Refrigerant Changeover Guidelines
HCFC R-22 to HFC R-438A
for Medium and Low Temperature Applications

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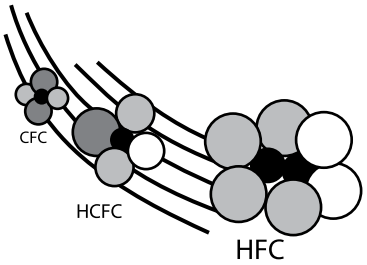

Emerson does not advocate the wholesale changeover of HCFCs to HFCs. If a system is not leaking refrigerant to the atmosphere, and is operating properly, there is no technical reason to replace the HCFC refrigerant. In fact, changing the refrigerant may void the U.L. listing of the system. However, once the decision has been made to make the change from HCFC R-22 to HFC R-438A, the following guidelines are recommended.

The following guidelines only apply to Copeland Discus™ compressors in existing refrigeration medium and low temperature Supermarket applications. Copeland Scroll™ and Copeland™ hermetic compressors are being evaluated for their acceptance of these refrigerants in similar medium and low temperature refrigeration systems.

These refrigerants are not approved for use in any air conditioning systems using Copeland™ compressors. For any updates contact Emerson.

CONSIDERATIONS

1. Retrofitting systems that employ compressors manufactured prior to 1973 is not recommended. This is due to the different materials used in motor insulation that have not been evaluated for compatibility with the new refrigerants and lubricants. Failure to heed this advice will violate the U.L. Standard For Field Conversion/Retrofit Of Alternate Refrigerants In Refrigeration and Air Conditioning Equipment (U.L.2170-2172).

2. HFC refrigerants have generally required the use of polyol ester (POE) lubricants in order to ensure oil return. However, R-438A contains a small percentage of isobutane and isopentane that promotes adequate oil return in properly piped systems with oil separators and no change out of the mineral oil or alkylbenzene is required. Minor equipment modifications such as replacement or adjustment of the expansion device may be required in some applications.

   Oil return is determined by a number of design and operating conditions. In some systems a small amount, up to 5%, of POE may need to be added to assist in oil return.

   While R-438A will operate properly with an oil charge of 100% POE, the POE can dislodge debris in older systems requiring liquid line filter drier change outs to keep the system free of this debris.

3. The system capacity and efficiency will be somewhat different with R-438A than with HCFC R-22. In most multiple compressor racks, there should still be adequate capacity. However, it is strongly recommended that system capacity verification be done using the refrigerant manufacturer published comparison factors.

4. R-438A can be used in either low or medium temperature systems. R-438A should not be mixed with any other refrigerant! Demand Cooling™ is required for low temperature applications.

5. When retrofitting from R-22 to R-438A, the expansion valve will likely not require replacement; however, it is recommended that the valve loadings be evaluated to verify that they are adequate. Following the retrofit, superheat should be checked and adjusted if necessary.

6. Filter-driers must be changed at the time of conversion. This is proper air conditioning/ refrigeration practice.

   a. Solid core driers such as Emerson ADK are compatible with either
      HCFC R-22 or R-438A.

   b. Compacted bead type driers such as the Emerson EK series are also compatible.

   c. Loose fill type driers are not recommended and should be replaced with the types referenced in a. and b. above.

7. Pressure regulators such as EPR valves may have to be reset. Contact the EPR manufacturer for the correct settings.

8. Systems that use a low pressure controller to maintain space temperature may need to have the cut in and cut out points changed. Although R-438A does exhibit “glide”, the average evaporator or condenser temperature is within 0.5ºF of the saturated vapor temperature; therefore no correction is required.

9. Systems using R-438A should have approximately the same system pressure drop as with HCFC R-22. Check with the manufacturer of any pressure regulators and pilot operated solenoid valves used in the system to be sure that they will operate properly.

NOTE: R-438A is not compatible with the seal material used in the HCFC R-22 Moduload Unloading system of 3D compressors. If your system has Moduload,

WARNING: Use only Emerson approved refrigerants and lubricants in the manner prescribed by Emerson. In some circumstances, other refrigerants and lubricants may be dangerous and could cause fires, explosions or electrical shorting. Contact Emerson, Sidney, Ohio for more information.

the valve plate assembly MUST be changed.

Consult your Emerson wholesaler for the proper part numbers.

Many other system seals such as elastomeric seals, gaskets, and valve packing may be affected by the change over from HCFC R-22 to R-438A. The part manufacturer should be contacted for their recommendations as to whether the seals need to be changed or replaced.

Before starting the changeover, it is suggested that at least the following items be readily available:

1. Safety glasses
2. Gloves
3. Refrigerant service gauges
4. Electronic thermometer
5. Vacuum pump capable of pulling 250 microns
6. Thermocouple micron gauge
7. Leak detector
8. Refrigerant recovery unit including refrigerant cylinder
9. Proper container for removed lubricant
10. New liquid control device
11. Replacement liquid line filter-drier(s)
12. New Mineral Oil lubricant
13. R-438A pressure temperature chart
14. R-438A refrigerant

CHANGEOVER PROCEDURE

1. The system should be thoroughly leak tested with the HCFC R-22 refrigerant still in the system. All leaks should be repaired before the R-438A refrigerant is added.
2. It is advisable that the system compressor operating conditions be recorded with the HCFC R-22 still in the system. This will provide the base data for comparison when the system is put back into operation with the R-438A.
3. Disconnect electrical power to system.
4. Properly remove the HCFC R-22 from the compressor. Measure and note the amount removed.
5. Replace the liquid line filter-drier with one that is compatible with R-438A.
6. Replace the elastomeric seals and gaskets with material compatible with R-438A per refrigerant manufacturer.
7. Evacuate the system to 250 microns. A vacuum decay test is suggested to assure the system is dry and leak free.
8. Recharge the system with R-438A.
9. Charge the system with R-438A. Charge to 90% of the refrigerant removed in item 4. R-438A must leave the charging cylinder in the liquid phase. It is suggested that a sight glass be connected between the charging hose and compressor suction service valve. This will permit adjustment of the cylinder valve to assure the refrigerant enters the compressor in the vapor state.
10. Operate the system. Record the data and compare to the data taken in item 2. Check and adjust the TEV superheat setting if necessary. Make adjustments to other controls as needed. Additional R-438A may have to be added to obtain optimum system performance.
11. Properly label the components. Tag the compressor with the refrigerant used (R-438A) and the lubricant used. The proper color code for R-438A is Blue PMS (Paint Matching System) 2727.

CAUTION: These guidelines are intended for use with R-438A only*. Other refrigerants may not be compatible with the materials used in our compressors or the lubricants recommended in this bulletin resulting in unacceptable reliability and durability of the compressor.*

ADDENDUM

The contents of this publication are presented for informational purposes only and are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. Emerson Climate Technologies, Inc. and/or its affiliates (collectively "Emerson"), as applicable, reserve the right to modify the design or specifications of such products at any time without notice. Emerson does not assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use and maintenance of any Emerson product remains solely with the purchaser or end user.

POE must be handled carefully and the proper protective equipment (gloves, eye protection, etc.) must be used when handling POE lubricant. POE must not come into contact with any surface or material that might be harmed by POE, including without limitation, certain polymers (e.g. PVC/CPVC and polycarbonate).

⚠ CAUTION

HFC R-438A Saturated Vapor/Liquid Pressure/Temperature Chart

Pressure PSIG	Vapor Temp. °F	Liquid Temp. °F	Pressure PSIG	Vapor Temp. °F	Liquid Temp. °F	Pressure PSIG	Vapor Temp. °F	Liquid Temp. °F
0	-44.2	-33						
2	-39.3	-28.2	80	43.5	52.7	230	106.1	113.4
4	-34.8	-23.9	85	46.5	55.7	235	107.6	114.4
6	-30.7	-19.8	90	49.4	58.5	240	109.1	116.3
8	-26.9	-16.1	95	52.2	61.2	245	110.5	117.7
10	-23.4	-12.6	100	54.9	63.9	250	112.0	119.1
12	-20.1	-9.4	105	57.5	66.4	255	113.4	120.5
14	-16.9	-6.3	110	60.1	68.9	260	114.8	121.8
16	-13.5	-3.4	115	62.6	71.3	265	116.2	123.1
18	-11.1	-0.6	120	65.0	73.6	270	117.6	124.4
20	-8.4	2.0	125	67.3	75.9	275	118.9	125.7
22	-5.8	4.6	130	69.6	78.1	280	120.3	127.0
24	-3.4	7.0	135	71.8	80.3	285	121.6	128.3
26	-1.0	9.3	140	73.9	82.4	290	122.9	129.5
28	1.3	11.6	145	75.0	84.4	295	124.4	130.7
30	3.5	13.7	150	78.1	86.4	300	125.4	131.9
32	5.7	15.8	155	80.1	88.4	310	127.9	134.3
34	7.7	17.8	160	82.1	90.3	320	130.4	136.6
36	9.7	19.8	165	84.0	92.1	330	112.7	138.9
38	11.7	21.7	170	85.9	94.0	340	135.1	141.1
40	13.6	23.5	175	87.8	95.8	350	137.4	143.3
42	15.4	25.3	180	89.6	97.5	360	139.6	145.4
44	17.2	27.1	185	91.4	99.2	370	141.8	147.5
46	18.9	28.8	190	93.1	100.9	380	143.9	149.5
48	20.6	30.4	195	94.8	102.6	390	146.1	151.5
50	22.3	32.1	200	96.5	104.2	400	148.1	153.4
55	26.3	36.0	205	98.2	105.8			
60	30.1	39.6	210	99.8	107.4			
65	33.6	43.2	215	101.4	108.9			
70	37.1	46.5	220	103.0	110.5			
75	40.3	49.7	225	104.6	112.0			

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