

White paper

Food safety: suitability for use in the food industry through high compressed air quality



Great care must always be taken when compressed air comes into contact with food, because compressed air is not clean by nature. On the contrary, solids and particles are present almost everywhere in the form of dust in various concentrations. Water, in the form of natural atmospheric humidity, is released in large quantities when the compressed air cools down. And thus compressed air quality in accordance with the requirements of the respective application provides best possible safety for foods, consumers and food producers.

This white paper includes information on:

- Compressed air preparation and compressed air quality classes
- Filter cascades for typical applications

Standards-compliant compressed air preparation

Extremely strict requirements are stipulated for compressed air quality in the food and beverage industry. Adherence to them is important in order to ensure best possible food safety, and thus reduce consumers risks as well.

International standards are helpful in this respect. For example, ISO 8573-1:2010 specifies quality requirements for compressed air and stipulates maximum permissible levels of contamination and particle sizes for the respective quality classes. At the same time, standards provide us with the opportunity of penetrating global markets thanks to clear-cut, logical standardisation.

Standards-compliant, energy efficient compressed air preparation for automation solutions therefore makes it necessary to answer questions regarding various parameters such as quality classes for:

- Solid particles
- Water content
- Total oil content

A corresponding definition is included in ISO 8573-1:2010.



ISO 8573-1:2010 Klasse	Feststoffpartikel			Massekonzentration mg/m ³	Wasser		Öl Gesamtanteil Öl (flüssig, Aerosol und Nebel) mg/m ³
	Maximale Anzahl Partikel pro m ³				Drucktaupunkt Dampf	Flüssigkeit	
	0,1 – 0,5 µm	0,5 – 1 µm	1 – 5 µm		°C	g/m ³	
0	Gemäß Festlegung durch den Gerätenutzer, strengere Anforderungen als Klasse 1						
1	≤ 20.000	≤ 400	≤ 10	–	≤ -70	–	0,01
2	≤ 400.000	≤ 6.000	≤ 100	–	≤ -40	–	0,1
3	–	≤ 90.000	≤ 1.000	–	≤ -20	–	1
4	–	–	≤ 10.000	–	≤ +3	–	5
5	–	–	≤ 100.000	–	≤ +7	–	–
6	–	–	–	≤ 5	≤ +10	–	–
7	–	–	–	5 – 10	–	≤ 0,5	–
8	–	–	–	–	–	0,5 – 5	–
9	–	–	–	–	–	5 – 10	–
X	–	–	–	> 10	–	> 10	> 10

Compressed air quality classes according to ISO 8573-1:2010

Success factors for correct compressed air preparation

Different compressed air qualities are required at different points within the production system. Consequently, a carefully thought-out concept is necessary for efficient use of compressed air preparation which, essentially, should take the special requirements for the production of each type of food into consideration. A combination of centralised, basic compressed air preparation and decentralised auxiliary preparation is advisable.

→ Compressed air as pilot air

In most cases, compressed air is used as pilot air, for example in order to control valves, cylinders and grippers. For this type of application, contamination only needs to be removed from the compressed air in order to protect the pneumatic components against corrosion and excessive wear. **Class 7:4:4** is recommended in this case, which can be achieved by means of a central refrigeration dryer with oil trap and a coarse particle filter (40 µm). For special applications in the food zone, it is beneficial to have the pilot air discharged centrally via an exhaust air collector.

→ Compressed air as process air

Significantly higher levels of purity are required when compressed air is used as process air, e.g. for blowing out moulds, or when it comes directly into contact with food. However, this is usually limited to specific locations.

Decentralised compressed air preparation, as close as possible to the consuming device, is advisable in this case. Consequently, only the required amount of air is prepared to the higher purity level, thus resulting in energy savings. Close proximity of compressed air preparation to the consuming device also minimises the danger of recontamination of highly purified air in the piping network, for instance with rust particles.

Filter cascades for typical applications

ISO 8573-1:2010 serves the exclusive purpose of defining quality classes. However, it makes no recommendations regarding which degree of compressed air purity should be specified in the food industry. Guidelines and recommendations issued by, for example, the VDMA and the BCAS (see also references on the last page) offer assistance in specifying suitable filter cascades.

→ Compressed air comes into direct contact with non-dry foods (e.g. beverages, meat, vegetables etc.).

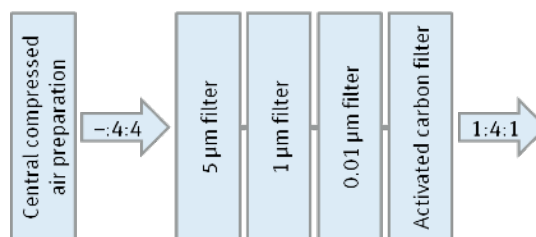
The compressed air is used for transporting and mixing, as well as for food production in general. It comes into direct contact with the food.

The following compressed air quality classification in accordance with ISO 8573-1:2010 applies:

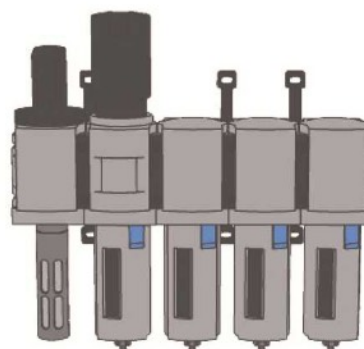
Solid particles: class 1

Water: class 4

Oil: class 1



Filter cascade for compliance with class 1:4:1



Example:

Service unit combination MS6 from Festo for compliance with class 1:4:1

→ Compressed air comes into direct contact with dry foods.

The compressed air is used for transporting and mixing, as well as for food production in general. It comes into direct contact with the food. Because these foods are dry, even stricter requirements apply with regard to atmospheric humidity. Consequently, the following classification in accordance with ISO 8573-1:2010 is recommended in this case:
Solid particles: class 1
Water: class 2
Oil: class 1



Filter cascade for compliance with class 1:2:1

Tip: If volumetric flow is throttled down to 70%, it's even possible to comply with class 1:1:1 using this cascade.



Example:
Adsorption dryer PDAD for targeted, decentralised compressed air drying

Important: In special applications involving contact with foodstuffs, it is advisable to also use a sterile filter to further reduce micro-organisms.

→ In packaging machines

The compressed air comes into direct contact with the packaging materials, which are subsequently filled with food. This makes the packaging material part of the food zone. The following compressed air quality classification in accordance with ISO 8573-1:2010 applies:
Solid particles: class 1
Water: class 4
Oil: class 1

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Further information is available on the web:
[Brochure: “Reliable processes through ideal compressed air preparation”](#)
www.festo.com/foodsafety

- Sources:
- VDMA specifications compressed air purity part 1 and 2
 - VDMA Position paper: “materials and articles for contact with packing gases, propellants, air or compressed air for food production or processing.”
ISO 8573-1:2010
 - Food grade compressed air – A code of practice (bcas.org.uk)
 - EnEffAH brochure; Energieeffizienz in der Produktion im Bereich Antriebs- und Handhabungstechnik, page 31