

# **Introduction to ISO Air Quality Standards**

# ISO

ISO (International Standards Organization) 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 organization 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 CAGI (USA), BCAS (UK) 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:

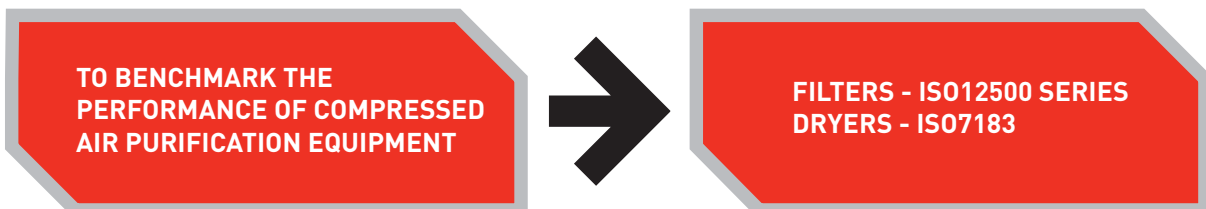
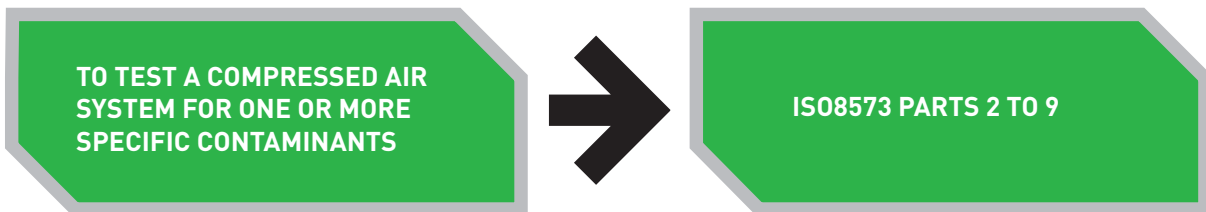
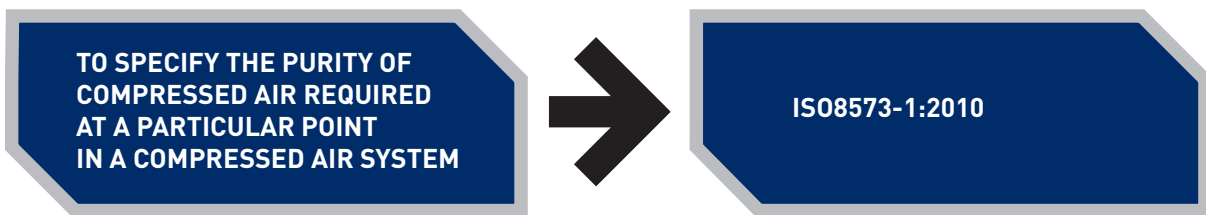
**ISO8573 Series / ISO12500 Series / ISO7183**

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

**Which of the three standards should I use?**

## OBJECTIVE

## STANDARD TO 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 meter 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 <sup>3</sup>			Mass Concentration mg/m <sup>3</sup>	Vapor Pressure Dewpoint	Liquid g/m <sup>3</sup>	Total Oil (aerosol liquid and vapor) mg/m <sup>3</sup>
	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	-	≤ -100°F (-70°C)	-	0.01
2	≤ 400,000	≤ 6,000	≤ 100	-	≤ -40°F (-40°C)	-	0.1
3	-	≤ 90,000	≤ 1,000	-	≤ -4°F (-20°C)	-	1
4	-	-	≤ 10,000	-	≤ +37.4°F (+3°C)	-	5
5	-	-	≤ 100,000	-	≤ +44.6°F (+7°C)	-	-
6	-	-	-	≤ 5	≤ +50°F (+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 :

### ISO8573-1:2010 Class 1.2.1

ISO8573-1:2010 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 meter 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°F (-40°C) or better is required and no liquid water is allowed.

#### Class 1 Oil

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

## 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.

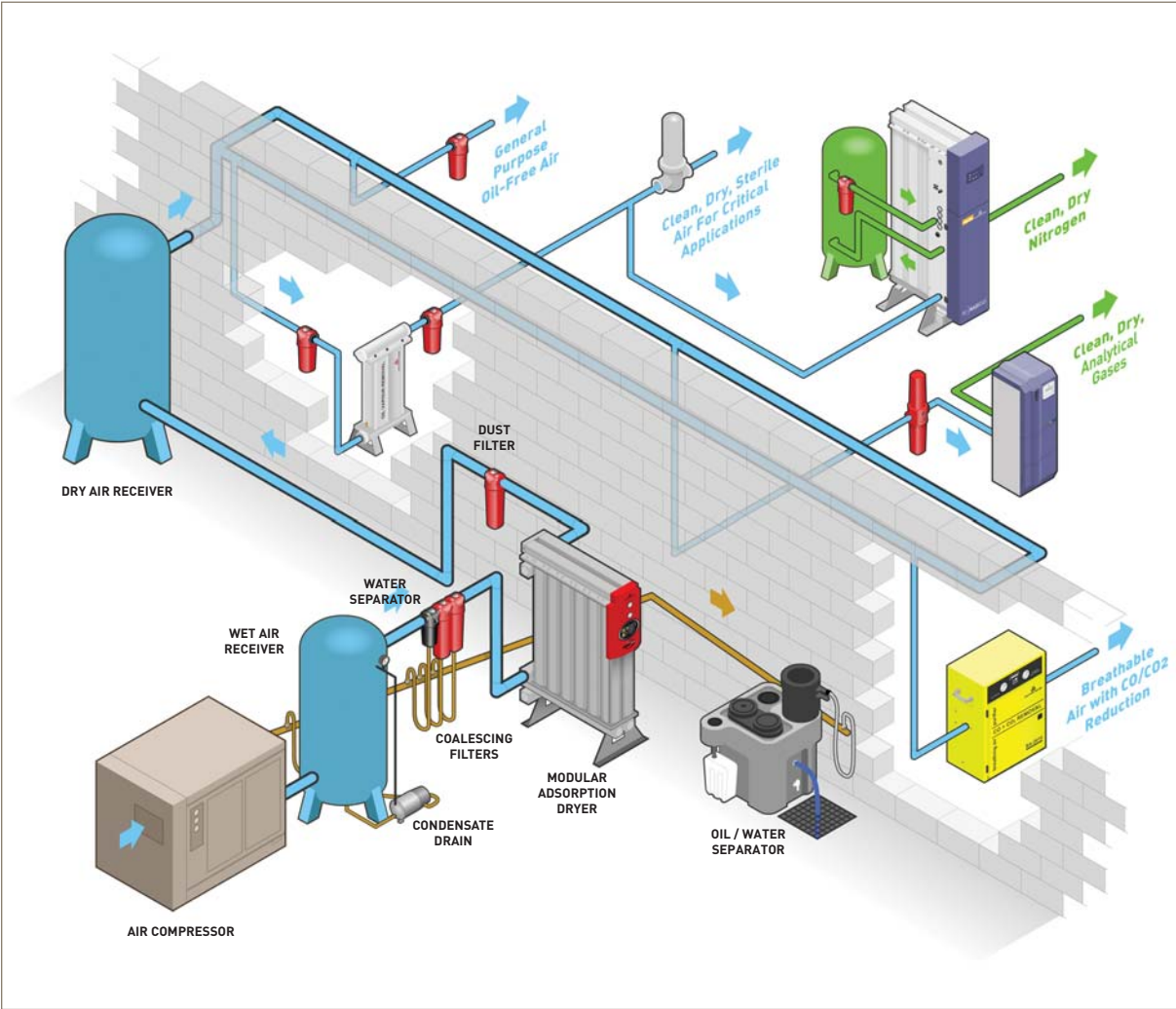
ISO8573-1:2010 CLASS	Solid Particulate		Water	Oil
	Wet Particulate	Dry Particulate	Vapor	Total Oil (aerosol liquid and vapor)
1	OIL-X EVOLUTION Grade AO + AA	OIL-X EVOLUTION Grade AR + AAR	PNEUDRI -100°F (70°C) PDP	OIL-X EVOLUTION Grade AO + AA + OVR OIL-X EVOLUTION Grade AO + AA +ACS OIL-X EVOLUTION Grade AO + AC
2	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PNEUDRI -40°F (-40°C) PDP	OIL-X EVOLUTION Grade AO + AA
3	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PNEUDRI -4°F (-20°C) PDP	OIL-X EVOLUTION Grade AO
4	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +37.4°F (+3°C) PDP	OIL-X EVOLUTION Grade AO
5	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +44.6°F (+7°C) PDP	-
6	-	-	PSD +50°F (+10°C) PDP	-

# Optimized 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

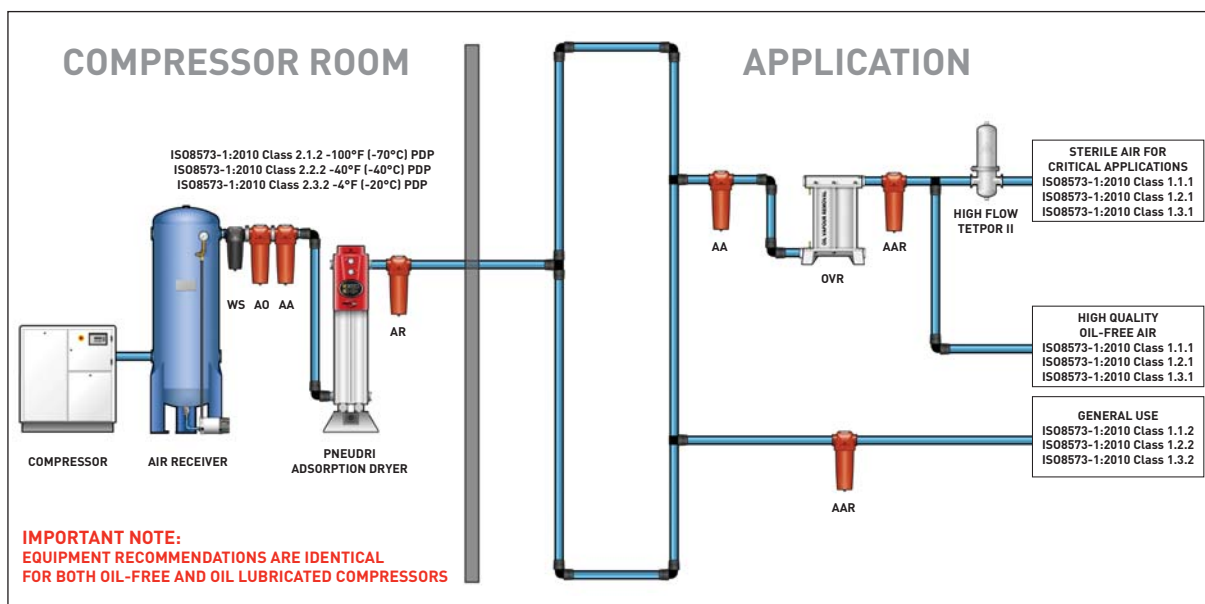
To achieve the stringent air quality levels required for today's modern production facilities, a careful approach to system design, commissioning and operation must be employed.

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

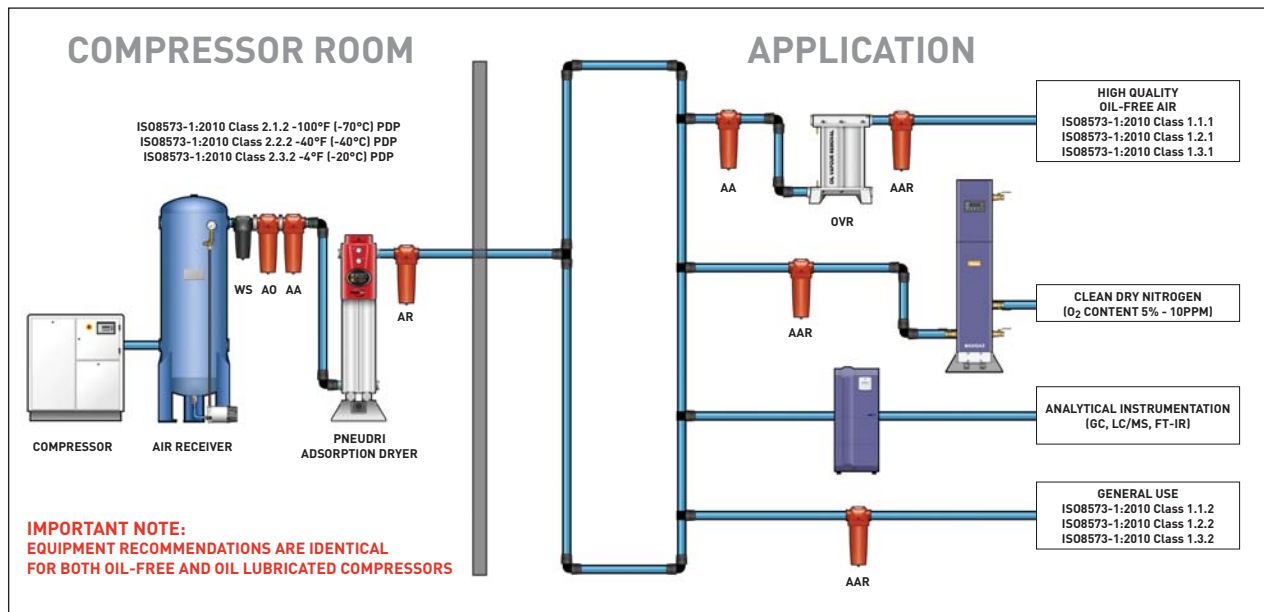


## Typical Applications

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



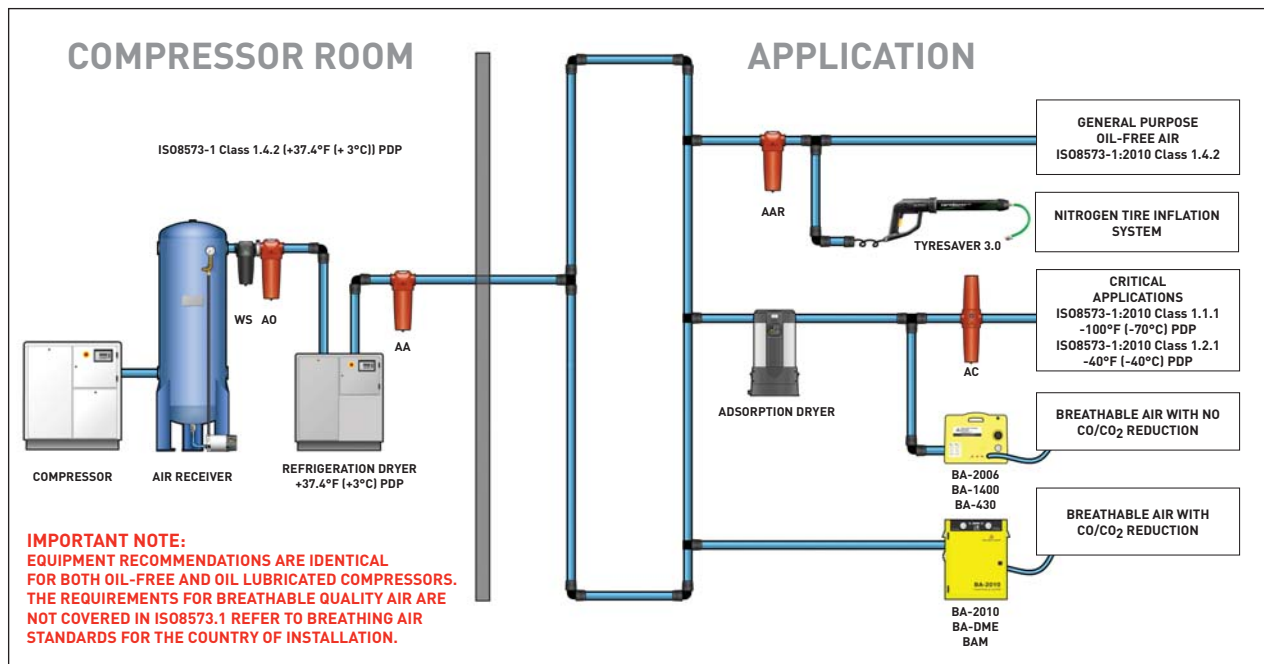
## Typical Applications

Blow Molding 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 (Tire 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 organizations.

## 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:

<b>Purification equipment to test</b>	<b>Standard to use</b>
Coalescing filters	ISO12500-1
Oil Vapor 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 standardized 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<sup>3</sup> 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 vapor. Adsorption filters have a finite ability to remove oil vapor 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 7.3 - 232 psi g (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	Vapor	Total Oil (aerosol liquid and vapor)
1	OIL-X EVOLUTION Grade AO + AA +TETPOR	OIL-X EVOLUTION Grade AR + AAR +TETPOR	PNEUDRI -100°F (-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°F (-40°C) PDP	OIL-X EVOLUTION Grade AO + AA
3	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PNEUDRI -4°F (-20°C) PDP	OIL-X EVOLUTION Grade AO
4	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +37.4°F (+3°C) PDP	OIL-X EVOLUTION Grade AO
5	OIL-X EVOLUTION Grade AO	OIL-X EVOLUTION Grade AR	PSD +44.6°F (+7°C) PDP	-
6	-	-	PSD +50 (+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	Vapor	Total Oil (aerosol liquid and vapor)
1	OIL-X EVOLUTION Grade AO + AA	OIL-X EVOLUTION Grade AR + AAR	PNEUDRI -100°F (-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°F (-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 +44.6°F (+7°C) PDP	-
6	-	-	PSD +50 (+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 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.

## Dry particulate filters

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

## Oil vapor removal filters

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

## 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'.



<p>LRQ4003083    LRQ4001479</p>	<p>INTERNATIONAL APPROVALS</p> <p>CRN    AS1210</p>	<p>bcas BRITISH COMPRESSED AIR SOCIETY LIMITED</p> <p>pneurop</p> <p>VDMA</p> <p>Druckluft effizient</p>
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## Purification, Dehydration and Filtration Division

4087 Walden Avenue  
Lancaster, NY 14086  
T 716 686 6400, F 877 857 3800

### Sales Offices

5900-B Northwoods Parkway  
Charlotte, NC 28269  
T 716 686 6400, F 877 857 3800

160 Chisholm Drive  
Milton, Ontario L9T 3G9 Canada  
T 905 693 3000, F 905 876 1958

[www.parker.com/pdf](http://www.parker.com/pdf)

## North America

### Parker Hannifin Corporation Filtration Group

#### Global Headquarters

6035 Parkland Boulevard  
Cleveland, OH 44124-4141  
T 216 896 3000, F 216 896 4021  
[www.parker.com](http://www.parker.com)

## Compressed Air Treatment

### Filtration & Separation/Balston

242 Neck Road  
Haverhill, MA 01835-0723  
T 978 858 0505, F 978 858 0625  
[www.parker.com/balston](http://www.parker.com/balston)

### Filtration & Separation/Finite

500 Glaspie Street, PO. Box 599  
Oxford, MI 48371-5132  
T 248 628 6400, F 248 6281850  
[www.parker.com/finitefilter](http://www.parker.com/finitefilter)

## Engine Filtration & Water Purification

### Racor

3400 Finch Road, PO Box 3208  
Modesto, CA 95353  
T 209 521 7860, F 209 529 3278  
[www.parker.com/racor](http://www.parker.com/racor)

### Racor

850 North West St., PO Box 6030 Holly  
Springs, MS 38635  
T 662 252 2656, F 662 274 2118  
[www.parker.com/racor](http://www.parker.com/racor)

### Racor

302 Parker Drive  
Beaufort, SC 29906  
T 843 846 3200, F 843 846 3230  
[www.parker.com/racor](http://www.parker.com/racor)

### Racor -- Village Marine Tec.

2000 West 135th Street  
Gardena, CA 90249  
T 310 516 9911, F 310 538 3048  
[www.villagemarine.com](http://www.villagemarine.com)

## Hydraulic Filtration

### Hydraulic Filter

16810 Fulton County Road #2  
Metamora, OH 43540-9714  
T 419 644 4311, F 419 644 6205  
[www.parker.com/hydraulicfilter](http://www.parker.com/hydraulicfilter)

## Process Filtration

### Process Advanced Filtration

2340 Eastman Avenue  
Oxnard, CA 93030  
T 805 604 3400, F 805 604 3401  
[www.parker.com/processfiltration](http://www.parker.com/processfiltration)

## Europe

### Compressed Air Treatment

#### domnick hunter Industrial

Dukesway, Team Valley Trading Estate  
Gateshead, Tyne & Wear  
England NE11 OPZ  
T +44 (0) 191 402 9000,  
F +44 (0) 191 482 6296  
[www.domnickhunter.com](http://www.domnickhunter.com)

### Hiross Zander

#### Padova Business Unit

Strada Zona Industriale 4  
35020 S. Angelo di Piove Padova, Italy  
T +39 049 9712 111, F +39 049 9701 911  
[www.dh-hiross.com](http://www.dh-hiross.com)

### Hiross Zander

#### Essen Business Unit

Zander Aufbereitungstechnik GmbH  
Im Teelbruch 118  
D-45219 Essen, Germany  
T +49 2054 9340, F +49 2054 934164  
[www.zander.de](http://www.zander.de)

### Parker Gas Separations

Oude Kerkstraat 4  
P O Box 258  
4870 AG Etten- Leur, Netherlands  
T +31 76 508 5300, F +31 76 508 5333

## Engine Filtration & Water Purification

### Racor

Shaw Cross Business Park Churwell Vale  
Dewsbury,  
WF12 7RD England  
T +44 (0) 1924 487000,  
F +44 (0) 1924 487038  
[www.parker.com/rfde](http://www.parker.com/rfde)

### Racor Research & Development

Parker Hannifin GmbH & Co KG  
Inselstrasse 3 – 5  
70327 Stuttgart Germany  
T +49 (0)711 7071 290-0,  
F +49 (0)711 7071 290 -70  
[www.parker.com/racor](http://www.parker.com/racor)

## Hydraulic Filtration

### Hydraulic Filter

Stieltjesweg 8, 6827 BV  
P.O. Box 5008 6802 EA  
Arnhem, Holland  
T +31 26 3760376, F +31 26 3643620  
[www.parker.com/eurofilt](http://www.parker.com/eurofilt)

### Urjala Operation, Finn Filter

Salmentie 260  
31700 Urjala as Finland  
T +358 20 753 2500, F +358 20 753 2501  
[www.parker.com/fi](http://www.parker.com/fi)

### Condition Monitoring Center

Brunel Way Thetford,  
Norfolk IP 24 1HP England  
T +44 1842 763299, F +44 1842 756300  
[www.parker.com/cmcc](http://www.parker.com/cmcc)

## Process Filtration

### domnick hunter Process

Durham Road, Birtley Co. Durham, DH3  
2SF England  
T +44 (0) 191 410 5121,  
F +44 (0) 191 410 5312  
[www.domnickhunter.com](http://www.domnickhunter.com)

## Asia Pacific

### Australia

9 Carrington Road, Castle Hill  
NSW 2154, Australia  
T +61 2 9634 777, F +61 2 9899 6184  
[www.parker.com/australia](http://www.parker.com/australia)

### China

280 YunQiao Road  
JinQiao Export Processing Zone  
Shanghai 101206 China  
T +86 21 5031 2525, F +86 21 5834 3714  
[www.parker.com/china](http://www.parker.com/china)

### India

Plot EL 26, MIDC, TTC Industrial Area  
Mahape, Navi Mumbai 400 709 India  
T +91 22 5613 7081, 82, 83, 84, 85  
F +91 22 2768 6618 6841  
[www.parker.com/india](http://www.parker.com/india)

### Japan

626, Totsuka-cho, Totsuka-ku  
Yokohama-shi, 244-0003 Japan  
T +81 45 870 1522, F +81 45 864 5305  
[www.parker.com/japan](http://www.parker.com/japan)

### Korea

1-C Block, Industrial Complex of Jangan,  
615-1, Geumui-Ri Jangan-Myeon,  
Hwaseong-City Gyeonggi-Do, Korea  
T +82 31 359 0771, F +82 31 359 0770  
[www.parker.com/korea](http://www.parker.com/korea)

### Singapore

No. 11 4th Chin Bee Road  
Jurong Town, Singapore 619702  
T +65 6887 6330, F +65 6261 4929  
[www.parker.com/singapore](http://www.parker.com/singapore)

### Thailand

1023 3rd Floor, TPS Building  
Pattanakam Road, Suanluang,  
Bangkok 10250 Thailand  
T +66 2717 8140, F +66 2717 8148  
[www.parker.com/thailand](http://www.parker.com/thailand)

## Latin America

### Parker Comercio Ltda.

#### Filtration Division

Estrada Municipal Joel de Paula  
900 Eugenio de Melo,  
Sao Jose dos Campos  
CEP 12225390 SP Brazil  
T +55 12 4009 3500, F +55 12 4009 3529  
[www.parker.com/br](http://www.parker.com/br)

### Pan American Division - Miami

7400 NW 19th Street, Suite A  
Miami, FL 33128  
T 305 470 8800 F 305 470 8808  
[www.parker.com/panam](http://www.parker.com/panam)

## Africa

### Parker Hannifin Africa Pty Ltd Parker

Place, 10 Berne Avenue,  
Aeroporto Kempton Park,  
1620 South Africa  
T +27 11 9610700, F +27 11 3927213  
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