SCREW PAKS

List of drawings:

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SCREW PAKS

1 INTRODUCTION

This type of compressor pak allows use of an environmentally acceptable refrigerant such as R22. It is particularly appropriate where control pressures of 4 psi are required to control the refrigeration of frozen food.

The pak incorporates two compressors, each driven by a 30 kw three phase motor.

The function of the pak is to deliver clean refrigerant at a controlled pressure to the units on the shop floor. Returned gas from the units on the shop floor is processed by the pak before being re-cycled.

The screw pak is linked to the front end.

The controller needs a data input for the required configuration to be selected. This is achieved by setting the appropriate bit switches on the CPU board and using the hand held unit to force load the corresponding parameters into the controller.

2 FUNCTIONAL DESCRIPTION

The basic operation of the screw pak is to control the suction pressure of the refrigerant, by varying the combined speed of two compressors.

Compressor 1, is variable in speed from 1500 to 4500 RPM.

Compressor 2 has two speeds, 1500 and 3000 RPM.

Both compressors can be individually started and stopped by the system, as a function of the current conditions.

When the system is switched on, compressor 1 starts and attains 1500 RPM.

The suction pressure is continuously monitored by a probe in the suction line. Compressor 1 increases speed up to a maximum of 4500 RPM or until the suction pressure has dropped to 4 psi.

If this pressure has not yet been reached, compressor 2 is turned on and runs up to a speed of 1500 RPM.

Compressor 1 then drops back to 1500 RPM and again builds up speed to a maximum of 4500 RPM or until the suction pressure has dropped to 4 psi.

If the required suction pressure of 4 psi has still not been reached, compressor 2 switches to its higher speed of 3000 RPM.

Compressor 1 then varies its speed to control the suction pressure at 4 psi.

The compressor pak is controlled automatically by software in the electronic unit, which regulates compressors speed, solenoid valves and oil expansion valves according to demand.

3 OPERATIONAL DESCRIPTION

Operation of the screw pak is described under five main sub-headings:

(1) Refrigerant gas circuit (drawing SK345)
(2) Oil circuit (drawing SK346)
(3) Combined gas and oil circuit (drawing SK347)
(4) Electronic unit (drawing SK344)
(5) Compressor sequencing

3.1 GAS CIRCUIT (drawing SK345)

3.1.1 Suction header

The suction header has two or more inputs for gas from the units on the shop floor. The suction header passes gas to the two compressors.

3.1.2 Compressors

The two compressors are controlled by the electronic system in accordance with the measured pressure in the suction header. The output of the two compressors is fed to a common discharge line. This takes the compressed gas/oil mixture at high velocity to the oil separator.

3.1.3 Oil separator

On entering the oil separator, the gas/oil mixture is forced at high speed against the internal walls of the oil separator cylinder. Centrifugal force causes the mixture to rotate inside the cylinder of the oil separator. The oil drops to the bottom, and the gas is discharged to the condenser.

3.1.4 Condenser

The condenser converts the incoming hot gas to a liquid, which then passes into the liquid receiver.

3.1.5 Liquid receiver

The liquid receiver stores the condensed liquid from the condenser, and passes the liquid on demand via the drier to the liquid header.

3.1.6 Liquid header

The liquid header feeds liquid refrigerant on demand to the various unit on the shop floor.

3.1.7 Saturated vapour header

The saturated vapour header takes gas from the top of the liquid receiver for hot gas defrost.

3.2 OIL CIRCUIT (drawing SK346)

3.2.1 Oil separator

The oil separator (see para 3.1.3) receives a mixture of gas and hot oil from the compressor discharge. This mixture is separated, and the hot oil drops to the bottom of the separator. After passing through a non return valve, the hot oil extracted by the oil separator divides into two routes;

(1) Hot oil feed to compressors.
(2) Hot oil feed to cooling system.

3.2.2 Hot oil feed to compressors

Hot oil from the separator is combined with cold oil from the oil cooler (see para 3.2.4). This combination of hot and cold oil is fed to both compressors. The oil flow rate of the hot oil is controlled by a standard modulating solenoid valve in the feed line to each compressor. This valve opens fully in the event of a power failure, or if hot oil flow ceases for any reason.

3.2.3 Hot oil feed to cooling system

Hot oil is cooled by two stages in succession:

(1) Water de-superheater.
(2) Oil cooler.

3.2.4 Cool oil feed to compressors

Cool oil from the oil cooler is delivered to both compressors, after being combined with the hot oil as described in para 3.2.2 above.

A modulating valve is incorporated in the feed line to each compressor. This electronically controlled valve (para 3.2.2) ensures that the correct oil feed temperature is maintained for each compressor.

Oil temperature is monitored by a probe in the combined hot/cold feed to each compressor.

3.2.5 Combined hot and cold oil feed to compressors

The temperature controlled oil is fed to each compressor through the following stages:

(1) Oil filter, to remove any sediment.
(2) Flow control switch, which stops compressor if oil flow ceases for any reason.
(3) Injection solenoid valve, energise open.
(4) Sight glass, which allows the oil quality to be visually checked.

3.2.6 Compressor discharge

The discharge oil and gas from the compressors is combined and returned to the top of the oil separator to complete the circuit.

3.3 COMBINED FLOW (drawing SK347)

The total system is shown in drawing SK347, where the oil and gas circuits are combined into one drawing.

The following features are also shown:

(1) Hot gas dump.
(2) Pressure equalisation.
(3) Liquid injection.

3.3.1 Hot gas dump

If the back pressure falls to a dangerously low level, a solenoid valve is opened to allow saturated discharge gas to flow into the suction header.

3.3.2 Pressure equalisation

If both compressors are off, a solenoid valve opens in a feed from the top of the oil separator, to even out the suction and discharge pressures. An oil heater in the sump of the oil separator is left permanently on, which will then boil out any liquid refrigerant in the system.

3.3.3 Liquid injection

Whenever the hot gas dump comes into operation, a solenoid valve is opened on a liquid injection line. A probe on the suction line senses the temperature of gas in the line. If this becomes over-heated, a TEV in the liquid injection line is opened fully. This allows cool liquid vapour to be injected into the hot gas supply to maintain the compressors at their correct temperatures.

3.4 CONTROL AND MONITOR PANELS (drawing SK344)

The functions of the screw pak are controlled from the following panels:

3.4.1 Speed controller (panel A)

A digital readout on this panel indicates the frequency of the three phase supply to the variable speed motor which drives compressor 1.

3.4.2 Compressor 1 speed inverter (panel B)

This panel incorporates a mains isolator switch for compressor 1, two meters which show the current and RPM of the (variable speed) compressor 1, and two lamps to indicate alarm and run status for compressor 1.

3.4.3 Compressor 2 dual speed (panel C)

This panel incorporates a mains isolator switch for compressor 2, a meter to show the current fed to the (dual speed) compressor 2, and three lamps to indicate alarm and run status for compressor 2.

3.4.4 Incomer distribution section (panel D)

This panel incorporates a mains isolator switch for the complete screw pak system, a light switch and mains outlet, together with four indicator as follows:

(1) Essential services (ES) supply healthy.
(2) Low level oil alarm.
(3) Low oil temperature alarm.
(4) Low level refrigerant alarm.

3.4.5 Condenser fan section (panel E)

This panel incorporates two indicator lamps for each condenser fan. The lamps indicate:

(1) Overload trip.
(2) Motor running.

Additionally, an alarm lamp is illuminated when the air flow ceases.

3.4.6 Electronic section (panel F)

This panel incorporates a readout panel, and socket for the handheld unit. The readout panel provides the following indications:

(1) Discharge pressure (digital display).

(2) Suction pressure (digital display).
(3) Electronics supply healthy (lamp).
(4) Liquid injection (lamp).
(5) Gas dump (lamp).
(6) C1 oil flow fault (lamp).
(7) C1 thermistor fault (lamp).
(8) C1 SAMI fault (lamp).
(9) C1 HP/LP fault (lamp).
(10) C2 oil flow fault (lamp).
(11) C2 thermistor fault (lamp).
(12) C2 overload fault (lamp).
(13) C2 HP/LP fault (lamp).

3.5 COMPRESSOR SEQUENCING

3.5.1 Control sequence

When the system is powered up, C1 starts, and speeds up to 1500 RPM. It remains at that speed until ramp suction pressure is reached.

At this point C1 speeds up at a variable ramp rate until suction pressure is at set point, or to a maximum speed of 4500 RPM.

If the suction pressure is still above set point, C2 is started, and runs at 1500 RPM. This compressor is started when the suction pressure is at least 2 psi above set point.

Once C2 is running, C1 varies its speed until the suction pressure has reached set point, or until the speed once again reaches 4500 RPM.
At this point, if the suction pressure is still above set point, C2 is switched from its low speed, 1500 RPM to its high speed, 3000 RPM.

C1 again varies its speed until the suction pressure has reached set point, or until the speed once again reaches 4500 RPM.

If the reduction in suction pressure is too rapid, the dump solenoid valve is opened, thus increasing suction pressure.

As the suction pressure falls, C1 reduces speed. If the speed reaches 1500 RPM, C2 switches to its low speed 1500 RPM, when suction pressure is at least 2 psi below set point.

If the suction pressure again falls to at least 2 psi below set point, C2 will be switched off, and the process will be controlled solely by C1.

3.5.2 Compressor start criteria

Four important criteria must be met to allow a compressor to start:

(1) Three phase supply rotation must be correct.
(2) Inhibit start timers must be at zero.
(3) Oil level - must be above a pre-determined minimum.
(4) Fault chain must be healthy.

These conditions are detected by the electronic system, and unless all four are correct, will prevent operation of either compressor, or control of the equalise valve.

3.6 COMMISSIONING

3.6.1 General instructions

Before coupling the compressors to their respective motors:

(1) Check correct rotation of both C1 and C2 motors, high speed and low speed for C2.

(2) Slide the female flanges together, leaving 1/8" space between their faces.

(3) Fully tighten the two Allen keys.

Check for direction of rotation of condenser fans.

Check for direction of rotation of damper motors.

Carry out functional tests on all solenoids, using bit switch settings given in Table 1.

TABLE 1 BIT SWITCH MAP

SWITCH 1			**SWITCH 2**		
Bit 1	System equalise SV	OFF	Bit 8	C1 Start/stop	ON
Bit 2	Gas dump SV	OFF	Bit 7	C1 oil flow override	ON
Bit 3	Injection SV LIQ	OFF	Bit 6	C1 oil injection SV	ON
Bit 4	1190 alarm	OFF	Bit 5	C1 thermistor reset	ON
Bit 5	C2 bypass SV	OFF	Bit 4	C2 low speed	ON
Bit 6	n/a		Bit 3	C2 high speed	OFF
Bit 7	n/a		Bit 2	C2 oil override	ON
Bit 8	Oil level override	OFF	Bit 1	C2 oil inject SV	ON
SWITCH 1 (not fitted)			**SWITCH 2**		
Bit 1	n/a		Bit 8	C2 thermistor reset	ON
Bit 2	n/a		Bit 7	Fan 1 run	ON
Bit 3	n/a		Bit 6	Fan 2 run	ON
Bit 4	n/a		Bit 5	Fan 3 run	OFF
Bit 5	n/a		Bit 4	No air flow lamp	OFF
Bit 6	n/a		Bit 3	Oil level low lamp	OFF
Bit 7	n/a		Bit 2	Oil temp low lamp	OFF
Bit 8	n/a		Bit 1	Low level refrigerant	OFF

Note: If the system is working with bit switch settings as above, the oil flow will not stop if a machine goes off.

Ensure that the plant room is clear of loose papers or other items which may get drawn into the fans.

Periodically check the accuracy of the pressure transducers against quality service gauges.
Ensure all pressure switches are correctly set.

Ensure that sufficient refrigerant has been charged for run mode.

Notes:

1. Compressor 1 is driven by the inverter driven motor, 1500 to 4500 RPM.
   Compressor 2 is driven by two motors in one frame, 1500 and 3000 RPM.

2 Direction of rotation is *clockwise* looking at the fan end of the motor. This should be checked against the arrow cast into the compressor housing.

CAUTION:

The speed controller has no serviceable items within its protective covers. Due to the high voltages and high frequencies used inside the unit, servicing must not be attempted by unqualified personnel. All warning labels fitted to the unit must be observed.

3.6.2 Start up

Ensure that the heaters in the oil separator are on. Both heaters are controlled by a single thermostat, which controls the oil temperature up to 55 degrees C. The power supply for the thermostat is from the essential services board, (generator standby). The heaters must be left on for a minimum of 24 hours before proceeding further.

Ensure that all cabinets and cold stores associated with the pak have been programmed to run.

Enter pak data from the hand held unit; refer to the appendix to this section which gives a comprehensive list of hand held unit functions for the screw pak.

Switch on the condenser fans and number 1 compressor.

After a short delay, and providing the suction pressure is greater than the set point of 4 psig, the system will begin to rotate.

When C1 reaches 1500 RPM, the oil injection solenoid will open.

After 20 seconds, the oil flow switch will be enabled.

If the oil flow fails, that compressor will stop.

If the oil level in the separator falls below a satisfactory level, the entire system will shut down.

Compressor 1 should continue to run slowly, speeding up until the suction pressure reduces to its set point of 4 psig. The speed of ramp up is limited on initial start up until safe suction pressure limit is achieved. Then, controlled speed variations are allowed between 1500 and 4500 RPM.

When control is seen to operate correctly, switch off compressor 1.

Switch on compressor 2. Check that operation is correct, and that number 2 compressor starts at 1500 RPM. Check that if the suction pressure is still above 10 psig, the motor changes over to run at 3000 RPM.

Switch off compressor 2.
Switch on both number 1 and number 2 compressors. The system should now run under automatic control, registering delays to satisfy compressor restart times, etc.

Note:

The safety chain (which contains the compressor discharge thermistors, high and low side pressure switches, overloads and oil flow failure switches) has a two second time delay. This is in the form of a capacitor wired across the 1d1 and 2d1 safety relay. This serves to reduce any nuisance fluttering of devices.

3.6.3 Operational sequence

The following paragraphs describe the start up sequence from the off state, with a high suction pressure.

(1) Compressor 1 starts at 1500 RPM. After suitable delays, speed ramps up to 4500 RPM, provided that the suction pressure is at least 2 psig above its set point.

(2) At 4500 RPM on compressor 1, compressor 2 starts at 1500 RPM. Compressor 1 then regulates its speed *down* to compensate number 2.

(3) Compressor 1 will again ramp up to 4500 RPM if the pressure is at least 2 psi above its setpoint.

(4) Compressor 2 will change over from 1500 to 3000 RPM, and number 1 will readjust its speed to compensate.

(5) As the suction pressure falls, number 1 compressor will slow down to match the 4 psig set point.

(6) If compressor 1 falls to 1500 RPM, compressor 2 will change speed from 3000 to 1500 RPM if the suction pressure is 2 psig below the set point. Number 1 compressor will again speed up to adjust to the demand.

(7) If number 1 falls to 1500 RPM again, number 2 will change from 1500 RPM to off, providing that the suction pressure is at least 2 psig below the set point. Number 1 compressor will again re adjust its speed to suit the demand.

3.6.4 Fan control

Fans are sequenced about the set discharge pressure. An increase of pressure causes the fans to be turned on, and a decrease will cause the fans to be turned off.

The fan/damper strategy has three modes:

(1) Shop heating required.
(2) No shop heating required, but ambient temperature below setpoint.
(3) No shop heating required, but ambient temperature above setpoint.

3.6.5 Damper motors

Damper motors are linked into the fan strategy, so that fresh air will be induced in preference to starting an additional fan.

3.6.6 Oil control

The compressor operation is optimum when the discharge temperature is between 75 and 80 degrees C. To achieve this a sensor on each discharge line activates the hot oil valves.
In the event of a probe failure, a sensor on the oil supply line takes control, and an alarm is initiated.

3.6.7 Cold oil supply

Cold oil is supplied straight from the oil condenser, and is mixed with the hot oil supplied by the modulating valve.

3.6.8 Hot oil supply

This supply incorporates a modulating valve (0 to 24 volts). The valve is normally open when de-energized. By modulating the valve, hot oil is supplied according to demand.

3.6.9 Dump valve

The dump valve (230 volts) is a solenoid operated valve. When the suction pressure falls to 25% below the control setpoint the valve is opened to allow saturated discharge gas to be delivered from the top of the receiver to the suction header.

3.6.10 Equalise solenoid valve

The equalise solenoid valve (230 volts) allows the oil separator to equalise its pressure to the suction header, when both compressors are off. This prevents any boiled off liquid in the oil to escape in the event of a pak shut down.

3.7 FAN AND DAMPER SEQUENCING

Three modes of operation are possible:

(1) No shop heating required, and outside air temperature above HI setpoint (F61).
(2) No shop heating required, and outside air temperature below LO setpoint (F62).
(3) Shop heating required.

3.7.1 Mode (1) HI NSH

The HI setpoint (F61) for outside air temperature has a default value of 9 degrees C, but is variable between 7 and 11 degrees C.

A set of discharge pressure values is programmed into the software, in the range 170 to 140 psig. This range can be raised or lowered by up to 5 psig (F63).

As the discharge pressure drops through this range, the actions at each step are as shown in Table 2.

As the discharge pressure rises, the actions are reversed. For increasing pressure, an offset (F65) is added to each step. The offset defaults to 3 psig.

A reaction timer can be set up (F64) to delay actions taken at each step. This is set to a default value of 5 seconds. The timer operates on both HI NSH and LO NSH modes.

TABLE 2 FAN AND DAMPER STRATEGY HI STATE
(NO SHOP HEATING, OUTSIDE AIR TEMP ABOVE 9 DEGS C)

Nominated psi	Action (head pressure falling)
170	Switch off fan 3
165	Switch off fan 2
160	Close air intake dampers by 2/6
155	Close air intake dampers by further 2/6
156	Close air intake dampers by further 1/6 (now 1/6 open)
148	Close air intake dampers fully
146	Open recirculation damper by a further 3/6 (now fully open)
144	Shut off fan 1

140	Flag up non critical alarm
The above procedure is reversed if head pressure rises, at a pressure differential (F65) above the stated figures. The differential has a default value of 3 psi, but is variable between 1 and 5 psi.	
The figures for nominated psi in the table may be varied by up to +/- 5psi (F63).	

3.7.2 Mode (2) LO NSH

The LO setpoint (F62) for outside air temperature has a default value of 4 degrees C, but is variable between 2 and 6 degrees C. A set of discharge pressure values is programmed into the software, in the range 170 to 163 psi (pressure reducing), and 163 to 181 psi (pressure increasing). This total range can be raised or lowered by up to 5 psig (F63).

As the discharge pressure varies through this range, the actions at each step are as shown in Table 3.

A reaction timer can be set up (F64) to delay actions taken at each step. This is set to a default value of 5 seconds. The timer operates on both LO NSH and HI NSH modes.

TABLE 3 FAN AND DAMPER STRATEGY LO STATE
(NO SHOP HEATING, OUTSIDE AIR TEMP BELOW 4 DEGS C)

Nominated psi	**Action**
170	Switch off fan 3
165	Switch off fan 2
160	Close fresh air dampers fully
150	Open recirculation dampers fully
153	Shut recirculation dampers by 3/6
163	Shut recirculation dampers fully and open fresh air dampers to 1/6
168	Open fresh air dampers to 2/6
170	Open fresh air dampers to 3/6
172	Open fresh air dampers to 4/6
174	Open fresh air dampers to 5/6
176	Open fresh air dampers fully
179	Switch on fan 2
181	Switch on fan 3
The figures for nominated psi in this table may be varied by up to +/- 5 psi (F63)	

3.7.3 Mode (3) SH

In this mode, shop heating requirements have been called for by the heating and ventilation system. The objective of the system is to maintain plant room temperature (air supply) at or near the SH air off condenser temperature setpoint (F67), by controlling the fans and dampers. The recirculation dampers should be fully closed.
The setpoint temperature (F67) has a default value of 31 degrees C, but is variable between 27 and 35 degrees C.

If the air supply temperature is below the setpoint the following actions occur to attempt to attain the setpoint:

(1) Shut off number 3.
(2) Shut off fan number 2.
(3) Close air intake dampers to 3/6.

(4) Close air intake dampers to 5/6.

If the air supply rises above the setpoint the following actions occur to attempt to attain the setpoint:

(1) Open fresh air dampers to 2/6.
(2) Open fresh air dampers to 3/6.
(3) Open fresh air dampers to 4/6.
(4) Open fresh air dampers to 5/6.
(5) Open fresh air dampers fully.
(6) Start fan number 2.
(7) Start fan number 3.

4 MAINTENANCE

4.1 DIAGNOSTIC MAINTENANCE

Diagnostic maintenance is facilitated by the presence of indicator lamps on the control panels, and by use of the hand held unit.

Screw pak HHU functions				
HHU	DESCRIPTION	TYPE	LIMITS/UNITS	DEFAULTS
00	Condenser air on temp TA1	D	deg C	
01	Condenser air off temp TA2	D	deg C	
02	Common suction line temp TS1	D	deg C	
03	Oil out from separator temp TO3	D	deg C	
04	Heat reclaim water in temp TW1	D	deg C	
05	Heat reclaim water out temp TW2	D	deg C	
06	Oil in to condenser temp TO4	D	deg C	
07	Oil out off condenser temp TO5	D	deg C	
08	Suction pressure PS1	D	psi	
09	Discharge pressure PD1	D	psi	
10	Run status compressor 1	D	0= off, 1= run	
11	-			
12	Discharge temp compressor 1 TD1	D	deg C	
13	Mixed oil temp compressor 1 TO1	D	deg C	

14	-			
15	Time before starting compressor 1	D	0 to 7 minutes	
16	-			
17	Software issue number	D		
18	-			
19	-			
20	Run status compressor 2	D	0=off,1=lowspeed, 2= high speed	
21	-			
22	Discharge temp compressor 2 TD2	D	deg C	
23	Mixed oil temp compressor 2 TO2	D	deg C	
24	-			
25	Time before starting compressor 2	D	0 to 7 minutes	
26	-			
27	Fresh air dampers open by 0 to 6/6in 1/6 steps	D	0 to 6	
28	Recirculation/supply air dampers open 0 to 6/6 in 1/6 steps	D	0 to 6	
29	-			
30	Compressor 1 system fault	A	0 = OK, 1 = alarm	
31	-			
32	Compressor 1 oil flow fault	A	0 = OK, 1 = alarm	
33	Compressor 1 HP/LP fault	A	0 = OK, 1 = alarm	
34	-			
35	Compressor 1 thermistor fault	A	0 = OK, 1 = alarm	
36	Compressor 1 discharge temp sensor fault TD1	A	0 = OK, 1 = alarm	
37	-			
38	-			
39	Unit type number	D		
40	Compressor 2 fault low speed	A	0 = OK, 1 = alarm	
41	Compressor 2 fault high speed	A	0 = OK, 1 = alarm	
42	Compressor 2 oil flow fault	A	0 = OK, 1 = alarm	
43	Compressor 2 HP/LP fault	A	0 = OK, 1 = alarm	
44	-			
D = DISPLAY S = SETTABLE A = ALARM				
Screw pak HHU functions				
HHU	DESCRIPTION	TYPE	LIMITS/UNITS	DEFAULTS
45	Compressor 2 thermistor fault	A	0 = OK, 1 = alarm	
46	Compressor 2 discharge temp sensor fault TD2	A	0 = OK, 1 = alarm	
47	-			
48	-			
49	-			
50	Suction pressure setpoint	S	1 to 8 psi	4
51	Percentage open of MV1 and/or MV2 when oil temp control has failed	D	0 to 100	0
52	-			
53	-			
54	Discharge pressure for fan 1	S		
55	Discharge pressure to force capacity decrease	S	225 to 245 psi	230
56	Low suction line pressure alarm setpoint	S	-6 to 1 psi	0

57	High suction line pressure alarm offset from the setpoint	S	15 to 30 psi	26
58	-			
59	System start/shutdown	S	0 = shutdown,	
60	Outside air temp TA3	D		
61	NSH HI outside air temp setpoint	S		
62	NSH LO outside air temp setpoint	S		
63	NSH HI differential for nominated psi figures	S		
64	NSH HI reaction timer between nominated psi steps	S		
65	NSH HI pressure differential for discharge rise	S		
66	NSH LO differential for nominated psi figures	S		
67	SH air flow condenser temp setpoint	S		
68	Force heating mode or read state	S		
69	Number of fans running	D		
70	Set device number	S		
71	Non critical alarm group	D		
72	Critical alarm group system	D		
73	Critical alarm group compressor 1	D		
74	Critical alarm group compressor 2	D		
75	-			
76	-			
77	-			
78	-			
79	-			
80	Low air flow alarm	A	0 = OK, 1 = alarm	
81	Low oil level alarm	A	0 = OK, 1 = alarm	
82	Low refrigerant alarm	A	0 = OK, 1 = alarm	
D = DISPLAY S = SETTABLE A = ALARM				
Screw pak HHU functions				
HHU	DESCRIPTION	TYPE	LIMITS/UNITS	DEFAULTS
83	Low oil temperature alarm	A	0 = OK, 1 = alarm	
84	Temperature sensor alarm			
85	-			
86	-			
87	Low suction pressure alarm			
88	High suction pressure alarm			
89	High discharge pressure alarm			
90	CPU board fault			
91	Fan 1 fault			
92	Fan 2 fault			
93	Fan 3 fault			
94	Oil cooling override mode			
95	Total data loss flag			
96	ES supply fault			
97	-			
98	-			
99	-			
D = DISPLAY S = SETTABLE A = ALARM				