

INNOVATION

QUALITY

RELIABILITY

WORLDWIDE

# Air & Gas Measurement Systems

Quality through Measurement



## »» More reliable gas quality because it can be monitored

### Only a measurable limit is a reliable limit

Since 1946, the companies of the Bauer Group have stood for the highest quality in the areas of compression, treatment, storage and distribution of air and other gases. Following this tradition, Rotorcomp® has continued to set new standards in the field of compressed air treatment since 2001 with the ETC® series of catalytic air treatment systems for hydrocarbon removal. The targeted residual oil content in the compressed air generated by the ETC®

systems meets the strict requirements for Class 0 in accordance with ISO 8573-1 ( $<0.0025 \text{ mg/Nm}^3 = 1.93 \text{ ppbw}$ ) and thus presents the highest demands on measurement technology for its monitoring. For this reason, since 2001, ROTORCOMP® has been developing different methods of analysis and measurement systems in parallel to the ETC® series to make the compressed air quality measurable and therefore more reliable and more predictable for customers.

### Modularity for optimal, customized solutions

- › A modular measurement concept consisting of a sampling module, a gas treatment module, a detector module and a monitor module
- › All detector modules can be combined through the modular, central RCS CONTROL analysis unit.
- › Measurement systems can also be expanded at a later time
- › 4 online measurement systems for the residual oil content in air
- › 2 online measurement systems for the residual oil content in inert gases.
- › 1 collection measurement method for measuring the residual oil in nearly all gases under system pressures of up to 350 bar.
- › Sensors for CO<sub>2</sub>, CO, NO<sub>x</sub>, SO<sub>x</sub>, CH<sub>4</sub>, O<sub>2</sub>, humidity, pressure, temperature and flow rate are available as standard.
- › Other gas components and special solutions upon request

### What is "compressed air quality"?

Since 1991, ISO 8573-1 has provided the standard that governs the qualitative assessment of compressed air purity in industrial applications. In Parts 2 to 9 of ISO 8573, the test

methods for the different components of compressed air are described. Afterwards, the most important limit values for particles, humidity and residual oil content are listed:

### Compressed air quality classes in accordance with SO 8573-1:2010

Quality Classes	Particles				Humidity		Residual Oil Content
	$\leq 0.1 \mu$	$0.1 \mu < d \leq 0.5 \mu$	$0.5 \mu < d \leq 1.0 \mu$	$1.0 \mu < d \leq 5.0 \mu$	Pressure Dewpoint	Residual Humidity	(Aerosols & Vapor)
	[ particles/Nm <sup>3</sup> ]				[ °C ]	[ g/Nm <sup>3</sup> ]	[ mg/Nm <sup>3</sup> ]
<b>0</b>	As specified by the equipment user or supplier and more stringent than Class 1						Rotorcomp: $\leq 0.0025$
<b>1</b>	N. S.	$\leq 20,000$	$\leq 400$	$\leq 10$	$\leq -70$	$\leq 0.003$	$\leq 0.01$
<b>2</b>	N. S.	$\leq 400,000$	$\leq 6,000$	$\leq 100$	$\leq -40$	$\leq 0.11$	$\leq 0.1$
<b>3</b>	N. S.	N. S.	$\leq 90,000$	$\leq 1,000$	$\leq -20$	$\leq 0.88$	$\leq 1$
<b>4</b>	N. S.	N. S.	N. S.	$\leq 10,000$	$\leq +3$	$\leq 6$	$\leq 5$
<b>5</b>	N. S.	N. S.	N. S.	$\leq 100,000$	$\leq +7$	$\leq 7.8$	$> 5$
<b>6</b>	Cp: $0 \text{ mg/Nm}^3 < \text{Cp} \leq 5 \text{ mg/Nm}^3$				$\leq +10$	$\leq 9.4$	–
<b>7</b>	Cp: $5 \text{ mg/Nm}^3 < \text{Cp} \leq 10 \text{ mg/Nm}^3$				Cw $\leq 0.5 \text{ mg/Nm}^3$		–
<b>x</b>	Cp: $\text{Cp} > 10 \text{ mg/Nm}^3$				$0.5 \text{ mg/Nm}^3 < \text{Cw} \leq 5 \text{ mg/Nm}^3$		–
	Maximum residual particles / Nm <sup>3</sup> of given sizes in $\mu\text{m}$ in accordance with ISO 8573-4				Maximum pressure dewpoint in accordance with ISO 8573-3		Maximum residual oil content in accordance with ISO 8573-2 and -5
Reference conditions: Temperature: 20 °C / Pressure: 1 bar (abs.) / H <sub>2</sub> O Pressure: 0 bar in accordance with ISO 8573-1:2010 / Clause 4 Cp = Mass concentration; Cw = Concentration of liquid water; N.S. = Not Specified.							

## According to ISO 8573-1, what is "oil" actually?

### Sometimes "It's all a matter of definition"

According to ISO 8573-1, all hydrocarbons with 6 or more carbon atoms per molecule are "oil" within the meaning of the standard. This wide range of compounds places high demands on measurement technology.

What does this mean in practice?

The following organic compound classes (hydrocarbons) are therefore "oils" within the meaning of the standard:

- › Solvents (such as toluene and hexane)
- › VOCs (Volatile Organic Compounds)
- › Adhesives
- › Thread and surface sealants
- › Fragrances (air fresheners, perfumes, etc.)
- › Detergents / cleaning agents

### Only a measurable limit is a certain limit

#### 1. Why should measurements be made?

First of all, it is necessary to clarify what the objective of the measurement is.

What is supposed to be measured and monitored:

- › the quality of the compressed air after treatment (SP4)?
- › the performance of a single treatment component (SP3)?
- › the compressor and/or the intake air (SP1 / SP2)?
- › the quality at the application site (SP5)?

#### 2. How should measurements be made?

Should measurements be made online (= continuously) or offline (= collecting samples)?

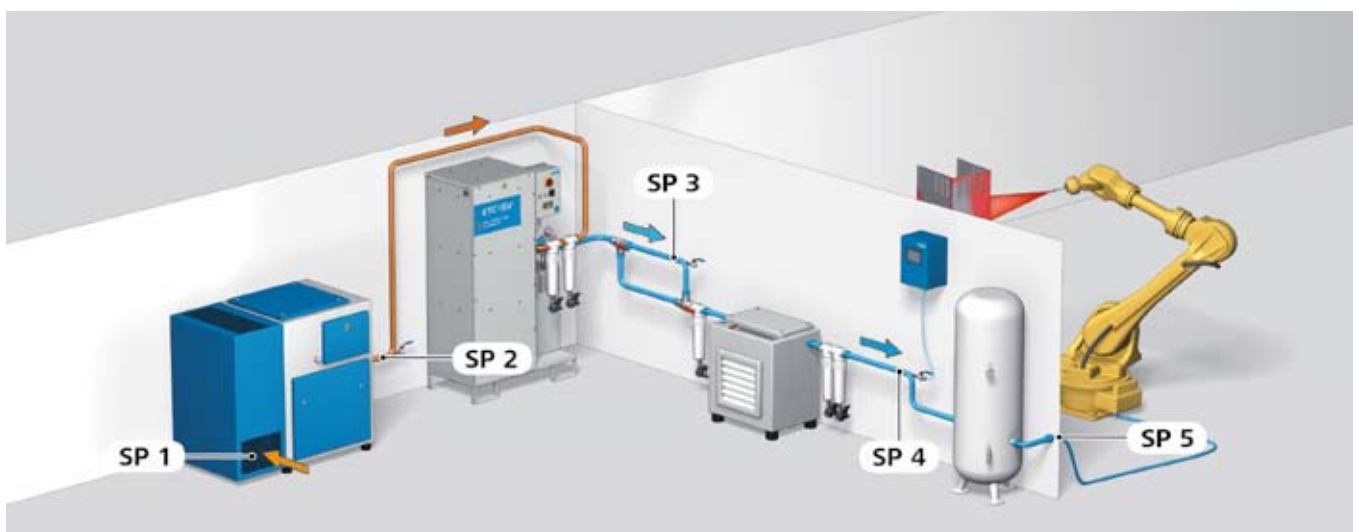
#### 3. What should be measured?

Which components of the gas and/or which other variables (such as pressure or temperature) should be measured?

#### 4. Which limit values should be monitored?

Which quality classes should be monitored and according to which standard?

Not until the answers to these questions are known is optimal planning and customer-specific configuration of the measurement and analysis modules possible.



## »»» RCS GDM – Gas Detector Modules

### RCS NMHC/CH<sub>4</sub> NDIR

FID\* was yesterday!

RCS NMHC/CH<sub>4</sub> is today!



High resolution system for online NMHC and CH<sub>4</sub> measurements in gases. The standard in compressed air measurement technology!

#### Measurements of the following:

- › THC (Total HydroCarbons), NMHC (Non-Methane HydroCarbons), CH<sub>4</sub> (Methane) and absolute CO<sub>2</sub> (total carbon dioxide)  
THC: Pyrolytic combustion and measurement of the CO<sub>2</sub> rise using NDIR. Parallel determination of the CH<sub>4</sub> using NDIR. Calculation of the NMHC = THC – CH<sub>4</sub>.
- › NO<sub>x</sub>, SO<sub>x</sub>, CO (NDIR, optional)
- › O<sub>2</sub> 0–25 % / 0–100 % (diamagnetic, optional)
- › rH / P / T / Flow (optional)

Pressure range: 0–420 bar

#### Measurement methods:

NDIR: Non-Dispersive Infrared Spectroscopy  
Diamagnetic: Diamagnetic O<sub>2</sub> measurements

#### Sample composition:

Gas, vapor, aerosols, liquids  
(in accordance with ISO 8573-1, -2, -5, -6)

#### Detection limits:\*\*

LQD: 0.0003 mg/Nm<sup>3</sup> (NMHC)  
LDL: 0.0001 mg/Nm<sup>3</sup> (NMHC)

### RCS VOC PID / RCS VOC MOx

VOC measurements in high purity gas applications and inert gases



Measurement systems for the online measurement of vapor phase oil/hydrocarbon content in compressed gases in accordance with ISO 8573-5

#### Measurements of the following:

- › VOC (Volatile Organic Compounds)
- › Oil vapors
- › rH / P / T / Flow (optional)

Pressure range: 4–420 bar

#### Measurement methods:

MO<sub>x</sub> sensors: Catalytic measurements on Metal Oxide sensor surfaces  
PID sensors: Measurements using Photo Ionization Detection

#### Sample composition:

Gas, vapor. Aerosols optional

#### Detection limits:\*\*

LQD: 0.01 mg/Nm<sup>3</sup>  
LDL: 0.001 mg/Nm<sup>3</sup>

For details, please refer to the respective technical data sheets.

## RCS MSS (Multi-gas Sensor System)

The multi-component online monitoring system for Class 2 limit values in accordance with ISO 8573-1



Measurement systems for **online measurements** of **VOC, CH<sub>4</sub>, CO and NO<sub>x</sub>** in compressed air of Class 2 quality in accordance with ISO 8573-1

### Measurements of the following:

- › VOC (Volatile Organic Compounds) /CH<sub>4</sub> / CO / NO<sub>x</sub>
- › rH / P / T / Flow (optional)

**Pressure range:** 1–420 bar

### Measurement methods:

MO<sub>x</sub> sensors: Catalytic measurements on **Metal Oxide** sensor surfaces

NDIR: **Non-Dispersive Infrared Spectroscopy**

### Sample composition:

Gas, vapor

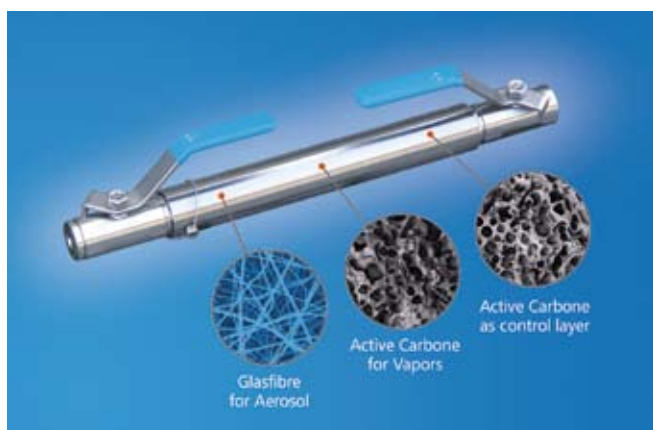
### Detection limits:\*\*

LQD: 0.1 mg/Nm<sup>3</sup>

LDL: 0.03 mg/Nm<sup>3</sup>

## RCS HP OC (High Pressure Offline Collector)

Collection measurement method in accordance with ISO 8573-2 and -5 for 1–350 bar



**High pressure collection method** for the analytic determination of **vapor and aerosol phase oil/hydrocarbon content** in **compressed gases** under system pressure in accordance with ISO 8573-2, -5

### Measurements of the following:

- › Sum parameters for oil vapor and oil aerosols
- › Semi-quantitative analysis (optional)
- › Siloxane (optional)

**Pressure range:** 1–350 bar

### Measurement methods:

Aerosols: Collection on fiberglass filters, detection limit (LQD): 0.003mg/Nm<sup>3</sup>

Vapors: Collection on activated carbon, detection limit (LQD): 0.005mg/m<sup>3</sup>

Laboratory: Analysis of samples by an independent, accredited laboratory in accordance with ISO 8573-2 and -5.

### Sample composition:

Vapor and aerosols

### Detection limits:\*\*

LQD: 0.008 mg/Nm<sup>3</sup> (total)

LDL: 0.005 mg/Nm<sup>3</sup> (total)

rH: Humidity | P: Pressure | T: Temperature | Flow: Mass Flow

\*FID: Flame Ionization Detector | \*\*LDL: Lowest Detection Limit | \*\*LQD: Lowest Qualified Detection Limit

---

## »»» RCS GDM – Gas Detector Modules

### RCS Particle Laser

Online particle measurements in gases

### RCS Microbio

Online bacteria count measurements in gases

Measurement systems for online measurement of particle load and bacteria count measurements in compressed gases



**Measurements of the following:**

- › Bacteria count
- › Particle load (8 channels)

**Pressure range:** 1–420 bar

**Measurement methods:**

Particles: Laser measurements

Bacteria count: Autofluorescence spectroscopy

**Sample composition:**

Gas, vapor, particles

**System tuning for the particular application**

### RCS rH, P, T, Flow

**Sensors for the standard variables in compressed air:  
Humidity, pressure, temperature and mass flow.**

All RCS DETECTOR MODULES are expandable via the RCS CONTROL unit and the RCS MULTILOG unit with appropriate sensors for the measurement of standard physical quantities in compressed air. ROTORCOMP® provides solutions for up to 420 bar.

## »»» Online trace gas measurement systems for compressed gases up to 420 bar

### RCS O<sub>2</sub> Trace

Oxygen measurements down to trace levels (ppb)

### RCS CO<sub>2</sub> Trace

Carbon dioxide measurements down to trace levels (ppb)

### RCS rH Trace

Humidity measurements down to trace levels (ppb)



Since optimal solutions for these measurements can not be standardized, we will be happy to create an individual concept for you.

*For details, please refer to the respective technical data sheets.*

## »»» RCS MCM – Monitoring Control Modules

### RCS Control Units 45 and 65

Freely configurable analysis, communications and control modules

### RCS Multilog Unit

6-channel display and logger module



Central monitor modules for data analysis and acquisition

ROTORCOMP® provides the optimal solution for every application via its RCS CONTROL and RCS MULTILOG monitor modules.

### RCS Control Units

Because of their modular design, the RCS Control units are adaptable even to the most complex of measurement tasks. The optional communications modules allow data transfer and remote maintenance via LAN / WLAN and UMTS networks. Remote access is via an integrated web browser and VPN, as well as data transfer via an integrated FTP server. Simple configuration using PC software. The integration of the RCS CONTROL units in higher-level guidance and control systems is easily carried out through the use of appropriate interface modules.

### RCS Multilog Unit

6-channel data logger for data collection and analysis from up to 6 RCS DETECTOR MODULES. Data recording and analysis on a PC is possible by using the included software.

## »»» RCS GSM – Gas Sampling Modules

ROTORCOMP® Sampling systems up to 420 bar  
So that their quality is never under pressure

### RCS GSM

Sampling systems in accordance with ISO 8573-2,-5



Isokinetic sampling systems for standard-compliant gas sampling under system pressures of up to 420 bar.

### Isokinetic sampling

To obtain reproducible and reliable results, it is recommended that a so-called isokinetic sampling system (see figure at left) be used. Using this system, a sample is taken from the gas stream isokinetically via a centered sampling tube. Isokinetic here means that the gas flows into the sampling tube with the same speed as the main stream. The Rotorcomp® RCS GSM series of sampling systems makes it possible to make online measurements for system pressures of up to 420 bar.

rH: Humidity | P: Pressure | T: Temperature | Flow: Mass Flow

\*FID: Flame Ionization Detector | \*\*LDL: Lowest Detection Limit | \*\*LQD: Lowest Qualified Detection Limit

INNOVATION

QUALITY

RELIABILITY

WORLDWIDE

**ROTORCOMP VERDICHTER GmbH**

Industriestraße 9  
82110 Germering  
Deutschland

Tel.: +49 (0)89 724 09-0  
Fax: +49 (0)89 724 09-38

[info@rotorcomp.de](mailto:info@rotorcomp.de)  
[www.rotorcomp.de](http://www.rotorcomp.de)

A member of BAUER COMP Holding GmbH