domnick hunter

CRD Refrigeration Dryers

3.3 - 110 m³/min (118 - 3885 cfm) ISO 7183 50Hz

Energy efficient
compressed air refrigeration dryers

1995 1998 ISO 9001 BSI REGISTERED FIRM Q 5240 SINCE 1987 BCAS MEMBER SINCE 1970 MEMBER COMPRESSED AIR AND GAS INSTITUTE CAGI

Compressed Air contains water, oil and dirt

The Problem

Compressed air is an essential power source that is widely used throughout industry. This safe, powerful and reliable utility can be the most important part of your production process. However, your compressed air will contain water, dirt, wear particles, bacteria and even degraded lubricating oil which all mix together to form an unwanted abrasive sludge. This sludge, often acidic, rapidly wears tools and pneumatic machinery, blocks valves and orifices causing high maintenance and costly air leaks. It also corrodes piping systems and can bring your production process to an extremely expensive standstill! Only compressed air that is totally clean and dry will ensure maximum savings.

Corrosion

Unwanted Abrasive Sludge

Damaged Tools

The Solution

All of these costly problems can be avoided by installing a **domnick hunter** CRD compressed air refrigeration dryer package complete with OIL-X$_{PLUS}$ filtration. The packages are suitable for use with any compressor type and provide air quality to ISO 8573.1 Class 1.4.1.

Benefits

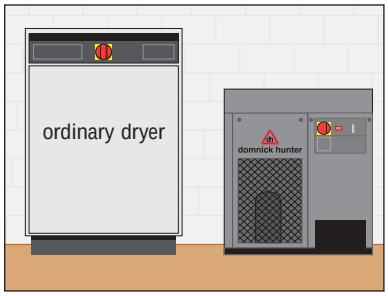
Clean, Dry, Compressed Air

Stops Damage & Corrosion

Prevents product spoilage and prolongs life of compressed air systems and pneumatic tools.

Energy Efficient, Low Running Costs

Use of R407C refrigerant reduces refrigerant charge, compressor size and running costs when compared to more traditional HFC refrigerants. Scroll compressors in models CRD0660 to CRD6600 reduce energy costs by a further 20%.



Compact & Lightweight

Efficient heat exchanger and refrigeration circuit design combined with R407C refrigerant reduces size and weight when compared to dryers charged with more traditional HFC refrigerants.

Reliable Operation

Simple circuit design and use of high quality components, ensures a long operating life. Easy to remove casing and instant access to condensate drain simplifies routine cleaning and maintenance.

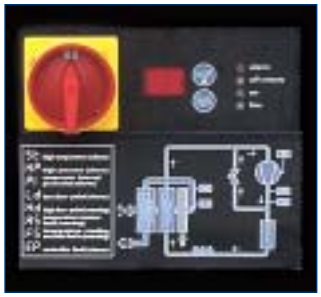
Montreal Protocol compliant

Use of R407C environmentally friendly HFC refrigerant ensures compliance with the Montreal Protocol. With no proposed 'phase out' of this refrigerant, the dryer will not have to be replaced prematurely.

The inside story

Simple Controller

Fitted on models CRD0200 to CRD0540, the simple controller provides on / off operation and visual indication of dryer performance.



Electronic Controller

Models CRD0660 to CRD6600, are fitted with an electronic control system. A keypad provides total control of the dryer and allows access to performance and service functions. The digital display shows dryer perfomance and alarm conditions for high refrigerant pressure, high refrigerant temperature, high and low dewpoint and compressor faults. Manual electrical isolation and a full refrigeration system mimic display is also included on the front panel.

Anti-Galvanic Corrosion Couplings

Anti-galvanic corrosion couplings between copper refrigerant circuit and aluminium heat exchanger ensures no leaks.

Efficient Heat Exchanger Design

All models use the High Performance Cross Flow Heat Exchange Module.

Using R407C and the High Performance Cross Flow Heat Exchanger Module allows the refrigeration circuit to be typically 30% smaller than traditional HFC based systems, providing savings of up to 10% in energy consumption.

Energy Efficiency

The combination of an efficient heat exchanger design, R407C refrigerant, and level sensing, no air loss condensate drains produces a compact energy efficient dryer. Models CRD0660 to CRD6600 utilise energy efficient scroll compressors. Scroll compressors have 50% less moving parts, lower vibration and noise levels and consume 20% less energy than an equivalent output piston compressor, increasing energy efficiency even further.

ENERGY EFFICIENT

SCROLL COMPRESSOR

Additional Energy Saving 'Cold Mass' Control System

The electronic controller can also be connected to the compressor start - stop circuit, a flow switch or a remote timer to provide additional energy savings in periods of no demand such as evenings or weekends.

In 'Cold Mass' mode, the evaporator temperature is always maintained allowing instant start up when required.

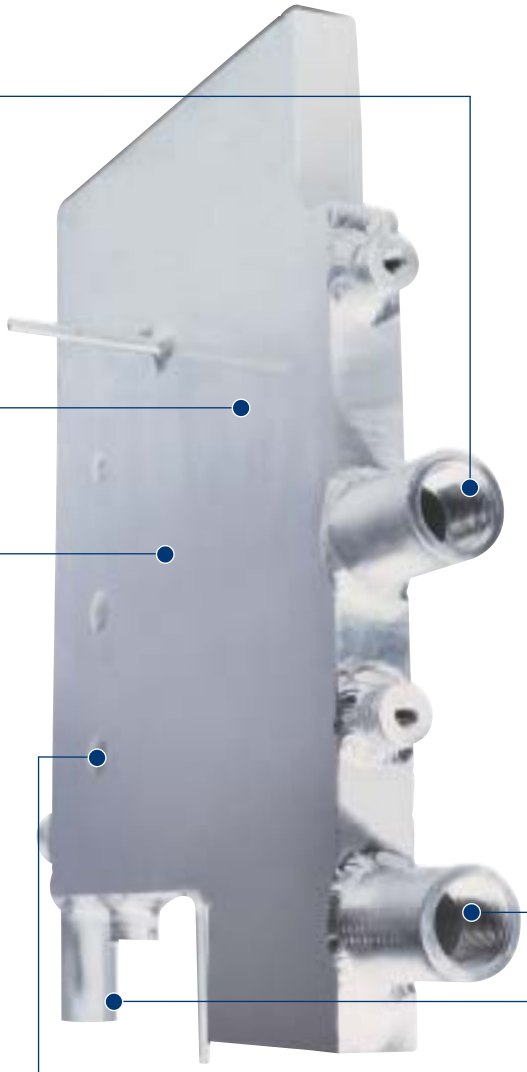
Energy Efficient Level Sensing Drain

Level sensing condensate drains only discharge when liquid is present and close before compressed air is lost.
Saving Air – Saves Energy – Saves Money.

High Performance Cross Flow Heat Exchanger

At the centre of the CRD dryer is the high performance Cross Flow Heat Exchanger Module. This module is a combination of two brazed aluminum bar and plate heat exchangers and a high efficiency stainless steel water separator.

The flow paths through each heat exchanger allow them to be constructed into a single, very compact package. By using a cross flow arrangement, the air flow can exit the air to air heat exchanger and enter directly into the air to refrigerant heat exchanger without any interconnecting piping to direct the flow, resulting in a size, weight and pressure drop reduction when compared to conventional heat exchangers. The brazed and welded construction also means that there are no gasket joints internal to the assembly, providing a maintenance free unit.



1 Air Inlet

2 Air to Air Heat Exchanger

The air to air heat exchanger is a pre-cooler / re-heater. It pre-cools the hot, saturated, incoming air by transferring heat to cold air that is returning from the stainless steel water separator. This part of the process also has the effect of re-heating the cold air before distribution to the compressed air system, reducing the likelihood of external pipeline condensation or "sweating" that can occur on chilled surfaces in humid conditions. The importance of this heat exchanger is that it produces some of the cooling load that would otherwise have to be handled by the refrigeration system. This significantly reduces the size and energy consumption of the refrigeration circuit.

3 Air to Refrigerant Heat Exchanger

The air to refrigerant heat exchanger takes the pre-cooled air from the air to air heat exchanger and cools it to the required dewpoint by transferring heat into the evaporating refrigerant. After cooling, the air enters directly into the high efficiency stainless steel water separator to remove the condensed water.

6 Air Outlet

The dry cold air returns to the air to air heat exchanger through an inverted "L" shaped wrap around manifold. This completely eliminates any need for external piping between the two heat exchangers and the water separator.

5 Condensate Outlet

An energy efficient, no air loss drain mounted at the bottom of the module removes the separated condensate.

4 Water Separation

The heat transfer matrix of the Cross Flow Heat Exchanger Module has an enhanced low velocity, low pressure drop geometry, providing greater heat transfer. Low velocity allows the inclusion of an integral stainless steel water separator. Most of the droplet separation occurs in the heat transfer matrix with a stainless steel wire mesh removing any remaining droplets suspended in the air flow..

How it Works

Refrigeration Compressor

This compressor forms part of a closed loop system compressing the refrigerant and circulating it around the system. Models CRD0200 to CRD0540 use piston compressors, and models CRD0660 to CRD6600 use energy efficient scroll compressors.

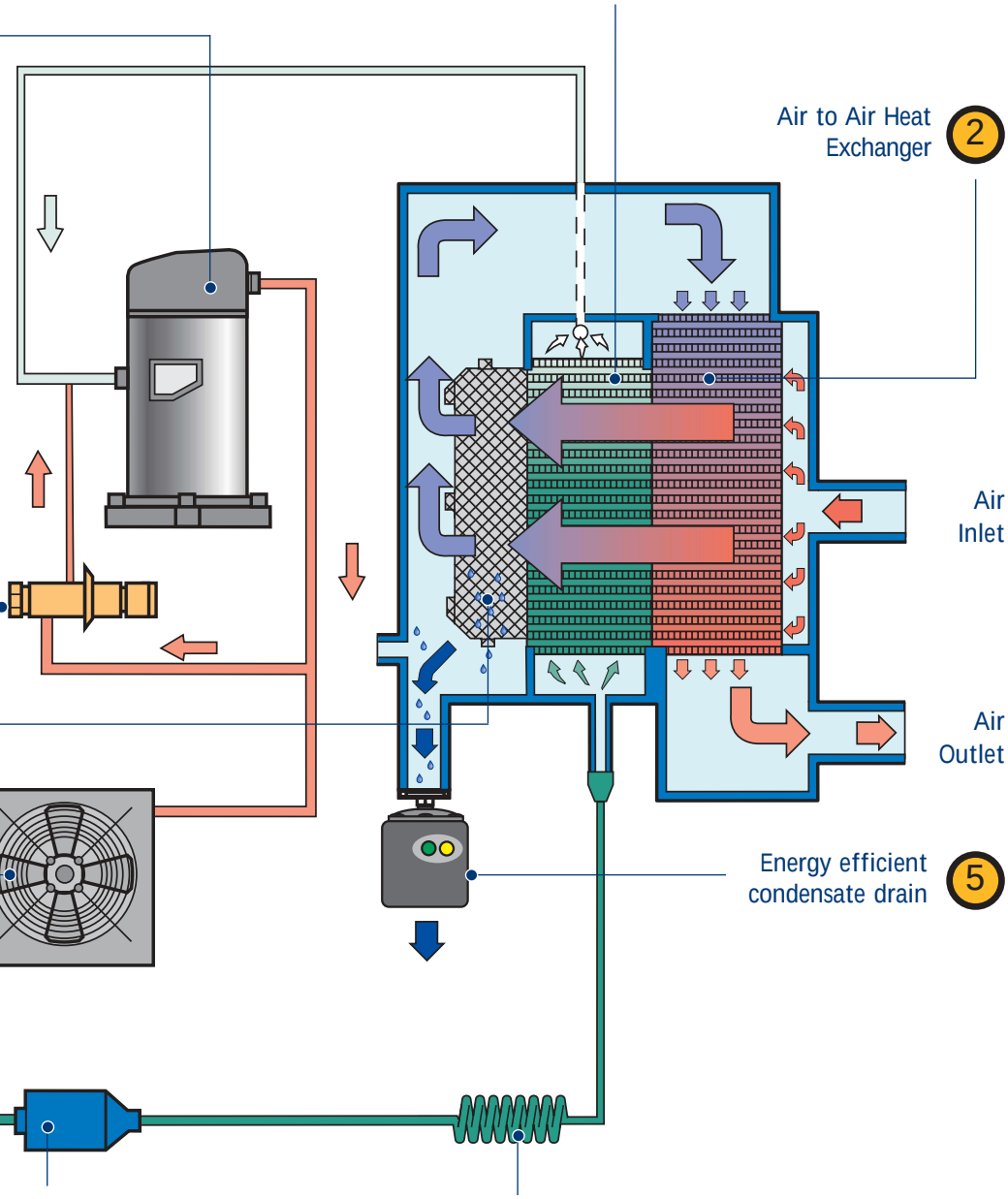
ENERGY EFFICIENT
SCROLL COMPRESSOR

Evaporator (air to refrigerant heat exchanger)

The evaporator removes heat from the compressed air and transfers it to the cold refrigerant. The saturated refrigerant evaporates with the heat from the compressed air. Superheated vapour is then returned to the compressor.

Hot Gas by-pass Valve

The function of the hot gas by-pass valve is to prevent freezing of the evaporator in low load conditions. It does this by sensing low pressure refrigerant leaving the evaporator and re-directing hot refrigerant gas back to the compressor inlet as required. This ensures optimum dewpoint control under all operating conditions. CRD dryers use a 100% modulating valve which is pressure operated, providing a quicker response than temperature controlled valves.



Condenser

The condenser receives the hot, high pressure vapour from the compressor and cools it. The heat added to the refrigerant is exchanged with the cooling air flow. Condensation occurs as the refrigerant passes through the condenser and high pressure, sub-cooled liquid is formed to feed the capillary expander.

Filter / Dryer

The filter dryer removes moisture or particulate that may be present in the refrigerant system.

Capillary Expander

The capillary expander reduces the pressure of the liquid refrigerant to ensure the correct refrigerant flow rate enters the evaporator. This provides maximum heat exchange, and correct compressed air dewpoint. Simple design with no moving parts offers increased reliability.

Technical Specifications

* Flow capacities in accordance with ISO7183, air suction of FAD 20°C (68°F), 1 bar (14.5 psi) at the following operating conditions :
Ambient temperature = 25°C (77°F), Inlet temperature = 35°C (95°F), Relative humidity 60%. Working pressure = 7 bar g (102 psi g), Dewpoint 3°C (37°F).

Model	Nominal Capacity *			Max Pressure		Electrical Supply		Absorbed Power		Refrigerant	Air Connections
	m^3/min	m^3/hr	cfm	bar g	psi g	230V / 1ph / 50Hz	400V / 3ph / 50Hz	kW	hp		
CRD0200	3.3	200	118	12	174	●		0.57	0.76	R407C	1½" BSP
CRD0240	4.0	240	141	12	174	●		0.58	0.78	R407C	1½" BSP
CRD0310	5.2	310	182	12	174	●		0.96	1.29	R407C	1½" BSP
CRD0380	6.3	380	224	12	174	●		0.95	1.27	R407C	1½" BSP
CRD0450	7.5	450	265	12	174	●		0.98	1.31	R407C	1½" BSP
CRD0540	9.0	540	318	12	174	●		1.23	1.65	R407C	1½" BSP
CRD0660	11	660	388	12	174		●	1.18	1.58	R407C	2" BSP
CRD0735	12	735	433	12	174		●	1.21	1.62	R407C	2" BSP
CRD0860	14	860	506	12	174		●	1.49	2.00	R407C	2" BSP
CRD1100	18	1100	647	12	174		●	1.49	2.00	R407C	2" BSP
CRD1340	22	1340	789	12	174		●	2.11	2.83	R407C	DN80
CRD1500	25	1500	883	12	174		●	2.69	3.61	R407C	DN80
CRD1650	28	1650	971	12	174		●	2.76	3.70	R407C	DN80
CRD1950	33	1950	1148	12	174		●	3.08	4.13	R407C	DN80
CRD2300	38	2300	1354	12	174		●	3.19	4.28	R407C	DN80
CRD3000	50	3000	1766	12	174		●	4.38	5.87	R407C	DN100
CRD3850	64	3850	2266	12	174		●	5.63	7.55	R407C	DN100
CRD4620	77	4620	2719	12	174		●	8.57	11.49	R407C	DN150
CRD5400	90	5400	3178	12	174		●	7.72	10.35	R407C	DN150
CRD6600	110	6600	3885	12	174		●	9.93	13.32	R407C	DN150

Correction Factors

To obtain dryer capacity at new conditions, multiply nominal capacity * x C1 x C2 x C3 x C4

Ambient Temperature (C1)							
°C	20	25	30	35	40	45	50
°F	68	77	86	95	104	113	122
Correction Factor	1.03	1.00	0.96	0.92	0.88	0.80	0.70

Inlet Temperature (C2)							
°C	30	35	40	45	50	55	60
°F	86	95	104	113	122	131	140
Correction Factor	1.20	1.00	0.84	0.71	0.60	0.50	0.45

Inlet Pressure (C3)										
Pressure bar g	3	4	5	6	7	8	9	10	11	12
Pressure bar psi g	44	58	73	87	100	116	131	145	160	174
Correction Factor	0.74	0.84	0.90	0.96	1.00	1.04	1.06	1.09	1.11	1.13

Dewpoint (C4)				
°C	3	5	7	10
°F	38	41	45	50
Correction Factor	1.00	1.14	1.25	1.35

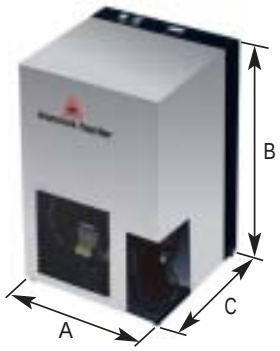
Maximum ambient temperature 50°C (122°F)
Maximum inlet temperature 60°C (140°F)
Minimum ambient temperature 5°C (41°F)

Options:

Water Cooled Condenser : on models CRD1340 to CRD6600

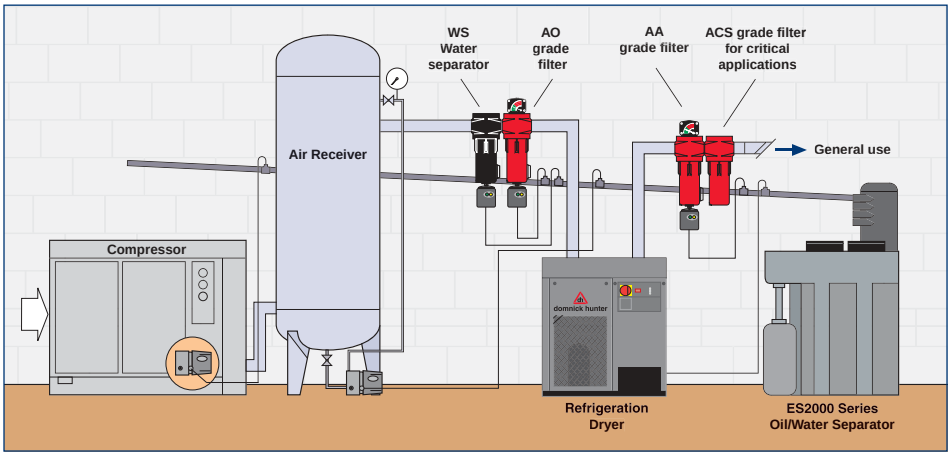
Weights and Dimensions

Model	Width (A)		Height (B)		Depth (C)		Weight	
	mm	in	mm	in	mm	in	kgs	lbs
CRD0200	615	24.21	791	31.14	552	21.73	65	143
CRD0240	615	24.21	791	31.14	552	21.73	66	146
CRD0310	615	24.21	791	31.14	552	21.73	68	150
CRD0380	615	24.21	791	31.14	552	21.73	69	152
CRD0450	615	24.21	791	31.14	552	21.73	70	154
CRD0540	615	24.21	791	31.14	552	21.73	73	161
CRD0660	920	36.22	1015	39.96	672	26.46	140	309
CRD0735	920	36.22	1015	39.96	672	26.46	142	313
CRD0860	920	36.22	1015	39.96	672	26.46	144	317
CRD1100	920	36.22	1015	39.96	672	26.46	150	331
CRD1340	1010	39.76	1500	59.06	1310	51.57	400	882
CRD1500	1010	39.76	1500	59.06	1310	51.57	420	926
CRD1650	1010	39.76	1500	59.06	1310	51.57	425	937
CRD1950	1010	39.76	1500	59.06	1310	51.57	450	992
CRD2300	1010	39.76	1500	59.06	1310	51.57	456	1005
CRD3000	1010	39.76	1500	59.06	1310	51.57	470	1036
CRD3850	1010	39.76	1500	59.06	1810	71.26	550	1213
CRD4620	1010	39.76	1500	59.06	1810	71.26	580	1279
CRD5400	1010	39.76	1500	59.06	1810	71.26	590	1301
CRD6600	1010	39.76	1500	59.06	1810	71.26	660	1455



ISO 8573.1 Air Quality classes

QUALITY CLASS	DIRT Particle size in Micron	WATER Pressure Dewpoint °C (ppm. vol.) at 7 bar g	OIL (Including vapour) mg/m³
1	0.1	-70 (0.3)	0.01
2	1	-40 (16)	0.1
3	5	-20 (128)	1.0
4	15	+3 (940)	5
5	40	+7 (1240)	25
6	-	+10 (1500)	-



OIL-X$_{PLUS}$ filtration required to meet ISO 8573.1

Grade AO

High Efficiency General Purpose Protection

For the removal of particles down to 1 micron including coalesced liquid water and oil, providing a maximum remaining oil aerosol content of 0.5 mg/m^3 @ 21°C.

Grade AA

High Efficiency Oil Removal Filtration

For the removal of particles down to 0.01 micron including water and oil aerosols, providing a maximum remaining oil aerosol content of 0.01 mg/m^3 @ 21°C.

(Precede with Grade AO filter).

Grades AC & ACS

Activated Carbon Filtration

For the removal of oil vapour and hydrocarbon odours giving a maximum remaining oil content of <0.003 mg/m^3 (<0.003 ppm) (excluding methane) @ 21°C.

(Precede Grade ACS with Grade AA filter).
(AC filter combines AA and AC Grades).

Environmental Impact of Inefficient Compressed Air Systems

Global Warming

The greatest environmental impact of any compressed air system is the indirect contribution to global warming.

Any compressed air system which uses electricity produced by fossil fuel burning power stations contributes to carbon dioxide emissions.

Carbon dioxide is the major “greenhouse gas” contributing to global warming.

The more energy efficient the compressed air system, the less carbon dioxide produced.

domnick hunter can provide a total solution to inefficient compressed air systems

CRD REFRIGERATION DRYERS - Clean, dry compressed air to ISO 8573.1 Class 1.4.1 Energy efficient. Low running costs.

Environmentally friendly refrigerant and components.

OIL-Xplus - Highest quality compressed air.

Energy efficient filter housings and elements giving low pressure drop and running costs.

ED2000 SERIES - Electronic level sensing drains discharge only condensate and not compressed air.

Saving Air and Energy – Saves Money.

ES2000 SERIES - ES2000 Series Oil/Water Separators treat oily condensate at a fraction of the cost of other disposal methods and keep discharges within legal limits.

This can also assist in attaining ISO 14000 environmental approval.

ISO 9001 REGISTERED FIRM
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