ISO

ISO (International Standards Organisation) is the world's largest developer and publisher of international standards.

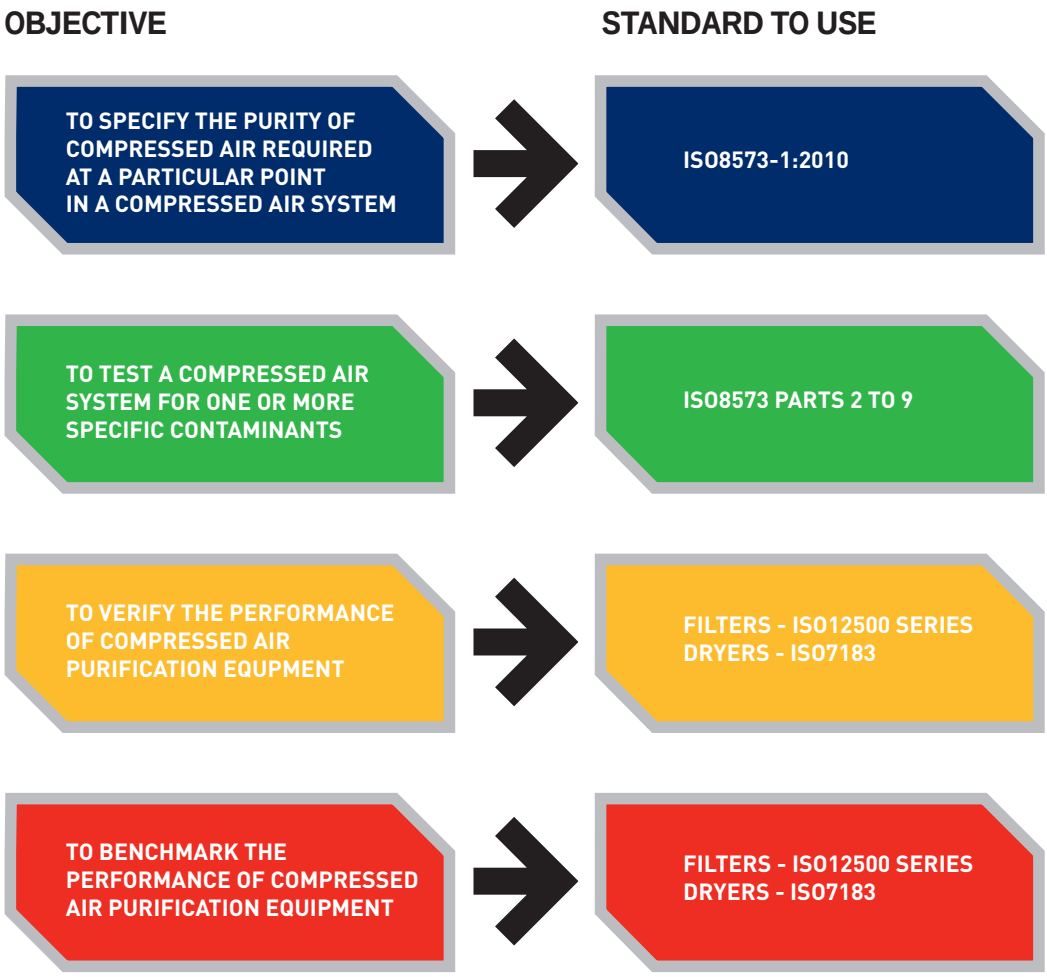
ISO is a network of the national standards institutes of 159 countries, one member per country, with a Central Secretariat in Geneva, Switzerland, that co-ordinates the system. ISO is a non-governmental organisation that forms a bridge between the public and private sectors.
On one hand, many of its member institutes are part of the governmental structure of their countries, or are mandated by their government. On the other hand, other members have their roots uniquely in the private sector, having been set up by national partnerships of industry associations.

Parker is a member of governing bodies such as BCAS (UK), CAGI (USA) and VDMA (Germany), which directly contribute to the development of international standards for compressed air quality and compressed air testing.

There are three ISO standards currently in use which directly relate to compressed air quality (purity) and testing. These are:

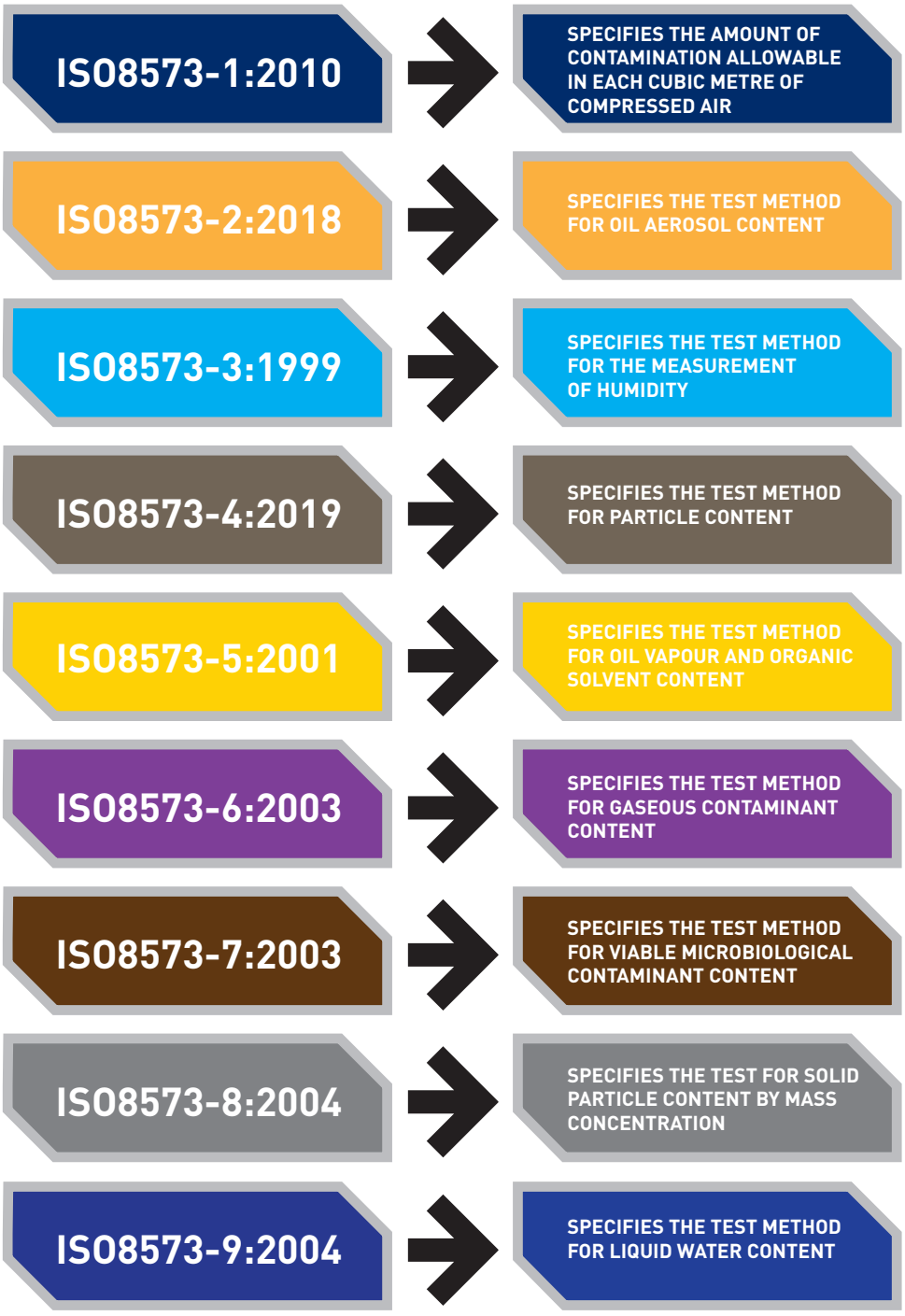
ISO8573 Series / ISO 12500 Series / ISO7183
The most commonly used standard is the ISO8573 Series and in particular ISO8573-1:2010.

Which of the three standards should I use?



ISO8573 - The Compressed Air Quality Standard

ISO8573 is the group of international standards relating to the quality (or purity) of compressed air. The standard consists of nine separate parts, with part 1 relating to quality classifications for compressed air and parts 2 - 9 specifying the methods of testing for a range of contaminants.



For information on testing in accordance with ISO 8573 parts 2 to 9, refer to Parker White Paper Compressed Air Quality Testing - WPCAQT-EN

ISO 8573 Series - Part 1

ISO8573-1 is the primary document used from the nine parts of the ISO8573 standard. Importantly, ISO8573-1 contains air purity classification tables which can be used in one of three ways.

1. **Compressed air users can use the air purity classifications it contains to specify the amount of contamination allowed in each cubic metre of compressed air**

   i.e. specify the minimum air purity (quality) they require at each usage point in the compressed air system

2. **Compressed air purification equipment manufacturers can use the air purity classifications to specify the purity (quality) of compressed air delivered downstream of their purification equipment**

3. **It can be used to classify the purity (quality) of compressed air at a specific point in the compressed air system (based upon the contaminants found following testing at that sample point)**

ISO8573-1 Air Purity Classifications Tables

It should be noted that within the ISO8573-1 standard document there are three individual classification tables, one for solid particulate, one for water and one for total oil. However, for many years the compressed air industry (compressor manufacturers and air treatment manufacturers) have combined the three tables into a single table for ease of use (see below).

Combined ISO8573-1 Table

ISO8573-1:2010 CLASS	Solid Particulate				Water		Oil
	Maximum number of particulates per m³			Mass Concentration mg/m³	Vapour Pressure Dewpoint	Liquid g/m³	Total Oil (aerosol liquid and vapour) mg/m³
	0.1 - 0.5 micron	0.5 - 1 micron	1 - 5 micron				
0	As specified by the equipment user or supplier and more stringent than Class 1						
1	≤ 20,000	≤ 400	≤ 10	–	≤ -70°C	–	0.01
2	≤ 400,000	≤ 6,000	≤ 100	–	≤ -40°C	–	0.1
3	–	≤ 90,000	≤ 1,000	–	≤ -20°C	–	1
4	–	–	≤ 10,000	–	≤ +3°C	–	5
5	–	–	≤ 100,000	–	≤ +7°C	–	–
6	–	–	–	≤ 5	≤ +10°C	–	–
7	–	–	–	5 - 10	–	≤ 0.5	–
8	–	–	–	–	–	0.5 - 5	–
9	–	–	–	–	–	5 - 10	–
X	–	–	–	> 10	–	> 10	> 10

Specifying Air Purity (Quality) in Accordance with ISO8573-1

In the ISO8573-1 table, compressed air contaminants are grouped into Particulate, Water and Total Oil. Different levels of contamination (per cubic metre) are then assigned “Purity Classes”.

When using ISO8573-1 to define the air purity (quality) required at a specific usage point in the compressed air system, the specification should be written as follows:

First the standard (ISO8573-1) must be written, then the year (revision) stated then the purity classes required (each separated with a colon), e.g. ISO8573-1:2010 [A:B:C:]

Where:

A is the purity class for particles

B is the purity class for humidity (vapour) and liquid water

C is the purity class for total oil (aerosol, liquid and vapour)

An example of how to write an air purity (quality) specification using ISO8573-1 is shown below :

ISO8573-1:2010 Class 1:2:1

Selecting an air purity classification of 1.2.1 would specify the following air purity (quality) when operating at the standard’s reference conditions:

Class 1 Particulate

In each cubic metre of compressed air, the particulate count should not exceed 20,000 particles in the 0.1 - 0.5 micron size range, not more than 400 particles in the 0.5 - 1 micron size range and not more than 10 particles in the 1 - 5 micron size range.

Class 2 Water

A pressure dewpoint (PDP) of -40°C or better is required and no liquid water or water aerosols are allowed.

Class 1 Oil

In each cubic metre of compressed air, not more than 0.01mg of oil is allowed. This is a value for total oil (liquid oil, oil aerosol and oil vapour combined).

ISO8573-1 Class 0

Class 0 (Class Zero) is a reference to an ISO8573-1 air purity classification (although this is not always stated by equipment manufacturers) which is often misused in marketing literature and is the cause of much confusion for compressed air users.

1991 Classification Table (combined)

When ISO8573-1 was first developed and introduced in 1991, the classification for each contaminant (particulate / water / total oil) had a value associated to it and the classifications were numbered from 1 to 6.

ISO8573-1:1991 CLASS	Solid Particles		Water	Oil
	Maximum Particle Size µm	Maximum Concentration mg/m³	Maximum Pressure Dewpoint	Maximum Concentration mg/m³
1	0.1	0.1	-70°C	0.01
2	1	1	-40°C	0.1
3	5	5	-20°C	1
4	15	8	+3°C	5
5	40	10	+7°C	25
6			+10°C	

2010 Classification Table (combined)

In 2001, the standard was updated and Class 0 was introduced for all 3 contaminants (this carried through to the 2010 update). Class 0 was introduced as a "customisable" specification for users or manufacturers to use should the air purity requirement (users) or delivered air quality (for equipment manufacturers) be more stringent (cleaner) than Class 1.

ISO8573-1:2010 CLASS	Solid Particulate				Water		Oil
	Maximum number of particulates per m³			Mass Concentration mg/m³	Vapour Pressure Dewpoint	Liquid g/m³	Total Oil (aerosol liquid and vapour)
	0.1 - 0.5 micron	0.5 - 1 micron	1 - 5 micron				mg/m³
0	As specified by the equipment user or supplier and more stringent than Class 1						
1	≤ 20,000	≤ 400	≤ 10	–	≤ -70°C	–	0.01
2	≤ 400,000	≤ 6,000	≤ 100	–	≤ -40°C	–	0.1
3	–	≤ 90,000	≤ 1,000	–	≤ -20°C	–	1
4	–	–	≤ 10,000	–	≤ +3°C	–	5
5	–	–	≤ 100,000	–	≤ +7°C	–	–
6	–	–	–	≤ 5	≤ +10°C	–	–
7	–	–	–	5 - 10	–	≤ 0.5	–
8	–	–	–	–	–	0.5 - 5	–
9	–	–	–	–	–	5 - 10	–
X	–	–	–	> 10	–	> 10	> 10

ISO8573-1 Class 0 - Myths

Unfortunately, the ISO8573-1 Class 0 classification is often misapplied to air compressors or treatment products (almost all oil-free compressors are sold under the banner of Class 0). It is often implied in marketing literature that:

- **Class 0 means zero contamination in the compressed air**
- **Class 0 refers to oil contamination only**
- **A Class 0 compressor guarantees totally oil free compressed air**
- **The contamination value associated with Class 0 for oil is 0mg/m³**

ISO8573-1 Class 0 - Facts

When referring to ISO8573-1 Class 0, it is important to remember:

- **Class 0 does not mean zero contamination**
- **Class 0 does not mean oil-free compressed air**
- **A Class 0 compressor does not guarantee oil-free compressed air**
- **Class 0 does not solely refer to oil contamination**
- **A Class 0 specification must be 'cleaner' than the Class 1 specification for the contaminant chosen**
- **The contamination levels stated for a Class 0 specification must also be within the measurement capabilities of the test equipment and test methods shown in ISO8573 Pt 2 to Pt 9**
- **The Class 0 specification must clearly state which contaminant the Class 0 claim refers to**

  - i.e. "Solid Particulate", "Water" or "Total Oil (aerosol, liquid & vapour)"
- **Class 0 requires the user or the equipment supplier to show a contamination level as part of a written specification**

Example of a correctly written Class 0 specification

> ***"When preceded by OIL-X Grade AO General Purpose & Grade AA High Efficiency Coalescing Filters, OIL-X OVR Grade Adsorption Filters provide a delivered air quality in accordance with ISO8573-1:2010 Class 0 (≤0.003 mg/m³) for total oil (oil aerosol & oil vapour)"***

- **The agreed Class 0 specification must be written on all documentation to be in accordance with the standard**
- **Stating Class 0 without an accompanying contaminant specification is meaningless and not in accordance with the standard**

Which Revisions of ISO8573-1 Should I Use?

There are currently 3 revisions of ISO 8573-1, 1991, 2001 & 2010, with the 2010 edition being the latest. Ideally, the 2010 edition should be used when specifying a new system or when upgrading a system.

The table below provides an overview of the Parker purification equipment required to meet or exceed the classifications shown in the 2010 edition of the ISO8573-1 standard.

ISO 8573-1:2010

ISO 8573-1:2010 CLASS	Solid Particulate		Water	Oil
	Wet Particulate	Dry Particulate	Vapour	Total Oil (aerosol liquid and vapour)
0	–	–	–	OIL-X Grade AO + AA + OVR
1	OIL-X Grade AO + AA	OIL-X Grade AO (M) + AA (M)	Dryer sized for -70°C PDP	OIL-X Grade AO + AA + OVR OIL-X Grade AO + AA +ACS
2	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for -40°C PDP	OIL-X Grade AO + AA
3	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for -20°C PDP	OIL-X Grade AO
4	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for +3°C PDP	OIL-X Grade AO
5	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for +7°C PDP	–
6	–	–	Dryer sized for +10°C PDP	–

If the purity (quality) levels of a compressed air system have previously been specified using previous editions of the standard (2001 or 1991) it is perfectly acceptable to continue using these revisions, however it should be noted that due to changes in the contamination levels, different purification equipment may be required to achieve the required classifications.

The table below provides an overview of the Parker purification equipment required to meet or exceed the classifications shown in the 2001 edition of the ISO8573-1 standard.

ISO 8573-1:2001

ISO 8573-1:2001 CLASS	Solid Particulate		Water	Oil
	Wet Particulate	Dry Particulate	Vapour	Total Oil (aerosol liquid and vapour)
0	–	–	–	OIL-X Grade AO + AA + OVR
1	OIL-X Grade AO + AA + TETPOR II	OIL-X Grade AO (M) + AA (M) + TETPOR II	Dryer sized for -70°C PDP	OIL-X Grade AO + AA + OVR OIL-X Grade AO + AA +ACS
2	OIL-X Grade AO + AA	OIL-X Grade AO (M) + AA (M)	Dryer sized for -40°C PDP	OIL-X Grade AO + AA
3	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for -20°C PDP	OIL-X Grade AO
4	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for +3°C PDP	OIL-X Grade AO
5	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for +7°C PDP	–
6	–	–	Dryer sized for +10°C PDP	–

The table below provides an overview of the Parker purification equipment required to meet or exceed the classifications shown in the 2001 edition of the ISO8573-1 standard.

ISO 8573-1:1991

ISO 8573-1:1991 CLASS	Solid Particulate		Water	Oil
	Wet Particulate	Dry Particulate	Vapour	Total Oil (aerosol liquid and vapour)
1	OIL-X Grade AO + AA	OIL-X Grade AO (M) + AA (M)	Dryer sized for -70°C PDP	OIL-X Grade AO + AA + OVR OIL-X Grade AO + AA +ACS
2	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for -40°C PDP	OIL-X Grade AO + AA
3	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for -20°C PDP	OIL-X Grade AO
4	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for +3°C PDP	OIL-X Grade AO
5	OIL-X Grade AO	OIL-X Grade AO (M)	Dryer sized for +7°C PDP	–
6	–	–	Dryer sized for +10°C PDP	–

Selecting Parker Purification Equipment to Comply with ISO8573-1:2010 Classifications

The extensive range of purification equipment available from Parker allows the user to specify the quality of compressed air for every application, from general purpose ring main protection, through to critical clean dry air (CDA) point of use systems. Parker has comprehensive ranges of purification equipment available to exactly match system requirements, ensuring both capital and operational costs are kept to a minimum.

Simple guidelines for the selection of purification equipment

1. Purification equipment is installed to provide air quality and you must first of all identify the quality of compressed air required for your system. Each usage point in the system may require a different quality of compressed air dependent upon the application. Using the quality classification's shown in ISO8573-1 will assist your equipment supplier to quickly and easily select the correct purification equipment necessary for each part of the system.

2. ISO8573-1:2010 is the latest edition of the standard. Ensure it is written in full when contacting suppliers. Specifying air quality as ISO8573-1, ISO8573-1:1991 or ISO8573-1:2001 refers to the previous editions of the standard and may result in a different quality of delivered compressed air.

3. Ensure that the equipment under consideration will actually provide delivered air quality in accordance with the quality classifications you have selected from ISO8573-1:2010.

4. When comparing coalescing filters, ensure that they have been tested in accordance with both the ISO 12500-1 and ISO 8573-4 standards.

5. Ask for independent validation of product performance by a third party.

6. For peace of mind, ensure the manufacturer provides a written guarantee of delivered air quality.

7. Oil-free compressor installations require the same filtration considerations as oil lubricated compressor installations.

8. ISO 12500-1 requires pressure losses for coalescing filters to be recorded when the element is saturated (wet dP). When considering the operational costs of coalescing filters, ensure the pressure loss stated in literature is the saturated pressure loss as initial or dry pressure loss is not representative of actual performance in a normally wet compressed air system.

9. Look at the blockage characteristics of the filter. Just because it has a low starting dP, doesn't mean it will remain low throughout the filter element's lifetime. Energy costs should always be calculated based upon the blockage characteristics of the filter, not just initial saturated dp. Ask supplier for verification of blockage characteristics.

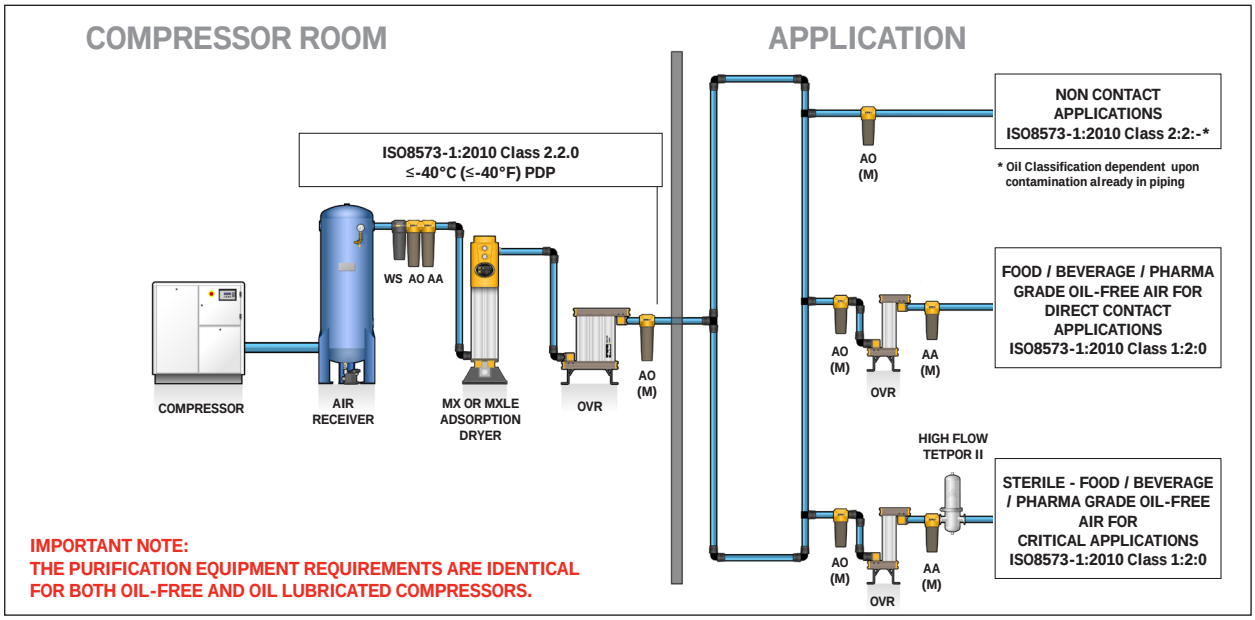
10. Look at the total cost of ownership for purification equipment (purchase cost, operational costs and maintenance costs), a low initial purchase price, may look inviting, but may end up costing significantly more in terms of poor air quality and high operational costs.

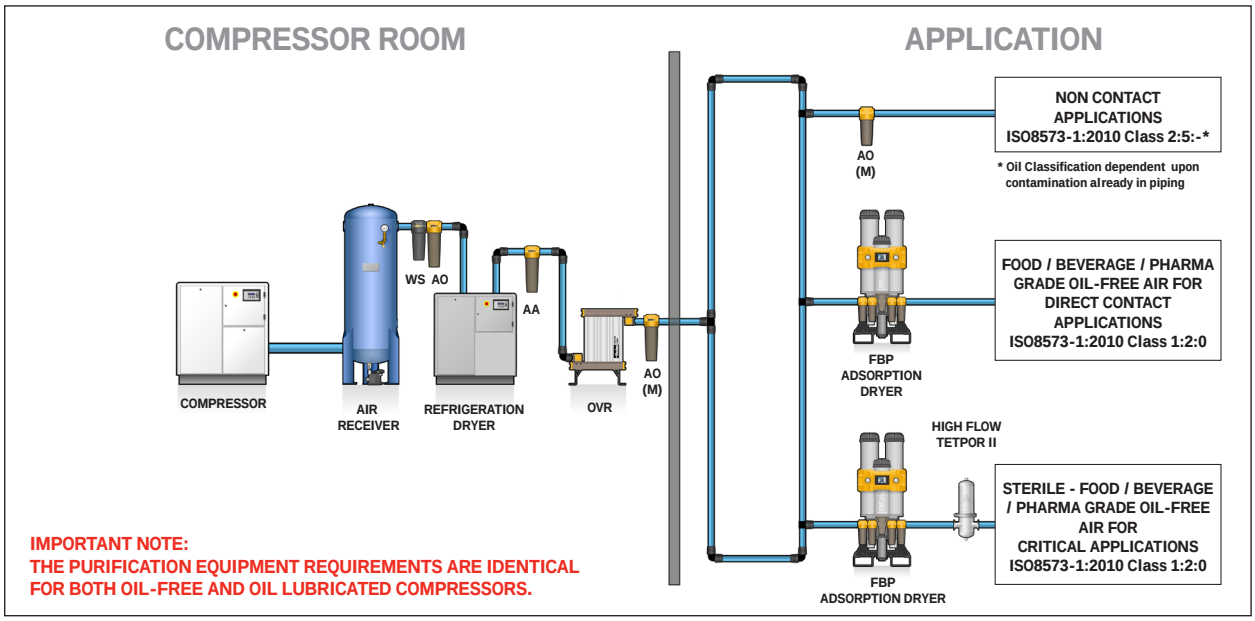
Cost Effective System Design

To achieve the stringent air quality levels required for today's modern production facilities, a careful approach to system design, commissioning and operation must be employed.

Treatment at one point alone is not enough and it is highly recommended that the compressed air is treated in the compressor room to a level that will provide general purpose air to the site and also protect the distribution piping. Point of use purification should also be employed, not only to remove any contamination remaining in the distribution system, but also with specific attention on the quality of air required by each application. This approach to system design ensures that air is not 'over treated' and provides the most cost effective solution to high quality compressed air.

FOOD / BEVERAGE / PHARMACEUTICAL - DIRECT CONTACT APPLICATIONS

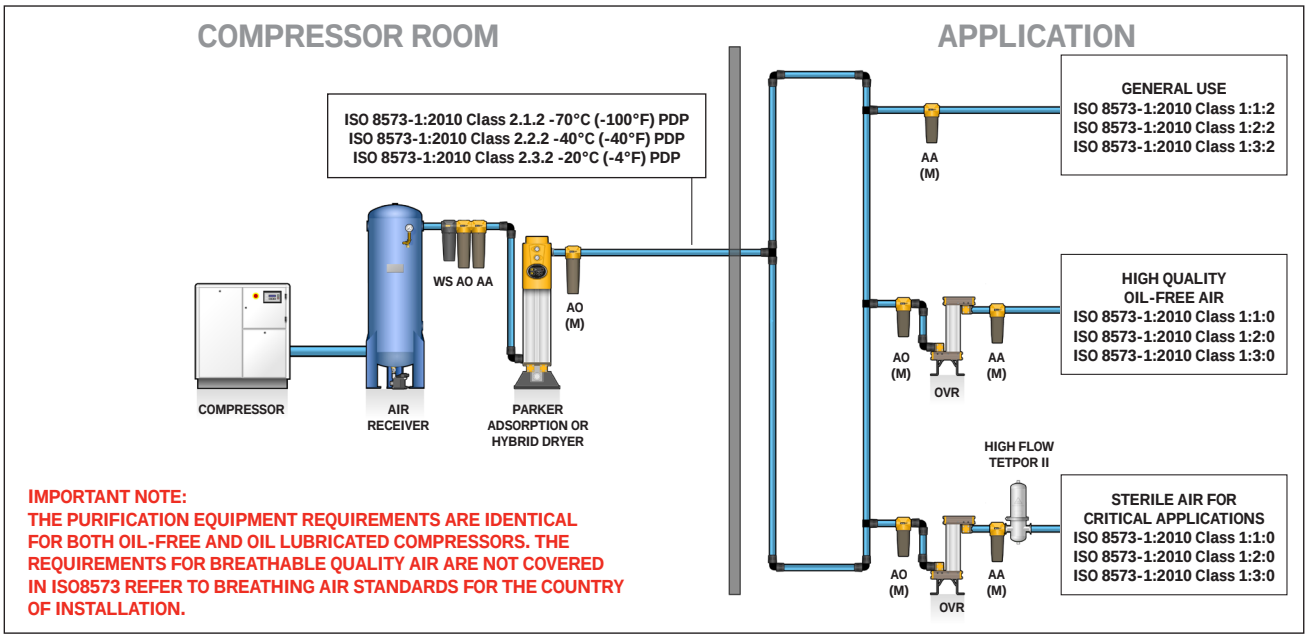




Typical Applications

Direct contact / in-direct contact applications in food manufacturing / beverage bottling / pharmaceutical manufacturing / dairies / breweries / wineries / distilleries (In accordance with BCAS Best Practice Guideline 102 Food & Beverage Grade Compressed Air).

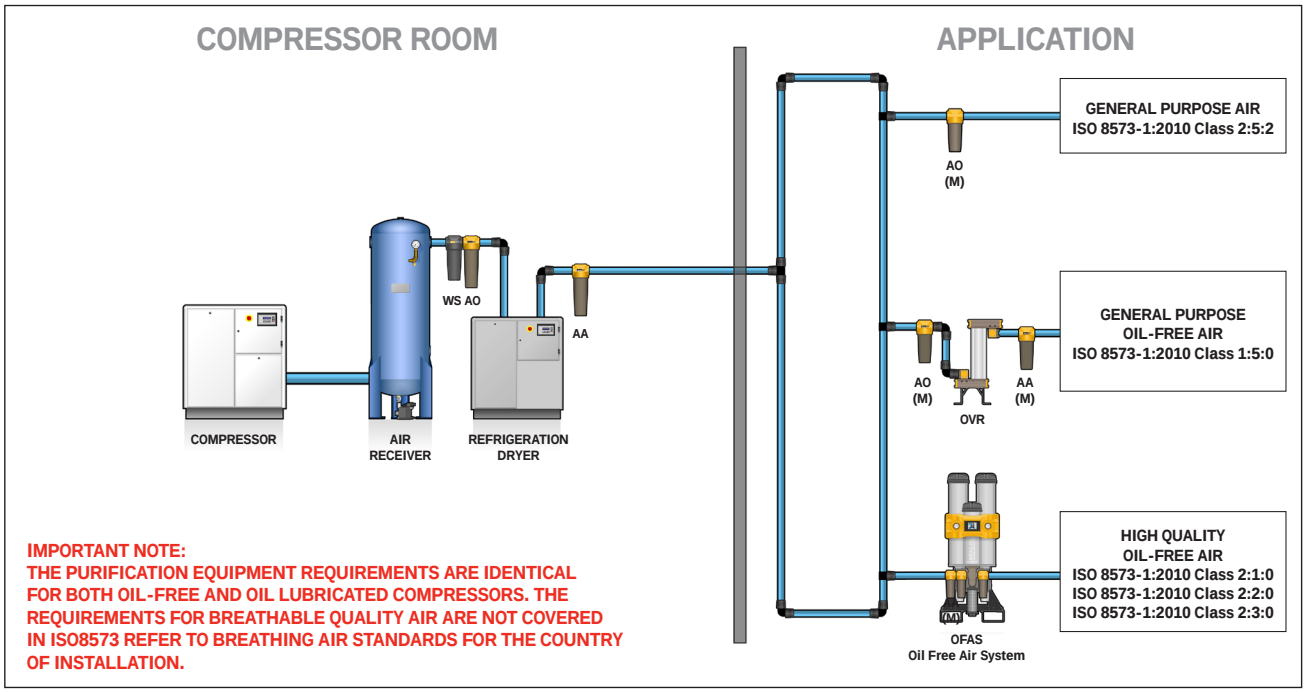
HIGH QUALITY TECHNICALLY OIL-FREE AIR



Typical Oil-Free Air Applications

Blow Moulding of Plastics e.g. P.E.T. Bottles
Electronics Manufacturing
CDA systems for electronics manufacturing
Film processing
Critical instrumentation
Advanced pneumatics
Air blast circuit breakers
Decompression chambers
Cosmetic production
Medical air
Dental air
Lasers and optics
Robotics
Spray painting
Air bearings
Pipeline purging
Measuring equipment
Blanketing
Modified Atmosphere Packaging
Pre-treatment for on-site gas generation

GENERAL PURPOSE AIR WITH OIL-FREE AIR FOR CRITICAL APPLICATIONS



Typical General Purpose Applications

General ring main protection
Pre-filtration to point of use adsorption air dryers
Plant automation
Air logistics
Pneumatic tools
General instrumentation
Metal stamping
Forging
General industrial assembly (no external piping)
Air conveying (Non Food)
Air motors
Workshop (Tools)
Garage (Tyre filling)
Temperature control systems
Blow guns
Gauging equipment
Raw material mixing
Sand / bead blasting