

DX SERIES DIRECT EXPANSION ENERGY SAVING AIR DRYER

400 to 3000 scfm



Features:

- Digital Scroll Compressor
- Qualifies for energy rebates



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Setting a new standard in Quality and Reliability



DX Series Direct Expansion Energy Saving Air Dryer with Capacity Modulation Control™

For decades the non-cycling, direct expansion refrigerated air dryer has proven to be the most effective and reliable method of lowering the dew point and removing moisture from compressed air systems throughout industry.

The non-cycling, direct expansion air dryer design uses a refrigerant vapour expansion/ compression cycle to directly cool the compressed air stream. The moisture in the air condenses to a liquid and is separated from the air stream and drained away. This dryer design is fitted with a hot gas bypass valve that prevents the compressed air in the evaporator (air to refrigerant heat exchanger) temperature from dropping below the freezing point and blocking the air flow. The down side to this design is that it runs at or near full power regardless of the amount of air flow going through the dryer.

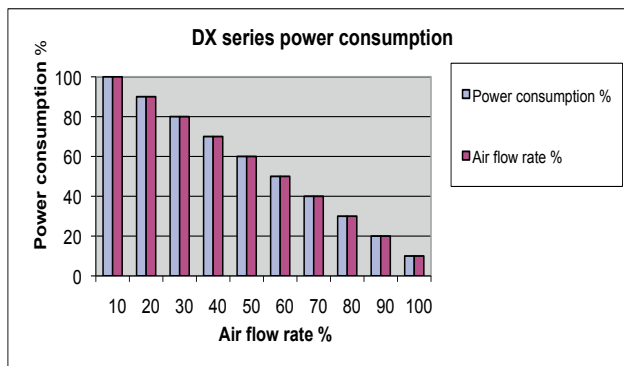
- **Now there is a better alternative**

Today, more than ever before, the need to reduce power consumption and lower energy costs is paramount. MACAIR engineers have developed the DX series direct expansion energy saving air dryer featuring the revolutionary digital scroll compressor. The DX series dryer is able to match its power consumption in direct proportion to the current load on the dryer. The control system is called Capacity Modulation Control™. Pressure transducers coupled by a closed loop digital controller instantaneously unloads the digital scroll compressor during periods of low air flow. When the compressor is unloaded it is doing no work. When in the unloaded position power consumption is reduced by 90%. The DX series dryer delivers accurate and consistent dew point control from 0 to 100% load conditions and reduces power consumption up to 90%.

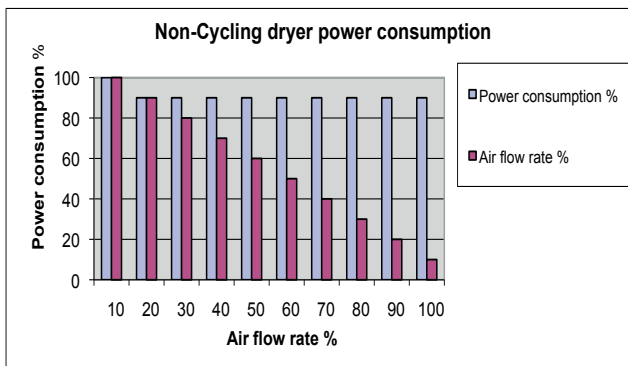
- **Qualifies for energy rebates**

- **Reliable Energy Saving Performance**

DX Series Energy Saving Dryer
Power Consumption vs Inlet Air Actual Capacity



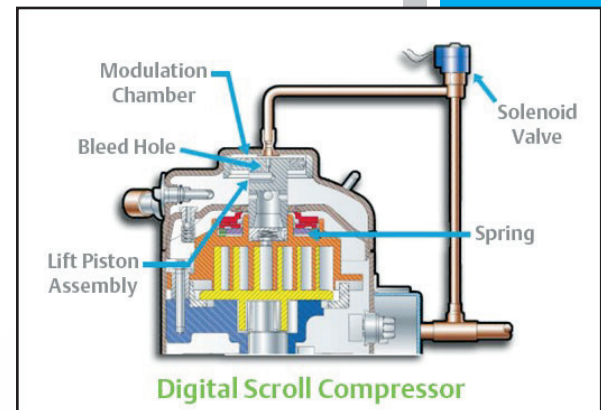
Non-Cycling, direct expansion dryers
power consumption vs Inlet Air Actual Capacity



Reduces operating costs up to 90%

- **Capacity Modulation Control™**

On most compressed air systems the actual air usage varies widely most of the time. This means that the load on the dryer is constantly fluctuating. The Capacity Modulation Control system consists of a closed loop digital controller and pressure transducers. When the air flow going through the dryer decreases a signal is sent to the digital scroll compressor to unload and stop pumping refrigerant to the evaporator. During this unloaded state the dryer power consumption is reduced by 90%. When air flow increases the compressor is loaded and resumes pumping refrigerant. The result is up to 90% reduction in power consumption and operating costs.



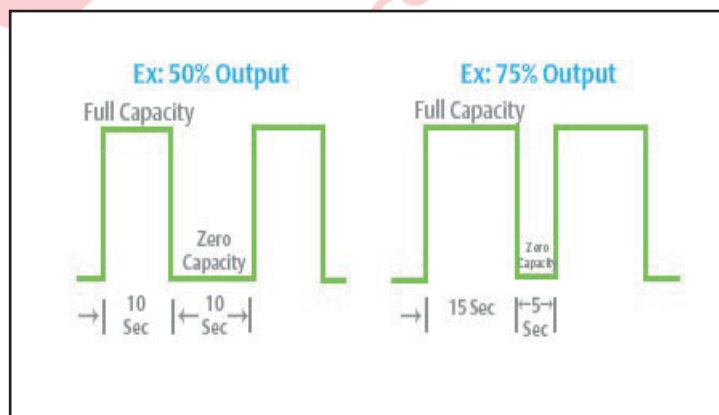
- **Qualifies for energy rebates**

- **Reliable Energy Saving Performance**

Cycle Time

The Digital Scroll operates in two stages the “loaded state”, during which the solenoid valve is normally closed and “unloaded state”, during which the solenoid valve is open. During the loaded state, the compressor operates like a standard scroll and delivers full capacity and mass flow. However, during the unloaded state, there is no capacity and no mass flow through the compressor.

At this stage, let us introduce the concept of a cycle time. A cycle time consists of a “Loaded State” time, and an “Unloaded State” time (Figure 2). The duration of these two-time segments determines the capacity modulation of the compressor. By varying the loaded state time and the unloaded state time, any capacity between 10% and 100% can be delivered by the compressor.



DX Series Direct Expansion Energy Saving Air Dryer with Capacity Modulation Control™

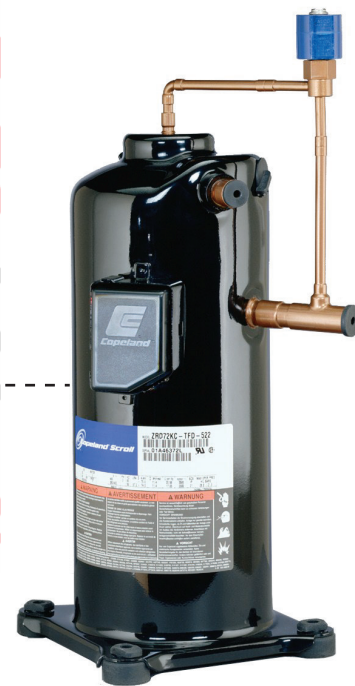
PUTTING IT ALL TOGETHER

THE DX Series air dryer featuring a digital scroll refrigeration compressor and capacity modulation control is the only type of air dryer that will respond during periods of lower compressed air usage by unloading the refrigeration compressor thereby reducing the power consumption of the dryer down to 10% of its typical full power (watts) running requirements. The beauty of this technology is its inherent simplicity. The standard Scroll has a unique feature called axial compliance. This allows the fixed scroll to move slightly in the axial direction to ensure that the fixed and orbiting scrolls are always engaged together with the optimal force. This optimal force, which holds the two Scrolls together at all operating conditions, ensures high efficiency of the Scroll. The Digital Scroll operation builds on this principle. A piston is fixed to the top scroll to ensure that when the piston moves up, the top scroll also moves up. There is a modulation chamber at the top of the piston that is connected to the discharge pressure through a bleed hole of diameter 0.6 mm. An external solenoid valve connects the modulation chamber with the suction side pressure. When the solenoid valve is in the closed position, the pressure on either side of the piston is discharged and a spring force ensures that the two scrolls are loaded together. When the solenoid valve is energized, the discharge gas in the modulation chamber is relieved to the low pressure. This causes the piston to move up and consequently the top scroll also moves up. This action separates the scrolls and results in no mass flow through the scrolls. At this point the power consumption is reduced by 90%. De-energizing the external solenoid valve again loads the compressor fully and the compression is resumed.

CLD Controller tm



Digital Scroll Compressor tm



- Modulation range of full load capacity: 10- 100%
- Significantly reduces compressor wear and tear by eliminating compressor start-stops.
- Precise control of system refrigerant pressures.
- Eliminates energy wasting hot gas bypass valves.
- Provides low consistent dew points from 0 to 100% compressed air flow capacities.
- Reduces operating costs up to 90%

Non-Cycling Dryer Design vs DX Series Energy Saving Dryer

Typical Non-Cycling dryers use a hot gas bypass valve and run continuously to control the flow of the refrigerant and maintain a stable dew point. Energy consumption remains at or near full power regardless of air demands. While this type of dryer delivers steady 38 F dew point it is very energy inefficient.

The DX series dryer does not have a hot gas bypass valve. By loading and unloading the refrigerant compressor the DX series dryer delivers steady and constant 38 F dew point air while also providing reliable energy savings during periods of low air flow.

There is only one way to determine the actual cost of an air dryer.

$$\text{Initial Cost} + \text{Operating Cost} = \text{Actual Cost}$$

Guaranteed Annual Energy Reduction and Operating Costs Savings with the DX Series Energy Saving Air Dryer.

	Non-Cycling Dryer w/Hot Gas Bypass	DX Series Energy Saving Dryer	Non-Cycling Dryer w/Hot Gas Bypass	DX Series Energy Saving Dryer
DRYER MODEL—SCFM	500	DX500A	1000	DX1000A
PRESSURE DEWPOINT	39°F	39°F	39°F	39°F
INITIAL DRYER COST	\$8099.	\$12485.	\$12915	\$16595.
ENERGY CONSUMPTION PER YEAR (kWh)	25134	20935	48300	43940
ENERGY COSTS PER YEAR IN U.S.D.	\$3529.	\$881.	\$4347	\$1852.
1st YEAR COSTS	\$11854.	\$13366	\$17,262	\$18447
5 YEAR COSTS*	\$26874.	\$16890 Save 37%	\$34,650.	\$25855. Save 25%

*Based on a 3 shift operation @ \$.09/ kWh

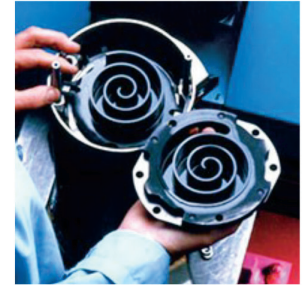
ANNUAL ENERGY COSTS @ 100% RATED CAPACITY	INLET AIR FLOW % ENERGY SAVINGS % MODEL	ANNUAL ENERGY SAVINGS \$ PER YEAR BY MODEL AT LESS THAN 100% RATED CAPACITY			
		75%	50%	25%	0%
		22%	46%	67%	91%
\$2938.	DX500A	\$646	\$1351	\$1968	\$2674
\$3272.	DX625A	\$720	\$1505	\$2192	\$2978
\$3916.	DX800A	\$862	\$1801	\$2624	\$3564
\$5045.	DX1000A	\$1110	\$2321	\$3380	\$4591
\$6175.	DX1200A	\$1359	\$2841	\$4137	\$5619
\$7533.	DX1600A	\$1657	\$3465	\$5047	\$6855
\$10,796.	DX2000A	\$2375	\$4966	\$7233	\$9824
\$12,095.	DX2500A	\$2661	\$5564	\$8104	\$11,006
\$13,395.	DX3000A	\$2947	\$6162	\$8975	\$12,189

DX Series Direct Expansion Energy Saving Air Dryer with Capacity Modulation Control™

QUALITY FEATURES - MADE IN THE USA

DIGITAL SCROLL REFRIGERANT COMPRESSOR (Patented)
Increased efficiency by precisely matching compressor output to the inlet air load on the dryer. Capacity modulation between 10% and 100% is achieved quickly and smoothly reducing operating costs up to 90%.

SCROLL COMPRESSOR TECHNOLOGY



CLD CONTROLLER

Is a closed loop digital controller that precisely monitors the refrigeration system high side and low side pressures, cycles the condenser fan motors on and off, loads and unloads the digital scroll compressor based on the current heat load (Air flow) going through the dryer.

- Refrigerant Suction Pressure readout
- Refrigerant Discharge pressure readout
- Condenser fan on/ off indicators

CLD Controller



ADX HEAT EXCHANGER MODULE

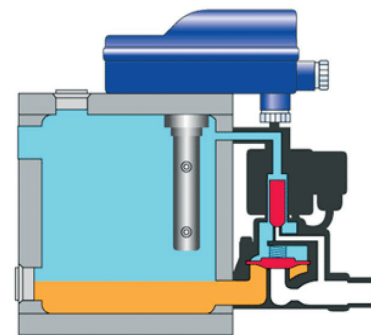
The ADX heat exchanger module combines the air to air, air to refrigerant and moisture separator in one compact corrosion proof module. Because of the compact design and no interconnecting piping the pressure drop average of 2.0 psid is the lowest in the dryer industry.

SIMPLE, RELIABLE CONTROLS

- Suction Pressure Gauge
- Discharge Pressure Gauge
- Inlet Air Temperature Gauge
- On-Off switch
- Power on light

NO LOSS CONDENSATE DRAIN VALVE is an electronically controlled level sensing drain system designed to efficiently discharge condensate from your compressed air system. By minimizing the loss of compressed air during discharge overall plant efficiency is improved by reducing the cost of compressed air production.

No Loss Drain



SPECIFICATIONS & DIMENSIONS

MODEL	INLET AIR CAPACITY (1)		POWER kW	PRESS. DROP PSID	IN/OUT ₂ CONN SIZE	DIMENSIONS (IN)			SHIP WGT (LBS)	REF TYPE	VOLTAGES v/ph/hz
	SCFM	Nm3/hr				W	L	H			
DX500A	500	802	3.36	2.0	2" NPT	29	46	37	525	R404A	Standard 380-420/3/50 460/3/60
DX600A	700	1123	4.47	2.0	3" NPT	29	46	37	535		
DX800A	800	1365	5.01	2.10	3" NPT	35	50	59	855		
DX1000A	1000	1605	6.91	2.15	3" NPT	35	50	59	875		
DX1200A	1200	1926	7.05	2.13	3" NPT	35	50	59	925		Optional 230/3/60 575/3/60
DX1500A	1500	2247	7.30	2.30	4" NPT	35	50	59	1395		
DX1750A	1750	2728	8.60	2.20	4" NPT	40	56	72	1695		
DX2000A	2000	3210	12.32	2.10	4" NPT	40	56	72	1795		
DX2500A	2500	4494	17.20	2.95	6" FLG	40	69	72	1985		
DX3000A	3000	5457	18.01	2.25	6" FLG	40	69	72	2100		

NOTES

1. Dryer inlet air capacity is based on ISO7138 conditions: Inlet Air at 100 psig and 100°F (38°C) saturated, ambient air at 100°F (38°C), operating on 60 Hz power supply.
2. kW power rating is based on 460v/3ph/60hz power supply.
3. Air-cooled condensers are standard on all models. Water-cooled are available.
4. H Series pre-filter is recommended installed before the dryer.
5. Information in this catalog is subject to change without notice. Please contact the factory for certified prints if needed.

SELECTION GUIDE & CORRECTION FACTORS

Example: What is the right dryer for the following conditions?

Out put from the air compressor: 500 SCFM, Inlet Air Pressure: 80 PSIG, Inlet Air Temp: 110 F, Ambient Temp: 110 F, Dew point Temp: 38 F.

Inlet Air Flow Capacity of a UA150A:

(Nominal Capacity) 800 SCFM x .95 x .72 x .94 x 1 = 96 SCFM (Corrected Capacity)

Based on the correction factors the DX800A would be a good choice for this application.

(Nominal Capacity) 800 SCFM x .95 x .72 x .94 x 1 = 514 SCFM (Corrected Capacity)

INLET PRESSURE	50	80	100	125	150	175	200
CORRECTION FACTOR	.85	.95	1.0	1.07	1.13	1.18	1.20

INLET TEMP	80	90	100	110	120	140	160
CORRECTION FACTOR	1.50	1.21	1	.72	.61	.53	.53

AMBIENT TEMP	70	80	90	100	110
CORRECTION FACTOR	1.1	1.07	1.05	1	.94

DEWPOINT TEMP	38	45	50
CORRECTION FACTOR	1	1.24	1.29

The DX series dryers take energy savings to another level. Problems inherent in other "energy saving air dryer" designs such as dew point spikes, compressor cycling, improper lubrication, high initial costs have been eliminated. The DX series dryer is able to match its power consumption in direct proportion to the current load providing the benefits of an energy saving dryer at the cost level of a non-cycling dryer.

MACAIR is an independently owned and operated company located in Walled Lake, MI USA that specializes in manufacturing compressed air treatment equipment for all commercial and industrial markets. There are thousands of our systems installed worldwide in every type of industry. The following are several MACAIR customers:

- | | |
|--------------------|------------------------|
| • FORD MOTOR CO | • MEIJERS |
| • COPELAND CORP | • DETROIT CHROME |
| • EMERSON ELECTRIC | • JIFFY MIX |
| • FEDERAL RESERVE | • AMTRAK |
| • U.S. AIR FORCE | • DANA CORP |
| • WHIRLPOOL CORP | • ATTENTIVE INDUSTRIES |

Made In USA Quality

MACAIR takes the craftsmanship of quality air dryers seriously. That's what the Made in USA moniker is proudly displayed. All MACAIR dryers are handmade by highly skilled and experienced craftsman in Walled Lake, Michigan USA.

The Finest in American Craftsmanship

MACAIR creates air dryers that embody the traditional American values of quality, performance and durability that are part of our countries heritage.

5 YEAR WARRANTY

MACAIR DX Series dryers are warranted to be free from materials and workmanship defects for 1 year from the date of shipment. When the DX dryer is purchased with an H Series pre filter the warranty on the heat exchanger is extended to 5 years from the date of shipment.
(See warranty guidelines for details)

**MHR
HEATLESS DRYERS**



**H SERIES
FILTERS**



**MD SERIES
HIGH CAPACITY**



**MHT SERIES
HIGH TEMP DRYERS**



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