BEACONMEDÆS®

Life
is in the
details.

mAir™
Medical
Air
Systems

Medical Air

The critical field of patient care requires ultra clean, purified, medical air delivered to operating theatres and hospital beds with absolute reliability. A hospitals medical air supply is a vital life support service, maintaining respiration of the critically ill during mechanical ventilation. As such, within Europe, 'medicinalair' is classified as a drug, and the concentration of impurities therein must be carefully controlled to ensure compliance with the European Pharmacopoeia monograph.

Regulatory Compliance

BeaconMedæs mAir systems have been carefully designed to surpass the requirements of the most comprehensive regulatory requirements, including:

- MDD 93/42/EEC
- European Pharmacopoeia
- EN ISO 7396-1
- HTM 02-01
- HTM 2022

mAir systems are designed and manufactured under an ISO 13485:2003 quality management system.

mAir Systems

BeaconMedæs mAir systems have a unique multi-stage purification system that converts a compressed air source into internationally certified breathing air. The dMED purification package is independently certified to provide medicinal air in compliance with the European Pharmacopoeia.

Unsurpassed Purity

Built to exacting standards, mAir systems are engineered to provide certified breathing air, even in situations where the air intake may contain high concentrations of ambient pollution. The dMED multi-stage filtration system ensures patient safety in 'worst case', but real life pollution scenarios. With the assurance of worldwide after sales and service, mAir systems offer the complete solution for all critical breathing air applications.

Tailor Made

BeaconMedæs mAir systems are composed of modular blocks, enabling you to select up to 8 compressors and match the volumetric medical air flow with the purification package of your choice. Downstream pressures range from 4 to 11 bar as standard, with options including additional sensors for monitoring of contaminants in the medical air supply and the intelligent EWD 'zero loss' condensate drain for coalescing filters.

Unparalleled Efficiency

An mAir system is packed with features to lower your cost of ownership (life cycle cost) and save energy. Microprocessor controlled off-load running of compressors reduces the number of starts that compressors must make, reducing wear, increasing reliability and lowering power consumption. The 'zero loss' EWD condensate drains fitted to all air receivers, coupled with an extremely low pressure drop across the purification packages, further enhances the efficiency of the overall system.

Carbon Monoxide Removal

Carbon monoxide concentrations inurban areas are closely related to motor traffic density and weather, varying greatly with time and distance from the source(s). The European Pharmacopoeia monograph for medicinal air specifies a maximum concentration of 5 ppm for carbon monoxide.

The HOC filter downstream of the desiccant dryer contains a catalyst which oxidises carbon monoxide to give carbon dioxide. If you cannot be certain that background levels of carbon monoxide in the environment will never exceed 5 ppm, the dMED's HOC component is the ultimate safety device, ensuring patient safety and consistent compliance with the European Pharmacopoeia.

Purge Control

Maintaining a consistently low dew point is critical to patient safety, and to the operation of air driven surgical tools. Purge control is supplied as standard with the dMED and ensures purge air consumption for desiccant regeneration is proportional to the hospitals demand. This dramatically increases the efficiency of the mAIR system, reducing purge air by up to 70% when operating under a hospitals typical load.

Minimal Pressure Drop

Generously sized desiccant towers are filled with a high efficiency adsorption media to ensure the required dew point is maintained at the highest periods of demand. Changeover of the towers is carefully controlled with separate depressurisation and repressurisation cycles, maximizing desiccant life and minimising dusting. The generously sized components minimise pressure drop, saving energy and maximising available volumetric flow rate.

GA Compressor

For critical air applications, compressor reliability is of paramount importance, and since a hospitals medical air supply is a life support service, continuity and adequacy are vital to patient safety. Atlas Copco's GA screw compressor range has led the market for over 20 years. With an endless process of continuous improvement, the oil-injected GA compressor dominates it's field as an advanced air compressor system, which brings you proven reliability and Atlas Copco's latest patented high efficiency compression element.

dMED Purification Module

Elektronikon Controller

Elektronikon Control

Atlas Copco's Elektronikon controller is fitted to every GA compressor in the mAir system. The Elektronikon is an advanced microprocessor based, real-time operating system with anergonomic alhpanumeric user interface.

The Elektronikon controls, monitors and protects the GA compressor and provides service warnings. The array of sensors provide functional and operational information as well as a warning if a problem develops.

Acoustic Optimisation

The balanced design of the compression element coupled with careful isolation of vibration within the drive mechanism results in a extremely quiet operation with minimal transmission of vibration to the surrounding environment. This allows the compressors to be installed closer to noise sensitive areas like accomodation wards and offices, often negating the need for additional sound proofing or other expensive remedial works.


GA Screw Compressor

GA Components

1. **Cooling Fans** Cooling air flow is optimized by placing dedicated cooling fans at each point of use. This ensures that the right amount of cooling air is delivered where it is needed, and in the most efficient manner.
2. **Coolers** Optimally sized aluminium block and fin collers or combi style coolers ensure ideal running temperatures under all conditions. The coolers are horizontally mounted and easily accessible for cleaning.
3. **Oil-separator** The multi-stage oil separator yields a maximum of 2 ppm oil carry over, which ensures minimal oil is wasted and lowers the load on downstream purification equipment.
4. **Elektronikon Controller** Intelligent microprocessor control and monitoring of the compressor optimizes the operation for increased efficiency, reduced wear and maximum reliability.
5. **Inlet Filter** Generously sized inlet filter ensures efficient operation in worst case conditions.
6. **Motor** High efficiency, totally enclosed fan-fooled (TEFC), IP55 class F electric motor with greased for life bearings for continuous trouble-free operation.
7. **Screw Element** Atlas Copco's patented screw element for optimal energy efficiency and outstanding reliability.
8. **Drive** V-belt drive or direct drive depending on compressor size. The application of modern techniques invibro-acoustic optimisation provide a very quiet operation with minimal transmission of vibration.

Flow Diagram

Wet compressed air	Wet compressed air
Oil	Air / oil mixture
Filtered ambient air	Liquid water
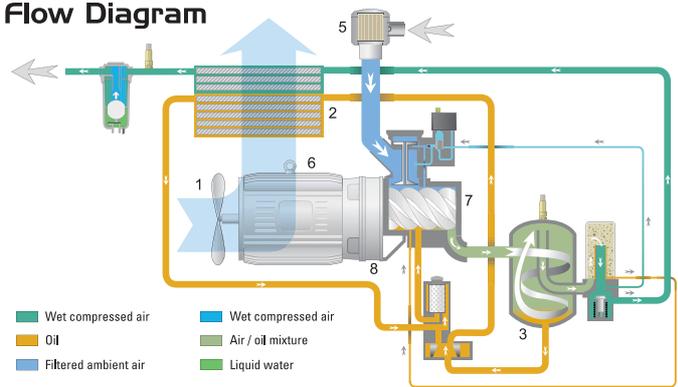
Certified Purity

dMED Purification

The dMED (dual MED) is a duplexed purification package for converting a compressed air source into breathing quality air. There are also simplex versions available for surgical air supply for driving pneumatically actuated tools in operating theatres.

The dMED has 7 stages of active purification:

1. Water separator - liquid water
2. Bulk aerosol filter - oil and water
3. Fine coalescing filter - oil and water
4. Desiccant dryer - water and CO_2
5. Activated carbon - gaseous impurities
6. Catalyst - CO oxidation
7. Bacteria filter - bacteria/fine particles.

Challenge Tested

The dMED purification system has been independently certified by SGS Belgium NV(Société Générale deSurveillance) to provide medicinal air complying with the European Pharmacopoeia monograph. The results of the challenge test below were obtained using a carefully controlled, highly contaminated inlet air supply, validating the dMED's performance in the worst case scenario, i.e. extreme levels of environmental pollution.

Desiccant
Adsorption of water vapour and carbon dioxide. Exhausted during the heat-less regeneration cycle.
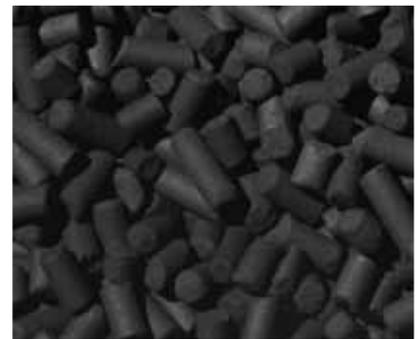
Impregnated Activated Carbon
An activated carbon media with specialimpregnation adsorbs sulphur dioxide, oilvapour and oxides of nitrogen.

Catalyst
A heterogeneous catalytic reaction converts carbon monoxide into carbon dioxide.

Standard Duty - for Clinical Applications

Test	European Pharmacopoeia	mAir [1]
CO_2	< 500 ppm	408 ppm [2]
CO	< 5 ppm	< 1 ppm [3]
SO_2	< 1 ppm	< 0.1 ppm [4]
NOX	< 2 ppm	< 0.05 ppm [5]
Water Vapour	ADP - 46 C (-50F)	ADP - 53 C (-64F) [6]
Oil Vapour	< 0.1 mg/m3	< 0.003 ppm [7]
Dust Particles	Not Specified	< 0.01 ppm
Taste and Odour	Taste and Odour Free	Free

(1) Results shown for a dMED39

(2) With 900 ppm of CO_2 at inlet

(3) With 80 ppm of CO at inlet

(4) With 9 ppm of SO_2 at inlet

(5) Results shown for a dMED39

(6) System operating at maximum design flow

(7) With 0.7 mg/m3 of oil vapour at inlet

CCU3 Interface

The BeaconMedæs CCU3 is an advanced control system and intelligent Human-Machine Interface (HMI), which is the heart of every mAIR system. Based around a powerful microprocessor, the CCU3 communicates with a wide range of equipment including PSTN and short-haul modems, PC's and printers through an onboard RS 232 serial port.

The CCU3 can control up to 8 compressors, cycling the lead compressor with each call to ensure even wear and maximum energy efficiency. The CCU3 also controls the desiccant dryer operation, with the ability to independently control up to 24 solenoid actuated control valves. The dryer control includes a selectable purge control function and will also provide timing for electronic coalescing filter drains.

The CCU3 includes an event log browser facility that stores events in it's onboard flash memory against a time stamp provided by the onboard real-time clock. By default the CCU3 will store the maximum and minimum values of ambient temperature and dew point of the delivered medical air in each 24 hour period of operation.

Communications

The CCU3 communicates directly with a BeaconMedæs MediPoint 125 central alarm system, such that any fault conditions are immediately relayed to the facilities management office. A set of volt-free contacts can also be used to transmit operating alarms through an exsiting Building Management System(BMS) or other central alarm network.

By connecting the CCU3 to a PC via the RS 232 port, remote monitoring of plant parameters, and easy to understand notifications of any alarm conditions are available from a desktop in the engineering office.

Added Safety

In the unlikely event of a microprocessor malfunction, the CCU3 incorporates an automatically actuated mechanical back-up pressure switch, ensuring continuity of the medical air supply.

Additional safety features include continuous monitoring of transducers and solenoid control valve coils, ensuring any fault is immediately detected and relayed to the central alarm network. The event browser can then be used to identify the root cause, assisting the proactive corrective maintenance process.

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