

# ■ Application report University Clinic Bonn



## Trendsetting measurement instrumentation in Universitätsklinikum Bonn

<b>Industry:</b>	Medical
<b>Customer/Location/Year:</b>	Universitätsklinikum Bonn, 2015
<b>Use of compressed air:</b>	Hospital technology
<b>Installed products:</b>	METPOINT OCV

Via a line network with a length of 4.5 kilometers and with 1,671 points of consumption, Universitätsklinikum Bonn provides its operating theatres, surgeries, and patient rooms with a daily amount of 3,500 cubic meters of medical compressed air. Thanks to modern measurement instrumentation, the continuous quality monitoring of the "Aer medicalis" can be implemented in real time. With this, the University Hospital of Bonn leads the way in safe patient care with medical compressed air.

The machinery room, in which the medical compressed air is generated, is situated in the first basement floor of the supply center and is under slight overpressure. The latter prevents ambient air, and with it dust particles, from flowing in. Therefore, the room is extraordinarily clean. However, the intake of fresh air takes place at an elevated point of the supply center in an area which is poor in contamination. The compressors function according to the principle of oil-free compression.

### Pharmacists in clinics bear the responsibility

Aer medicalis is used as a substitute for normal air, for example for the operation of ceiling-mounted supply units, for anesthetic gas line systems, as air for the breathing of patients, for checking or drying of medical products, hyperbaric chambers etc. Corresponding to its central significance, the European Pharmacopoeia consequentially classifies Aer medicalis as a pharmaceutical preparation – and transforms the high demands on its purity into legal duties.

The hospital pharmacist needs to comply with this obligation and exercise his responsibility by providing evidence of the compliance with the legally stipulated limit values regarding components and contaminants. The problem up to now: no solutions and methods existed worldwide that were feasible during the hospital's daily routine in order to meet the test specifications of the European Pharmacopoeia. Even the pharmacopoeia itself only describes schematically represented test setups that are difficult to perform in practice.

The only thing a hospital pharmacist could do at best was to perform a random check of the medical compressed air by means of gas test tubes, which was informative only to a limited extent. Apart from the fact that these checks were only snapshots, they were followed by longer laboratory analyses. A situation far away from continuous real-time monitoring.

In the supply center, a daily amount of approximately 3,500 cubic meters of medical, and 2,500 cubic meters of technical compressed air is produced. Sent via two strictly separated line networks

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with a length of 4.5 or 4.6 kilometers, respectively, to the points of consumption all over the hospital grounds. For the medical compressed air alone, there are 1,671 points of consumption. Quality assurance is of the utmost concern in view of these dimensions.

At this time, a new measurement system, that was presented in a brochure from the BEKO TECHNOLOGIES company, attracted the attention of the Technical Facility Management (MediStrutura). The innovation was developed by the German compressed-air system specialist BEKO TECHNOLOGIES. With the new system, it extended its METPOINT measuring equipment family and, with it, transferred its treasure trove of experience from compressed-air processing and measurement technology also to the quality assurance in the medical field.

The pharmacy already knew BEKO TECHNOLOGIES and its measurement systems since 2007. At this time, the "air for medical applications" was still analyzed at regular intervals by means of gas test tubes by an external company under the general management of the hygiene institute. The purchase of a measuring device through the pharmacy was not realizable by reason of the missing experience regarding the quality and measuring accuracy of such a device and of high costs.

### **Aer medicalis under control – around the clock in real time**

Huge advantages for the University Hospital of Bonn were obvious: METPOINT MMA allows for the continuous 24-hour monitoring of the sensitive air for medical application, which is of utmost relevance to patient safety. With this round-the-clock monitoring of the medical compressed air, the system was far superior to the standard method that was used until now, namely the more or less frequent random check via indicator tubes, also with a view to the economic aspects, since the high time and cost expenditure regarding complex laboratory analyses of samples is fully omitted.

The measured values are available at all times and in real time – in contrast to the laboratory random sample, where several days can lie between the sampling and the results.



METPOINT MMA continuously records and monitors all of the decisive parameters in the central breathing air supply. The values that are recorded are the oxygen, carbon monoxide, carbon dioxide, sulphur dioxide, nitrogen oxide, and water vapour content.

For this purpose, samples are continuously drawn from the compressed-air line and supplied to the measuring systems of the device. Electrochemical measuring cells determine the values for SO<sub>2</sub>, NO, NO<sub>2</sub>, CO, and O<sub>2</sub>. The CO<sub>2</sub> content is ascertained via non-dispersive infrared light.

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The electrical signals that result from the measurements are subsequently amplified and evaluated. The results are displayed on the intuitively operable external 7-inch touch screen of the METPOINT BDL. Simultaneously, recording in the internal memory takes place.

### **Adjustable alarm parameters against the exceedances of limits**

All the measuring results are presented as numeric values and, alternatively, as curve charts on the display. This includes the critical moisture content, the specified trace gases, and the operating pressure. Optionally, the residual oil vapor content of the medical compressed air can also be indicated via the complementing METPOINT OCV residual oil measuring device from BEKO TECHNOLOGIES.

When a limit value is exceeded, the value is marked. The system will immediately release an alarm which will be retrieved in a targeted manner or directly processed in the quality assurance system. It goes without saying that the device is network-compatible and boasts the necessary interfaces such as Ethernet, RS-485, MODBUS, or USB.

Therefore, METPOINT MMA renders the purity of breathing air visible even in several ways: preset alarm parameters guarantee the compliance with the limit values that are stipulated in the European Pharmacopoeia, while the continuous documentation of all the measured values supports the quality management of the hospital. An optimum measuring method.



### **Process safety through daily autocalibration**

After the completion of the field test under real conditions, the METPOINT MMA is in normal operation since the end of 2014. The compact system with the METPOINT MMA and the 7-inch touch screen METPOINT BDL operating unit is accommodated in the central compressed-air processing of the hospital, meaning that it is in view and accessible always for technicians and pharmacists.

Other than the adjustment that is carried out at most sporadically during maintenance measures, calibration of the METPOINT MMA is effectuated daily and automatically via defined measuring gases. They are conducted via the measuring cells, outside of the normal compressed-air flow and are supplied from spatially separately placed bottles with certified reference gases. Through this, the measuring cells are regularly and automatically calibrated to the reference values.

Therefore, the clinical center can be certain always to have correctly determined measured values and does not need to rely on a calibration that is carried out only once or twice a year, a hitherto unattained level of process safety during the processing of medical compressed air.

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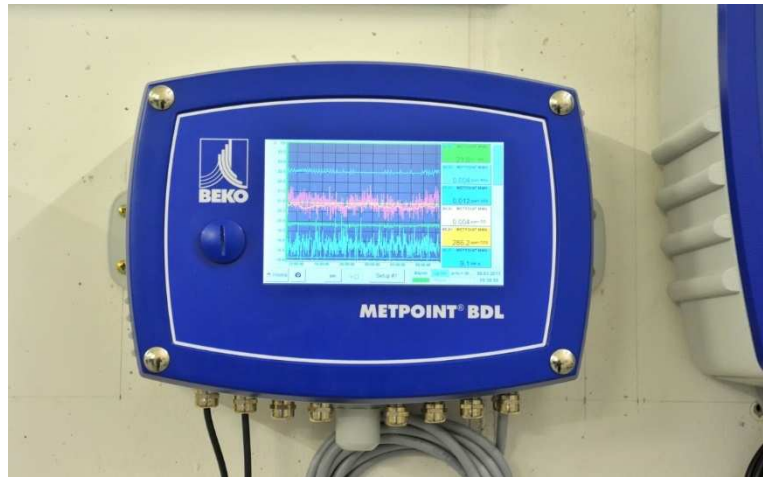


### Humidification of measuring cells guarantees long-term stability

Another unique selling point of the system was praised by the technician F. Bensberg: the regular humidification of the measuring cells with water vapor via an internal, closed cycle. This technology reliably prevents the electrochemical measuring cells from drying out and overacidifying. The results of this method are a significantly increased operational reliability, higher long-term stability, and noticeably lower maintenance costs through a longer service life of the measuring cells.

The supply of water for this humidification is effectuated optionally via a separate tank with fully processed steeping water or, alternatively, via an available domestic water connection and a BEKO filter cartridge with ion-exchange material for the softening. It goes without saying that, thanks to the separate circulation, the water that is supplied to the measuring cells for their humidification does not come into contact with the Aer medicalis. It can be discharged via the normal process water network, without requiring further treatment.

With METPOINT MMA, the Bonn institution is on the safe side, since they we can reliably and continuously document the quality of their compressed air. They are well prepared for an audit within the scope of the quality management but also against possible legal claims.



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