

TWIN-CON^{med}

Description:

Compressed air for medical use is governed in Europe by the document “**Aer medicalis**” of Pharmacopoeia. This code contains guide lines to be observed for scrupulous health and safety of patients and operators concerned, since compressed air for medical use is dedicated to everything related to the treatment of patients, and also to operators safeguard, who are often and chronically exposed to compressed air dangers, as vehicle of contaminants.

Examples of the various applications for therapeutic, diagnostic and prophylactic purpose, as well as for the use of surgical instruments, are:

- ventilation treatment for weak patients, by direct application to the patient through artificial or natural cavity (windpipe or by means of a ventilator), and relevant interlocking of the feed equipment,
- sterile applications in medical white rooms, decompression rooms, oxygen as well as hyperbaric therapy,
- use as energy vector for equipments which can get in touch with patients tissues during surgical operations.

Since compressed air inevitably expands and consequently potentially pollutes the surrounding environment, compressed air for medical use is also utilized for auxiliary applications, such as:

- breathing air of surgical staff,
- air for controlling the lifting arms inside the operating rooms,
- sterilization and laboratory operations,
- anaesthetic gas purges,
- pneumatic control of the air conditioners,
- tests of medical equipment.

These specifications have the purpose to guarantee compressed air carefully purified and to establish the limits for impurities, but also for much more insidious poisons, such as CO and CO₂ and others which can arise in the compressed air carried through the piping reserved to medical use.

The problems are well-known: the compressors intake atmospheric air together with its content of toxicants which contaminate it: dusts, humidity, hydrocarbons or volatile organic substances, odours and acid smokes. The compression phase concentrates the pollution load proportionally to the compression ratio, while the temperature rise favours the development of the virus and bacteria which have been sucked. The subsequent cooling phase saturates the compressed air into condensate, possibly dissolved by mineral or synthetic lubricant, thus causing sequences of chemical reactions which make this air unsuitable to the medical use.

TWIN-CON^{med} range manufactured by **ETHAFILTER** guarantees compressed air purified for medical use. By exploiting the technology of the selective adsorption this unit is an alternative of sure economical and operating advantage in comparison with the artifice of air “reconstituted” by mixtures of expensive cryogenic gas.

TWIN-CON^{med} is a compressed air purification unit in a integral package version. It is delivered ready for connection, and its autonomy lies in only one source of energy: compressed air.

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All components are generously dimensioned and conceived according to the best criteria available from today's technology. The charging capacity and the purification barriers allow the reliability of extremely low operating costs.

For a better safety, the mapping of the cycles is controlled by an electronic board with with the **energy saver device EVO^{economy}**.

The unit is composed of (filters manifolds are integrated within dryer as standard):

PREFILTER grade MFO

The function of this filter is to free the compressed air from great impurities due to possible corroding because of the transmigration of the liquid phase of oil and water in the piping section between the compressor unit and the depuration unit inlet.

This prefilter is also necessary to prevent the coalescing filter installed downstream from quick clogging caused by the dusts carry-over.

The filter element type **MFO** ensures 100 % of solid particle removal down to 1 μ , while a first layer of borosilicate glass microfibers already improve the separation by coalescence of the condensate and oil possibly dragged by the air compressor.

The initial pressure drop of the filter element oil saturated is < 0.04 bar.

The filter housing is made of cast aluminium, internally impregnated and externally painted.

On this filter there's the standar accessories as follow:

- differential pressure gauge to monitor the evolution of the pressure drop and thus to schedule its replacement.
- automatic condensate trap, timed electronical type **ETHADRAIN^{trim}**, with adjustable trim to energize purge phase as well as adjustable trim for interval between purge, in order to optimise drain frequency according to the real conditions of use. A test push button is also supplied to check and reset cycle.

SUBMICROFILTER grade SMA

A great part of oil aerosol mixed up with water vapour condensate resulting from the cooling forced action of the compressor group, is normally partially eliminated at the level of the prefilter element type **SMA**.

The fine separation of the remaining traces of oil aerosol and condensate is completed through a specific element, constituted by multilayers of borosilicate glass microfibre. The separation of the liquid phase is achieved through coalescing effect developed by deep aggregation and integrated with a prefiltering 0.1 μ layer to ensure the removal of smallest solid particles..

The residual oil content is < 0.1 mg/m³ with 99,99 % efficiency (@ ISO 8573.1).

The initial pressure drop of the filter element oil saturated is < 0.08 bar.

The filter housing is made of cast aluminium, internally impregnated and externally painted.

On this filter there's the standar accessories as follow:

- internal float automatic type drain valve.

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ADSORPTION DRYER/DEGASSER

The purification unit is fit with an adsorption dryer **TWIN-CON^{med}**, which exploit the unusual characteristics of a family of natural substances: **ZEOLITES**. These substances trap in their special molecular structure a great quantity of moisture; the zeolites "pump" the water so that they cause evaporation, thus absorbing their heat.

The dryer is sized in order to reach a dew point of - 46°C. The desiccant material consists of particular molecular sieves which capture the carbon dioxide so that residual content in the air leaving is < 500 ppm_v. The expected life of a desiccant filling is of min. 8,000 hours.

The dryer/degasser is composed of:

- two aluminum columns.
- desiccant mass.
- inlet and outlet commutation valves between the two columns for automatic switch-over.
- two blow-off solenoid valves.
- blow-off silencers.
- base frame structure.
- electronic board for automatic control and economy run by dew meter log
- wiring and electrical protections, power supply 220-1-50
- degree of electro-mechanical protection : IP55.
- pressure drop: ≤ 0.18 bar.

ACTIVATED CARBON FILTER grade CA

It is very important to de-contaminate the compressed air from the load of volatile hydrocarbons and from oil vapours drawn during the compression phase.

The atmospheric air sucked by the compressors is in fact contaminated by organic odours and compounds of volatile hydrocarbon chains emanated by industrial processing, power plants, road traffic; ..., and the same accumulation of lubricants in the compression chamber increases the presence of oil vapour into the air stream. The cooling action improves a possible condensation phase, and then an easier but partial separation through coalescing filtration. Migration of oil traces to the use is not tolerated by the rigorous hygiene and purity of the medical air, and thus elimination of the remaining gas phase must be completed by a process of absorption on activated carbon which will protect the conditioned purity with residue < 0.005 mg/Sm³ of hydrocarbons or volatile organic substances.

The easiest and most effective method for the elimination of odours and vapours of hydrocarbons is the use of activated carbons, characterized by an immense capacity to absorb its gaseous phase. Due to the geometry of the filter element type CA it is possible to optimize an increased surface of absorption and a sufficient time between carbon grains and air to be purified on the whole development of the length of the column.

CATALYST FILTER grade HC (SOFNO^{cat})

The presence of carbon monoxide is very dangerous due to its molecular affinity to haemoglobin ~ 300 times superior to the one of oxygen. At sea level, 2 % only (~ 10 ppm_v) of CO into blood is

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sufficient to complain the first troubles to psycho-motorial functions, which become serious problems when reaching values of 5 % (~ 25 ppm_v)!

In case of compressors, carbon monoxide can be introduced into the network, for instance when atmospheric air suction is in proximity of bad ventilated thermal stations or also in the neighbourhood of heavy road traffic; but it can also arise from decomposition of lubricant in case of high compression temperatures.

To remove CO, ETHAFILTER adopts a catalyst with cool operating process, so as to avoid a further cooling and the relevant safety and control devices. **SOFNO^{cat}** catalyst converts the carbon monoxide into carbon dioxide, less toxic and at lower concentration than the demanded limit, because compressed air has already been subject to decarbonation.

The sizing has been calculated to obtain CO residual values < 5 ppm_v.

The expected life of **SOFNO^{cat}** filler is about 800 hours, in “normal” intake concentration conditions.

MEDICAL STERILE FILTER grade HST

It is necessary to stop any spreading of bacteria potentially present into gas vein.

The filter consists of an element type **HST**, constituted by a multilayers of borosilicate glass microfibre. A first superficial microfibre layer assures 100 % of solid particle removal to 0,6 µ: this symmetric arrangement is placed into stainless steel perforated plate supports in order to bear reversibility of flow direction.

An inner layer placed between this sandwich will condition high aseptic capacity, by restraining bacteria throughout its thickness to 0,01 µ.

Filter element materials have been selected in order to prevent bacteria charge by means of a phase into autoclave at conventional conditions of traditional sterilization processes.

Direction of air flow is from outside to inside to exploit the largest surface of filtration and thus to allow lower pressure drop.

Initial pressure drop of the filter element is < 0,15 bar.

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