BAUER air purification

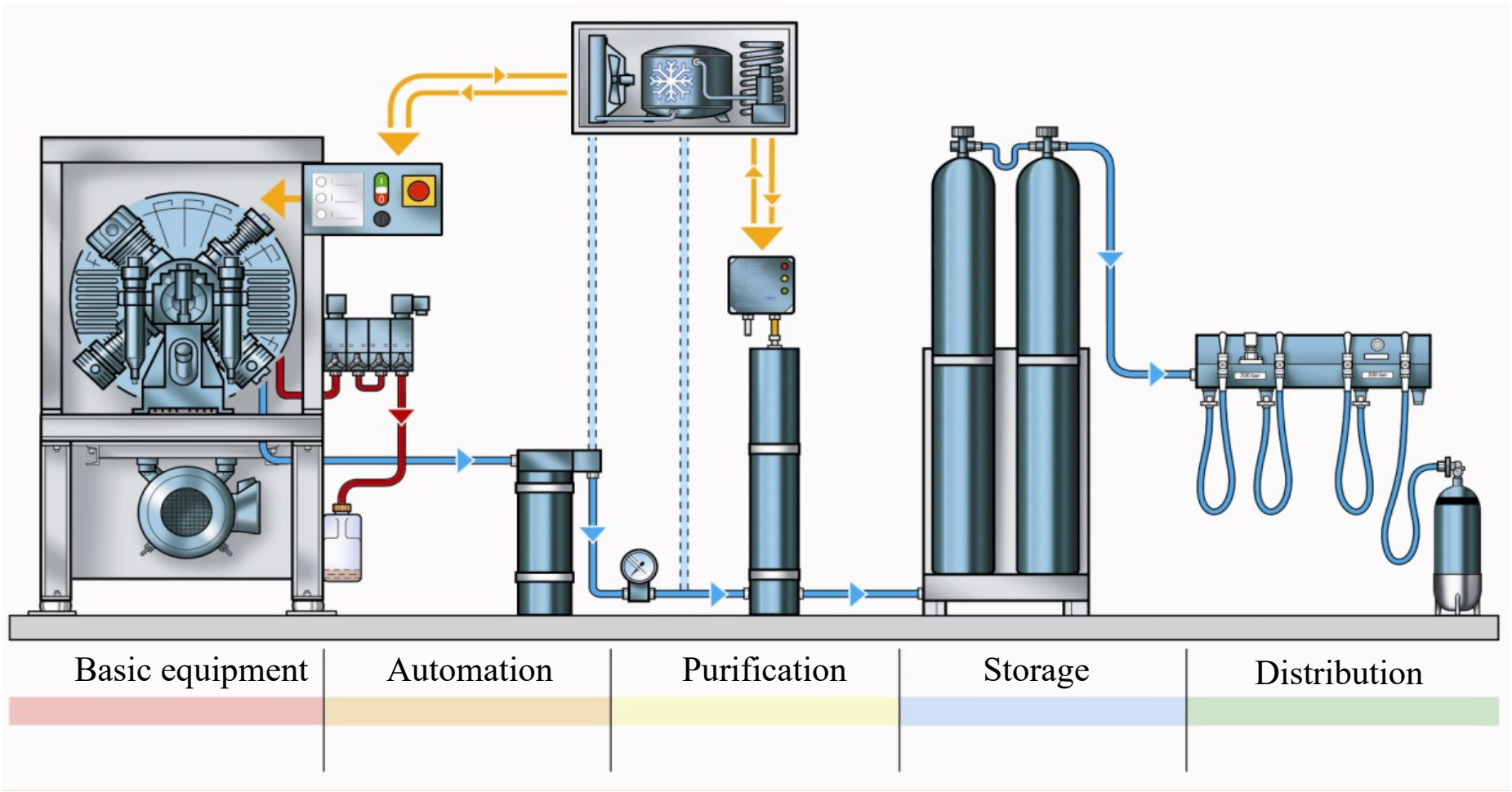
Technical Training

Breathing air standards

Pure BAUER breathing air is in compliance with international standards, i.e.

- **EN 12021**
- **BS 4001**
- **CGA Grade D+E**
- **US Navy Standard**
- **Plongées Profonde Offshore**

General overview



Purification system

Introduction

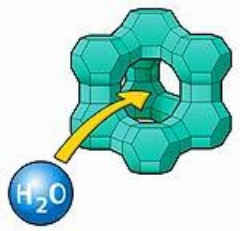
- The purpose of all Bauer breathing air purification systems is to remove oil, water, taste, odor and convert Carbon Monoxide from the compressed air stream before final delivery.

General Purification System Procedures

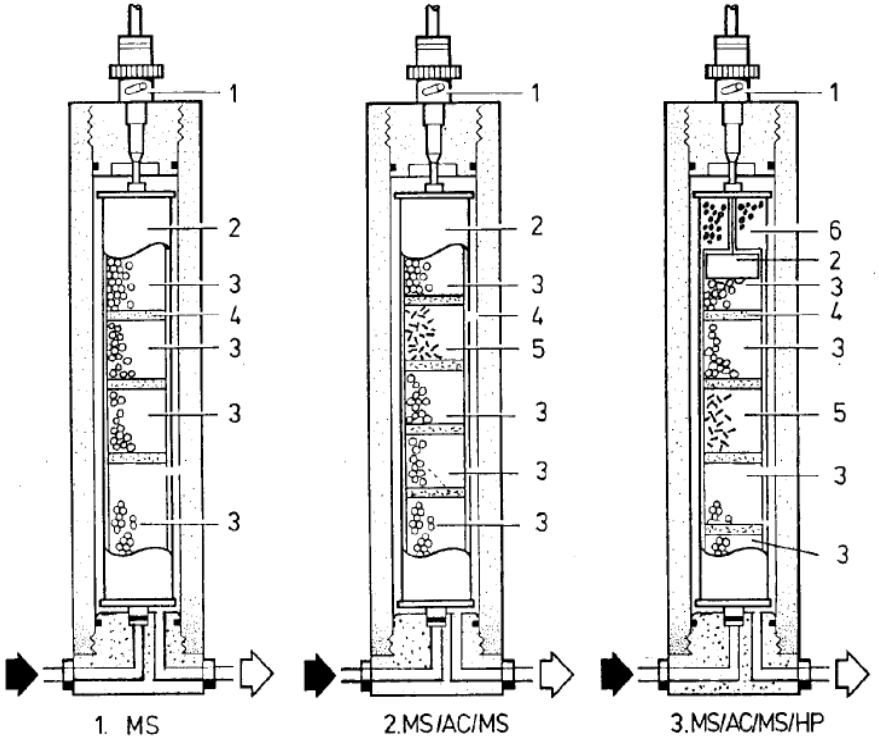
- Keep an accurate record of operating hours to ensure exact attention to maintenance intervals
- Change all cartridges before reactivating a compressor unit that has been out of service more than six months. Leave cartridges in the unit as long as it is out of service.
- While out of service keep all condensate drain valves closed. Maintain a pressure of 700 to 1,100 psi (50 to 80 bar) within the system to prevent moisture from entering the compressor and purification system.

BAUER filter system

- An adsorption filter is used to remove gaseous contaminants from air or gas. These filters have an extremely porous particle structure and hence an extremely large surface area. Both activated carbon, used in purification, and molecular sieve, used as a drying agent (see diagram on the right), have these characteristics.
- The air's speed of flow may not exceed 0,5 m/s to ensure that the reaction time between filter material and potential contaminants is sufficiently long.
- Water vapour reduces the filter's efficiency. Furthermore, physical and chemical reactions with water cause activated carbon to heat up. We therefore recommend drying the air/gas before passing it through the activated carbon filter. Please note that this filter has been designed to absorb gaseous contaminants only.
- Felt layers, contained within special filter cartridges, remove suspended dust particles and aerosols.



BA Purification – P41 / P61 System



Pos.	Designation	Purpose
1	Coaxial plug	Attachment of the signal cable, connection between cartridge and **SECURUS** indicator unit
2	Sensor	Indication of cartridge saturation to the **SECURUS** indicator unit
3	Molecular sieve	Drying ˙ partial adsorption of CO_2
4	Foam plastic disc	Separation of the filter agents
5	Activated charcoal	Adsorption of odour producing substances, oil vapours, and aerosols
6	Hopcalite	Catalytic agent with excellent contact time characteristics for converting CO into CO_2

Overview

- BAUER filter systems (P-Filter)
- Air quality with BAUER Compressors
- Dew point / pressure dew point
- Oil content

BAUER filter system

BAUER P-Filter

Pressure range: 90 - 350/420/550* bar

filter system:	max. flow:
-P60/P61	-680 l/min
-P80/P81	-1000 l/min
-P100	-1000 l/min

Pressure range: 90 - 350* bar

filter system:	max. flow:
-P120	-2200 l/min
-P140	-3500 l/min

*safety valve setting! Working pressure 10-20bar lower

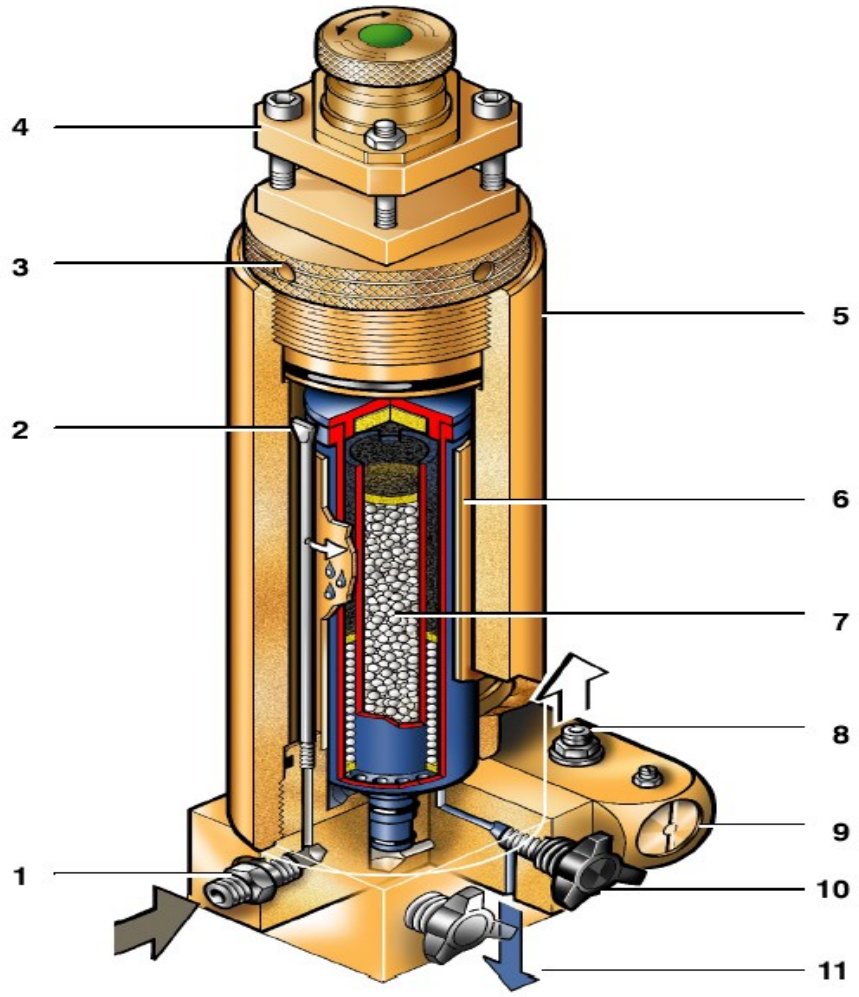
WARNING

- The rapid depressurizing and re-pressurizing of the oil and water separator during condensate draining subjects it to metallurgical stresses. To prevent catastrophic failure with the possibility of damage, injury or death the oil and water separator (P/N 079416) must be replaced after a predetermined number of cycles.
  - One load cycle equals one pressurization plus one depressurization.
  - Refer to Bauer guidelines for the periodic inspection and testing/replacement of separator and filter units
- The Bauer recommended frequency of condensate draining is every fifteen minutes and is a balance between maximizing the life of the separator chamber and maintaining the quality of the delivered air.

P21 Purification System

- The P21 Purification System consists of a separator and a cartridge chamber.
- In the separator surrounding the cartridge chamber, liquid oil and water particles are separated from the compressed air by a pipe nozzle.
- Residual oil and water particles are then removed by the filter cartridge and the air leaving the P21 Purification System is free of water, oil, taste and smell.
- The P21 Purification System is subject to dynamic loading.
  - It is designed for a certain number of load cycles.
  - A load cycle equates to an abrupt pressure loss caused by draining the condensate.
  - The P21 Purification System must be replaced after reaching the maximum number of load cycles, otherwise the housing may fail due to material fatigue.
  - Refer to Bauer guidelines for the recommended periods for inspection and testing/replacement of separator and filter units.

BA Purification – P21 System

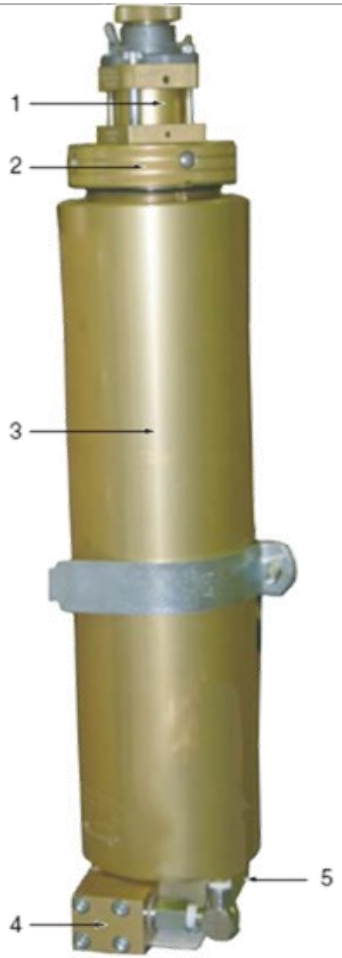


1 Filter inlet
2 Jet pipe
3 Filter head
4 Final pressure safety valve
5 Housing
6 Chamber separator
7 Cartridge
8 Filter outlet
9 Pressure maintaining valve
10 Condensate drain tap
11 Condensate outlet

P31 Purification System

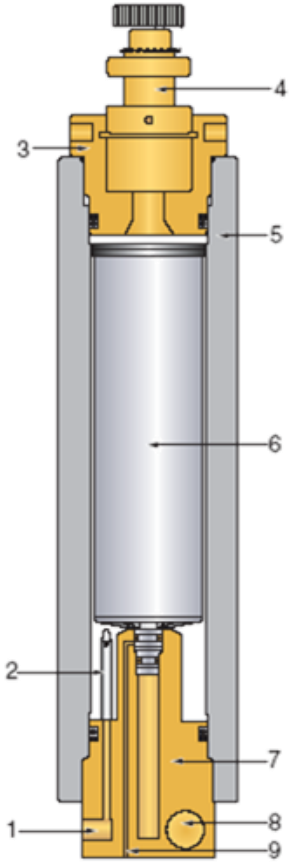
- The P31 purification system assembly consists of a separator and a cartridge chamber.
  - In the separator liquid oil and water particles are separated from the compressed air by a pipe nozzle.
  - Residual oil and water particles are then removed by the filter cartridge and the air leaving the filter assembly is free of oil, taste and smell.
- Chamber Replacement Interval
  - The P31 Filter System is subject to dynamic loading. It is designed for a certain number of load cycles.
    - A load cycle equates to an abrupt pressure loss caused by draining the condensate.
    - The filter assembly must be replaced after reaching the maximum number of load cycles, otherwise the housing may fail due to material fatigue
    - Refer to Bauer guidelines for the recommended periods for inspection and testing/replacement of separator and filter units.

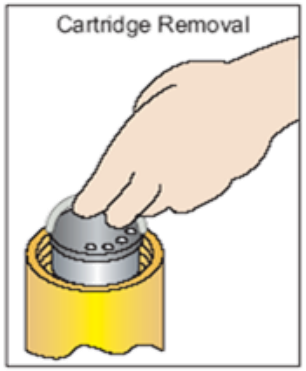
P31 Purification System



1. Final Safety Valve
2. Plug
3. Housing
4. System Check Valve
5. Bottom

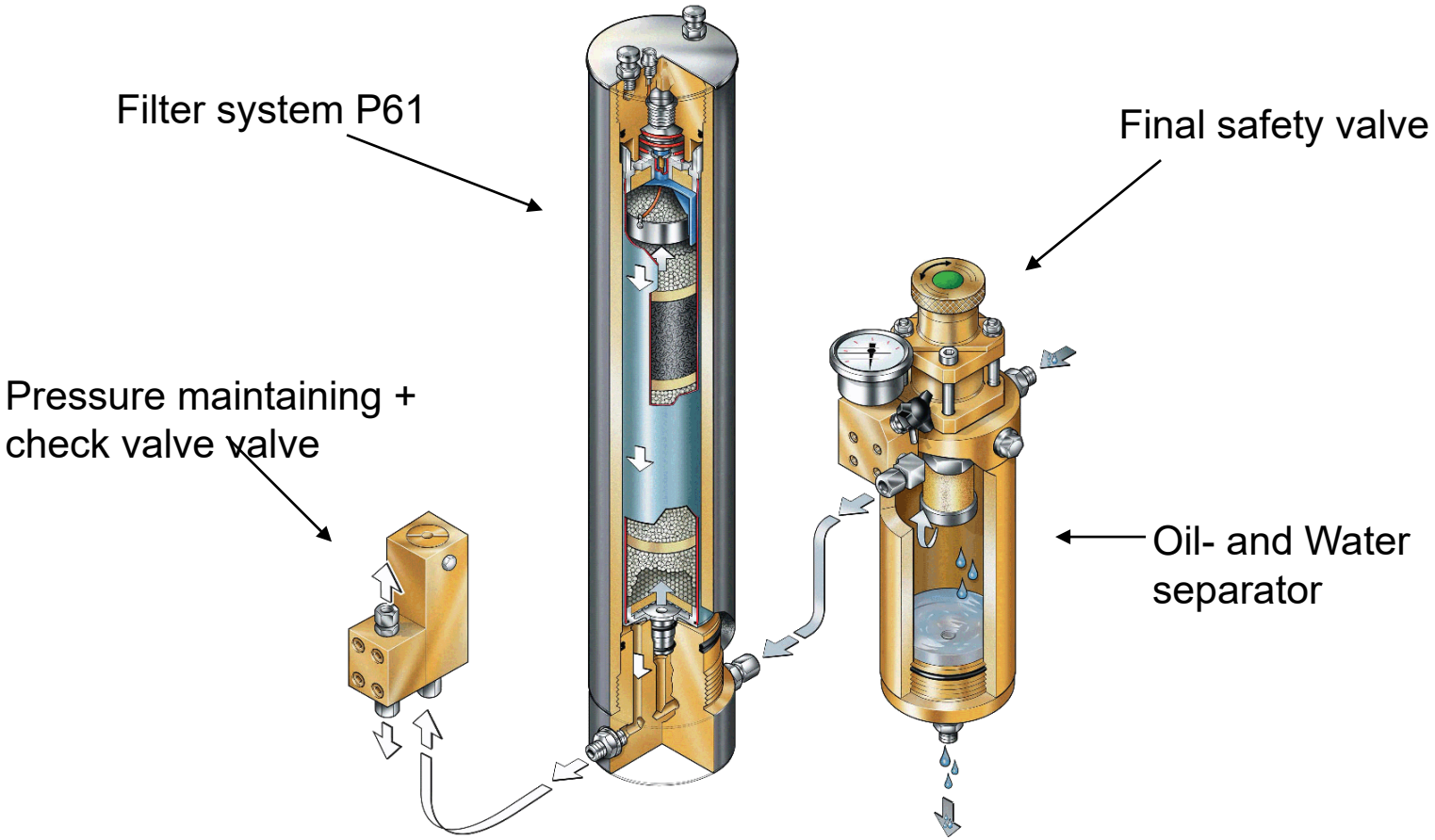
P31 Purification System Cross Section



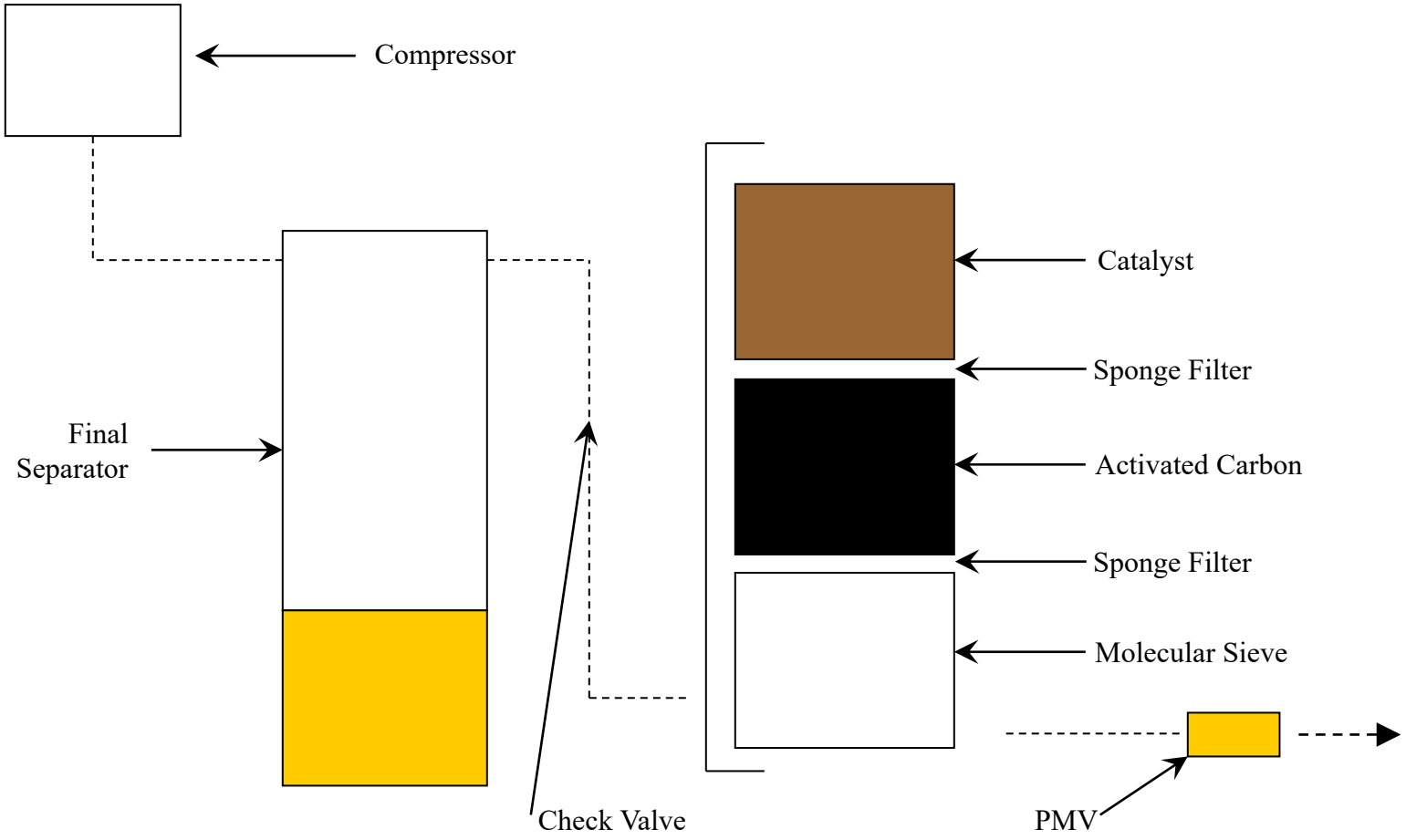


1. Inlet
2. Jet Pipe
3. Plug
4. Final Pressure Safety Valve
5. Housing
6. Cartridge
7. Bottom
8. Pressure Maintaining Valve
9. Safety Bore
10. Cartridge Removal

BAUER filter system

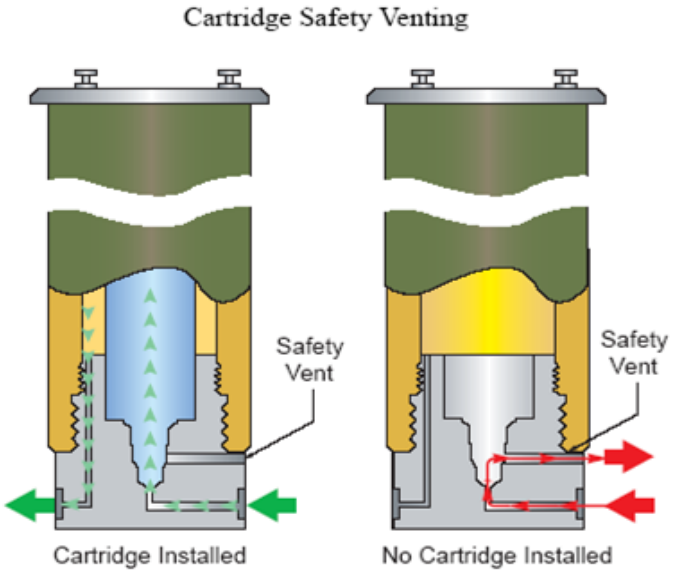


Air flow through single tower purification



Chamber Safety Bore

- The chambers in all Bauer purification systems are designed to prevent pressurization if the cartridge is missing, not seated properly or damaged.
- Without a cartridge properly in place the safety bore is not sealed, the air escapes into the atmosphere, no pressure can be built up and thus it is ensured that unfiltered air is not supplied to the consuming device.
- If air is escaping from the safety bore remove and check cartridge. If necessary replace the cartridge or O-rings.

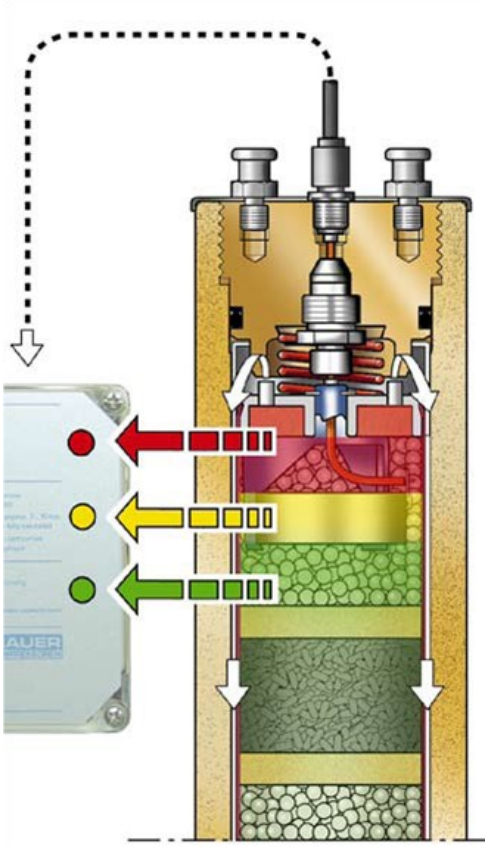


› OPTION

- Securus

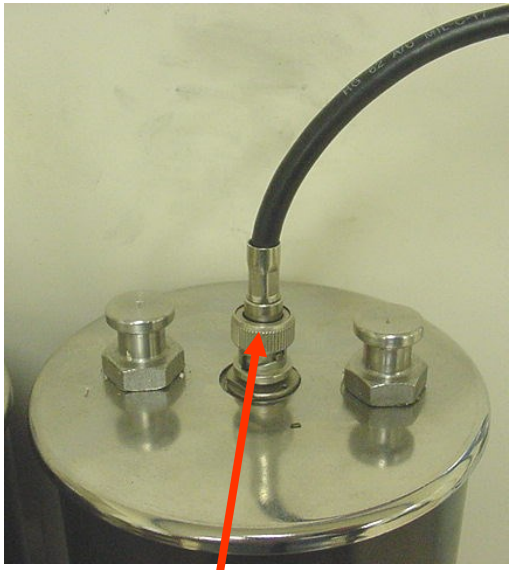
The patented SECURUS system (optional) reliably monitors the service life of the cartridge.

- With SECURUS it is impossible to overuse the filter.
- This can only be achieved with a patented sensor technology, which is integrated in the filter cartridge. The integrated sensor indicates the necessity for cartridge change prematurely, warning in time about the exhaustion of the cartridge capacity and, finally switches the compressor off.



Securus

Securus



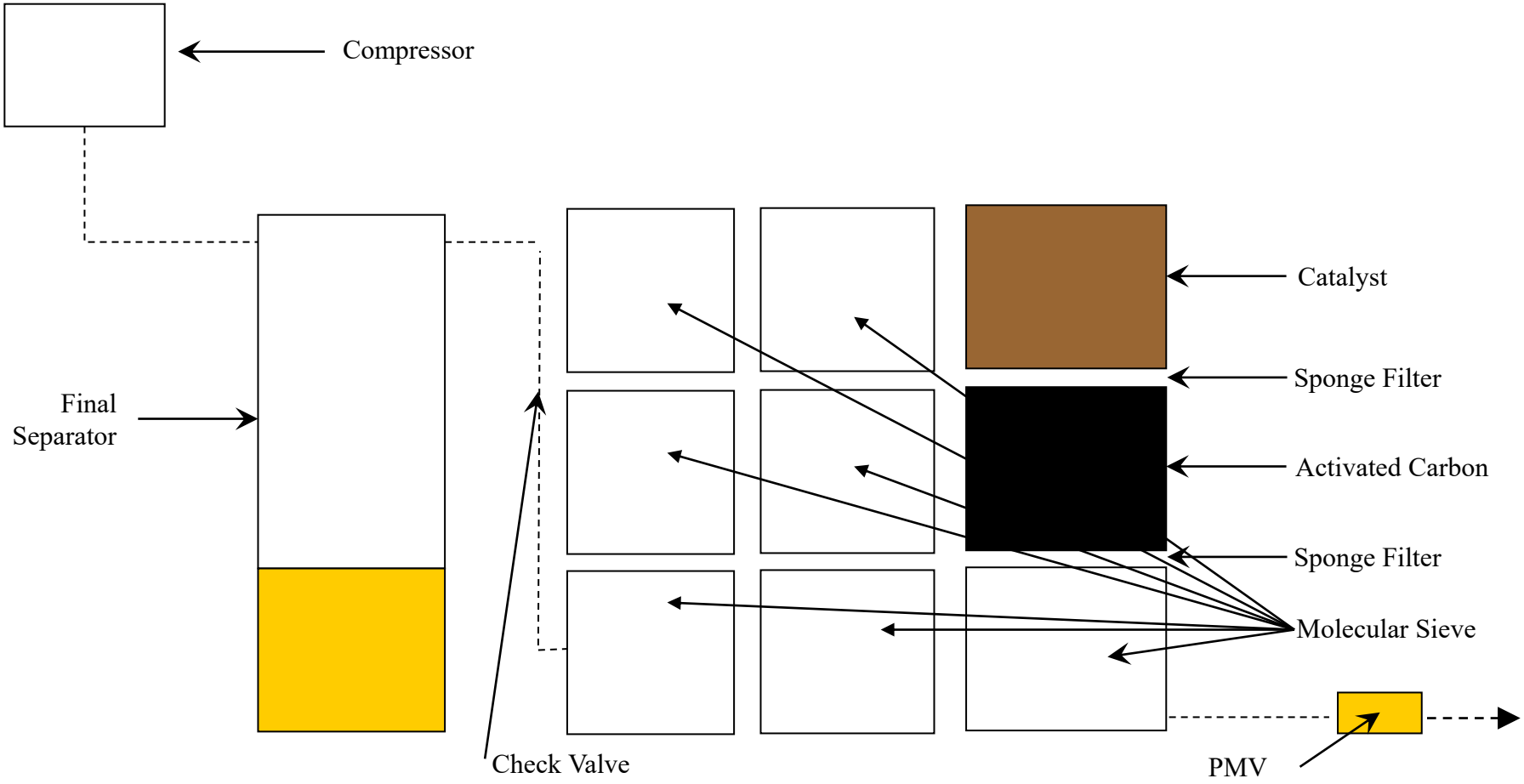
COAXIAL CABLE TO THE CARTRIDGE HOUSING

COAXIAL CABLE FROM THE INDICATOR TO THE HOUSING

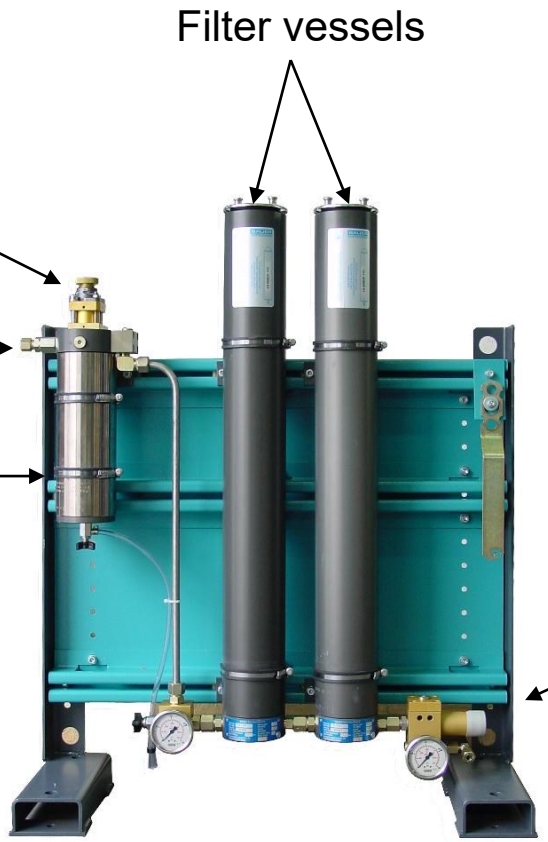
PIN SHOULD BE INSPECTED FOR DAMAGE. DAMAGE TO PIN WILL CAUSE INCORRECT ASSESTMENT OF THE CARTRIDGE.

SECURUS CARTRIDGE

Air flow through three tower purification



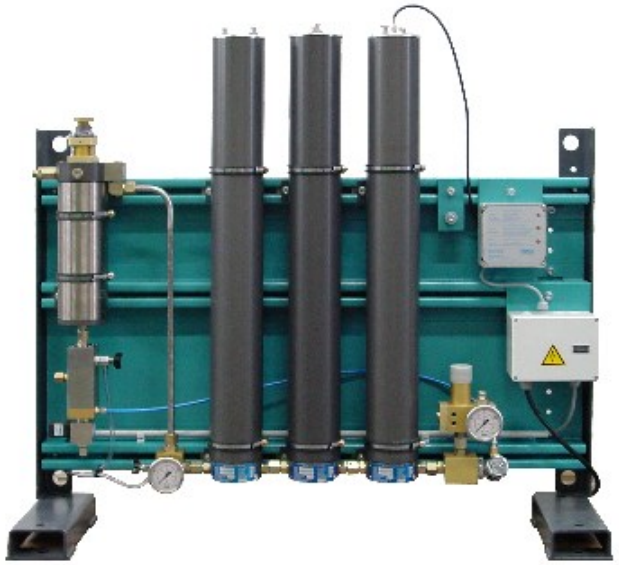
BAUER filter system



P80 with oil/water separator

BAUER filter system

P60 with oil/water separator + ACD



P100 with oil/water separator + ACD + Securus

BAUER filter system

P120 with oil/water
separator + ACD

P140 with oil/water
separator + ACD + Securus

Pressure maintaining valve

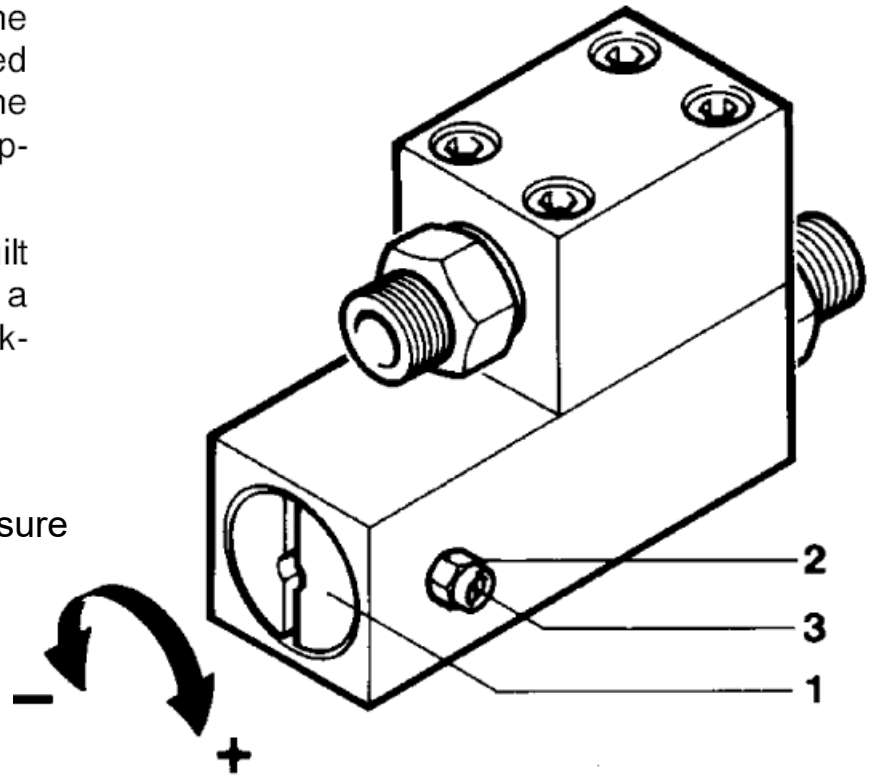
Clockwise = increase pressure
Counter-clockwise = decrease pressure

A pressure maintaining and a non-return valve are provided downstream of the filter system. Depending on the model, the combined pressure maintaining/non-return valve is mounted on the frame of the compressor unit, or on the outside of the housing. For the bare compressor block it is available as an optional extra.

The pressure maintaining valve ensures that pressure is built up in the filters even from the start of delivery, thus achieving a constant, optimum filtration. It will also guarantee proper working conditions for the final stage cylinder.

The pressure maintaining valve is adjusted to

160-180 Bar dependant upon operating pressure



1 PMV adjusting screw

2 Lock nut

3 Stud

Dew point / pressure dew point

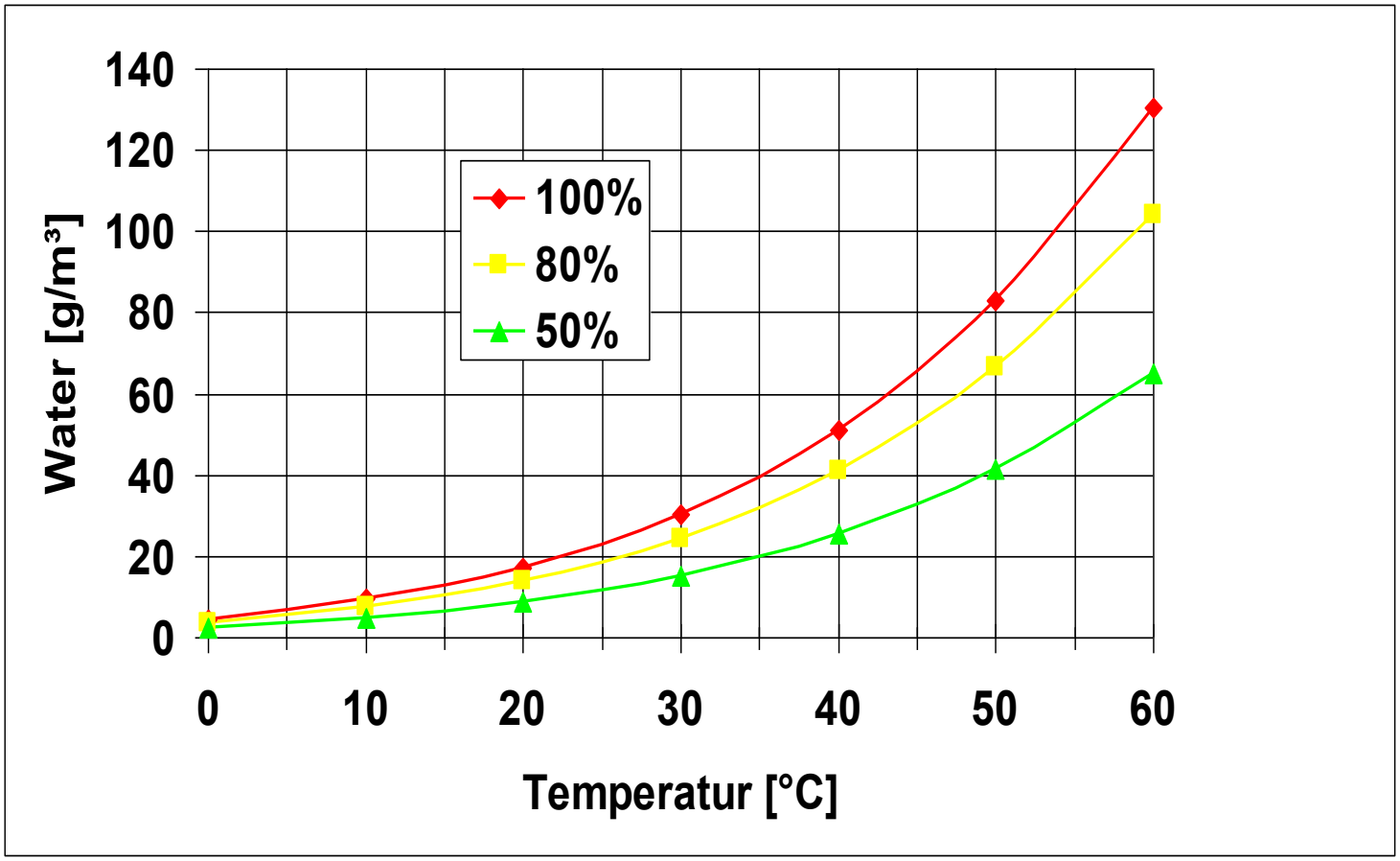
The simplified explanation…

When air of 1 bar (abs) pressure is cooled down, a dew droplet will be formed when a certain temperature has been reached. That temperature is called “dew point”.

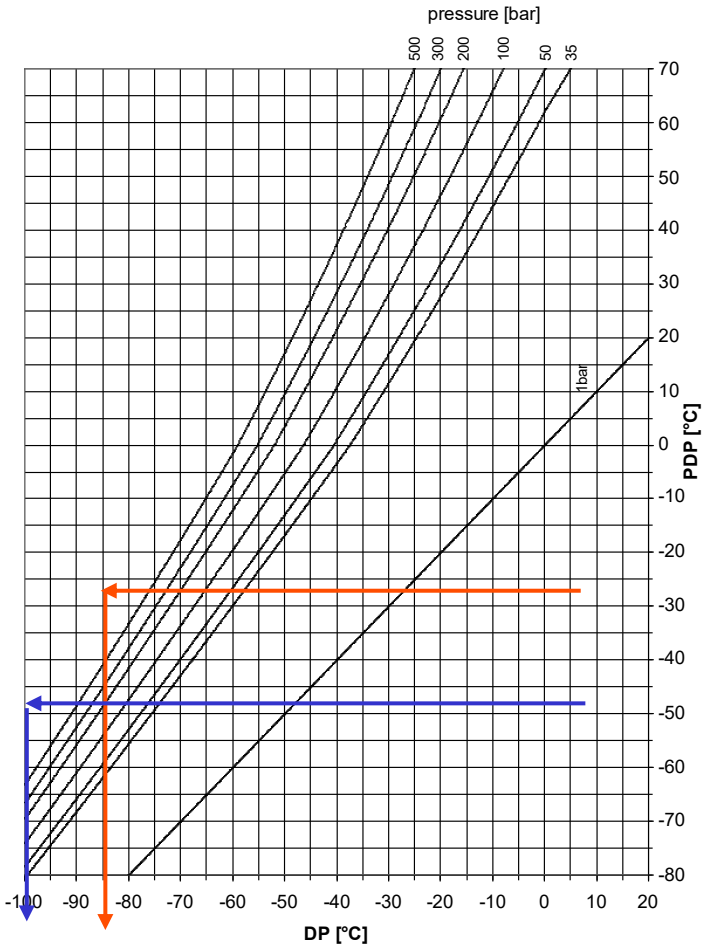
When air of a higher pressure is cooled down, a dew droplet will be formed when a certain temperature has been reached, too. That temperature is called “pressure dew point at X bar”.

The lower the aforementioned temperatures, the dryer the air is.

Dew point / pressure dew point



Dew point / pressure dew point



Example 1: pressure dew point - dew point

Air quality with P-filter:

Pressure dew point: -20°C

Final pressure compressor: 300 bar

Atmospheric dew point: -69°C (according chart)

Example 2: pressure dew point - dew point

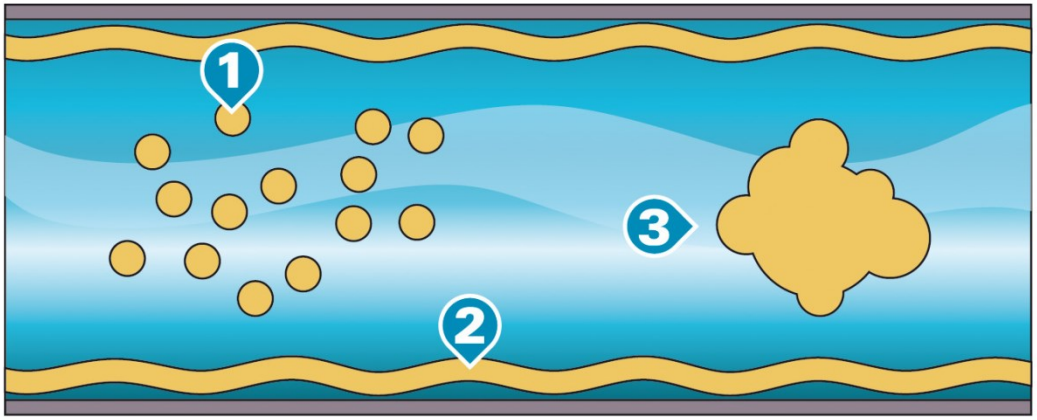
Air quality with external filter:

Pressure dew point: -40°C

Final pressure compressor: 500 bar

Atmospheric dew point: ~84°C

Air quality - Oil content



1. **Aerosols** - Minute droplets of oil suspended in the air stream
2. **Wall flow** - Oil in liquid form, which creeps along the pipe wall
3. **Vapors or oil mist** - Vaporised oil in a cloud form

Air quality

Compressed air according ISO 8573-1

Class	Oil	Particle	Water
	Aerosol + Vapour [mg/m³]	[µm]	Pressure dew point [°C]
1	0,01	0,1	-70
2	0,1	1	-40
3	1	5	-20
4	5	15	3
5	25	40	7
6	--	--	10

EN 12021 Standard for Breathing Air Quality

Substance	Criteria
Oxygen	20 to 22 %
Carbon Monoxide	15ppm Max.
Carbon Dioxide	500ppm Max.
Oil Mist	0.5 mg/m^3
Odour - Taste	Without significant odour or taste
Water (Liquid)	No free liquid
Water (Vapour) Tube	
0 to 40 Bar	50 to 200 mg/m^3
40 to 200 Bar	50mg/m^3 Max.
200 to 300 Bar	35mg/m^3 Max.

Any Questions?