

Medical Gas Supply System
HTM02-01 / HTM2022 / ISO7396-1
MAT-S (HTM/ISO Version)

Medical Gas Supply System



Description and intended use

The BeaconMedaes Medical Gas Supply System, mainly consists of cylinder manifold system, manifold changeover system, header & tailpipe and other necessary components, is intended to work in conjunction with other devices within the medical gas pipeline system (MGPS) to assist with maintaining continuity of supply throughout the hospital to local connection points for eventual introduction into the human body. The device controls the gas pressure within the specification as required by the MGPS. In all cases other devices outside of this scope are connected downstream of the MGPS are required to control the final gas pressure and flow requirements for safe supply to the patient. Therefore, this device is not intended to control supply parameter hazards directly to the patient, only to the MGPS.

The device including Cylinder Manifold System and Manifold Changeover System (abbreviate as manifold below) is principally designed for use as a primary or secondary source of supply, or for emergency backup.

The Medical Gas Supply System supplies one of the following medical gases to a piped distribution system, Oxygen, Nitrous Oxide, O₂/N₂O 50%: 50%, Medical Air, Surgical Air, Nitrogen & Carbon Dioxide.

BeaconMedaes MAT-S Medical Gas Supply System

The distinctive features of MAT-S

A constant supply of medical gases such as oxygen, nitrous oxide, and medical air is critical to ensure safe, quality patient care. That is why we designed the new MAT-S Medical Gas Supply System to deliver superior reliability. Our medical gas supply system offers a higher utilization rate and uptime for using it more frequently and for longer periods. In addition, its smart features make it easy and efficient to operate the net result: is premium performance and durability and lower operational and maintenance costs.

MAT-S offers flexibility for hospitals to choose between two variants only for the 4 bar variant:

The first variant allows to choose a high flow delivery of 1800lpm at 4 bar based on the design requirement of the hospital. The changeover pressure in this case will be at 15 bar.

The second variant focuses on savings on the cylinder consumption having a changeover pressure of 10 bar. The flow output at 4 bar will be 1450lpm in this variant.

For E.g. In the table below considering a 5 cylinder bank, and 7 days of time between cylinder changes. Assuming its in the UK with the cost of 59.99 GBP per cylinder (137 bar, 47.2 water capacity of cylinder). The annual savings on a 10 bar changeover pressure of cylinders would be around GBP 571 per year.

Manifold Design

There are two separate stages of regulation to enable high peak flow rates without reducing line pressure. Regulators comply with BS EN ISO 10524-2 with test reports from a third party, such as the successful completion of the oxygen ignition test.

BeaconMedaes in-house designs both the 1st and 2nd stage regulators for medical applications. They are designed with better-integrated forged brass housing with minimized connection points to reduce the risk of leakages. The regulators are protected against overpressure with dedicated relief valves. The venting valve on the regulator is considered for commissioning and service operation. Each regulator on the manifold system can be isolated individually for service.

The manifold is supplied with a non-return valve for connection to the distribution system. The test point with an antimicrobial GEM Shield medical gas outlet is incorporated into the manifold with a lockable valve to minimize installation time.

The manifold assembly is housed in a single control panel having a solid construction using an ABS plastic material case (front cover) for corrosion resistance and high impact strength. The case is fully removable to provide unlimited access to all internal components. A two-layer powder-coated 3mm steel backplate holds all components, providing additional protection and a robust fixture for a durable design.

To aid maintenance and avoid leakage, the connections within the panel use 'O' rings sealing against flat-face connectors to facilitate easy removal and replacement of components.

An installation bracket is attached to the wall with four screws to simplify installation. The main panel is then hung on this bracket and is then secured. A P&ID diagram is fixed internally to identify spare parts and wiring connections. The instruction book shall be easily reached via Q.R. Code for operation and service.

Features	Customer Benefit
ABS Plastic cover	A new, lightweight, high-strength ABS plastic cover brings a fresh look and feel. More importantly, it eliminates the risk of corrosion to ensure a longer lifetime.
Dome-loaded forged regulators	The dome bias regulator design has proven its reliability and performance for over a decade. It helps reduce connections and no threaded connections and therefore also the risk of leakages of gases. MAT-S Medical Gas Supply System use dome biased bank (1st stage) regulators to ensure maximum flow rates. Dome biased regulators do not open to the atmosphere and thus are not subject to the formation of ice in the regulator. Accumulated ice in the regulator is a very common cause of manifold failure. No air and no ice ensures solid reliability. The new design enables servicing of the regulators without having to replace them. As a result, manifold offers faster and more costefficient maintenance.
Automatic changeover pressure setting	The changeover pressure for a 4.0 bar manifold output pressure is improved to 10 bar. This increases the utilization of the cylinder to minimize wastage. This brings huge savings over a year, resulting in lower operational costs. The changeover pressure for the manifold with an output line pressure of 8.0 bar and 11.0 remains unchanged at 20 bar
Individual service valves	MAT-S has individual service valves after each bank (1st stage) and line (2nd stage) regulators. Each regulator can be isolated for service with the best redundancy. This allows you to service any regulator without disrupting the gas supply to the distribution system.
Built-in test terminal unit	A medical gas terminal unit is built in for easy testing. It removes the need to install terminal units, copper pipes, brazing, and testing on-site, giving you additional installation time and cost savings. In addition, Gem shield terminal units offer high durability and antimicrobial protection at any time.
New smart digital controller	A smart operating system powers MAT-S. The controller features a highly responsive 7" LCD color display with 1024px X 768px high resolution. The control is enabled by a simple, clean and easy-to-use, intuitive user interface (U.I.)
Built-in Smartbox with MyMedgas Enabled	A Smartbox is included as a standard to allow real-time remote monitoring and reporting of the functioning of the manifold. It offers to push notifications and access to manifold system details wherever you are and when you need.
Analog gauges	In addition to the digital control panel, MAT-S comes equipped with analog gauges to give you the peace of mind that you can always monitor gas pressure and operation.
Individual exhaust line for pressure relief	MAT-S ensures compliance with HTM standards by offering individual pressure relief valves for the left bank, right bank, and line to separate the high-pressure and low-pressure exhaust pipes. It also comes with a retrofit kit that allows easy replacement of existing BeaconMedaes Lifeline Manifolds.
Integrated Non-return valve	MAT-S has an integrated non-return valve along with a lockable isolation valve to the distribution system to ensure compliance with HTM/ISO standards and to ensure safety.

SPECIFICATION

Control System

The control of the various changeover system conforms to NHS Health Technical Memorandum 06-01(HTM06-01) Electrical services supply and distribution. Following the Chapter 11 requirement, the manufacturer will provide evidence of Electromagnetic compatibility (EMC) for the manifold, e.g., an EMC test certificate.

The pressure sensor monitors the pressure in each bank of cylinders and bank pressure gauges attached to each bank regulator (1st stage). A pressure sensor measures delivery pressure, and a delivery pressure gauge is attached to each line (2nd stage) regulator for easy service.

The system incorporates a color, graphical interface to indicate pressure in each bank of cylinders and line pressure. All alarms are shown on display with a color indication as per code requirement, and the history of the alarms can be accessed through the logs. A mechanical pressure gauge backs up the digital display in case of power failure.

To increase safety, the control system has an electronic warning signal to inform the user to perform regular maintenance. The warning should be reset once the maintenance is done.

When cylinder capacity, pressure, and quantity are corrected and updated in the control system, it provides an estimated average gas consumption, with a clear indication for cylinders with gas phase inside. A flow sensor is available as an option for hospitals needing a more accurate gas consumption measurement.

All electrical components are in a separate enclosure to limit dust and water penetration and simplify electrical connection with BMS and Alarms. The control system supports RS485 and BACnet communication network.

The control system is linked with plug and socket connectors for easy removal. For added safety, the voltage inside the panel does not exceed 24V D.C.

The control system has a 1024*768 high-resolution 7-inch capacity touch screen. It has a "screen saver" function to extend the lifetime of the display to more than 20,000 hours. The display may run at a reduced 30% brightness to save screen life. The screen comes to full brightness if any alarm conditions are active and revert to 30% brightness 5 minutes after the manifold system returns to normal.

The control system has a restricted Setup Mode to adjust warning levels for line pressure, selecting a pressure measurement system between the bar and psi. Additionally, a Service Mode is provided to allow alarms to be deactivated during commissioning and service and manual operation selection of a duty bank. Service mode is accessible with secured ID and Password.

Features	Available in the MAT-S Medical Gas Supply System controller
7" LCD color display	Yes
Capacitive Touch screen	Yes
Intuitive User Interface	Yes
Clean U.I. Design	Yes
Left & right bank pressure indication	Yes
Line bank pressure indication	Yes
Volume indication of gas flow to hospital	Yes
Left bank gas flow trend	Yes
Right bank gas flow trend	Yes
Banks running status	Yes
Clear alarm warnings (Text+color)	Yes
Alarms status overview	Yes
Custom messaging option for warnings	Yes
Alarms log history	Yes
RS485 & BACnet connections	Yes
Device data information	Yes
Device installation information	Yes
Device initial-set-up information	Yes
Service mode	Yes
QR code for user manual	Yes
QR code for ordering service kit	Yes
User ID & Password	Yes
Device logs history	Yes
Maintenance timer	Yes
MMG integration	Yes
Smartbox connectivity	Yes

Power Supply

The system has a universal input and operates in a wide power range: AC 100 to 250 Volts 50/60 Hz. The power supply board has a built-in over-voltage protection circuit and overload protection, which recovers automatically after the fault condition is removed.

Operation

Either the left or right-hand manifold bank may be designated "Duty." The MAT-S Medical Gas Supply System automatically changes to supply the distribution system from the "Standby" bank when the pressure in the "Duty" bank falls to a predetermined level.

Each side of the manifold can be fully isolated via a full-flow ball valve, facilitating servicing of any regulator without supply interruption. The inlet of the 1st stage (bank) regulator is protected from the particulate matter by a 25µm sintered bronze filter. There is a fail-safe system in the event of power failure. The left bank supply is a primary source, with full supply pressure and flow continuity.

The right bank supply will take over when the left bank is empty. Once the primary left bank is refilled, it will remain a primary source. Upon power restoration, the unit reverts to the original bank of cylinders. Once a changeover has occurred, and the cylinders have been replaced, the system automatically resets alarm conditions.

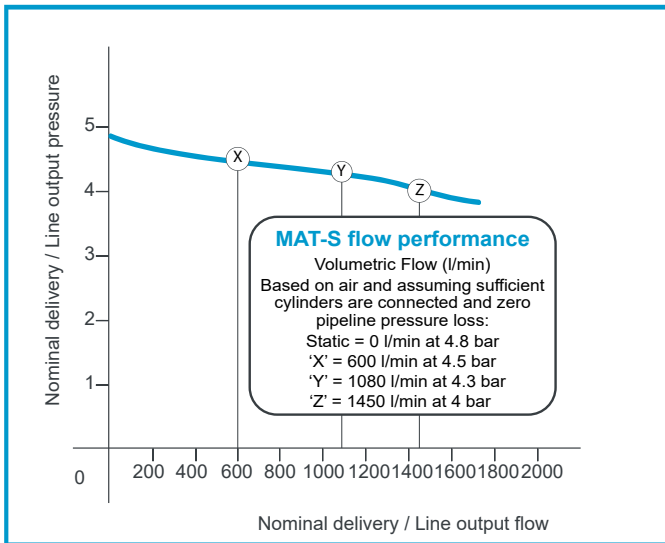
Manual changeover arrows allow servicing on either side of the system to be achieved. The manual changeover to an already exhausted side is blocked for safety reasons.



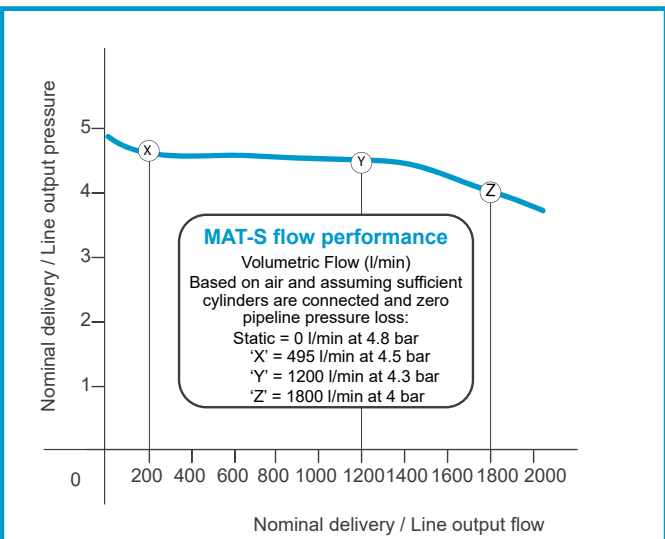
Output Flow

MAT-S output flow is tested according to ISO 10524-2.

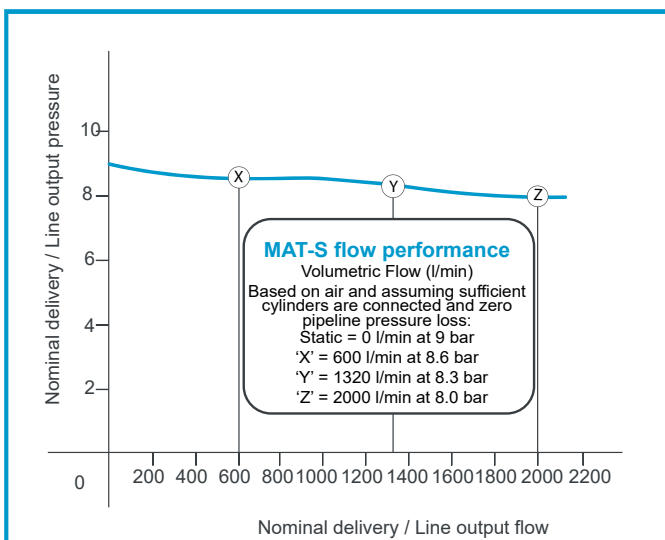
Typical 4 bar Manifold flow



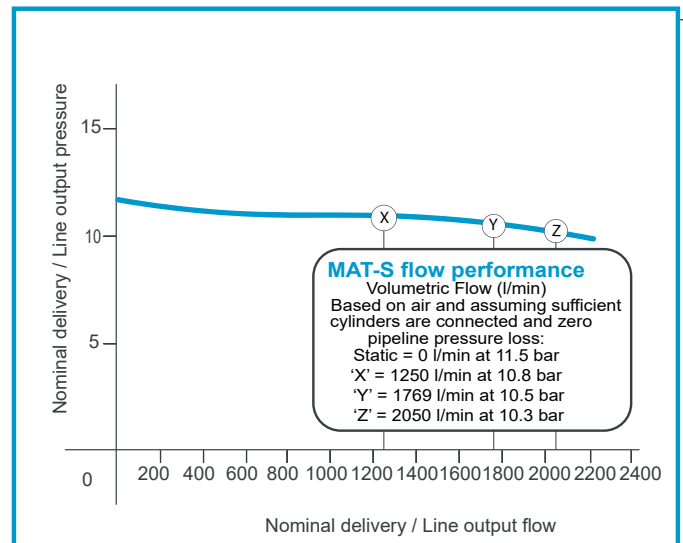
Typical 4 bar Manifold big flow



Typical 8 bar Manifold flow



Typical 11 bar Manifold flow



Materials

All polymers and elastomers in the gas flow that can be subjected to working pressure greater than 3,000 kPa are halogen-free. The materials selected are compatible with oxygen and other types of gases.

Modular Header Manifold

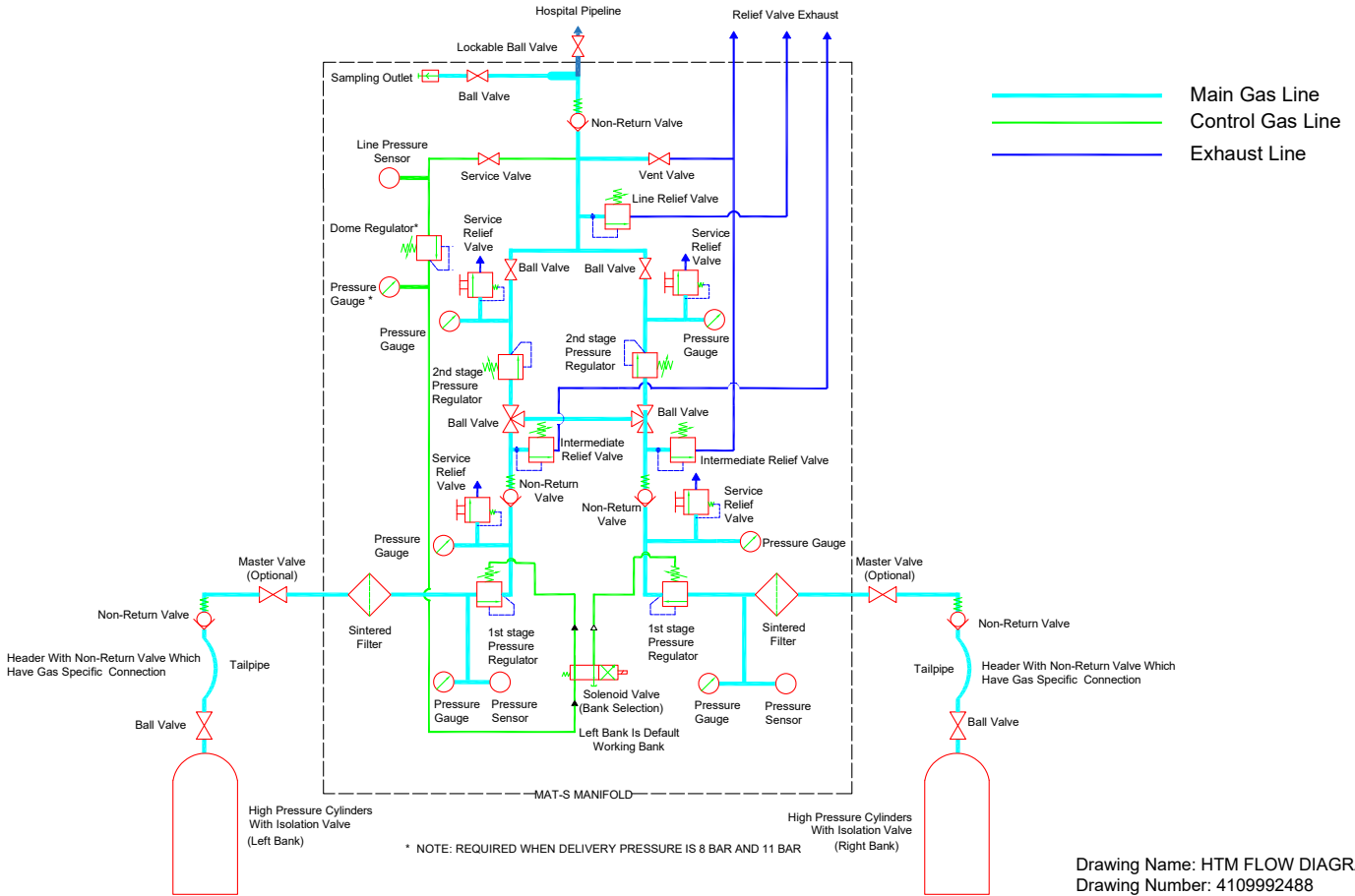
The modular Header shall provide connection points for flexible copper-nickel tailpipes. Non-return valves shall be fitted to each tailpipe connection point to protect the system in case of a tailpipe fracture.

Corner connectors shall be available to enable the installation of manifold headers around the corners of the manifold room. A custom-length corner connector is available to enable header manifolds to be installed in a 'U' configuration across 3 adjacent walls of a manifold room.

CE Marking

The standard range of BeaconMedaes MAT-S manifold system and headers are certified with a 'C.E.' Mark as a Class IIb medical device according to MDR* (Medical Device Regulation) (E.U.)2017/745.

*MDR certificate under application

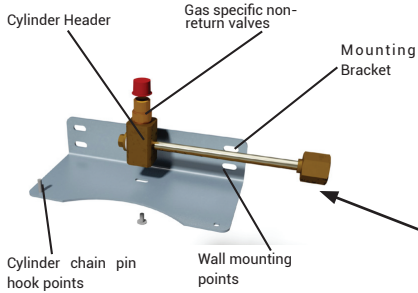
Typical Automatic Changeover Manifold Schematic


HTM/ISO Technical Parameter					
Model Type	Units	MAT-S-HH-XX-A		MAT-S-HH-XX-B	MAT-S-HH-XX-C
		Low changeover pressure	High flow		
Nominal delivery / Line output pressure	bar	4.0±0.1		8.0±0.1	11.0±0.1
2 nd Stage regulator test pressure as per 10524-2 at 10% pressure drop	bar	4.3±0.1		8.1±0.1	10.5±0.1
2 nd stage regulator output flow (Single) as per 10524-2 at 10% pressure drop	l/min	1450±50	1800±50	2000±50	2050±50
Input pressure range	bar	0-230			
1 st Stage regulator pressure (Intermediate)	bar	15±0.1	15±0.1	17.2±0.1	17.2±0.1
2 nd Stage regulator pressure output (Line)	bar	4.0±0.1		8.0±0.1	10.3±0.1
Line output flow	l/min	1450±50	1800±50	2000±50	2050±50
High-pressure regulator relief valve setting	bar	24.1±3%			
Line pressure relief valve setting	bar	5.2±3%		11±3%	13±3%
Changeover pressure	bar	10±1	15±1	20±1	20±1
Alarm display (Default setting)	bar	High line pressure: 5bar	High line pressure: 5bar	High line pressure: 10.5bar	High line pressure: 12bar
		Low line pressure: 3.7bar	Low line pressure: 3.7bar	Low line pressure: 6.5bar	Low line pressure: 9bar

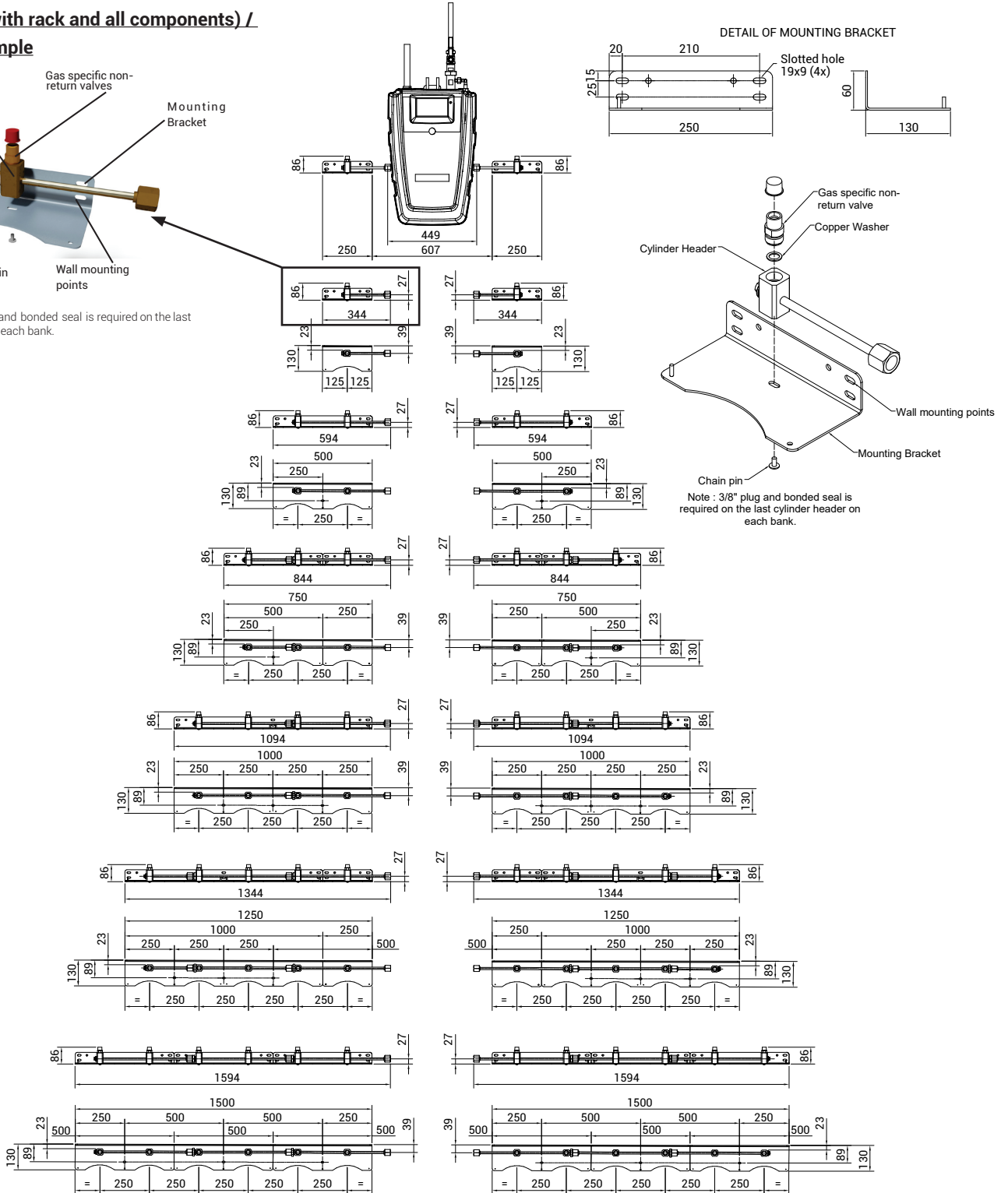
Typical Cylinder Header & Extension Layout Details

Note :

- 1.Manifold weight is 35kg.
- 2.Dimension: Length*Width*height=460mm*200*1100

Headers (with rack and all components) /
1 side example


NOTE - 3/8" plug and bonded seal is required on the last cylinder header on each bank.


 Drawing Name: INSTALLATION PROPOSAL
 Drawing Number: 410992438

Manifold Designation

e.g., MAT-S-HH-O2-A

A-B-C-D-E

Variable	Definition	Allowable Value	Allowable Value Description
A	Model name	MAT	Fully Automatic Manifold
B	Smart	S	Smartbox & MyMedgas enabled
C	Input type	H.H.	High-pressure gas cylinder
		L.H.	Low-pressure liquid cylinder
D	Gas type	O2	Oxygen (O2)
		N2O	Nitrous Oxide (N2O)
		EN	Entonox (O2/N2O)
		MA	Medical Air (M.A.)
		SA	Surgical Air (SA)
		N2	Nitrogen (N2)
		CO2	Carbon Dioxide (CO2)
E	Nominal Delivery / Line pressure	A	4 bar
		B	8 bar
		C	11 bar

Description	Part No
MAT-S-HH-O2-A	4109005131
MAT-S-HH-N2O-A	4109005132
MAT-S-HH-O2/N2O-A	4109005133
MAT-S-HH-SA-B	4109005134
MAT-S-HH-N2-C	4109005135
MAT-S-HH-CO2-A	4109005136
MAT-S-HH-MA-A	4109005137
MAT-S-HH-SA-C	4109005138
MAT-S-HH-N2-B	4109005139


Headers (with rack and all components)/ both sides

Gas Type	2x1	2x2	2x3	2x4	2x5	2x6
Oxygen (O2)	4109150303	4109150304	4109150305	4109150306	4109150307	4109150308
Nitrous Oxide (N2O)	4109150309	4109150310	4109150311	4109150312	4109150313	4109150314
Entonox (O2/N2O)	4109150315	4109150316	4109150317	4109150318	4109150319	4109150320
Medical Air (MA)	4109150321	4109150322	4109150323	4109150324	4109150325	4109150326
Nitrogen (N2)	4109150327	4109150328	4109150329	4109150330	4109150331	4109150332
Carbon Dioxide (CO2)	4109150333	4109150334	4109150335	4109150336	4109150337	4109150338

*If request headers quantity is above 2x6 need to add up with available configuration. For example: for 2x7 may order 2x3 and 2x4.

Tail pipe

Gas Type	Pin-Indexed (ISO 407)	Pin-Indexed (ISO 407) Extended	Bull nose (ISO5145) Side entry	Bull nose (BS341) Top entry	Bull nose (BS341) Side entry	Bull nose (BS341) Extended	US Std (CGA)	Chinese Bullnose
Oxygen (O2)	4109150344	4109150345	4109150346	4109150347	4109150348	4109150349	4109150350	4109150351
Nitrous Oxide (N2O)	4109150352	-	-	-	4109150353	4109150354	4109150355	4109150356
Entonox (O2/N2O)	4109150357	4109150358	4109150359	-	-	-	-	-
Medical Air (MA)	4109150360	4109150361	-	4109150363	4109150364	4109150365	4109150366	4109150367
Nitrogen (N2)	-	-	-	4109150368	-	-	-	4109150369
Carbon Dioxide (CO2)	4109150370	-	-	-	4109150371	4109150372	-	4109150374

Note: 1. Bull nose tailpipes (except Chinese type) are according to the following B.S. standards: Oxygen, Air, Nitrogen: BS: 341-1 No. 3; Carbon dioxide: BS: 341-1 No. 8; Nitrous oxide: BS: 341-1 No. 13.

2. Mixture N2O - O2 (registered trade name Entonox BOC) low-pressure cylinder "G" type has a Pin-indexed connector according to standard BS EN ISO 407, and 230 bar cylinder "E.W." type has Bull nose connector according to ISO 5145 No. 13.

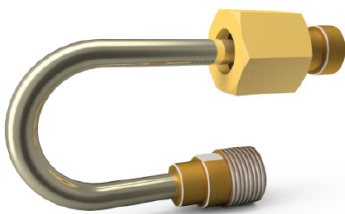
3. The oxygen cylinder "J" type has a Pin-Indexed connector according to ISO 407, whereas the "W" type (230 bar) has a Bull nose according to ISO 5145 No.5

Kit	Corner Connector 90°
kit	4109150343

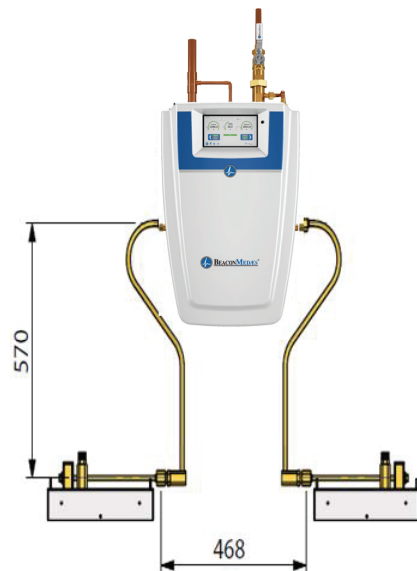

Headers (with rack and all components)/ one side

Gas Type	1X1	1X2	1X3	1X4	1X5	1X6
Oxygen (O2)	4109150396	4109150397	4109150398	4109150399	4109150400	4109150401
Nitrous Oxide (N2O)	4109150402	4109150403	4109150404	4109150405	4109150406	4109150407
Entonox (O2/N2O)	4109150408	4109150409	4109150410	4109150411	4109150412	4109150413
Medical Air (MA)	4109150414	4109150415	4109150416	4109150417	4109150418	4109150419
Surgical Air (SA)	4109150414	4109150415	4109150416	4109150417	4109150418	4109150419
Nitrogen (N2)	4109150420	4109150421	4109150422	4109150423	4109150424	4109150425
Carbon Dioxide (CO2)	4109150426	4109150427	4109150428	4109150429	4109150430	4109150431

Extend connector 180°
4109150435



VF cylinder connector
4109150436

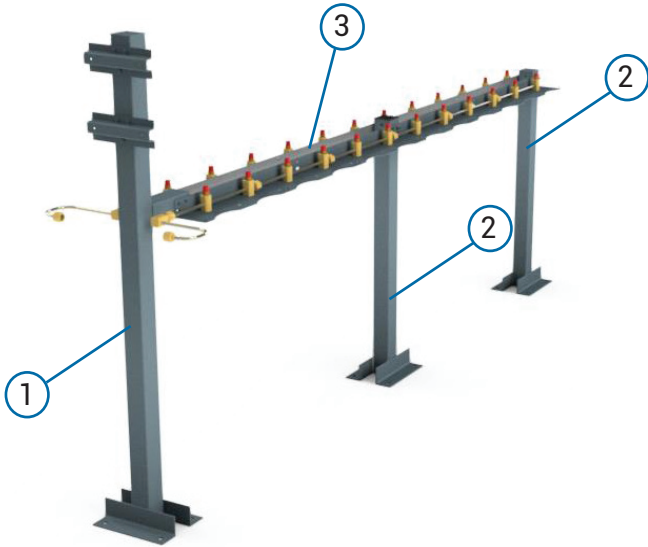


Free standing configuration

The illustration below shows the new free standing option.

The free standing assembly is a contained, optimised and space saving configuration. Main parts are:

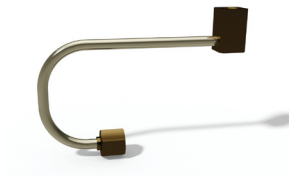
Description	Pos
Post for manifold support	1
Post for Cylinder rack support	2
Manifold Header Assembly	3



Description	Part Number
Post for manifold support	4109626500
Post for Cylinder rack support	4109626600
Drop Down Connector	4109630200
Post joint to Cylinder rack	4109630300

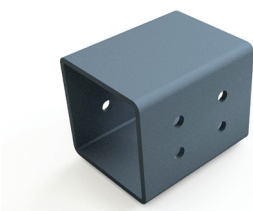
Drop Down Connector

4109630200



Post joint to Cylinder rack

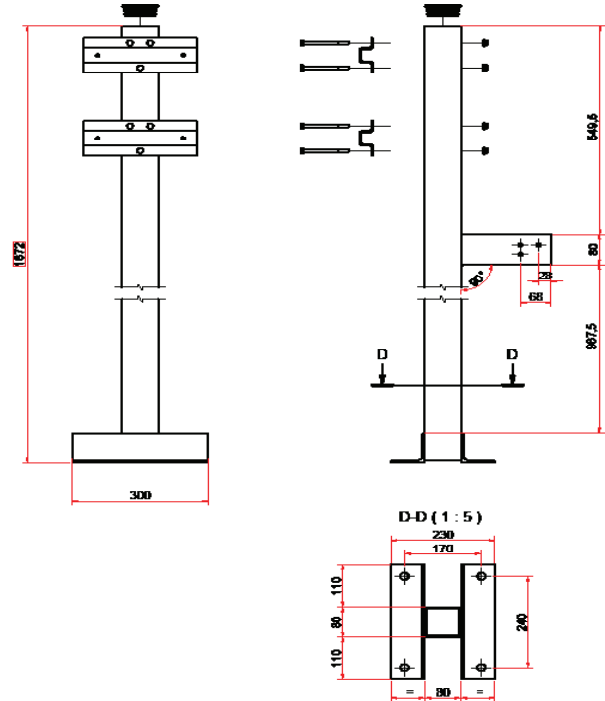
4109630300



Post for manifold support with Dimension shown below.

Note:

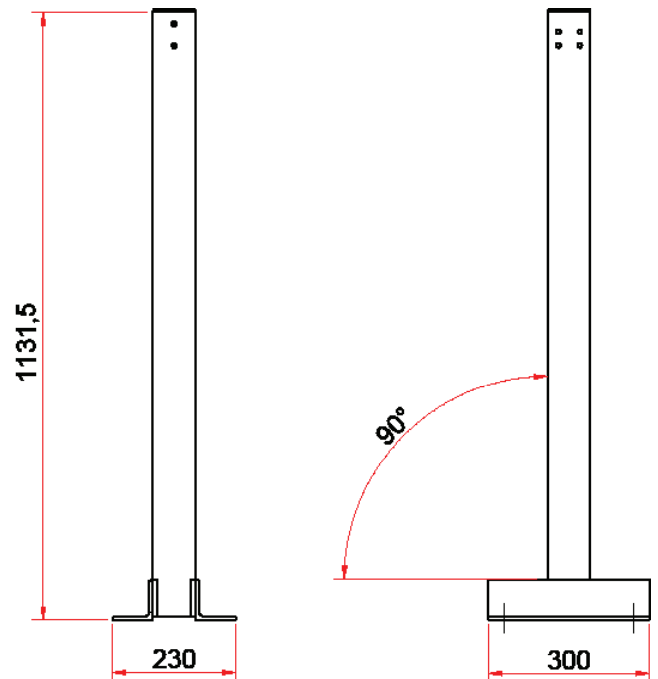
To be supplied with kit [4109626500]



Post for Cylinder rack support with Dimension shown below

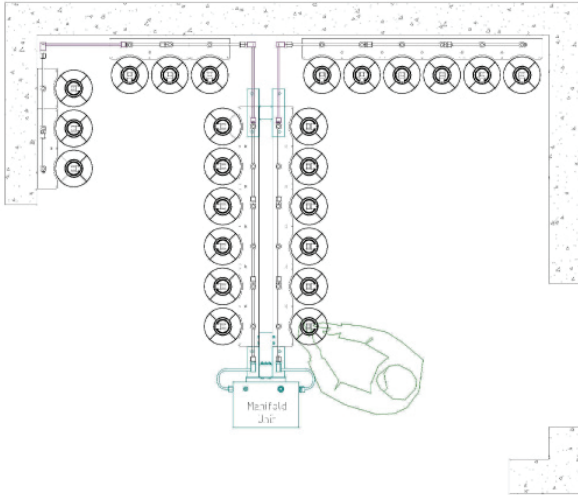
Note:

To be supplied with kit [4109626600]



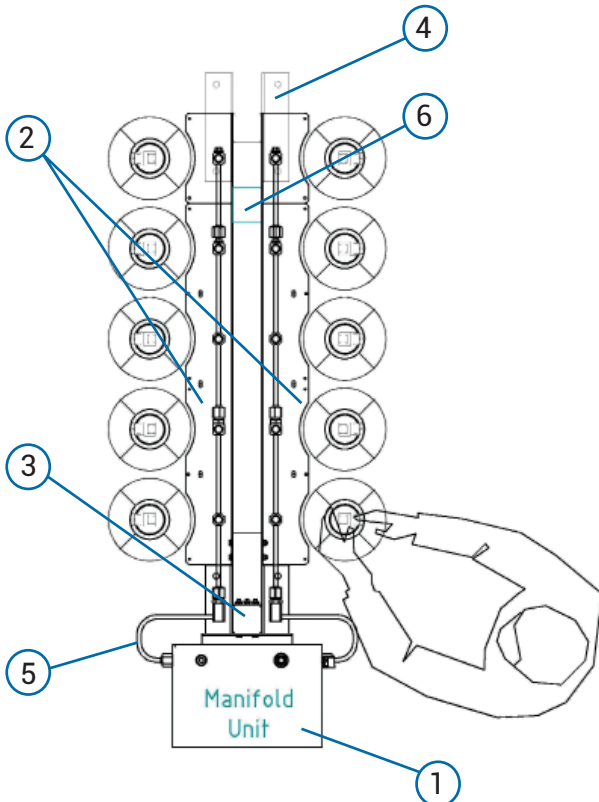
Sample configuration 1

Mix between the free standing and the wall mounted arrangement.



Sample configuration 2

Free standing arrangement.



For the arrangement shown in Configuration 1, the items below are required:

Sample configuration order table 1

For all HTM marketing

Part Number	Description	Qty
4109003845	MAT-S-HH-O2-A	1
4109150308	O2 MANIFOLD HEADER RACK 2X6	1
4109150401	O2 MANIFOLD HEADER RACK 1X6	1
4109150305	O2 MANIFOLD HEADER RACK 2X3	1
4109150343	(Length specified on order) Corner Connector 90°	3
4109626500	Kit - Post for manifold support	1
4109626600	Kit - Post for Cylinder rack support	1
4109630200	Drop Down Connector	2
4109629900	Retrofit kit Lifeline MCS to MAT-S HTM standard (option)	1

For S-HTM Scotland marketing

Part Number	Description	Qty
4109630000	Retrofit kit MAT-S HTM standar to MAT-S S-HTM	1

Sample configuration order table 2

For all HTM marketing

Position	Part Number	Description	Qty
1	4109003845	MAT-S-HH-O2-A	1
2	4109150307	Oxygen Manifold Header Rack 2x5	1
3	4109626500	Kit - Post for manifold supp	1
4	4109626600	Kit - Post for Cylind. rack supp	1
5	4109630200	Drop Down Connector	2
6	4109630300	Post joint to Cylinder rack	1

For S-HTM Scotland marketing

Part Number	Description	Qty
4109630000	Retrofit kit MAT-S HTM standar to MAT-S S-HTM	1