Opteon™ XP40
Refrigerant

Opteon™ XP40 Retrofit Guidelines to Replace HCFC-22

Introduction

Opteon™ XP40 (R-449A) is a low global warming potential (GWP) hydrofluoro-olefin (HFO)-based refrigerant developed as a direct replacement for HCFC-22 (R-22) and R-404A/R-507 in positive displacement, direct expansion, low- and medium-temperature commercial and industrial applications.

Opteon™ XP40 is the registered trade name for a blend of HFC-32/HFC-125/HFC-134a/HFO-1234yf (24.3/24.7/25.7/25.3 wt%) with an ANSI/ASHRAE Standard 34 refrigerant designation of R-449A. It is commercially available for both retrofit of existing R-22 or R-404A/R-507 equipment, as well as a suitable replacement option for these refrigerants in new equipment.

Opteon™ XP40 offers improved environmental properties vs. R-22 and R-404A/R-507, with a GWP* of 1282 (vs. 1760 for R-22, 3943 for R-404A, and 3985 for R-507), and has a zero ozone depletion potential (ODP).

Using these retrofit guidelines, existing R-22 direct expansion refrigeration systems can be converted to operate using Opteon™ XP40, allowing the equipment to continue to function safely and efficiently with a greatly reduced environmental impact.

Important Safety Information

Like all Freon™ refrigerants, Opteon™ XP40 is safe to use when handled properly. However, any refrigerant can cause injury or even death when mishandled. Please review the following guidelines and consult the product Safety Data Sheet (SDS), including proper personal protective equipment recommendations, before using any refrigerant. At a minimum, appropriate hand (gloves) and eye (safety glasses) protection should be used.

- Do not work in high concentrations of refrigerant vapors. Always maintain adequate ventilation in the work area. Do not breathe vapors. Do not breathe lubricant mists from leaking systems. Ventilate the area well after any leak before attempting to repair equipment.
- Do not use handheld leak detectors to check for breathable air in enclosed working spaces. These detectors are not designed to determine if the air is safe to breathe. Use oxygen monitors to ensure adequate oxygen is available to sustain life.
- Do not use flames or halide torches to search for leaks. Open flames (e.g., halide torches or brazing torches) in the presence of any fluorocarbon refrigerant can decompose the refrigerant, forming hazardous acidic compounds. Halide torches are not effective as leak detectors for HFO or HFC refrigerants, as they only detect the presence of chlorine in the refrigerant. Chlorine is not present in Opteon™ XP40; and, consequently, these detectors will not detect the presence of this refrigerant. Use an electronic leak detector specifically designed for the refrigerants you are using.

If you detect a visible change in the size or color of a flame when using brazing torches to repair equipment, stop work immediately and leave the area. Ventilate the work area well, and stop any refrigerant leaks before resuming work. These flame effects may be an indication of very high refrigerant concentrations, and continuing to work without adequate ventilation may result in injury or death.

*GWP = IPCC Fifth Assessment Report (AR5)

Chemours™

LOW GWP ©

Table 1: Comparison of Performance Data

Refrigerant	Evap (psig)	Cond (psig)	Disch T (°F)	Avg Glide (°R)	Vol Cap (Btu/ft³)	Cap vs. R-22	EER (Btu/watt-hr)	EER vs. R-22	Mass Flow (lb/min)	Mass Flow vs. R-22
R-22 Alternatives - Low Temperature Conditions Avg Condenser T= 104 °F; Avg Evaporator T = -22 °F; Subcool Amount = 7 °R; Return Gas T = 14 °F; Compressor Efficiency = 70%										
R-22 (no liq inj)	9	208	270	0	29.1	100%	6.07	100%	81.6	100%
R-22 (with liq inj)			250*		27.5	94%	5.74	94%	77.1	94%
Opteon™ XP40	10.5	240	221	8.3	28.7	99%	5.77	95%	87.5	107%
(vs. R-22 with liq inj)						104%		100%		114%
R-22 Alternatives - Medium Temperature Conditions Avg Condenser T= 104 °F; Avg Evaporator T = 14 °F; Subcool Amount = 7 °R; Return Gas T = 50 °F; Compressor Efficiency = 70%										
R-22	37	208	221	0.0	63.8	100%	10.03	100%	168.8	100%
Opteon™ XP40	41.5	240	190	8.3	66.8	105%	9.66	96%	188.0	111%

*Max Compressor Discharge T with liquid injection

Note: Any refrigerant can be hazardous if used improperly. Hazards include liquid or vapor under pressure as well as frostbite from the escaping liquid.

Overexposure to high concentrations of refrigerant vapor can cause asphyxiation or cardiac arrest. Please read all safety information before handling any refrigerant.

Refer to the Opteon™ XP40 SDS for more specific safety information. Safety Bulletin AS-1 also provides additional information for safe handling of refrigerants.

Flammability

Opteon™ XP40 is nonflammable. It has been assigned an A1 safety classification under the ANSI/ASHRAE Standard 34. However, as with all HFC-containing blends, Opteon™ XP40 should not be mixed with air to check for system leaks.

General Retrofit Information: R-22 to Opteon™ XP40

Expected Performance of Opteon™ XP40 vs. R-22

Table 1, based on thermodynamic cycle analysis, provides a comparison of R-22 and Opteon™ XP40 across a number of key performance factors. Actual performance for a specific system depends on a number of factors, including equipment conditions and operating environment.

System Modifications

Lubricant

Most R-22 systems use mineral oil (MO) or alkylbenzene (AB) lubricants, however, due to the current phaseout of R-22 refrigerant, there are some R-22 systems that now utilize polyolester (POE) lubricants, to facilitate future retrofit of the system to an HFC or HFO refrigerant.

POE lubricants are recommended for use in most HFO and HFC systems. If the R-22 system currently uses POE lubricant, the POE lubricant currently in the system should be suitable for use with Opteon™ XP40. If there are questions about the POE lubricant, or tests indicate that it is contaminated or has a high acid number, then the lubricant should be changed. Consult with the compressor manufacturer for specific recommendations on viscosity and brand of lubricant.

Special care should be taken when handling POE lubricants, due to their tendency to absorb water. Contact with air should be minimized, and the lubricant should be stored in a sealed metal container.

Changing to POE lubricant is recommended when converting to Opteon™ XP40 from an R-22 system with MO or AB lubricant. To achieve equivalent miscibility after retrofitting the system, the residual MO/AB lubricant should be equivalent to 5 wt% or less. Allowable residual MO/AB lubricant is highly dependent on system configuration and

operating conditions. If the system shows signs of poor heat transfer in the evaporator or poor oil return to the compressor, it may be necessary to further reduce the residual MO/AB.

A series of successive lubricant changes using POE can normally reduce the MO/AB concentration to low levels. Lubricant manufacturers have developed field test methods for determining the weight percent of MO in POE lubricant. Contact the lubricant manufacturer for the recommended test method.

Filter Drier

Change the filter drier during the retrofit. This is a routine system maintenance practice. There are two types of filter driers commonly used, solid core and loose filled. Replace the drier with the same type currently in use in the system. The drier label will show which refrigerants can be used with that drier. Select a drier specified to work with HFO refrigerants. (Many driers sold today are "universal" – they will work with most fluorocarbon refrigerants.) Check with your Chemours Refrigerants Distributor for the correct drier to use in your system.

Elastomeric Seals

R-22 and, to a lesser extent, R-22-containing refrigerant blends, interact relatively strongly with many elastomers, causing significant swelling and often, over time, a measurable increase in hardness. Opteon™ XP40, like other HFO or HFC refrigerants, does not have as strong of an effect on elastomers commonly used as seals in refrigeration systems. As a result, when performing an R-22 retrofit to an HFO or HFC alternative, it is possible for leaks to occur at elastomeric seals that have been previously exposed to R-22 refrigerant. This is not a problem attributable specifically to the use of Opteon™ XP40. Such seal leaks have been reported when replacing R-22 with other HFC refrigerants such as R-407A/C or R-404A. Components commonly affected are Schrader core seals, liquid level receiver gaskets, solenoid valves, ball valves, flange seals, and some shaft seals on open drive compressors. Leaks do not occur in every system retrofitted; and, in practice, it is difficult to predict whether such leaks will occur. (As a rule of thumb: the older the system, the higher the probability that leaks will be observed after a retrofit.)

As a consequence, it is recommended to change elastomeric seals and gaskets as a matter of course during a retrofit, particularly any system-critical seals (those which would require removal of the refrigerant charge to allow seal replacement, e.g., liquid receiver, refrigerant high-pressure side, etc.). It is also recommended to have spare seals for other components available during restart of the system. The same type of seal can be used; it should just be a new one that has not previously been in R-22 service. A rigorous leak check regime pre- and post-retrofit will minimize any refrigerant losses. Obviously any seals found to be leaking before the retrofit takes place should be replaced during the retrofit.

Compressor

Overall system performance (capacity and energy efficiency) will be similar when operating on Opteon™ XP40 as to that when using R-22.

Compressor suction and discharge pressures for Opteon™ XP40 will differ from R-22, and it may be necessary to adjust set points and cutouts to avoid exceeding the operating limits of the compressor. Consult with the specific system manufacturer for guidance.

Opteon™ XP40 also has a slightly lower (-15 to -10 °R) discharge temperature than R-22. Again, you should consult with your compressor manufacturer for details regarding operation of your specific compressor on Opteon™ XP40.

Expansion Device

Opteon™ XP40 has a slightly higher mass flow rate (~7-11%) than R-22, but should be within the usable range of a properly sized and installed R-22 expansion device, and not require replacement. Some adjustment to the expansion valve(s) may be needed in order to reset the superheat following conversion of the system. Use the pressure-temperature chart (dew point [saturated vapor] values) at the end of this guide for correct measurement and setting of evaporator superheat. If you have further questions, consult with the expansion device manufacturer for correct valve sizing and superheat adjustments.

Line Sizing

Opteon™ XP40 has slightly higher mass flow rates and density than R-22. It is recommended that the existing refrigerant line sizing be checked to verify that the system pressure drops and line velocities are acceptable with the new refrigerant. Correct pipe sizing is important in order to ensure adequate refrigeration capacity and sufficient oil return to the compressor.

Condenser and Evaporator

Due to the differences in suction pressure between Opteon™ XP40 and R-22, it may be necessary to reset evaporator pressure regulators (EPR) and cutouts to properly operate the system. The discharge pressure of Opteon™ XP40 is slightly higher than R-22, and may require slight adjustments to condenser fans and head pressure controls.

Opteon™ XP40 is a blend refrigerant; therefore, when setting superheat, the dew point (saturated vapor) in the pressure-temperature chart should be used. Similarly, the bubble point (saturated liquid) should be used for measuring subcooling.

System Controls

Many supermarkets use refrigeration control systems and methodologies that rely on the pressure-temperature relationship of a specific refrigerant for proper operation. During conversions from R-22 to Opteon™ XP40, although the controls will likely function adequately, for optimal performance they should be updated for operation using Opteon™ XP40 refrigerant properties. Consult with the control system manufacturer for guidance on updating refrigerant data or operating instructions when using Opteon™ XP40.

Retrofit of R-22 Systems to Opteon™ XP40

The following detailed steps are the recommended procedure for retrofitting R-22 systems to Opteon™ XP40:

1. **Establish Baseline Performance with R-22**

   Collect system performance data while R-22 refrigerant is in the system. Check for correct refrigerant charge and operating conditions. The baseline data of temperatures and pressures at various points in the system (evaporator, condenser, compressor suction and discharge, evaporator vapor superheat, and condenser liquid subcool) at normal operating conditions will be useful in noting any deficiencies in system operation and when optimizing operation of the system with Opteon™ XP40. A System Data Sheet is included at the back of this bulletin to record baseline data.

2. **Drain/Charge System Lubricant**

   Where MO or AB oil is the existing lubricant in the system, it will have to be drained. This may require removing the compressor from the system, particularly with small hermetic compressors that have no oil drain. In this case, the lubricant can be drained from the suction line of the compressor. In most small systems, 90-95% of the lubricant can be removed from the compressor in this manner. Larger systems may require drainage from additional points in the system, particularly low spots around the evaporator, to remove the majority of the lubricant. In systems with an oil separator, any lubricant present in the separator should also be drained. In all cases, measure the volume of lubricant removed from the system. Compare to the compressor/system specifications to ensure that the majority of lubricant has been removed. Polyol ester lubricant is recommended for use with Opteon™ XP40. In order to achieve equivalent miscibility to R-22/oil, the residual oil should be about 5 wt% or less of the total lubricant used in the system. In larger systems, this amount of residual mineral oil can be achieved by using a flushing technique. Three or more lubricant flushes may be required. Lubricant flushes involve:

   - Draining existing lubricant from the system, as described above.
   - Selecting a polyol ester lubricant with similar viscosity to the existing lubricant.
   - Charging an amount of polyol ester equal to the amount of lubricant removed.
   - Running the system with R-22 for thorough mixing of polyol ester/existing lubricant (48 to 72 hours of operation may be required).

   Repeat these steps two more times. On the last flush, R-22 will be replaced with the retrofit refrigerant.

3. **Remove the R-22 Charge into Recovery Cylinders**

   Remove the entire R-22 refrigerant from the system into a recovery cylinder(s). Use a recovery device capable of pulling 10-15 in Hg vacuum (50-67 kPa absolute). Weigh the amount removed to use as a guide for the quantity of Opteon™ XP40 to be charged to the system.

4. **Replace Filter Drier and Critical Elastomeric Seals/ Gaskets**

   It is routine practice to replace the filter drier during system maintenance. Replacement filter driers are available that are compatible with Opteon™ XP40. While the system is empty, check and replace any elastomeric seals that may be near the end of their serviceable life. Even if they were not previously leaking, the change of swell characteristics when changing to any new refrigerant (e.g., R-22 to any HFO or HFC refrigerant) and the general disturbance to the system may cause worn seals to leak after retrofit. Components commonly affected are Schrader core seals, liquid level receiver

gaskets, solenoid valves, ball valves, flange seals, and some shaft seals on open drive compressors; but, all external seals in contact with the refrigerant should be viewed as a potential leak source post-retrofit. Field experience has shown that the older the system, the greater the likelihood of seal and gasket leaks. It is recommended to change any system critical seals (e.g., those that require removal of the refrigerant charge to allow seal replacement, e.g., liquid receiver, condenser system) as a matter of course and to have spare seals for other components available during the retrofit should any seal failure occur. A rigorous leak check regime pre- and post-retrofit will minimize any refrigerant losses.

5. Perform Other System Modifications

Perform any system modifications or upgrades as needed for the system.

6. Evacuate System and Check for Leaks

To remove air or other non-condensable gases and any residual moisture from the system, evacuate the system to full vacuum (<1000 microns [<29.88 in Hg vacuum] [<1.33 mbar]). If the system is not able to hold vacuum, it may be an indication of a leak. After vacuum test, pressurize the system with dry nitrogen, taking care not to exceed the system design maximum pressure, and check for leaks. Do not use mixtures of refrigerant and air to check for leaks, as these mixtures can become combustible. After leak checking, remove residual nitrogen with a vacuum pump.

7. Charge System with Opteon™ XP40

Opteon™ XP40 is a blend; so, it is important to remove liquid only from the charging cylinder. (If the cylinder does not have a valve with a dip tube, invert the cylinder so that the valve is underneath the cylinder.) The proper cylinder position is often indicated by arrows on the cylinder and the cylinder box. Once liquid is removed from the cylinder, the refrigerant can be allowed to enter the refrigeration system as liquid or vapor as desired.

WARNNG: Do not charge liquid refrigerant into the suction line. This can cause irreversible damage to the compressor. Use the manifold gauges or a throttling valve to flash the liquid refrigerant to a vapor prior to entering the suction line.

In general, refrigeration systems will require a slightly smaller charge size of Opteon™ XP40 than the original R-22 charge. The optimum charge will vary depending on the system design and operating conditions. The initial charge should be approximately 85% of the standard charge size for R-22. After startup and adjustment, the final charge amount will be approximately 95% of the R-22 charge.

8. Start Up System and Check Operation

- Monitor and adjust TXV and/or charge size to achieve optimum superheat/subcooling.
- Monitor oil levels in compressor. Add oil as required to maintain proper levels.

9. Label System with New Refrigerant and Lubricant

Table 2: Physical Properties of Opteon™ XP40

Physical Property	Unit	Opteon™ XP40	R-22
Boiling Point	1 atm (101.3 kPa)	-50.7 °F	-41.4 °F
Vapor Pressure	70 °F psia	144.0 psia	136.1 psia
Liquid Density	70 °F	69.5 lb/ft^3	75.3 lb/ft^3
Density Sat Vapor	70 °F lb/ft^3	2.73 lb/ft^3	2.47 lb/ft^3
GWP AR5	CO_2 = 1.0	1282	1760

Table 3: Composition of Opteon™ XP40 (wt%)

	HFC-32	HFC-125	HFO-1234yf	HFC-134a
Opteon™XP40	24.3	24.7	25.3	25.7

Appendix A.

Table 4: Evaporator Suction Pressure Set Points

R-22 psig	Average Evaporator Temp (°F)	Opteon™ XP40 psig
7.4	-25	8.9
8.0	-24	9.5
8.5	-23	10.1
9.1	-22	10.7
9.6	-21	11.3
10.2	-20	11.9
10.8	-19	12.6
11.4	-18	13.2
12.0	-17	13.9
12.6	-16	14.6
13.2	-15	15.3
13.9	-14	16.0
14.5	-13	16.7
15.2	-12	17.4
15.9	-11	18.1
16.5	-10	18.9
17.2	-9	19.7
17.9	-8	20.5
18.7	-7	21.2
19.4	-6	22.1
20.1	-5	22.9
20.9	-4	23.7
21.7	-3	24.6
22.4	-2	25.4
23.2	-1	26.3
24.0	0	27.2
24.9	1	28.1
25.7	2	29.0
26.5	3	30.0
27.4	4	30.9
28.3	5	31.9
29.2	6	32.9
30.1	7	33.9
31.0	8	34.9
31.9	9	36.0
32.8	10	37.0
33.8	11	38.1
34.8	12	39.2
35.8	13	40.3
36.8	14	41.4
37.8	15	42.5
38.8	16	43.7
39.9	17	44.9
40.9	18	46.1
42.0	19	47.3
43.1	20	48.5
44.2	21	49.7
45.3	22	51.0
46.5	23	52.3
47.6	24	53.6
48.8	25	54.9
50.0	26	56.3
51.2	27	57.6
52.4	28	59.0
53.7	29	60.4
55.0	30	61.8
56.2	31	63.3
57.5	32	64.7
58.8	33	66.2
60.2	34	67.7
61.5	35	69.3
62.9	36	70.8
64.3	37	72.4
65.7	38	74.0
67.1	39	75.6
68.6	40	77.2
70.0	41	78.9
71.5	42	80.5
73.0	43	82.2
74.5	44	84.0
76.1	45	85.7

After converting from R-22 to Opteon™ XP40, the evaporator temperature can be set by locating the desired average evaporator temperature or (R-22 evaporator pressure) on this chart and determining the new set point required for Opteon™ XP40 in order to achieve an equivalent average evaporator temperature.

Table 5: Condenser Pressure Set Points

R-22 psig	Average Condenser Temp (°F)	Opteon™ XP40 psig
143.6	80	166.4
146.0	81	168.8
148.4	82	171.2
150.8	83	174.6
153.2	84	178.2
155.7	85	180.4
158.2	86	182.6
160.7	87	186.2
163.2	88	189.0
165.8	89	192.0
168.4	90	194.4
171.0	91	197.8
173.7	92	201.2
176.4	93	203.6
179.1	94	207.1
181.8	95	210.6
184.6	96	213.5
187.4	97	217.6
190.2	98	219.9
193.0	99	223.4
195.9	100	226.8
198.8	101	230.4
201.8	102	233.8
204.7	103	237.4
207.7	104	240.8
210.8	105	244.4
213.8	106	247.9
216.9	107	251.4
220.0	108	254.8
223.2	109	258.4
226.4	110	261.9
229.6	111	266.6
232.8	112	270.1
236.1	113	273.6
239.4	114	278.2
242.8	115	281.8
246.1	116	285.3
249.5	117	290.0
253.0	118	293.6
256.5	119	297.0
260.0	120	301.8
263.5	121	306.4
267.1	122	310.0
270.7	123	314.6
274.3	124	318.2
278.0	125	322.9
281.7	126	327.6
285.4	127	332.4
289.2	128	335.8
293.0	129	340.6
296.9	130	345.3
300.8	131	350.0
304.7	132	354.8
308.7	133	359.5
312.6	134	364.2
316.7	135	369.0
320.7	136	375.0
324.8	137	378.4
329.0	138	383.2
333.2	139	388.0
337.4	140	394.0

After converting from R-22 to Opteon™ XP40, the condensing pressure can be determined by locating the desired average condenser temperature (or R-22 pressure setting) on this chart and determining the new set point required for equivalent operation with Opteon™ XP40.

Appendix B.

Table 6: Opteon™ XP40 Pressure-Temperature Data (Eng)

P (psig)	Sat Liq T (°F)	Sat Vap T (°F)	P (psig)	Sat Liq T (°F)	Sat Vap T (°F)	P (psig)	Sat Liq T (°F)	Sat Vap T (°F)
-4.7	-64.6	-53.5	145.3	67.4	76.6	295.3	114.6	122.3
-1.7	-55.3	-44.3	148.3	68.6	77.8	298.3	115.3	123.0
1.3	-47.6	-36.7	151.3	69.8	79.0	301.3	116.1	123.8
4.3	-41.0	-30.1	154.3	71.0	80.1	304.3	116.8	124.5
7.3	-35.1	-24.3	157.3	72.1	81.3	307.3	117.5	125.1
10.3	-29.8	-19.1	160.3	73.3	82.4	310.3	118.3	125.9
13.3	-25.0	-14.4	163.3	74.4	83.5	313.3	119.0	126.6
16.3	-20.6	-10.0	166.3	75.6	84.6	316.3	119.7	127.2
19.3	-16.5	-6.00	169.3	76.7	85.7	319.3	120.4	127.9
22.3	-12.7	-2.2	172.3	77.8	86.8	322.3	121.1	128.6
25.3	-9.1	1.4	175.3	78.9	87.8	325.3	121.8	129.3
28.3	-5.7	4.7	178.3	79.9	88.9	328.3	122.5	129.9
31.3	-2.5	7.9	181.3	81.0	89.9	331.3	123.2	130.6
34.3	0.5	10.9	184.3	82.0	90.9	334.3	123.9	131.3
37.3	3.5	13.8	187.3	83.1	91.9	337.3	124.6	131.9
40.3	6.2	16.5	190.3	84.1	92.9	340.3	125.3	132.6
43.3	8.9	19.2	193.3	85.1	93.9	343.3	126.0	133.2
46.3	11.5	21.7	196.3	86.1	94.9	346.3	126.6	133.8
49.3	14.0	24.2	199.3	87.1	95.9	349.3	127.3	134.5
52.3	16.4	26.5	202.3	88.1	96.8	352.3	128.0	135.1
55.3	18.7	28.8	205.3	89.1	97.8	355.3	128.6	135.7
58.3	20.9	31.0	208.3	90.0	98.7	358.3	129.3	136.4
61.3	23.1	33.1	211.3	91.0	99.6	361.3	130.0	137.0
64.3	25.2	35.2	214.3	91.9	100.5	364.3	130.6	137.5
67.3	27.2	37.2	217.3	92.9	101.4	367.3	131.2	138.2
70.3	29.2	39.2	220.3	93.8	102.3	370.3	131.9	138.8
73.3	31.2	41.1	223.3	94.7	103.2	373.3	132.5	139.4
76.3	33.0	43.0	226.3	95.6	104.1	376.3	133.2	140.0
79.3	34.9	44.8	229.3	96.5	105.0	379.3	133.8	140.6
82.3	36.7	46.5	232.3	97.4	105.8	382.3	134.4	141.2
85.3	38.4	48.3	235.3	98.3	106.7	385.3	135.1	141.8
88.3	40.1	50.0	238.3	99.2	107.5	388.3	135.7	142.4
91.3	41.9	51.6	241.3	100.1	108.4	391.3	136.3	143.0
94.3	43.5	53.2	244.3	100.9	109.2	394.3	136.9	143.5
97.3	45.1	54.8	247.3	101.8	110.0	397.3	137.5	144.1
100.3	46.7	56.4	250.3	102.6	110.9	400.3	138.1	144.7
103.3	48.2	57.9	253.3	103.5	111.7	403.3	138.7	145.2
106.3	49.8	59.4	256.3	104.3	112.5	406.3	139.3	145.8
109.3	51.3	60.9	259.3	105.1	113.3	409.3	139.9	146.4
112.3	52.7	62.3	262.3	105.9	114.1	412.3	140.5	146.9
115.3	54.2	63.7	265.3	106.8	114.8	415.3	141.1	147.5
118.3	55.6	65.1	268.3	107.6	115.6	418.3	141.7	148.0
121.3	57.0	66.5	271.3	108.4	116.4	421.3	142.	148.6
124.3	58.4	67.8	274.3	109.2	117.1	424.3	142.9	149.1
127.3	59.7	69.1	277.3	109.9	117.9	427.3	143.5	149.7
130.3	61.0	70.4	280.3	110.7	118.7	430.3	144.1	150.2
133.3	62.3	71.7	283.3	111.5	119.4	433.3	144.6	150.7
136.3	63.6	73.0	286.3	112.3	120.1	436.3	145.2	151.3
139.3	64.9	74.2	289.3	113.0	120.9	439.3	145.8	151.8
142.3	66.1	75.4	292.3	113.8	121.6	442.3	146.3	152.3

Table 7: Opteon™ XP40 Temperature-Pressure Data (Eng)

Temp (°F)	Sat Liq P (psig)	Sat Vap P (psig)	Temp (°F)	Sat Liq P (psig)	Sat Vap P (psig)	Temp (°F)	Sat Liq P (psig)	Sat Vap P (psig)
-40	4.8	-0.1	25	64.0	50.4	90	208.2	181.6
-39	5.3	0.3	26	65.5	51.7	91	211.4	184.5
-38	5.8	0.8	27	67.0	53.0	92	214.5	187.5
-37	6.3	1.2	28	68.5	54.3	93	217.7	190.5
-36	6.8	1.6	29	70.0	55.6	94	221.0	193.6
-35	7.4	2.0	30	71.5	57.0	95	224.3	196.6
-34	7.9	2.5	31	73.0	58.3	96	227.6	199.8
-33	8.5	2.9	32	74.6	59.7	97	230.9	202.9
-32	9.0	3.4	33	76.2	61.1	98	234.3	206.1
-31	9.6	3.9	34	77.9	62.6	99	237.7	209.3
-30	10.2	4.4	35	79.5	64.0	100	241.1	212.6
-29	10.8	4.9	36	81.2	65.5	101	244.6	215.9
-28	11.4	5.4	37	82.8	67.0	102	248.1	219.2
-27	12.0	5.9	38	84.5	68.5	103	251.7	222.6
-26	12.7	6.4	39	86.3	70.0	104	255.3	226.0
-25	13.3	6.9	40	88.0	71.6	105	258.9	229.4
-24	14.0	7.5	41	89.8	73.2	106	262.5	232.9
-23	14.7	8.0	42	91.6	74.8	107	266.2	236.4
-22	15.3	8.6	43	93.4	76.4	108	270.0	240.0
-21	16.0	9.2	44	95.2	78.0	109	273.7	243.6
-20	16.7	9.8	45	97.1	79.7	110	277.5	247.2
-19	17.5	10.4	46	99.0	81.4	111	281.4	250.9
-18	18.2	11.0	47	100.9	83.1	112	285.2	254.6
-17	18.9	11.6	48	102.8	84.8	113	289.1	258.3
-16	19.7	12.3	49	104.8	86.6	114	293.1	262.1
-15	20.5	12.0	50	106.8	88.4	115	297.1	266.0
-14	21.3	13.6	51	108.8	90.2	116	301.1	269.8
-13	22.0	14.2	52	110.8	92.0	117	305.2	273.7
-12	22.9	14.9	53	112.9	93.9	118	309.3	277.7
-11	23.7	15.6	54	115.0	95.8	119	313.4	281.7
-10	24.6	16.3	55	117.0	97.7	120	317.6	285.7
-9	25.4	17.0	56	119.2	99.6	121	321.8	289.8
-8	26.3	17.8	57	121.4	101.6	122	326.0	294.0
-7	27.2	18.5	58	123.5	103.5	123	330.3	298.1
-6	28.0	19.3	59	125.8	105.5	124	334.7	302.4
-5	29.0	20.1	60	128.0	107.6	125	339.0	306.6
-4	29.9	20.8	61	130.3	109.6	126	343.5	310.9
-3	30.8	21.7	62	132.5	111.7	127	347.9	315.3
-2	31.8	22.5	63	134.9	113.8	128	352.4	319.7
-1	32.8	23.3	64	137.2	116.0	129	356.9	324.1
0	33.8	24.1	65	139.6	118.1	130	361.5	328.6
1	34.8	25.0	66	142.0	120.3	131	366.1	333.2
2	35.8	25.9	67	144.4	122.5	132	370.8	337.8
3	36.8	26.8	68	146.8	124.8	133	375.5	342.4
4	37.9	27.7	69	149.3	127.0	134	380.3	347.1
5	39.0	28.6	70	151.8	129.3	135	385.0	351.8
6	40.0	29.5	71	154.4	131.7	136	389.9	356.6
7	41.1	30.5	72	157.0	134.0	137	394.7	361.5
8	42.3	31.4	73	159.5	136.4	138	399.7	366.3
9	43.4	32.4	74	162.2	138.8	139	404.6	371.3
10	44.6	33.4	75	164.8	141.3	140	409.6	376.3
11	45.7	34.4	76	167.5	143.7	141	414.7	381.3
12	46.9	35.4	77	170.2	146.2	142	419.8	386.4
13	48.1	36.5	78	172.9	148.8	143	424.9	391.6
14	49.4	37.6	79	175.7	151.3	144	430.1	396.8
15	50.6	38.6	80	178.5	154.0	145	435.3	402.1
16	51.9	39.7	81	181.3	156.6	146	440.6	407.9
17	53.1	40.8	82	184.2	159.2	147	445.9	412.8
18	54.4	42.0	83	187.1	161.9	148	451.2	418.2
19	55.7	43.1	84	190.0	164.6	149	456.6	423.7
20	57.1	44.3	85	193.0	167.4	150	462.1	429.3
21	58.4	45.5	86	196.0	170.1			
22	59.8	46.7	87	199.0	173.0			
23	61.2	47.9	88	202.0	175.8			
24	62.6	49.1	89	205.1	178.7			

Checklist for Opteon™ XP40 Retrofit

☐ Establish baseline performance while operating on R-22 (see data sheet for recommended data)

☐ Consult the original equipment manufacturer of the system components for their recommendation on the following:
- Plastics compatibility
- Elastomeric compatibility
- Lubricant (viscosity, manufacturer, additives)
- Thermal expansion device sizing
- Retrofit procedures to sustain warranty, if applicable

☐ If POE lubricant in system: Check quality of existing POE oil and change if necessary
If MO or AB lubricant in system: Remove 90–95% MO or AB lubricant from the system
- Measure amount of lubricant removed and record _____
- Charge POE lubricant. Run system for 8 hours minimum
- Recharge with amount equivalent to amount of MO removed
- Repeat lubricant drain and POE charging until MO content is less than 5%

☐ Replace filter drier and elastomeric seals/gaskets
- Check and replace elastomeric seals and gaskets that cannot be replaced without removing refrigerant
  - Components commonly affected are Schrader core seals, liquid level receiver gaskets, solenoid valves, ball valves, flange seals, or shaft seals on open drive compressors; but, all external seals in contact with the refrigerant should be viewed as a potential post-retrofit leak source.

☐ Complete system modifications (TXV, line sizing, etc.) based on engineering analysis

☐ Reconnect system, and evacuate with vacuum pump to full vacuum
(<1000 microns [<29.88 in Hg vacuum] [<1.33 mbar])

☐ Leak check system (re-evacuate system following leak check)

☐ Charge system with Opteon™ XP40 (R-449A) refrigerant
- Initially charge ~85% by weight of original equipment manufacturer specified R-22 charge
- Amount of refrigerant charged: _____

☐ Start up equipment, and adjust charge until desired operating conditions are achieved
- If low in charge, add in increments of 2–3% by weight
- Amount of refrigerant charged: _____
- Total refrigerant charged: _____

☐ Label components and system for type of refrigerant and lubricant

☐ Conversion is complete!

System Data Sheet

Type of System/Location: _____

Equipment Mfg.: _____ Compressor Mfg.: _____

Model No.: _____ Model No.: _____

Serial No.: _____ Serial No.: _____

Date of Manufacture: _____ Date of Manufacture: _____

Original Charge Size: _____ Lubricant Type: _____

Lubricant Charge Size: _____ Drier Mfg.: _____

Drier Type: _____ Condenser Cooling Medium: _____

Expansion Device (check one):

☐ Capillary Tube: _____ ☐ Expansion Valve: _____

If Expansion Valve:

Manufacturer: _____ Model No.: _____

Control/Set Point: _____ Location of Sensor: _____

Other System Controls (e.g., head pressure control): _____

_____

Date/Time				
Refrigerant				
Charge Size (lb)				
Ambient Temperature (°F)				
Compressor				
Suction Temperature (°F)				
Suction Pressure (psig)				
Discharge Temperature (°F)				
Discharge Pressure (psig)				
Evaporator				
Coil Air/H_2O In T (°F)				
Coil Air/H_2O Out T (°F)				
Operating Service Temperature (°F)				
Condenser				
Coil Air/H_2O In T (°F)				
Coil Air/H_2O Out T (°F)				
Superheat and Subcool (derived values)				
Refrigerant T at Superheat Ctl. Pt. (°F)				
Calculated Superheat (°R)				
Expansion Device Inlet T (°F)				
Calculated Subcool (°R)				
Motor Amps (if rack: total)				

For more information on the Opteon™ family of refrigerants , or other Chemours refrigerants products, visit opteon.com, call (800) 235-7882, or follow us on Twitter@RefrigChemours.

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