



**DuPont™ ISCEON® 9 Series**

REFRIGERANTS

**Technical Information**

**Retrofit Guidelines for  
DuPont™ ISCEON® MO49Plus™  
for Automotive Air-Conditioning**



*The miracles of science™*



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## Introduction

ISCEON® MO49Plus™ (R-437A\* Pending) is an HFC retrofit refrigerant for R-12 in automotive air conditioning and stationary refrigeration systems and for replacing HCFC-containing refrigerant blends (e.g., MP39, MP66, and R-409A) in refrigeration systems. ISCEON® MO49Plus™ also replaces ISCEON® MO49 (R-413A). ISCEON® MO49Plus™ is compatible with traditional and new lubricants; in most cases no change of lubricant type during retrofit is required.

ISCEON MO49Plus™ is not recommended for use in centrifugal compressor systems or for chillers with flooded evaporators or low pressure receivers.

**Note:** ISCEON® MO49Plus™ is not available for automotive air-conditioning in the U.S.

## Easy Steps to Retrofit

The following provides a summary of the basic automotive air-conditioning retrofit steps for ISCEON® MO49Plus™.

1. **IDENTIFY REFRIGERANT.** Before conversion, know what refrigerant is currently in the system. Then, ensure that the system is in good working order and leak free. Pay special attention to the compressor shaft seal when performing all leak checks. Check typical evaporator and condensing pressures of the system.
2. **RECOVER REFRIGERANT.** Recover the R-12 to a dedicated recovery cylinder. Do not vent the reclaimed refrigerant to the air and do not mix the reclaimed refrigerant with other refrigerants.
3. **REMOVE OIL AND FLUSH SYSTEM.** Check the condition of the lubricant, e.g. water, acid, solids; and, if necessary, renew the contaminated oil with the same type of lubricant and dispose of the old oil responsibly; check local and federal guidelines regarding disposal. ISCEON® MO49Plus™ is compatible with new and traditional lubricants.
  - If required for proper oil return to the compressor, a small amount of approved PAG, of similar viscosity to the MO in the system should be added.
  - It is considered good practice to change the filter dryer whenever the system is exposed to atmospheric air.
  - Removal of R-12 from the system can result in the loss of some oil. If the oil level can be checked, add the quantity lost. Recheck after a period of running. If the oil level cannot be checked, it is advisable to add 5 to 10% of the oil charge to the system.
4. **REPAIR NECESSARY PARTS/RESEAL.** Check the condition of hoses and replace if necessary. It is not necessary to use any different materials when converting to ISCEON® MO49Plus™.
5. **ADD NEW SERVICE PORT ADAPTERS.** Install the new service fitting for ISCEON® MO49Plus™, if required.
6. **APPLY NEW LABELS.** Apply new ISCEON® MO49Plus™ labels under the hood. Clearly label the system as containing ISCEON® MO49Plus™ and type of lubricant.
7. **EVACUATE SYSTEM.** Remove all air and moisture from the system before retrofitting with new refrigerant.
8. **CHARGE SYSTEM WITH ISCEON® MO49Plus™.** Charge the system with the new refrigerant – remove from the cylinder in the liquid phase. Do not charge liquid refrigerant directly into the compressor. The total charge of ISCEON® MO49Plus™ will be approximately 10% less than R-12, based on density versus R-12.

**Note:** It is not unusual for an occasional bubble to be seen in the liquid line sight glass. A small number of bubbles in the sight glass is not a reliable indication of an under charged system.

  - Run the system and check the operating conditions. The pressure of ISCEON® MO49Plus™ is higher than with R-12. Note: the pressure-temperature relationship of ISCEON® MO49Plus™ is different than that of R-12. Therefore, it is necessary to have the ISCEON® MO49Plus™ pressure table available.
  - Check and adjust any pressure switches that might be in the system.
9. **LEAK CHECK SYSTEM.** Carry out a thorough leak check paying special attention to the compressor shaft seal. Any electronic detection system suitable for detecting HFC refrigerants (e.g., R-134a) is suitable for detecting ISCEON® MO49Plus™ .
  - In the event of a leak from the system, it is possible to top-off the system after repair, with virgin product without detriment to performance.
10. **RECYCLE REFRIGERANT.** It is possible to recycle ISCEON® MO49Plus™ , but care must be taken to ensure the whole of the refrigerant charge is removed from the system. It is equally important to ensure that when recovered product is once again charged to a system the refrigerant is taken from the liquid phase.

### **Retrofit Complete**

After retrofit, ISCEON® MO49Plus™ can be topped off during service without removing the entire refrigerant charge.

## Important Safety Information

Like CFCs, and other retrofit HFC blends, ISCEON® MO49Plus™ is safe to use when handled properly. However, any refrigerant can cause injury or even death when mis-handled. Please review the following guidelines before using any refrigerant.

- 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 (eg. Halide detection torches, or brazing torches) can release large quantities of acidic compounds in the presence of all refrigerants, and these compounds can be hazardous. Halide torches are not effective as leak detectors for HFC refrigerants; they detect the presence of Chlorine, which is not present in ISCEON® MO49Plus™. Consequently, these detectors will not detect the presence of these refrigerants. Use an electronic leak detector designed to find 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.

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

- Overexposure to high concentrations of refrigerant vapor can cause asphyxiation and cardiac arrest and potentially be fatal. Please read all safety information before handling any refrigerant.

For more detailed information on the properties, uses, storage, and handling of ISCEON® refrigerants, see DuPont Technical Bulletin K-10926 or other literature specific to these products. Refer to the appropriate Material Safety Data Sheet (MSDS) for more safety information about each refrigerant. DuPont Safety Bulletin AS-1 also gives additional information for safe handling of refrigerants.

### Flammability

DuPont™ ISCEON® MO49Plus™ has an ASHRAE safety classification of A1 and is non-flammable as formulated and under leakage scenarios as specified in ASHRAE standard 34-2007. See the Safety of DuPont™ Suva® and ISCEON® 9 Series Refrigerants (AS-1) bulletin and the DuPont™ ISCEON® MO49Plus™ MSDS for proper storage, handling and use details.

ISCEON® MO49Plus™ is non-flammable in air under normal conditions. However, mixtures of ISCEON® MO49Plus™ with high concentrations of air or oxygen at elevated pressure and/or temperature can become combustible in the presence of an ignition source. This product should not be mixed with air to check for leaks.

## Lubricant and Filter Drier Information

### Lubricants

Lubricant selection is based on many factors, including compressor wear characteristics, material compatibility, and lubricant/refrigerant miscibility (which can affect oil return to the compressor). ISCEON® MO49Plus™ is compatible with traditional and new lubricants – in most retrofit situations no change of oil type is required.

### 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 HFC refrigerants. (Many driers sold today are “universal” – they will work with most fluorocarbon refrigerants.) Check with your DuPont Distributor for the correct drier to use in your system.

## General Retrofit Information

### System Modifications

The composition of ISCEON® MO49Plus™ has been selected to provide performance comparable to the refrigerants being replaced in terms of both capacity and energy efficiency. As a result, minimal system modifications are anticipated with retrofitting. ISCEON® MO49Plus™ is a non-azeotrope. Therefore, the vapor composition in the refrigerant cylinder is different from the liquid composition. For this reason, this refrigerant should be transferred from the container from the liquid phase during system charging (or when transferring from one container to another).

Retrofits of R-12 systems with a non-ozone-depleting alternative refrigerant such as R-134a will require multiple oil changes and possibly more extensive modifications to the existing equipment. For some systems, the cost of conversion may be large.

**Note:** ISCEON® MO49Plus™ should not be mixed with other refrigerants or additives. Mixing this refrigerant with CFC or HCFC refrigerants, or mixing two different refrigerants, may have an adverse effect on system performance. "Topping off" a CFC or HCFC refrigerant with ISCEON® MO49Plus™ is not recommended.

### Refrigerant Recovery Information

Most recovery or recycle equipment used for R-12 can be used for ISCEON® MO49Plus™. Use standard procedures to avoid cross-contamination when switching from one refrigerant to another. Most recovery or recycle machines can use the same compressor oil that was used for R-12. However, some modifications may be necessary, such as a different kind of drier or a different moisture indicator. Consult the equipment manufacturer for specific recommendations.

Contact your DuPont refrigerant distributor for details of the refrigerant reclaim program.

### Expected Performance After Retrofit

Based on calorimeter testing and thermodynamic property data. Actual results may vary due to system design and operating conditions).

ISCEON® MO49Plus™ provides up to 11% cooling capacity and similar to slightly lower energy efficiency in R-12 systems. ISCEON® MO49Plus™ operates at lower discharge temperatures vs. R-12.

**Table 1**  
**ISCEON® MO49Plus™ Performance Comparison in Automotive Air-Conditioning System**

	<b>Automotive Air-Conditioning</b>
	41°F (5°C) Evaporator T 129°F (54°C) Condenser T 59°F (15°C) Return Gas T 70% Comp Eff With 7°F (4K) subcooling
<b>Performance Relative to R-12:</b>	<b>MO49Plus™ R-437A*</b>
Compressor Discharge Temperature, °F (°C)	-11 (-6)
Compressor Discharge Pressure, psia (kPa abs)	+45 (+312)
Cooling Capacity %	+11
Energy Efficiency %	-6
Temperature Glide, °F (K)	+3 (+1.7)

+ is increase and – is decrease in performance vs. R-12

Compressor Discharge Pressure, psia (kPa abs)

# Appendix

**Table 2**  
**Pressure – Temperature Chart (ENG Units): R-12 and ISCEON® MO49Plus™**

Temp. (°F)	R-12 Pressure (psia)	ISCEON® MO49Plus™ Liquid Phase Pressure (psia)	ISCEON® MO49Plus™ Vapor Phase Pressure (psia)	Temp. (°F)	R-12 Pressure (psia)	ISCEON® MO49Plus™ Liquid Phase Pressure (psia)	ISCEON® MO49Plus™ Vapor Phase Pressure (psia)
-50	7.1	7.7	6.4	0	23.8	27.4	24.1
-49	7.3	8.0	6.6	1	24.3	28.1	24.7
-48	7.5	8.2	6.8	2	24.8	28.7	25.2
-47	7.7	8.4	7.0	3	25.4	29.3	25.8
-46	7.9	8.7	7.2	4	25.9	30.0	26.4
-45	8.1	8.9	7.4	5	26.4	30.6	27.0
-44	8.4	9.2	7.6	6	27.0	31.3	27.6
-43	8.6	9.4	7.8	7	27.6	32.0	28.3
-42	8.8	9.7	8.1	8	28.1	32.7	28.9
-41	9.1	10.0	8.3	9	28.7	33.4	29.6
-40	9.3	10.3	8.6	10	29.3	34.1	30.2
-39	9.5	10.5	8.8	11	29.9	34.8	30.9
-38	9.8	10.8	9.1	12	30.5	35.5	31.6
-37	10.0	11.1	9.3	13	31.1	36.3	32.3
-36	10.3	11.4	9.6	14	31.7	37.1	33.0
-35	10.6	11.7	9.9	15	32.4	37.8	33.7
-34	10.8	12.0	10.1	16	33.0	38.6	34.4
-33	11.1	12.4	10.4	17	33.7	39.4	35.2
-32	11.4	12.7	10.7	18	34.3	40.2	35.9
-31	11.7	13.0	11.0	19	35.0	41.0	36.7
-30	12.0	13.4	11.3	20	35.7	41.9	37.5
-29	12.3	13.7	11.6	21	36.4	42.7	38.3
-28	12.6	14.1	12.0	22	37.1	43.6	39.1
-27	12.9	14.4	12.3	23	37.8	44.5	39.9
-26	13.2	14.8	12.6	24	38.5	45.4	40.7
-25	13.5	15.2	12.9	25	39.3	46.3	41.6
-24	13.9	15.6	13.3	26	40.0	47.2	42.5
-23	14.2	16.0	13.7	27	40.8	48.1	43.3
-22	14.5	16.4	14.0	28	41.5	49.1	44.2
-21	14.9	16.8	14.4	29	42.3	50.0	45.1
-20	15.2	17.2	14.8	30	43.1	51.0	46.0
-19	15.6	17.6	15.1	31	43.9	52.0	47.0
-18	16.0	18.1	15.5	32	44.7	53.0	47.9
-17	16.3	18.5	15.9	33	45.5	54.0	48.9
-16	16.7	19.0	16.3	34	46.3	55.0	49.8
-15	17.1	19.4	16.8	35	47.2	56.1	50.8
-14	17.5	19.9	17.2	36	48.0	57.2	51.8
-13	17.9	20.4	17.6	37	48.9	58.2	52.9
-12	18.3	20.9	18.1	38	49.8	59.3	53.9
-11	18.7	21.4	18.5	39	50.7	60.4	54.9
-10	19.2	21.9	19.0	40	51.6	61.6	56.0
-9	19.6	22.4	19.4	41	52.5	62.7	57.1
-8	20.0	22.9	19.9	42	53.4	63.9	58.2
-7	20.5	23.4	20.4	43	54.4	65.0	59.3
-6	20.9	24.0	20.9	44	55.3	66.2	60.4
-5	21.4	24.5	21.4	45	56.3	67.4	61.6
-4	21.9	25.1	21.9	46	57.3	68.7	62.7
-3	22.3	25.7	22.5	47	58.3	69.9	63.9
-2	22.8	26.2	23.0	48	59.3	71.1	65.1
-1	23.3	26.8	23.5	49	60.3	72.4	66.3



**Table 2**  
**Pressure – Temperature Chart (ENG Units): R-12 and ISCEON® MO49Plus™ (continued)**

Temp. (°F)	R-12 Pressure (psia)	ISCEON® MO49Plus™ Liquid Phase Pressure (psia)	ISCEON® MO49Plus™ Vapor Phase Pressure (psia)	Temp. (°F)	R-12 Pressure (psia)	ISCEON® MO49Plus™ Liquid Phase Pressure (psia)	ISCEON® MO49Plus™ Vapor Phase Pressure (psia)
50	61.3	73.7	67.6	100	131.6	163.7	154.5
51	62.3	75.0	68.8	101	133.5	166.0	156.8
52	63.4	76.3	70.1	102	135.3	168.4	159.1
53	64.5	77.7	71.3	103	137.2	170.9	161.5
54	65.5	79.0	72.6	104	139.1	173.3	163.9
55	66.6	80.4	74.0	105	141.0	175.8	166.3
56	67.8	81.8	75.3	106	142.9	178.3	168.8
57	68.9	83.2	76.7	107	144.9	180.9	171.3
58	70.0	84.7	78.0	108	146.8	183.4	173.8
59	71.2	86.1	79.4	109	148.8	186.0	176.3
60	72.3	87.6	80.8	110	150.8	188.6	178.9
61	73.5	89.1	82.3	111	152.8	191.3	181.5
62	74.7	90.6	83.7	112	154.9	194.0	184.1
63	75.9	92.1	85.2	113	156.9	196.7	186.8
64	77.1	93.7	86.7	114	159.0	199.4	189.5
65	78.4	95.2	88.2	115	161.1	202.2	192.2
66	79.6	96.8	89.7	116	163.3	204.9	194.9
67	80.9	98.4	91.2	117	165.4	207.8	197.7
68	82.2	100.1	92.8	118	167.6	210.6	200.5
69	83.4	101.7	94.4	119	169.8	213.5	203.3
70	84.8	103.4	96.0	120	172.0	216.4	206.2
71	86.1	105.1	97.6	121	174.2	219.3	209.0
72	87.4	106.8	99.3	122	176.5	222.3	212.0
73	88.8	108.5	100.9	123	178.7	225.3	214.9
74	90.1	110.2	102.6	124	181.0	228.3	217.9
75	91.5	112.0	104.3	125	183.3	231.3	220.9
76	92.9	113.8	106.0	126	185.7	234.4	223.9
77	94.4	115.6	107.8	127	188.0	237.5	227.0
78	95.8	117.5	109.6	128	190.4	240.7	230.1
79	97.2	119.3	111.4	129	192.8	243.9	233.3
80	98.7	121.2	113.2	130	195.2	247.1	236.4
81	100.2	123.1	115.0	131	197.7	250.3	239.6
82	101.7	125.0	116.9	132	200.2	253.6	242.9
83	103.2	127.0	118.8	133	202.7	256.9	246.1
84	104.7	128.9	120.7	134	205.2	260.2	249.4
85	106.3	130.9	122.6	135	207.7	263.6	252.8
86	107.9	132.9	124.6	136	210.3	267.0	256.1
87	109.4	135.0	126.5	137	212.9	270.4	259.5
88	111.0	137.0	128.5	138	215.5	273.9	263.0
89	112.7	139.1	130.6	139	218.1	277.4	266.4
90	114.3	141.2	132.6	140	220.7	280.9	269.9
91	116.0	143.4	134.7	141	223.4	284.5	273.5
92	117.6	145.5	136.8	142	226.1	288.1	277.1
93	119.3	147.7	138.9	143	228.8	291.7	280.7
94	121.0	149.9	141.1	144	231.6	295.4	284.3
95	122.7	152.1	143.2	145	234.4	299.1	288.0
96	124.5	154.4	145.4	146	237.2	302.8	291.7
97	126.2	156.7	147.6	147	240.0	306.6	295.5
98	128.0	159.0	149.9	148	242.8	310.4	299.3
99	129.8	161.3	152.2	149	245.7	314.3	303.1
				150	248.6	318.2	307.0

**Table 3**  
**Pressure – Temperature Chart (SI Units): R-12 and ISCEON® MO49Plus™**

Temp. (°C)	R-12 Pressure (kPa)	ISCEON® MO49Plus™ Liquid Phase Pressure (kPa)	ISCEON® MO49Plus™ Vapor Phase Pressure (kPa)
-40	64.1	70.7	59.0
-39	67.2	74.3	62.1
-38	70.3	77.9	65.3
-37	73.6	81.8	68.7
-36	77.0	85.7	72.3
-35	80.6	89.9	75.9
-34	84.3	94.2	79.8
-33	88.1	98.6	83.7
-32	92.0	103.2	87.9
-31	96.1	108.0	92.2
-30	100.3	113.0	96.6
-29	104.6	118.1	101.2
-28	109.1	123.4	106.0
-27	113.8	128.9	111.0
-26	118.5	134.6	116.2
-25	123.5	140.5	121.5
-24	128.6	146.6	127.0
-23	133.9	152.9	132.8
-22	139.3	159.4	138.7
-21	144.9	166.1	144.8
-20	150.7	173.0	151.2
-19	156.7	180.2	157.8
-18	162.8	187.6	164.5
-17	169.1	195.2	171.6
-16	175.6	203.0	178.8
-15	182.3	211.1	186.3
-14	189.2	219.5	194.0
-13	196.3	228.1	202.0
-12	203.6	236.9	210.2
-11	211.1	246.1	218.6
-10	218.8	255.5	227.4
-9	226.7	265.1	236.4
-8	234.8	275.1	245.6
-7	243.2	285.3	255.2
-6	251.8	295.8	265.0
-5	260.6	306.7	275.2
-4	269.6	317.8	285.6
-3	278.9	329.2	296.3
-2	288.4	340.9	307.3
-1	298.1	353.0	318.7
0	308.2	365.4	330.3
1	318.4	378.1	342.3
2	328.9	391.1	354.6
3	339.7	404.5	367.3
4	350.7	418.2	380.3

Temp. (°C)	R-12 Pressure (kPa)	ISCEON® MO49Plus™ Liquid Phase Pressure (kPa)	ISCEON® MO49Plus™ Vapor Phase Pressure (kPa)
5	362.0	432.3	393.6
6	373.6	446.8	407.3
7	385.4	461.6	421.4
8	397.6	476.7	435.8
9	410.0	492.3	450.6
10	422.7	508.2	465.8
11	435.7	524.5	481.3
12	449.0	541.3	497.3
13	462.5	558.4	513.6
14	476.4	575.9	530.4
15	490.6	593.8	547.6
16	505.1	612.2	565.1
17	520.0	630.9	583.1
18	535.1	650.1	601.6
19	550.6	669.8	620.5
20	566.4	689.9	639.8
21	582.6	710.4	659.5
22	599.1	731.4	679.8
23	615.9	752.9	700.5
24	633.1	774.8	721.6
25	650.6	797.2	743.3
26	668.5	820.1	765.4
27	686.7	843.5	788.0
28	705.3	867.3	811.1
29	724.3	891.7	834.7
30	743.7	916.6	858.9
31	763.4	942.0	883.5
32	783.5	967.9	908.7
33	804.0	994.4	934.5
34	824.9	1021.4	960.7
35	846.2	1048.9	987.5
36	867.9	1077.0	1014.9
37	890.0	1105.7	1042.9
38	912.5	1134.9	1071.4
39	935.5	1164.7	1100.5
40	958.8	1195.1	1130.2
41	982.6	1226.0	1160.5
42	1006.8	1257.6	1191.4
43	1031.5	1289.8	1222.9
44	1056.6	1322.6	1255.0
45	1082.1	1356.0	1287.8
46	1108.1	1390.0	1321.2
47	1134.5	1424.7	1355.3
48	1161.4	1460.0	1390.0
49	1188.8	1495.9	1425.3

**Table 3**  
**Pressure – Temperature Chart (SI Units): R-12 and ISCEON® MO49Plus™ (continued)**

<b>Temp. (°C)</b>	<b>R-12 Pressure (kPa)</b>	<b>ISCEON® MO49Plus™ Liquid Phase Pressure (kPa)</b>	<b>ISCEON® MO49Plus™ Vapor Phase Pressure (kPa)</b>
50	1216.6	1532.5	1461.4
51	1244.9	1569.8	1498.1
52	1273.7	1607.8	1535.6
53	1303.0	1646.4	1573.7
54	1332.7	1685.8	1612.6
55	1363.0	1725.8	1652.1
56	1393.8	1766.6	1692.4
57	1425.0	1808.1	1733.5
58	1456.8	1850.3	1775.3
59	1489.1	1893.2	1817.9

<b>Temp. (°C)</b>	<b>R-12 Pressure (kPa)</b>	<b>ISCEON® MO49Plus™ Liquid Phase Pressure (kPa)</b>	<b>ISCEON® MO49Plus™ Vapor Phase Pressure (kPa)</b>
60	1521.9	1936.9	1861.2
61	1555.3	1981.3	1905.3
62	1589.2	2026.6	1950.3
63	1623.6	2072.5	1996.0
64	1658.6	2119.3	2042.5
65	1694.1	2166.9	2089.9
66	1730.2	2215.3	2138.2
67	1766.8	2264.5	2187.2
68	1804.1	2314.5	2237.2
69	1841.9	2365.4	2288.1
70	1880.2	2417.1	2339.8

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