

# PROCESS GAS AND LIQUID FILTRATION

## ProAir



**ProAir** are world leaders in filtration design and technology and for the chemical and petrochemical process industries have designed and developed a comprehensive range of pressure filters for the removal of particulate contaminants from air, gas and liquid streams. Coalescing filters are also available for the removal of liquid aerosols and particulates from air and gases.

A wide range of coded designs are available, including A.S.M.E. VIII Div.1 Single or duplex systems can be manufactured in the **ProAir** fabrication facility from carbon steel, stainless steels and other high duty alloys. All models incorporate elements that are easily accessible for field cleaning or replacement.

Manufactured to a wide range of flow rates and pressures, **ProAir** filters are suitable for use in applications including, compressed air, natural gases, chemical feed stocks, gas separation, land fill and gas distribution systems.

As further service **ProAir** will be pleased to design and fabricate specialised filtration systems to meet your individual requirements.

### VACUUM FILTERS - AIR/GAS

From full vacuum to  $1.0 \text{ kg/cm}^2$  and flow rates to  $40,000 \text{ Nm}^3/\text{hr}$ . These **ProAir** particulate removal filters are ideal for vacuum pump protection and other vacuum applications within the process industry.

### LIQUID PROCESS FILTERS

For liquid process applications **ProAir** filters are available for pressures upto  $200 \text{ kg/cm}^2$  and flow rates upto  $16,000 \text{ L/min}$ .

### PRESSURE FILTERS - AIR/GAS

The **ProAir** range of process air/gas filters are available for pressures upto  $200 \text{ kg/cm}^2$  and flow rates upto  $600,00 \text{ Nm}^3/\text{hr}$  with up to NB300 connections. For particulate removals.

### COALESCING FILTERS - AIR/GAS

For the removal of particulate and liquids such as oil and water from compressed air and gas flows, **ProAir** filters are available for pressures upto  $200 \text{ kg/cm}^2$  and flow rates upto  $200,000 \text{ Nm}^3/\text{hr}$ .

# ProAir

# Why Select ProAir Filters ?

It would be irresponsible to assume that all process gas & liquid filters could give equal performance, reliable and service life.

- ☞ Complete range of process gas and Liquid filtration products for every application so you can get all your filtration requirement, from one reliable supplier.
- ☞ Full after sales support.
- ☞ Guaranteed product performance.
- ☞ Large stock and spares for immediate delivery.
- ☞ Competitively priced solutions to your compressed air and gas problems.
- ☞ On-site testing and validation service
- ☞ Filters designed and manufactured to ASME codes
- ☞ Filters can be designed to specific customer requirements.
- ☞ Long life filter elements guaranteed for one year under normal recommended use.

## Other ProAir Products

- ✧ Particulate & Oil removal filters
- ✧ Water separators
- ✧ High pressure filters
- ✧ Breathing air purifiers
- ✧ Vacuum pump protection filters
- ✧ Electronic Drain valves
- ✧ Refrigerated air dry
- ✧ Vapor odour removal adsorbers

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ProAir is a trademark of Shah Pneumatics.

**Compressed Air Treatment Products**

## Shah Pneumatics

28-30, NAVKETAN IND. ESTATE, MAHAKALI CAVES ROAD,  
ANDHERI-(E), MUMBAI-400093, INDIA.

Ph:- +91-22-6695 1090 Fax:- +91-22-26875317,

E-mail:- Shahpneu@bom3.vsnl.net.in

Website : [www.shah-pneumatics.com](http://www.shah-pneumatics.com)

# Special Gas Filtration

The term “special gas” is used to describe gases other than air which are widely used throughout industry. It is rare to find any chemical process not involving some type of reactive or inert gas and many different gases are in common use in refrigeration duties. All of these gases are either produced in chemical reactions or are separated from gas mixtures occurring naturally. To be acceptable to industry they must be clean. In addition, many processes involve compression of the gas either for storage or to make use of its physical properties. This is often carried out by an oil lubricated compressor, the oil acting as a lubricant which also seals the compressor. This oil also creates its own problems by contaminating the gas and it is usually necessary to remove all traces of oil by filtration.

There are five main areas to consider :-

- Refrigeration Systems
- Liquefaction Systems
- Cryogenic Systems
- Industrial Gas Production
- Processes Utilising Catalyst Beds

Refrigeration represents probably the largest special gas usage, being applied in virtually all types of industry from foodstuffs and breweries to air conditioning. Many gases are in common use, for example, Ammonia, Halocarbons 12, 13 and 22, Propane, Propylene, Butane and Ethane although many more exist and are used depending on the duty.

Cryogenics is the science of very low temperatures and many applications are in existence. One of the most critical areas uses helium as the refrigerant gas and because of the extremely low temperatures involved and the equipments used, any pollution in the gas is unacceptable. Often the maximum oil contamination level allowed is five parts per billion (0.005ppm) and therefore filtration is an essential part of the system.

Industrial gas production and processes involving catalyst beds are very general areas and the contamination may be solid, liquid or gaseous. Industrial gases for resale should be as free from any contamination as possible so as not to affect customers' processes. Many processes involve the use of catalyst beds which often use very expensive chemicals and are easily polluted by

Oil, water or other gases.

Filtration of special gases, there are as already stated, different types of contamination to be considered. These are solids, liquids and vapours. Solid contamination usually takes the form of pipescale and installation dirt. Liquid contamination could be water but in the majority of cases, is oil from the compressor. It should be noted that this liquid oil occurs in bulk form as large droplets and also as very fine particles commonly referred to as aerosols. It is important to distinguish oil aerosols from oil vapour. Oil aerosols form the majority of the oil carried over in the gas after primary separation and they are capable of remaining in suspension for long periods.

Oil vapour is a gas and, unlike oil aerosol, cannot be removed by mechanical separation. The amount of oil vapour in a gas depends on many factors, the type of oil, temperature, pressure, the gas itself, the age of the oil and the type of system.

Removal of solid and liquid contamination is achieved by using deep bed coalescing filters such as the **ProAir** Grade XO and XA filters. The most important part of any filter is the element.

Two standard grades of coalescer are available, designated XO and XA. The Grade XO is designed for high dirt holding capacity and to remove large quantities of bulk liquid. It is rated at 1 micron and is used as a general filter and as a pre-filter to higher efficiency grades. The Grade XA is capable of filtering down to 0.01 micron and is used to remove the fine oil aerosols and dirt in more critical applications.

Oil vapour can be removed by adsorption using activated carbon. Activated carbon can however only be used in certain circumstances when the process gas itself is not preferentially adsorbed. Using activated carbon, it is possible to reduce the total oil content including vapour down to 0.003 ppm. In all of these, contamination in the gas can **prevent correct operation, reduce product quality and cause extensive maintenance problems with increased operating costs.**

**ProAir** has a complete technical backup and testing service and is able to recommend the best filtration combination to solve specific problems. Special types of filter elements are available for corrosive gases and other special requirements can be catered for, such as stainless steel housings.

**ProAir**

# Selection/Compatibility Chart

Gas	Molecular Weight	Gas Density at 20° C, 1 Atmos		Type of Elements to be used		Multiply By Sizing Factor
		lbs/ft <sup>3</sup>	Kg/m <sup>3</sup>	up to 50° C	50-120° C	
AIR	28	0.0749	1.20	STANDARD	TS	1.00
AMMONIA	17	0.0445	0.71	NH3	NH3	1.30
BUTANE	58	0.1550	2.48	STANDARD	TS	0.70
CARBON DIOXIDE	44	0.1144	1.83	STANDARD	TS	0.81
CARBON MONOXIDE	28	0.0725	1.16	STANDARD	TS	1.02
ETHANE	30	0.0781	1.25	STANDARD	TS	0.98
ETHYLENE	28	0.0730	1.17	STANDARD	TS	1.01
HALOCARBON 12	121	0.3180	5.09	TS	TS	0.48
HALOCARBON 13	104	0.2700	4.32	TS	TS	0.53
HALOCARBON 22	86	0.2290	3.67	TS (WITH NEOPRENE 'O' RING)	TS	0.57
HELIUM	4	0.0103	0.16	STANDARD	TS	1.00
HYDROGEN	2	0.0052	0.08	STANDARD	TS	1.50
METHANE	16	0.0417	0.67	STANDARD	TS	1.34
METHYL CHLORIDE	50	0.1330	2.13	NH3	NH3	0.75
NEON	20	0.0522	0.84	STANDARD	TS	1.19
NITROGEN	28	0.0725	1.16	STANDARD	TS	1.02
OXYGEN	32	0.0828	1.33	STANDARD	TS	0.95
PROPANE	44	0.1154	1.85	STANDARD	TS	0.80
PROPYLENE	42	0.1070	1.71	TS	TS	0.84

## Notes :

1. If given a mass flowrate of gas (in Kg/hr or lbs/minute) divide this flowrate by the above density to give a corresponding free flow of gas (NM<sup>3</sup>/hr or scfm) for selection purposes.
2. The sizing factors show the factors which should be applied to a gas flow in order to select a filter from the standard **ProAir** compressed air selection table, e.g. A filter rated at 1,200 dm<sup>3</sup>/sec (2,520 Scfm) at 7 bar g (100 psig) with compressed air will flow 1,560 dm<sup>3</sup>/sec (3,276 scfm) of Ammonia under the same conditions and with the same pressure drop.

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### Shah Pneumatics (Regd.)

Regd. Office : 28-30, Navketan Industrial Estate,  
Mahakali Caves Road, Andheri (East),  
Mumbai - 400 093, INDIA.  
Phone : +91-22-66951090 Fax: +91-22-26875317  
E-mail : shahpneu@bom3.vsnl.net.in  
Website : www.shah-pneumatics.com

