MAQUET

CENTRAL GAS SUPPLY SYSTEMS MEDAP-MED. GAS

SURGICAL WORKPLACES





STRONG PARTNER FOR CENTRAL MEDICAL GAS SUPPLY SYSTEMS MAQUET – THE GOLD STANDARD



The reliable step into the future: In hospitals and sanatoriums, central systems for life-supporting supplies of medical gases are taken for granted these days. Operating safety, top product quality and an optimum workflow continue to be absolutely crucial, however.

On the basis of decades of experience, MAQUET can provide future-oriented service which sets both national and international standards. Alongside planning, designing and maintaining central medical gas supply systems, the range of services provided by MEDAP Medical Gases also includes the timely adaptation of system components to changing legal regulations. Experienced contractual MAQUET partners provide installing and following site acceptance tests or certification of the central medical gas supply system. Thanks to the modular design, existing systems can easily be extended.

Customized solutions, top product and process quality as well as a team of trained employees and international contractual partners prove that MAQUET always has to be first choice worldwide.

MAQUET - The Gold Standard.



Training and advanced education courses take place in the Surgical Academy in Rastatt, Germany.

COMPREHENSIVE SERVICE PORTFOLIO GUARANTEES CUSTOM FITTING SOLUTIONS COMPETENCE THROUGH EXPERIENCE

Quality you can feel: MAQUET supports hospitals and sanatoriums in the central areas of plant engineering – from planning through implementation by appropriate contractual partners to maintenance. And MEDAP products have been guaranteeing top quality and reliability in this sector for more than four decades.

Planning and dimensioning: The specialists from MAQUET plan and dimension the sources/central supply units, the pipeline including installation locations for the control and valve boxes and the gas terminal units. The treatment of compressed air to produce the medicine air for breathing and the economic and transparent alarm systems are just some of the standard planning tasks carried out by MAQUET. Individual customer requirements are taken into consideration, so that MAQUET can always provide a suitable solution.

Reliable and durable products: For MAQUET, product quality means that each individual system component has to work safely, whereby components with lower wear are preferred. For this reason, one of the main focuses is on straightforward maintenance and repair even during the development stage. MAQUET also applies these criteria when selecting external products (compressors, vacuum pumps, control units and compressed air treatment systems).

Special know-how: A high standard of quality can only be achieved in planning, designing and maintaining medical gas supply systems if all responsible fitters have special and detailed knowledge about the product. Continuity in brand selection and training sessions every six months – also for the contractual MAQUET partners – guarantee a sound technical performance.

High standards: MAQUET Quality Management and the auditors of the TÜV* product service guarantee a high standard.

* German Technical Board

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Betten Faktor	68,00	3	0,81
1 0,85	57,00	4	0,79
2 0,48	76,00	5	0,77
3 0,48	89,00	6	0,77
4 0,45	102,00	7	0,72
5 0,43	113,40	8	0,72





MAQUET system components are made of high-quality durable materials.



Being in close contact to customers is very important to MAQUET Customer Services.



MAQUET has TÜV certification

CENTRAL MEDICAL GAS SUPPLY SYSTEMS SUMMARY OF SYSTEM COMPONENTS

Economically mature: MAQUET systems, terminal units and appliances comply perfectly with the demands made of a central gas supply system. Each individual system component combines decades of experience, continual development and tried-and-trusted technology. The range of services provided by MAQUET includes the planning, design and maintenance of:

- Gas supply plants for oxygen, nitrous oxide and carbon dioxide
- Control and valve boxes
- Gas terminal units
- Copper pipelines

Compressed air and vacuum supply plants Contractual MAQUET partners provide installing and following site acceptance tests or certification of the central medical gas supply system.

> The supply of oxygen, nitrous oxide and carbon dioxide is via banks of cylinders, the size and scope of which are dimensioned according to respective individual requirements.

The locations of the gas supply plants are chosen in such a way that the cylinders can be transported to and from the locations quite easily.

In the compressed air supply plant, the compressed air is generated by three compressors switched parallel and driven by electric motors. Two dryers remove humidity from the compressed air. Treatment systems ensure oil-free, medically pure compressed air. Pressure reducers then reduce the compressed air to the required operating pressure.

inserted in the pipe network. These enable every line to be shut off individually. The pressure in the pipeline on the consumer side can be read off at any time. In the vacuum supply

> plant, the vacuum is produced by three pump units. There is a secretion trap located before the vacuum tank. Bacteria filters keep the system free of germs and ensure

that non-contaminated

waste air is released

to the outside.

There are control and valve boxes

Differentiated alarm detectors are installed to monitor the supply plants and guarantee uninterrupted supply.

The gases are transported through a pipeline network to the gas terminal units. The pipelines are made of seamless, extracted, vacuum annealed, low-acid and low-grease special copper pipe.



MEDAP gas supply plants are economic, reliable and future-oriented.

GAS SUPPLY PLANTS FOR OXYGEN, NITROUS OXIDE AND CARBON DIOXIDE FLEXIBLE MODULAR SYSTEM

Flexibility thanks to modular system: MAQUET has developed two basic models for central gas supply through the cylinder store in compliance with the individual requirements of hospitals and sanatoriums:

- Large switch-over device
- Small switch-over device

Both models can be developed in many versions and can be supplemented by accessories. The advantage of this flexible modular system with its variable development stages can also be seen in later extensions.

Ideal solution for all gas types: MAQUET gas supply plants can be used for all medical gases, especially for oxygen, nitrous oxide and carbon dioxide. Every gas supply plant complies with the basic requirements specified in DIN EN 737, Part 3 and ISO 7396.

Knowing what is needed: Thanks to years of experience in the central supply system sector, MEDAP gas supply plants have a range of convincing features to offer:

- The maximum cylinder admission pressure is 200 bar, optionally the large switch-over device can be converted to 300 bar
- Within the context of a flexible modular system, many individual components have been designed non gas-specific to make multiple application possible
- Thanks to this multiple component application, store levels of spares and wearing parts can be reduced too
- Operation and monitoring equipment are identical for all types of gas
- The renowned high quality of MEDAP components ensures a long service life and low maintenance expenditure
- The generous dimensioning of the gas supply plants provides free accessibility for any necessary maintenance work, with all safety-related wearing parts available duplicated
- The operating and shut-off equipment has consciously been adapted to the common standard to ensure quick and safe operation even without routine

HIGH SWITCHING AND CONTROLLING ACCURACY LARGE SWITCH-OVER DEVICE

Precise at all pressure levels: A special feature of the large switch-over device is its high regulating accuracy within the capacity range of 25 to 110 Nm³/h, thus guaranteeing pressure sensors at all pressure levels top switching and control-ling accuracy. In addition, manometers in the sensitive pressure levels are used for reference measurement and emergency operation indication in the event of a power failure.

Perfect down to the last detail: The large switch-over device has maintenance-friendly, freely accessible fittings and safety features. It offers an integrated fittings group for the connection of cryogenic gas supplies outdoors as well as a clear full text display including pressure, operation and

alarm messages. Further important functions of the switchover device are the gradual emptying of the three supply sources in the event of a power failure and switching from primary to secondary cylinder supply at the push of a button.

Optional features: The cabinet housing can also be supplied with a plexiglass door to prevent unauthorised operation. Retrofitting can take place at any time.

More safety thanks to the optional cabinet housing with plexiglass door.





up to 25 Nm³/h

SAFE OPERATION WITH VARIABLE CONNECTION POSSIBILITIES SMALL SWITCH-OVER DEVICE

Perfect for smaller hospitals and sanatoriums: The small switch-over device has been specially developed for oxygen supplies in hospitals with up to 250 beds, for nitrous oxide supplies of up to 20 operating groups and supplies of carbon dioxide to up to 12 treatment stations.

User-friendly features: The small switch-over device guarantees high regulating accuracy in the capacity range of up to 25 Nm3/h and has short-term capacity reserves for consumption peaks in the range of up to 30 Nm3/h. In the basic version there are connections for three sources available, as well as variable connection possibilities for pressure, operating and alarm displays. In addition, the highpressure shut-off valve and the vent valve have already been integrated.

Operating safety in every situation: The pneumatic and mechanical operating and switch-over functions - without electrical auxiliary power - ensure operating safety even in the event of a power failure. Like the large switch-over device, the small switch-over device also has maintenancefriendly, freely accessible fittings and safety features. The accessibility of the wearing parts, in particular the valve seats of the non-return and shut-off valves, is possible in next to no time.

Pneumatic control: In order to reduce the high and changeable cylinder pressure in two steps from a maximum of 200 bar to an operating pressure of 5 bar, the small switch-over device is controlled pneumatically.

RELIABLE AND SAFE THANKS TO DIFFERENTIATED CONTROL AND WARNING MECHANISMS AREA CONTROL AND VALVE BOXES



Differentiated warning messages ensure a continuous supply.

Pressure monitoring saves lives: For continuous medical gas supplies to patients, pressure monitoring in the control and valve box plays a key role in directly informing hospital staff. During product development, MAQUET made particularly sure that clear information of the operating state would be given in the event of an alarm. Types of gas, current operating pressure and switch-off function of the acoustic alarm are self-explanatory for hospital staff.

Individual shut-off possibilities: Control and valve boxes are situated within the supply network. These enable every line to be shut off individually. The pressure in the pipeline on the consumer side can be read off at any time. Up to three types of gas can be connected in small control and valve boxes, in large versions up to six types of gas.

Differentiated warning systems: Differentiated alarm detectors are installed to monitor the supply plants and guarantee uninterrupted supply. Sensors or contact manometers are installed.

Pneumatic function module: A pneumatic function module belongs to each type of gas. This module is made up of an shut-off valve, a sensor and an emergency and maintenance inlet connection. The pneumatic function module is particularly service-friendly, since all parts can be replaced and repaired without any soldering work being necessary. The shut-off valve for the vacuum system is standard MAQUET equipment. This shut-off system makes it possible to carry out a leak test per segment after initial installation.

SIMPLE THREE-PHASE INSTALLATION DIGITAL AND ANALOGUE CONTROL AND VALVE BOX





Analogue control and valve box with three types of gas

Safe and reliable: Digital and analogue control and valve boxes are installed in the medical gas supply network in compliance with EN 737, Part 3. The shut-off valves are positioned upstream from every supply segment according to individual planning.

Phase one: First of all, the bottom part of the control and valve box – concealed box made of steel plate – is inserted.

Phase two: Now the pneumatic function modules are mounted in the concealed box. The connection pipes of the gas supply network are routed to the control and valve box

Digital control and valve box with three types of gas

from above and connected. Thanks to the insertion of test manometers per type of gas, the pressure in the pipeline can be controlled during the whole construction procedure. To avoid damage and soiling, the bottom part is closed by a plexiglass cover.

Phase three: In the third phase either the analogue or the digital upper part of the box is installed, according to the customer's wishes. Both are made of steel plate which is powder-coated in RAL 9002. The function module is equipped with sensors or manometers and, optionally, with gas terminal units for emergency supplies.

MAXIMUM SAFETY DIGITAL CONTROL AND VALVE BOX





Lockable door with emergency opening

Digital alarm panel

High-quality features: The upper part of the digital control and valve box has a lockable door with emergency opening, a digital display for type of gas and pressure, an optical and acoustic alarm system as well as a test and reset function.

More safety: Integrated pressure monitoring signalises when operating pressure values are exceeded or undercut. The gas supply can be shutt off ward for ward at any time. Emergency supplies are guaranteed by emergency and maintenance inlet. The operating pressure of each type of gas is indicated in a digital display.

Alarm messages: There are additional potential-free break contacts and make contacts available for external alarm messages. When pressure drops or excess pressure occurs, an optical and acoustic alarm is switched on at the control and valve box. The acoustic alarm can be switched off. If the problem has not been eliminated within 12 minutes, the signal is repeated. An optical servicing display indicates which tests are necessary.

Digital alarm panel: The digital alarm panel installed at the monitoring station is optically and technically identical to the panel on the digital control and valve box. It is built in flush and connected with the digital control and valve box via an RS485 interface. The display indicates the same values. The acoustic alarm can also be switched off via one of the panels. A further analogue or digital alarm panel can be connected parallel.

RELIABLE THANKS TO NON-CURRENT PRINCIPLE ANALOG CONTROL AND VALVE BOX



The gas type lettering is above the viewing windows.

Top features: With the analogue control and valve box, the upper part consists of a lockable door with emergency opening. The gas type lettering is above the viewing windows for the respective manometers. The integrated pressure monitoring feature in case the operating pressure values are exceeded or undercut is represented and switched via the contact manometer using analogue technology. An analogue alarm panel is installed near the monitoring station for the representation of the optical and acoustic alarm.

Analogue alarm panel: The analogue alarm panel is installed flush and works according to the non-current principle. This means that mechanical faults, caused by a broken wire in the signal cable, for example, are also indicated. If the manometer contact is interrupted the buzzer and signal lamp are switched on. The buzzer can be switched off. The acoustic signal is repeated after approx. 12 minutes. **Potential-free add-on:** Parallel, the alarm messages can be added on potential-free through reserved terminals to external monitoring systems, e. g. BMS. The supply voltage is 24 V DC or AC current. Lettering windows make individual marking possible.



Analogue alarm panel

WIDE RANGE OF PRODUCTS FOR MEDICAL COMPRESSED GASES AND VACUUM GAS TERMINAL UNITS



MAQUET terminal units are coded according to gas type and can be used both nationally and internationally.

NATIONAL AND INTERNATIONAL STANDARDS TERMINAL UNITS CODED ACCORDING TO GAS TYPE

Top-level proven technology: Since 1958 gas-coded MEDAP terminal units for medical gas supplies are available. These units have set international standards in terms of operational safety and long service life, as well as design and production quality. In comparison to standard requirements, MEDAP terminal units achieve top performance and unique features in terms of flow rate, air-tightness, filtration and forced parking position.

For patient protection: The installation of a sintered metal filter in the direction of flow upstream from the quick-action valve of the gas terminal unit protects patients from particles that could have got inside the pipes despite maximum care during pipe installation. In addition, the sealing surfaces are protected from particle deposits, which results in a long service life for the seals. The gas-specific interface on the base block – inner gas-coding – is not a wearing part on MEDAP products. Later re-coding is only possible by destroying the safety unit and completely replacing it.

Loosening the plug from the gas terminal unit: MEDAP DIN gas terminal units have a forced parking position. This prevents that the plug is becoming loose from the gas terminal unit of the unlocking mechanism by only actuated once. The plug is only released when it has been actuated twice. The brief pause in the parking position releases the operating pressure and the plug can remain depressurised in the terminal unit or be removed.

Specifications: All MEDAP gas terminal units meet the basic requirements stipulated in DIN EN 737-1.



Gas terminal unit MEDAP type H



Gas terminal unit MEDAP Air Motor



Anaesthetic scavenging system MEDAP type EN



Gas terminal unit MEDAP type G



Anaesthetic scavenging system MEDAP type E



Stoppers are used to protect the pipes from soiling during storage and installation.

FROM THE SUPPLY PLANT TO THE GAS TERMINAL UNITS DISTRIBUTION SYSTEM MADE OF COPPER PIPE



The copper pipes and fittings are connected by brazing under inert gas / forming gas.



Pipes and fittings have a bright, non-oxidised interior surface.

High-quality pipeline system for medical gases and

vacuum: Distribution systems are used for the transport of medical gases and vacuum between the supply plants and the terminal units within the hospital. MAQUET uses special copper pipe in compliance with DIN EN 13348 only for the distribution systems.

Special copper pipes with high-purity interior surface:

For the prescribed brazing connections, special copper pipes for medical gases are used with material and production features in compliance with EN 12450. They are drawn without seams, specially de-greased on the inside, free of acid and cleaned. This means that the lubricant residue on the inside of the pipes is max. 0.020 g/m², in compliance with EN 13348. The pipeline connections have to be welded or are usually brazed. The mechanical features have to be able to withstand environmental temperatures of up to 450 °C. Brazing filler materials may not contain more than 0.025 % cadmium. **Extremely high copper content:** The copper pipes installed by MAQUET are made of copper deoxidised with phosphor. They are oxygen-free, vacuum annealed and have a minimum copper content of 99.9 % in compliance with DIN 1787. The manufacturer's test of air-tightness, material homogeneity and freedom from cracks is by means of a eddy current test according to EN 1971.

Delivery and storage: Pipes are delivered soft in 50 m coils or hard in 2.5 m or 5 m rods. Stoppers are used to protect the pipes from soiling during storage and installation.

EFFICIENT PERFORMANCE CENTRAL COMPRESSED AIR SUPPLY

Secure supplies: Hospitals require medical compressed air mainly as respiratory air. It is also often used as a source of energy for various medical connection units and to generate a vacuum with the aid of venturi tubes.

Compressed air supply plant with three compressors: For safety reasons, compressed air is generated by at least three compressors connected in parallel series, which require clean suction air. A switch system ensures the units operate alternately and are thus placed under an even load.

How they work: The units work on two vessels connected in parallel series. The maximum operating pressure is 15 bar. When the units are switched on and off is determined by the vessel pressure. The pressure vessels are fitted with an automatic condensation emptying fixture. A treatment plant is connected downstream from the pressure vessels. It is made up of duplicated compressed air dryers, microfilters, active carbon and sterile filters.

The compressed air supply plant guarantees hospitals supplies of medically pure respiratory air





COMPRESSED AIR SOURCE WITH DUPLICATED PIPELINE SYSTEMS AND COMPONENTS

Schematic layout of a compressed air supply plant for hospitals

Components of a compressed air supply plant:

- Piston compressor
- Refrigeration dryer
- Adsorption dryer
- Condensation trap
- Oil-water separator
- Control cabinet
- Compressed air tank
- Filter combination
- Sterile filter
- Safety valve
- Pressure reducer

Reliable technology: MAQUET supplies a comprehensive range of products for the construction of new compressed air supply plants as well as for the extension or maintenance of existing systems. All the makes and product types used by MAQUET have been in use for decades and have proved their worth in hospital operation.

SUCTION OF LARGE QUANTITIES OF BLOOD, SECRETION AND SEROUS FLUIDS CENTRAL VACUUM SUPPLY

Life-supporting task: Hospitals and sanatoriums use vacuums as a source of energy for suctioning off blood, secretion and other serous fluids. A respective vacuum supply is thus required both in the operating theatre as well as on wards and in the treatment area.

How a vacuum supply plant works: In the vacuum supply plant, the vacuum is produced by three pump units for safety reasons. A switch system ensures that the pumps operate alternately and are thus placed under an even load. The secretion trap takes over the control function. **Safe from bacterial contamination:** Secretion from patients can only advance through the pipeline network to the supply plant if the equipment is handled incorrectly. For safety reasons the secretion trap is therefore equipped with a septic fluid jar with a capacity of at least 5 litres. The bacteria suctioned off are routed via the bacteria filter and trapped by this, thus preventing germinal contamination of the downstream components and the waste air.



VACUUM SOURCE WITH DUPLICATED PIPELINE SYSTEMS AND COMPONENTS



supply plant for hospitals

Components of a central vacuum supply system:

- Vacuum pump
- Vacuum tank
- Control cabinet
- Pressostat
- Filter
- Secretion trap

Mature technology: MAQUET supplies a comprehensive range of products for the construction of new vacuum supply plants as well as for the extension or maintenance of existing systems. All the makes and product types used by MAQUET have been in use for decades and have proved their worth in hospital operation.

CUSTOMIZED SOLUTIONS FOR DEMANDING TASKS MAQUET SERVICE



MAQUET has first-class qualified service technicians.

Reliably nearer: With its highly motivated staff of experienced customer services technicians, MAQUET is the ideal partner for all maintenance and service tasks. The reliable proximity to customers is a particular advantage. Because short reaction times save time and money and guarantee even more customer satisfaction.

National and international service competence: Within Germany, maintenance and repair work is carried out by MAQUET's own experienced technicians. They are excellently trained and guarantee a high standard of service. The same applies to authorised MAQUET partners. They are available for MAQUET customers all over the world – for consultation, planning and implementation of individual central gas supply system projects.

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