical directive and has been designed and tested in order to guarantee its safety. In particular the pressure regulators comply with EN 738-2 and EN 737-3 standards.

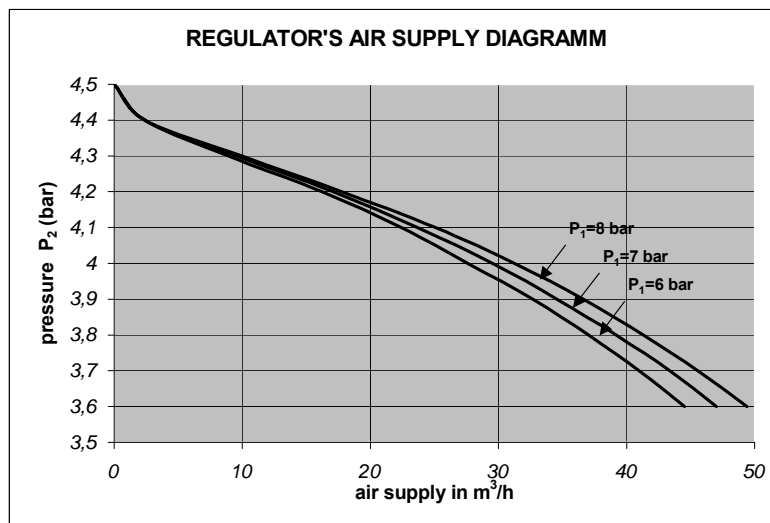
The multiple 2nd stage panels are consisted of:

- Partially wall embedded box made of 1.5mm painted sheet.
- Finishing door with painted sheet frame, with key operated lock and window for reading pressure gauges and vacuum meters.



- Internal painted sheet panel with connections to the box and spacers for supporting internal cooper pipelines.
- Pressure regulators made of anodized aluminum, complete with:
 - stainless steel reps filter with 75µm porosity
 - brass outlet pressure adjustment screw
 - M20x1.5 threaded inlet/ outlet connections with nut and nozzle to be brazed to a 12mm cooper pipe
 - on/off ball valves installed upstream and downstream from the pressure regulator to permit maintenance
 - pressure gauge downstream from the pressure regulator
 - pressure switches (low-high) downstream from the pressure regulator for signal alarm (transducer on request)
 - emergency inlet connection specific gas
 - G 1/4" threaded holes upstream from upstream on/off valve and downstream from the on/off downstream from the pressure regulator to connect a second pressure regulator of the same type
 - technical data

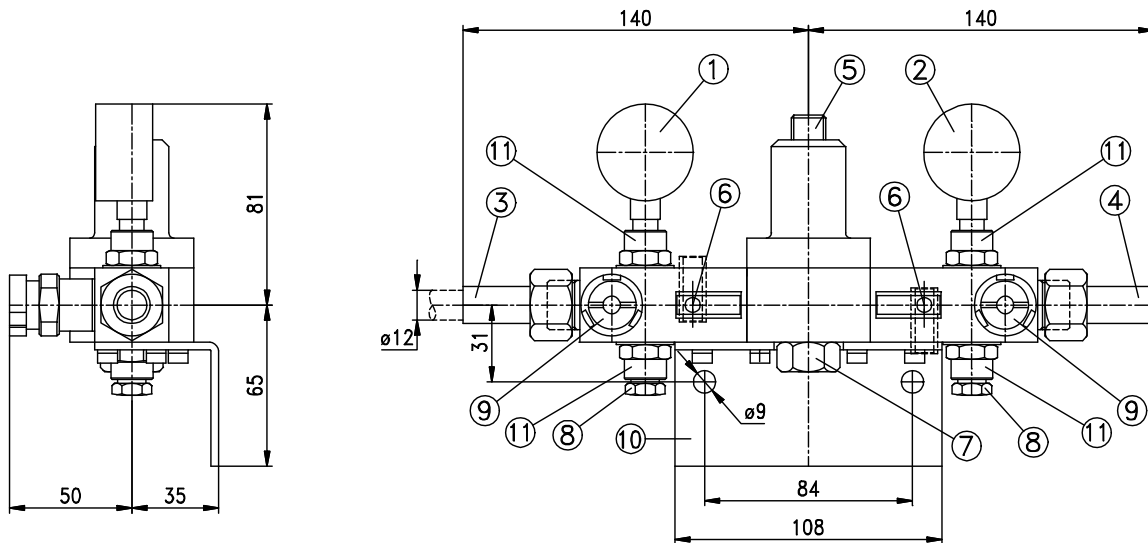
TYPE OF GAS	IN LET PRESSURE (P1)	OUTLET PRESSURE (P2)	FLOW RATE (Q1)
O2, N2O, AIR, N2	8 bar	4 bar	28,5 m3/h
AIR 800	10 bar	8 bar	34,5 m3/h



Multiply by the following coefficients to obtain values for gases different from air:

- Oxygen = **0.95**
- Nitrous Oxide = **0.81**
- Carbon Dioxide = **0.81**
- Nitrogen = **1.02**

- Ball valve complete with vacuum gauge, pressure switch (transducer on request) for signal alarm and threaded inlet/outlet connections with nut and nozzle to be brazed.
- Polycarbonate name and color plate for the gas.



POSITION	DESCRIPTION
1	High pressure manometer
2	Low-pressure manometer
3	Inlet connection (high pressure)
4	Outlet connection (low pressure)
5	Adjustment screw
6	On/off ball valves
7	Access plug to the filter and the pressure regulators valve
8	G1/4" female plugged connections to be connected to a pressure transmitter for remote control of the gas distribution system.
9	G3/8 front plug
10	Support bracket
11	Fittings with Φ 0,4 mm. holes

Components are sized to ensure a long operating life. It is good practice every three months to check pipeline pressure and vacuum values and also to check the tightness of connection using a leak detector. Annual replacement of the pressure regulating unit's filter valves and membrane is recommended.

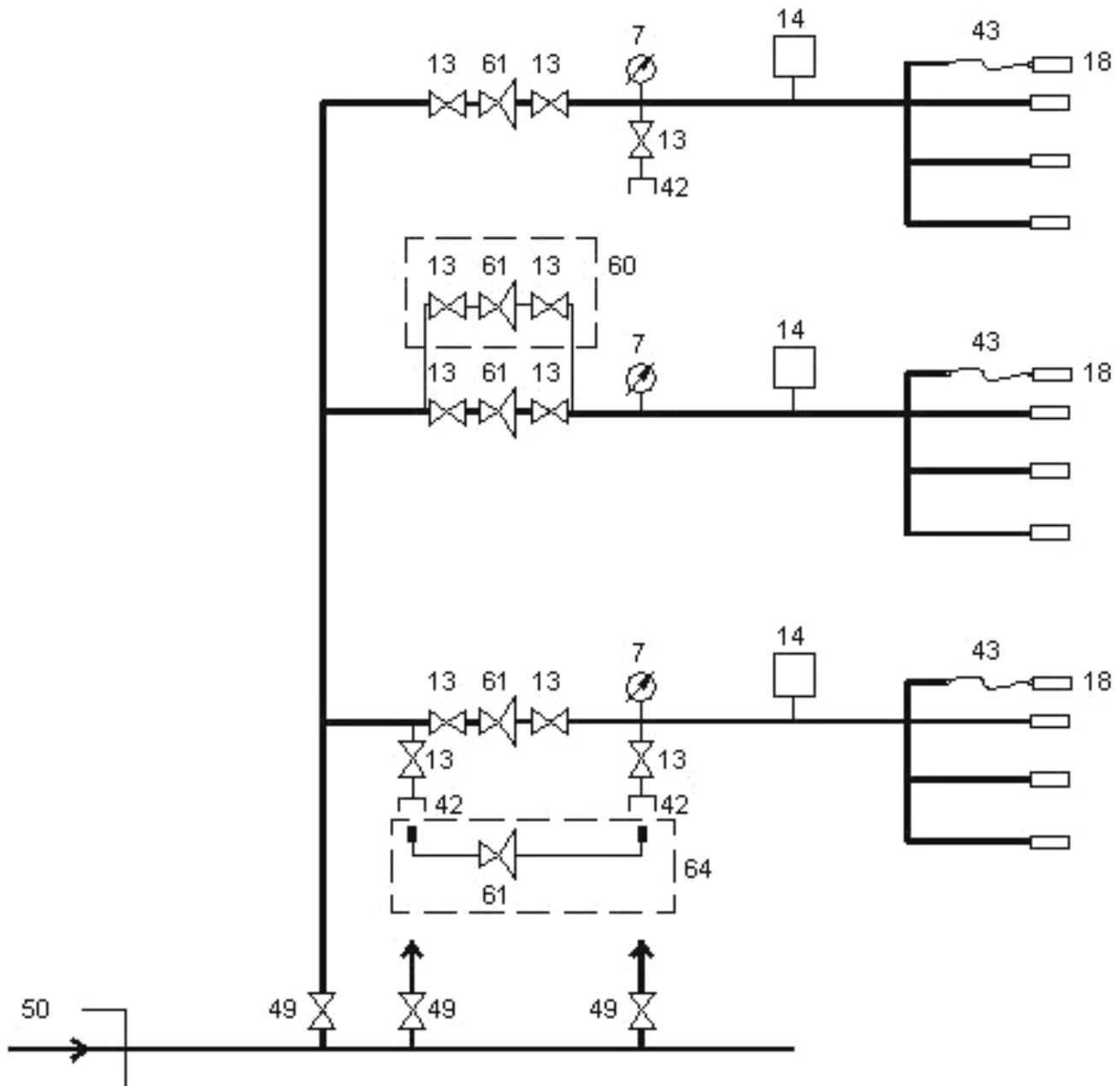
The working line of this product is equal to ten years from the date of manufacture. After this time period consult the manufacturer to evaluate if the product is still able to furnish the performance it was originally designed to provide.

NO COMPONENT NEEDS LUBRICATION. Use of lubricants is very dangerous because Oxygen, in contact with lubricants, can cause fire or explosions.

The 2nd stage panels are labeled CE to guarantee a high level of safety for patients and personnel.



2ND STAGE AREA DISTRIBUTION PIPELINE SYSTEM ACCORDING TO EN 737-3



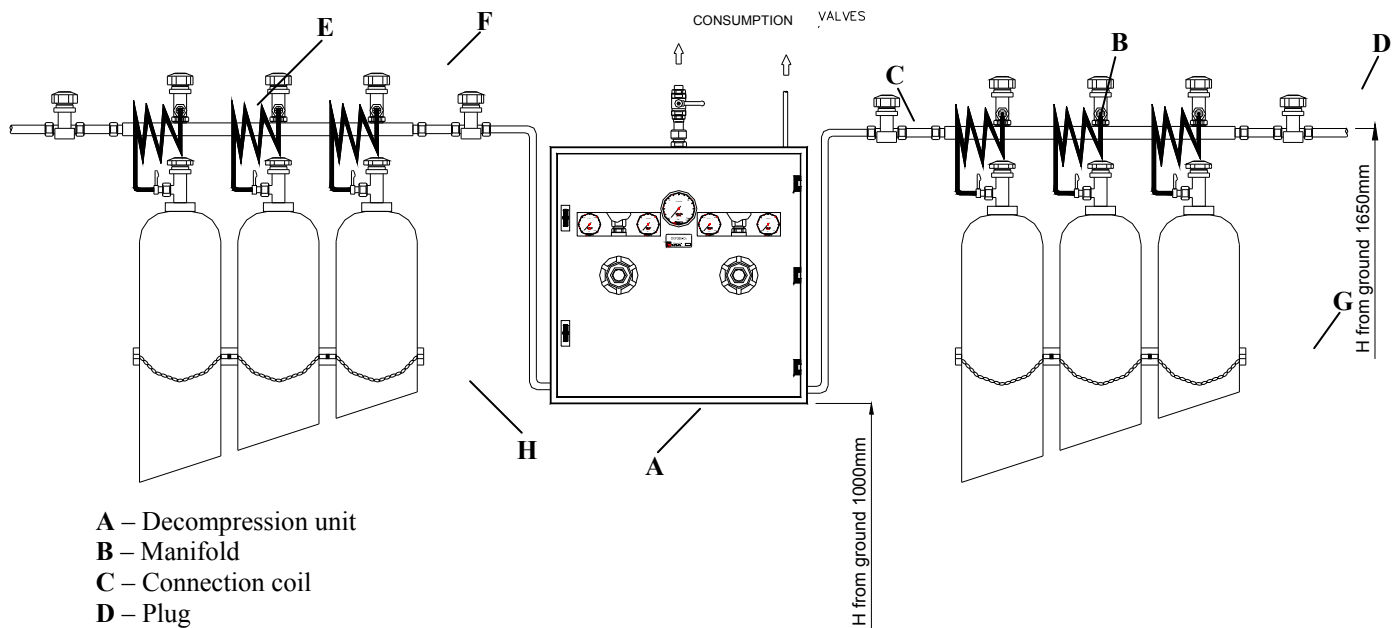
INDEX

- 7. Pressure gauge
- 13. Shut-off valve
- 14. Low and high pressure switch or transducer
- 18. Terminal unit
- 42. Gas specific connector
- 43. Low pressure hose assembly
- 49. Riser shut-off valve
- 50. Connection to the supply system
- 60. Second line pressure regulator
- 61. Line pressure regulator
- 64. Emergency line pressure regulator



**AUTOMATIC CHANGE
OVER DECOMPRESSION UNIT
FOR OXYGEN - NITROUS OXIDE – AIR – NITROGEN – CARBON DIOXIDE**

The automatic change over decompression unit is designed to supply medical gas (oxygen-nitrous oxide-air-nitrogen-carbon dioxide) of any type of medical gas network, where continuity of supply is essential and where the pipeline is supplied from manifold high pressure gas cylinders. This product complies with all current safety regulations and laws and is designed and tested to guarantee safety operation.



- A – Decompression unit
- B – Manifold
- C – Connection coil
- D – Plug
- E – High Pressure coil
- F – Connection valve
- G – Cylinder support rack
- H – Cylinders safety chain

DESCRIPTION

The automatic change-over decompression units are composed of:

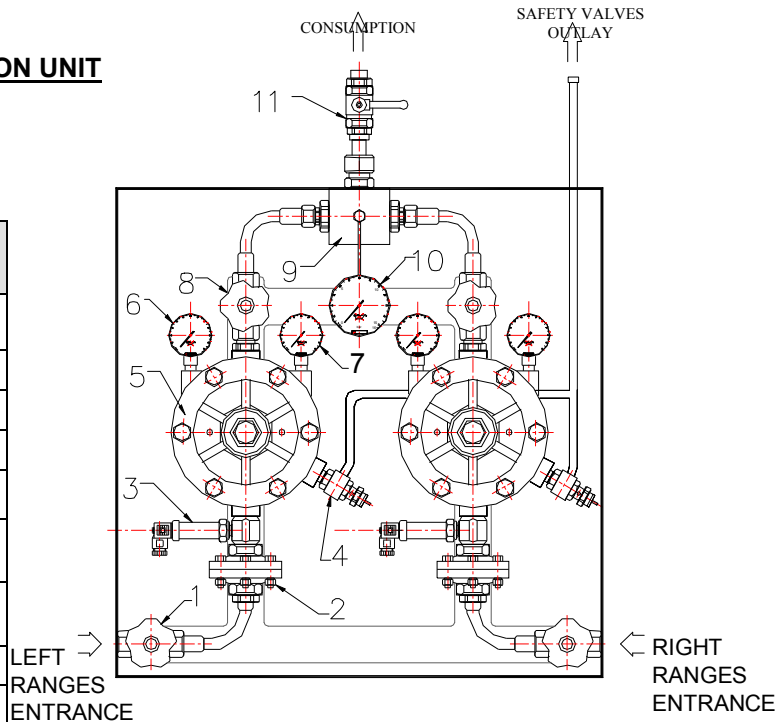
- A wall mounted box 600x600x180 mm made of 1.5mm painted steel with door key-operated lock and window for reading pressures gauges.
- Two pressure regulators (OT 58) connected in parallel and linked respectively to the right and to the left manifold of cylinders. Each regulator is fitted with brass safety valve set at 13bar, with one pressure gauge diameter Ø63mm for high pressure (315bar full range) and with stainless steel outlet pressure adjustment screw.
- Two inlet filter with pressed brass body and bronze filter mesh.
- Two inlet high pressure valves.
- Two outlet low pressure valves.
- One automatic change over device (inverter) which is connected to the outlet of the regulators.
- One pressure gauge diameter Ø100mm indicates the network pressure.
- Two pressure transmitters for monitoring the pressure in the cylinders.

No parts can be detached without using tools.



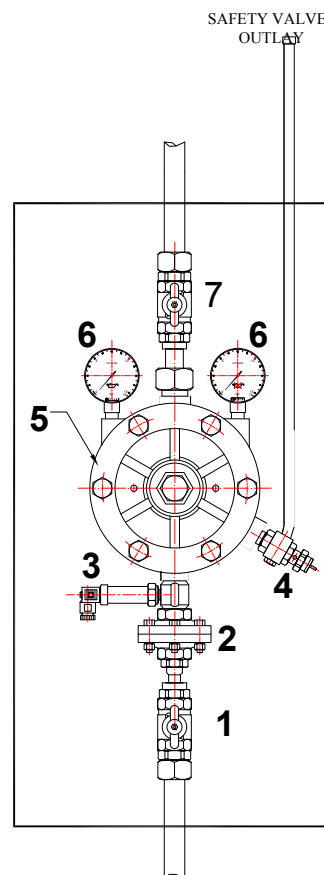
AUTOMATIC CHANGE OVER DECOMPRESSION UNIT

POSITION	DESCRIPTION
1	High Pressure valve
2	Bronze filter
3	Transducer ((0÷250 bar, 4÷20mA)
4	Safety valve
5	Pressure reducer
6	High pressure manometer Ø63 (0÷315 bar)
7	Low pressure manometer Ø63 (0÷16 bar)
8	Low pressure valve
9	Automatic change over unit
10	Low pressure manometer Ø100 (0÷16 bar)
11	Ball valve



OXYGEN'S VESSEL REDUCER PANEL

POSITION	DESCRIPTION
1	Ball valve 1/2"
2	Bronze filter
3	Transducer ((0÷16 bar, 4÷20mA)
4	Safety valve
5	Pressure reducer
6	High pressure manometer Ø63 (0÷16 bar)
7	Ball valve 1/2"



From Vessel



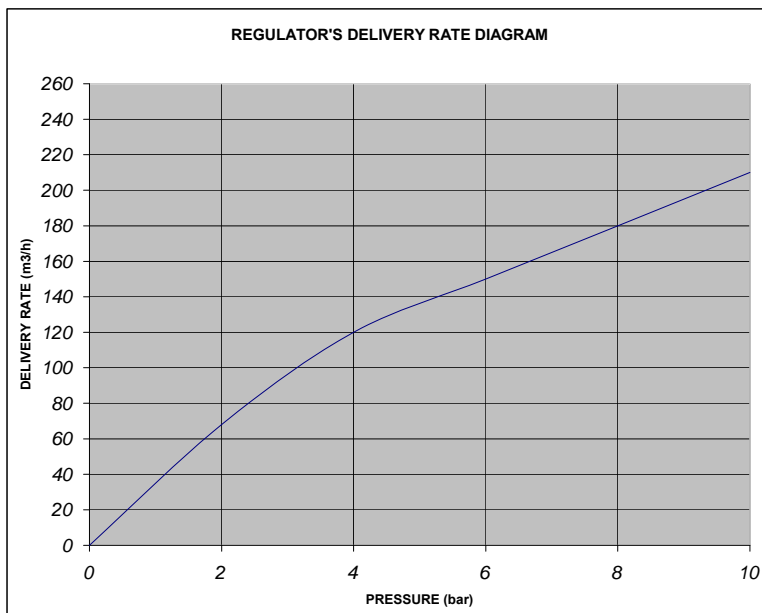
AUXILIARY SOURCE UNIT FOR N2O

POSITION	DESCRIPTION
1	High Pressure valve
2	Bronze filter
3	Transducer (0÷250 bar, 4÷20mA)
4	Safety valve
5	Pressure reducer
6	High pressure manometer Ø63 (0÷315 bar)
7	Low pressure manometer Ø63 (0÷16 bar)
8	Low pressure valve

TECHNICAL DATA

The units are designed to operate a maximum gas pipeline pressure of 200bar.

TYPE OF GAS	INLET PRESSURE (P1)	OUTLET PRESSURE (P2)	FLOW RATE(Q1)	INLET CONNECTION
NITROGEN OXYGEN AIR	200bar 200bar 200bar	8 bar	180 m ³ /h	21.7x1 ¼ left male 21.7x1 ¼ male 21.7x1 ¼ male 3/8 male 21.7x1 ¼ left male
NITROUS OXIDE CARBON DIOXIDE				



Flow rate with nitrogen refers to normal pressure and temperature conditions.



For other gases multiply the values for nitrogen by the following coefficients:

- AIR = 0.98
- OXYGEN = 0.93
- NITROUS OXIDE = 0.79
- CARBON DIOXIDE = 0.79

Operating conditions: -20° ÷ +60°C

The following information is marked on the pressure regulator body:

- Name of gas (oxygen, nitrogen, air, carbon dioxide, nitrous oxide)
- Model GIGANTE 476/D (for air and oxygen)
GIGANTE 476/F (for carbon dioxide, nitrous oxide, nitrogen)
- CE 0434 marking
- Regulator code, number
- Manufacturing lot (number of need and last two digits of the year)
- Symbol of the gas:
 - O₂ = OXYGEN
 - Air = AIR
 - CO₂ = CARBON DIOXIDE
 - N₂O = NITROUS OXIDE
 - N₂-800 = NITROGEN
- Maximum supply pressure (200bar)

The pressure gauges carry:

- The name of the manufacturer
- The symbol that indicates "USE NO OIL"
- The symbol for the unit of pressure (bar)

REFERENCE STANDARDS

The automatic change-over units are manufactured and tested in accordance with the standards:

- EN 738-2 "pressure regulators for use with medicals"
- EN 873-1 "pressure gauges"
- EN 737-3 "medical gas distribution systems"

INSTALLATION OF DECOMPRESSION UNITS

The automatic change-over units must be installed by personnel specialized in installing medical gas distribution system.

The units must be installed in separate place from the rest of the building with the wall by reinforced cement roof made of light materials. Surface of the door and windows must be 1/5 of the surface's perimeter.

The decompression units are to be fastened to the wall using their brackets with expansion bolts (excluded from delivery).

Manifolds must be connected together and to the supply plant using coils (connection pipes) and fastened to the wall using their brackets with expansion bolts. The coils are to be fitted on manifold valves. The threading of the valves on the supply plant, at the ends of the manifolds, on the coils and the connection pipes are all right-hand for oxygen, nitrogen and air and left-hand for nitrous oxide.

This is for avoiding any mistakes during assembly.

Make sure that seals, supplied together with the plant, are installed at its threaded connection.

At the ends of the last manifolds (right and left) must be connected the emergency evacuation valves and outlets of this valves with the outlets of the safety valves must be conveyed to the open area.

The cylinder anchor racks are to be fastened to the wall using their brackets.

Apply a 60-70 Nm tightening torque when making the connection.



The signal device is connected up using electrical cables, following the wiring diagram of the device.

SIZING – DIMENSIONS

- Load pressure 200 bar.
- Operation pressure 8 bar.
- Flow (Table A) m³/h
- Capacity (Table A) cylinders + (Table A) m³ Vessel of liquid O₂
- Capacity (Table A) cylinders of N₂O
- Capacity (Table A) of air for medical use

For the rest of the gases the flow should be multiplied with the factors: Nitrous oxide 0,85, air 1,05, nitrogen 1,07.

The automatic centre consist of two (2) high pressure reducers, that each one is provided with shut-off valve, metallic filter and safety valve against overpressures.

Both reducers will be connected with corresponding cylinders of high pressure, while its exit will be connected with the automatic changeover, which makes the automatic changeover of working cylinders to the backup cylinders, as soon as the cylinders on regular operation will exhaust.

Two (2) manometers of high pressure show the pressure that exists in left and right ramp of cylinders and two (2) manometers of low pressure show the pressure in the reducers exit, while a (1) manometer of low pressure of Ø80 mm diameter shows the pressure that exists in the network.

Two analogue pressure sensors (transducer) that are placed in right and left ramp of cylinders and a pressure sensor that is connected to the centre outlet, transfer (in distance) signals to the alarm and signaling system (the pressures mentioned before).

All these should be placed in metal box of dimensions 600x600x200mm suitable for wall mounted installation.

The automatic centre is connected with flexible high pressure copper pipes 13x7mm with right and left ramp of cylinders.

Each place of the cylinders connection is provided with shut-off valve of high pressure with non-return valve (according to the EN standards). The existence of these valves in every cylinder connection provides additional safety mainly at the cylinders replacement process.

The cylinders are connected with the ramp of high pressure with arc-shaped flexible copper pipe of high pressure Ø 7x4mm of 150cm length.

The automatic oxygen centre is connected in parallel operation with the third source that in this case is the vessel of liquid oxygen.

THIRD SOURCE: VESSEL OF LIQUID OXYGEN

AMBIENT AIR HEATED VAPORIZER

Capacity : O₂ – 120 m³/h (8 hour operation)

Pressure max : 40 Bar

Empty Weight : 111 kg

Operating Weight : 591 Kg

Dimensions : 1120 x 720 mm

Height : 3860 mm

Inlet Connection : DN 15 / PN 40

Outlet Connection : DN 15 / PN 40

CE Marking /Documentation



Tank Type T 18 S115

Gross capacity : 11.535 Liter
 Pressure max : 18 bar
 Capacity Oxygen max : 9.365 m3
 Empty weight : 5910 kg
 Weight filled with Oxygen : 18.430 kg
 Diameter : 2000 mm
 Height : 7315 mm
 Automatic pressure control Regulator
 Level and Pressure Gauge
 Pressure Gauge (Transmitter working pressure 4 – 20 mA)
 Liquid level indicator (Transmitter differential pressure 4 – 20 mA)
 Level Indicator Scala m3
 LOX Filling Flange (Euro DN 40)
 Valve 3 (Waste Gas)
 Safety Valve 25 Bar after Valve 11
 CE Marking / Certificates / Documentation
 Operating Manual.

Technical data

Model	T18 S32	T18 S64	T18 S115	T18 S200	T18 S300	T18 S490	T18 S610	T18 S800
Max. working pressure Standard Tank (bar)	18	18	18	18	18	18	18	18
High-pressure tank (bar)	36	36	36	36	36	36	36	36
Geometric volume (liters)	3,160	6,365	11,535	20,355	30,205	49,020	61,620	80,360
Contents (m ³ at 1 bar, 15 °C)								
Oxygen (m ³)	2,560	5,170	9,365	16,520	24,515	39,775	50,000	65,120
Nitrogen (m ³)	2,075	4,160	7,570	13,360	19,825	32,170	40,400	52,752
Argon (m ³)	2,505	5,055	9,160	16,160	23,980	38,915	48,915	63,746
Diameter (mm)	1,600	1,600	2,000	2,500	2,500	3,000	3,000	3,000
Depth including fittings (mm)	2,125	2,145	2,650	3,070	3,070	3,570	3,570	3,570
Overall height (mm)	4,110	7,010	7,350	8,040	11,520	11,510	14,110	18,030
Foundation slab (m)	3.0 x 3.0	3.0 x 3.0	3.5 x 3.5	3.5 x 3.5	3.5 x 3.5	4.5 x 4.5	4.5 x 4.5	5 x 5
Empty weight (standard tank) (kg)	1,900	3,260	5,910	10,130	14,130	19,770	24,420	30,600
Gross weight								
with Oxygen (kg)	5,325	10,170	18,430	32,220	46,905	72,950	91,270	117,706
with Nitrogen (kg)	4,325	8,150	14,765	25,760	37,320	57,400	71,720	92,361
with Argon (kg)	6,080	11,700	21,200	37,110	54,170	84,735	106,080	137,021
Evaporation rate								
with Oxygen (%/24 h)	0.42	0.37	0.29	0.20	0.17	0.13	0.12	0.12
with Nitrogen (%/24 h)	0.67	0.58	0.44	0.31	0.27	0.21	0.20	0.20
with Argon (%/24 h)	0.46	0.40	0.32	0.21	0.19	0.15	0.14	0.14





The supply box of liquid oxygen from the vessel will be a metallic box (dimensions 600x300x200mm) for wall mounted installation, which includes:

- regulator 15/8 bar, flow (Table A)m³/h,
- inlet diaphragmatic valves y
- inlet metal filter
- manometers of high-low pressure
- safety valve against overpressures
- pressure sensor

The supply box for liquid oxygen vessel will be connected with the automatic oxygen centre in way that the operation of system is automatic as following: in the normal operation oxygen supply comes via the corresponding box, from the liquid oxygen vessel. In case of exhaustion of the vessel, or malfunction, automatically the supply of oxygen comes via the automatic centre of oxygen from one of the cylinders ramp connected to the centre, while the other ramp remains backup and is activated automatically as soon as the first one is exhausted.

THIRD SOURCE of N₂O

The third source of nitrous oxide is consisted by a metal box of dimensions 600x300x200mm for wall mounted installation, which includes:

- regulator 200/8 bar
- safety valve against over pressure
- inlet metallic filter
- inlet high pressure diaphragmatic valve
- high-low pressure manometers
- (Table A) cylinder ramp of N₂O same as those of automatic centre of N₂O, pressure sensor for monitoring the third source operation.

The third source of nitrous oxide is connected in parallel with the automatic centre of oxygen in order to achieve the system's automatic operation as following: in the regular operation nitrous oxide supplied via the automatic centre of nitrous oxide. In case of exhaustion of centre's cylinders or malfunction, automatically the third source supply to the network.

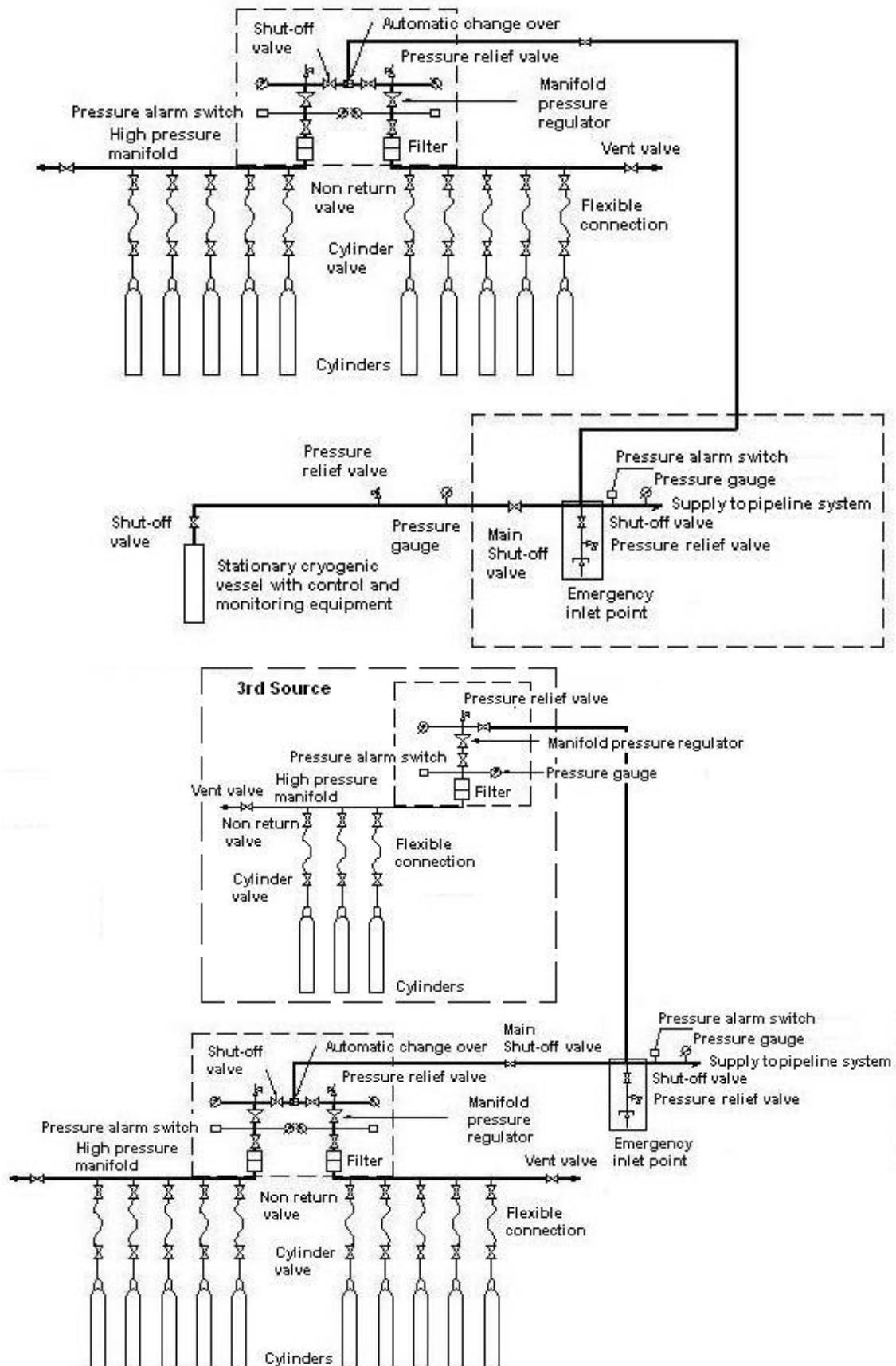
EMERGENCY PANEL

The oxygen, nitrous oxide, compressed air emergency metallic panel complies with **EN 737-3 standard**:

- main shut off valve
- emergency hose of **NIST** type (non - interchangeable screw – threaded connector) according to model **EN 739**
- manometer
- safety valve
- in-line pressure sensor
- other sources inlet points



**Typical diagram of centre O₂ - N₂O- compressed air with 3 sources of supply
(Third source of supply in oxygen is the vessel of liquid oxygen) according to EN 737-3**

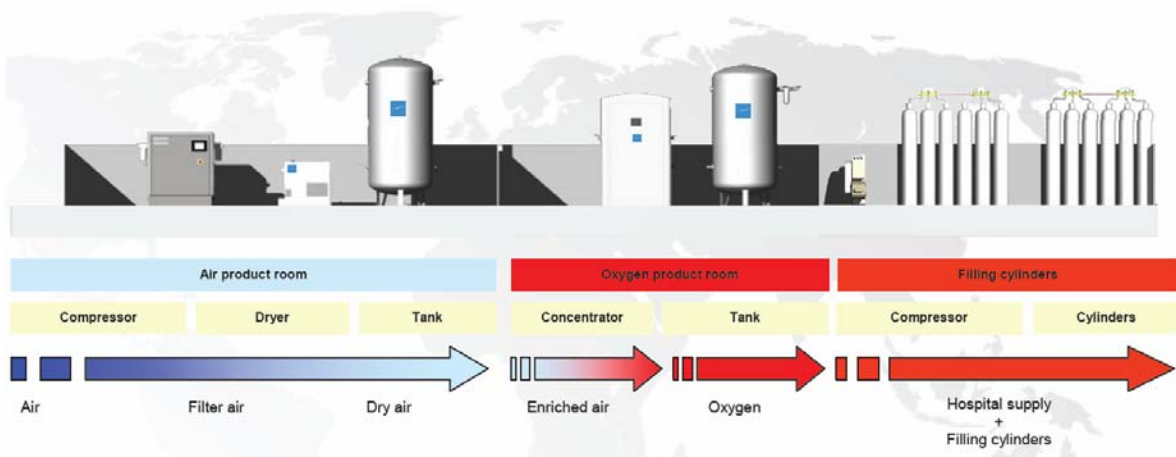




OXYGEN GENERATOR

Pressure Swing Adsorption (PSA) is a low power consuming solution, efficient and reliable for onsite production of high purity oxygen. It uses the basic principle of passing air over adsorbent material which bound with nitrogen to leave rich stream of oxygen.

During pressurization of one column, zeolite adsorbs nitrogen and let oxygen pass through to the oxygen receiver. In order to convert this batch process into a continuous process, we use two adsorbent vessels as one is adsorbing while the second one is regenerating and vice versa



Compressed Air Systems:

- Air Compressor
- Air Treatment unit by refrigerating dryer and filters
- Air Receiver in proper sizing

The air receiver is a vertical fully galvanized (in and outside) vessel. It will therefore resist against corrosion. It complies with the 97/23/CE standard concerning pressurized vessels.

Oxygen Generator:

- PSA Plant
- PLC
- Oxygen Analyser
- Oxygen Receiver & high efficiency O2 filter

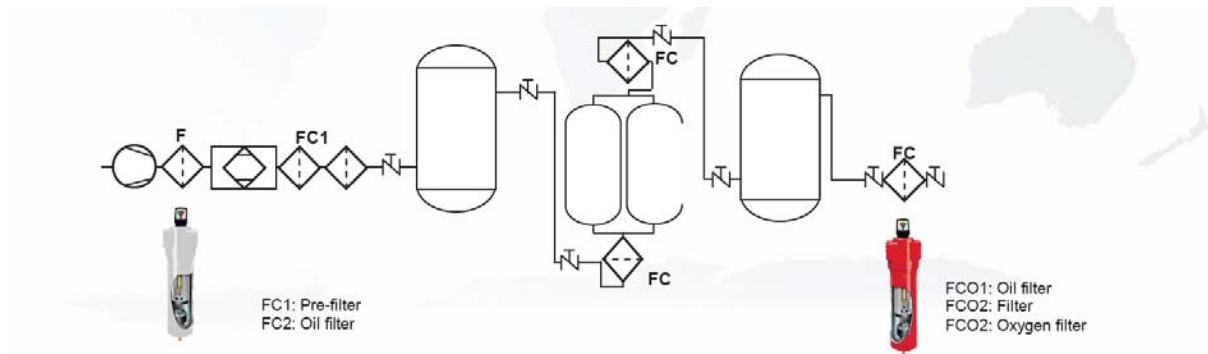
High Pressure Filling System

Booster to fill the cylinders bank (150 bar at 5 bar inlet pressure / 200 bar at 8 bar inlet Pressure)

no	O ₂ Flow (m ³ /h)	Oxygen receiver (litres)	Air Compressor Power (kW)
1	1.2	50	3
2	2.4	100	5
3	5	300	11
4	10	500	15
5	14	750	18
6	18	1.000	30
7	22	1.000	30
8	29	1.500	37
9	36	2.000	45



Typical diagram of O₂ generator





LOCAL ALARM SYSTEM AND REPEATERS (IP - BASED) OF REDUCER PANELS AND ASVU BOXES OF VALVES

The local electronic alarm system is controlling from distance the pressure alternation (max. - min.) of five medical gases and vacuum (O₂ – N₂O – Air – Vac – Air 800). It will be manufactured according to **EN737-3 standard. Each alarm panel (IP-based) should be able to connect to a LAN network**

The local alarm panel **is provided with screen on which are transmitted every moment the gases pressure** or the level of gases pressure depending on the type of sensor used.

The alarms are optical (led) and acoustic (buzzer) with silence button of sound signal and repeater of sound signal, after 15 minutes, reminding the malfunction if it is not fixed.

The electronic local alarm panel will be manufactured in a way that it could be associate with the devices listed below:

- **Analogue Sensor (transducer 4-20 mA) in order to have in display the level of pressure in real time**
- Digital sensors (pressure switch ON - OFF) in the ASVU boxes
- Central alarm panel
- Repeater
- BMS

Finally the local alarm panel will be provided with TEST button – self diagnostic, for controlling and operating the local alarm.

Sensor's malfunction can be realized by LED indication and an indication on the LCD.

ALARM PANEL- 5 GASES CONTROL

1. It accepts up to 5 inputs, either analogical (transducers) or digital (switches). (Selection by user through COM).
2. It has 10 outputs for: a) repeating to second panel b) central alarm system c) BMS of installation.
3. It has 10 LED of 2 situations (red) for upper or low indication of pressure.
4. A buzzer for signaling of the alarms.
5. LCD display 2X16 characters for monitoring the pressure in real time and for alarm messages
6. Adjustable limits and alarm messages. (by user programming)
7. Adjustable analogical sensors range and type
8. Alarm programming through Ethernet connection with an IP address
9. LIVE monitoring the pressure of the gases
10. Button test and silence.
11. 220V Voltage 50Hz-60Hz (Double transformer).

CENTRAL ALARM SYSTEM OF LOCAL ALARMS AND REPEATERS

All the signals from local alarm panels (serving reducer panels and ASVU boxes), that are found in several departments and floors, can be collected by central alarm panels-repeaters. Each central alarm panel serves a number of local alarm panels, up to six. There could be used as many central alarm panels as needed to serve the total of local alarm panels in groups or all the panels depending on the provision of the hospital.

Central alarm panels will be provided with indication LED, acoustic buzzers, with TEST – self diagnostic button and SILENCE button.

Monitoring and controlling local and central alarm panels

The alarm panels should be provided with RJ 45 connector for individual TCP/IP connection for every alarm panel (local – repeaters – central) in order to be monitored and controlled and to establish communication with other alarm panels . Each alarm panel is provided with its own IP address and is using the hospital data network for their connection but with different subnet mask (192.168. *. *). Local alarm panels will be connected with the central alarm panel that supervises all the hospital's systems.

The technical personal – maintenance will be able to be informed for all the faults-problem through every terminal PC that is equipped with web explorer and that is connected to the hospital data network. Consequently every alarm panel will have the possibility of monitoring, controlling and changing limits and services from distance via TCP of / IP protocol in Java environment.

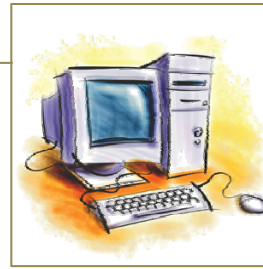


Typical alarm panels layout

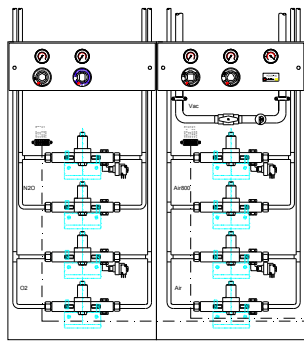
Central local alarm



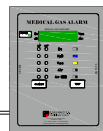
Html page Of Local alarms



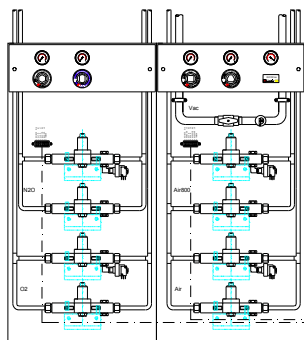
Html page Of Master alarms



Possible repeater of IP n1
IP: 192.168.*.n2



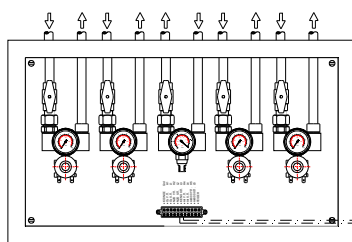
IP: 192.168.*.n1



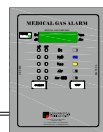
Possible repeater of IP n3
IP: 192.168.*.n4



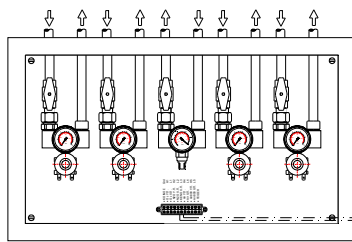
IP: 192.168.*.n3



Possible repeater of IP n5
IP: 192.168.*.n6



IP: 192.168.*.n5



Possible repeater of IP n7
IP: 192.168.*.n8

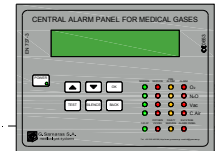


IP: 192.168.*.n7

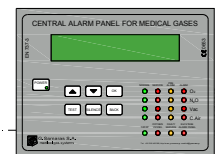
Relay control
IP: 192.168.*.n

DATA NETWORK BACKBONE

Possible repeater of IP: 192.168.*.100
IP: 192.168.*.104



Possible repeater of IP: 192.168.*.100
IP: 192.168.*.105



IP: 192.168.*.100



OXYGEN - O2
Central station

OXYGEN - O2
Vessel

Compressed Air - Air
Central station

IP: 192.168.*.101

Vacuum - Vac
Central station

IP: 192.168.*.102

Nitrous Oxide - N2O
Central station

Anaesthetic Gas
Scavenging System - AGSS
Central station



AUTOMATIC COMPRESSED MEDICAL AIR PLANT

The fully automatic medical compressed air plant provides a reliable and constant air supply, in predefined pressure level, without the transport and management cost associated with heavy gas cylinders. The plant is designed to operate at a maximum of 10bar. A wide range of models are available to satisfy all types of installations.

The automatic control-monitor unit monitors continuously the medical air net pressure via the electronic pressure transducer and regulates the network pressure via controlling the operation (remote start and stop) of the compressors (individually controlled). In every demand, as long as the vessel buffer is exhausted, the first compressor is automatically starts and works until the predetermined pressure level is achieved. In case of larger demand that the one compressor cannot meet, then a second or a third compressor automatically starts working until the predetermined pressure level for each compressor has been achieved. The operation and rotation mode in every operation cycle is defined by the automatic control-monitor unit.

The rotation mode is depending on the operation hours of every compressor, in order to have equable wear for all the compressors. In every operation cycle, the compressor holds the minimum operation hour start working. Also there is an option, by activating a parameter on the automatic control unit, according to which if the compressor working cannot reach the predefined pressure level, then a second or a third compressor automatically starts working and so on. The automatic control unit can be connected to hospital's local area network providing remote monitoring and setting through TCP/IP protocol using an internet browser.

The major subsystems/elements of Automatic Compressed Medical Air Station are:

1. Three (3) electrically driven air compressors, screw type, connected directly with 3Ph electrical motors, that constitute a solid unit
2. Air receivers according to DIN of 4810 (capacity depends on model). The receivers are galvanized inside-outside
3. The required piping
4. A group of double pre-filters in parallel connection (one in operation and one in stand by mode), each rated at full flow rate of the medical Air central station
5. Two (2) absorption or refrigerator type dryers
6. A group of double oil coalescing filter, activated carbon filter, dust filter and a sterile filter is used in order to provide quality medical air as defined ISO 8573.1. This group includes two (2) filters of every category in parallel connection (one in operation and one in stand by mode), each rated at full flow rate of the medical Air central station, with overall switches in the entry, connections, with differential manometers for the control of cleanliness of filters.
7. Analogue pressure sensor (transducer) that measures the network pressure. It is the sensing element of the Automatic control unit, used for regulating the air pressure level and alarm monitoring.
8. Analogue sensor (transducer) that measures the network's medical air humidity(dew point level)
9. Emergency inlet point
10. Automatic control-monitor unit, an electronic waterproof control panel which is the operating, indicating and alarm system of the Medical Air Central Station.
11. Analogue sensor that measures CO₂ – CO - SO₂ and NO concentration(optional)

Automatic Compressed Medical Air Station description

1. Electrical screw type compressor

The automatic compressed air centre is consisted of three compressors. The capacity of the compressor will be calculated in order that each compressor can respond to 100% of maximum demand.

The operation of compressors is automatic and they are controlled by pressure sensor. The compressors connected to the automatic control unit can operate via their pressure sensors or via the



automatic control unit pressure sensor that allows the operation of each compressor in one of the following conditions:

- **Aut.** Operation via automatic control unit
- **Man.** Operation via compressor's pressure sensor
- **0** Operation without load, compressor stops

The compressors are noiseless and provided with inlet air filters, air-coolers, automatic control panel, operation hour meter, 3 operation options and alarm in case of malfunction.

Technical characteristics of each compressor :

- Operation pressure 10 bar
- Flow (Table A) m³/h FAD (at DIN 1945/1952 and ISO 1217)
- Power (Table A) HP ((Table A)kW)
- Noise level 74 DB

2. Air receiver/s

The receiver or receivers (Table A) of total capacity (Table A) litres at DIN 4810, with inlets and outlets for the connection of compressors and network, with safety valves, manometers and evacuation valve of condensates. The receivers are galvanized inside-outside and are accompanied by testing certificates.

Technical characteristics of each receiver:

- Receiver volume (Table A) litres
- Receiver quantity (Table A) pcs
- Maximum test pressure 16,5 atm
- Operation pressure 12 atm

3. Pre-filters

Pre-filters for cleaning the air to protect the dryers, as filters of dust, filters of dust of subdivision micron, all with valves and differential manometers and connected between them in parallel provision.

The filters will be cartridge type and provided with:

- Automatic valve of evacuation of condensates.
- Differential manometer for controlling filter's clarity.
- Flow Indicator.

The layout of cleaning air filters consists of two (2) lines of filters in parallel.

Technical characteristics of the filters

- Type of (dust 10 micron), (dust 1micron),
- Flow (Table A) m³/h
- Maximum operation pressure 16 bar
- Initial pressure drop 85 mbar
- Maximum pressure drop for change of filter 680 mbar

4. Dryers absorption type

The absorption type dryers, regenerative desiccant dryers, are used to dry the produced air providing reliable performance in low dew point under full load pressure. The compressed air is passed through a pressure vessel filled with an adsorbent media such as activated alumina or other desiccant material. The desiccant can bring the dewpoint of the air down to -40 degrees Celsius. This means that the air will not condense water until it is cooled to -40 degrees Celsius. In practice two cylinders with desiccant



are used; one is drying the air, while the other vessel is being regenerated. The switching of the vessels and the regeneration sequence is typically done automatically via solenoid operated valves. The regeneration of the desiccant vessel is done by heatless "pressure-swing" drying which uses part of the dry compressed air coming from the other vessel to dry the desiccant in the vessel being generated at lower pressure. The desiccant material is water proof and stable, which provide long term usage.

Technical characteristics of dryers:

- Flow (Table A) m³ / h
- Dew point -40 0 C
- Maximum operation pressure 16 bar

5. Air – filters

Provision of filters for cleaning the air, as filters of dust, filters of dust of subdivision micron, filters of active coal and finally filters of sterilization of air, all with overall valves and differential manometers and connected between them in parallel provision. The filters will be cartridge type and will be provided with:

- Automatic valve of evacuation of condensates
- Differential manometer for controlling filter's clarity
- Flow Indicator
-

More analytically the provision of filters of cleaning of air includes two (2) lines of mentioned before filters in parallel.

Technical characteristics of filters:

- Type of (dust 1 micron), (dust desiccating medium 0,01 micron), (dust 0,01 micron), (active coal)
- Flow (Table A) m³ /h
- Maximum operation pressure 16 bar
- Initial pressure drop 85 mbar
- Maximum pressure drop for cartridge change 680 mbar
- The bacteriological filters of sterilization are stainless type

6. Analogue sensors

Two (2) analogue sensors (transducer type) network pressure and humidity (dew point) for remote control of centre's operation.

7. Emergency box

One (1) emergency box supply according to **EN 737-3 standard**, with **NIST outlet**, safety valve, shut off valves, manometer and pressure sensor.

8. Automatic control-monitoring unit

One (1) automatic control- monitoring unit for automatic operation of the compressed air plant, which is ensures the automatic changeover operation of compressors. The compressed air plant control center can be connected to hospital's local area network and authorized personnel can remotely control and monitor the centre's operation, pressure limits and services via TCP/IP protocol using any available internet browser.

The MGS automatic control-monitoring unit monitors continuously the air net pressure and dew point via the electronic pressure transducers and regulates the network pressure via controlling the operation (remote start and stop) of the compressors (individually controlled).

The automatic control- monitoring unit is a state of the art processor (high processing ability), an index LCD panel 4x40 characters and a keyboard for managing the operation of vacuum plant. The centre also includes 3-phases and current fluctuation controller.



Via the automatic control-monitoring unit can be achieved the following operations:

- Automatic or manual compressors operation
- Automatic circular rotation of compressors operation
- Index of air network pressure in bar and situation of compressor operation (ON - OFF)
- Index of operation time and number of starts per hour for each compressor
- Alarm Index about the compressors maintenance (oil replacement, cartridges replacement etc)
- Alarm Index on the filters replacement
- Index of compressors malfunction
- Optical index of changing phases
- Optical and acoustic alarm minimum limit pressure (5,6 bar)
- Optical and acoustic alarm maximum limit pressure (9,6 bar)
- Optical and acoustic alarm of pressure sensor malfunction
- Optical and acoustic alarm maximum humidity limit (dew point)
- Optical and acoustic alarm of dew point sensor malfunction

The automatic control-monitoring unit will be also accompanied by the following luminous lamps (leds)

- Green – presence of volt
- Yellow – monitoring of phases (right rotation of pumps)
- Three green of – operation of pumps 1-2-3
- Three white – compressors service 1-2-3
- Three red – compressors problem 1-2-3
- Yellow – medical air center maintenance - filters
- Red – alarm minimum-maximum pressure limit or pressure sensor malfunction(also have sound alarm).

General features of MGS automatic control-monitoring unit:

- built in three transfer switches for AUTO and MANUAL mode selection, independent for each source. OFF position also included
- microprocessor based design, user friendly interface via built in LCD screen, 4x40 characters
- additional 4 led indicators (NORMAL /PREALARM /ALARM /SERVICE) independent for each source , functionality according to EN 737-3, ISO 7396-1, HTM 02-01-PART 1
- additional 4 led indicators (NORMAL /PREALARM /ALARM /SERVICE) for pressured air network according to EN 737-3, ISO 7396-1, HTM 2022
- cyclic operation of sources based on time balance operation,
- 3 independent timers for load and run time measurement of each source
- time delay function avoiding simultaneously start of sources
- text messages (40 characters max) for all conditions, emergency alarms and events for real time status viewing
- multi language support
- built in buzzer for audible signaling emergency alarms warnings and errors
- Temporary audible signal muting via SILENCE button. During the silencing mode, the audible signal is activated again by any new alarm condition
- TEST button for checking all visual and audible signals
- automatic resetting when any alarm condition reverts to normal
- **self test procedures** and diagnostics utilities included for system integrity, communication and wiring testing
- real time clock with battery back up
- built in non volatile memory
- default values for all parameters ensures reliable operation
- user programmable configuration and parameter settings (code protected area for authorized staff only)
- advanced algorithm that reduces the restart times per hour of sources
- **alarm / events / services report and log file** (max 250 records with time stamp) for plant performance analysis and debugging
- **15 analog inputs**, 10 Bit resolution, (4...20mA measuring range that simplifies the use of any 4...20mA transducer).

Basic Analog measurements are:



- air net pressure
- humidity (dew point)
- **12 digital inputs** with predefined function with NO/NC and enabling/disabling capability
The digital inputs are used for:
 - filters performance monitoring,
 - power supply over/under voltage monitoring
 - phase sequence monitoring,
 - thermal protection and operation status monitoring of each source independently
- Additional capability of primary Net pressure measurement redundancy for enhancing the system's reliability, using an extra digital pressure sensor connected to digital input (built in auto transfer algorithm for operation via the digital pressure switch if the primary analog pressure transducer failed)
- **9 digital outputs (relay output, 1 change over dry contact, 12A / 250 Vac) with predefined functions)**
 - dry contacts for remote signaling and interface with other monitoring systems (BMS etc)
 - independent dry contact (relay NC / NO) for each source FAILURE remote signaling
 - independent dry contact (relay NC / NO) for temperature controller function
 - Battery back up system and DC UPS capability with mains power failure signaling function
 - on site firmware upgrade capability via a common USB memory stick without affecting the system functionality
 - **remote access via Ethernet** by any internet browser , no additional software needed
 - on line remote system viewing and additional **daily graphs** for all Net pressures (data logging function) for plant pressure monitoring and analysis (24 hours depth,1 sample per 15 sec)
 - **remote parameter settings via Ethernet** using any internet browser (code protected area for authorized staff only)
 - water proof Metal enclosure, IP 54

9. CO2 – CO - SO2 and NO sensors

These sensors are analogue type (transducer) and their use is optional.

Finally the automatic compressed medical air centre will be connected to the remote central alarm system, that in case of faulty operation (fall of pressure, increased humidity), gives luminous and sound alarm signal (ALARM), with possibility of temporary interruption (15 minutes) only the sound signal.

Produced medical air quality – surgical tools air

The quality of produced compressed medical air is according to ISO of 8573.1 group 1.2.1 (0,1μ /-40°C / 0,01ppm – dust/water/oil) and according to the European Pharmacopoeia 5.4.1.4/5 with the following maximum contents in oil 0,5 ppm, humidity 60 ppm, carbon monoxide 5 ppm, carbon dioxide 500 ppm, dust of diameter 0,01 micron, mixture NO and NO2 2ppm, SO2 1 ppm. All sizes referring to regular conditions of pressure and temperature.

The produced medical air should have the following characteristics:

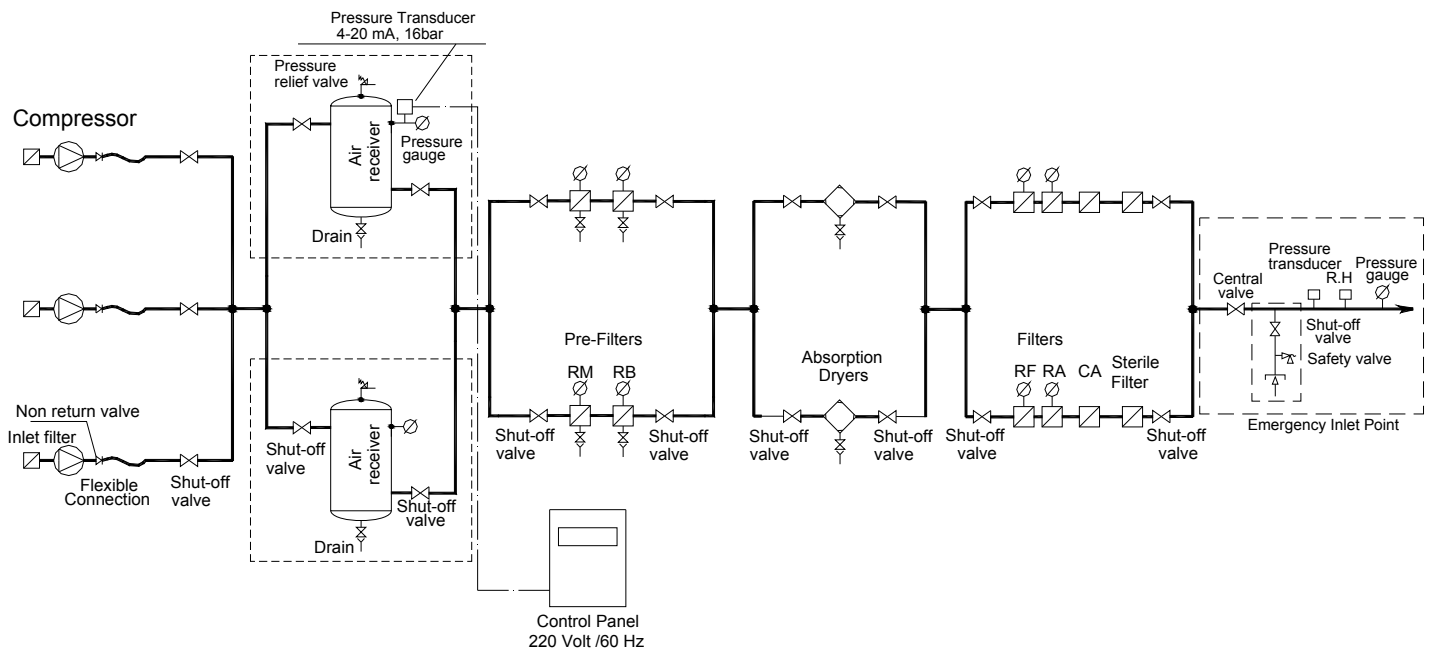
no	Medical air specifications	
1	Oxygen concentration	≥ 20,4% και ≤21,4% του όγκου του αέρα
2	Oil concentration	≤0,1mg/m ³ υπό ατμοσφαιρική πίεση
3	Carbon monoxide concentration	≤5ml/m ³
4	Carbon dioxide concentration	≤500ml/m ³
5	Steam concentration	≤67ml/m ³
6	Sulfur dioxide concentration	≤1ml/m ³
7	NO+NO ₂ concentration	≤2ml/m ³



The produced air for surgical tools use should have the following characteristics:

no	Surgical tools air specifications	
1	Oil concentration	$\leq 0,1 \text{ mg/m}^3$ υπό ατμοσφαιρική πίεση
2	Steam concentration	$\leq 67 \text{ ml/m}^3$

**TYPICAL AUTOMATIC COMPRESSED AIR PLANT
FOR MEDICAL USE AT 737-3**





AUTOMATIC VACUUM PLANT

The vacuum plant is fully automatic and it is capable to maintain the vacuum network pressure from 550mmHg until 650mmHg. The automatic vacuum plant is consisted of three vacuum pumps and its capacity has been calculated in order that each pump can respond to 100% of maximum demand.

The automatic control-monitor unit monitors continuously the medical air net pressure via the electronic pressure transducer and regulates the network pressure via controlling the operation (remote start and stop) of the compressors (individually controlled). In every demand, as long as the vacuum receiver is exhausted, the first pump is automatically starts and operates until the predetermined vacuum level is achieved. In case of larger demand that the one pump cannot meet, then a second or a third pump automatically starts working until the predetermined vacuum level for each pump has been achieved. The operation and rotation mode in every operation cycle is defined by the automatic control-monitor unit.

The rotation mode is depending on the operation hours of every pump, in order to have equable wear for all the pumps. In every operation cycle, the pump holds the minimum operation hour starts working. Also there is an option, by activating a parameter on the automatic control unit, according to which if the pump working cannot reach the predefined vacuum level, then a second or a third pump automatically starts working and so on. The automatic control unit can be connected to hospital's local area network providing remote monitoring and setting through TCP/IP protocol using an internet browser.

The major subsystems/elements of Medical Vacuum Central Station are:

1. Three (3) electrically driven vacuum oil lubricated pumps, rotary, connected directly with 3Ph electrical motors, that constitute a solid unit, mounted on metallic no vibrating base.
2. Vacuum receivers according to DIN of 4810 (capacity depends on model). The receivers are galvanized inside-outside or painted.
3. The required piping.
4. MGS automatic control-monitoring unit, an electronic waterproof control panel which is the operating, indicating and alarm system of the Medical Vacuum Central Station.
5. Pressure sensor (transducer) that measures the network pressure. It is the sensing element of the MGS automatic control-remote unit, used for regulating the vacuum pressure level and alarm monitoring.
6. A group of bacteriological filters for holding bacteria of living micro-organisms, thing that ensures the personnel of maintenance from likely pollutions and exempts defused air from the pumps in the countryside from polluted micro-organisms. This group includes two (2) bacteriological filters of vacuum in parallel connection (one in operation and one in stand by mode), each rated at full flow rate of the medical Vacuum central station, with overall switches in the entry, connections, with differential manometers for the control of cleanliness of filters. The bacteriological vacuum filters , are tested in flame of sodium according to the BS 3928 and the infiltration in those of micro-organisms and bacteria of diameter from 0,02 to 2 micron, is smaller than 0,05%. In the lower part of the filters located evacuation valve that leads in transparent sterilized glass container of meditation of condensates.

Automatic Vacuum Station description

1. Electrical vacuum pump

The automatic Vacuum plant is consisted of three pumps. The capacity of the pump will be calculated in order that each pump can respond to 100% of maximum demand. The electrically driven vacuum pump, rotary type, is connected directly with three phase electrical motor, that constitute a solid unit placed on a metallic no vibrating base.

The pumps are noiseless and provided with inlet oil filters, automatic control panel, operation hour meter, operation options and alarm in case of malfunction.



The operation of pumps is automatic and they are controlled by vacuum level sensor. The pumps connected to the automatic control-monitor unit can operate via the automatic control unit vacuum level sensor that allows the operation of each pump in one of the following conditions:

- **Aut.** Operation via automatic control-monitor unit
- **Man.** Operation via pump's vacuum level sensor
- **0** Operation without load, pump stops

Technical characteristics of each pump :

- Flow (Table A) m³/h
- Maximum vacuum 753 mms Hg
- Electrical power (Table A) kw

2. Vacuum receiver/s

The receiver or receivers (Table A) of total capacity (Table A) liters at DIN 4810, with inlets and outlets for the connection of the pumps and network, and vacuum meters. The receivers are galvanized inside-outside and are accompanied by testing certificates.

Technical characteristics of each receiver:

- Receiver volume (Table A) litres
- Receiver quantity (Table A) pcs
- Maximum test pressure 16,5 atm

3. Automatic control-monitoring unit

One (1) automatic control-monitoring unit for automatic operation of the vacuum plant, which ensures the automatic changeover operation of the pumps. The vacuum plant automatic control-monitor unit can be connected to hospital's local area network and authorized personnel can control and monitor by distance the plant's operation, vacuum limits and services via TCP/IP protocol using any available internet browser.

The MGS automatic control-monitoring unit monitors continuously the air net pressure and dew point via the electronic pressure transducers and regulates the network pressure via controlling the operation (remote start and stop) of the compressors (individually controlled).

The automatic control-monitor unit is a state of the art processor unit (high processing ability), an index LCD panel 4x40 characters and a keyboard for managing the operation of vacuum plant. The automatic control-monitor unit also has a 3-phases and current fluctuation controller.

Via the automatic control – monitoring unit can be achieved the following operations:

- Automatic or manual pumps operation
- Automatic circular rotation of pumps operation
- Index of vacuum network pressure in mmHg and situation of pumps operation (ON - OFF)
- Index of operation time and number of starts per hour for each pump
- Alarm Index about the pumps maintenance (oil replacement, cartridges replacement etc)
- I Alarm Index on the bacteriological filters replacement
- Index of pumps malfunction
- Optical index of changing phases
- Optical and acoustic alarm minimum limit pressure (360 mmHg)
- Optical and acoustic alarm of pressure sensor malfunction

The automatic control-monitoring unit will be also accompanied by the following luminous lamps (leds)

- Green – presence of volt
- Yellow – monitoring of phases (right rotation of pumps)
- Three green of – operation of pumps 1-2-3
- Three white – pumps service 1-2-3



- Three red – pump problem 1-2-3
- Yellow – vacuum center maintenance - filters
- Red – alarm minimum pressure limit or pressure sensor malfunction(also have sound alarm).

The alarms of maintenance are signaled with constant yellow light, the pumps malfunction with constant red, while minimum pressure limit or pressure sensor malfunction with red flashing light and siren.

The vacuum centre's automatic control-remote unit includes outputs for transferring the operation and alarm indexes in BMS system (Three indexes of pumps fault)

General features of MGS automatic control-monitor unit:

- Built in three transfer switches for AUTO and MANUAL mode selection, independent for each source. OFF position also included
- microprocessor based design, user friendly interface via built in LCD screen, 4x40 characters
- additional 4 led indicators (NORMAL /PREALARM /ALARM /SERVICE) independent for each source , functionality according to EN 737-3, ISO 7396-1, HTM 02-01-PART 1
- additional 4 led indicators (NORMAL /PREALARM /ALARM /SERVICE) for vacuum/ pressured air network according to EN 737-3, ISO 7396-1, HTM 2022
- cyclic operation of sources based on time balance operation,
- 3 independent timers for load and run time measurement of each source
- Time delay function avoiding simultaneously start of sources
- text messages (40 characters max) for all conditions, emergency alarms and events for real time status viewing
- multi language support
- built in buzzer for audible signaling emergency alarms warnings and errors
- Temporary audible signal muting via SILENCE button. During the silencing mode, the audible signal is activated again by any new alarm condition
- TEST button for checking all visual and audible signals
- automatic resetting when any alarm condition reverts to normal
- **self test procedures** and diagnostics utilities included for system integrity, communication and wiring testing
- real time clock with battery back up
- built in non volatile memory
- default values for all parameters ensures reliable operation
- user programmable configuration and parameter settings (code protected area for authorized staff only)
- advanced algorithm that reduces the restart times per hour of sources
- **alarm / events / services report and log file** (max 250 records with time stamp) for plant performance analysis and debugging
- **15 analog inputs**, 10 Bit resolution, (4...20 mA measuring range that simplifies the use of any 4...20 mA transducer).

Basic Analog measurements are:

- vacuum net pressure
- ambient temperature

- **12 digital inputs** with predefined function with NO/NC and enabling/disabling capability

The digital inputs are used for:

- filters performance monitoring,
- power supply over/under voltage monitoring
- phase sequence monitoring,
- thermal protection and operation status monitoring of each source independently
- Additional capability of primary Net pressure measurement redundancy for enhancing the system's reliability, using an extra digital pressure sensor connected to digital input (built in auto transfer algorithm for operation via the digital pressure switch if the primary analog pressure transducer failed)



- **9 digital outputs** (relay output, 1 change over dry contact, 12A / 250 Vac) with predefined functions)
- dry contacts for remote signaling and interface with other monitoring systems (BMS etc)
- independent dry contact (relay NC / NO) for each source FAILURE remote signaling
- independent dry contact (relay NC / NO) for temperature controller function
- Battery back up system and DC UPS capability with mains power failure signaling function
- on site firmware upgrade capability via a common USB memory stick without affecting the system functionality
- **remote access via Ethernet** by any internet browser , no additional software needed
- on line remote system viewing and additional **daily graphs** for all Net pressures (data logging function) for plant pressure monitoring and analysis (24 hours depth,1 sample per 15 sec)
- **remote parameter settings via Ethernet** using any internet browser (code protected area for authorized staff only)
- water proof Metal enclosure, IP 54

4. Analogue sensors

Two (2) analogue sensors (transducer type) network and receiver vacuum level for remote and local control of centre's operation.

5. Bacteriological filters

A group of bacteriological filters for holding bacteria of living micro-organisms, thing that ensures the personnel of maintenance from likely pollutions and exempts defused air from the pumps in the countryside from polluted micro-organisms. This group includes two (2) bacteriological filters of vacuum in parallel provision, with overall switches in the entry, connections, with differential manometers for the control of cleanliness of filters. The bacteriological vacuum filters are tested in flame of sodium according to the BS 3928 and the infiltration in those of micro-organisms and bacteria of diameter from 0,02 until 2 micron, is smaller than 0,05%. In the lower part of the filters there is an evacuation valve that leads to a transparent sterilized glass container for condensates.

Technical characteristics of the filters

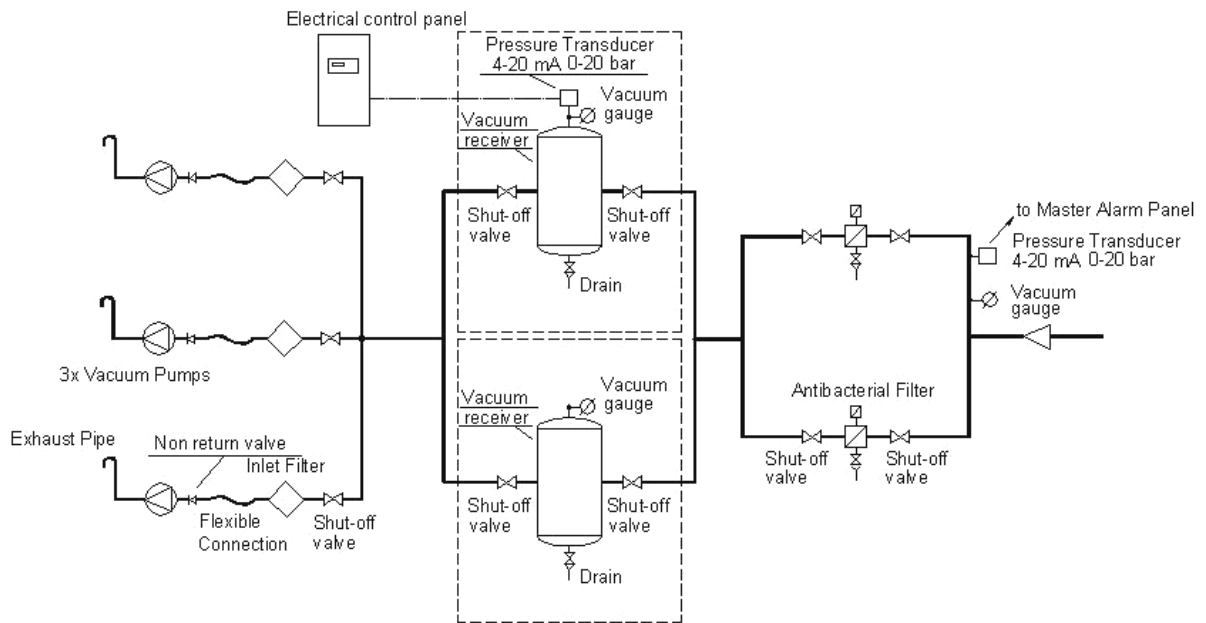
- Flow (Table A) m³/h
- Flow (Table A) m³/h at 500mmHg
- Type (Table A)

The automatic vacuum centre is connected with the remote control and alarm system, that in case of false plant operation, gives luminous and sound alarm signal (ALARM), with possibility of temporary interruption (15 minutes) only for the sound signal.

The automatic control-monitor unit of VACUUM plant can be connected to hospital's area network and provides the option of remote operation control, limits and service via TCP/IP protocol using an internet browser.



TYPICAL AUTOMATIC VACUUM PLANT





CENTRAL ALARM SYSTEM FOR MEDICAL GAS PLANTS

The medical gas central alarm system is based on microprocessor technology to provide an alarm system capable of monitoring the complete medical gas services installed in a hospital and transfer all the information through internet (TCP/IP) connection to the control room.

The central alarm system, is manufactured according to the paragraph of 6.2 regulations of **EN 737-3 standard**, and according to corresponding regulations HTM 2022 and is suitable for operation with electric current of 220Volt - 50 Hz and it includes labels of high, medium and low priority, as well as signals of information.

Usually the main unit is placed at the control room and one repeater in the supervising engineer office or in the maintenance personnel office.

The system is digital and it has LCD screen 4x20cm, on which there are shown all the indications about the medical gas plants operation and also signals of high, medium and low priority. Also for each gas there are one green, one yellow, white and red led that are activated (color and touch frequency) depending on the type of signal (high, medium and low priority). The signals of high and medium priority are also accompanied by acoustic signal, which can be interrupted using the SILENCE button, for 15 minutes (ISO 7396). None of the signals can be interrupted permanently if the cause of it has not been previously restored.

The central alarm system of O₂, N₂O, vacuum, compressed air of medical use and scavenging automatic plant, is electronic with three main operations that serve different objectives, displays all the alarm signals that are specified in the table 6 of EN 737-3 European Standards which are grouped in the following categories:

- a) Emergency alarms (ALARM)
- b) Operating alarms (PRE ALARM) - (SERVICE)
- c) Information signals

with analogue signals of all medical gases pressure on LCD screen, with individual power supply, with all the optical and sound signals that are demanded by EN 737-3 standard.

Automatic control-monitoring unit

The automatic control-monitor unit is a state of the art processor unit (high processing ability), an index LCD panel 4x40 characters and a keyboard for managing the operation of central alarm panel. General features of automatic control-monitoring unit:

- Built in three transfer switches for AUTO and MANUAL mode selection, independent for each source. OFF position also included
- microprocessor based design, user friendly interface via built in LCD screen, 4x40 characters
- additional 4 led indicators (NORMAL /PREALARM /ALARM /SERVICE) independent for each source, functionality according to EN 737-3, ISO 7396-1, HTM 02-01-PART 1
- text messages (40 characters max) for all conditions, emergency alarms and events for real time status viewing
- multi language support
- built in buzzer for audible signaling emergency alarms warnings and errors
- Temporary audible signal muting via SILENCE button. During the silencing mode, the audible signal is activated again by any new alarm condition
- TEST button for checking all visual and audible signals
- automatic resetting when any alarm condition reverts to normal
- **self test procedures** and diagnostics utilities included for system integrity, communication and wiring testing
- real time clock with battery back up
- built in non volatile memory
- default values for all parameters ensures reliable operation



- user programmable configuration and parameter settings (code protected area for authorized staff only)
- advanced algorithm that reduces the restart times per hour of sources
- **alarm / events / services report and log file** (max 250 records with time stamp) for plant performance analysis and debugging
- Medical gases plants monitoring using graphs, that are stored in MGS controller memory and they can be retrieved for farther evaluation by using a USB memory stick.
- **15 analog inputs**, 10 Bit resolution, (4...20 mA measuring range that simplifies the use of any 4...20 mA transducer).

Basic Analog measurements are:

- vacuum/medical air/O₂/NO₂ net pressure,
- humidity of produced medical air

- **12 digital inputs** with predefined function with NO/NC and enabling/disabling capability

The digital inputs are used for:

- filters performance monitoring,
- power supply over/under voltage monitoring
- phase sequence monitoring,
- thermal protection and operation status monitoring of each source independently
- Additional capability of primary Net pressure measurement redundancy for enhancing the system's reliability, using an extra digital pressure sensor connected to digital input (built in auto transfer algorithm for operation via the digital pressure switch if the primary analog pressure transducer failed)
- **9 digital outputs** (relay output, 1 change over dry contact, 12A / 250 Vac) with predefined functions)
- dry contacts for remote signaling and interface with other monitoring systems (BMS etc)
- independent dry contact (relay NC / NO) for each source FAILURE remote signaling
- independent dry contact (relay NC / NO) for temperature controller function
- Battery back up system and DC UPS capability with mains power failure signaling function
- on site firmware upgrade capability via a common USB memory stick without affecting the system functionality
- **remote access via Ethernet** by any internet browser , no additional software needed
- on line remote system viewing and additional **daily graphs** for all Net pressures (data logging function) for plant pressure monitoring and analysis (24 hours depth,1 sample per 15 sec)
- **remote parameter settings via Ethernet** using any internet browser (code protected area for authorized staff only)
- water proof Metal enclosure, IP 54

Signals - indexes

The information that is provided in real time on the LCD screen, for each gas separately is:

- O₂ network: left ramp pressure LR - network pressure NET - right ramp pressure of RR - backup ramp pressure AUX (or reservoir Vessel) – reservoir capacity.
- N₂O network: left ramp pressure LR - network pressure NET - right ramp pressure of RR - backup ramp pressure AUX.
- Compressed air network: network pressure - 3 compressors status (thermal – operation problem) – network's relative humidity.
- Vacuum network: network pressure - 3 vacuum pumps status (thermal – operation problem).
- Second stage network status (signals from central alarm panels)
- Anesthetic gas scavenging system status

The simultaneous existence of various priorities signals are presented successively on the LCD screen.

Signals of low priority are presented when O₂ or N₂O ramp reaches the 50% of its content. It is quoted in which ramp has happened (for example left ramp of O₂). At the same moment if the same thing



happens to another ramp, the information of the second ramp the content of which has decreased by 50% is presented in the screen successively.

Signals of medium priority are presented when the content of O₂ or N₂O ramp descends below 10%. In this case it turns on the corresponding gas yellow flashing (frequency 0,6 z) led, activates the buzzer and in the LCD screen, is shown which ramp has the problem (f.e. right ramp O₂). At the same moment if another ramp has the same problem in the screen the signals of two ramps which content decreased in 10% are shown successively. Also signals of medium priority are presented when a vacuum pump or a compressor is out of order, or the relative humidity of compressed air exceeds the limit of 50%. In this case a yellow flashing (frequency 0,6 Hz) led of corresponding gas turns on, the buzzer is activated and on the LCD screen is shown what has happened (f.e. vacuum pump).

Signals of high priority are presented when the pressure in one of the networks O₂ or N₂O or compressed air, or vacuum, or the O₂ pressure from the reservoir of liquid the O₂ descend or amount at 20% of nominal pressure that usually is 8 bar. In this case it turns on with red flashing (frequency 2 Hz) color of led corresponding gas, it sounds the buzzer and on the LCD screen, it is quoted the previous incident (low pressure the O₂). At the same moment if the same thing happens to another gas on the screen will be presented successively the information of these two situations.

The information that is provided per all moment in the LCD screen and the LED panel, for every gas:

Description		clinical-emergency (alarm status)	
Medical gas	MSG	Pre-alarm yellow led	alarm red led
O ₂	Left Ramp	<50 bar	<6,5 bar
	Right Ramp	<50 bar	<6,5 bar
	Aux Ramp	<50 bar	<6,5 bar
	Vessel	-	<+20% -30%
	Net	-	<+20% -30%
	SERVICE	LED O ₂ service	
N ₂ O	Left Ramp	<14bar	<6,5 bar
	Right Ramp	<14bar	<6,5 bar
	Aux Ramp	<14bar	<6,5 bar
	Net	-	<+20% -30%
	SERVICE	LED N ₂ O service	-
C. Air	S1 Comp	Pro TH1 - thermal contact problem	-
	S2 Comp	Pro TH2 - thermal contact problem	-
	S3 Comp	Pro TH3 - thermal contact problem	-
	Net	-	<+20% -30%
	% RH	if -18C-(6,14%) PRO atm -40C	if -4C (20,5%) > alarm atm -26C
	dryer/filters	Error message C. Air	-
	SERVICE	LED C. Air service	-
Vacuum	S1 pump	Pro TH1 - thermal contact problem	-
	S2 pump	Pro TH2 - thermal contact problem	-
	S3 pump	Pro TH3 - thermal contact problem	-
	Net	clini 360mmHg abs	Pro 450 mmHg below limit
	SERVICE	LED vacuum service	-
2 nd stage central alarm panels	all b' stage panels	LED 2 nd stage network malfunction	
	SERVICE	LED general service	
AGSS		LED 2 nd stage network malfunction	

All sensors which are used for signaling are analogue (4-20 mA) transducer and they provide in real time multiple sources pressure.



Internet (TCP/IP) connection:

The system supports the possibility of monitoring and control devices, operation limits and services from distance via TCP / IP protocol and special web interface software as well as the possibility of e-mail notices addressing to technical staff. For this reason it should be foreseen the connection to hospital's DATA network.

The system informs the technical personnel automatically and will record messages referring to faults, maintenance, and devices operation.

The technical - maintenance personnel could be informed about faults or problems referring to medical gas systems through every terminal PC that is connected to hospital's DATA network.

Report service

The central alarm panel is provided with real time clock and operation counter for monitoring the maintenance schedule in order to inform the technical personal with messages on the LCD screen and LED signals.

Service table

Central alarm	Time
N ₂ O - O ₂ plant	Annual check – every 5 years – every 10 years
Vacuum plant	Bacteriological filter
	Oil
	Oil separator
	Vacuum receiver
Compressed air plant	Oil filters
	Air inlet filter
	Oil separator
	Compressed air filters
	Dryer - material
	Receiver (vessel)
2 nd stage reducer panels	Annual – every 5 years
Scavenging system	Annual – every 5 years



INDUSTRIAL AIR PLANT

The major subsystems/elements of Industrial air plant are:

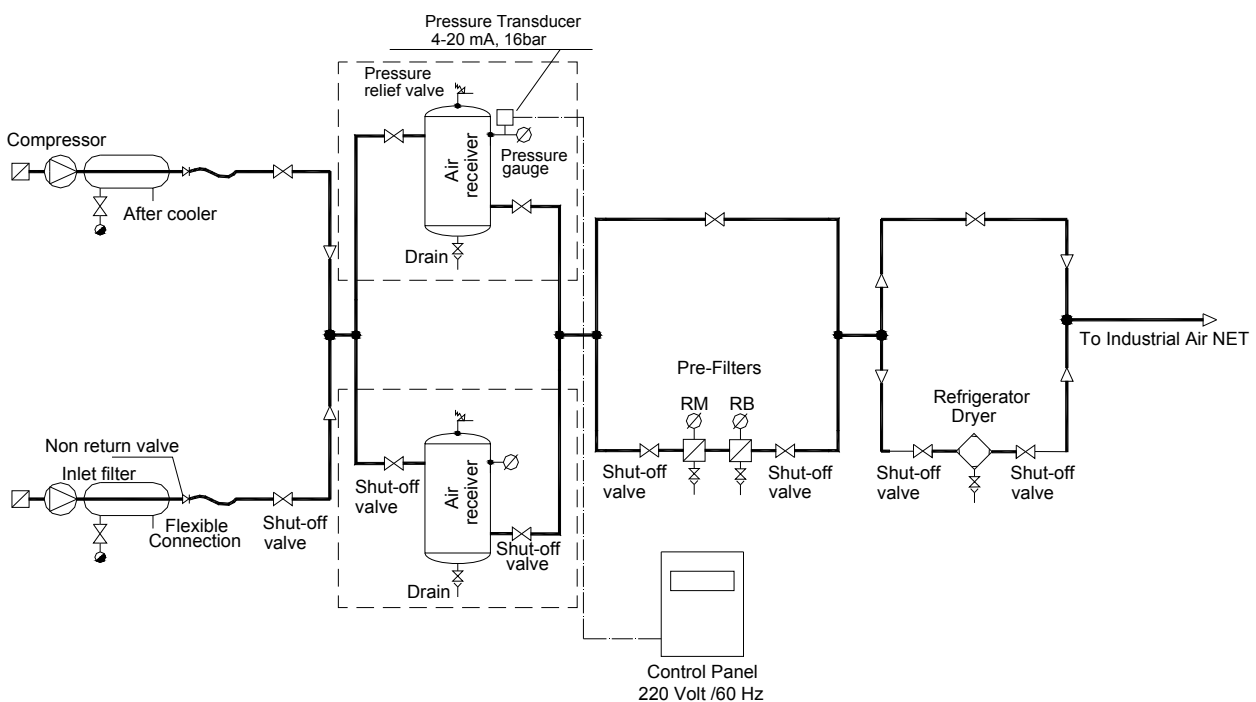
- Two (2) piston compressors, flow (Table A) m³/h, and power (Table A) HP,
- Two (2) after coolers air-cooled with automatic evacuation valve of condensates
- Two (2) air receivers volume (Table A) litres, according to DIN 4810, with inlets and outlets for the connection of compressors and network, with safety valves, manometers and evacuation valve of condensates. The receivers are galvanized inside-outside and are accompanied by testing certificates
- One (1) electrical board for plant's automatic operation, metallic box for wall mounted installation, IP 55
- One (1) dryer refrigerated type
- The necessary piping, valves, non-return valves for the connection of the compressor systems to the network
- Provision of filters for cleaning the air, as filters of dust, filters of dust of subdivision micron, , all with overall valves and differential manometers and connected between them in parallel provision. The filters will be cartridge type and will be provided with:
 - Automatic valve of evacuation of condensates
 - Differential manometer for controlling filter's clarity
 - Flow Indicator

Technical characteristics of filters:

- Type of (dust 1 micron), (dust 0,01 micron)
- Flow (Table A) m³ /h
- Maximum operation pressure 16 bar
- Initial pressure drop 85 mbar
- Maximum pressure drop for cartridge change 680 mbar

- The materials needed for the fully automatic operation of the industrial air plant

TYPICAL INDUSTRIAL AIR PLANT





ANAESTHETIC GAS SCAVENGING DISPOSAL SYSTEM (AGSS)

The suction and disposal to the environment of the redundant gases from the anesthetic equipment inside the operating theatres but also from the emitted anesthetic gases from patients in the stage of recovery, is being applied by using an automatic anesthetic gas scavenging disposal system (AGSS), through the AGSS outlets which are installed in various departments. The Anesthetic Gas Scavenging (AGS) system removes anesthetic gas mixtures from theatres and recovery areas, thereby protecting the medical staff from possible long term health hazards. By virtue of its design, the new active disposal system can produce high levels of capture simply by connecting the terminal unit to the anaesthetic breathing circuit via a receiver unit, thereby removing the majority of "pollution" at source.

The AGSS central system is manufactured according to the regulations of EC EN 737-2 and includes, two vacuum blowers for continuous operation (flow (Table A) m³/h), one electric operation panel, automatic valve for maintaining constant depression in the network (no matter the number of the AGSS outlets that operate), pump protection filter and sensors for distant control of AGSS system operation.

Advantages of the central AGSS station against the Venturi system and the autonomous outlets:

1. It serves continuously any number of outlets always under constant vacuum, without any influence from the parameters of the respiratory equipment.
2. It does not consume compressed Air and does not overload the Compressed Air plant
3. It can serve any supply asked in the outlet (even 250LPM), contrary to VENTURI system that is difficult to exceed the 20 LPM supply. It should be mentioned that for recovery rooms, the required supply is at least 150 LPM per bed.

Finally the automatic AGSS system is also provided with remote alarm panel for monitoring system's operation signals by distance.

The AGSS central station is activated by remote switch placed on the alarm panel, which is usually placed inside or near the surgery rooms or in each surgery room.

Description

The Anesthetic Gas Scavenging disposal system consists of the following four basic elements:

Exhauster Unit

The exhauster units is a two stage lateral channel vacuum pump unit with an impeller mounted directly on the master shaft. Operation of the exhauster units is similar to a fan and requires a low level of maintenance and no lubrication. A range of exhauster units are available giving flow rates from 500 to 400 liters/min. Exhauster units are electrically driven either by a single phase motor on the smaller models, or a three phase motor on the larger models.

The choice of exhauster units dependent upon the requirements of the system, i.e. number of terminal units and pipeline installation. A duplex installation is available and provides a "Duty" and "Standby" exhauster unit. The "Standby" unit will automatically operate when the "Duty" unit fail or during periods of high usage. Duplex installations provide increased reliability, system capacity and prolong exhauster unit life.

Vacuum/Flow Regulating valve

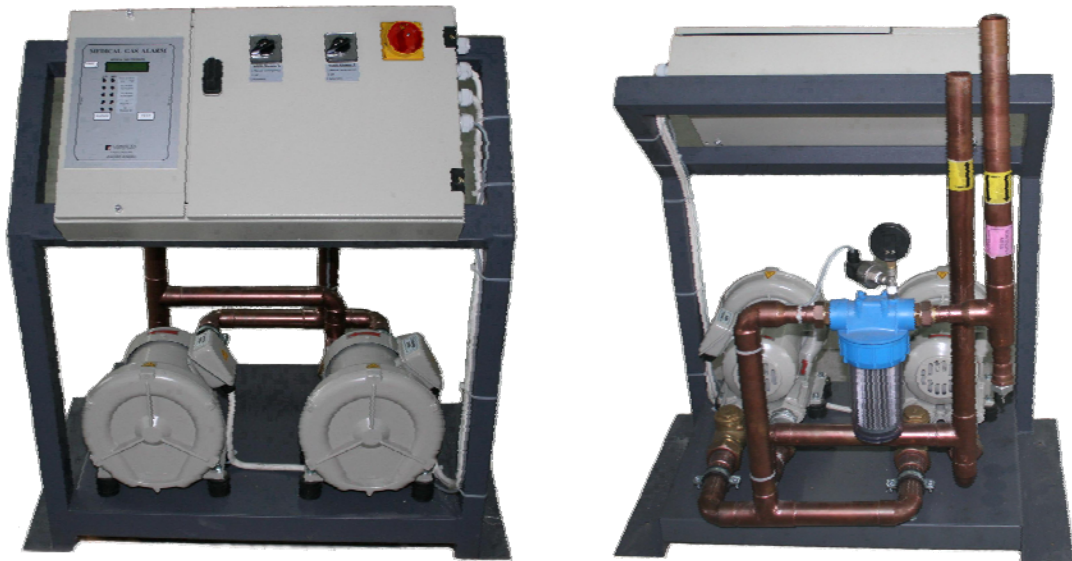
The vacuum/flow regulating valve controls the vacuum level in the pipeline installation and therefore the flow rate at each terminal unit. The regulating valve is automatic in operation and controls the flow rate at the terminal unit within precise limits regardless of the number of terminal units in use. The regulating valve consists of a spring loaded plate valve which allows air ingress to control the system vacuum level. The spring pressure is adjustable and is set up to produce the correct terminal unit flow rate during commissioning.

Pipeline system

The pipeline system must be specifically designed to suit individual installations, ensuring that the correct flow rate is obtained at each terminal unit



- **Inlet filter:** The inlet filter protects the pumps from the induction air through the vacuum/Flow regulating valve and from anesthetic gases coming from patient breathing through the scavenging outlet.



- **Electric/electronic control panel:** Contains the electric board, control panel, selector switches (0 off 1 automatic 2 manual), thermal switch, relays. The control panel controls the pumps operation and the time based pump rotation and also controls the network pressure and operates the alarm in case of pump failure.
- **Local alarm and operation panel:** The Electric/electronic AGSS control panel updates the local alarm panel about failure or proper operation pumps signals and network pressure. This information is available to the local user. The local user is able to activate and deactivate the system at will as every local panel is equipped with remote activation-deactivation button.
- **Network:** The scavenging network should be properly designed in order to have the desirable flow to scavenging outlets.
- **Scavenging outlet:** Scavenging outlet I similar to the other medical gas outlets. It is designed for nominal flow that exceeds 150 litres/min. The scavenging system is designed in order that every outlet has a flow area of 130 litres/min (maximum) with 1 kPa pressure drop to 80 litres/min (minimum) with 4 kPa pressure drop, regardless the operating outlets number.



BED HEAD UNITS (BHU)

The bed head unit is placed on the wall above the patient bed . It includes all the elements that are required for patient treatment and nursing personnel needs and provides lighting (general and local), electrical energy (sockets), data (telephone, nurse call etc.), medical gases and vacuum.

The bed head unit is manufactured from a special profile of aluminum and coated with electrostatic paint.

The characteristics of various types of the bed head units are presented analytically in Table 1 that follows.

In rooms with architectural difficulties where wall mounted installation is not possible special types of BHU are suggested:

- Suspended (single – double)
- Vertical- pendant

Drawings of B.H.U. are presented below describing the various types of bed head units, providing general characteristics (terminal units, sockets, EQ etc).



Table 1 : BHU description table

A/A	BHU room description	BHU description						Equipment per bed								Lighting			Nurse call		Switching operation							
								Medical gas outlets*					Electrical sockets			EQ	Data RJ45 cat6		Direct	Night	Indirect	Operation		Direct	Night	Indirect		
	Room	Bed (pc.)	Length (m)	Type	Rail on BHU	Rail on the wall	Extra equipment	O ₂	Air	Vac	N ₂ O	SC	Generator	Main power supply	UPS	EQ	Data	Voice	18 W	5W LED	36W or 58 W	18W	36W or 58 W	Nurse call	18 W	5W LED	36W or 58 W	
1	Nursery single bed	1	1,80	Elisa (one profile)				1	1				1	1			1	1	1	1	1	Yes		Yes	From nurse call hand set	Yes	Switch on the BHU	
2	Nursery two bed	2	3,60	Elisa (one profile)				1	1				1	1			1	1	1	1	1	Yes		Yes	From nurse call hand set	Yes	Switch on the BHU	
3	Day-clinic	1	1,80	Elisa (one profile)				1	1				1	1			1	1	1	1	1	Yes		Yes	From nurse call hand set	Yes	Switch on the BHU	
4	(AIDS, SAR)	1	1,80	Elisa (one profile)				1	1				1	1			1	1	1	1	1	Yes		Yes		Yes	Switch on the BHU	
5	Artificial kidney	1	1,80	Theodoro+Kassandra (two profiles)				1	1				3	3		1	1	1	1		1	Yes		Yes			Switch on the BHU	
6	Delivery	1	1,80	Elisa (one profil)		Yes		1	1	1			2	2		2	1	1	1		1					Switch on the BHU	Switch on the BHU	
7	ICU, CCU, High Dependency unit, Isolation	1	2,00	Theodoro+Kassandra (two profiles)	Yes	Yes	Digital clock - Horizontal rail for trolley /Φ38 tubes for instruments	4	4	4			8	8	4	2			1	1	1				Switch on the BHU	Yes	Switch on the BHU	
8	Neonatal unit	1	2,00	Theodoro (one profile)	Yes			2	2	2			4	4	2	2												
9	Resuscitation	1	2,00	Theodoro (one profile)	Yes	Yes		2	2	2	2	2	4	4	2	2												
10	Recovery	1	2,00	Theodoro (one profile)	Yes			2	2	2			4	4	2	1												
11	Preparation	1	1,00	Theodoro (one profile)	Yes			1	1	1	1	1	2	2	2	1												
12	Triage	1	1,80	Theodoro (one profile)	Yes			1	1	1			4	2	2	1												
13	Accident and emergency	1	1,80	Theodoro (one profile)	Yes			1	1				2	2		1	1											
14	Suspended for special rooms	1	2,00	Panorama	Yes (double)		Horizontal rail for trolley /Φ38 tubes for instruments	4	4	4			8	8	4	2			1		1					Yes		Yes

NOTE:

- There are three ways of installation: a) wall mounted, b) suspended from the ceiling (using metallic columns) and c) suspended (using metallic columns from ceiling to floor)
- Installation height (from finishing floor)
 - Elisa profile : 1,60 – 1,80m lower part of BHU from finishing floor
 - Theodoro profile: 1,20 – 1,40m lower part of BHU from finishing floor
 - Kassandra profile: 1,70 – 1,80m lower part of BHU from finishing floor (when used as lighting profile with Theodoro profile)
- The suggested profile types are the most common and there is other solutions according to the project

*The number and the type of the medical gas outlets per bed are according to HTM 02.01



BED HEAD UNIT
NURSERY - DAILY CARE (DAYCLINIC)

The Bed Head Unit is installed beyond the patient bed, wall mounted installation, and provides all the necessary means for the patient's treatment and the means for nursery staff to work with (lighting (general and reading), electrical supply (sockets), low voltage circuits (telephone, data, nurse call etc), supply of medical gases and vacuum (outlets)).

The B.H.U is manufactured from a special profile of aluminum, electro statically painted, has a thickness of 3mm, with an exterior dimension of 185x175 mm complying with the EN793 standard and holds a certificate of conformity CE **0653**. Typical mounted height is 1,60m from the finishing floor (lower part of BHU).

The manufacture of BHU is according to regulations of European Union EN793, EN 60601-1-1 (medical electric appliances), EN 60598-1 part.1 and EN 60598-2-25(lighting).

The BHU internally is separated in five (5) independent channels for:

- Indirect lighting, night lighting and the bodies of lightings, ballast etc
- Lighting for reading, for examination and electric elements (switches, sockets etc.)
- Two independent channels are used for wiring, low and high voltage.
- Copper pipes and medical gases outlets

The individual channels described above are closed with covers from aluminum profile that can be easily removed.

The BHU length is about 1,80 m., if more than one bed is required then the length is multiplied by 1,80m - depending on the number of beds.

Each B.H.U. includes the following lighting components:

- General lighting (indirect) with a fluorescent lamp of 36 or 58 W / 220V operated from a switch placed at room's entrance.
- Lighting of reading (direct) with a fluorescent lamp of 1x18 W / 220 V, operated from a nurse call hand set.
- Night Lighting 5 W / 220 V with LED operated from a switch on the BHU.

The ballast is electronic.

All light equipment is installed and are protected by a transparent polycarbonate accompanied with aluminum reflectors.

Each B.H.U. includes the following equipment:

- one (1) oxygen (O₂) outlet
- one (1) vacuum (Vac) outlet
- two (2) electrical sockets from which the one is from generator (green color).
- one (1) telephone terminal RJ45 cat6
- one (1) data terminal RJ45 cat6
- nurse call handset
- terminal connections for high and low voltage

NOTE:

A) According to HTM 02.01 there is also a medical air outlet (Air 4bar)

B) The night light is supplied from the general light circuit and operates from a switch placed at the nearest nurse station (there is no need for power supply circuit for night light, just a pair of cables to activate the night light from a nurse station using a switch)



C) For the BHU for special treatment (AIDS, SAR etc) the vacuum outlet is replaced with Air4bar outlet, which is used to create vacuum.

The bed head unit will be equipped with the medical gases terminal units and copper pipes connecting the BHU to the medical gas network all in a separate channel.

The medical gases terminal units are double block type, manufactured according to EN 737-1 standard and the fitting is according to EN 737- 6 standard.

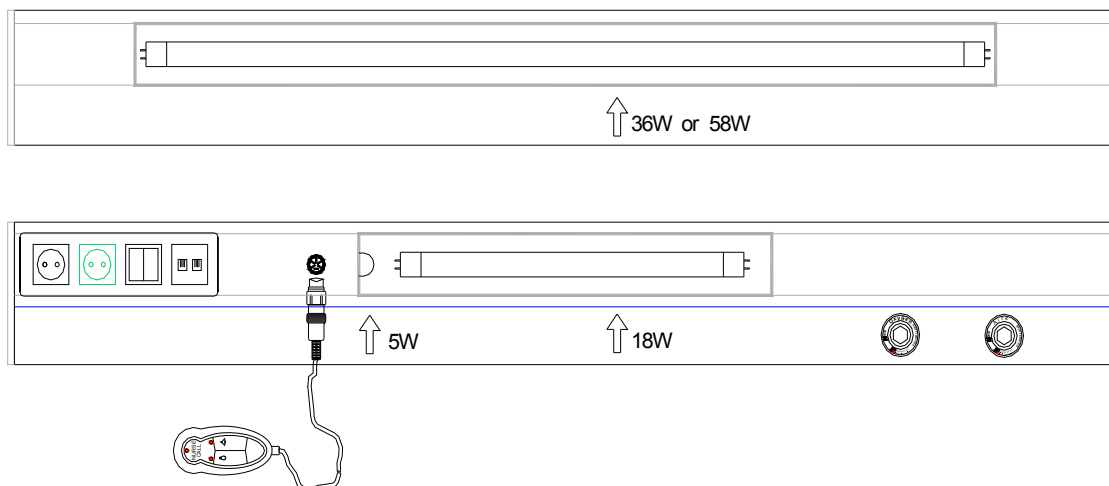
Each medical gases terminal unit is accompanied by indelible polycarbonate plate (can't be removed) according to EN 60601-1 regulations labeled with the name of medical gas, the color and the chemical symbol of corresponding gas.

The copper pipes supplying the medical gases are placed inside the unit, according to EN 13348 standard, DIN 1786 and DIN 17671, type SF Cu / F 37, and are free of arsenic, free of oil, protected to their ends, characterized according to the regulations for use in medical gas installations using silver welding of 40% content in silver, in atmosphere of neutral gas (N₂).

The following tests take place after the manufacturing of a BHU (good operation of unit, i.e.):

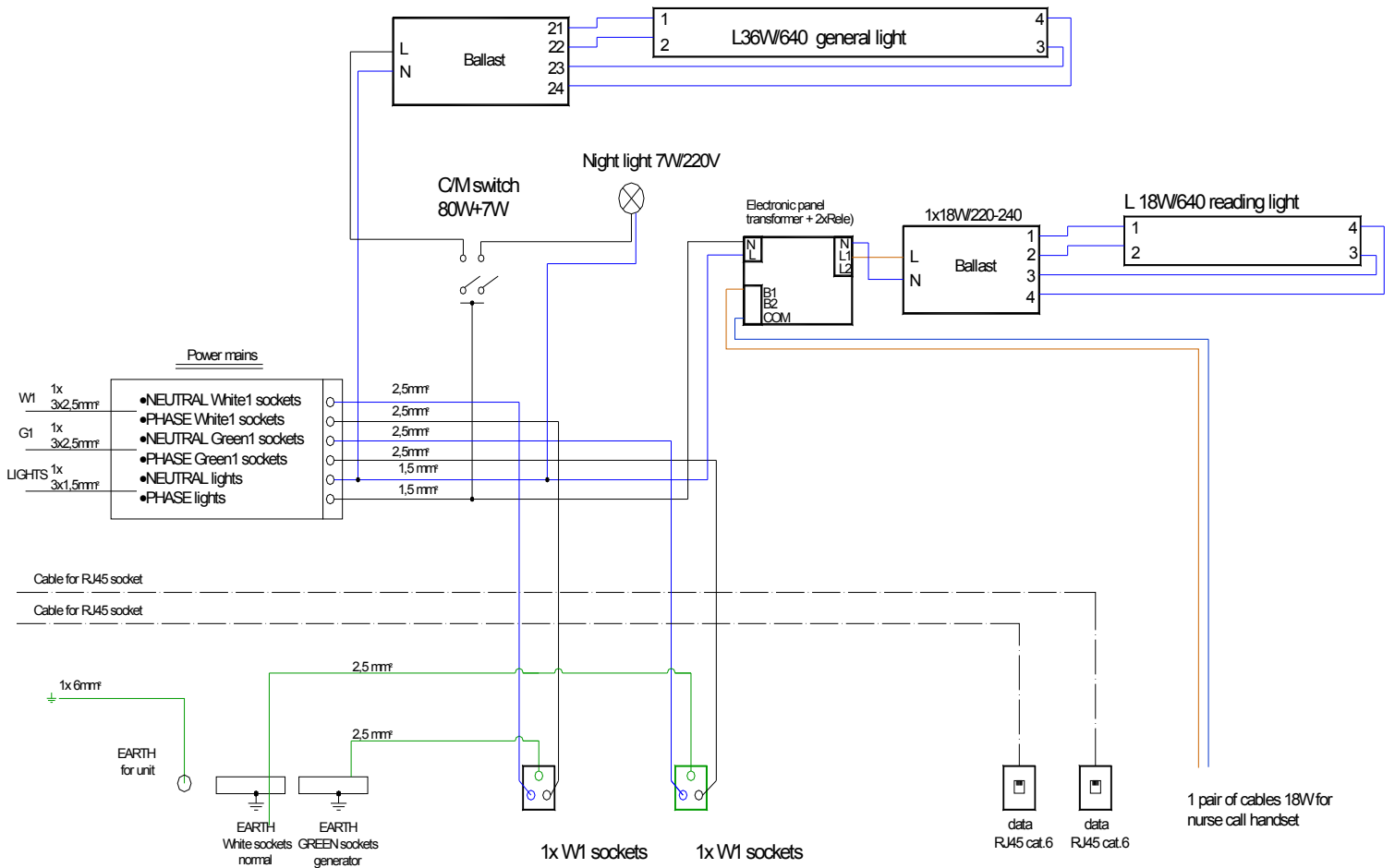
- Lightings and the switches
- Electric sockets
- Grounding the metal parts
- Nurse call handset and data cables
- Leakage, cross-connection and flow for medical gases terminal units

BHU drawing (top view – front view)





ELECTRICAL DRAWING (circuits - cabling)



HIGH VOLTAGE:

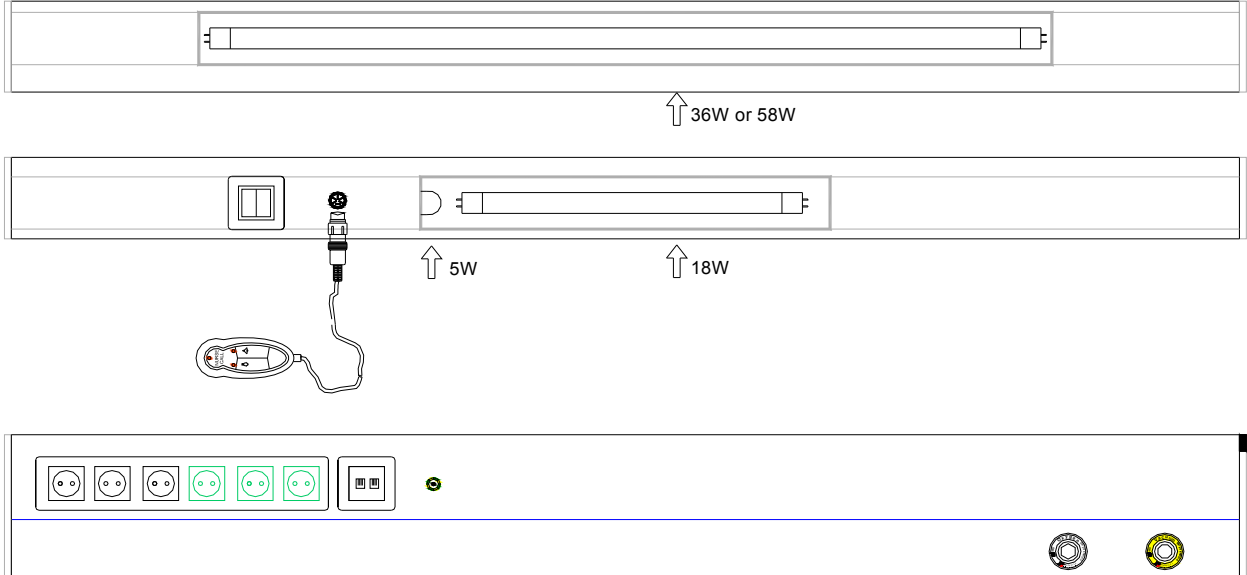
- 1 x circuit for general lighting operating by switch at room's entrance (58W ḡ 2x36W) per BHU – cable 3X1,5mm²
- 1 x circuit for reading lighting operating by nurse call handset (18W) per BHU – cable 3X1,5mm²
- 1 x circuit for white sockets(from main power supply) per BHU – cable 3X2,5mm²
- 1 x circuit for green sockets (from generator) per BHU – cable 3X2,5mm²

LOW VOLTAGE:

- 1x circuit for telephone per bed
- 1x circuit for data per bed

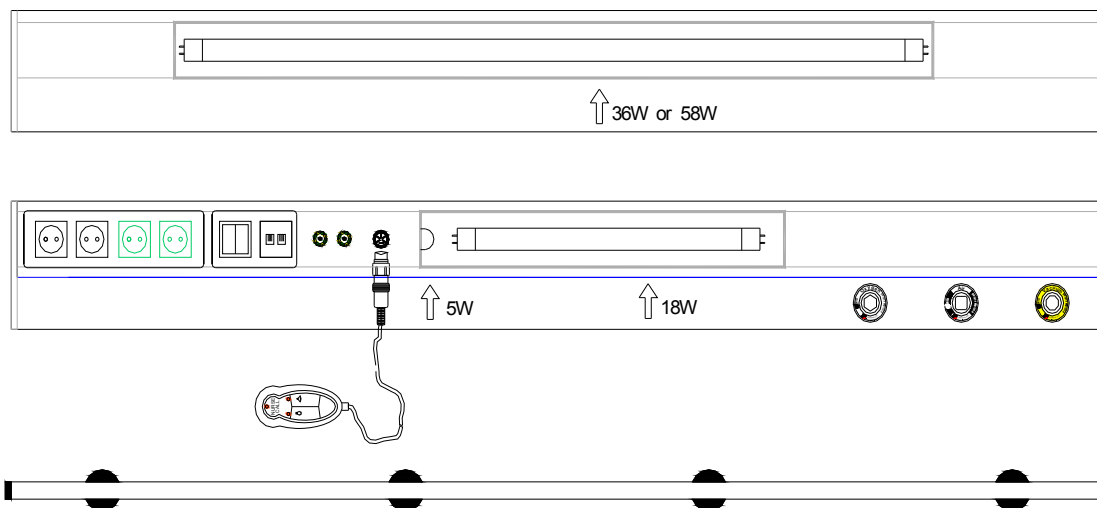


ARTIFICIAL KIDNEY





LABOR BHU





BHU: INTENSIVE CARE UNIT – CORONARY CARE UNIT - HIGH DEPENDENCY UNIT – ISOLATION ICU

The B.H.U is manufactured from a special profile of aluminum, electrostatic painted, has a thickness of 3mm, with an exterior dimension of 216x100 mm complying to the EN793 standard and has a certificate of conformity **CE 0653**. Typical mounted height is 1,40m from the floor (lower part of BHU) and has two independent visiting channels in which they are placed:

- the electric installations (sockets and wirings). This channel is separated in two parts for the low and high currents.
- the medical gas outlets and copper pipes the medical gases .

The manufacturing of the BHU is according to European Union standards EN793, EN 60601-1-1 (medical electric appliances), EN 60598-1 part.1 and EN 60598-2-25 (lighting).

The unit of electrical sockets and medical gas outlets length is 2,50m, while for more a bed, length is multiplied by 2,50m depending on the number of beds.

Each B.H.U. includes the sockets and receptions listed below:

- Four (4) oxygen (O₂) outlets
- Four (4) vacuum (Vac) outlets
- Four (4) medical air (Air 4 bar) outlets
- Eight (8) electrical sockets, supplied from generator (green color)
- Eight (8) electrical sockets, supplied from UPS (orange color)
- Four (4) EQ DIN
- One (1) place for nurse call button
- Two (2) terminal data RJ 45 cat 6
- One place for reception monitor
- One (1) grounding metal parts unit
- Rail the stainless in the above part of unit, for support of monitor dimensions 25x10 mm
- Rail stainless in the wall under the unit, for the support of bodies of intensive dimensions 25x10 mm
- One (1) mobile lightning body with suspended arm of length 1,20m., with halogen lamp 50 W, 12 V, 25.000 lux, with transformer of 220/12V, with luminous intensity regulator of DIM type. The lighting has two arms with springs and it can execute all the movements and to remain constant in the desirable place. The lightning body is provided with special support.
- (1) stainless table for monitor placement, suitable for suspension in rail, provided with mounted arms
- Vertical stainless support tube Ø38 (infusion pumps etc)
- Digital clock

The medical gas terminal units are double block type and they are manufactured according to EN 737-1 standard and the fitting is according to EN 737-6 standard.

Each medical gases terminal unit is accompanied by indelible polycarbonate plate (can't be removed) according to EN 60601-1 regulations labeled with the medical gas name, the color and the chemical symbol of corresponding gas.

The unit of lighting is manufactured from a single profile of aluminum having dimensions 164x90 mm, with two (2) independent visiting channels, electrostatic painted of white color RAL 9016 and is suitable for wall mounted installation.

The unit of lighting for each bed includes the following equipment:

- General lighting (a medium) with (1) fluorescent lamp of 36 or 58 W/ 220 V. Operated by a switch on the BHU
- Reading lighting with a fluorescent lamp of 1x18 W /220V, operated by a switch on the BHU

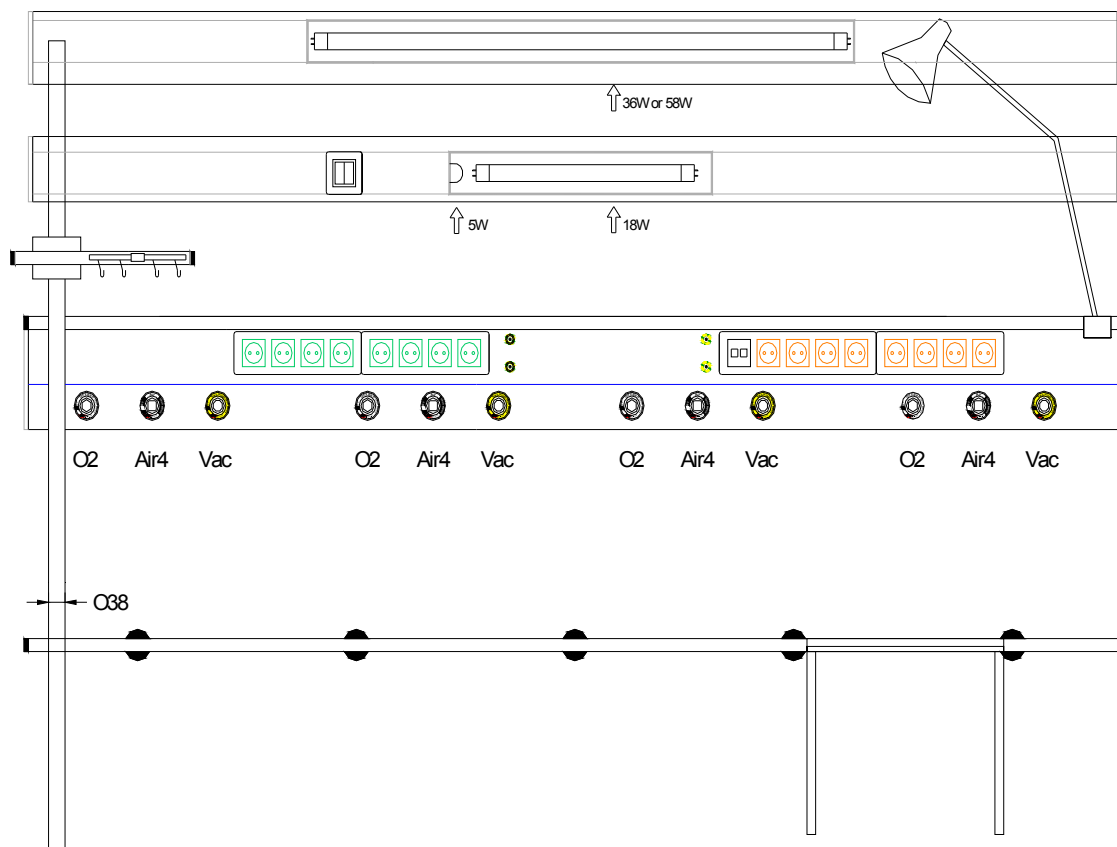


The copper pipes supplying the medical gases are placed inside the unit, according to EN 13348 standard, DIN 1786 and DIN 17671, type SF Cu / F 37, and are arsenic free, oil free, protected to their ends, characterized according to the regulations for use in medical gas installations using silver welding of 40% content in silver, in atmosphere of neutral gas (N₂).

The following tests take place after the manufacturing of a BHU (good operation of unit, i.e.):

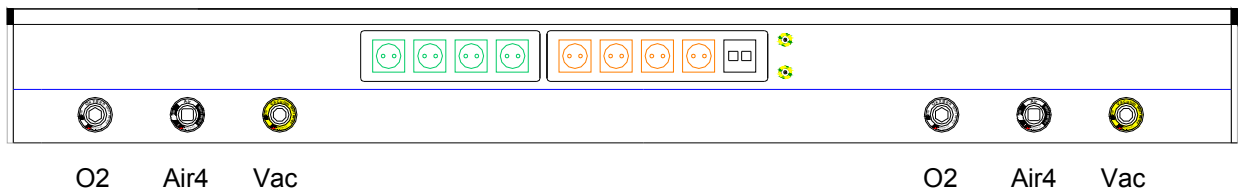
- Lightings and the switches
- Electric sockets
- Grounding the metal parts
- Nurse call handset and the data cables
- Leakage, the right connection and flow medical gases terminal units

BHU drawing (top view – front view)



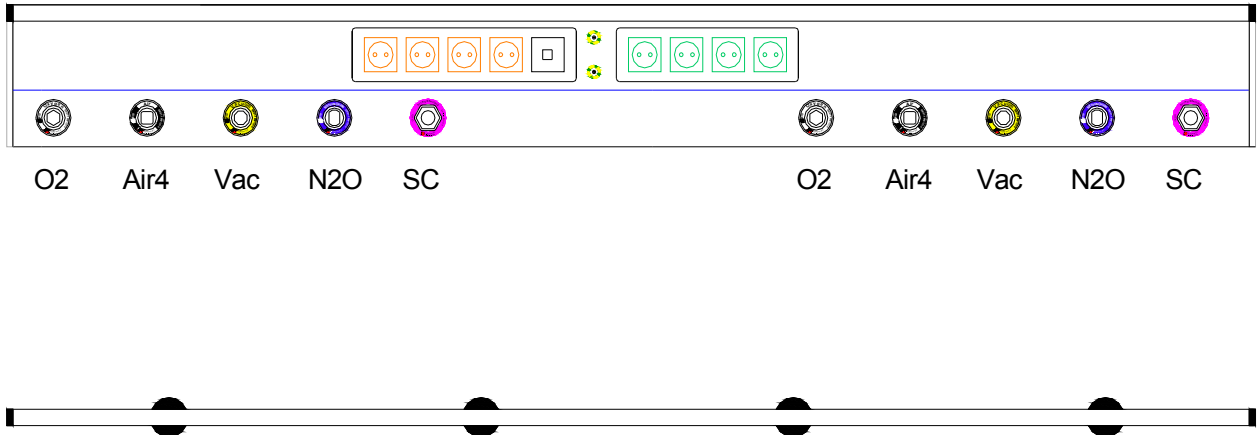


NEONATAL BHU



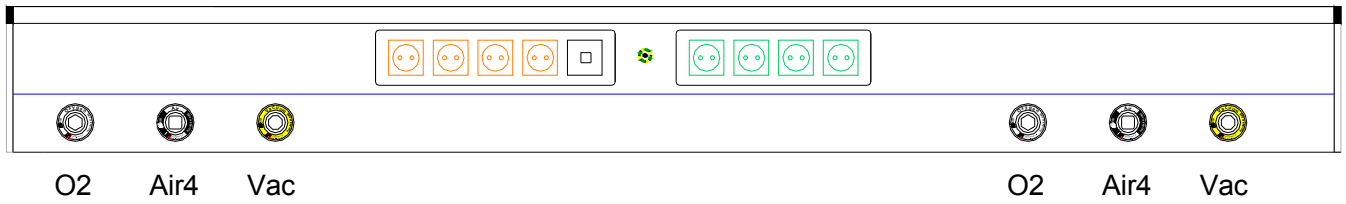


RESCUSCITATION BHU



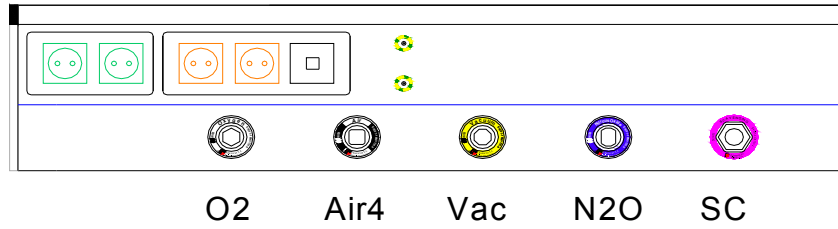


RECOVERY BHU



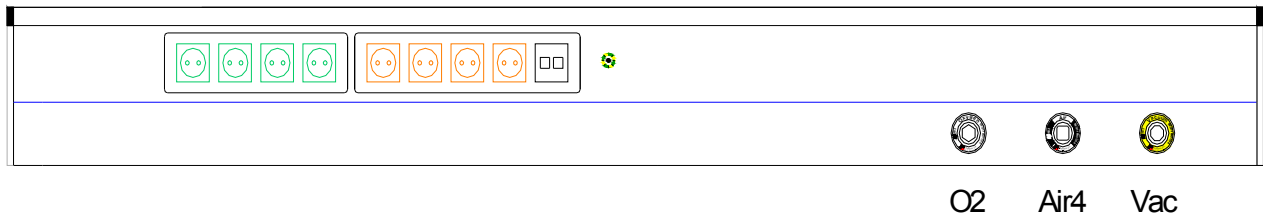


PREPARATION BHU





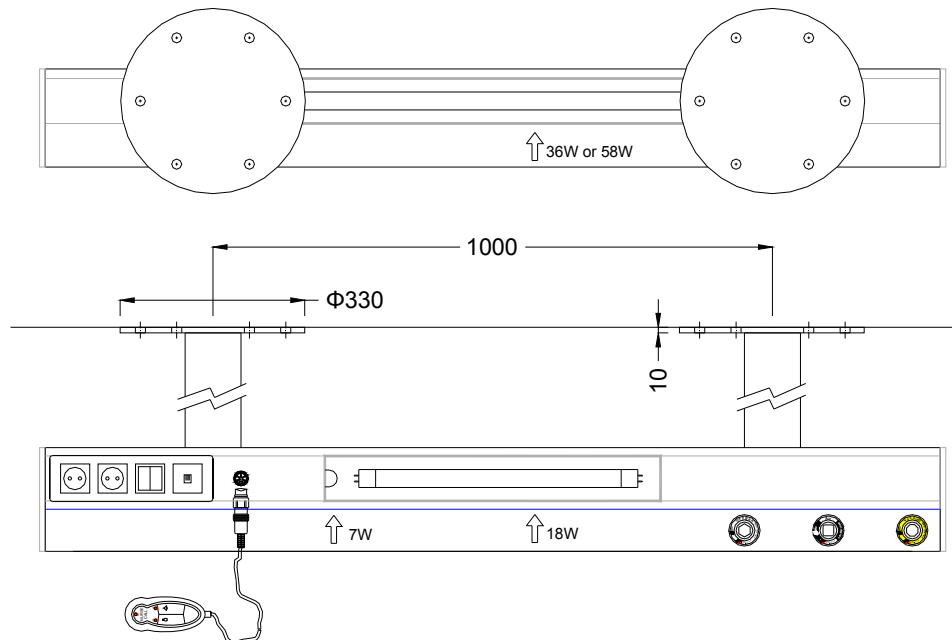
TRIAGE BHU





SPECIAL BHU

A) Suspended BHU (ceiling)

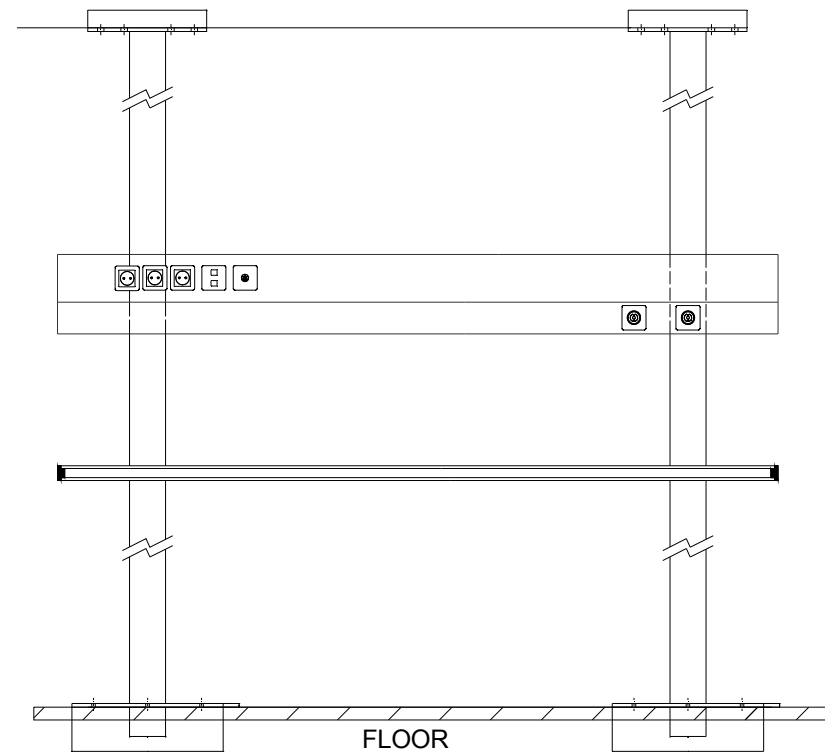
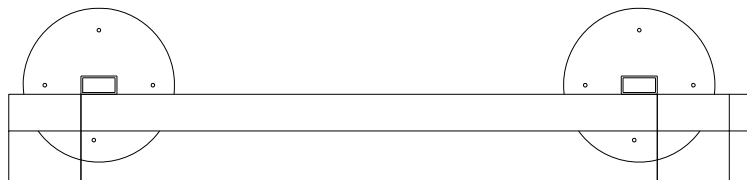


The suspended supply system offers a number of decisive advantages for optimum patient treatment in the field of intensive care.

It is used in specific rooms where wall mounted BHU installation is not possible (in cases where there are windows, columns or other obstacles).

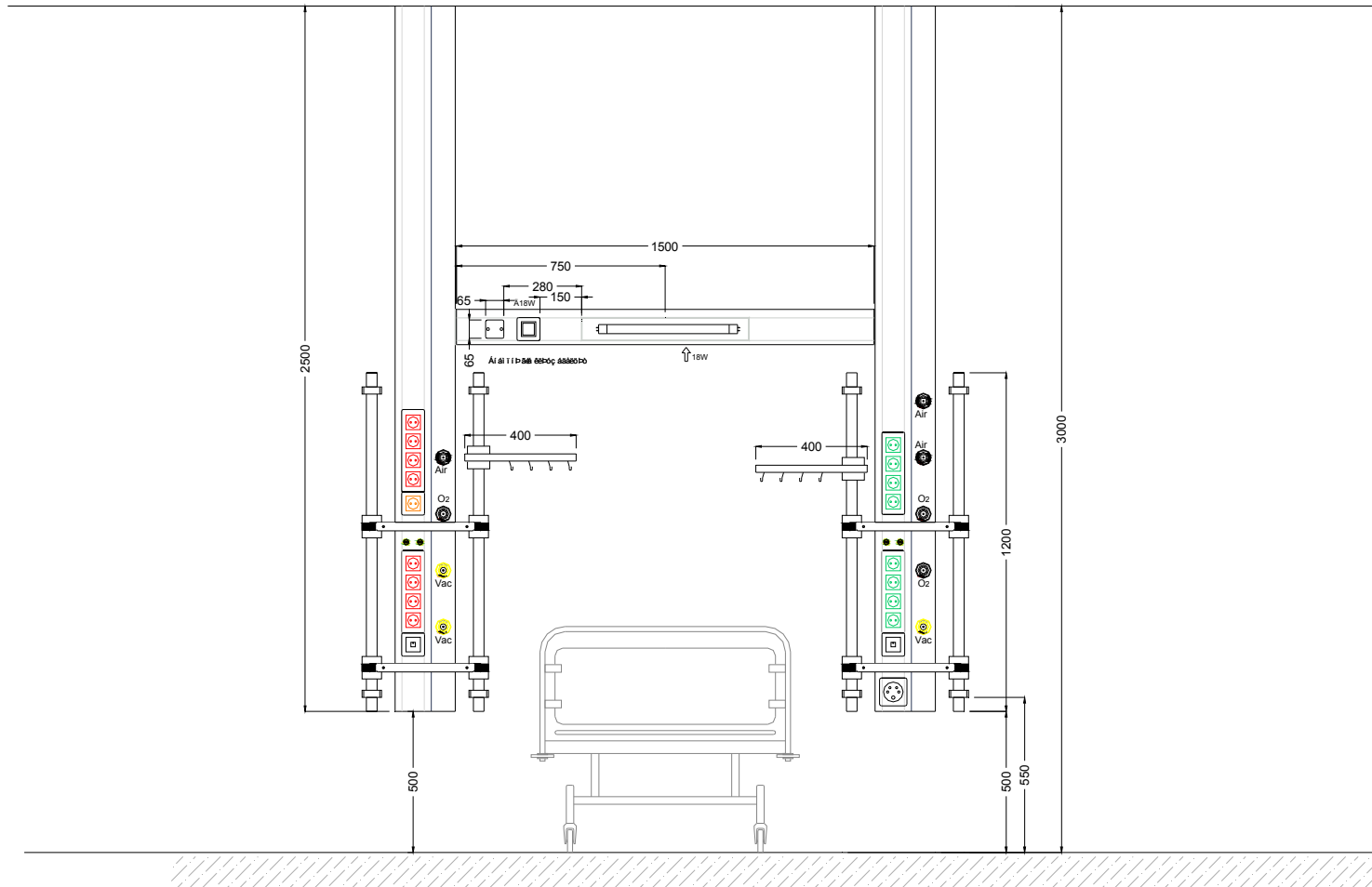


B) Suspended BHU floor - ceiling



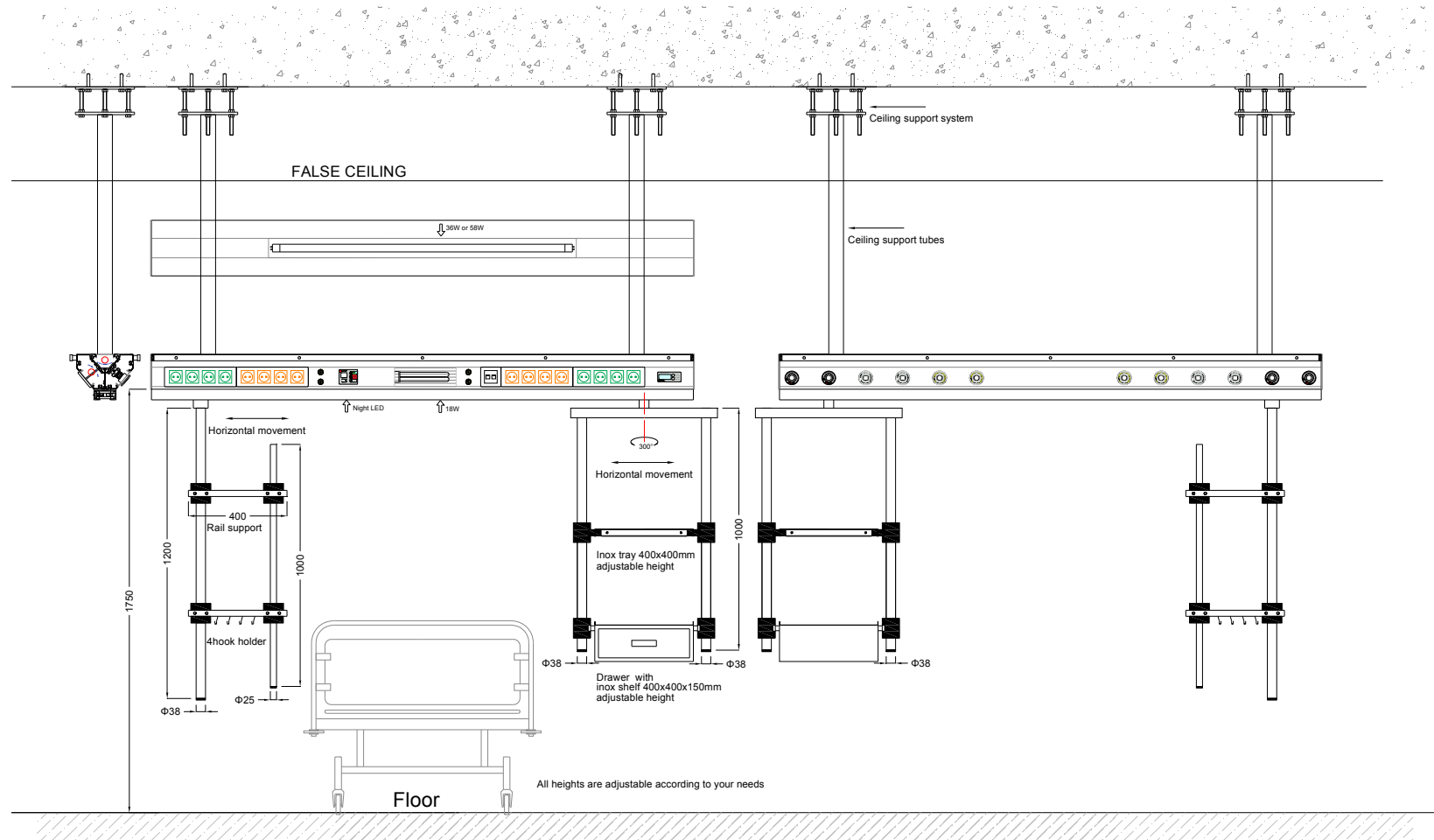


C) Vertical BHU





Δ) Suspended BHU with trolley





CEILING PENDANTS

The ceiling pendants for special treatment rooms, is placed at the ceiling of these rooms, as intensive care units and surgeries, above the patient bed or above the surgical table. The ceiling pendant has been created for grouping all the necessary electrical, data and medical gases services, required for use in operating theaters in anesthetic, surgical rooms and intensive care areas.

These ceiling pendants are manufactured and installed to the customer's specifications to suit a particular location and purpose. The installed position ensures that the outlets can be placed immediately above the medical equipment or the anesthetic machine, thereby removing the hazard of trailing hoses and cables.

The ceiling mounted pendant system is manufactured totally of special extruded anodized aluminum profiles and is electrostatic painted.

In the Table 2 that follows are presented analytically the characteristics of various types of ceiling pendants of special rooms with the general characteristics (electrical sockets, jacks, EQ etc) that is in effect for every case. Corresponding drawings are presented afterwards the description of various ceiling pendants types.



Table 2 : Ceiling pendants

Ceiling pendant description room		Ceiling pendant description									Terminal units												
A/A	Room	Type	Arms	Rail on pendant	Vertical movement (non electrical move)	Electrical head move	Extra equipment				O2	Air4	Vac	N ₂ O	Air8	SC	Generator	UPS	EQ	Data	Voice		
							Tube Φ38	Table-drawer	Elevation ability	Load													
1	Anesthesiologist	VERGINA version Ia/ Ib	1	YES	NO	NO	NO	YES		350kgr													
		VERGINA version II / III/ IV	1	YES	NO	NO	YES	YES		350kgr													
		THERMI version Ia/ Ib	2	YES	NO	NO	NO	YES	YES		350kgr												
		THERMI version II / III/ IV	2	YES	NO	NO	YES	YES	YES		350kgr	2	2	2	1	1	4	4	3	2			
		THESSALONIKI version I	1	YES	NO	YES	YES	YES	YES	350kgr	350kgr												
		THESSALONIKI version II	2	YES	YES	YES	YES	YES	YES	350kgr	350kgr												
		PELLA	NO	NO	NO	NO	NO	NO	NO		350kgr												
2	Surgeon	OLYMPIA 04 version I / II	1	YES	YES	YES	NO	YES	240kgr	240kgr													
		OLYMPIA 04 version III	2	YES	YES	YES	NO	YES	240kgr	240kgr	1	1	1		1	4	4	3	2				
		OLYMPIA 06 version I	1	YES	YES	YES	NO	YES	80kgr	100kgr													
		OLYMPIA 06 version II	2	YES	YES	YES	NO	YES	80kgr	100kgr													
3	Endoscopy	VERGINA version Ia/ Ib	1	YES	NO	NO	NO	YES															
		VERGINA version II / III/ IV	1	YES	NO	NO	YES	YES															
4	Hemodynamic	OLYMPIA 04 version I / II	2	YES	YES	YES	NO	YES	240kgr	240kgr	1	1	1	1	1	1	4	4	4	2			
		OLYMPIA 04 version III	1	YES	YES	YES	NO	YES	240kgr	240kgr													
		OLYMPIA 06 version I	2	YES	YES	YES	NO	YES	80kgr	100kgr													
5	ICU	MACEDONIA dry type	1	YES	NO	NO	NO	NO		250kgr													
		MACEDONIA wet type	2	YES	NO	NO	YES	YES		250kgr	4	4	4			6+6	6+6	6+6	1+1				
		VERGINA version IV	2	YES	NO	NO	YES	YES		250kgr													
		THERMI version IV	2	YES	NO	NO	YES	YES		250kgr													
6	Operation theatre	Panorama OPT									2	2	2	1		1	8	8	4	1			
		BHU 1									1	1	1	1	1	1	8	8	4	1			
		BHU 2	YES	NO	NO	YES	YES	-	-														
		BHU 3											2		2		8	8	4	1			
		BHU 4									1	1	1	1	1	1	8	8	4	1			



CEILING PENDANT WITH ELECTRIC MOVE

The ceiling pendant is suitable for suspension from operating room ceiling and is designed for the exclusive surgeries service. It is placed at the ceiling near the surgical bed, and it is consisted of an horizontal and a vertical arm that ends in a head, on which are installed the electric sockets, the medical gases outlets and other terminal units.

The ceiling mounted pendant system is manufactured totally of special extruded anodized aluminum profiles according to **EN 737-3**, **EN 739** standards.

With the horizontal and vertical motion the ceiling pendant serves completely the surgical bed in medical gases and electric energy, it is also offered for the placement of various medical appliances and tools essential for the surgical operations.

The horizontal motion applied by hand with service head's turning angle setting of $270^\circ + 270^\circ$. The two circling movements are achieved by using cylindrical bearing cases.

The vertical motion of pendant is telescopic and applied electrically via electric motor of 8.000N(traction) – 230V – 50 Hz – 360W, with automatic space terminals. The handling of movement applies via an up-down button placed in the head of the pendant.

The rotation cylinder of the arm is provided with pneumatic brake for the stabilization of pendant during the rotation in the desirable place, while head cylinder uses adjustable mechanical brake.

The support of pendant from the concrete ceiling of operation room has to be constant so that it is ensured a minimum suspension weight of 2.500N and a maximum torque of 4.400 Nm.

The pendant consists of three main parts:

- the head with stainless table for placement of medical appliances and tools
- the arms
- the metallic support base of the pendant (by the ceiling)

In the head of the pendant and in separate apartments, are found installed the terminal units of medical gases with the corresponding manometers, the electric sockets and EQ, while around the table exists a special stainless rail of dimensions 25x10 mm, for the suspension of various medical appliances and tools.

The head of pendant in regular version will carry:

- 8 electrical sockets 220V (4 electric sockets UPS)
- 1 ground bar for electrical sockets
- 1 automatic switch 10A for the electric motor protection
- 1 double button for the up-down movement of pendant's head
- 3 equipotential sockets DIN 42801/2
- 4 medical gas outlet (O₂-Vac-Air5bar -N₂O) according to **EN 737-1** and **EN 737- 6**
- 4 manometers and a vacuum gauge for the medical gases pressure indication
- 1 compressed air (Air 8 bar) outlet according to **EN 737-1/6**
- 1 scavenging (Sc) outlet according to **EN 737-4**
- 1 bar of equipotential grounding system and grounding of metallic parts

The pendant can include different elements (in number and type) from mentioned before depending on the demand.

Technical characteristics:

- vertical movement range 500mm
- work load 240kg or 80 Kg for the surgeon pendant and 350 kg for the anesthesiologist type
- pendant weight 90kg or 110 Kg and 130kg respectively
- table dimensions of 400mm width and 350mm length



- minimum head distance from the floor 1400mm, maximum 1900mm
- metallic support construction with metal plate 500x500 mm, with 6 metallic suspension M16 and with 4 spacer bolts 1 1/2", of length depending on the false ceiling height.

The medical gases and vacuum outlets of the pendant are according to EN 737-1 and EN 737-6 standards and the scavenging outlet according to EN 737-4. They are connected with special flexible anti-static pipes of different colors for each gas, which lead to bronze breasts to the upper part for their connection with the corresponding copper pipe medical gas network.

Each medical gas outlet is accompanied by indelible polycarbonic label according to EN 60601-1 standard, with the name of each gas, the color and the chemical symbol of corresponding gas.

When pendant's manufacture is finished the following tests of good operation applied, i.e.:

- the electric sockets
- metal parts grounding
- the leakage, the mechanical function and medical gases terminal units flow.

The electric power supply cable that required for the pendant is:

- 220 V, 3x2,5 mm² for each electrical sockets circuit and for the electric motor
- Ground cable 1x16mm² for the equipotential terminal units

The electric power supply connections of the pendant to the corresponding electric power network become through terminal strips that are found in waterproof box in the base of the pendant and according to the existing electrical drawing that accompanies the pendant.

TYPICAL SURGEON PENDANT

The surgeon pendant for grouping all the necessary electrical, data and medical gases services required for use in operating theaters will be suitable for suspension from the operation theatre's ceiling near the surgical table and it will consist of a horizontal and vertical arm that ends in a head, on which are installed the electric sockets, the medical gases outlets and other terminal units and tools.

The pendant will be manufactured of special extruded anodized aluminum profiles and will conform with EN 737-3, EN 739 and EN 793 standards.

With the horizontal and vertical motions the surgeon pendant will completely serve the surgical table in medical gases and electric energy. In addition it is offered for the placement of various medical appliances and tools essential for the surgical operations.

The horizontal motion will become manually with pendant rotation ability of 330°+180° (head+arm). The two circling movement will be achieved with the help of cylindrical bearing cases.

The vertical motion of pendant is telescopic and applies via an electric motor of 8.000N traction – 230V – 50Hz – 360W, with automatic space terminals. The handling of this movement will apply via an up-down button installed in the head of the pendant.

The rotation cylinders of arms will be provided with adjustable friction brakes for the stabilization of pendant at the desirable place. (optional use of pneumatic brakes)

The support of pendant from operation's room concrete ceiling has to be stable so that it is ensured a minimum suspension weight of 6.000N and a maximum torque of 5.400 Nm.

The pendant consists of the following three main parts:

- the head with stainless table for placement of medical appliances and tools
- two arms horizontal and vertical(1,00 + 0,80 m)
- the metallic support construction of pendant's support from the ceiling

In the head of the pendant which is manufactured totally of special extruded anodized aluminum and in separate apartments, are found installed the medical gases outlets with the corresponding manometers, the electric sockets and EQ, while around the table exists a special stainless rail of dimensions 25x10 mm, for the suspension of various medical appliances and tools.

The head of pendant will carry:

- 8 electric sockets 220V color: orange (UPS) or green (Generator)
- 1 ground bar for electrical sockets
- 1 automatic switch 10A for the electric motor protection



- 1 double button for the up-down movement of pendant's head
- 3 equipotential sockets DIN 42801/2
- 4 medical gas outlets (O₂ – Vac – Air 5bar – Air 8bar) according to EN 737-1
- 4 manometers and a vacuum gauge for pressure indication
- 1 bar of equipotential grounding system and grounding of metallic parts

Technical characteristics:

- vertical movement range 500mm
- work load 240kg
- pendant weight 110 Kg
- table dimensions of 400mm width and 350mm length
- minimum head distance from the floor 1400mm, maximum 1900mm
- metallic support construction with metal plate 500x500 mm, with 6 metallic suspension M16 and with 4 spacer bolts 1 ½", of length depending on the height of false ceiling height.

The medical gases and vacuum outlets of the pendant are according to EN 737-1 and EN 737- 6 standards and the scavenging outlet according to EN 737- 4. They are connected with special flexible anti-static pipes of different colors for each gas, which lead to bronze breasts to the upper part for their connection with the corresponding copper pipe medical gas network.

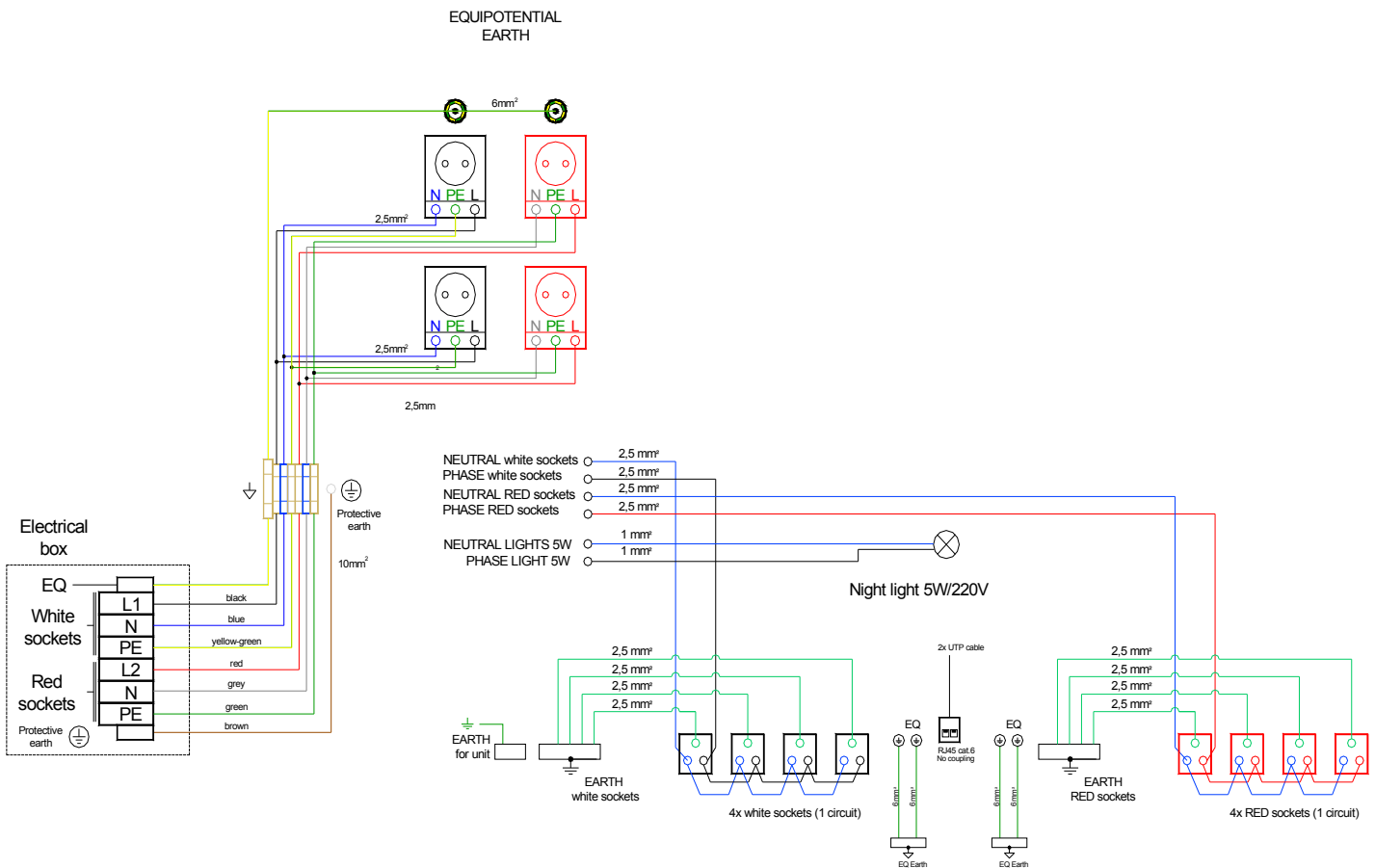
Each medical gas outlet is accompanied by indelible polycarbonic label according to EN 60601-1 standard, with the name of each gas, the color and the chemical symbol of corresponding gas.

The electric power supply connections of the pendant to the corresponding electric power network become through terminal strips that are found in waterproof box in the base of the pendant and according to the existing electrical drawing that accompanies the pendant.

Below are presented various types of pendants and are separated in two categories:

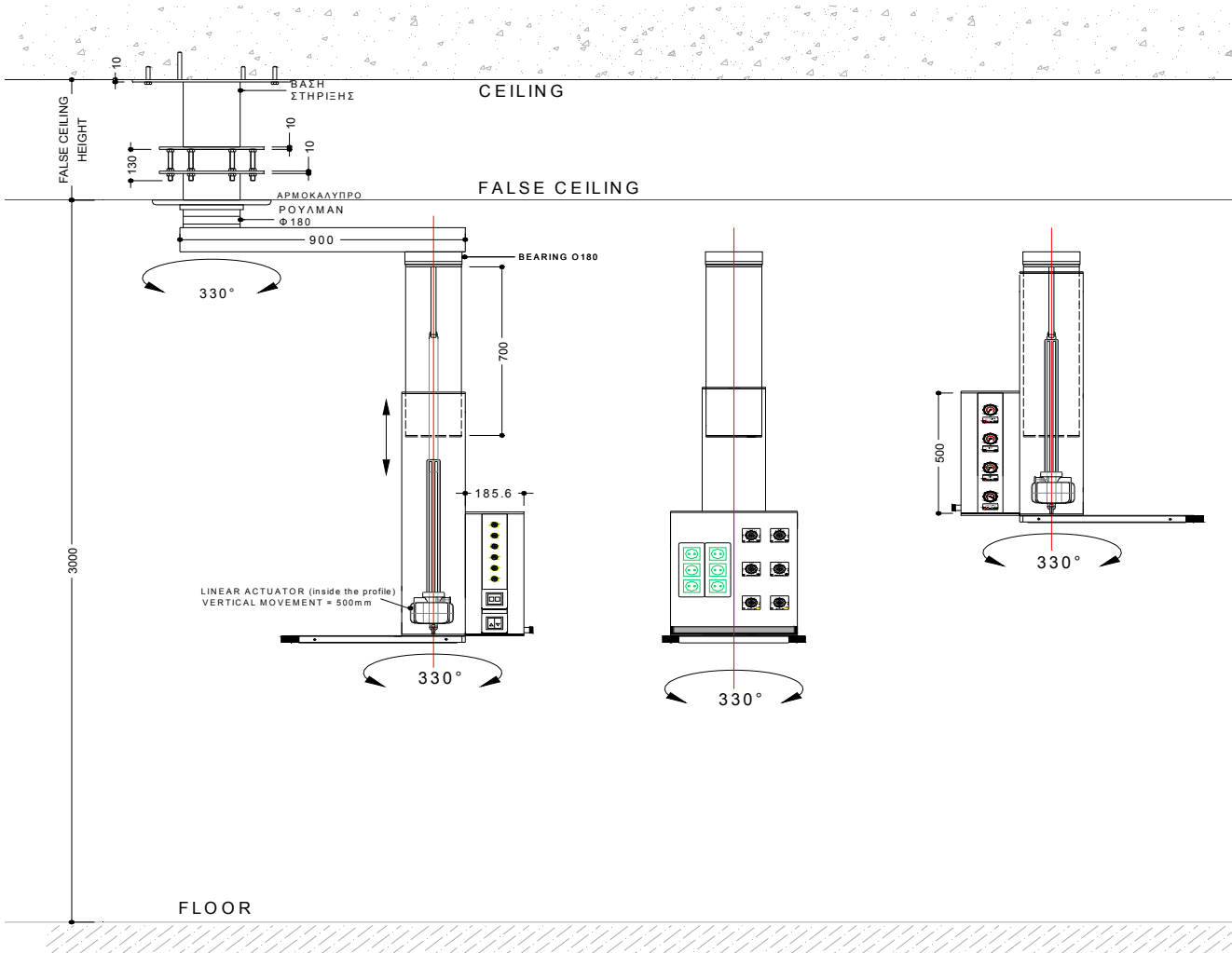
- Not electrically driven (circling movement)
- Electrically driven (circling movement and movement in the vertical axis)

Wiring diagram





Typical installation drawing



TYPICAL ANESTHESIOLOGIST PENDANT

The anesthesiologist pendant will be used to exclusively service the anesthesiologist. It is placed at the ceiling near the surgical bed, and it is constituted by a horizontal and a vertical arm that ends in a head, on which are installed the electric sockets, the medical gas outlets and other terminal units.

The pendant will be manufactured of special extruded anodized aluminum profiles and will conform to EN 737-3, EN 739 and EN 793 standards.

With the horizontal and vertical motions the surgeon pendant will completely serve the surgical table in medical gases and electric energy. In addition it is offered for the placement of various medical appliances and tools essential for the surgical operations.

The horizontal motion will become manually with pendant rotation ability of $330^{\circ}+270^{\circ}$ (vertical arm+ horizontal arm). The two circling movement will be achieved with the help of cylindrical bearing cases.

The vertical motion of pendant is telescopic and applies via an electric motor of 8.000N traction – 230V – 50Hz – 360W, with automatic space terminals. The handling of this movement will apply via an up-down button installed in the head of the pendant.



The rotation cylinder of horizontal arm will be provided with pneumatic brakes for the stabilization of column in the desirable place, while the rotation cylinder of vertical arm has adjustable friction brake. (optional use of pneumatic brakes)

ELECTRICAL MOTOR TECHNICAL SPECIFICATIONS	
Type	MAX 6A
Push/ pull force	8000N / 6000N*
Speed at nominal load	6 mm/sec.
Stroke length	min. 500 mm
Voltage (50 Hz)	230 V~
Power consumption	175 W
Current consumption 24 V =	0.9 A
Duty cycle: Intermittent mode	1 min
Ambient temperature	0 / +40 °C
Protection class/ Insulation class	I/B
Degree of protection	IP 66
Weight	5.5 kg
*Max. load for medical applications 5000N	

The pendant consists of the following main parts:

- the vertical telescopic arm with the head
- the horizontal arm
- two stainless tubes F38mm along the vertical arm for the suspension of various appliances
- stainless table for the placement of medical appliances and tools
- Metallic support construction with metal plate 500x500 mm , with 6 metallic suspension M16 and with 4 spacer bolts 1 ½", of length depending on the height of false ceiling height.

In the vertical arm there is the possibility of anesthesiologist machine suspension.

In the head of the pendant which is manufactured totally of special extruded anodized aluminum and in separate apartments, are found installed the terminal units of medical gases with the corresponding manometers, the electric sockets and EQ, while around the table exists a special stainless rail, for the suspension of various medical appliances and tools.

The head of column will carry:

- 8 electric sockets 220V color: orange (UPS) or green (Generator)
- 1 ground bar for electrical sockets
- 1 automatic switch 10A for the electric motor protection
- 1 double button for the up-down movement of pendant's head
- 3 equipotential sockets DIN 42801/2
- 2 data or telephone sockets RJ45 cat.6 or cat.5e
- 7 medical gas outlets (2 x O₂ –2 x Vac – 2 x Air 5 bar – 1 x N₂O) according EN 737-1/6
- 1 scavenging (Sc) outlet according to **EN 737-4**
- 4 manometers and a vacuum gauge for pressure indication
- 1 bar of equipotential grounding system and grounding of metallic parts

Technical characteristics:

- Horizontal rotation in three axes
- Horizontal arm of length of 950mm



- Vertical arm of 1400mm
- Table 500x350mm
- Vertical range 500mm
- Pendant weight 140 kg
- Pneumatic and mechanic brake
- Work load 350 kg

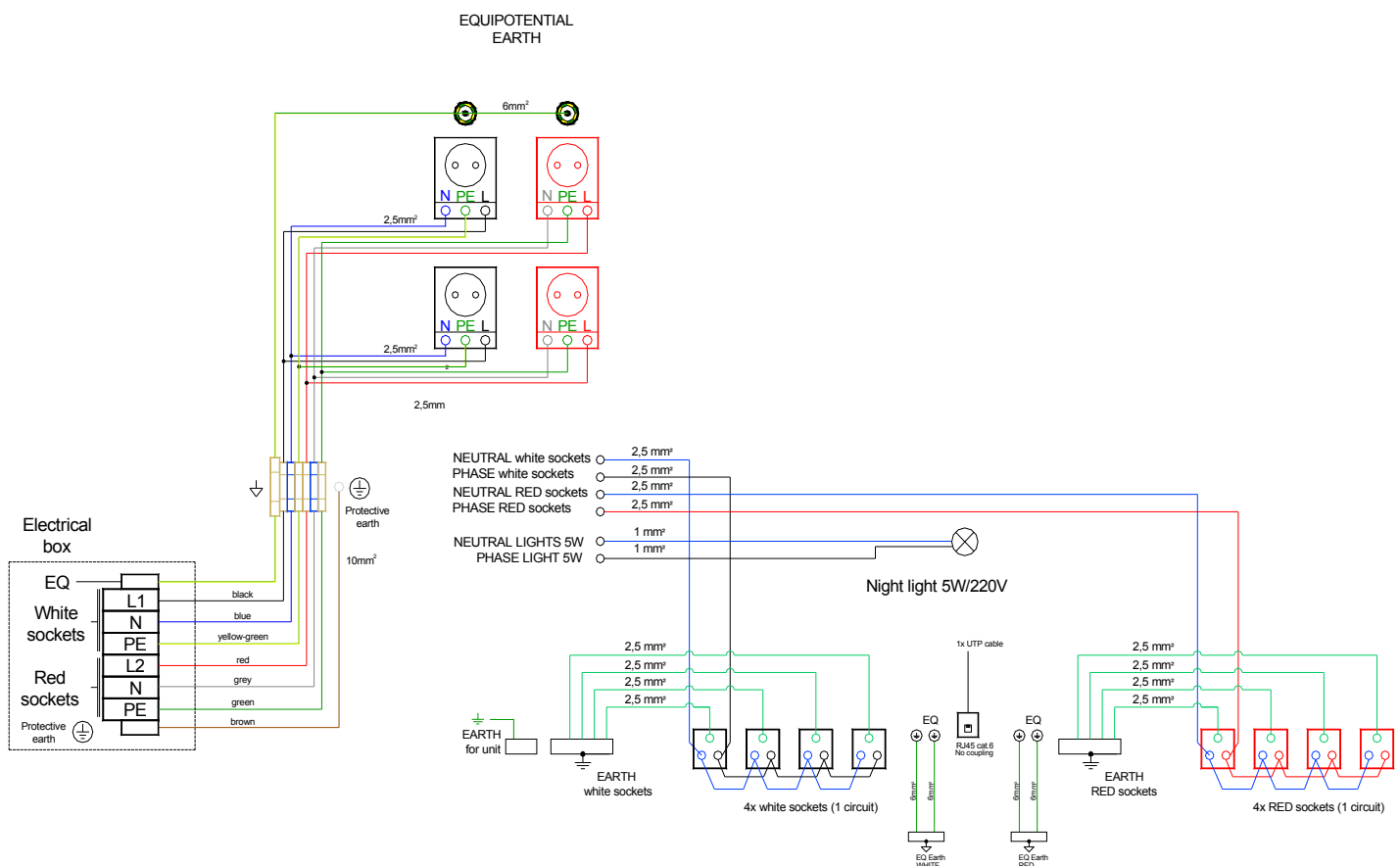
The support of pendant from the concrete ceiling of operation room has to be stable so that it is ensured a minimum suspension weight of 6.000N and a maximum torque of 5.000 Nm.

The medical gases and vacuum outlets of the pendant are according to EN 737-1 and EN 737- 6 standards and the scavenging outlet according to EN 737- 4. They are connected with special flexible anti-static pipes of different colors for each gas, which lead to bronze breasts to the upper part for their connection with the corresponding copper pipe medical gas network.

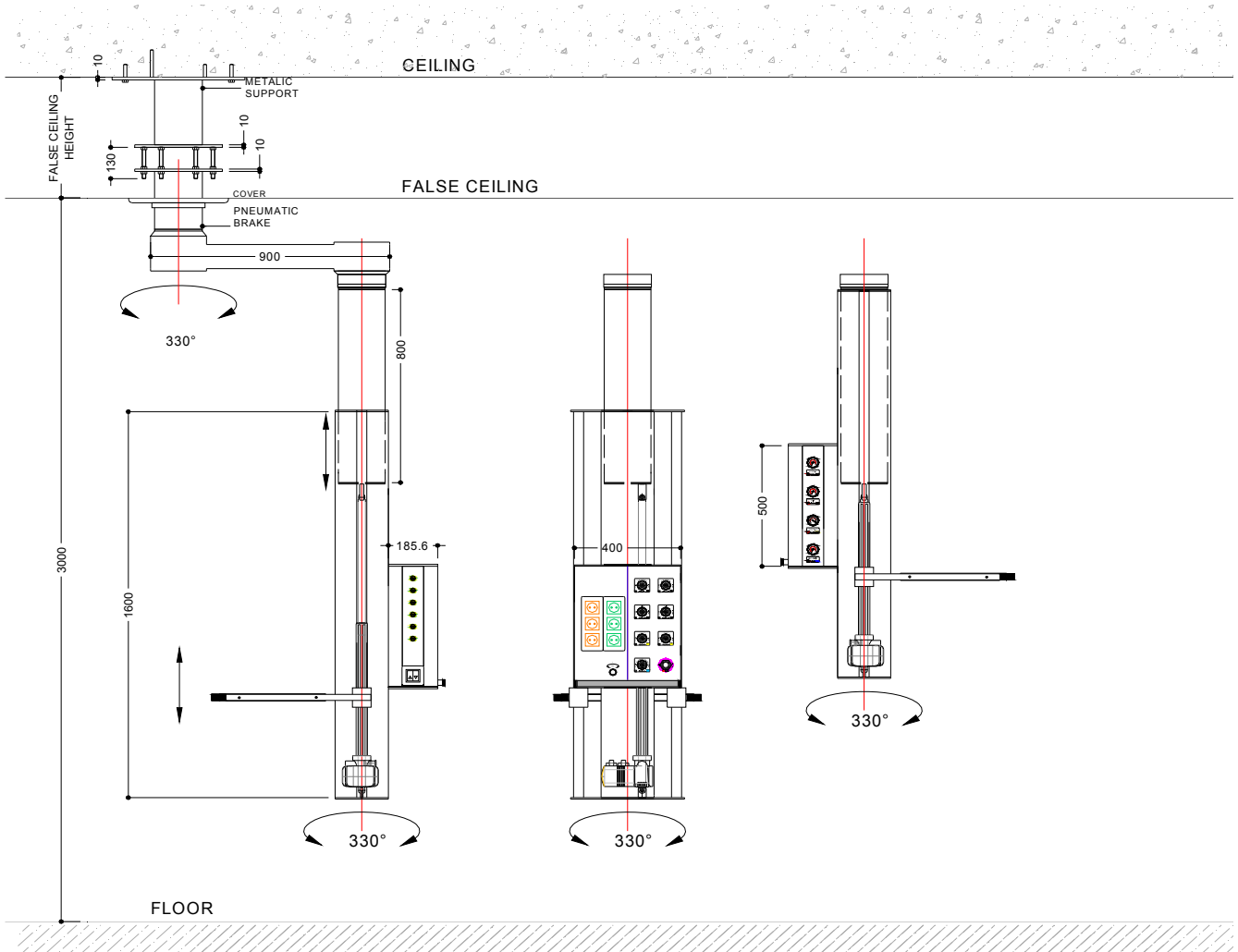
Each medical gas outlet is accompanied by indelible polycarbonic label according to EN 60601-1 standard, with the name of each gas, the color and the chemical symbol of corresponding gas.

The electric power supply connections of the pendant to the corresponding electric power network become through terminal strips that are found in waterproof box in the base of the pendant and according to the existing electrical drawing that accompanies the pendant.

Wiring diagram



Typical installation drawing





ENDOSCOPY PENDANT

The endoscopy pendant will be placed at the ceiling of endoscopy room near the surgical bed, and it consists of a horizontal and a vertical arm that ends in a head, on which are installed the electric sockets, the medical gas outlets and other terminal units.

The pendant will be manufactured of special extruded anodized aluminum profiles and will conform with EN 737-3, EN 739 and EN 793 standards.

With the horizontal and vertical motions the endoscopy pendant will completely serve the endoscopy table in medical gases and electric energy. In addition it is offered for the placement of various medical appliances and tools essential for the endoscopy operations.

The horizontal motion will become manually with pendant rotation ability of $330^{\circ}+180^{\circ}$ (vertical arm+horizontal arm). The two circling movement will be achieved with the help of cylindrical bearing cases.

The vertical motion of pendant is telescopic and applies via an electric motor of 8.000N traction – 230V – 50Hz – 360W, with automatic space terminals. The handling of this movement will apply via an up-down button installed in the head of the pendant.

The rotation cylinder of horizontal and vertical arm will be provided with friction brakes for the stabilization of column in the desirable place.

The support of pendant from the concrete ceiling of operation room has to be stable so that it is ensured a minimum suspension weight of 6.000N and a maximum torque of 5.400 Nm.

The pendant consists of the following three main parts:

- the head with stainless table for placement of medical appliances and tools
- two arms horizontal and vertical(1,00 + 0,80 m)
- the metallic construction of pendant's support from the ceiling

In the head of the pendant which is manufactured totally of special extruded anodized aluminum and in separate apartments, are found installed the medical gases outlets with the corresponding manometers, the electric sockets and EQ, while around the table exists a special stainless rail, for the suspension of various medical appliances and tools.

The head of column will carry:

- 4 electric sockets 220V of orange color (UPS)
- 4 electric sockets 220V of green color (Generator)
- 1 ground bar for electrical sockets
- 1 automatic switch 10A for the electric motor protection
- 1 double button for the up-down movement of pendant's head
- 4 equipotential sockets DIN 42801/2
- 2 data or telephone sockets RJ45 cat.6 or cat.5e
- 4 medical gas outlets (O₂-Vac-Air5bar-N₂O) according to **EN 737-1** and **EN 737-6**
- 4 manometers and a vacuum gauge for the medical gases pressure indication
- 1 compressed air (Air 8bar) outlet according to **EN 737-1/6**
- 1 scavenging (Sc) outlet according to **EN 737-4**
- 1 bar of equipotential grounding system and grounding of metallic parts

Technical characteristics:

- vertical movement range 500mm
- work load 240kg
- pendant weight 110 Kg
- table (400mm width and 350mm length)
- minimum head distance from the floor 1400mm, maximum 1900mm



- metallic support construction with metal plate 500x500 mm , with 6 metallic suspension M16 and with 4 spacer bolts 1 ½", of length depending on the height of false ceiling height.

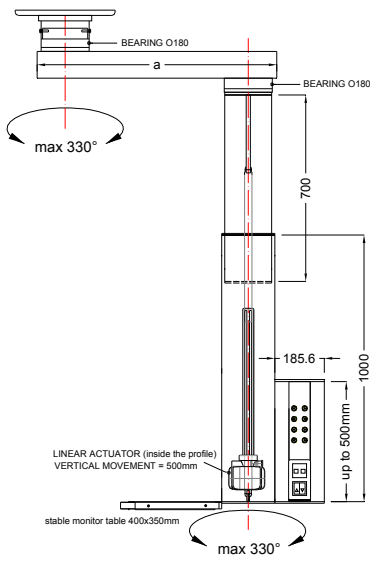
The electric power supply connections of the pendant to the corresponding electric power network become through terminal strips that are found in waterproof box in the base of the pendant and according to the existing electrical drawing that accompanies the pendant.



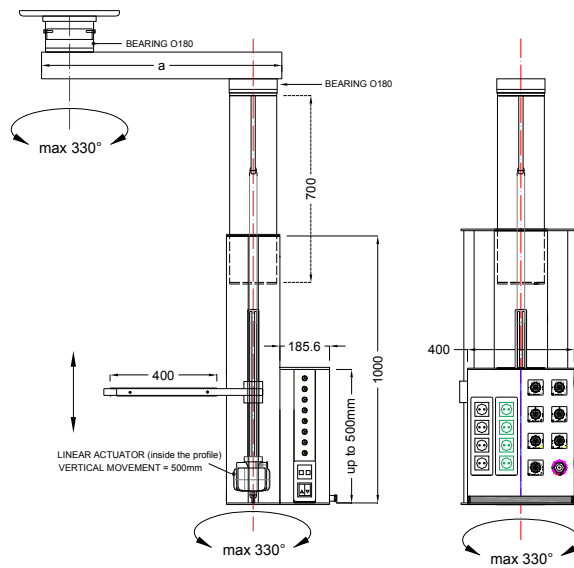
ELECTRICALLY DRIVEN RENDANTS

Model: OLYMPIA 04

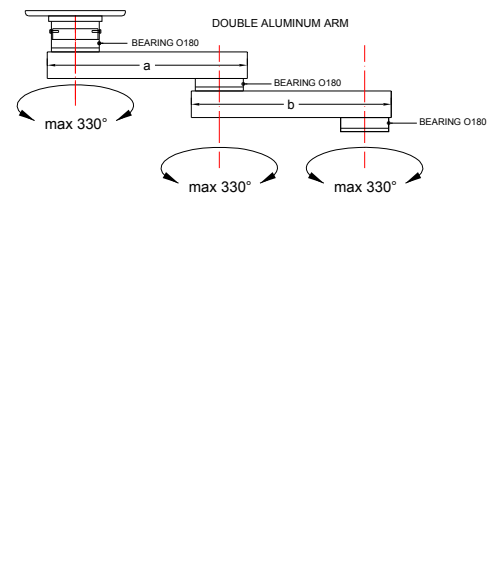
Version: I



Version: II

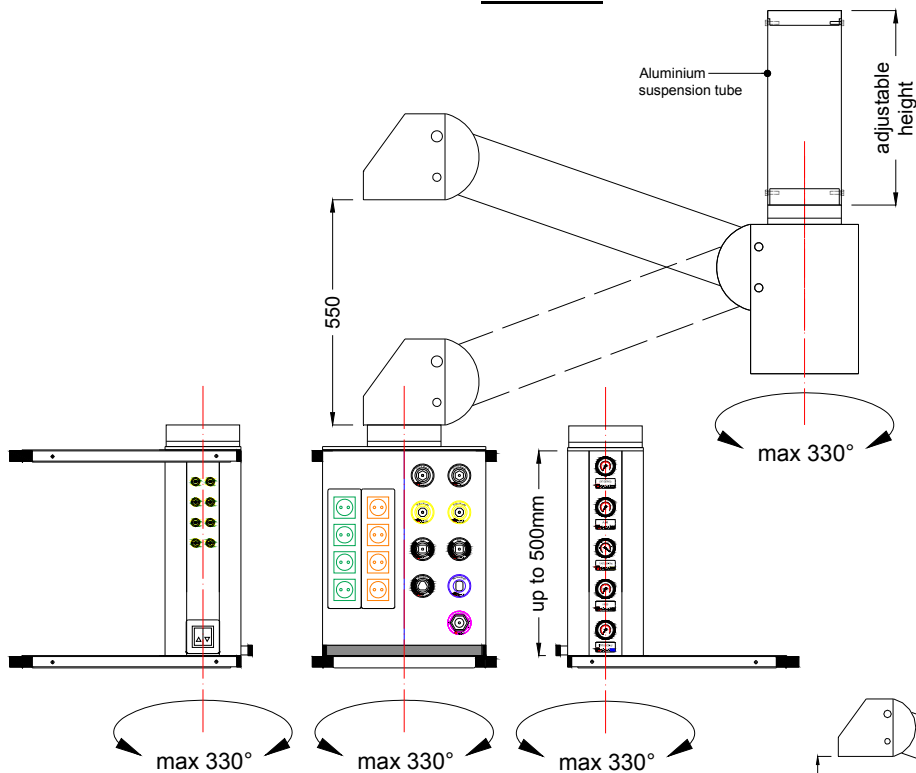


Version: III

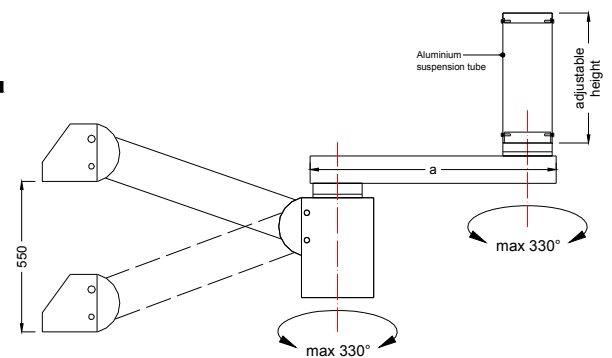


Model: OLYMPIA 06

Version: I



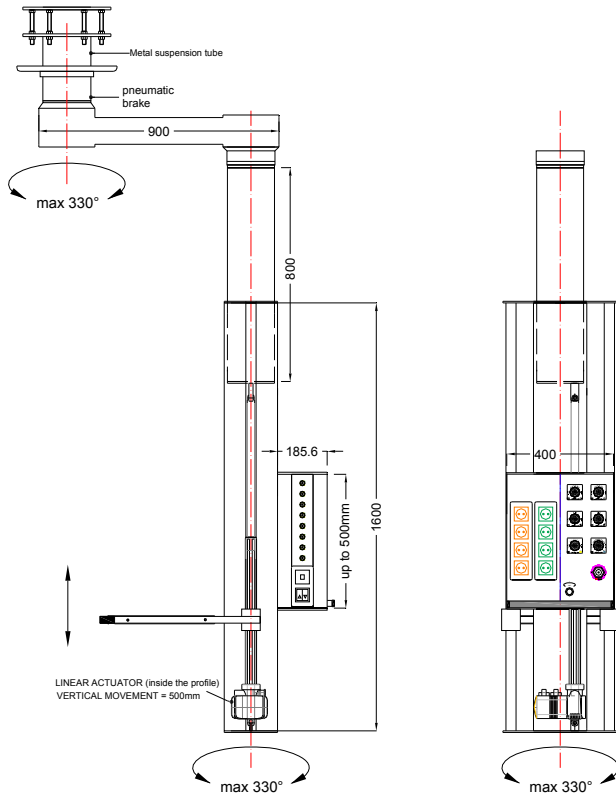
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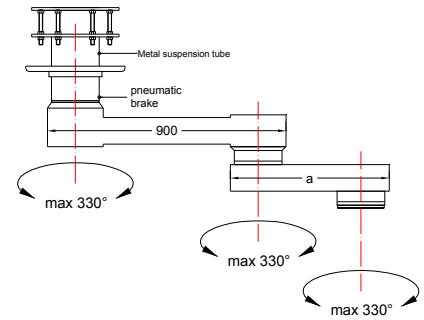


Model: THESSALONIKI

Version: I



Version: II





CEILING PENDANT

The ceiling pendant is suitable for suspension from operating room ceiling and is designed for the exclusive surgeries service. It is placed at the ceiling near the surgical bed, and it is constituted by an horizontal and a vertical arm that ends in a head, on which are installed the electric sockets, the medical gases outlets and the other terminal units.

The ceiling mounted pendant system is manufactured totally of special extruded anodized aluminum profiles according to **EN 737-3**, **EN 739** and **EN 793** standards.

With the horizontal and vertical motion the ceiling pendant serves completely the surgical bed in medical gases and electric energy. It is also offered for the placement of various medical appliances and tools essential for the surgical operations.

The horizontal motion applied by hand with service head's turning angle setting of $270^{\circ} + 270^{\circ}$. The two circling movements are achieved by using cylindrical bearing cases.

The rotation cylinder of the arm is the provided with pneumatic brake for the stabilization of pendant during the rotation in the desirable place, while head cylinder uses adjustable friction brake.

The support of pendant from the concrete ceiling of operation room has to be stable so that it is ensured a minimum suspension weight of 2.500N and a maximum torque of 4.400 Nm.

The pendant consists of three main parts:

- the head with stainless table for placement of medical appliances and tools
- the arms
- the metallic base of the pendant support by the ceiling

In the head of the pendant and in separate apartments, are found installed the terminal units of medical gases with the corresponding manometers, the electric sockets and EQ, while around the table exists a special stainless rail of dimensions 25x10 mm, for the suspension of various medical appliances and tools.

The head of pendant in regular version will carry:

- 8 electrical sockets 220V (4 electric sockets UPS)
- 1 ground bar for electrical sockets
- 1 automatic switch 10A for the electric motor protection
- 1 double button for the up-down movement of pendant's head
- 3 equipotential sockets DIN 42801/2
- 4 medical gases outlets (O_2 -Vac-Air5bar- N_2O) according to **EN 737-1** and **EN 737-6**
- 4 manometers and a vacuum gauge for the medical gases pressure indication
- 1 compressed air (Air 8 bar) outlet according to **EN 737-1** and **EN 737-6**
- 1 scavenging (Sc) outlet according to **EN 737-4**
- 1 bar of equipotential grounding system and grounding of metallic parts

The pendant can include different elements (in number and type) from these mentioned before depending on the demand.

Technical characteristics:

- vertical movement range 500mm
- work load 240kg for the surgeon pendant and 350 kg for the anesthesiologist type
- pendant weight 90kg and 130kg respectively
- table dimensions of 400mm width and 350mm length
- minimum head distance from the floor 1400mm, maximum 1900mm
- metallic support construction with metal plate 500x500 mm, with 6 metallic suspension M16 and with 4 spacer bolts 1 1/2", of length depending on the height of false ceiling height.



The medical gases and vacuum outlets of the pendant are according to EN 737-1 and EN 737-6 standards and the scavenging outlet according to EN 737-4. They are connected with special flexible anti-static pipes of different colors for each gas, which lead to bronze breasts to the upper part for their connection with the corresponding copper pipe medical gas network.

Each medical gas outlet is accompanied by indelible polycarbonic label according to EN 60601-1 standard, with the name of each gas, the color and the chemical symbol of corresponding gas.

When pendant's manufacture is finished the following tests of good operation of unit applied, i.e.:

- the electric sockets
- metal parts grounding
- the leakage, the mechanical function and medical gases terminal units flow.

The electric power supply cable that required for the pendant is:

- 220 V, 3x2,5 mm² for each electrical sockets circuit and for the electric motor
- Ground cable 1x16mm² for the equipotential terminal units

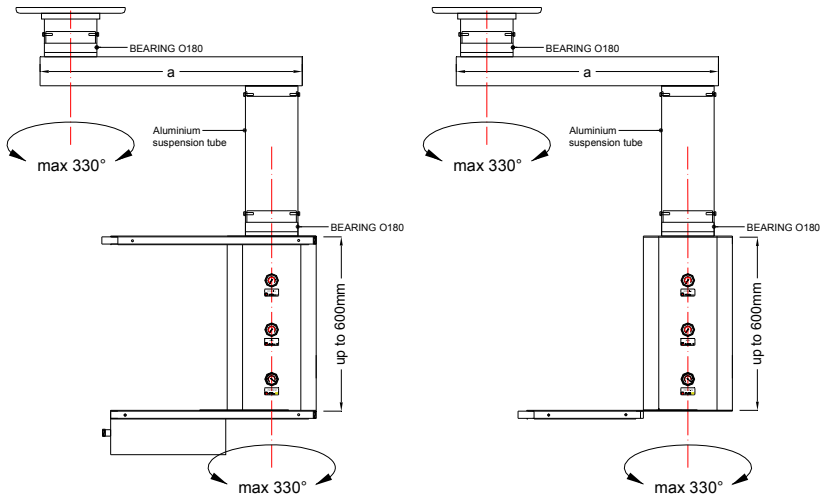
The electric power supply connections of the pendant to the corresponding electric power network become through terminal strips that are found in waterproof box in the base of the pendant and according to the existing electrical drawing that accompanies the pendant.



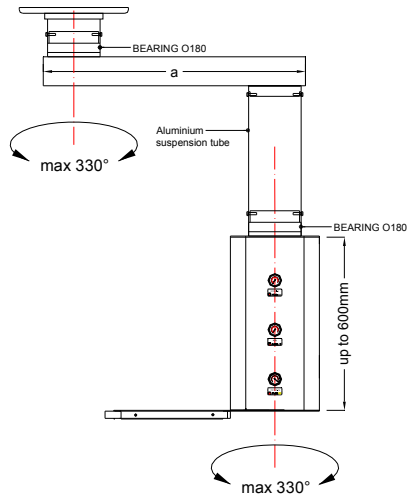
MECHANICALLY DRIVEN RENDANTS

Model: VERGINA

Version: Ia

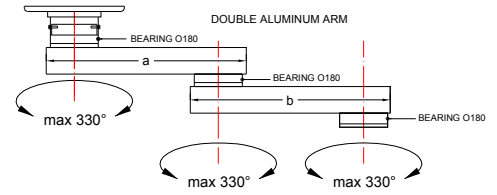


Version: Ib

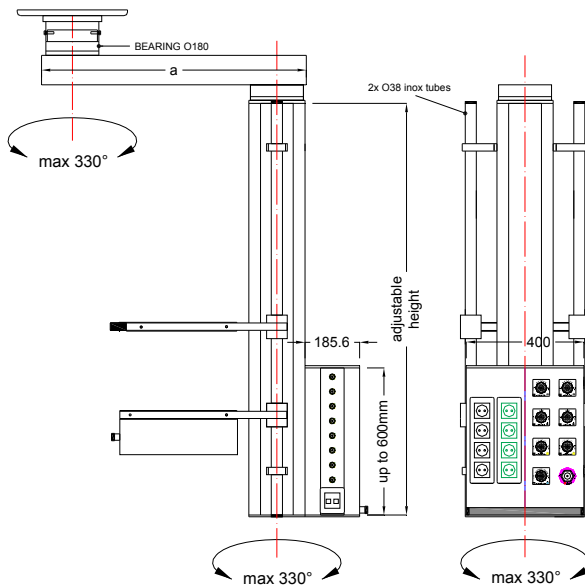


Model: THERMI (with two Arms)

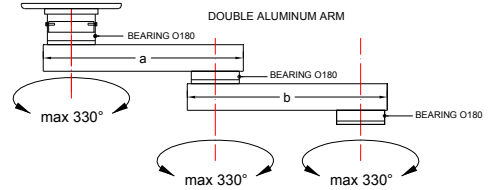
Version: Ia & Ib



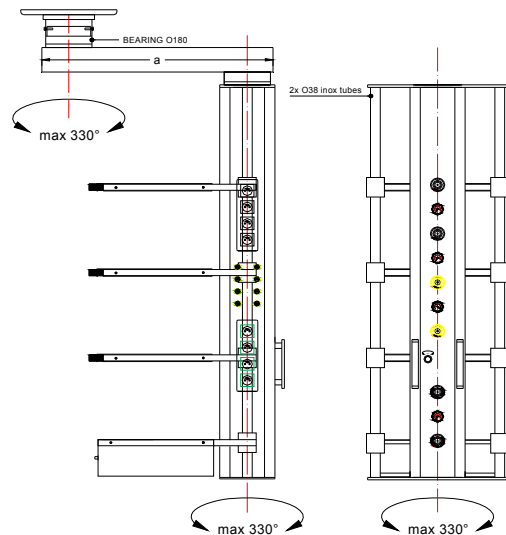
Version: II



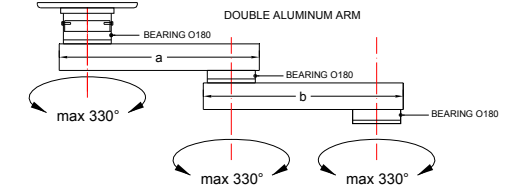
Version: II



Version: III

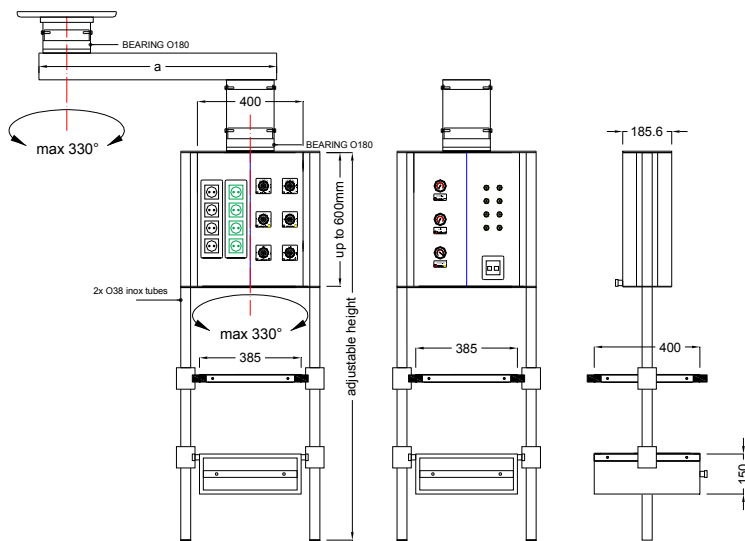


Version: III

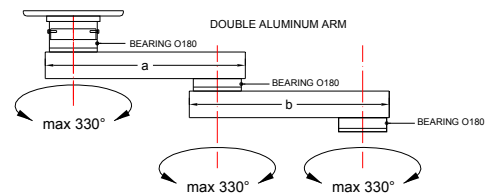




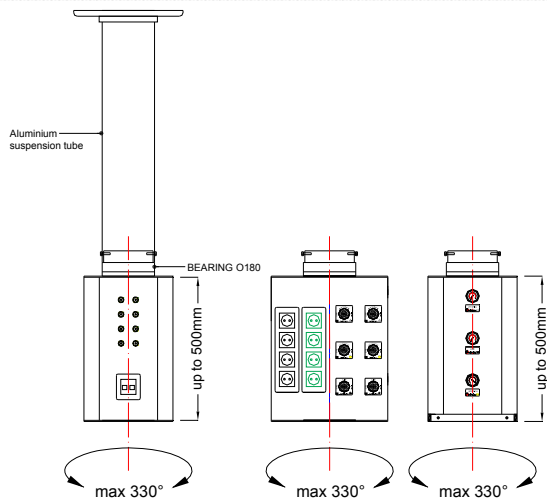
Model: VERGINA
Version: IV



Model: THERMI
Version: IV



Model: PELLA





ICU PENDANT

The ICU ceiling mounted pendant system has been created for grouping all the necessary electrical, data and medical gases services, required for use in operating theaters in intensive care areas.

The system is combining two (2) different pendants on opposite sides of the ICU bed and suspended from two ceiling columns. Each pendant easily changes-over its position with the other pendant on the opposite side.

The ICU ceiling pendants consist from a group of two distinguished pendants from which the one (**dry**) is constituted by a horizontal and vertical arm that ends to a head on which are installed the electric sockets, the medical gases outlets and other terminal units and the other (**wet**) will be consist by two horizontal and vertical arm on which are installed the required electric elements (electric sockets, equipotential sockets etc).

With the horizontal motions ICU ceiling pendants serves completely the intensive care bed in medical gases and electric energy and they are also offered for the placement of various medical appliances and tools essential for the for patient's treatment in the Intensive care unit.

The horizontal motions will apply manually with rotation range of pendant (**dry**) at 330° and at 330° the pendant (**wet**). The circling movements of each pendant apply in two vertical axes and will be achieved with the help of cylindrical bearings.

The rotation cylinder of the arm is the provided with adjustable friction brake for the stabilization of pendant during the rotation in the desirable place.

The ceiling mounted pendant system is manufactured totally of special extruded anodized aluminum profiles and consists of two separate units:

- **"Dry" side (monitor) pendant**
- **"Wet" side (infusion) pendant**

"Dry" side (monitor) pendant:

The unit is manufactured with combination of special extruded anodized aluminium and stainless steel profiles with epoxy powder coating, highly resistant against impacts and disinfection liquids and consists of three main parts:

- suspension tubes
- horizontal aluminum arm
- technical box

"Wet" side (infusion) pendant:

The unit is manufactured totally of special extruded anodized aluminum profiles and consists of three main parts:

- suspension tubes
- double horizontal aluminum arm
- vertical aluminum body (technical box)
- tubes support system

"Dry" side (monitor) pendant

- Horizontal rotation in two axis (suspension tube-arm and arm- technical box)
- Horizontal movement with one arm
- Upper flange suspension tube
- 2nd suspension tube
- Mechanical brakes



- Tube-arm bearing rotation 330°
- Arm-technical box bearing rotation 330°
- Load capability 200 Kg
- 1 ground bar for electrical sockets
- Electrical sockets (16A 250V~), separately protected by thermo magnetic bi-polar switches
- 6 electric sockets 220V of orange color (UPS)
- 6 electric sockets 220V of green color (Generator)
- 1 double data or telephone socket RJ45 cat.6 or cat.5e
- 6 equipotential sockets DIN 42801/2 type
- 12 medical gases outlets(4xO₂ –4xVac–4xAir5bar) according to EN 737-1 and EN 737- 6
- 4 manometers and a vacuum gauge for the medical gases pressure indication
- 1 bar of equipotential grounding system and grounding of metallic parts
- Optional inox monitor table (400x350 mm standard dimensions), load capacity 50 Kg

"Wet" side (infusion) pendant

- Horizontal rotation in three axis (suspension tube-arm1, arm1-arm2 & arm2- technical box)
- Horizontal movement with two arms
- Upper flange suspension tube
- Mechanical brakes
- Tube-arm bearing rotation max330°
- Arm1-arm2 bearing rotation max330°
- Arm2-aluminum body bearing rotation max330°
- Load capability 150 Kg
- 1 ground bar for electrical sockets
- Electrical sockets (16A 250V~), separately protected by thermo magnetic bi-polar switches
- 6 electric sockets 220V of orange color (UPS)
- 6 electric sockets 220V of green color (Generator)
- 6 equipotential sockets DIN 42801/2 type
- 1 double data socket RJ45 cat.6 or cat.5e
- 1 bar of equipotential grounding system and grounding of metallic parts
- Two (2) stainless steel tubes for pumps Ø38
- Optional inox monitor table (385x400 mm standard dimensions), load capability 50 Kg

Facilities may be incorporated to accommodate special electrical installations e.g. patient monitoring in accordance to customer's specifications.

ICU pendants will be manufactured according to model EN 737-3, EN 739 and EN 793.

ICU pendant "**dry**" has working load 250 kg and is consisted of the following main parts:

- horizontal arm length 1,10 m
- vertical arm with the head length 1,60 m
- stainless table for the placement of medical appliances of dimensions 500mm x 350mm
- metallic support construction for pendant's support from the roof

ICU pendant "**wet**" has working load 250 kg and is consisted of the following main parts:

- two horizontal arms of length of 0,60+0,60 m
- a vertical arm of length of 1,40 m
- two stainless tubes Ø 38mm along the vertical arm for the suspension of various appliances
- stainless table for placement of medical appliances of dimensions 500mm x 350mm
- the metallic support construction

The support of pendant from the concrete ceiling of operation room has to be stable so that it is ensured a minimum suspension weight of 6.000N and a maximum torque of 5.400 Nm.

The medical gases and vacuum outlets of the pendant are according to EN **737-1** and EN **737- 6** standards and the scavenging outlet according to EN 737- 4. They are connected with special flexible



anti-static pipes of different colors for each gas, which lead to bronze breasts to the upper part for their connection with the corresponding copper pipe medical gas network.

Each medical gas outlet is accompanied by indelible polycarbonic label according to EN 60601-1 standard, with the name of each gas, the color and the chemical symbol of corresponding gas.

When pendant's manufacture is finished the following tests of good operation of unit applied, i.e.:

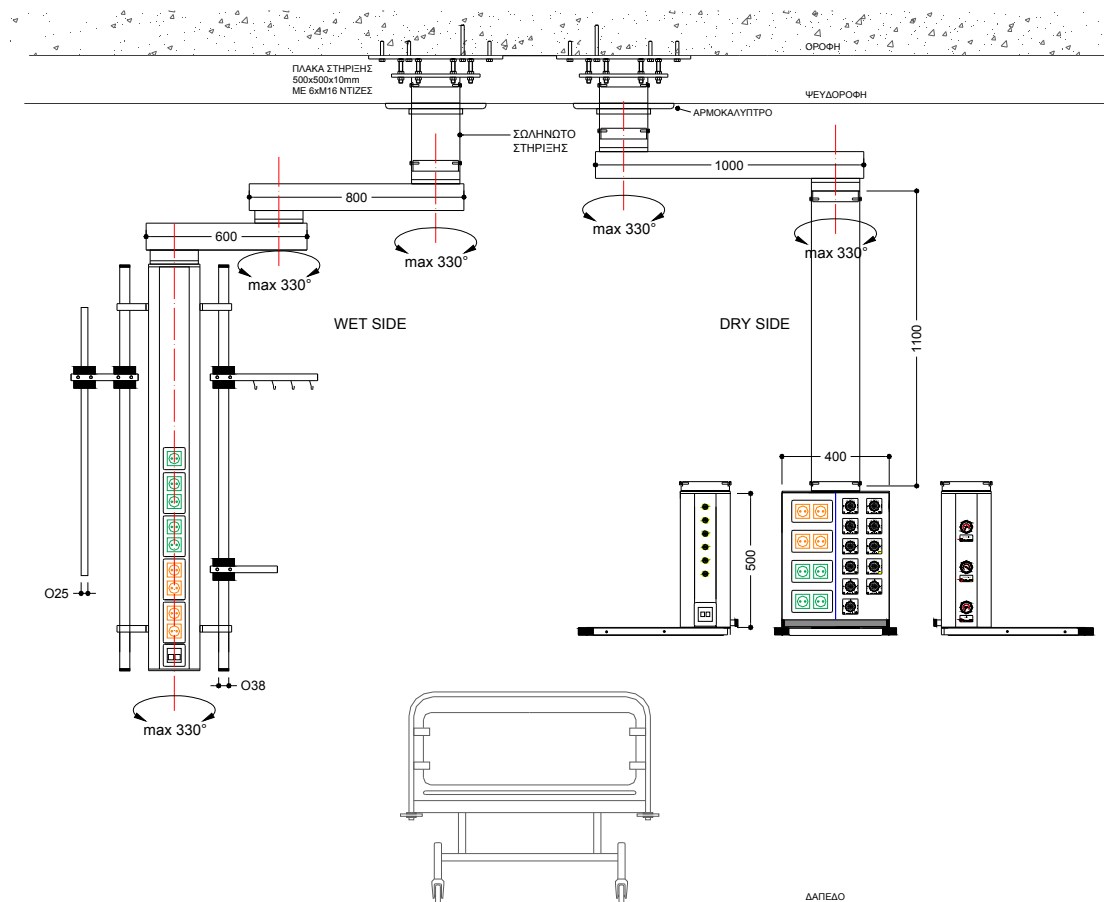
- the electric sockets
- metal parts grounding
- the leakage, the mechanical function and medical gases outlets flow.

The electric power supply cable that required for the pendant is:

- 220 V, 3x2,5 mm² for each electrical sockets circuit and for the electric motor
- Ground cable 1x16mm² for the equipotential terminal units

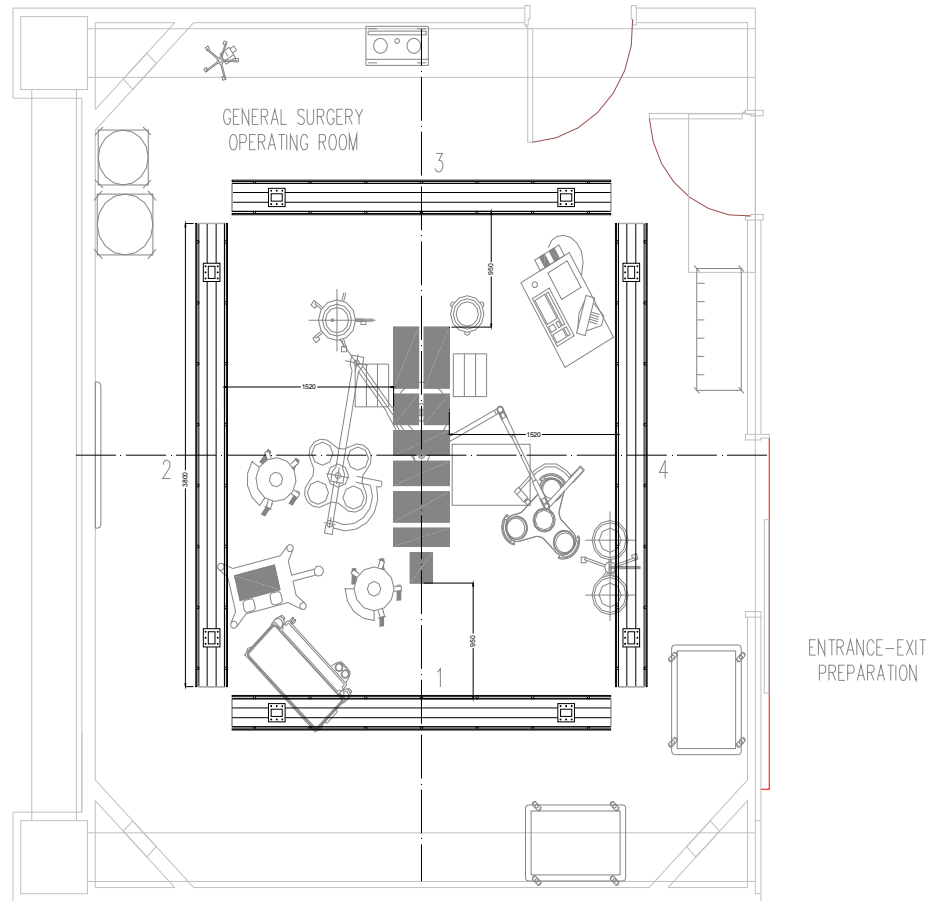
The electric power supply connections of the pendant to the corresponding electric power network become through terminal strips that are found in waterproof box in the base of the pendant and according to the existing electrical drawing that accompanies the pendant.

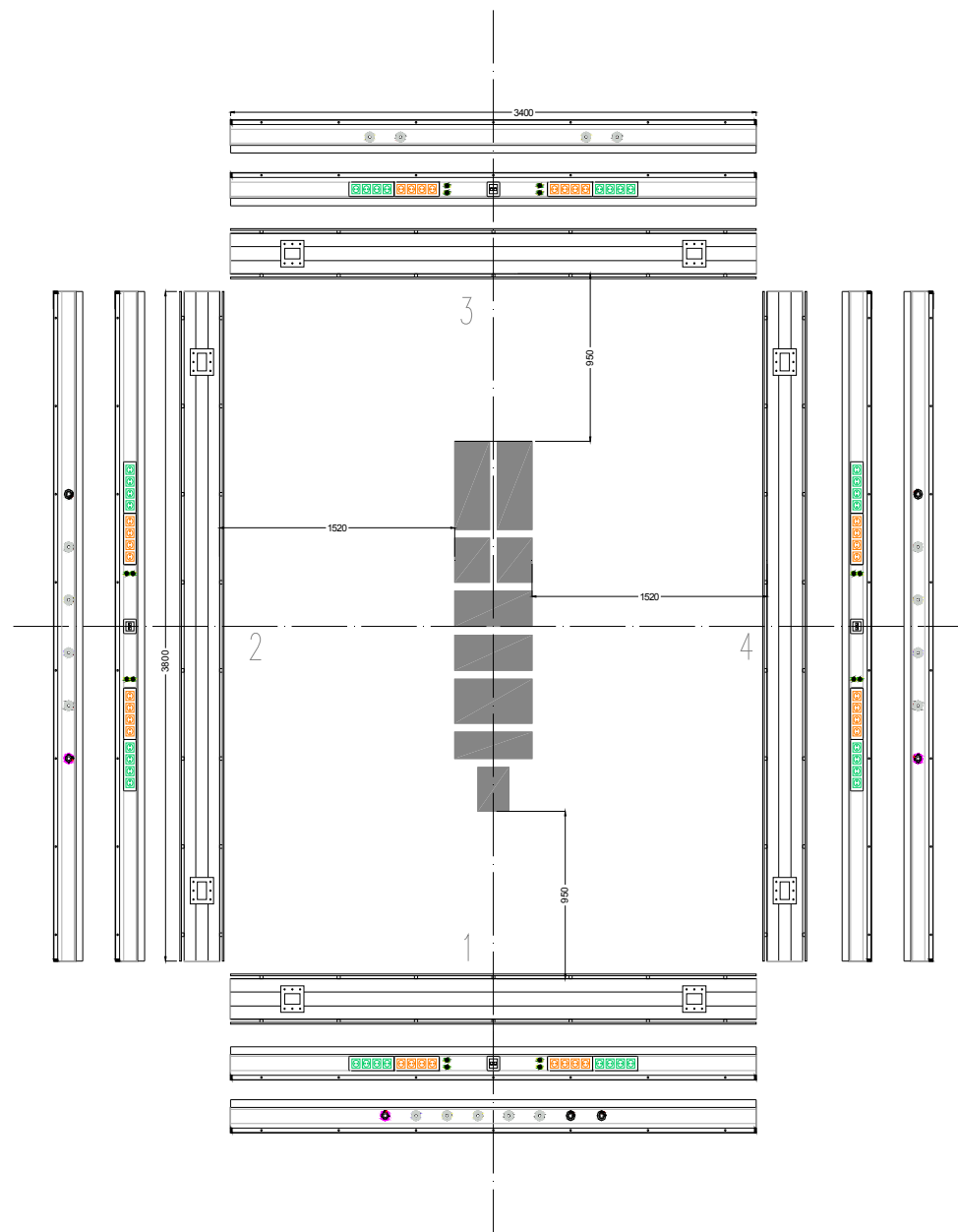
Typical installation drawing

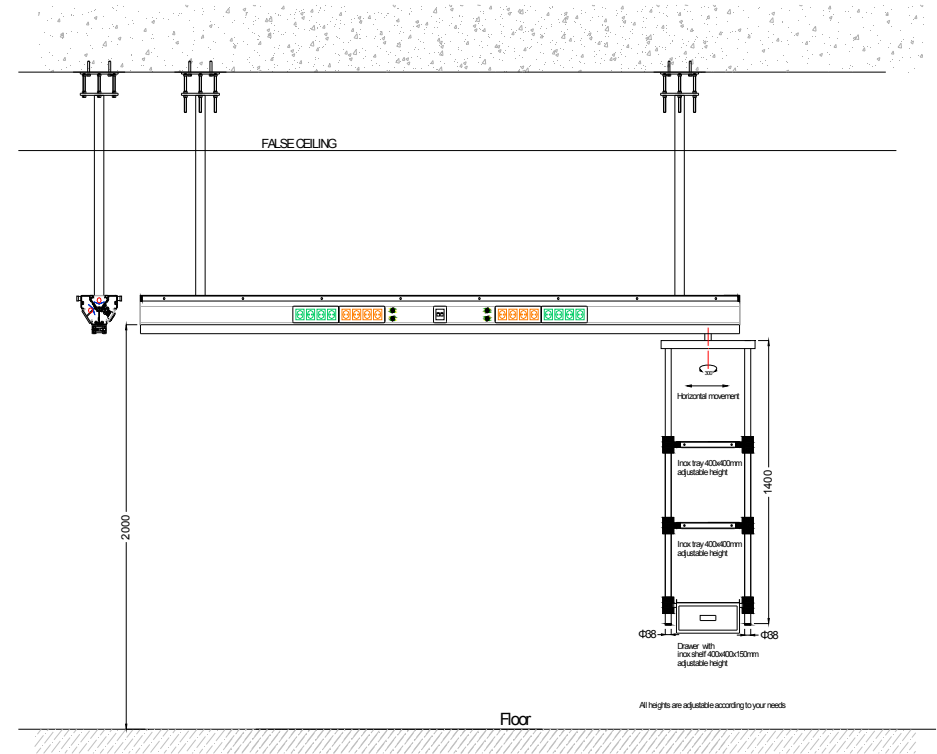
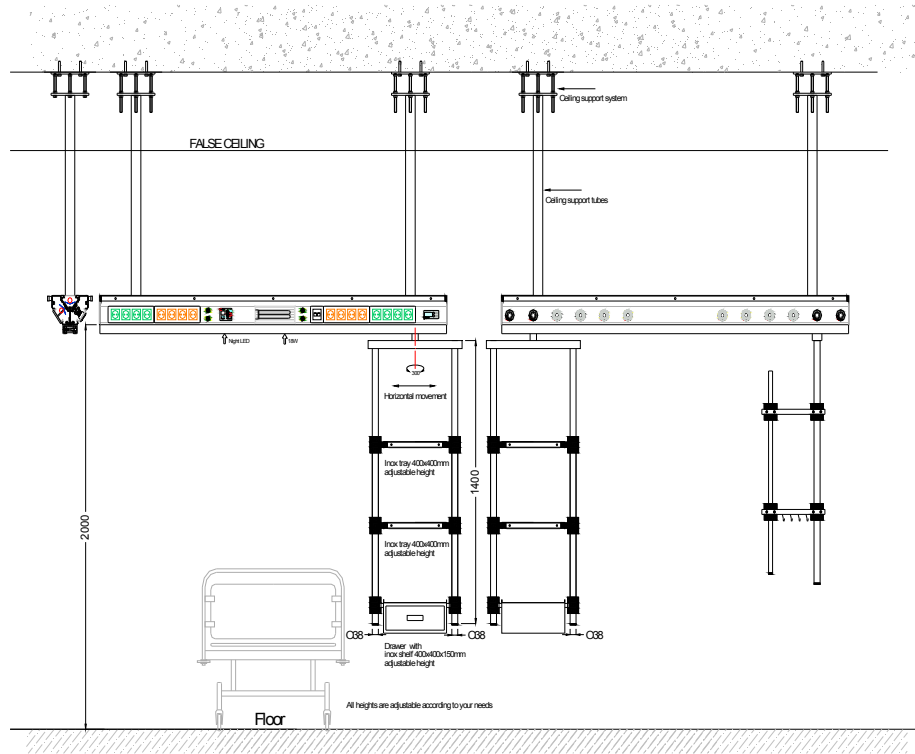




B.H.U. OPERATION
ROOM SYSTEM









B. H. U. OPERATION ROOM SYSTEM

The system of perimetric suspended BHU for operation rooms is designed for exclusive surgeries service. BHU are placed at the ceiling around the surgical table to provide medical gases and electricity. It consist of four BHU installed with the electric sockets, medical gases outlets and other terminal units.

This system replaces the surgeon and anesthesiologist pendants in one typical operation room and offers flexibility and advantages:

1. laminar flow
2. trolley
3. low cost

The BHU system supports from operation room concrete ceiling by using eight tubes 60x100 mm of proportional length. The one end of the tube will be fixed in the metallic support construction and the other end will fix to the BHU.

The electric cables pass through the right support tube and end up at the terminal strips that are found in the BHU. All medical gases will pass through the left tube.

T The medical gases and vacuum outlets of the pendant are according to EN 737-1 and EN 737-6 standards and the scavenging outlet according to EN 737-4. They are connected with special flexible anti-static pipes of different colors for each gas, which lead to bronze breasts to the upper part for their connection with the corresponding copper pipe medical gas network.

Each medical gas outlet is accompanied by indelible polycarbonic label according to EN 60601-1 standard, with the name of each gas, the color and the chemical symbol of corresponding gas.

The **B. H. U. operation room** system contains the following:

- 8 electric sockets 220V of orange color (UPS) per BHU
- 8 electric sockets 220V of green color (Generator) per BHU
- 1 ground bar for electrical sockets per BHU
- 4 equipotential sockets DIN 42801/2 per BHU
- BHU 1 : 8 medical gas outlets (2xO₂ – 2xVac – 2xAir 5bar – 1xN₂O – 1 x SC) according to EN 737-1/6
- BHU 2&4 : 6 medical gas outlets (1xO₂ – 1xVac – 1xAir 5bar – 1xAir 8bar – 1xN₂O – 1xSC) according EN 737-6
- BHU 3: 4 medical gas outlets (2xAir 8bar – 2xVac) according to EN 737-1/6
- 3 manometers of clue of pressures of medical gases
- 1 double data socket RJ45 cat.6
- 1 bar of equipotential grounding system and grounding of metallic parts
- double INOX rail along the BHU, dimensions 25x10mm

When the B.H.U system has been installed the following tests should be carried out in order to ensure good operation of each unit i.e.:

- Electric sockets
- Metal parts grounding
- Gas leakage, the mechanical function and medical gases outlets flow.



NURSE CALL SYSTEM

1. General

The nurse call system is installed in a nursing unit. It provides patients or others to be able to call a nurse in case of an emergency but also in case of some other patient need. It is an electronic system which is very easy to use. It is consisted of many individual units and its structure and operation are described below.

2. Specifications

- Maximum number of beds 50 beds
- Maximum number of rooms 24 rooms
- Corridor light of three situations (call – presence – emergency)
- Entry presence – cancellation button near the door
- Pull cord (bathroom/WC)– emergency button
- Nurse call from the BHU (double – emergency)
- Central unit – historical data
- Extracted printed circuits(4 pcs)
- Homogeneity with existing printed circuits

Signal inputs

- (bathroom/wc) button
- handset
- button i) presence II) emergency III) cancellation (perhaps certain different operations with extended use of the button)

Signal outputs

- Corridor light (LED) outside the room 3 situations i) presence - green II) emergency - red III) call - orange
- buzzer
- test
- silence
- display 5X20
- 3 LED on the printed circuit
- history calls report

3. System description

The nurse call system is consisted of the following individual units:

- Power supply unit (DPP100-24) has capacity 24V/4.2A. The installation should it be done in order that the two sides of the power supply unit to have the holes of refrigeration not enclaved and to abstain at least 25mm from any compact parallel surface.

- Main board control panel

The nurse call system is a central electronic board in which are transported the signals of all this system. The basic parts of central unit are the following:

- a) Central process unit
- b) COM with the ext boards.
- c) COM with the PC.
- d) RJ45 for remote control.
- e) Buzzer.

- Expansion panel

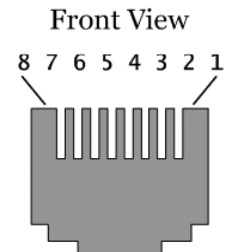
The expansion panel is an electronic board with 8 jack receptions which assembles the signals of the nurse call system from 8 control local points (usually the control local point = room). The nurse call system can assemble totally the signals from 24 local control points(or rooms). This means that in this case it should be connected three expansion panel serial from each other and from the last unit all signals should be transported in the central unit of system. The connection of the expansion panel between them it should be as follows: We connect the door



JP10 OUTPUT of the first unit with door JP9 INPUT of the second unit that we want to connect serial with first. We connect the door JP10 OUTPUT of the second unit with the door JP9 INPUT of the third unit that we want to connect serial with the other two. Finally by door JP10 OUTPUT of the third unit the signals are transported in door JP15 EXPANSION of central unit. Each one of these jack receptions of one expansion panel has 8 contacts. Each contact accepts also a signal. The equivalence of contacts and signals appears below.

Front view of a RJ45 connector (MALE)

- 1: Vdc
- 2: NURSE'S BUTTON (HANDSET UNIT)
- 3: ROOM'S BUTTON
- 4: WC CORD
- 5: PRESENCE LED (CORRIDOR LAMP)
- 6: CALL LED (CORRIDOR LAMP)
- 7: SILENCE LED (HANDSET UNIT)
- 8: EMERGENCY LED (CORRIDOR LAMP)



TIA/EIA 568B Wiring

1		White and Orange
2		Orange
3		White and Green
4		Blue
5		White and Blue
6		Green
7		White and Brown
8		Brown

iv. Main display and button panel

It is an electronic board which incorporates a liquid crystals display of multiple indications and a keyboard with a function button of the whole system. With this function button and the display of unit of indications we can import and process into operations' menu of the system of nurse call system which is described analytically below.

v. Nurse call system hand sets

It is placed next to each bed and includes:

- a) Nurse call button with silence led and one or two commands



Only with call without any commands



With call and one command



With call and two commands

Handset units

The handset units have been created especially to satisfy all requirements regarding light control, warning signals and requests for assistance in every place hospital bed.



1. Handset with one command



THC-401



THLC-1401

2. Handset with two commands









THLC-2502

3. Handset with three commands



THLC-2551

All series of electrical equipment described below, are constructed in accordance with EN 73/23, EN 89/336, EN 89/392, EN 92/31, EN 93/68 norm, and in accordance with European Community directives concerning electromagnetic compatibility (EMC).

Description	T	H	L	C
	hand-set	Hospital	with led diode	with connector
	A	B	C	
Sketch available.				
Type	single pole pushbutton	Single pole on-off switch	Single pole two way switch	Type of cable
THC-401	A			2 x 0.5
THLC-1401	A			4 x 0.5
THLC-2502	A/B			6 x 0.25
THLC-2551	A/B/C			6 x 0.25
				

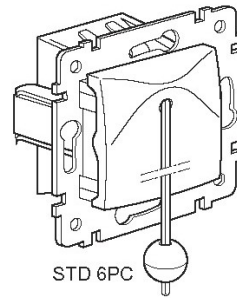


b) Socket 7 pin



vi. Nurse call cord for WC.

It is a lace which is placed in the bath with which can make a call of nurse by the patient if pulled



vii. Button for presence or cancel or emergency call

It is a button usually placed at the wall in the entrance of the room from which the nurse can correspond in the potential call of one patient to make any from the following actions:

- a) By pressing the button once, it declares her presence in the room
- b) By pressing the button for a second time it cancels the call, declaring that there is no reason of existing anymore.
- c) By holding the button pressed for some seconds it declares an emergency. And that the nurse needs the subscription of her colleagues in order to face the evolving emergency situation.

viii. Corridor indication lamps



- W **ORANGE** LED CALL
- R **RED** LED EMERGENCY
- G **GREEN** LED PRESENCE



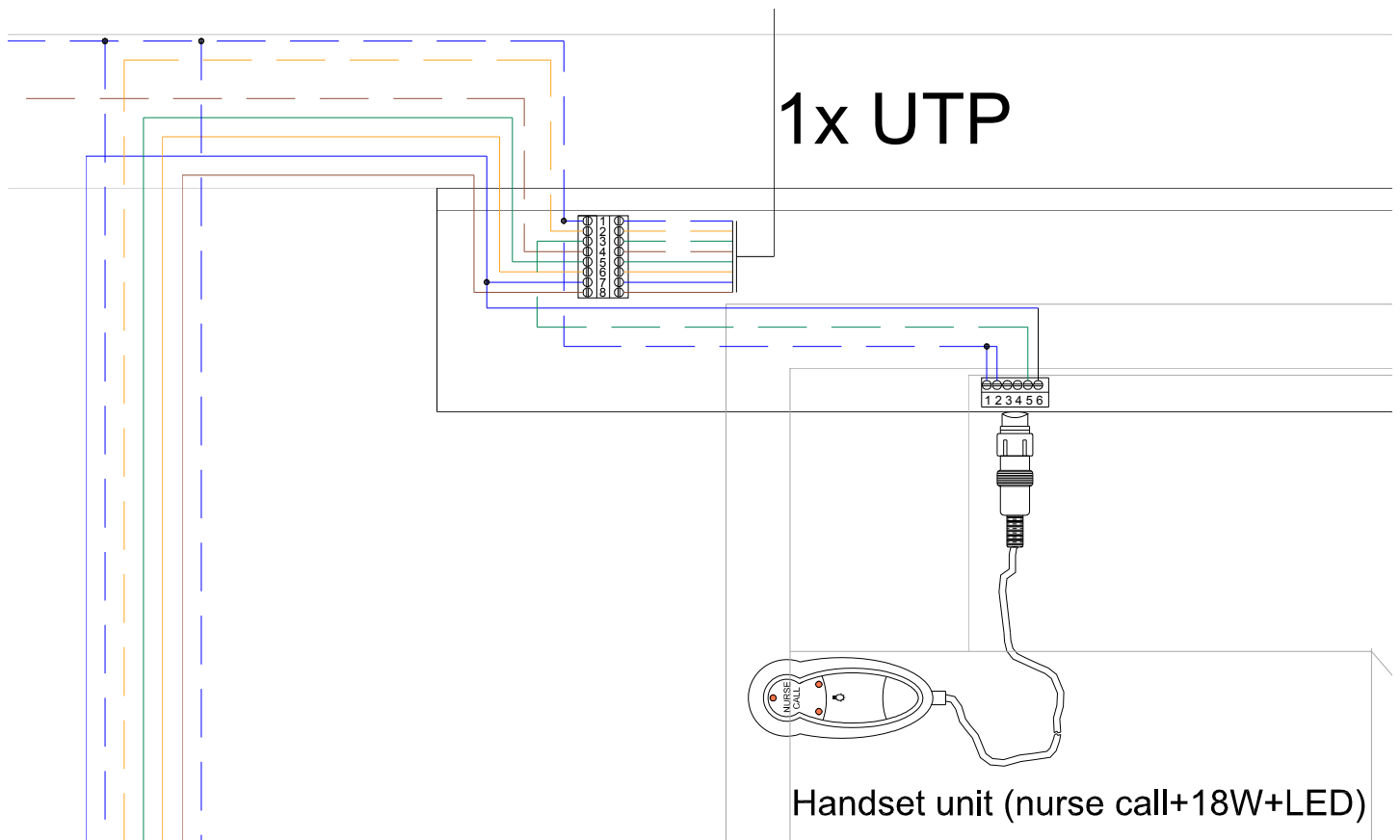
b. System description

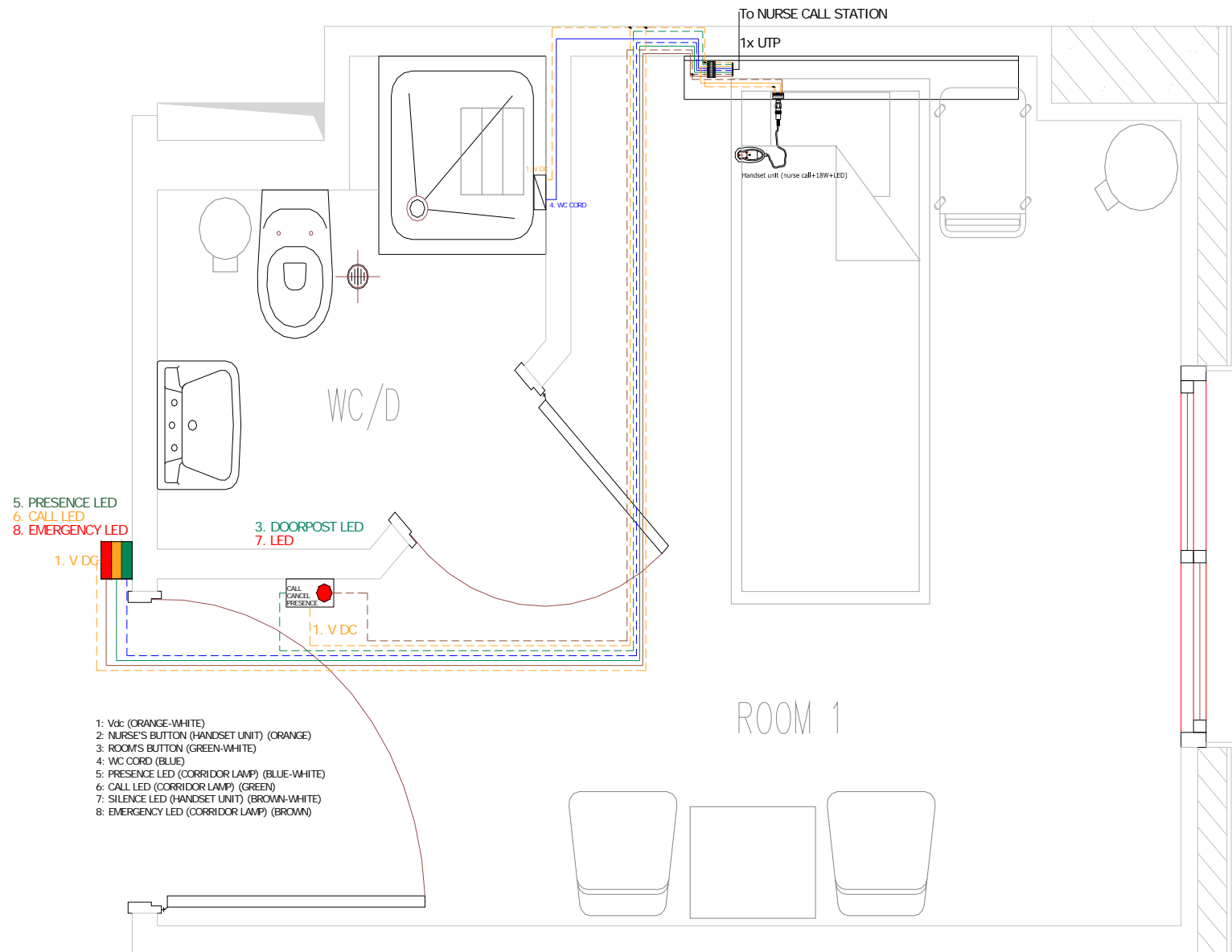
i. Room design

Typical diagram of a room:

i. Wirings

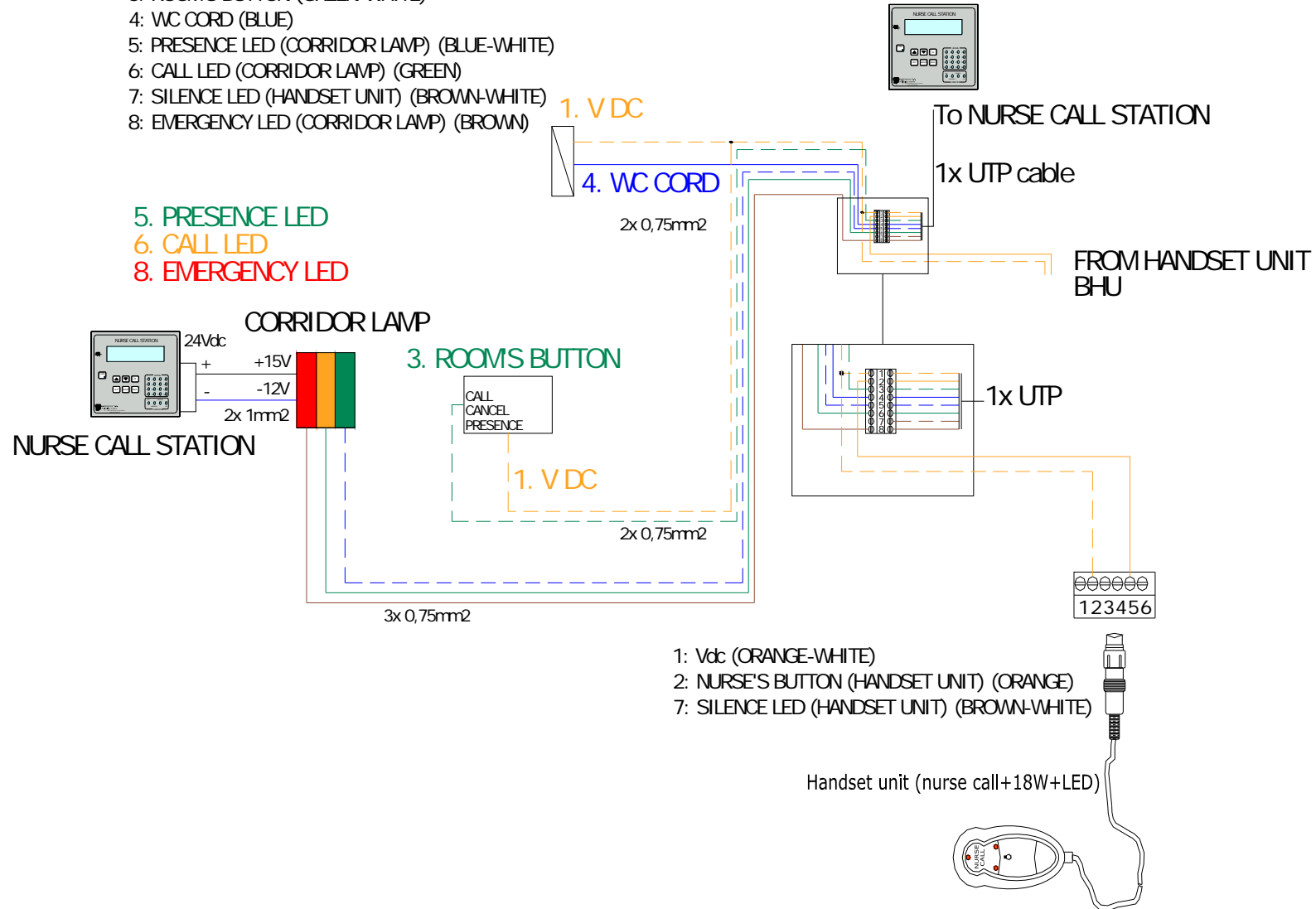
The wirings of internally each room appear in the following drawing

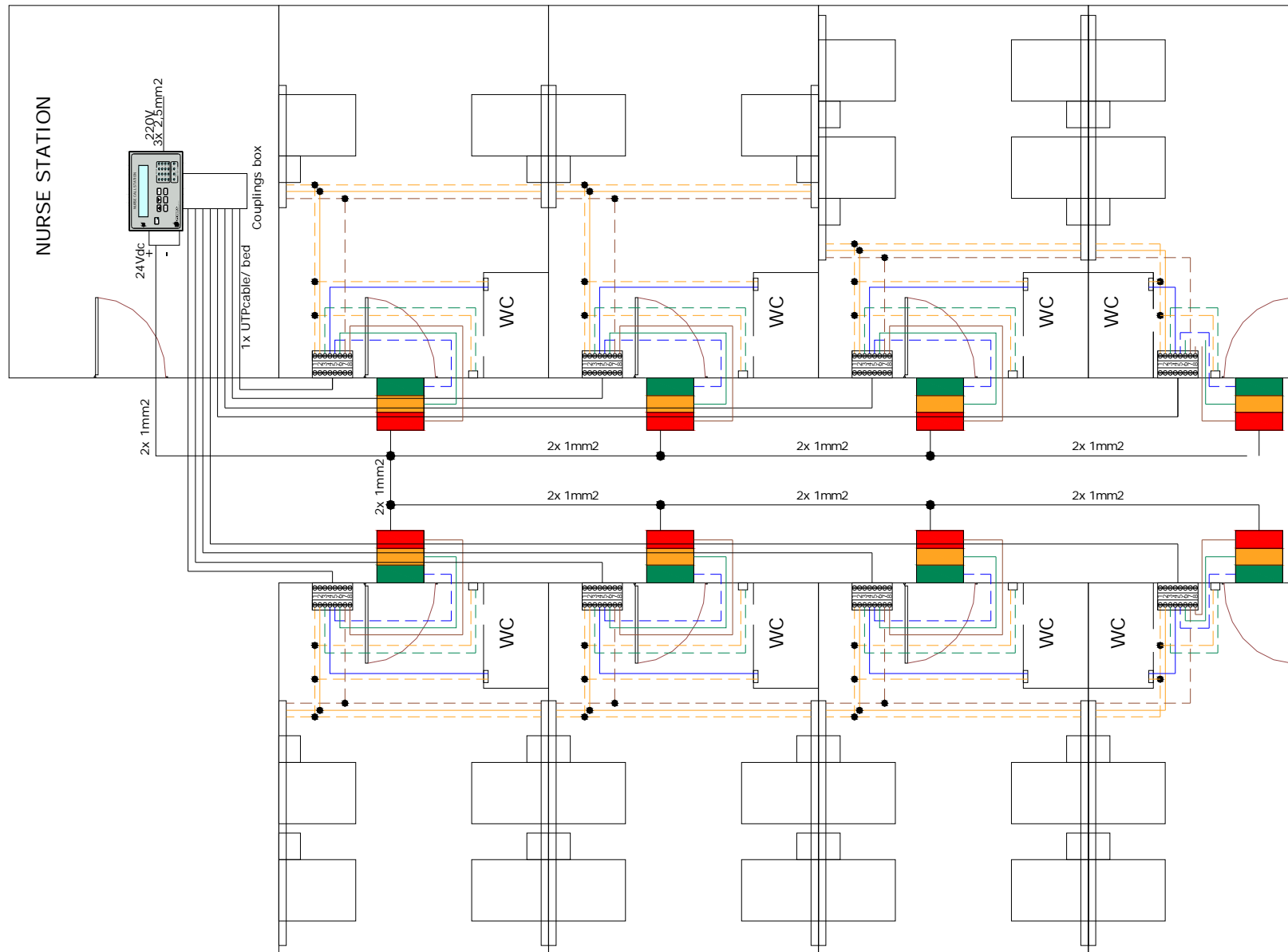






- 1: Vdc (ORANGE-WHITE)
- 2: NURSE'S BUTTON (HANDSET UNIT) (ORANGE)
- 3: ROOM'S BUTTON (GREEN-WHITE)
- 4: WC CORD (BLUE)
- 5: PRESENCE LED (CORRIDOR LAMP) (BLUE-WHITE)
- 6: CALL LED (CORRIDOR LAMP) (GREEN)
- 7: SILENCE LED (HANDSET UNIT) (BROWN-WHITE)
- 8: EMERGENCY LED (CORRIDOR LAMP) (BROWN)







4. Operation of system

a. Logic diagram

The logic diagram of operation of nurse call system showed below:

