

# Isceon<sup>®</sup> MO99

(R438A)

Isceon<sup>®</sup> MO99 is a zero ozone depletion (ODP) hydrofluorocarbon (HFC) refrigerant. Isceon<sup>®</sup> MO99 is a five component blend of R32, R125, R134a and R600 and R601a (8.5%/45.0%/44.2%/1.7%/0.6%). It is used as a retrofit replacement for HCFC R22 in direct expansion (DX) air conditioning and refrigeration systems.

## APPLICATION

Isceon<sup>®</sup> MO99 applications include commercial air conditioning, packaged rooftops, indoor packaged units, DX chillers, split systems, heat pumps and DX-refrigeration. Its use is particularly advantageous in retrofitting existing R22 DX-chillers where the expansion device is closely matched to system capacity.

## PROPERTIES AND PERFORMANCE

Isceon<sup>®</sup> MO99 is designed to meet the needs a wide spectrum of refrigeration and air conditioning systems that are running on R22 and when correctly retrofitted provides similar cooling capacity and energy efficiency. Isceon<sup>®</sup> MO99 is a zeotropic HFC refrigerant blend, which is rated A1 by ASHRAE (lowest levels of toxicity and flammability), having zero Ozone Depletion Potential and a Global Warming Potential of 2265.

## LUBRICATION

Isceon<sup>®</sup> MO99 is compatible with mineral oils, alkylbenzene and polyolesters lubricants. Generally, if retrofitting from R22 there is no need to change the existing lubricant charge. If the system is operating on mineral or alkylbenzene lubricants at very low temperatures, has complex pipe runs or has a liquid receiver and lubrication problems are experienced, replacing 25% the lubricant charge with a polyolester lubricant may improve lubrication.

## CHARGING

Due to the zeotropic nature of Isceon<sup>®</sup> MO99, it should be charged into the system as a liquid to prevent fractionation (changes in refrigerant composition due to vapour charging). In situations where vapour is normally charged into a system, a valve should be installed in the charging line to flash the liquid to vapour while charging.

## RETROFITTING

When retrofitting from R22 to Isceon<sup>®</sup> MO99, it is not always necessary to replace the existing lubricant with POE oil, unless the problems due to the issues detailed above in LUBRICATION occur. The final charge weight of Isceon<sup>®</sup> MO99 will be about 95% that of the R22 charge. Filter driers and elastomeric seals/gaskets should be replaced as standard for all Isceon<sup>®</sup> MO99 retrofits. Adjustment of expansion valve superheat may be necessary. Detailed retrofit procedures are available from Harp International upon request.

## MATERIAL COMPATIBILITY

Isceon<sup>®</sup> MO99 may not be compatible with the systems existing elastomeric seals and gaskets. For these reasons, before performing any Isceon<sup>®</sup> MO99 retrofit, Harp International recommends contacting the OEM for specific recommendations before retrofitting.



# Isceon® MO99 (R438A)

## Technical Data

### Isceon® MO99 (R438A) BASIC PROPERTIES

Chemical formula	R32 – CH <sub>2</sub> F <sub>3</sub> R125 – CHF <sub>2</sub> CF <sub>3</sub> R134a – CH <sub>2</sub> FCF <sub>3</sub> R600 – C <sub>4</sub> H <sub>10</sub> R601a – CHCH <sub>2</sub> (CH <sub>3</sub> ) <sub>3</sub>	Molecular weight	99.1
		Boiling point at 1 atmosphere	-42.3°C
		Critical temperature	85.27°C
		Critical pressure	43.05 bar absolute

### Isceon® MO99 (R438A) THERMODYNAMIC PROPERTIES

Pressure (bar)	Liquid Temperature (°C)	Vapour Temperature (°C)	Liquid Density (kg/m <sup>3</sup> )	Vapour Density (kg/m <sup>3</sup> )	Liquid Enthalpy (kJ/kg)	Vapour Density (kJ/kg)	Liquid Entropy (kJ/kg.K)	Vapour Entropy (kJ/kg.K)
0.6	-52.8	-46.4	1423.3	3.25	132.8	355.3	0.817	1.813
0.7	-49.8	-43.5	1414.2	3.75	136.5	357.1	0.834	1.808
0.8	-47.2	-40.9	1406.1	4.26	139.8	358.7	0.848	1.804
0.9	-44.8	-38.6	1398.7	4.75	142.8	360.1	0.862	1.801
1.0	-42.6	-36.4	1391.9	5.25	145.5	361.4	0.874	1.798
<b>1.013</b>	<b>-42.3</b>	<b>-36.1</b>	<b>1391.1</b>	<b>5.31</b>	<b>145.9</b>	<b>361.6</b>	<b>0.875</b>	<b>1.798</b>
.5	-33.7	-27.7	1363.8	7.70	156.8	366.7	0.921	1.787
2.0	-26.9	-21.0	1341.7	10.12	165.5	370.6	0.957	1.780
2.5	-21.3	-15.6	1323.2	12.53	172.8	373.8	0.986	1.775
3.0	-16.5	-10.9	1307.0	14.93	179.0	376.4	1.011	1.772
3.5	-12.3	-6.8	1292.5	17.32	184.6	378.7	1.032	1.768
4.0	-8.6	-3.1	1279.2	19.73	189.6	380.7	1.051	1.766
4.5	-5.1	0.3	1266.9	22.13	194.2	382.5	1.068	1.764
5.0	-2.0	3.4	1255.4	24.55	198.5	384.1	1.084	1.762
5.5	0.9	6.2	1244.6	26.98	202.5	385.6	1.098	1.760
6.0	3.7	8.9	1234.3	29.42	206.2	386.9	1.112	1.758
6.5	6.2	11.4	1224.5	31.88	209.8	388.2	1.124	1.757
7.0	8.7	13.7	1215.1	34.35	213.1	389.3	1.136	1.756
7.5	10.9	16.0	1206.0	36.84	216.3	390.4	1.147	1.755
8.0	13.1	18.1	1197.2	39.35	219.4	391.3	1.158	1.753
8.5	15.2	20.1	1188.7	41.87	222.4	392.2	1.168	1.752
9.0	17.2	22.1	1180.5	44.42	225.2	393.1	1.178	1.751
9.5	19.1	23.9	1172.4	46.99	228.0	393.9	1.187	1.750
10.0	21.0	25.7	1164.6	49.58	230.6	394.6	1.196	1.749
11.0	24.4	29.1	1149.3	54.84	235.7	396.0	1.213	1.747
12.0	27.7	32.2	1134.7	60.19	240.5	397.2	1.229	1.746
13.0	30.7	35.2	1120.5	65.66	245.1	398.2	1.244	1.744
14.0	33.6	38.0	1106.6	71.25	249.5	399.1	1.258	1.742
15.0	36.4	40.6	1093.1	76.96	253.7	399.9	1.271	1.740
16.0	39.0	43.1	1079.8	82.82	257.8	400.6	1.284	1.738
17.0	41.5	45.5	1066.7	88.81	261.7	401.2	1.296	1.737
18.0	43.9	47.8	1053.7	94.97	265.5	401.7	1.308	1.735
19.0	46.1	50.0	1040.9	101.30	269.2	402.1	1.319	1.733
20.0	48.3	52.1	1028.2	107.81	272.8	402.4	1.330	1.731
21.0	50.5	54.2	1015.4	114.52	276.3	402.6	1.341	1.729
22.0	52.5	56.1	1002.7	121.45	279.8	402.8	1.351	1.727
23.0	54.5	58.0	989.9	128.60	283.2	402.9	1.361	1.724
24.0	56.4	59.8	977.1	136.02	286.5	402.8	1.371	1.722
25.0	58.3	61.6	964.2	143.71	289.8	402.8	1.381	1.720
26.0	60.1	63.3	951.1	151.72	293.1	402.6	1.390	1.717
27.0	61.8	64.9	937.8	160.07	296.3	402.3	1.399	1.714
28.0	63.5	66.5	924.2	168.79	299.5	402.0	1.409	1.712
29.0	65.2	68.1	910.4	177.95	302.7	401.5	1.418	1.709
30.0	66.8	69.6	896.2	187.60	305.8	401.0	1.427	1.705
31.0	68.4	71.0	881.5	197.80	309.0	400.3	1.436	1.702
32.0	69.9	72.5	866.2	208.65	312.2	399.5	1.445	1.698
33.0	71.4	73.8	850.3	220.26	315.4	398.6	1.454	1.694
34.0	72.9	75.2	833.5	232.78	318.7	397.5	1.463	1.690
35.0	74.3	76.5	815.6	246.40	322.1	396.2	1.472	1.685