Introduction to ISO Air Quality Standards

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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.

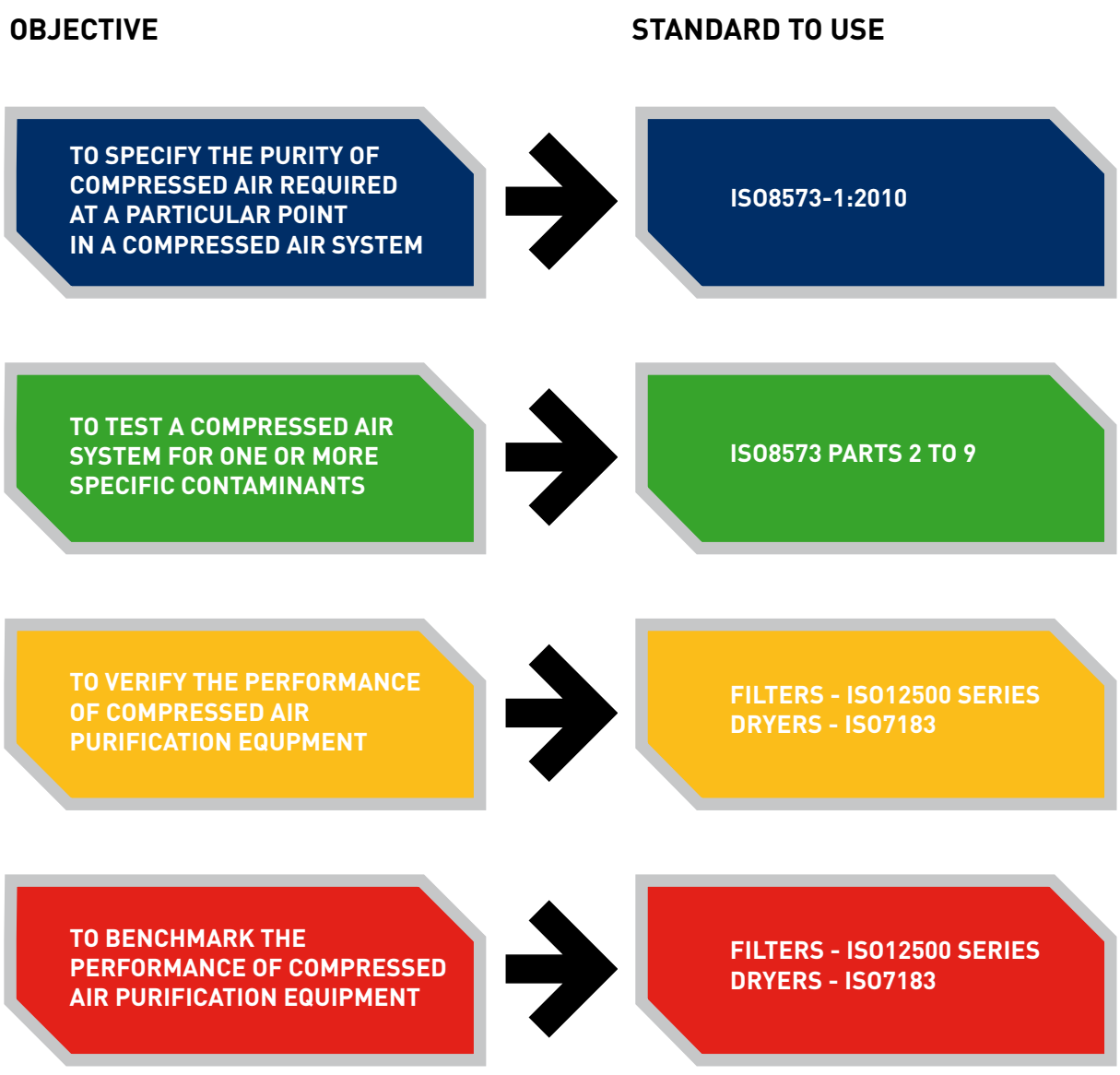
Parker domnick hunter are members of governing bodies such as BCAS (UK), CAGI (USA) and VDMA (Germany), which directly contribute to the development of international standards for compressed air quality and testing.

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

ISO8573 Series / ISO12500 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 specifying the quality requirements of the compressed air and parts 2 – 9 specifying the methods of testing for a range of contaminants.

Specifying air quality (purity) in accordance with ISO8573-1:2010, the international standard for Compressed Air Quality

ISO8573-1 is the primary document used from the ISO8573 series as it is this document which specifies the amount of contamination allowed in each cubic metre of compressed air.

ISO8573-1 lists the main contaminants as Solid Particulate, Water and Oil. The purity levels for each contaminant are shown separately in tabular form, however for ease of use, this document combines all three contaminants into one easy to use table.

ISO8573-1:2010 CLASS	Solid Particulate				Water		Oil
	Maximum number of particles per m^3			Mass Concentration mg/m^3	Vapour Pressure Dewpoint	Liquid g/m^3	Total Oil (aerosol liquid and vapour)
	0.1 - 0.5 micron	0.5 - 1 micron	1 - 5 micron				mg/m^3
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 in accordance with ISO8573-1:2010

When specifying the purity of air required, the standard must always be referenced, followed by the purity class selected for each contaminant (a different purity class can be selected for each contaminant if required).

An example of how to write an air quality specification is shown below :

ISO 8573-1:2010 Class 1.2.1

ISO 8573-1:2010 refers to the standard document and its revision, the three digits refer to the purity classifications selected for solid particulate, water and total oil. Selecting a air purity class of 1.2.1 would specify the following air 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, 400 particles in the 0.5 - 1 micron size range and 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 is allowed.

Class 1 Oil

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

ISO8573-1:2010 Class zero

- **Class 0 does not mean zero contamination**
- **Class 0 requires the user and the equipment manufacturer to agree contamination levels as part of a written specification**
- **The agreed contamination levels for a Class 0 specification should be within the measurement capabilities of the test equipment and test methods shown in ISO8573 Pt 2 to Pt 9**
- **The agreed Class 0 specification must be written on all documentation to be in accordance with the standard**
- **Stating Class 0 without the agreed specification is meaningless and not in accordance with the standard**
- **A number of compressor manufacturers claim that the delivered air from their oil-free compressors is in compliance with Class 0**
- **If the compressor was tested in clean room conditions, the contamination detected at the outlet will be minimal. Should the same compressor now be installed in typical urban environment, the level of contamination will be dependent upon what is drawn into the compressor intake, rendering the Class 0 claim invalid**
- **A compressor delivering air to Class 0 will still require purification equipment in both the compressor room and at the point of use for the Class 0 purity to be maintained at the application**
- **Air for critical applications such as breathing, medical, food, etc typically only requires air quality to Class 2.2.1 or Class 2.1.1**
- **Purification of air to meet a Class 0 specification is only cost effective if carried out at the point of use**

Selecting Parker domnick hunter purification equipment to comply with ISO8573-1:2010 air quality standard

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 ISO8573-1:2010 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 ISO8573-2, ISO8573-4 and ISO12500-1 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. When considering the operational costs of coalescing filters, only compare the initial saturated pressure loss as dry pressure loss is not representative of performance in a normally wet compressed air system. ISO12500-1 requires pressure losses for coalescing filters to be recorded when the element is saturated.
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.

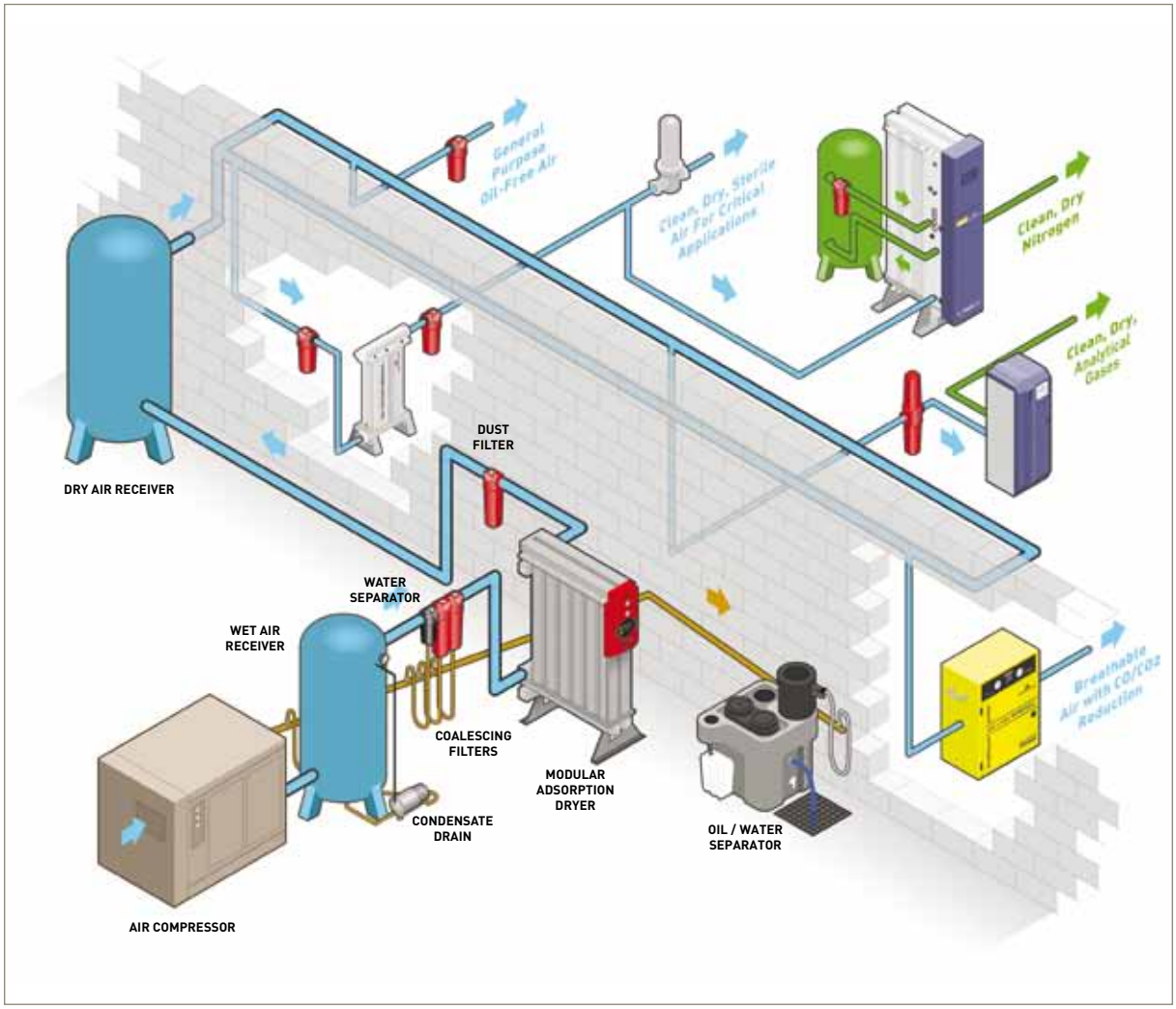
ISO8573-1:2010 CLASS	Solid Particulate		Water	Oil
	Wet Particulate	Dry Particulate	Vapour	Total Oil (aerosol liquid and vapour)
1	OIL-X EVOLUTION Grade AO + AA	OIL-X EVOLUTION Grade AR + AAR	PNEUDRI -70°C PDP	OIL-X EVOLUTION Grade AO + AA + OVR OIL-X EVOLUTION Grade AO + AA +ACS OIL-X EVOLUTION Grade AO + AC
2	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PNEUDRI -40°C PDP	OIL-X EVOLUTION Grade AO + AA
3	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PNEUDRI -20°C PDP	OIL-X EVOLUTION Grade AO
4	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +3°C PDP	OIL-X EVOLUTION Grade AO
5	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +7°C PDP	-
6	-	-	PSD +10°C PDP	-

Optimised system design

The quality of air required throughout a typical compressed air system can vary.

The extensive range of purification equipment available from Parker domnick hunter allows the user to specify the quality of air for every application, from general purpose ring main protection, through to critical clean dry air (CDA) point of use systems.

Parker domnick hunter has comprehensive ranges of purification equipment available to exactly match system requirements, ensuring both capital and operational costs are kept to a minimum.



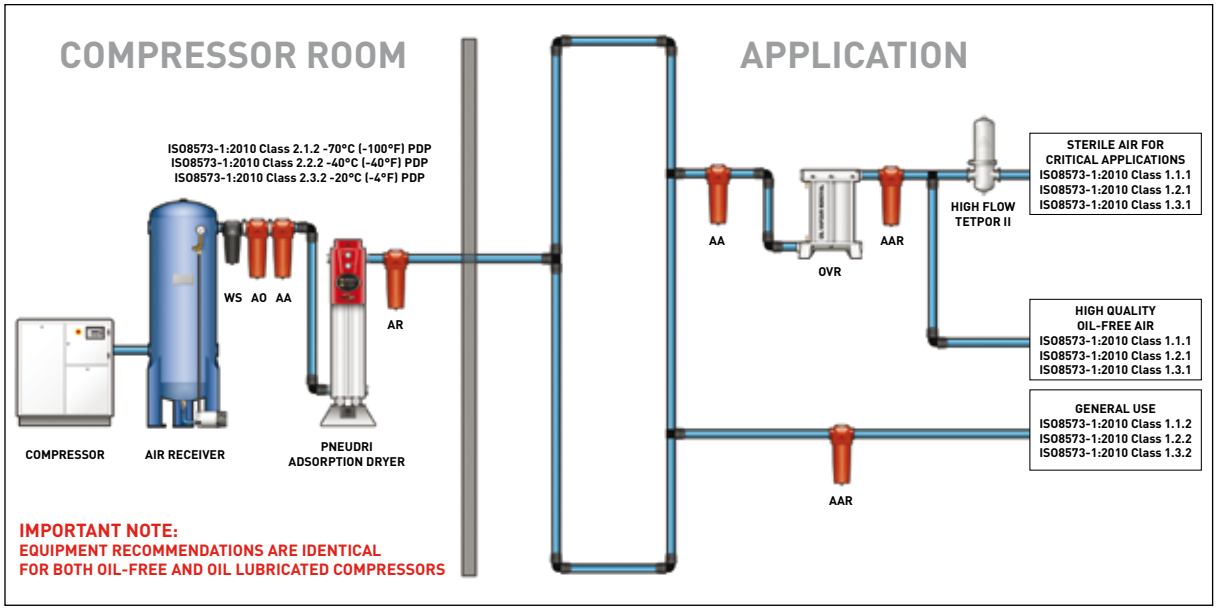
Cost effective system design

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.

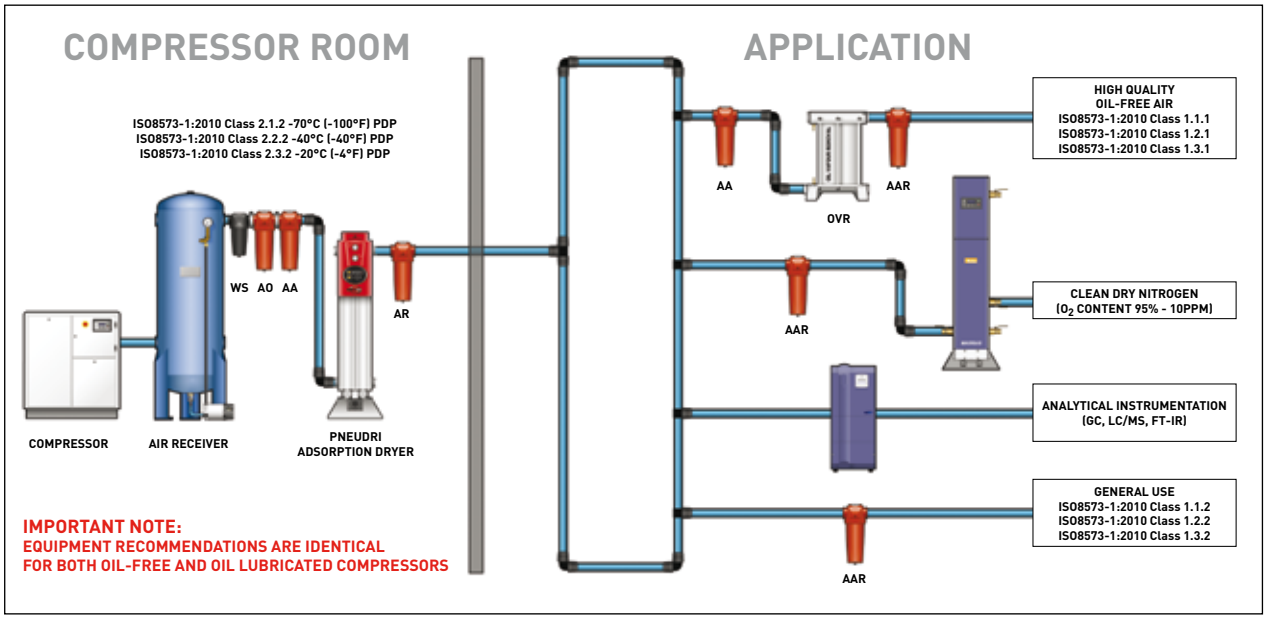
CRITICAL APPLICATIONS



Typical Applications

Pharmaceutical products
Silicon wafer manufacturing
TFT / LCD screen manufacturing
Memory device manufacturing
Optical storage devices (CD, CD/RW, DVD, DVD/RW)
Optical disk manufacturing (CD's/DVD's):
Hard disk manufacturing
Foodstuffs
Dairies
Breweries
CDA systems for electronics manufacturing

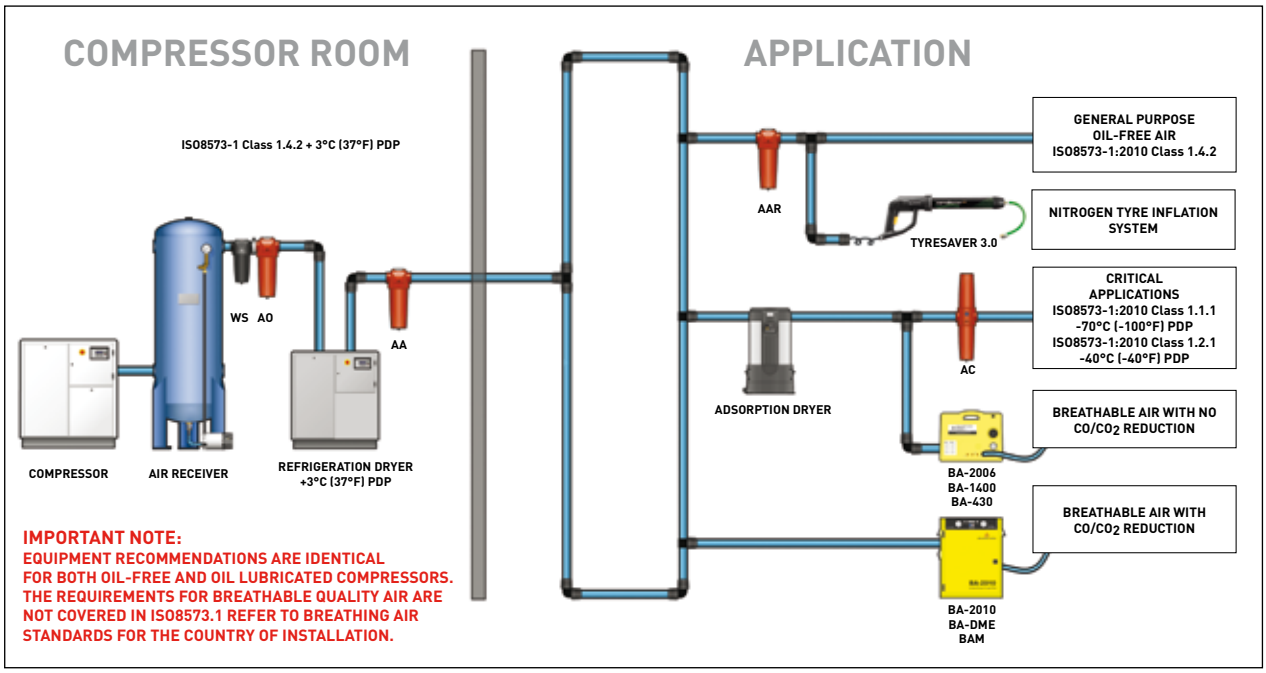
HIGH QUALITY OIL-FREE AIR



Typical Applications

Blow Moulding of Plastics e.g. P.E.T. Bottles
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 OIL-FREE AIR



Typical 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 pipework)
Air conveying
Air motors
Workshop (Tools)
Garage (Tyre filling)
Temperature control systems
Blow guns
Gauging equipment
Raw material mixing
Sand / bead blasting

System Testing and Product Validation

On-site testing using ISO8573 Test Methods

On-site testing is often difficult due to the complexity of the test method and the expense of test equipment required. For this reason, all Parker domnick hunter filtration products have been tested in accordance with the relevant parts of ISO8573 with performance independently verified by Lloyds Register, one of the world's largest risk management organisations.

Using the standards to select and purchase purification products

Presenting product data in this way should allow users to easily compare the performance of purification products from different manufacturers and cost effectively meet the air quality requirements of their application, however the ISO8573 test methods were primarily developed to verify air quality in a compressed air system, not test purification equipment, therefore not all products claiming compliance with the standards are tested in the same way.

To accurately detect contaminants in a compressed system and show compliance with the selected purity levels from ISO8573-1, the equipment and methods shown in ISO8573 parts 2 to 9 must be used.

These test methods have previously been used to test the performance of purification equipment, however for this purpose, they contain a major omission, one which makes comparison and selection of compressed air filters extremely difficult for the user.

The vital piece of information which is missing when testing products is a challenge concentration. So even though different manufacturers claim their products meet a certain purity class, they will most likely have been tested with differing concentrations of contamination entering the product and as challenge concentrations are rarely included in technical data, filter performance which may look similar or identical on paper, can provide significantly different results when installed in a compressed air system.

ISO12500

ISO12500 series has been introduced specifically to test purification equipment and complements the ISO8573 series. ISO12500 currently consists of four parts:

Purification equipment to test	Standard to use
Coalescing filters	ISO12500-1
Oil Vapour Removal filters	ISO12500-2
Coalescing & Dust Removal filters	ISO12500-3
Water Separators	ISO12500-4

ISO12500-1 – Testing of Coalescing Filters

ISO12500-1:2007 provides a set of standardised conditions with which coalescing filters should be tested in order to show their filtration performance in accordance with ISO8573-1. The testing will provide the user with an oil aerosol carryover figure in mg/m^3 and saturated (or wet) pressure drop in mbar. This is the filters performance at the reference conditions and can be used for benchmarking purposes.

ISO12500-2 – Testing of Adsorption Filters

ISO12500-2:2007 testing will assist users selecting adsorption filters used to remove oil vapour. Adsorption filters have a finite ability to remove oil vapour and when their capacity is used up, they must be replaced.

ISO12500-2 is an accelerated test used to determine a filters adsorption capacity. The higher the adsorption capacity, the longer the adsorption filter will last.

ISO12500-3 – Testing of Coalescing & Dust Removal Filters

ISO12500-3:2009 provides a guide for choosing an appropriate method of determining the solid particulate removal efficiency rating by particle size. Measurement methods are recommended based on the size range of the particulates that the filter being tested has been designed to remove. The test is performed as a 'type-test' on filters as being representative of a range. The following two particle diameter size ranges are identified: Fine Filter Range - 0,01 < 5,0 µm, and Coarse Filter Range, ≥ 5,0 ≤ 40 µm.

ISO12500-4 – Testing of Water Separators

ISO12500-4:2009 is designed to determine the water-removal efficiency and operational pressure drop of any device designed for water removal from compressed air (described as wall flow in accordance with ISO8573-2).

ISO7183:2007

ISO7183:2007 identifies test methods for measuring dryer parameters including: pressure dewpoint, flow rate, pressure drop, compressed air loss, power consumption and noise emission. It also provides partial-load tests for determining the performance of energy saving devices. The standard is only applicable to compressed air dryers working in the 0.5 – 16 bar g pressure range and include the following dryer types: adsorption dryers, membrane dryers and refrigeration dryers.

Selecting Parker domnick hunter purification equipment to comply with older revisions of ISO8573-1

Should a user who's compressed air system has been specified in accordance with the 2001 edition of the standard require additional purification equipment the table below should be used.

ISO8573-1:2001 CLASS	Solid Particulate		Water	Oil
	Wet Particulate	Dry Particulate	Vapour	Total Oil (aerosol liquid and vapour)
1	OIL-X EVOLUTION Grade AO + AA +TETPOR	OIL-X EVOLUTION Grade AR + AAR +TETPOR	PNEUDRI -70°C PDP	OIL-X EVOLUTION Grade AO + AA + OVR OIL-X EVOLUTION Grade AO + AA +ACS OIL-X EVOLUTION Grade AO + AC
2	OIL-X EVOLUTION Grade AO + AA	OIL-X EVOLUTION Grade AR + AAR	PNEUDRI -40°C PDP	OIL-X EVOLUTION Grade AO + AA
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4	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +3°C PDP	OIL-X EVOLUTION Grade AO
5	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +7°C PDP	-
6	-	-	PSD +10°C PDP	-

Should a user who's compressed air system has been specified in accordance with the 1991 edition of the standard require additional purification equipment the table below should be used.

ISO8573-1:1991 CLASS	Solid Particulate		Water	Oil
	Wet Particulate	Dry Particulate	Vapour	Total Oil (aerosol liquid and vapour)
1	OIL-X EVOLUTION Grade AO + AA	OIL-X EVOLUTION Grade AR + AAR	PNEUDRI -70°C PDP	OIL-X EVOLUTION Grade AO + AA + OVR OIL-X EVOLUTION Grade AO + AA +ACS OIL-X EVOLUTION Grade AO + AC
2	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PNEUDRI -40°C PDP	OIL-X EVOLUTION Grade AO + AA
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5	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +7°C PDP	-
6	-	-	PSD +10°C PDP	-

Parker domnick hunter performance validation

Parker domnick hunter OIL-X EVOLUTION filters have been designed to provide compressed air quality that meets or exceeds the levels shown in all editions of ISO8573-1:2010 international air quality standard and the BCAS Food Grade Compressed Air Code of Practice.

OIL-X EVOLUTION filters are not only tried and tested by Parker domnick hunter, filtration performance has also been independently verified by Lloyds Register.

Coalescing filters

Coalescing filter performance has been tested in accordance with ISO12500-1, ISO8573-2 and ISO8573-4.

Oil vapour removal filters

Oil vapour removal filter performance has been tested in accordance with ISO8573-5.

Dry particulate filters

Dry particulate filter performance has been tested in accordance with ISO8573-4.

Materials of construction

The materials used in the construction of OIL-X EVOLUTION filters are also suitable for use in the food industry, and have been independently verified to comply with FDA Code of Federal Regulations, Title 21 'Food and Drug'.

Performance Verified ISO8573-2 / ISO8573-4 / ISO8573-5 / ISO12500-1 Lloyd's Register

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