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REFRIGERATION COMPRESSED AIR DRYER ERF SERIES NON-CYCLING OWNER / OPERATOR MANUAL



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See GRF/ERF Electrical Addendum

DEFINITION OF THE SIGNS USED IN THIS MANUAL



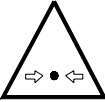
Before attempting any installation or maintenance on the dryer, read carefully the instructions reported in this manual.



General warning sign. Risk of danger or possibility of damage to the machine. Read carefully the text related to this sign.



Electrical hazard. The relevant text outlines conditions, which could result fatal. The related instructions must be strictly respected.



Danger hazard. Part or system under pressure.



Danger hazard. Its absolutely forbidden breathing the air treated with this apparatus.

This manual contains information and recommendations for installing, and operating, standard non-cycling Refrigeration Air Dryers.

Direct any question to the nearest equipment distributor. Always specify the **model number, serial number, refrigerant type, and gauge readings during operation.**

Replacement and maintenance parts along with any questions related to systems or installations should be directed to your local Great Lakes Air distributor. If local distributor is unknown, contact the Great Lakes Air @ 734-326-7080 for your local distributor.

Prior to performing any warranty service on Great Lakes Compressed Air Dryers, an authorization number must be obtained from the service department. Have **model number, serial number, and brief description of warranty issue** available for your service representative. Failure to obtain service authorization number will void equipment warranty.

The information, specifications in this manual are in accord with the information in effect at the time of printing. The manufacturer reserves the right to make changes without notice or incurring obligation.

GENERAL SAFETY WARNINGS



Compressed air is a highly hazardous energy source. Never work on the dryer with parts under pressure. Never point the compressed air or the condensate drain jet towards anybody. The user is responsible for the installation of the dryer, which must be executed on the basis of this manual. Otherwise, the warranty will be voided and dangerous situations for the personnel and/or damages to the machine could occur.



Only qualified personnel can use and service electrically powered devices. Before attempting any maintenance action, the following conditions must be satisfied:

- Be sure that the voltage is disconnected before any work is performed.
- Be sure that any part of the dryer under pressure cannot be connected to the compressed air system.



Any change to the machine or to the relevant operating parameters not previously authorized by the manufacture, creates the possibility of dangerous conditions, and will void the warranty.

PROPER USE OF THE DRYER

This dryer has been designed, manufactured and tested to separate the humidity normally contained in compressed air **only**. Any other use has to be considered improper. The manufacturer will void the warranty and not be held responsible for any problem arising from improper use. The correct use requires adherence to installation conditions specified in this manual. **THIS UNIT IS NOT DESIGNED FOR RESIDENTIAL USE.**

This dryer is supplied tested and fully assembled. The only operation left to the user is the connection to the plant in compliance with the instructions given in the following chapters.



The purpose of the machine is the separation of water and eventual oil particles present in compressed air. The dried air cannot be used for respiration purposes or for operations leading to direct contact with foodstuff *without* proper filtration per local and federal regulations. Please consult your distributor for further information.

RECEIVING EQUIPMENT

Immediately upon receipt of equipment, remove all crating and packaging around equipment. Examine machinery for any damages either external or internal that may have occurred in transit.

If there is any physical damage or a refrigerant leak, (**suction/analyzer gauge reads zero**) please note all damages on bill of lading during delivery or file claim immediately with shipper if damage is detected after delivery. Ask for a local terminal phone number to report all damages to the Transportation Company. The carrier is legally responsible for any damages, since the unit is shipped F.O.B.

INSTALLATION LOCATION AND PIPING



Particular care is required in selecting the installation site, as an improper location could jeopardize the proper operation of the dryer. This unit is not suitable to be used in an explosive atmosphere, or where the risk of fire could be present.

The unit should be installed in an area that is clean and dry, allowing sufficient space on all sides for routine maintenance and service. It should be located on a level floor or shelf free from vibrations and sufficient to support the total weight of the machinery. Although the dryer package is a freestanding unit, it may be secured by bolting the base to the floor but is not required. **This standard dryer is designed for indoor installation.** Contact distributor if installing unit outdoors.

Installations at altitudes above 4000 feet (1219 meters) may require adjustments. The unit has been factory adjusted to operate up to 4000 feet (1219 meters), and if installation is above this altitude, contact the factory service department for correct refrigerant settings.

Air-Cooled Units

Position the unit to permit free circulation of cooling air to the dryer. All the free air vents on the dryer must be two feet, minimum from obstructions preventing flow to and from the unit. The unit should be shielded from direct sunlight, weather elements, and hot discharge air from other air-cooled equipment. The ambient temperature around the dryer must not exceed 100°F (37.7°C) or be less than 50°F (10°C).

Ambient temperatures below 50°F (10°C) require optional equipment specified below.

Sufficient ventilation must be provided to maintain acceptable ambient for efficient operation. Consider heat rejection when locating dryer.

Water-Cooled Units

The fluid coolant temperature supplied to the refrigerant condenser must not exceed 90°F(32.2°C). The fluid supply lines to the condenser should be sized to deliver the required flow of coolant. If the ambient temperature exceeds the supply fluid temperature by 10°F, insulate the inlet line to the condenser. **For maximum efficiency filter with 20 mesh strainer and treat the fluid supply to the condenser.**

STARTUP PROCEDURE WATER COOLED

The unit is supplied with a water-regulating valve at the outlet of the refrigeration condenser. This valve modulates water flow to maintain a stable refrigerant discharge pressure of 250-275 PSIG for R-404a units and 125-145 PSIG for R-134A units. If the refrigeration discharge pressure maintains a pressure above or below this setting, adjustments will be required to the water-regulating valve. Contact a qualified refrigeration service technician or the Great Lakes Service Department.

RECOMENDED SYSTEM DESIGN

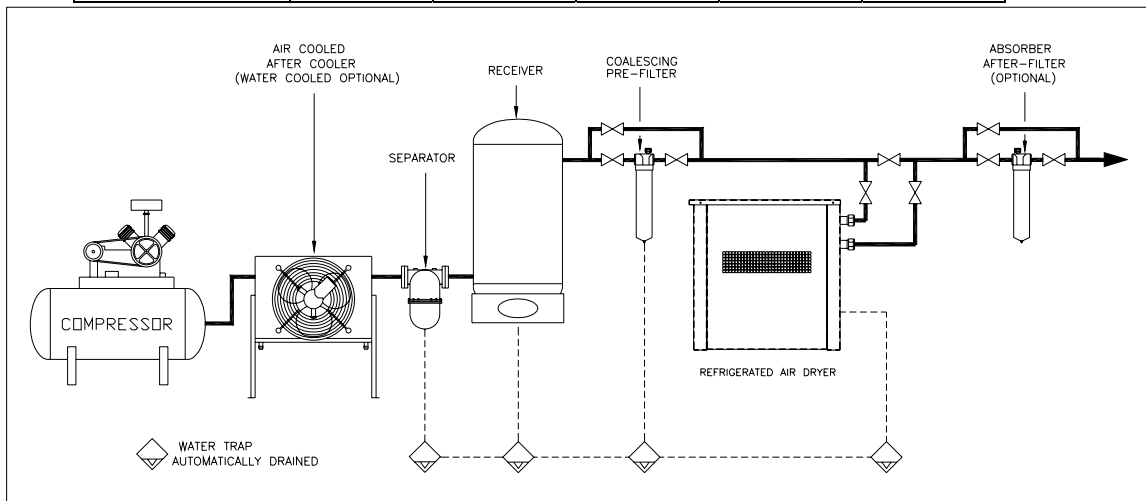
A healthy and long-term trouble free compressed air supply design should be approached as a complete system, not individual components.

The air compressor Intake location is vital to the system health. Locate it to supply clean fresh air that is free from possible containments (e.g. ammonia). Any containment entering the compressor intake will be concentrated by a factor of 8X in a typical compressed air system.

A properly sized and maintained compressed air aftercooler is vital to maintaining an acceptable system temperature range. ERF Series refrigerated air dryers are designed to operate at rated flow with a maximum inlet temperature of 100°F (37.7°C). Units can be oversized to accommodate higher inlet temperatures up to 120°F (48.8°C).

As dryer inlet temperatures rise above the design 100°F (37.7°C), the moisture holding capacity of the air rises dramatically. The following table represents the additional load at elevated temperatures.

Temperatures	100°F (37.7°C)	105°F (40.5°C)	110°F (43.3°C)	115°F (46.1°C)	120°F (48.8°C)
Additional Load	0%	15%	32%	51%	75%



The pipe connection to the dryer should match the standard connection ports provided. The chart below is provided as a basic guide to size branch and header piping. It is recommended that shut-off valves with unions be installed at each port, with a valve bypass to permit isolation of the unit for servicing without interruption of plant air supply.

Maximum Recommended Compressed Air flow										
Pipe Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"
Flow (SCFM)	40	100	150	200	350	650	900	1500	2500	5000

Schedule 40 pipe @ 95 to 115 PSIG

CONDENSATE DRAIN

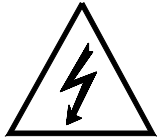


The condensate system is at line pressure and can cause personal injury or equipment damage when discharging. Securely anchor the drain tube prior to dryer operation.

This refrigerated dryer comes standard with an electronic timer solenoid condensate drain system. The drain timer is factory preset to 4 seconds of "on time" and 10 minutes of "off time". This factory setting is applicable for virtually all-industrial applications. If adjustment is required contact the Accessory Service Department for alternate settings and procedure.

Condensate discharged from the dryer may contain oil/lubricants. Verify and follow local regulations regarding disposal.

ELECTRICAL CONNECTION



The Nameplate/Data Plate located on each unit identifies the power supply requirements. Units supplied with cord and plug requires the installation of a receptacle rated for 15 amps.

Units supplied with electrical junctions, require a suitable fused disconnect in compliance with the National and Local Electrical Code requirements. Maximum fuse specification can be located on the Nameplate/Data Plate.

The wiring of all functional electrical components has been completed and tested at the factory in accordance with the electrical wiring schematic provided with this manual.

STARTUP PROCEDURE - ERF-20A through ERF-200A

Energize the refrigeration compressor by placing the “on/off” dryer switch with indicating light to the “on (I)” position. The refrigerant compressor and fan motor will begin to operate. The suction/analyzer gauge will fall to a range of 28-34 PSIG. If the suction/analyzer gauge is not in the specified range, contact a qualified refrigeration service technician or the Accessory Service Department.

THREE PHASE UNITS REQUIRE AN 8 HOUR CRANK CASE WARMUP PRIOR TO STARTUP TO PREVENT EQUIPMENT DAMAGE



The unit must have primary power applied with the “on/off” switch in the “OFF (0)” position for no less than 8 hours. This energizes the crank case heater to allow any liquid refrigerant in the crankcase to be turned into vapor prior to startup. Energizing the dryer prior to crank case heating can “wash away” compressor lubricants and will cause compressor premature failure.

STARTUP PROCEDURE - ERF-250A through ERF-2250A

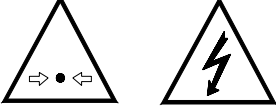
Energize the refrigeration compressor by placing the “on/off” dryer switch with indicating light to the “on (I)” position. The refrigerant compressor and fan motor will begin to operate. The suction/analyzer gauge will fall to a range of 73-82 PSIG and the discharge gauge will rise to a range of 200 to 382 PSIG. These units are equipped with condenser fan cycle controls and operate independent of the compressor. Each fan is controlled via a refrigeration discharge pressure switch (260-200 PSIG) for single fan units and (300-230 PSIG) for two fan units. If the suction/analyzer or discharge gauge is not in the specified range, contact a qualified refrigeration service technician or the Great Lakes Service Department.

SHUT DOWN PROCEDURE

Switch the dryer off by placing the “on/off” dryer switch with indicating light to the “OFF (0)” position, if compressed air is not being used. **If the shutdown resulted in loss of main power interruption, repeat start up procedure so crank case heater has time to raise the crank case temperature.**

REQUIRED MAINTENANCE

Inspection	Frequency
Verify operation of the solenoid drain system. The drain system will cycle and discharge some fluid and air from the clear condensate drain tube for approximately 4 seconds every 10 minutes. If no discharge is attained proceed to the drain service section of required maintenance.	Weekly or As required.



Disconnect and lockout dryer power as well as compressed air supply and depressurize prior to performing the following maintenance items.

General Maintenance	Frequency
Clean refrigeration condenser coil by blowing dust and dirt from the inside of the cabinet out. (Opposite from normal fan air flow) Be sure to clean condenser fan motor to provide adequate cooling and fan blades to allow proper balance.	Monthly
Isolate the valve prior to the Solenoid drain system and remove and clean the strainer screen	Monthly
Replace filter element of inline filters.	6 Months or High differential

Drain Service	Frequency
If the drain system is not discharging condensate, and the strainer is clean, try cleaning debris from diaphragm, or replacing the solenoid or timer.	As Required
If the drain system is continually discharging condensate and air from the drain tube, try replacing the solenoid valve diaphragm, or the complete drain valve.	As Required

MODEL CAPACITY CORRECTION MULTIPLIER

Inlet Temp.		90°F			100°F			110°F			120°F		
Ambient Temp.		90	100	110	90	100	110	90	100	110	90	100	110
Inlet Air Pressure	70	1.00	0.92	0.84	0.80	0.73	0.67	0.66	0.60	0.55	0.50	0.45	0.41
	80	1.12	1.03	0.94	0.90	0.82	0.75	0.73	0.67	0.61	0.55	0.51	0.46
	90	1.24	1.14	1.04	0.99	0.91	0.83	0.81	0.75	0.68	0.61	0.56	0.51
	100	1.36	1.25	1.13	1.09	1	0.91	0.89	0.82	0.74	0.67	0.62	0.56
	110	1.48	1.36	1.23	1.18	1.08	0.99	0.97	0.89	0.81	0.73	0.67	0.61
	120	1.60	1.46	1.33	1.28	1.17	1.06	1.04	0.96	0.87	0.79	0.72	0.66
	130	1.72	1.57	1.43	1.37	1.26	1.14	1.12	1.03	0.94	0.85	0.78	0.71
	140	1.83	1.68	1.53	1.47	1.35	1.22	1.20	1.10	1.00	0.91	0.83	0.76
	150	1.95	1.79	1.63	1.56	1.43	1.30	1.28	1.17	1.07	0.97	0.89	0.81

To obtain flow capacities at conditions other than standard (SCFM @ 100 PSIG, 100°F Inlet & 100°F Ambient), locate the multiplier at the interception of actual operating conditions. Multiply the rated capacity of the selected dryer by the selected multiplier. The result is the corrected flow capacity. Flow rates in excess of specified due to capacity correction can result in increasing pressure drop.

TROUBLESHOOTING

Sec	Symptom	Possible Cause(s)	Corrective Action
A	Water downstream of dryer.	1. Residual free moisture remaining in downstream piping	Drain low spots in system and purge with dry air
		2. Air By-pass system is open	Verify valve positions and correct valve positions
		3. Ambient temperature surrounding downstream piping is below the dryer's dewpoint.	Insulate and/or heat trace piping exposed to low ambient temperatures or dry air to a lower dewpoint.
		4. Free water (liquid) is entering the dryer	Dryers are designed to handle saturated air not condensed liquid. Install a separator and coalescing filter upstream of dryer.
		5. Condensate is not being drained	See section B
		6. Dryer is overloaded resulting in high dewpoint	See capacity charts to determine correct load
		7. Refrigeration system is not functioning.	See section E
		8. Suction pressure not in operating range	Contact Service Department for authorized technician to perform adjustments.
B	Drain System Failure with no condensate discharge on test initiation.	1. Drain strainer is clogged	Depressurize dryer and replace or clean drain strainer.
		2. Solenoid valve or electronic timer failure	Replace drain solenoid and or timer assembly
C	Drain System Failure with continuous condensate or air discharge.	1. Solenoid valve diaphragm rupture or orifice path blocked open	Clean or replace internal diaphragm assembly.
D	High pressure drop across dryer	1. Inlet flow exceeds maximum capacity	Check inlet flow vs. rated capacity
		2. Freezing of moisture in evaporator is restricting inlet air flow	If refrigerant suction pressure is out of standard operating range, contact a qualified refrigeration service technician or the manufacturers service department.
E	Refrigeration System Fault		
E1	Power on indicator does not illuminate	1. Power failure, Line fuses blown, or disconnect open.	Have an electrician check electrical feed and connection integrity.
E2	Refrigeration compressor cycles on and off	1. Ambient Conditions are above or below minimum or maximum ranges.	Verify range and rectify ambient conditions.
		2. Air-Cooled Units, Dirty condenser	Clean condenser as per required maintenance.
		3. Water-Cooled Units, High fluid temperature or low fluid flow.	Check fluid temperature, bring in range and check for free fluid flow through condenser. If problem persists contact a qualified refrigeration service technician or the manufacturers service department.

Great Lakes Air Products ERF Series Refrigeration Dryers
Effective for equipment manufactured 01/01/2010

ENGINEERING DATA	Refrigerated Air Dryer Model# ERF										
	20	25	40	50	75	100	125	150	200	250	300
Capacity in SCFM @ 100 PSIG, 100°F Inlet & 100°F Ambient	20	25	40	50	75	100	125	150	200	250	300
Min. / Max. Inlet Pressure	30 PSIG (2.1 kgf/cm ²) / 230 PSIG (16.2 kgf/cm ²)										
Max. Inlet Temperature	120°F (48.8°C)										
Min. / Max. Ambient Temperature	50°F (10°C) / 110°F (43.3°C)										
Inlet / Outlet Connections (NPT)	3/4"	3/4"	3/4"	3/4"	3/4"	1"	1"	1-1/2"	1-1/2"	1-1/2"	1-1/2"
Delta Pressure / ΔP (PSID) @ Std. Rated Conditions	1.5	1.7	1.7	1.9	2.7	3.0	3.5	2.4	3.4	3.4	3.9
Shipping Weight	105	118	123	165	170	237	270	302	326	334	344
Refrigeration Compressor Type	Non Cycling, Hermetic Type										
Refrigeration Compressor Horsepower	1/6	1/5	1/4	1/3	1/2	5/8	3/4	3/4	1	1-1/2	1-1/2
Ref. Compressor BTU/H @ 35°F Evaporator & 100°F Ambient	1010	1780	2160	2780	4430	5400	6120	6120	9550	12361	13561
Watts @ 35°F Evap. & 100°F Amb.	280	385	465	600	815	1080	1180	1180	1450	2292	2309
Refrigerant Suction Pressure	28-34 PSIG										73-82 PSIG
Refrigerant Type	R134a										R404A
Refrigerant Charge	4oz	8 oz	10oz	12 oz	15 oz	3 Lbs.	4 Lbs.	4 Lbs.	5 Lbs.	7 Lbs.	7 Lbs.
Nominal Voltage (Min-Max Range)	115-1-60 (103-126)										
Maximum Fuse Size (Amps)	15	15	15	15	15	20	20	20	Not Available		
RLA: Rated Load Amps	3.36	4.86	5.86	6.9	10.3	12.7	14.4	14.4	Not Available		
LRA: Locked Rotor Amps	18.0	24.0	28.0	35.0	48.0	58.8	69.0	69.0	Not Available		
Nominal Voltage (Min-Max Range)	230/208-1-60 (187-253)										
Min. Circuit Ampacity										11.6	11.6
Maximum Fuse Size (Amps)	Not Available				15	15	15	15	15	20	20
RLA: Rated Load Amps	Not Available				5.07	6.4	7.7	7.7	8.1	9.5	9.5
LRA: Locked Rotor Amps	Not Available				23	27.4	41.8	41.8	41	51	51
Overload	External "Klixon" Thermal and Current (Auto Reset)										

ENGINEERING DATA	Refrigerated Air Dryer Model# ERF											
	250	300	400	500	650	800	1000	1200	1500	1750	2000	2250
Capacity in SCFM @ 100 PSIG, 100°F Inlet & 100°F Ambient	250	300	400	500	650	800	1000	1200	1500	1750	2000	2250
Min. / Max. Inlet Pressure	See Above		30 PSIG (2.1 kgf/cm ²) / 150 PSIG (10.6 kgf/cm ²)									
Max. Inlet Temperature	120°F (48.8°C)											
Min. / Max. Ambient Temperature	50°F (10°C) / 110°F (43.3°C)											
Inlet / Outlet Connections (NPT)	1-1/2"	1-1/2"	2"	2"	2"	3"	3"	3"	4" Flg	4" Flg	4" Flg	4" Flg
Delta Pressure / ΔP (PSID) @ Std. Rated Conditions	3.4	3.9	3.7	3.8	3.9	3.7	3.9	4.2	3.9	4.0	4.2	4.4
Shipping Weight	334	344	621	678	686	1110	1178	1200	2520	2800	3000	3200
Refrigeration Compressor Type	Non Cycling, Hermetic Type											
Refrigeration Compressor Horsepower	1-1/2	1-1/2	2	2.8	3	4	5	7	9	9	10.5	10.5
Ref. Compressor BTU/H @ 35°F Evaporator & 100°F Ambient	12361	13561	17631	24515	28078	37492	46263	56186	84900	84900	102468	102468
Watts @ 35°F Evap. & 100°F Amb.	2107	2309	2587	4457	5199	6275	8302	10703	11477	11477	14705	14705
Refrigerant Suction Pressure	70-75 PSIG											
Refrigerant Type	R404a											
Refrigerant Charge	7 Lbs.	7 Lbs.	9 Lbs.	10 Lbs.	10 Lbs.	18 Lbs.	22 Lbs.	24 Lbs.	35 Lbs.	35 Lbs.	40 Lbs.	40 Lbs.
Condenser Fan Switch - In/Out (PSIG)	N/A		Primary = Cut In: 260 / Cut Out: 210 Secondary = Cut In: 290 / Cut Out: 250									
Overload	Internal Thermal and Current (Auto Reset)											
Nominal Voltage (Min- Max Range)	230/200-3-60 (180-253)											
Min. Circuit Ampacity	9.2	9.2	10	14.2	19.4	19.6	24.1	30.4	48.6	48.6	47.1	47.1
Maximum Fuse Size (Amps)	15	15	20	25	35	35	40	50	75	75	90	90
RLA: Rated Load Amps	7.6	7.6	8.2	11.5	15.9	17.1	25.7	33.6	38.3	38.3	42.2	42.2
LRA: Locked Rotor Amps	38	38	38	74	98	115	128	155	157	157	210	210
Nominal Voltage (Min- Max Range)	460-3-60 (414-506)											
Min. Circuit Ampacity	4.5	4.5	5.4	7.6	9.1	10.2	13.1	15.5	19.5	19.5	27.9	27.9
Maximum Fuse Size (Amps)	10	10	10	15	15	20	25	30	35	35	40	40
RLA: Rated Load Amps	3.8	3.8	4.4	6.3	7.5	8.9	11.8	13.7	17.9	17.9	21.1	21.1
LRA: Locked Rotor Amps	16	16	16	30	38	42	67	80	90	90	105	105
Nominal Voltage (Min- Max Range)	575-3-60 (546-603)											
Min. Circuit Ampacity	4.5	4.5	5.4	7.6	9.1	10.2	13.1	15.5	19.5	19.5	27.9	27.9
Maximum Fuse Size (Amps)	10	10	10	15	15	20	25	30	35	35	40	40
RLA: Rated Load Amps	3.8	3.8	4.4	6.3	7.5	8.9	11.8	13.7	17.9	17.9	21.1	21.1
LRA: Locked Rotor Amps	16	16	16	30	38	42	67	80	90	90	105	105