

| Effect of substances                |                                                                                                                     |                                                  |                                                                                       |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------|
| Device                              | Moisture                                                                                                            | Oil                                              | Particles                                                                             |
| Solenoid valve                      | - Malfunction by grease washed out<br>- Stuck valve due to rust<br>- Swollen rubber valve<br>- Reduced service life | - Swollen rubber valve<br>- Reduced service life | - Stuck valve                                                                         |
| Air cylinder rotary actuator        | - Malfunction by running grease<br>- Stuck valve due to rust<br>- Seized component<br>- Reduced service life        | - Reduced service life                           | - Poor piston rod sealing performance<br>- Reduced service life<br>- Stuck piston rod |
| Regulator pneumatic relay           | - Performance reduction or failure<br>- Reduced service life due to rust                                            | - Performance reduction or failure               | - Stuck valve                                                                         |
| Pneumatic instrumentation equipment | - Reduced service life due to rust<br>- Malfunction                                                                 | - Malfunction                                    |                                                                                       |
| Piping                              | - Rust formed inside a pipe                                                                                         | - Contamination                                  |                                                                                       |
| Air duster                          | - Contamination                                                                                                     |                                                  |                                                                                       |
| Air motor(Air driver/Air turbine)   | - Decreased revolutions<br>- Reduced service life due to rust                                                       | - Decreased revolutions or failure               | - Failure by seized component                                                         |
| Air blow                            | - Water droplets generated                                                                                          | - Contamination                                  |                                                                                       |
| Air micrometer                      | - Instrumentation error or failure                                                                                  |                                                  |                                                                                       |

## Understanding ISO quality air

There are no rules to define what air grade is suitable for each application, but ISO 8573-1 sets a scale depending on the concentration of each substance in the air. It uses three numbers in its classification, in order to set limits on particulate matter, moisture and oil contamination. Class 1, 1, 1 represents the cleanest, purest air under the standard, while -, -, - would represent air too contaminated to make the scale.

### ISO 8573-1 air quality classification chart

| Class | Solid particles, particle size, d(mm)                                             |             |             |                       | Humidity and liquid water |                                  | Oil                        |
|-------|-----------------------------------------------------------------------------------|-------------|-------------|-----------------------|---------------------------|----------------------------------|----------------------------|
|       | Maximum number of particles per cubic meter as a function of particle size d [µm] |             |             | Mass concentration Cp | Pressure dew point        | Concentration of liquid water Cw | Concentration of total oil |
|       | 0.10 <d ≤0.5                                                                      | 0.5 <d ≤1.0 | 1.0 <d ≤5.0 | [mg/m³]               | [°C]                      | [g/m³]                           | [mg/m³]                    |
| 0     | As specified by the equipment user or supplier and more stringent than class 1    |             |             |                       |                           |                                  |                            |
| 1     | ≤20000                                                                            | ≤400        | ≤10         | —                     | ≤-70                      | —                                | ≤0.01                      |
| 2     | ≤400000                                                                           | ≤6000       | ≤100        | —                     | ≤-40                      | —                                | ≤0.1                       |
| 3     | —                                                                                 | ≤90000      | ≤1000       | —                     | ≤-20                      | —                                | ≤1                         |
| 4     | —                                                                                 | —           | ≤10000      | —                     | ≤3                        | —                                | ≤5                         |
| 5     | —                                                                                 | —           | ≤100000     | —                     | ≤7                        | —                                | —                          |
| 6     | —                                                                                 | —           | —           | 0 <Cp ≤5              | ≤10                       | —                                | —                          |
| 7     | —                                                                                 | —           | —           | 5 <Cp ≤10             | —                         | Cw ≤0.5                          | —                          |
| 8     | —                                                                                 | —           | —           | —                     | —                         | 0.5 <Cw ≤5                       | —                          |
| 9     | —                                                                                 | —           | —           | —                     | —                         | 5 <Cw ≤10                        | —                          |
| x     | —                                                                                 | —           | —           | Cp >10                | —                         | Cw >10                           | >5                         |

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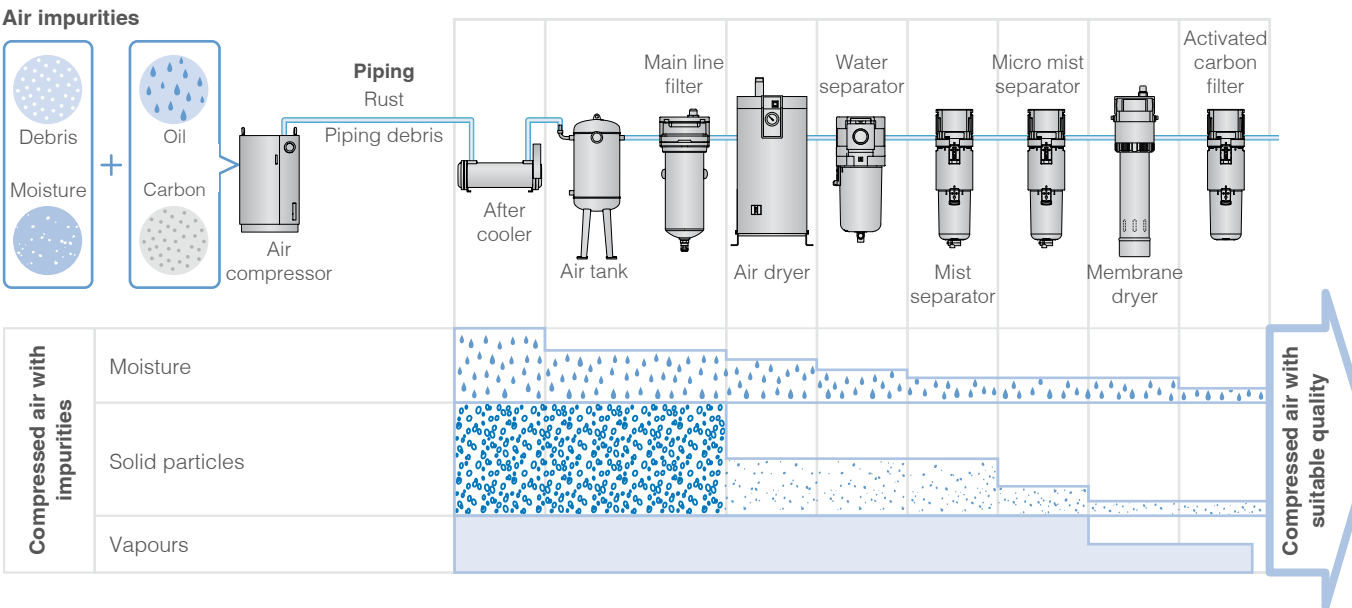
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**Air treatment guide**  
Choose your path to the right quality

**Atmospheric air contains pollution that remains in the system unless it's removed. Furthermore, not all contamination sources are external, others are added during the compression and supply of the air.**

**The following table shows how different substances can be removed with the right product for each purpose.**



## Most common problems in pneumatic systems

If not correctly removed, this foreign matter can result in many different problems, depending on the component and the type of substance.

**Moisture and oil**  
Wash out of grease

Swelling of rubber seals

Solidification of powder

**Water droplets**  
Contamination of air blow

**Rust**  
Piping: stuck auto drains

Devices: corroded pistons and spools

**Debris**  
Seal damage

**Weather and seasonal problems**  
Over processing due to increased humidity

Model selection guide

This table is a guide to choose the path to the right air quality for different industrial applications. Start by specifying the particle, water and oil parameters that you wish to achieve in your system or by selecting your application and seeing which components can help you fulfil your purpose. For further product information, please visit [www.smc.eu](http://www.smc.eu).

Note 1) When the oil mist concentration (compressor discharge concentration) on the inlet side is approx. 10 mg/m<sup>3</sup> (ANR) or less.  
Note 2) Refers to the compressed air quality based on ISO 8573-1:2010 with an inlet air quality [7:4:4].  
Note 3) This describes the grade of compressed air quality based on ISO 8573-1: 2010 (JIS B8392-1: 2012), which is the maximum quality grade for the system. It varies, however, depending on the inlet air conditions.  
Note 4) Inlet air should be adjusted so the products deliver the right quality.

| System | Application example                                                                                                                                                                | Recommended ISO Air quality class for the application <sup>3, 4)</sup> | Maximum number of particles per m <sup>3</sup> as a function of particle size d   | Humidity and liquid water                                                         |                                         | Oil                                    |               |      |  |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------|----------------------------------------|---------------|------|--|
|        |                                                                                                                                                                                    |                                                                        |                                                                                   | Dew point [°C]                                                                    | Water concentration [g/m <sup>3</sup> ] | Oil concentration [mg/m <sup>3</sup> ] | Odour removed |      |  |
| A      | Water droplets removed air                                                                                                                                                         | 5:7:~                                                                  | 1.0 µm < d ≤5.0 µm: ≤100000                                                       | —                                                                                 | 0.5                                     | >5                                     |               |      |  |
|        | - Air blowing (Simple removal of particles)<br>- General pneumatic tools<br>- Pilot air                                                                                            | 4:7:~                                                                  |                                                                                   |                                                                                   |                                         |                                        |               |      |  |
| B      | Dry air                                                                                                                                                                            | 4:6:~                                                                  | 1.0 µm < d ≤5.0 µm: ≤10000                                                        | ≤10                                                                               |                                         |                                        |               |      |  |
|        | - General pneumatic equipment with large temperature drops                                                                                                                         | 4:5:~                                                                  |                                                                                   | ≤7                                                                                |                                         |                                        |               |      |  |
|        |                                                                                                                                                                                    | 4:4:~                                                                  |                                                                                   | ≤3                                                                                |                                         |                                        |               |      |  |
| C      | Dry air                                                                                                                                                                            | 2:6:3                                                                  | 1.0 µm < d ≤5.0 µm: ≤100                                                          | ≤10                                                                               |                                         |                                        | ≤1            |      |  |
|        | - Pneumatic equipment<br>- General painting                                                                                                                                        | 2:5:3                                                                  | 0.5 µm < d ≤1.0 µm: ≤6000                                                         | ≤7                                                                                |                                         |                                        |               |      |  |
|        |                                                                                                                                                                                    | 2:4:3                                                                  | 0.1 µm < d ≤0.5 µm: ≤400000                                                       | ≤3                                                                                |                                         |                                        |               |      |  |
| D      | Dry & Clean air                                                                                                                                                                    | 1:6:2                                                                  | 1.0 µm < d ≤5.0 µm: ≤10<br>0.5 µm < d ≤1.0 µm: ≤400<br>0.1 µm < d ≤0.5 µm: ≤20000 | ≤10                                                                               | —                                       |                                        |               | ≤0.1 |  |
|        | - High grade painting<br>- Sequence control<br>- Measurement devices<br>- Instrumentation<br>- Drying and cleaning of precision parts<br>- Pneumatic bearings                      | 1:5:2                                                                  |                                                                                   | ≤7                                                                                |                                         |                                        |               |      |  |
|        |                                                                                                                                                                                    | 1:4:2                                                                  |                                                                                   | ≤3                                                                                |                                         |                                        |               |      |  |
| E      | Dry & Clean air                                                                                                                                                                    | 1:6:1                                                                  |                                                                                   | ≤10                                                                               |                                         |                                        |               |      |  |
|        | - Machine tools<br>- 3-D measurement device                                                                                                                                        | 1:5:1                                                                  |                                                                                   | ≤7                                                                                |                                         |                                        |               |      |  |
| F      | Deodorised air                                                                                                                                                                     | 1:4:1                                                                  |                                                                                   | 1.0 µm < d ≤5.0 µm: ≤10<br>0.5 µm < d ≤1.0 µm: ≤400<br>0.1 µm < d ≤0.5 µm: ≤20000 |                                         | ≤3                                     |               |      |  |
|        | - Stirring, transporting<br>- Packaging machines<br>- Blowing air onto food products                                                                                               |                                                                        |                                                                                   |                                                                                   |                                         |                                        |               |      |  |
| G      | Low dew point clean air                                                                                                                                                            | 1:3:1                                                                  |                                                                                   | ≤-20                                                                              |                                         | ≤0.003                                 | Yes           |      |  |
|        | - Drying electric and electronic parts<br>- Drying a filling tank<br>- Transporting powders<br>- Ozone generators<br>- Low temperature environments<br>- Food contact applications | 1:2:1                                                                  |                                                                                   | ≤-40                                                                              |                                         |                                        |               |      |  |
| H      | Low dew point clean air (for clean room)                                                                                                                                           |                                                                        | 1:1:1                                                                             | ≤-70                                                                              |                                         |                                        |               |      |  |
|        | - Blowing semiconductors<br>- Clean room applications                                                                                                                              |                                                                        |                                                                                   |                                                                                   |                                         |                                        |               |      |  |

|                                                   | Sub line                                                                            |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | Local line                                                                          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | Specialised filtration                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
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| Product name                                      | Main line filter                                                                    |                                                                                     |                                                                                     | Refrigerated air dryer                                                              |                                                                                     |                                                                                     | Water separator                                                                     | Mist separator                                                                      |                                                                                     |                                                                                     | Micro mist separator                                                                |                                                                                     |                                                                                     | Membrane air dryer                                                                  |                                                                                     | Activated carbon filter                                                             |                                                                                     | Clean air filter                                                                    | Clean gas filters                                                                   | Bacteria removal filter                                                             |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Model                                             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                                                   | AF-D                                                                                | AFF20-60D                                                                           | AFF70-90D                                                                           | IDFA3-15E                                                                           | IDFA60/70/80/90                                                                     | IDFA100/125/150F                                                                    | AFG-D                                                                               | AFM-D                                                                               | AM20-60D                                                                            | AM70-90D                                                                            | AFD-D                                                                               | AMD20-60D                                                                           | AMD70-90D                                                                           | IDG-D                                                                               | IDG                                                                                 | AMK                                                                                 | AMF450C-550C / 650-850                                                              | SFD                                                                                 | SFA, SFB, SFC                                                                       | HF2-BFA                                                                             | HF2-BFB                                                                             | HF2-BFC                                                                             | HF2-BFD                                                                             | HF2B-SFDA                                                                           |
| Maximum air flow (l/min) (ANR)) 0.7 MPa           | 14550                                                                               | 3700                                                                                | 14500                                                                               | 13700                                                                               | 16000                                                                               | 22700                                                                               | 4000                                                                                | 1100                                                                                | 3700                                                                                | 14500                                                                               | 600                                                                                 | 3700                                                                                | 14500                                                                               | 500                                                                                 | 1000                                                                                | 3700                                                                                | 12000                                                                               | 500                                                                                 | 300                                                                                 | 800                                                                                 |                                                                                     |                                                                                     | 500                                                                                 |                                                                                     |
| Maximum inlet air temperature                     | 60 °C                                                                               |                                                                                     |                                                                                     | 50 °C                                                                               | 65 °C                                                                               |                                                                                     | 60 °C                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 50 °C                                                                               | 55 °C                                                                               | 60 °C                                                                               |                                                                                     | 45 °C                                                                               | 80 °C, 120 °C                                                                       | 60 °C                                                                               |                                                                                     |                                                                                     | 45 °C                                                                               |                                                                                     |
| Nominal filtration degree (filtering efficiency)  | 5 µm                                                                                | 1 µm (99 %)<br>Water droplet removal rate: 99 %                                     |                                                                                     | —                                                                                   |                                                                                     |                                                                                     | —                                                                                   | 0.3 µm (99.9 %)                                                                     | 0.1 µm (99 %)                                                                       |                                                                                     | 0.01 µm (99.9 %)                                                                    |                                                                                     |                                                                                     | —                                                                                   |                                                                                     | —                                                                                   | 0.01 µm (99.9 %)                                                                    | 0.01 µm (99.9 %)                                                                    |                                                                                     | 5 µm (90 %)                                                                         | 0.1 µm (99 %)                                                                       | —                                                                                   | 0.01 µm (99.99 %)                                                                   |                                                                                     |
| Outlet oil mist concentration: max. <sup>1)</sup> | —                                                                                   |                                                                                     | —                                                                                   |                                                                                     |                                                                                     | —                                                                                   |                                                                                     | 1.0 mg/m <sup>3</sup> (ANR)<br>[0.8 ppm]                                            |                                                                                     |                                                                                     | 0.1 mg/m <sup>3</sup> (ANR)<br>[0.08 ppm]                                           |                                                                                     |                                                                                     | —                                                                                   |                                                                                     | 0.003 mg/m <sup>3</sup><br>[0.0025 ppm]                                             | 0.004 mg/m <sup>3</sup> (ANR)<br>[0.0032 ppm]                                       | —                                                                                   |                                                                                     |                                                                                     | 0.003 mg/m <sup>3</sup><br>[0.0025 ppm]                                             | —                                                                                   |                                                                                     |                                                                                     |
| Outlet ISO purity grade <sup>2)</sup>             | 6:4:4                                                                               | 5:4:4                                                                               |                                                                                     | —                                                                                   |                                                                                     |                                                                                     | —                                                                                   | 3:4:3                                                                               | 2:4:3                                                                               |                                                                                     | 1:4:2                                                                               |                                                                                     |                                                                                     | —                                                                                   |                                                                                     | 1:4:1                                                                               | Not rated                                                                           |                                                                                     | —                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Pressure dew point (Inlet pressure 0.7 MPa)       | —                                                                                   |                                                                                     |                                                                                     | 3 °C                                                                                |                                                                                     |                                                                                     | —                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | -57 °C                                                                              | -60 °C                                                                              | —                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

