

Quality of Air – Aftercoolers, Dryers, Filters



Quality of Air

The Quality of Air that you need for specific applications can vary dramatically. Ingersoll-Rand can provide the equipment you need to use together with your compressor to provide you with whatever quality of clean, dry air that your application requires.

Why You Need Clean Air

Clean air in your compressed air applications can be essential for safe and efficient operation. Harmful contaminants like oil, dust, dirt, and water – alone or in combination – can attack your system and:

- Contaminate abrasive blasting media
- Clog sensitive pneumatic instruments
- Reduce the efficiency of air-operated tools
- Increase maintenance and repair costs
- Contribute to product rejects, production down time – even complete plant shutdown
- Contaminate painting processes

Protect Your Air System

The best defense against contaminants in your air system is filtering out or removing any solids, moisture, and lubricants present in the air.

Solids – dust, dirt, and pollen – can enter the compressor at the air intake. Typical city air can contain more than four million dust particles per cubic foot of air. After compression, the particle concentration in the air is generally nine times greater!

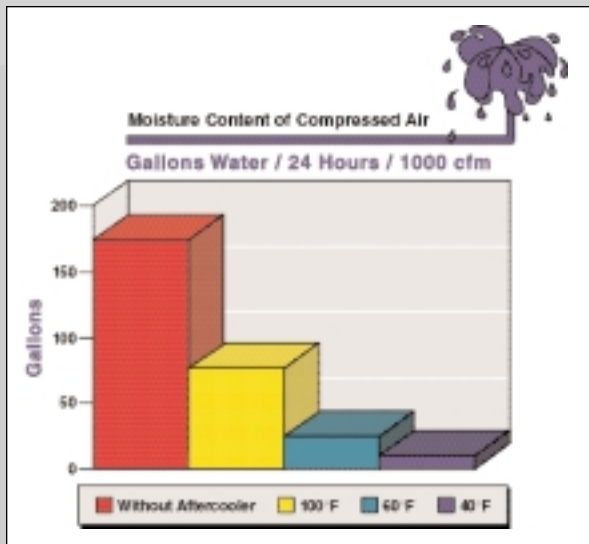
Moisture is present in the intake air as humidity. During the compression process air gets heated, then cooled as it's distributed. This causes condensation of water vapor. Condensed moisture can cause rust in pipelines or can freeze in exposed lines or hoses outdoors. This water condensation can also cause considerable problems directly with your equipment and process.

Oil can also be a major contaminant in your system in liquid, aerosol (mist), and vapor (gaseous) forms. Oil is most troublesome when combined with moisture and solid contaminants. This forms a sludge that can clog instruments and tools. The oil can also be a direct contaminate to many industrial and process applications that need clean or instrument quality air.

How to deal with Contaminates: Dirt, Oil, Moisture

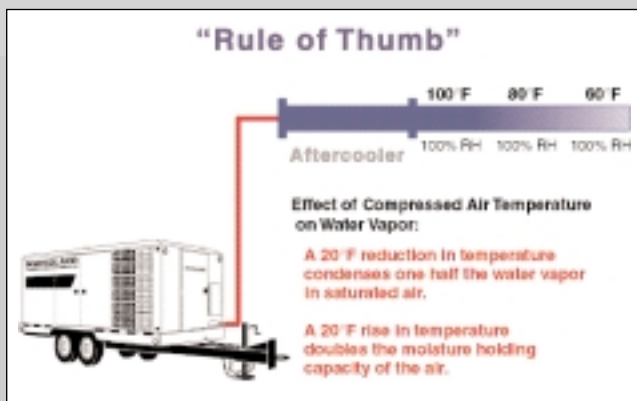
Dirt and other solid contaminants are removed through filtration. Oil is also removed through filtration. The filters utilized to remove both of these contaminants are combination particulate / coalescing filters. In terms of particle or aerosol droplet size, these contaminants range from 10 to 0.01 microns. The filters I-R utilizes can clean the air down to 0.01 microns depending on the level your application requires. How clean is that? In relative terms, 0.01 microns is 1000 times smaller than the diameter of a typical human hair.

Moisture in compressed air is addressed with a combination of aftercoolers, water separators, and dryers. Hot compressed air



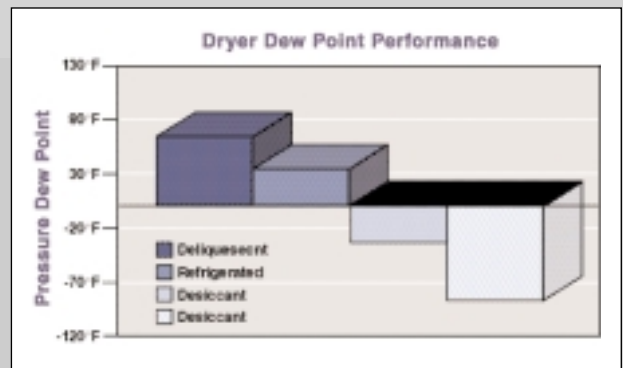
leaving a compressor contains large quantities of water in the form of vapor. A typical example would be 1000 CFM, which would transmit to the downstream pipeline more than 180 gallons of water each day. By using an efficient aftercooler and matching water separator, more than 113 gallons per day can be extracted before it passes into the system, greatly reducing condensation and maintenance problems. An aftercooler is essential if an in-plant refrigerated, or desiccant dryer is being utilized.

The use of an aftercooler and water separator can remove significant amounts of water from the air. As a rule of thumb, a 20°F reduction in temperature condenses one half the water vapor in saturated air. The compressed air exiting the aftercooler and water separator, however, is still at 100% relative humidity.

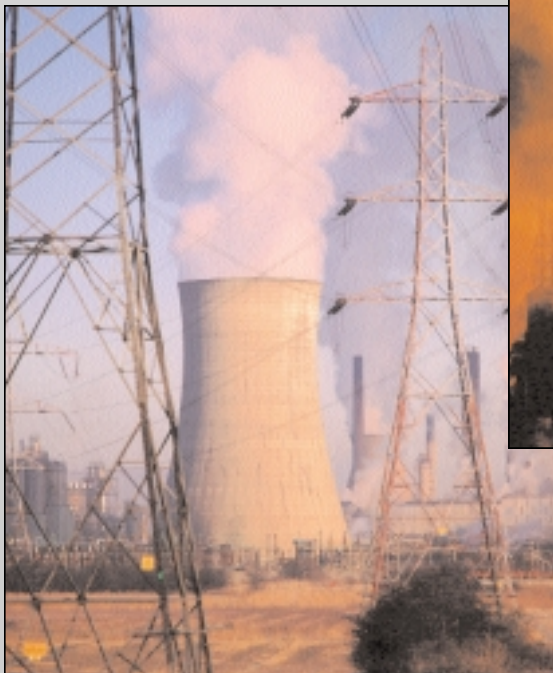


All of the I-R designs utilize highly efficient aftercoolers that provide an approach temperature (or CTD) of 20° F. With the air exiting the unit at only 20° F over the ambient temperature, significant amounts of moisture have been removed from the air even without the use of an additional dryer.

Dryers - Depending on your application and how "dry" your air needs to be, an additional dryer may be required. How "dry" your air needs to be can be measured with dew point. Dew point is the air temperature at which entrained moisture vapor condenses at a given pressure. Pressure dew point is the lowest temperature to which compressed air can be exposed without causing condensation of entrained water vapor.



Three types of dryers commonly used are deliquescent, refrigerated, and desiccant. I-R offers deliquescent and desiccant dryers for portable or rental applications. The type of dryer required depends on the dew point requirement for your particular application.



Low

Quality of Air

High

Typical Applications	Aftercoolers	AF1600 Aftercooler with Filtration	IQ System Compressors with Integrated Aftercooler & Coalescing Filters	D Series Deliquescent Dryer	AD Series Aftercooler with Deliquescent Dryer	RD Series Desiccant Dryer with Filtration
Painting	c	b	a	a	a	b
Sand Blasting	b	b	a	a	a	b
Steel Shot Blasting	c	b	b	a	a	b
Industrial Plant		b	a			a
Petro-Chemical & Process		b	a			a
Instrument Quality Air per ISA S 7.0.01-1996 Standard		b ²⁾	a ²⁾			a
Quality of Air	↓	↓	↓	↓	↓	↓
Aftercooling	20°F Approach Temperature	20°F Approach Temperature	20°F Approach Temperature	None	20°F Approach Temperature	1)
Filtration	None	0.01 Microns	0.01 Microns	0.5 Microns (optional)	0.5 Microns (optional)	0.01 Microns
Dewpoint	None	None	None	20°F Suppression	20°F Suppression	-40 to -100°F

1) An aftercooler and water separator are required in-line before use of this dryer.

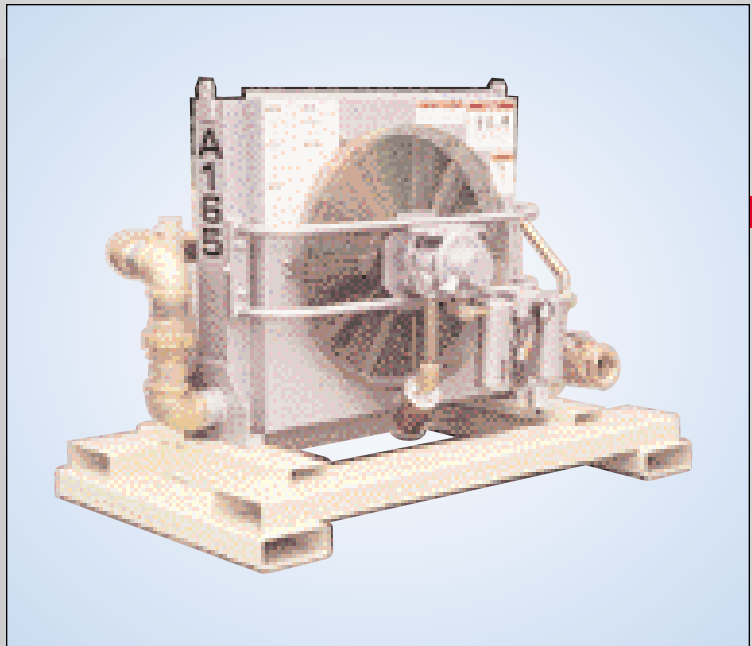
2) RD Series desiccant dryer required to achieve instrument quality air dew point

a – Best product for this application **b** – Can be used for this application **c** – Can possibly be used for this application

This chart represents general applications and general recommendations. Your specific applications may require further analysis of the detailed specifications of each product to assure proper application of the various equipment.

A85 and A165 Air Cooled Aftercooler Unit

The A85 and A165 Air Cooled Aftercooler and Water Separator Units deliver cool air with less moisture content delivering an approach temperature of 20°F.



Design Features: —

- Tubular steel base may be used for various mountings
- Optional forklift, heavy duty skid available
- Pneumatically powered air motor driven fan
- Requires up to 55 cfm on A85 and up to 130 cfm on A165
- Water separator
- Under 3 psi pressure drop
- Rated at 200 psig
- Built for rugged use
- 3" NPT Inlet ball valve

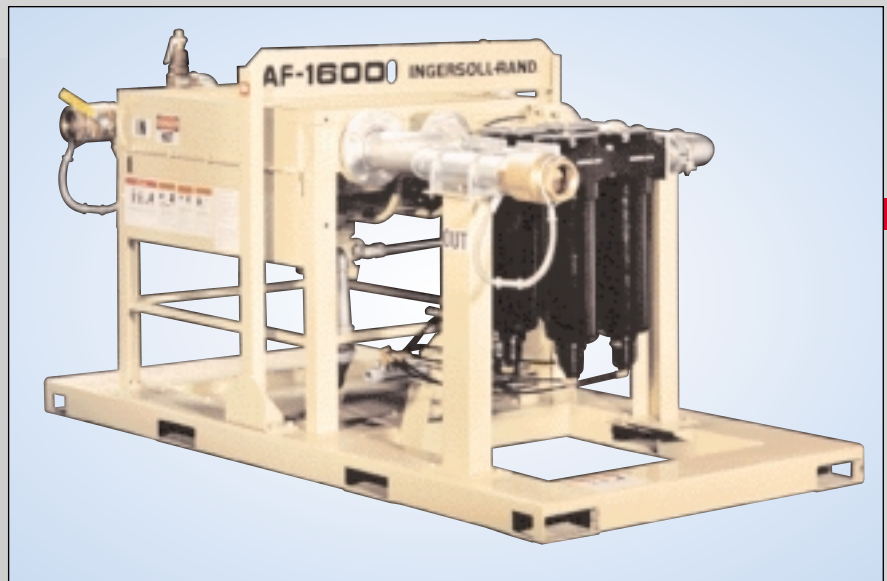
SPECIFICATIONS

	A85	A165	A165 with optional skid
CFM Capacity	up to 850 cfm	up to 1600 cfm	up to 1600 cfm
Maximum Ambient Temperature °F (°C)	125 (52)	125 (52)	125 (52)
Maximum Ambient Temperature °F (°C)	35 (2)	35 (2)	35 (2)
Aftercooler Approach °F (°C) Temperature	20 (11)	20 (11)	20 (11)
Weight lb. (kg)	440 (199)	660 (299)	790 (358)
Length in. (mm)	50 (1270)	59 (1499)	62 (1575)
Width in. (mm)	32 (813)	36¾ (934)	36¾ (934)
Height in. (mm)	38 (965)	41½ (1054)	44¾ (1137)

AF1600

The AF1600 provides the combination to give you cooler, dryer, and cleaner air. This unit combines an aftercooler, water separator, and two large, high efficiency coalescing filters assembled on a heavy-duty skid base. The unit features fork-lift slots or lifting bail capability for easily moving the unit.

This unit delivers instrument quality air relative to removal of dirt and oil contaminants, as well as removing significant amounts of water with the 20° F (11° C) aftercooler approach temperature. The aftercooler utilizes an air driven motor that consumes up to 130 cfm. An additional dryer may be required if specific dew point requirements are specified.



Cold Weather Option

- For use in temperatures from 0°F to 125°F when connected to a 120V AC circuit
- Insulated sheet metal enclosure
- Fan motor control valve
- 1750 watt heater with thermostat
- Requires heated drain hose for the central drain system (this is **not** available from I-R)

SPECIFICATIONS

General			Filtration Performance		
AF1600 maximum air capacity/delivery	cfm (l/s)	1600/1450 (754/683)	Solid particle removal down to	micron ²	0.01
Rated operating pressure	psig (bar)	100 to 150 (6.89 to 10.34)	Remaining liquid oil content	ppm ³	0.01
Maximum inlet operating pressure	psig (bar)	175 (12.07)	Physical Specifications		
Pressure drop with clean elements	psi (bar)	8 (0.55)	Air inlet/outlet connection		3" NPT
Maximum ambient temperature	°F (°C)	125 (52)	Overall length	in.(m)	96 (2.44)
Minimum ambient temperature	°F (°C)	35 (2)	Overall width	in.(m)	48 (1.22)
Aftercooler approach temperature	°F (°C) ¹	20 (11)	Overall height	in.(m)	48 (1.22)
			Weight	lb.(kg)	1500 (680)

¹ Based on operating conditions of 1600 cfm, 100 psig, 125°F ambient temperature, 80% relative humidity.

² • One micron is 0.04 thousandths of an inch.

• Penetration on D.O.R test <0.0001% dioctyl-phthalate particles with mean diameter of between 0.1 and 0.3 micron (most difficult size to remove).

³ • ppm = parts per million by weight.

• Based on filtration temperature of 70°F at 100 psig with a typical compressor lubricant utilizing the PNEUROP Recommended Test Method No. 6611/1984 part 2. Filter performance may vary with temperature and inlet liquid content variations.



Instrument Quality Air

When your needs for clean dry air require a complete and integral system, the IQ System™ line of compressors will fill your needs. These units feature an integral aftercooler, water separator, and two high-efficiency coalescing and particulate filters.

The units produce instrument quality air¹, which meets and exceeds ISA standard S7.0.01-1996 for dirt and oil aerosol removal, and when linked with an RD series dryer, the system produces instrument quality air with a -40°F dew point.

Package Design Features

- Rated for continuous-duty operation²
- Patented condensate flash system vaporizes **all** condensate for zero discharge
- Integral aftercooler discharges air at **only** 20°F above ambient
- Simple valving allows versatility of running the unit in the IQ mode or standard rotary screw compressed air mode
- Redundant circuit, safety shut-down system with pressure differential switches assures the proper filtration of air to the application and provides a warning for routine filter maintenance
- Cold weather protection available to -20°F

Three Models To Cover Any Application Need

Model	300	935	1300
Engine			
Make	Cummins	Cummins	Cummins
Model	B3.9-C	M11-C	N14-C
Compressor - Oil Flooded, Rotary Screw Type			
Free-air delivery (cfm)/(L/sec) ³	300 / 142	935 / 441	1300 / 613
Rated operating pressure (psig/bar)	125-150 / 8.6-10.3	125-150 / 8.6-10.3	125-150 / 8.6-10.3
Air discharge outlets (Qty)/size (in)	(1) 1.25	(1) 2	(1) 3
Fuel tank capacity (gal/L)	47 / 178	142 / 538	180 / 681
Unit w/ High Speed Running Gear			
Overall length including drawbar (in/mm)	149 / 3785	204 / 5182	274 / 2959
Overall width (in/mm)	77 / 1956	80 / 2032	88.6 / 2250
Overall height (in/mm)	68.5 / 1740	93.0 / 2362	102 / 2591
Track width (in/mm)	65 / 1651	65.2 / 1656	71 / 1803
Shipping weight (lb/kg) ⁴	3780 / 1715	9950 / 4513	16700 / 7575

Specifications are subject to change without notice so that improvements can be effected as quickly as possible.

1 Dryer required to achieve proper dewpoint and vapor removal

2 This feature is not available on the 300IQ model.

3 ISO1217±4%

4 Shipping weight includes all fluids *except* fuel.

RD Series–Desiccant Dryers

The RD Series of dryers provides the combination to give you clean and dry air. This unit combines a heatless desiccant dryer, and a high efficiency coalescing/particulate prefilter plus a particulate afterfilter.

These dryers provide exceptionally dry air with dewpoints down to -40°F or lower.

Design Features

- Mounted Coalescing/Particulate Prefilter to remove liquid moisture and oil down to 0.001 PPMW and particulate down to 0.01 with an efficiency of 99.999% D.O.P.
- Fully Automatic Control and Fail-Safe System for uninterrupted performance and safety.
- Adjustable Purge permits a purge rate to be selected for varying seasonal and process requirements.
- 115 VAC electrical service with grounded three-prong connection for simple installation and safety.
- Construction Grade Packaging with fork pockets and lifting eyes for ease of handling with no special trucking requirements.
- Mounted Particulate Afterfilter to remove any desiccant dust that may have resulted from the drying process. Particulate filter removes particulates 1.0 micron and larger with a 99.99% efficiency.
- Non-Lubricated Switching Valves with only one moving part for long and trouble-free service life.
- NEMA 4 electrics suitable for outdoor installation.



IR Model	Flow Inlet	SCFM(1) Outlet Dewpoint -40°F	Max. Working Pressure	Connection Size	Dimensions (in.)			Weight (lb.)
					H	W	L	
RD1000	1000	850	150	3"NPT	69.12	54	100	3691
RD1600	1600	1360	150	3"NPT	78	73.62	98.25	6500

(1) Flow shown is based on inlet compressed air at 100 psig and 100°F.

Operating Conditions

Maximum Inlet Temperature: 140°F

Minimum/Maximum Ambient Temperature 35/120°F Standard -20/120°F with Optional Low Ambient Package Installed.

AD Series – Aftercooler & Deliquescent Dryer

The AD series of units provides the combination to give you cooler and dryer air. This unit combines an aftercooler, water separator, and a deliquescent dryer, all assembled on a heavy-duty skid base.

The aftercooler provides a 20° F (11° C) aftercooler approach temperature. The aftercooler utilizes an air driven motor that consumes up to 55 or 130 cfm depending on the model. The deliquescent dryer provides additional drying capabilities by providing dew point suppression 20° F below the ambient conditions.

Design Features

- Dryer vessels are coated internally with an epoxy coating for long - life.
- Heavy-duty skid construction with forklift channels and lifting eyes.
- Large, efficient, vertically-mounted, aircooled aftercooler with air motor.
- Steps/platform provide safe, easy loading of deliquescent material.
- Safety relief valve provides over pressure protection of system and personnel.
- Two sight glasses allow easy inspection of deliquescent level.



Moisture Magnet® II

A deliquescent dryer is only as good as the deliquescent material used.

Moisture Magnet® II is a premium drying product for use in deliquescent (single tower) dryers of all sizes. It's specially made to be a long lasting tablet providing high performance and low operating cost.

Moisture Magnet® II is conveniently packaged in heavy-duty, plastic-lined, 50-pound bags—keeps out moisture and provides indefinite shelf life.

Moisture Magnet® II is not supplied with the unit. It must be ordered separately.

AD Series Options

- Coalescing filter removes water and liquid oil from compressed air. Maximum remaining liquid oil content is 0.5 PPM @ 70°F.
- Particulate filter insures removal of deliquescent particles down to one micron size.
- Automatic float drain on water separator.

D165 – Deliquescent Dryer

- Dew point suppression of 20°F
- Heavy-duty skid construction with forklift channels
- Safety relief valve provides over pressure protection of system and personnel
- Two sight glasses allow easy inspection of deliquescent level
- Dryer vessel is coated internally with an epoxy coating for long life

SPECIFICATIONS

Model	AD85	AD165	D165
Aftercooler			
Fan drive	Air motor	Air motor	None
Speed	1750 rpm	1750 rpm	None
SCFM (m ³ /hr)	55 (94)	130 (221)	None
PSIG (kg/cm ²)	60 (4.2)	60 (4.2)	None
System			
Max. working pressure - psig (kg/cm ²)	200 (14.1)	200 (14.1)	200 (14.1)
Dew point suppression °F (°C)	20° (12.5°)	20° (12.5°)	20° (12.5°)
Inlet/outlet connection	2" NPT	3" NPT	3" NPT
Maximum Capacities-scfm			
90 psig - scfm (kg/cm ²)	525 (892)	1050 (1784)	1050 (1784)
100 psig - scfm (kg/cm ²)	600 (1019)	1150 (1954)	1150 (1954)
125 psig - scfm (kg/cm ²)	700 (1189)	1400 (2379)	1400 (2379)
150 psig - scfm (kg/cm ²)	850 (1444)	1650 (2803)	1650 (2803)
Deliquescent (Purchased Separately)			
Deliquescent required	Moisture Magnet® II	Moisture Magnet® II	Moisture Magnet® II
Deliquescent weight - lb. (kg)	650 (295)	1800 (816)	1800 (816)
Approx. use/yr.* - lb. (kg)	494 (224)	953 (432)	953 (432)
Overall Dimensions			
Overall length - in. (mm)	88 (2235)	110 (2794)	55 (1397)
Overall width - in. (mm)	52 (1321)	63 (1600)	63 (1600)
Overall height - in. (mm)	68 (1727)	97 (2464)	97 (2464)
Weight (dry) - lb. (kg)	1425 (646)	3200 (1455)	2150 (977)
Weight (filled) - lb. (kg)	2075 (941)	5000 (2273)	3950 (1796)

* 100 psi, 80°F inlet temp. 40 hrs/wk – 50 wk/yr.

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More Than Air. Answers.

Online answers: <http://www.air.ingersoll-rand.com>

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