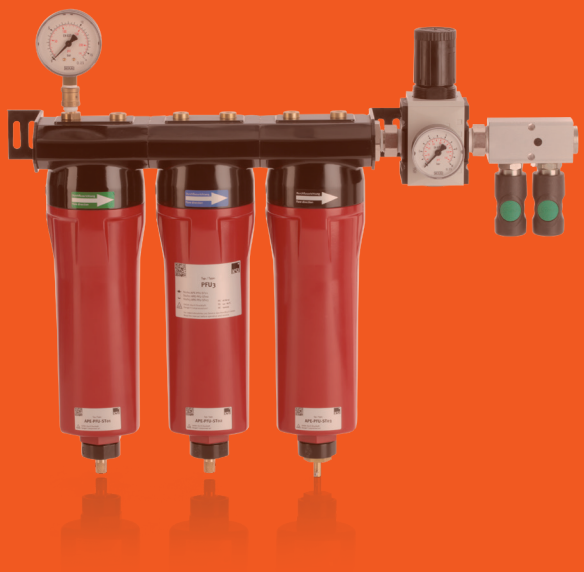
BREATHING AIR TREATMENT

Application guide

Rev 01_0525

QUALITY WITHOUT COMPROMISE



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Breathing air treatment

Reliable, high quality breathing air

Technical and medical breathing air have different areas of application that vary in their requirements and uses in order to ensure safety and health.
The exact composition and quality of the breathing air is of great importance in order to meet the specific requirements of the respective application.

Technical breathing air

Technical breathing air is required in closed or poorly ventilated rooms where the air quality is insufficient, e.g. when painting, welding or working in pressurized containers.
In fire protection, breathing apparatus with technical breathing air is used to protect against smoke and toxic gases. In mining, respiratory protection is required to work in oxygen-poor or contaminated environments.
Technical breathing air is also required in chemical or physical laboratories where hazardous substances are processed.

Medical breathing air

In hospitals, medical breathing air is needed for anesthesia and intensive care to supply patients with oxygen or special breathing gas mixtures and in diagnostics to check lung function and carry out tests.

The requirements

Specific regulatory requirements apply to breathing air in North America and Europe, focusing on composition, pollutant limits and safety standards.

USA

The Occupational Safety and Health Administration (OSHA) plays a central role in establishing and enforcing requirements for breathing air quality in US work environments. In 29 CFR 1910.146, OSHA stipulates that the oxygen content in work areas must be between 19.5 % and 23.5 %. The CGA G-7.1-2018 standard (recognized by OSHA) defines limit values for pollutants such as CO, CO_2 and oil mist.
In critical areas (e.g. confined spaces or fire protection systems), OSHA requires the use of monitoring systems to detect oxygen deficiency or the accumulation of pollutants at an early stage.

Canada

The Canadian standard CSA Z180.1-13 specifies that breathing air must contain at least 19.5-23.5% oxygen.
The standard limits impurities such as CO, CO_2 and oil vapour. Humidity (dew point ≤ -50°C) and particles are also checked.

Europe

DIN EN 12021 defines binding Europe-wide requirements for the quality of compressed gases for respiratory protective devices. Pollutant limits such as CO, CO_2 oil mist and water content are clearly defined. Furthermore, breathing air must be odorless and tasteless according to DIN EN 12021.

Due to the wide range of applications and requirements, KSI offers customized solutions for every application, which are presented below. From paint booths to surgery, users worldwide rely on KSI products - and therefore on quality without compromise.

Compressed air treatment for tank cleaning

Safe breathing air for safe work days

Cleaning tank systems places high requirements on people and technology. Hazardous gases, vapors or residues can accumulate in closed or poorly ventilated vessels, posing an immediate health hazard. The use of respiratory protection systems with treated compressed air is essential in order to guarantee the safety of the specialists deployed.

When entering tank facilities, the risk of explosive atmospheres, oxygen deficiency or toxic residues is omnipresent. Only a supply of clean breathing air provides protection here. The purified compressed air ensures that employees can work safely under heavy breathing protection, even for long periods of time.

The compressed air available in industrial plants is generally not suitable for direct breathing.

Compressed air is converted into breathing air through the use of special treatment systems. Filters and dryers remove pollutants, particles, oil residues and moisture so that the air meets the high requirements.

Only with clean, standard-compliant breathing air can the health of employees be protected and a safe workflow warranted.

MAK63: mobile breathing air system

Mobile solution for breathing air treatment consisting of:

1. Level

APF35-12MFO with automatic condensate drain D150

2. Level

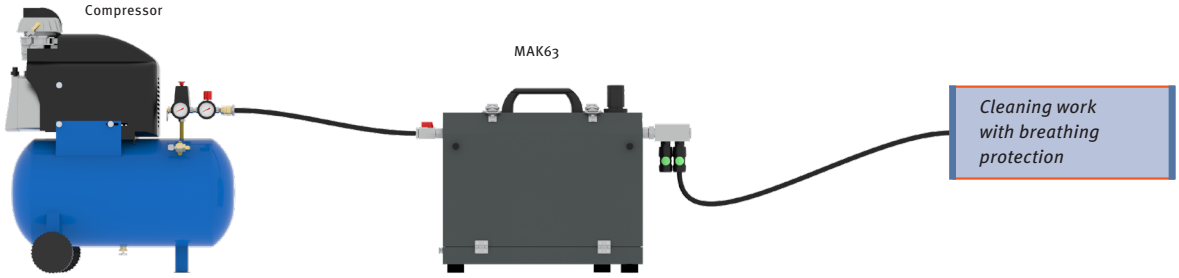
APF35-12SMA with automatic condensate drain D150

3. Level

APF35-12CA with manual condensate drain HAM12

- Pressure gauge for displaying the operating pressure
- Pressure regulator
- Condensate drip tray
- 2 tapping connections with safety coupling separator
- 2 connections for external oil/water separator

Mobile Solution



Respiratory protection in paint booths

Why the treatment of compressed air is essential

When painting, clean and healthy breathing air is not only a question of occupational safety, but also of quality. Painters often work for hours in areas where fine paint mist, solvents and chemical vapors are produced - a potentially dangerous strain on the respiratory tract. That is why the use of prepared compressed air for the breathing air supply is mandatory.
In many companies, breathing air is taken directly from the compressed air network. However, this often contains oil mist, water vapor, particles and other impurities that should not be inhaled under any circumstances. These residues are generated by the compressor, the piping system or environmental influences.
Without suitable treatment, the air can be harmful to health - with consequences such as headaches, irritation of the respiratory tract or long-term damage to the lungs and nervous system.
Reliable breathing air preparation not only protects your health, but also ensures clean, contamination-free painting results. For anyone who paints professionally, clean breathing air is not a luxury - it's a necessity.

PFU3 for breathing air systems

For breathing air systems in critical environments
100% technically oil- and particle-free air

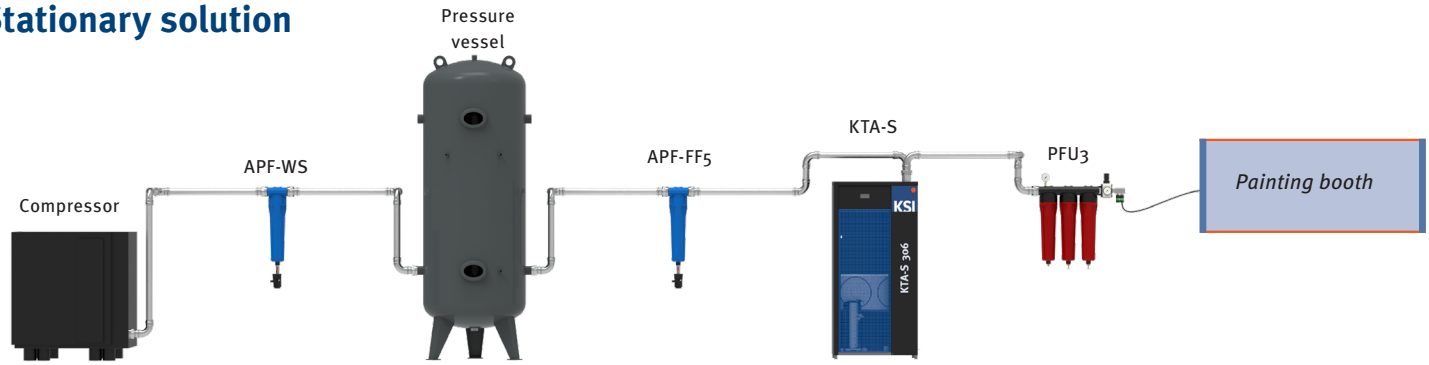
Areas of application
e.g. in the paint booth
- for water- and solvent-based coating systems
- for breathing protection hoods without activated carbon filter

PFU2 for painting work

For painting work
100% technically oil- and particle-free air

Areas of application
e.g. preparatory work in the paint booth
- for solvent-based coating systems
- for breathing protection hoods with activated carbon filter on the belt

Stationary solution



Medical breathing air for hospitals

When trust and reliability is paramount

In modern anesthesia, medical breathing air is an indispensable component of safe patient care. It is used in combination with other gases such as oxygen and anesthetics to ventilate patients during surgical interventions and to support lung function. The purity of the air used has top priority - because even the smallest impurities can jeopardize patient safety.

Medical breathing air should not be confused with conventional technical compressed air. The latter often contains particles, oil residues, moisture or other potentially harmful impurities. In order to meet the high requirements of clinical applications, the compressed air in cranes must be specially filtered, dried and treated. This is the only way to guarantee that it is free from pollutants, microorganisms and toxic residues.

Adherence to high standards ensures patients are supplied with absolutely pure, safe breathing air during anesthesia. The careful preparation and constant quality control of medical compressed air is therefore a central component of safe and effective anesthesia care in hospitals.

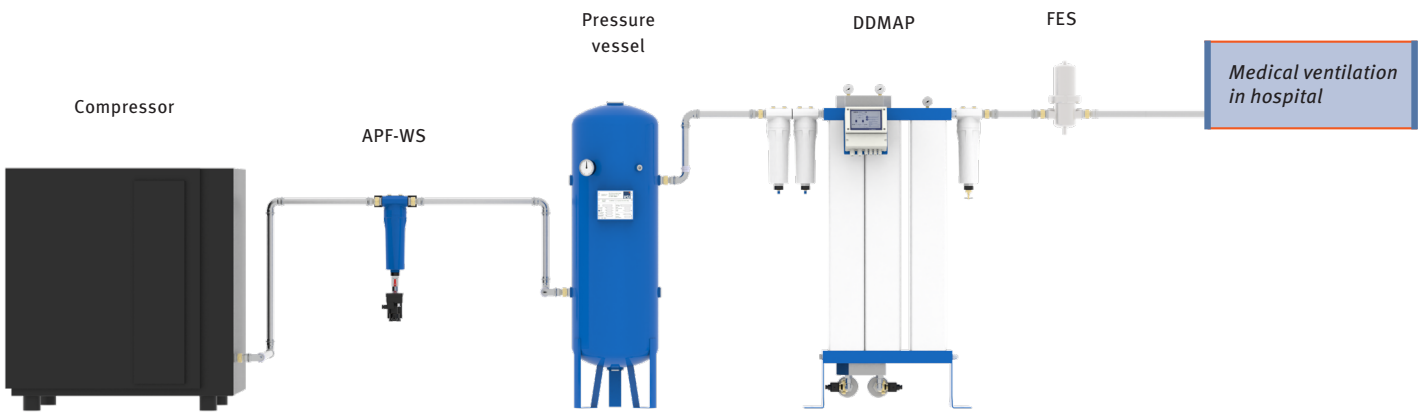
ECOTROC® DDMAP

Medical compressed air treatment

including:

Pre-filter combination **KSI ECOCLEAN®** MFO / SMA

- **ECOTROC®** desiccant dryer, heatless-regenerated, fully automatic with special desiccant filling, incl. third desiccant container with activated carbon and hopcalite filling
- **ECOMATIC** electrical control system including compressor synchronization (dew point controls optional)
- Final filter **KSI ECOCLEAN®** DSF (optional SE sterile filter)
- Optional: CO monitor



Breathing air treatment for mining applications

Clean air underground

In underground mining, clean, technically purified breathing air is a decisive factor for safety and health. Dust, exhaust fumes, high humidity and the use of heavy machinery create an environment in which polluted air can become an invisible danger. Without professional preparation, this air would massively increase the risk of respiratory illnesses, poisoning or long-term damage. The odorless and colorless carbon monoxide (CO), which can be produced by incomplete combustion - for example in dieselpowered machines - is particularly dangerous.

Carbon monoxide blocks the absorption of oxygen in the blood and can be life-threatening even in low concentrations.

Continuous CO monitoring in breathing air preparation is therefore essential. Modern systems detect even small amounts of CO at an early stage and ensure that these are filtered out or reported. This ensures that the breathing air remains safe and harmless at all times.

High-performance filter and drying systems reliably remove particles, oil vapors, water and harmful gases from the compressed air.

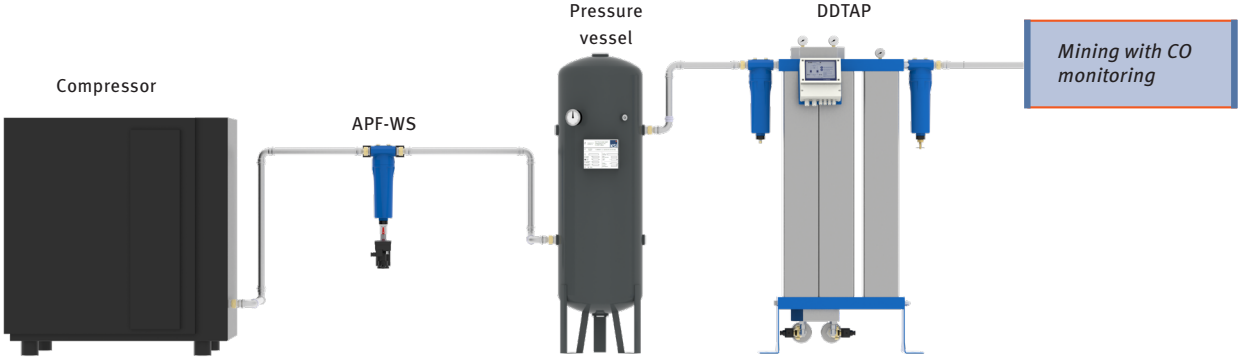
Only with high-quality breathing air can the high requirements for occupational safety and health be met in the long term.

ECOTROC® DDTAP

Industrial compressed air treatment

including:

- Pre-filter **KSI ECOCLEAN®** SMA
- **ECOTROC®** desiccant dryer, heatless-regenerated, fully automatic with special desiccant filling, incl. third desiccant container with activated carbon and hopcalite filling
- **ECOMATIC** electrical control system including compressor synchronization (dew point controls optional)
- Final filter **KSI ECOCLEAN®** DMF (optional SE sterile filter)
- Optional: CO monitor



Treatment of compressed air for medical and technical breathing air

Specifying air quality in accordance with ISO 8573-1:2010

Solid particles			
Class	Maximum number of particles per m³ with a particle size of d [µm]*		
	0.1 ≤ d ≤ 0.5	0.5 ≤ d ≤ 1.0	1.0 ≤ d ≤ 5.0
0	more stringent requirements than class 1 (to be defined)		
1	≤ 20,000	≤ 400	≤ 10
2	≤ 400,000	≤ 6,000	≤ 100
3	–	≤ 90,000	≤ 1,000
4	–	–	≤ 10,000
5	–	–	≤ 100,000

Water	
Class	Pressure dewpoint
0	more stringent requirements than class 1 (to be defined)
1	≤ -70 °C / ≤ -94 °F
2	≤ -40 °C / ≤ -40 °F
3	≤ -20 °C / ≤ -4 °F
4	≤ +3 °C / ≤ +37.4 °F
5	≤ +7 °C / ≤ +44.6 °F
6	≤ +10 °C / ≤ +50 °F

Oil	
Class	Total oil (liquid, aerosol & vapour) [mg/m³]*
0	more stringent requirements than class 1 (to be defined)
1	≤ 0.01
2	≤ 0.1
3	≤ 1.0
4	≤ 5.0
X	› 5.0

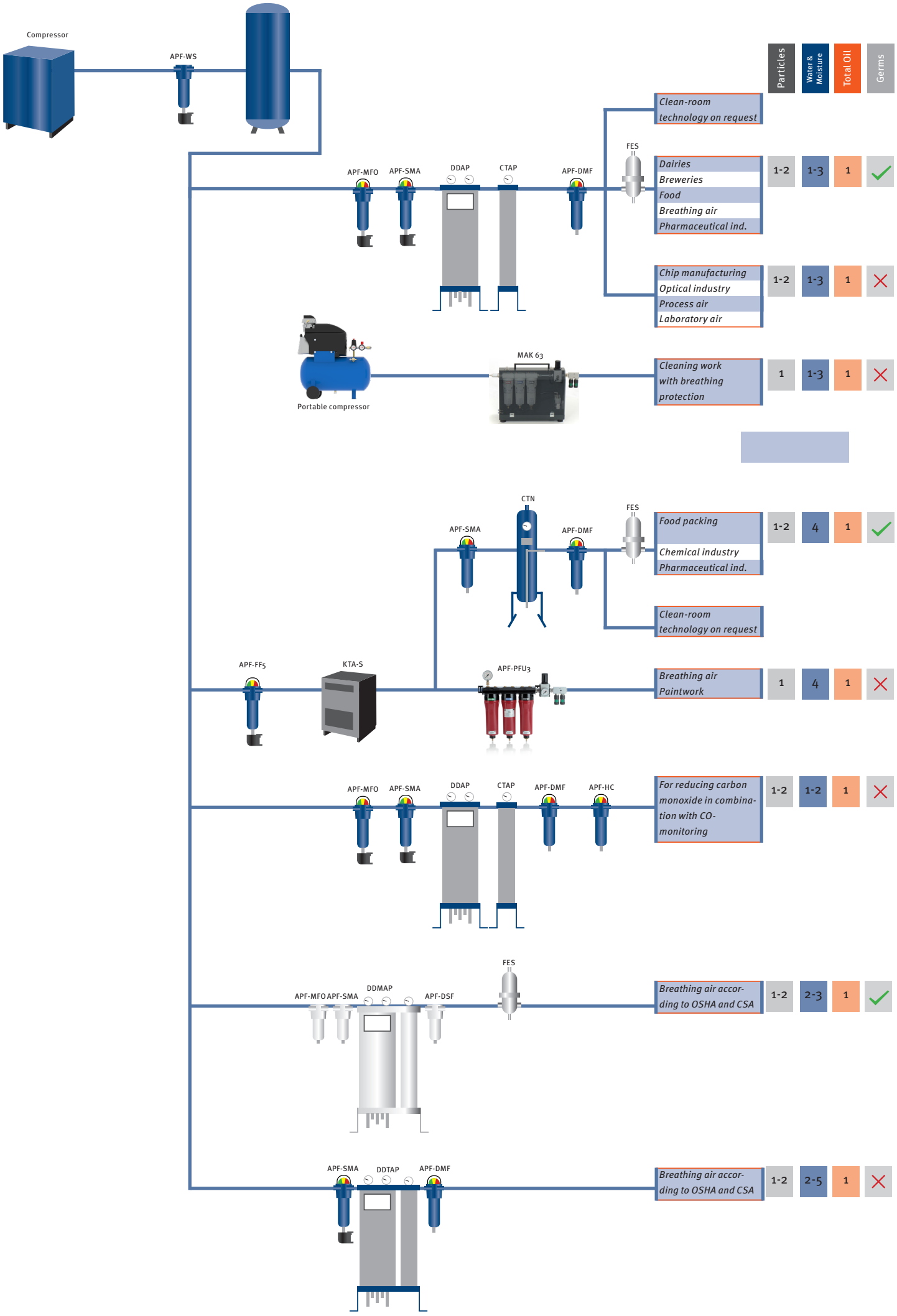
*at reference conditions 20°C, 1 bar(a), 0% air humidity

Breathing air requirements

			OSHA GRADE D	CSA	ECOTROC® DDMAP
Carbon monoxide	CO	(ppm)	‹ 10	‹ 5	‹ 5
Carbon dioxide	CO_2	(ppm)	1000	500	‹ 300
Oil vapor/residual oil content		(mg/m³)	5	1	‹ 0.003
Oxygen	O_2	%	19.5-23.5	20-22	20.9(+/-1)
Dirt particles			/	/	‹ 0.01 micron at 99.9999%
Odor and taste substances			free	free	free

Products

APF-WS	Water separator
APF-VF25·FF5	Prefilter · Fine filter
APF-SMA·MF1·MFO	Micro filter
APF-DSF·DF1·DMF	Dust filter
APF-CA	Activated carbon
APF-HC	Catalyst cartridge filters
FES	Sterile filter
DDAP	Dessicant dryer
CTN / CTAP	Oil vapour adsorber
KTA-S	Refrigeration dryer
DDMAP · DDTAP	Desiccant dryers · Technical breathing air
APF-PFU2	Filter combination
APF-PFU3	Filter combination
MAK63	Mobile Breathing air system


Compressor
APF-WS
Particles
Water & Moisture
Total Oil
Germs
Clean-room technology on request
FES
APF-MFO
APF-SMA
DDAP
CTAP
APF-DMF
Dairies
Breweries
Food
Breathing air
Pharmaceutical ind.
1-2
1-3
1
Chip manufacturing
Optical industry
Process air
Laboratory air
Portable compressor
MAK 63
Cleaning work with breathing protection
CTN
Food packing
Chemical industry
Pharmaceutical ind.
4
Clean-room technology on request
APF-FF5
KTA-S
APF-PFU3
Breathing air Paintwork
APF-HC
For reducing carbon monoxide in combination with CO-monitoring
1-2
DDMAP
APF-DSF
Breathing air according to OSHA and CSA
2-3
DDTAP
2-5

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