

## Addendum to the IOM Manual

# R410A Refrigerant Addendum to the IOM Manual

The STULZ Air Technology Systems (SATS) precision air conditioner covered by this addendum is provided with R410A refrigerant. This is indicated by a R410A label on the side of the compressor and by the Refrigerant Type listed on the unit nameplate. This addendum is for the use of R410A refrigerant and supplements the standard installation, operation and maintenance manual that was provided with your unit. Information for charging is provided in this addendum. The air conditioning system will operate in the manner described in the manual.


Refrigerant R410A is recognized as being safer for the environment. Refrigerant R410A is similar to R407C in that they are blended refrigerants that consist of component parts. However, the component parts of R410A refrigerant have the same composition at various operating temperature/pressures in the liquid phase and gas phase reducing the temperature glide effect experienced with R407C.

R410A operates at higher pressures than R407C. This must be considered when checking the operating temperatures/pressures while charging or troubleshooting the system. The tables provided in this document show the temperature/pressure characteristics for R410A.

### Warnings/Cautions

Review the manufacturers' Material Safety Data Sheet provided for R410A refrigerant. Follow the same warnings and cautions for R410A refrigerant that appear at the beginning of the standard manual for R407C refrigerant. Cautions for R410A refrigerant are below.

**NOTE:** Poly Oleaster (POE) oil is used in this system. If a replacement compressor is provided, ensure that it is filled with POE oil before installing.

 **CAUTION!** POE oil quickly absorbs moisture when exposed to air. High POE oil moisture levels react with refrigerant to form acid which results in system contamination. Keep the entire system sealed as much as possible and minimize exposure to POE oil to outside air.

### Refrigerant Line Sizing

Refrigerant line sizing should create no more than a 2° to 3° F pressure drop (1° F = 4.75 psi). R410A refrigerant lines are to be the same size as the recommended refrigerant line sizes shown in the standard A/C unit IOM for R407C and R22. If calculating the ideal pipe diameters for R410A, the optimum line size may be slightly smaller only in some cases. Since it is important to avoid excessive pressure drops, the slight variance is not significant enough to consider using the next smaller standard pipe size available.

**NOTE:** Consult the Copeland applications data guide for more detailed information regarding refrigerant line sizing and line traps.

### Liquid Line

Operating liquid line velocities must be less than 300 fpm to avoid liquid hammering during solenoid operation.

### Discharge Line

Operating discharge line velocities must be a minimum of 500 fpm for horizontal runs and 1,000 fpm for vertical risers.

Since refrigerant may condense during the off cycle, all vertical discharge risers should be designed to prevent liquid refrigerant and oil from flowing back into the compressor. Traps are required at the bottom of the riser and at every 20 feet of vertical rise. Install an inverted trap at the condenser inlet to prevent liquid refrigerant from flowing backwards into the hot gas riser during off cycles.

### Suction Line

Operating suction velocities must be a minimum of 500 fpm for horizontal runs and 1,000 fpm for vertical risers. Caution should be used when selecting suction lines as under-sized lines will reduce the compressor capacity; over-sizing may result in low gas velocity.

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### Charging

The refrigerant charging procedures for R410A are the same as described for R407C in the standard manual provided for your A/C system. These refrigerants are to be introduced into an evacuated system from the canister in liquid form rather than vapor form so components in the blend do not separate. An initial liquid refrigerant holding charge is introduced to the system so the low pressure switch will "hold" through the process of fine tuning the system charge.

### Fine Tuning the Charge

During the charging process, fine tune the system charge maintaining a constant discharge pressure of 480 to 520 psig. It may be necessary to block off the air intake to the condenser with cardboard until a constant discharge pressure is obtained. Slowly meter R410A liquid through the suction side while watching the pressure gauges and monitoring superheat and sub-cooling temperatures. The ideal superheat temperature range is 12-15°F. Maximum allowable superheat temperature is 20°F. The ideal sub-cooling temperature should be 10-20°F

### -30°F Flooded Head Pressure Control

In units with R410A refrigerant using flooded head pressure control, a receiver is provided to store the refrigerant during the time the condenser is not using the extra refrigerant charge. Once the correct superheat and sub-cooling temperatures are obtained, additional refrigerant must be added to the receiver.

A level indicator (sight glass), is located on the side of the receiver to assist in charging the air conditioning system. The proper charge can be determined by viewing the position of the "float ball" while the unit is running at an elevated discharge head pressure (approx. 485 psig). If the "float ball" is positioned at the bottom of the sight indicator, additional refrigerant charge is needed. When the float ball reaches the top of the indicator, the unit is fully charged.

### R410A Refrigerant Characteristics

The following tables assist with the normal settings of the system. Where applicable, the minimum and maximum settings are given along with the normal operating pressures.

**Table 1**

Pressure/Temperature Settings for R410A			
	Normal	Min.	Max.
Sub-cooling °F	10	5	20
Superheat °F	15	10	20
Design Condensing T. Air-Cooled (at 95°F Ambient)	125	105	140
Design Condensing T. Water-Cooled (at 85°F EWT)	105	105	140
Design Condensing T. Glycol-Cooled (at 110°F EGT)	130	105	140
Suction Pressure (psig)	120	105	155
0° Ambient Control			
Air Cooled Condenser Fan Switch ON 0° setting (psig)	440	420	460
-20°F Ambient Control			
Air Cooled Condenser Fan Speed (psig)	480	-	-
	<b>Opens</b>	<b>Closes</b>	
Low Pressure Switch (psig)	65	105	
High Pressure Switch (psig)	630	Manual Reset	

**Table 2**

R410A Refrigerant Pressures			
Temp. (°F)	Pressure (psig)	Temp. (°F)	Pressure (psig)
20	78.3	60	169.6
22	81.8	65	184.5
24	85.4	70	200.4
26	89.1	75	217.1
28	92.9	80	234.9
30	96.8	85	253.7
32	100.9	90	273.5
34	105.0	95	294.4
36	109.2	100	316.4
38	113.6	105	339.6
40	118.1	110	364.1
42	122.7	115	389.9
44	127.4	120	416.9
46	132.2	125	445.4
48	137.2	130	475.4
50	142.2	135	506.9
55	155.5	140	540.1