Section 1 — General Information

1.1 Certification

UL and CSA approvals have been obtained on the 06T screw compressors with the following refrigerants:

1. R-22
2. R-134a
3. R-404A & R-507

The UL file number is SA4936. CSA file number is LR29937; CSA report number is LR29937-579c.

For UL and CSA approvals it is essential that only listed special purpose circuit breakers or Furnas 958 series soild state overload relays be used. (See Section 5.2 and 5.3 for selection tables). The must trip amp settings should not exceed 140% of the compressor rated load amps.

Both UL and CSA approvals have been obtained for all voltage combinations listed in Section 5.3. 60 Hz compressors have been listed.

1.2 Screw Compressor Size (Displacement)

06T compressors are available in the following displacement sizes:

	60 Hz		50 Hz	
Model No.	ft^3/ min	m^3/ min	ft^3/ min	m^3/ min
06T**033	33	0.93	27.5	.78
06T**039	39	1.10	32.5	.92
06T**044	44	1.25	36.7	1.04
06T**048	48	1.36	40.0	1.13
06T**054	54	1.53	45.0	1.28
06T**065	65	1.84	54.2	1.53
06T**078	78	2.21	65.0	1.84
06T**088	88	2.49	73.3	2.08
06T**108	N/A	N/A	90.0	2.56

Semi-hermetic compressors will be supplied with single voltage motors 208/230 volts, 460 volts and 575 volts.

1.3 Compressor Mounting

The Carlyle 05T/06T screw compressors may be rigid mounted. However, Carlyle recommends the use of isolation mounts **(Carlyle P/N KA75KR007, Package No. 06TA660007)** for 06T compressors. These rubber mounts isolate the compressor from the system framework which helps to reduce noise transmission.

1.4 Oil Type

Carlyle screw compressors are approved for use with the oils in the table below (based on refrigerant application).

Contact Carlyle Application Engineering for alternate POE oil selections.

See section 9.1 for System oil charging recommendations.

		R-404A & R-507		R-134a	R-22	
POE Oil Type		Low Temp.	Medium Temp.	Medium Temp. & A/C	Low Temp.	Medium Temp.
Castrol SW100	*	NO	YES	YES	NO	YES
CPI Solest BVA 120	*†	YES	YES	YES	YES	YES
CPI Solest 170	**	YES	YES	YES	YES**	YES**
ICI Emkarate RL100S		YES	YES	YES	YES	YES
Castrol E100	*	YES	YES	YES	YES	YES

* UL Certified

† For application purposes, Solest 120 oil is considered to be the same viscosity as POE 100 oils.

** Required for R-22 systems without external oil Cooler. R-22 systems with external oil cooler may use POE 100 oils.

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1.5 Ambient Conditions

The screw compressor is designed for the following specified ambient temperature ranges:

Non-Operating	-40°F To 130°F (-40°C To 54°C)
Start-Up	-40°F To 130°F (-40°C To 54°C)
Operating	-25°F To 130°F (-32°C To 54°C)

1.6 Installation Environment

The intended installation modes for the screw compressor are:

Machine Rooms—Enclosed Atmosphere
External Environment—Sheet Metal Enclosure
NOTE: The electrical terminal box is not approved for external applications.

1.7 Pressure Relief Valve

All compressor models contain an automatic reset high pressure relief valve. The pressure relief valve is located inside the compressor and will internally vent the compressor discharge to the compressor suction when it relieves. The valve opens at a pressure differential of 400 psi (27.6 bar). The relief valve is not field serviceable.

1.8 Discharge Check Valve

All compressor models are supplied with an internal discharge check valve. This check valve prevents the reverse flow of refrigerant through the compressor during compressor off cycles. A check valve in the discharge line is not required for parallel applications. It may be required for pump down on single compressor systems.

The discharge check valve is field serviceable.

1.9 Compressor Inlet Screens

Filter screens are applied at all locations where liquid or gas enters the compressor, i.e., suction, economizer and oil connections.

For systems that operate below -25F (-32c), it is recommended that the suction screen be removed after 48 hours of system startup as the viscous oil can damage the screen.

The compressor inlet screens are field serviceable and available through Carlyle distribution.

1.10 Service Valves

Suction and discharge connections will interface with the 2-1/2" bolt pattern service valves currently being used on the Carlyle reciprocating compressors. Rotalock® service valves are used for the economizer line shut off. The line sizes are as follows:

Connection	Connection Size	
	Max.	Min.
Suction	1-5/8"	1-1/8"
Discharge	1-5/8"	1-1/8"
Economizer	7/8"	7/8"

All compressor models are supplied with the 1-5/8" suction and discharge service valves and the 7/8" economizer valve.

All 05T compressors and 06T compressors between 65cfm and 88cfm use a barstock service valve, (06TA680008) which is physically larger than the standard service valve (06TA660001) used on all 06T compressors between 33cfm - 54cfm (see compressor physical dimensions on pages 2 & 3).

1.11 Condenser Pressure Control

Important!

Large variations in head pressure will result in very poor oil separation which may result in nuisance oil level switch tripping. The condenser pressure must be controlled such that fluctuations are gradual. Carlyle screw compressors must be applied with a minimum of one condenser fan (preferably variable speed) active at all times and a means of minimum head pressure control for low ambient operation. For alternate methods of condenser control, please contact Carlyle Application Engineering.

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2.5 Inverters and Refrigerants

The Carlyle screw compressor is compatible with inverter drives. An inverter drive varies the speed of a compressor to improve system load matching.

VARIABLE SPEED LIMITS
For 06TR Low Temp Compressors

Table 1

Model No.	Nominal HP	Min. Hz	Max. Hz
06TRC033	15	50	70
06TRD039	20	40	70
06TRD044	20	35	70
06TRE048	25	30	70
06TRE054	25	30	70
06TRF065	30	25	70
06TRG078	35	20	68
06TRH088	40	20	60
06TRK108	50	20	50

VARIABLE SPEED LIMITS
For 06TA A/C & Med. Temp Compressors

Table 2

Model No.	Nom. HP	Min. Hz	Max. Hz
06TAD033	20	50	70
06TAE039	25	40	70
06TAF044	30	35	70
06TAF048	30	30	70
06TAG054	35	30	70
06TAG065	35	25	70
06TAH078	40	20	68
06TAK088	50	20	60

Carlyle recommends screw compressors be selected to match the system load at 60 Hz. Overspeeding is a good option during heavy load conditions. Carlyle does not recommend the screw compressor operate at maximum frequency for prolonged periods of time.

Operation above 60 Hz requires adequate motor cooling. Inverters have a tendency to increase the required motor cooling load due to irregular wave forms. When overspeeding, there will be an increased power consumption required to supply the additional capacity. This will also increase the required motor cooling load. It is important that the motor cooling system be capable of handling the increased cooling required for the motor. Oil return, economizer return gas, and the motor cooling valve all assist in cooling the motor. Carlyle recommends applying the largest motor cooling valve **(Carlyle P/N EF28BZ007)** with all screw compressors applied using inverters.

Inverters are an effective tool for efficiently matching system loads with screw compressors. Motor size and motor cooling capabilities must be considered when using an inverter to increase speeds above 60 Hz. Following these guidelines will result in improved system design and performance. An inverter is capable of changing the compressor's speed very quickly from full speed to minimum speed and vice versa. Compressors should ramp-up to the minimum speed within 15 seconds at start-up. After compressor start, Carlyle recommends that the rate of compressor speed change be limited to 600 RPM/Min for the 06T semi-hermetic. **The rate of compressor speed change for the 05T open drive models is required to be no greater than 500 RPM/MIN.**

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2.6 Compressor Cycling

Although compressor cycling is an effective means of capacity control, frequent starting and stopping shortens the compressor life. Carlyle screw compressors should not be cycled for capacity control more than **six times an hour** and should run for at least 5 minutes after each start.

2.7 Mechanical Unloading

All Carlyle screw compressors are equipped with one step of mechanical unloading.The unloader valve is controlled by a solenoid mounted on the compressor body.
The compressor is unloaded when the solenoid is de-energized and loaded when the solenoid is energized. The compressor should always be started unloaded (for a minimum time determined by the control module) which will provide a soft start by partially relieving the compression chamber back to suction. Unloaded operation reduces the effective capacity by 30% to 62%, depending on the model and system condition (see tables below).

ESTIMATED PERCENTAGE UNLOADING BY MODEL

Models @ 60 Hz	ft³/ min	m³/ min	Low Temp.	Med. Temp.
06T**033	33	0.93	60%	50%
06T**039	39	1.10	59%	49%
06T**044	44	1.25	58%	48%
06T**048	48	1.36	56%	46%
06T**054	54	1.53	55%	45%
06T**065	65	1.84	50%	40%
06T**078	78	2.21	45%	35%
06T**088	88	2.49	40%	30%

Models @ 50 Hz	ft³/ min	m³/ min	Low Temp.	Med. Temp.
06T**033	27.5	0.78	62%	52%
06T**039	32.5	0.92	61%	51%
06T**044	36.7	1.04	60%	50%
06T**048	40.0	1.13	59%	49%
06T**054	45.0	1.28	58%	48%
06T**065	54.2	1.53	55%	45%
06T**078	65.0	1.84	50%	40%
06T**088	73.3	2.08	47%	37%
06T**108	90.0	2.56	46%	-

Unlike reciprocating compressors that should not be run unloaded continuously, the Carlyle screw compressor can be run unloaded continually without affecting the reliability of the compressor. Other methods of reducing the compressor capacity are available and must be approved by Carlyle Application Engineering.

2.8 High Discharge Pressure Control

A high pressure cut out must protect the compressor from exceeding 350 psig (25.2 bar). The compressor may be brought back on line after the discharge pressure falls below 300 psig (21.4 bar). The maximum pressure differential (discharge-suction) is 350 psi. The internal pressure relief valve will open if the pressure differential exceeds 400 psi (+/-3%).

2.9 Low Suction Pressure Cut Out

A low suction pressure cut out must protect the compressor from operating in a vacuum (below 10" hg). Each compressor must be individually protected with a low pressure switch connected to the low side access port. The compressor may be brought back on line after a 3 minute delay.

2.10 Volume Index (Vi) Control

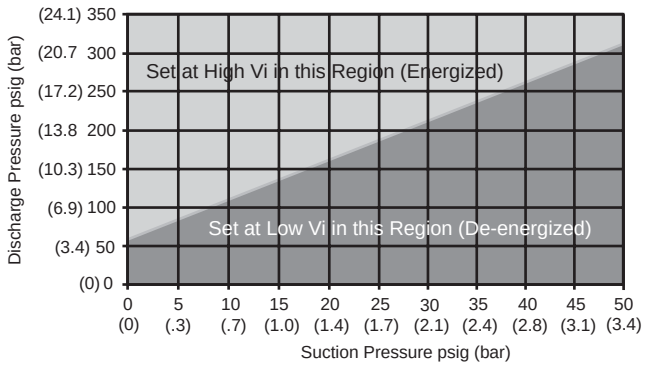
All low temperature models (05TR/06TR) are supplied with a Vi control valve that allows for two Vi settings (see chart below). This dual Vi allows for optimum efficiency over a wide range of head pressures. The Vi must be set to low (solenoid de-energized) during start-up for a minimum of 30 seconds. The Vi may then be set as desired for optimum energy efficiency. The following chart and graph reflect the operational specifications of the Vi control.

The current LonCEM® controller continuously monitors the operating pressure ratio and controls Vi output accordingly. The older CEM requires external controls to accomplish the same task.

System Pressure Ratio	Vi	Solenoid
Greater Than 5:1	High: 4.0	On
Less Than 5:1*	Low: 2.8	Off

*Medium/High temperature “TA” compressor models have a fixed Vi of 2.8.

Vi SETTINGS CHART (PSIG)



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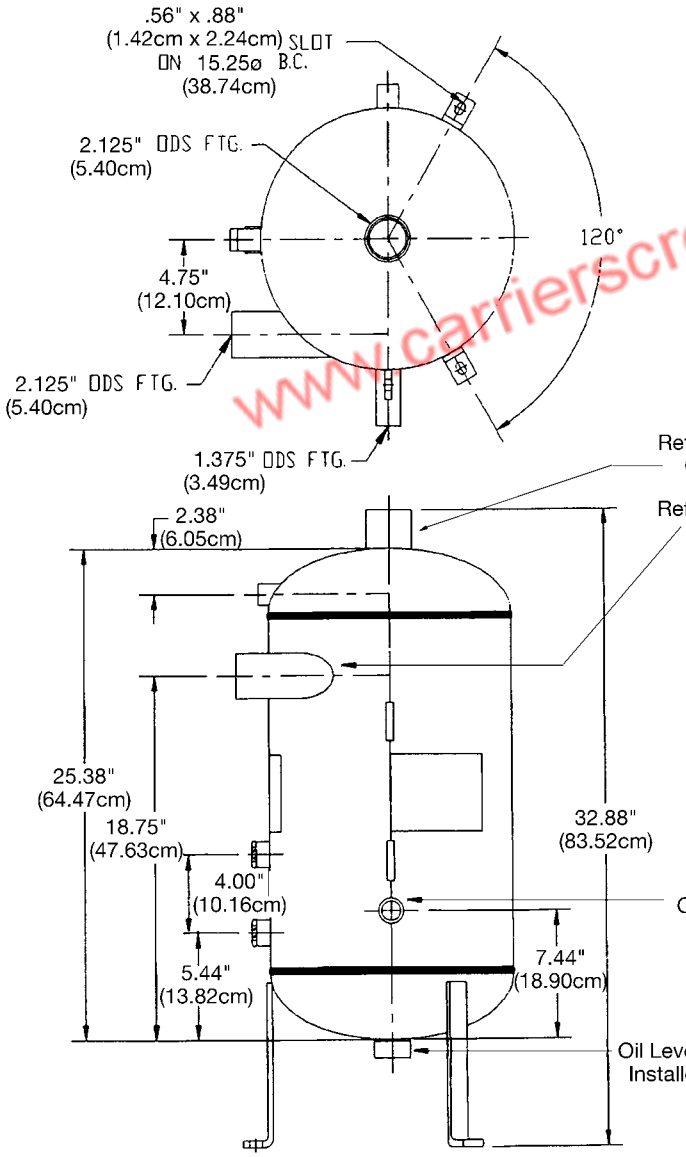
Section 3 — Oil Management System

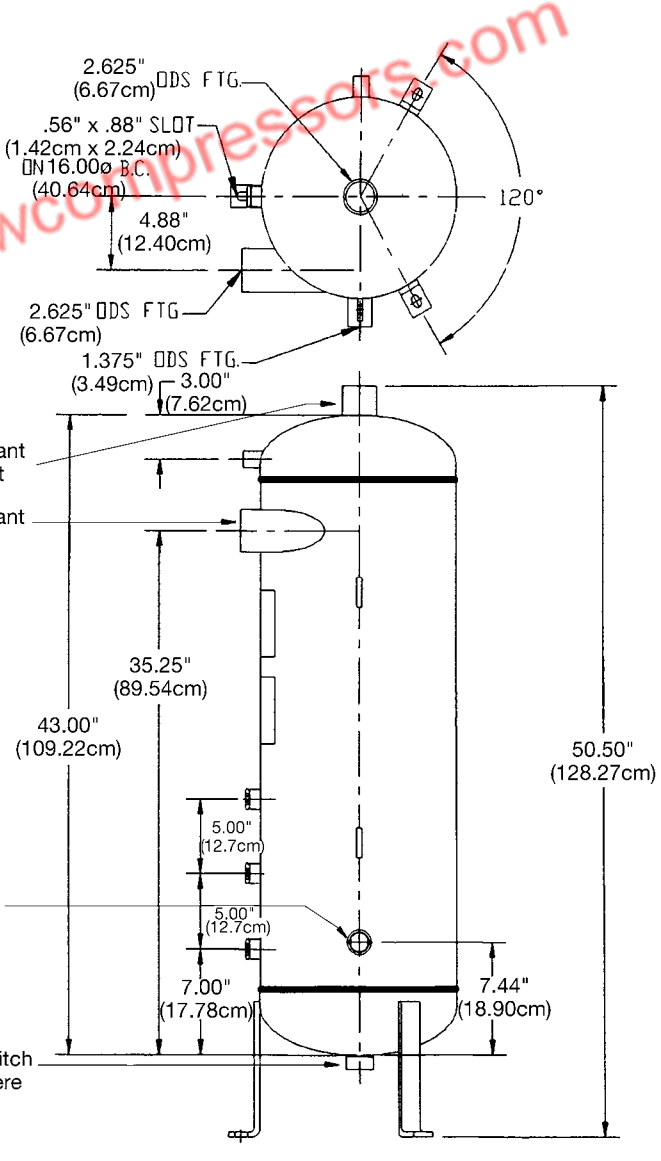
3.1 Oil Separator

An oil separator is required on all Carlyle screw compressor systems. Carlyle offers two sizes of vertical oil separators. Parallel systems (over two compressors) require the use of the Carlyle 14" (35.6cm) separator, and single and double compressor systems require the use of the Carlyle 12" (30.5cm) separator. See the drawings below for dimensional information on the oil separators.

12" (30.5cm) VERTICAL OIL SEPARATOR PHYSICAL DIMENSIONS



14" (35.6cm) VERTICAL OIL SEPARATOR PHYSICAL DIMENSIONS



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3.7 Oil Cooling Systems

Carlyle 06T semi-hermetic screw compressors can be operated for most applications without external oil cooling. 05T open drive screw compressors require external oil cooling any time the system discharge temperature may exceed 180°F. Carlyle's Carwin selection software can be used to estimate the discharge temperature for a given application.

When an oil cooler is not required, it also eliminates the need for any oil mixing components to keep the oil within a designated temperature range when the oil is being returned from an air cooled oil cooler during low ambient periods.

Operating without an oil cooler does not change the lubricant recommendations for R-404A/507. The recommendation is to use POE 100 or 170 lubricants. For R-22 applications the recommendation for a lubricant is POE 170, CPI Solest 170, for all R-22 low, medium and high temperature applications.

When an oil cooler is used with R-22, the recommendation is to use POE 100 or 170.

Operating without an oil cooler does impact the system's condenser selections. Since the oil cooler removes heat from the compressor, additional heat will be transferred to the compressor's heat of rejection, or condenser load. Current versions of Carlyle's compressor selection program take this into consideration, allowing selections to be made with or without an external oil cooler.

Operating without an oil cooler results in little or no performance change on higher displacement models. The slower rotor speeds on smaller CFM models results in a discernable capacity loss that may require consideration. Current versions of Carlyle's compressor selection program take this into consideration, allowing selections to be made with or without an external oil cooler.

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Allowable Application Range Without Oil Coolers			
Application:	**Saturated Suction:**	**Saturated Condensing:**	**Recommended Oils:**
R-404A/507 Low Temp.	-40 F to 0 F	70 F to 120 F	POE 100 or 170
R-404A/507 Medium Temp.	0 F to 50 F	70 F to 130 F	POE 100 or 170
R-134a Medium & High Temp.	-10 F to 50 F	70 F to 150 F`	POE 100 or 170
R-22 Low Temp.	-25 F to 0 F	70 F to 120 F	POE 170*
R-22 Low Temp.	-30 F to -26 F	70 F to 110 F	POE 170*
R-22 Medium & High Temp.	0 F to 50 F	70 F to 130 F	POE 170*

* If oil cooler used, oil can revert to POE 100

The oil cooler does offer some help in keeping the discharge and motor temperatures within their respective limits. To make up for this lost cooling some additional refrigerant injection is required. For screw compressors this injection is by the motor cooling valve or at the rotor injection port. Because refrigerant injection for motor and discharge cooling flows into the screw rotor chamber after the suction gas is trapped, compressor capacity is not affected significantly. Under some conditions the motor cooling valve can accommodate this extra cooling requirement. For conditions requiring additional injection, a Sporlan Y-1037 desuperheating valve, or its equivalent, is recommended. It should be selected to start opening at a discharge temperature of 190 F and be fully open at 200 F. The bulb should be located on the discharge line within 6" of the compressor discharge service valve. A properly sized solenoid valve should be located upstream to insure positive shut-off when the compressor is off.

The tables presented at the bottom of this page present desuperheating size and part number information for those applications where an oil cooler is not used.

Even when an oil cooler is used, desuperheating may still be required. For R-22 systems, the desuperheating valve is required when the saturated suction temperature is below -25°F (-32°C) and for R-404A/R-507 systems, it is necessary when the saturated suction temperature is below -40°F (-32°C). This valve is available through Carlyle (1 ton (3.5Kw); 1.5 ton (5.3Kw); contact Carlyle Application Engineering for valve selection).

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DESUPERHEATING VALVE SIZING WITHOUT OIL COOLER

Compressor Model	HP	R-22 Added Desuperheating		R-404A/507 Added Desuperheating		R134a Added Desuperheating	
		Low Temp.	Med/High Temp.	Low Temp.	Medium Temp.	Medium Temp.	High Temp.
Low Temp.							
SCT Range		70 to 120 F		90 to 120 F		70 to 150 F	70 to 150 F
		(21 to 49 C)		(32 to 49 C)		(21 to 65 C)	(21 to 65 C)
06TRC033	15	FV-2	N/A	FV-1*	N/A	None	None
06TRD039	20	FV-3	N/A	FV-1-1/2*	N/A	None	None
06TRD044	20	FV-3	N/A	FV-1-1/2*	N/A	None	None
06TRE048	25	FV-3	N/A	FV-2*	N/A	None	None
06TRE054	25	FV-3	N/A	FV-3*	N/A	None	None
06TRF065	30	FV-5	N/A	FV-3*	N/A	None	None
06TRG078	35	FV-5	N/A	FV-3*	N/A	None	None
06TRH088	40	FV-5	N/A	FV-3*	N/A	None	None
06TRK108	50	FV-5	N/A	FV-3*	N/A	None	None
Med Temp/High Temp							
SCT Range			70 to 130 F		70 to 130 F		
			(21 to 54 C)		(21 to 34 C)		
06TAD033	20	N/A	FV-2**	N/A	None	None	None
06TAE039	25	N/A	FV-3**	N/A	None	None	None
06TAF044	30	N/A	FV-3**	N/A	None	None	None
06TAF048	30	N/A	FV-3**	N/A	None	None	None
06TAG054	35	N/A	FV-3**	N/A	None	None	None
06TAG065	35	N/A	FV-5**	N/A	None	None	None
06TAH078	40	N/A	FV-5**	N/A	None	None	None
06TAK088	50	N/A	FV-5**	N/A	None	None	None

LEGEND
* Operation with Evap condensers below -25 F SST may not require any additional desuperheating. Contact Carlyle Applicatioon Engineering for limits.
** Operation with Evap condensers above +10F SST may not require any additional desuperheating. Contact Carlyle Application Engineering for limits.

Note: Valve P/N's shown above are for Sportan Valve Y-1037 series desuperheating valves. A valve with a 190 F temperature setting is required. Alternate desuperheating valve sizing or manufacturers must be approved by Carlyle Application Engineering.

Sporlan Part No.	Carlyle Part No.	Qty./Pkg.	Weight (Lbs.)	Size
FV-1	EA02ZD001	1	2	1 ton
FV-1-1/2	EA02ZD002	1	2	1-1/2 ton
FV-2	EA02ZD030	1	2	2 ton
FV-3	EA02ZD050	1	2	3 ton
FV-5	EA02ZD100	1	2	5 ton

3.8 Oil Cooler Selection

An oil cooler is required on all Carlyle screw compressor systems not operating in the range indicated in the previous section. This is generally for systems requiring lower suction temperatures or higher discharge temperatures. Also, 05T direct drive compressor systems with discharge temperatures that may exceed 180 F (82 C) always require an oil cooler. The oil cooler must be sized based on an oil flow rate of approximately 2 gallons per minute (7.6 liters/minute) per compressor. (The actual oil flow rate will vary based on pressure ratio of the application. The precise oil cooler load may be obtained from the Carlyle compressor selection software.) The maximum oil temperature leaving the oil cooler is 170 F (77 C) and the maximum temperature entering the oil cooler is 200 F (93 C) (based on discharge temperature control). The oil cooler load is nominally 1 ton (3.5 kilowatts) per compressor, but may be calculated with the above data and oil manufacturer's specifications. In applications which require oil cooling some means of controlling the oil temperature entering the compressor is required.

Several possible methods are;

- Oil cooler fan cycling based on oil outlet temperature (10FΔT)
- Oil cooler bypass via a solenoid valve controlled off of oil cooler entering temperature
- Use of a mixing valve to maintain a constant oil temperature entering the compressor
- Some combination of the three methods listed above

The oil may be cooled by means of an air cooled, refrigerant cooled, or water cooled oil cooler. Carlyle offers 4 sizes of air cooled oil coolers for use with the 05T and 06T screw compressor. Following is selection criteria for the various models along with dimensional information.

If using a refrigerant cooled oil cooler, the oil cooling load will need to be subtracted from either the compressor's evaporator capacity or the subcooling capacity. Using compressor suction pressure will led to a reduction in system capacity since some of the compressor suction mass flow will now come from the oil cooler. Using the compressor interstage port for oil cooling will not reduce the compressor suction pumping capacity but will indirectly reduce system capacity by decreasing the compressor's ability to do liquid subcooling. The additional mass flow from the oil cooler to the interstage will increase the interstage pressure. This will prevent the subcooler from achieving the lowest possible liquid temperature. Both systems require hold back valves to prevent the oil temperature from dropping below 80 F (27 C).

Also, caution must be taken to ensure that the return gas to the compressor is not too hot. For more information, contact Carlyle Application Engineering.

The oil cooler represents a heat source that may be used for heat reclaim processes such as hot water preheat. Since the oil cooler rejects discharge heat, the heat rejection from the oil cooler can be subtracted from the heat rejection required by the system condenser. This may lead to a smaller size condenser. Condenser circuiting may also be used for oil cooling; however, pressure drops must be taken into account for minimum oil pressure differential to the compressors. A mixing valve is recommended for all oil coolers circuited through a remote air-cooled condenser.

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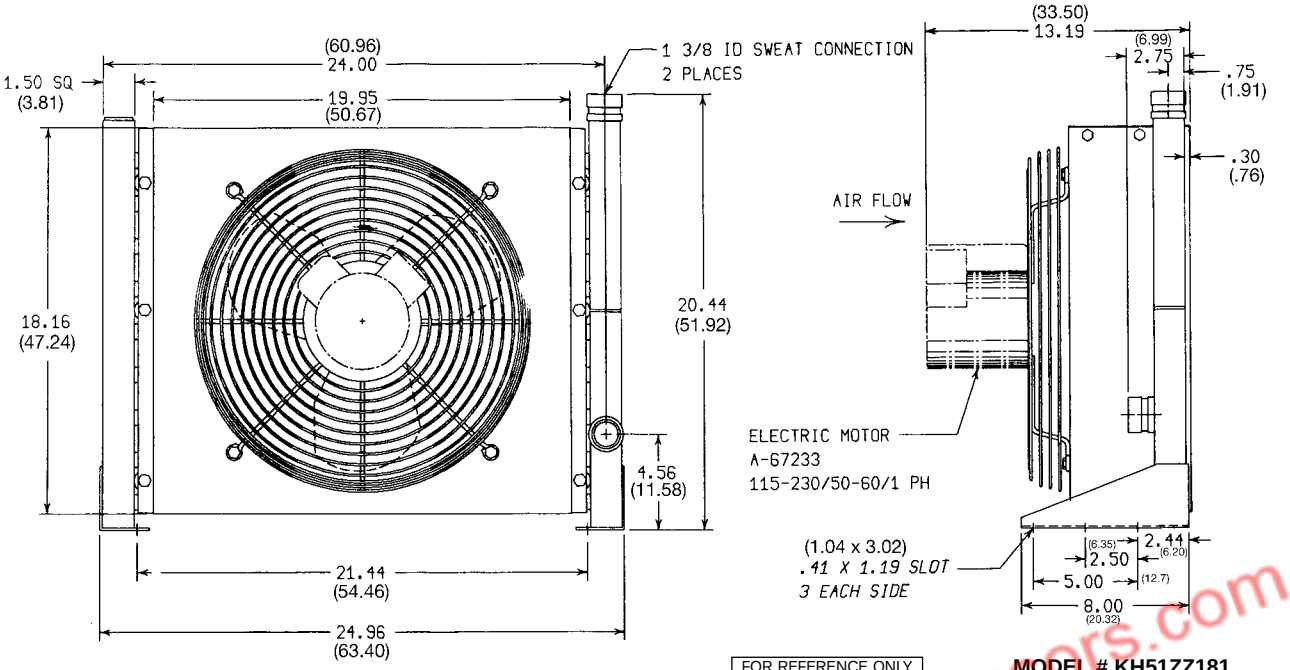
Oil Cooler Models Available	Oil Cooling Capacity @ Ambient Air Temperature			
Fan Speed 60Hz	**95ºF (35ºC)**	**100ºF (38ºC)**	**105ºF (41ºC)**	**110ºF (43ºC)**
KH51ZZ181 (2 Compressors Max)*	32,100 Btu/Hr (9,405 W/Hr)	30,600 Btu/Hr (8,966 W/Hr)	29,000 Btu/Hr (8,497 W/Hr)	27,600 Btu/Hr (8,087 W/Hr)
KH51ZZ182 (3 Compressors Max)*	69,100 Btu/Hr (20,246 W/H)	65,700 Btu/Hr (19,250 W/Hr)	62,400 Btu/Hr (18,283 W/Hr)	59,100 Btu/Hr (17,316 W/Hr)
KH51ZZ183 (4 Compressors Max)*	102,600 Btu/Hr (30,061 W/Hr)	97,700 Btu/Hr (28,626 W/Hr)	92,800 Btu/Hr (27,190 W/Hr)	87,900 Btu/Hr (25,755 W/Hr)
KH51ZZ184 (5 Compressors Max)*	134,100 Btu/Hr (39,291 W/Hr)	127,700 Btu/Hr (37,416 W/Hr)	121,300 Btu/Hr (35,541 W/Hr)	114,900 Btu/Hr (33,665 W/Hr)

Oil Cooler Models Available	Oil Cooling Capacity @ Ambient Air Temperature			
Fan Speed 50Hz	**95ºF (35ºC)**	**100ºF (38ºC)**	**105ºF (41ºC)**	**110ºF (43ºC)**
KH51ZZ181 (2 Compressors Max)*	32,200 Btu/Hr (9,405 W/Hr)	28,800 Btu/Hr (9,435 W/Hr)	27,300 Btu/Hr (8,438 W/Hr)	25,900 Btu/Hr (7,999 W/Hr)
KH51ZZ182 (3 Compressors Max)*	63,700 Btu/Hr (18,664 W/H)	60,600 Btu/Hr (17,756 W/Hr)	57,600 Btu/Hr (16,877 W/Hr)	54,600 Btu/Hr (15,998 W/Hr)
KH51ZZ183 (4 Compressors Max)*	94,900 Btu/Hr (27,805 W/Hr)	90,400 Btu/Hr (26,487 W/Hr)	85,900 Btu/Hr (25,168 W/Hr)	81,400 Btu/Hr (23,850 W/Hr)
KH51ZZ184 (5 Compressors Max)*	123,400 Btu/Hr (26,156 W/Hr)	117,500 Btu/Hr (34,427 W/Hr)	111,600 Btu/Hr (32,699 W/Hr)	105,800 Btu/Hr (30,999 W/Hr)

*Maximum Number of Compressors Based on Oil Cooler Pressure Drop of Less Than 6 PSID (.41 bar)



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INCHES
[CENTIMETERS (cm)]

MODEL # KH51ZZ181

OIL INLET AT BOTTOM – OIL OUTLET AT TOP; ALL MODELS

Electrical Specifications: All Models

Voltage: 115/230V 50/60Hz

Amperage*: 3.2/1.6 Amps Full Load 60Hz

2.8/1.4 Amps Full Load 50Hz

*Amperage ratings are per motor

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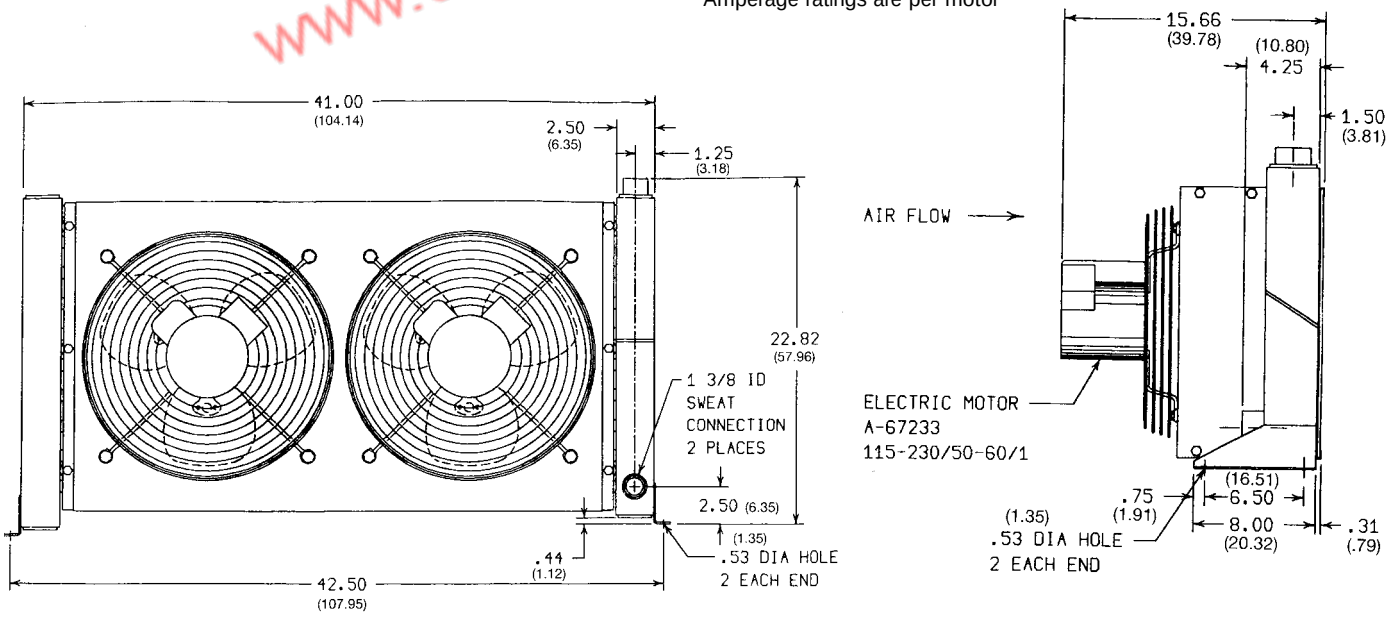

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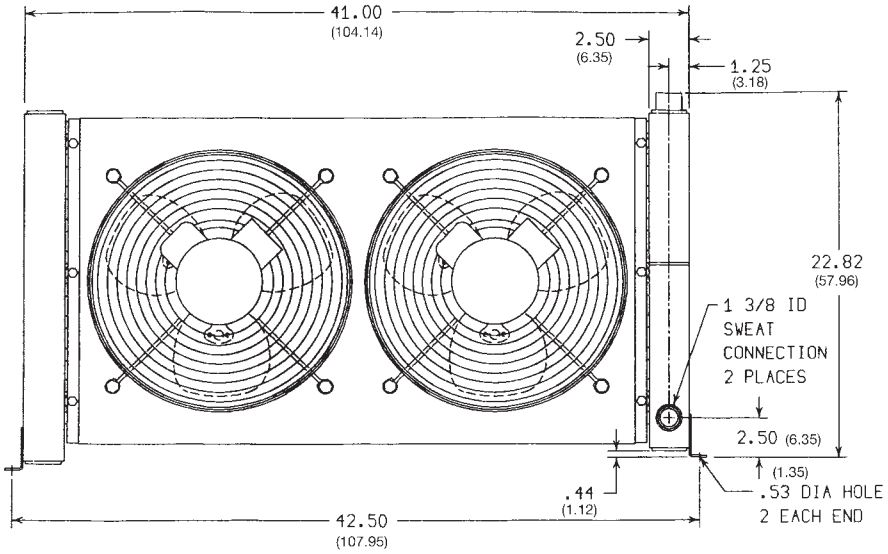
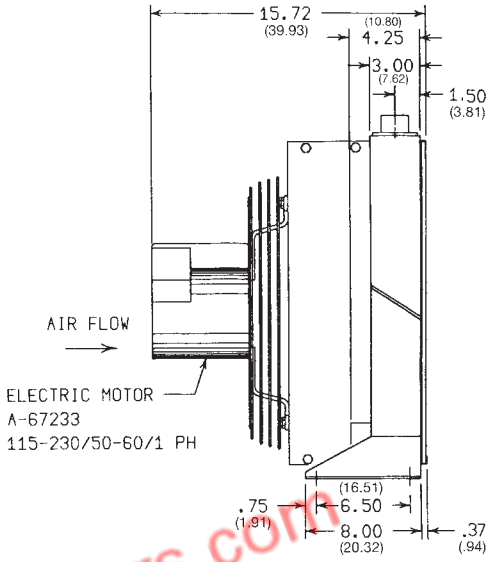
INCHES
[CENTIMETERS (cm)]

MODEL # KH51ZZ182





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INCHES
[CENTIMETERS (cm)]

MODEL # KH51ZZ183

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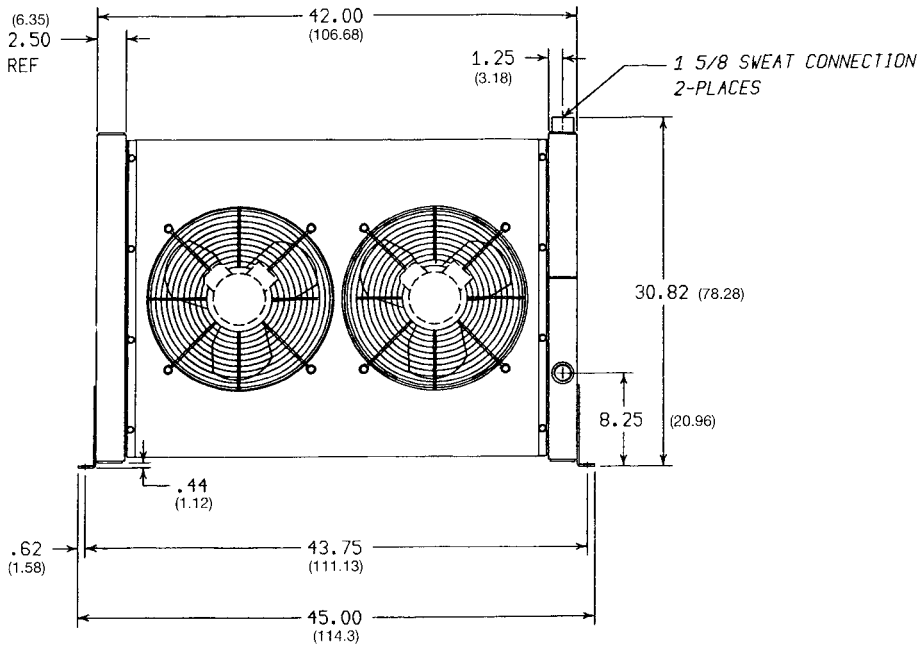
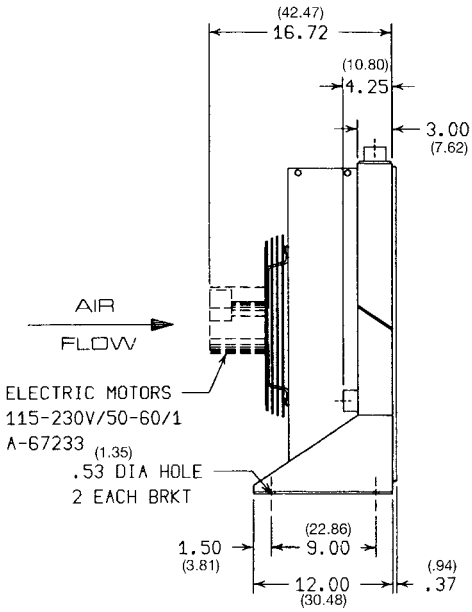
OIL INLET AT BOTTOM – OIL OUTLET AT TOP; ALL MODELS

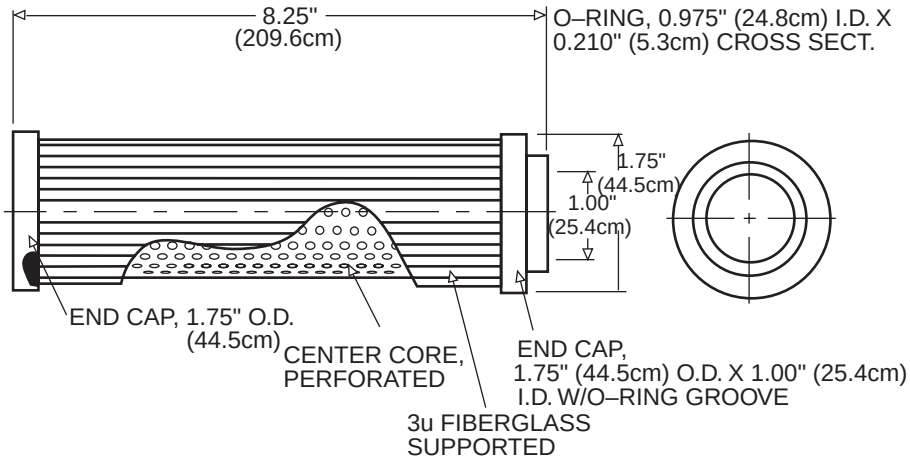




FOR REFERENCE ONLY
INCHES
[CENTIMETERS (cm)]

MODEL # KH51ZZ184

OIL CARTRIDGE FILTER ELEMENT



FOR REFERENCE ONLY
INCHES
[CENTIMETERS (cm)]

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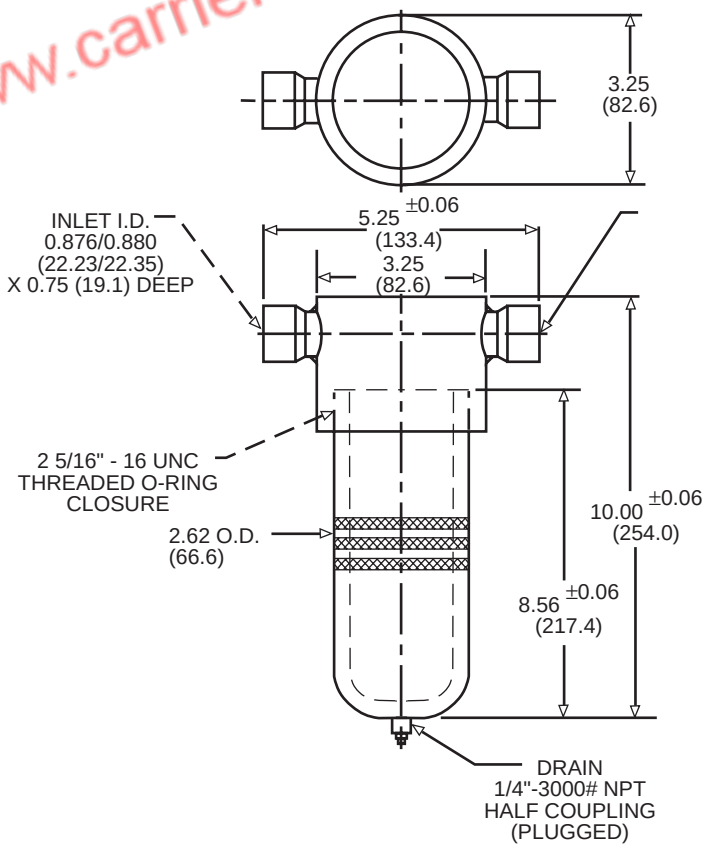
FILTER HOUSING REPLACEMENT TYPE



FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

3.9 Oil Filter

Carlyle screw compressors are designed with rolling element bearings to provide exceptional life. Oil to the bearings must pass through a 3 micron filter which is required on all Carlyle screw compressor systems. The use of filters in parallel as shown in Section 3.12 (Oil System Schematics) is recommended (one filter per compressor may also be used). One filter (both filters may be used simultaneously) is used at a time and the pressure drop across the filter is monitored. This design allows easy maintenance of the filter element without shutting the system down. The second filter is simply valved on while the first filter is changed.

In general, two oil filter housings are piped in parallel with isolation valves located on either side of the housings as shown in the schematic in section 3.12. If more than 5 compressors are fed by the oil system, 3 oil filter elements should be piped in parallel to avoid excessive pressure drop through the filter elements.

The LonCEM Module is currently used for compressor protection for 05T/06T compressors. It monitors the difference in pressure in the oil system from compressor discharge to the compressor oil inlet with transducers. This includes the pressure drop across the oil filters. See appendix A for settings.

In older systems incorporating the Carlyle Electronic Module (CEM) for compressor protection pressure transducers or a mechanical differential switch can be used to monitor the pressure drop across the oil filters. The setting for filter alarm or replacement can be at the customer's discretion with a maximum value of 25 psi (1.7 bar).

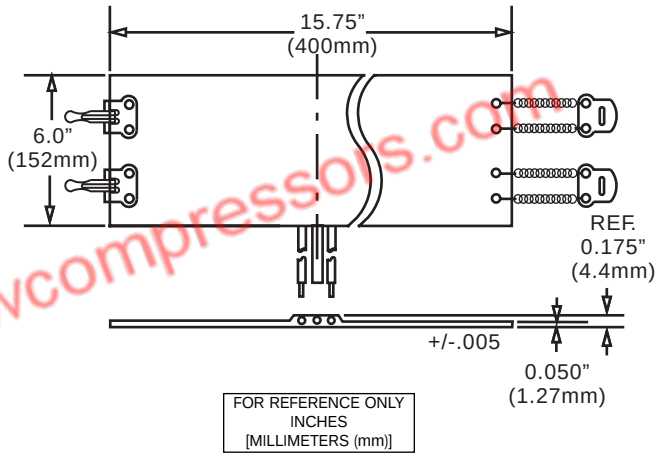
Note: Use of the Carlyle 3 micron filter element is required. Use of a non-Carlyle-approved filter element will void compressor warranty.

The oil filter(s) must be located after the oil cooler and as close to the compressor(s) as possible. The oil filter housing is designed for 450 psig (31 bar) maximum working pressure and has UL and CSA code approval for use in HVACR systems. Each new oil filter housing contains one filter element. *Additional filter elements should be ordered and supplied with each compressor system. Six additional elements per rack are recommended.*

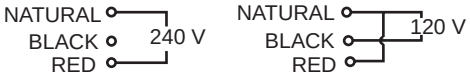
3.10 Oil Sump Heaters

A 500 watt, 120/240 volt silicon rubber flexible heater is recommended for use on the oil sump of the 12" (30.5cm) oil separator. Two of the above 500 watt heaters (connected together) are recommended for use with the 14" (35.6cm) separator. The heater must be energized during the system off cycle if used. This is required in all air conditioning systems and is recommended in refrigeration systems to keep refrigerant out of the oil sump during compressor off cycles.

FLEX
HEATER



FLEX HEATER WIRING DIAGRAM
(TO BE LABELED ON PART)



3.11 Oil Sight Glass

A sight glass is required in the main oil line. The sight glass must be located after the oil filters and just prior to the first compressor on a multiple compressor rack. (See Oil System Schematics, Section 3.12.) Carlyle recommends a sight glass be placed in each branch oil line between the compressor and its oil solenoids. The sight glass offers a useful feature to help field personnel verify oil is flowing when required and not leaking through when the compressor is off.

Carlyle offers a combination oil solenoid/sight glass that can be used for the application (P/N EF23ZZ025). It mounts directly to the oil inlet of the compressor. Refer to Figure 2, Appendix A for details.

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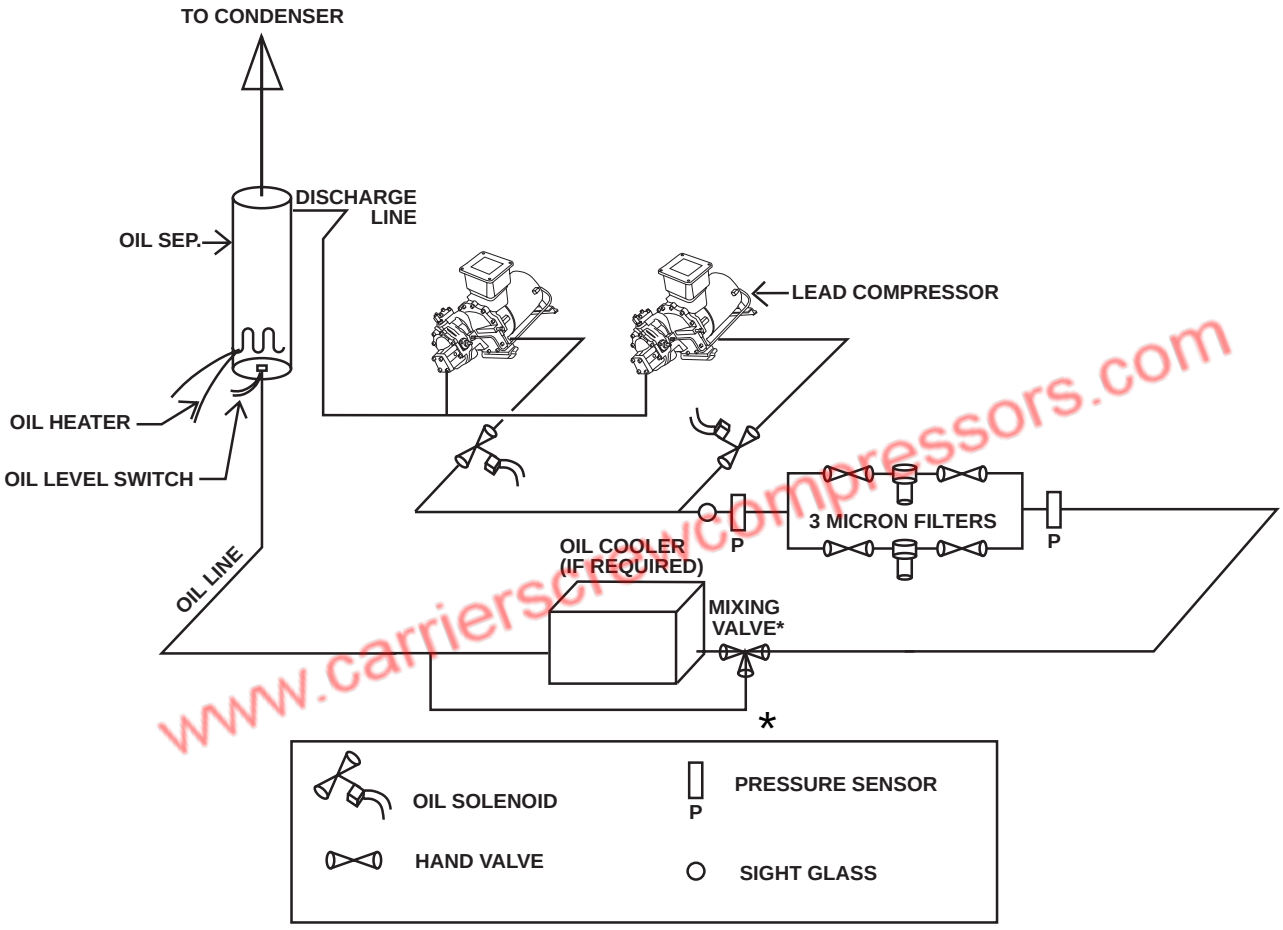
3.12 Oil System Schematics

OIL SYSTEM SCHEMATIC

ISOMETRIC VIEW



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* Note: Other oil temperature control options are available. See section 3.8.

3.13 Oil Line Manifold Selection Table

OIL MANIFOLD SIZING FOR PRESSURE DROP

10 Ft Manifold Length

Number of Compressors	Assumed		Manifold O.D. (in.)	Delta P (PSI)			
	GPM	LPM		at 10 cSt	at 45 cSt	at 100 cSt	at 170 cSt
1	2	7.6	7/8	0.17	0.77	1.72	2.92
2	4	15.2	7/8	0.34	1.54	3.43	5.83
3	6	22.8	7/8	0.52	2.31	5.15	8.76*
4	8	30.4	1-1/8	0.22	0.97	2.16	3.67
5	10	38	1-1/8	0.27	1.21	2.69	4.58

20 Ft Manifold Length

Number of Compressors	Assumed		Manifold O.D. (in.)	Delta P (PSI)			
	GPM	LPM		at 10 cSt	at 45 cSt	at 100 cSt	at 170 cSt
1	2	7.6	7/8	0.34	1.54	3.43	5.84
2	4	15.2	1-1/8	0.22	0.97	2.16	3.67*
3	6	22.8	1-1/8	0.32	1.46	3.24	5.50
4	8	30.4	1-1/8	0.43	1.94	4.31	7.33
5	10	38	1-1/8	0.54	2.43	5.39	9.17*

30 Ft Manifold Length

Number of Compressors	Assumed		Manifold O.D. (in.)	Delta P (PSI)			
	GPM	LPM		at 10 cSt	at 45 cSt	at 100 cSt	at 170 cSt
1	2	7.6	1-1/8	0.15	0.70	1.62	2.75*
2	4	15.2	1-1/8	0.32	1.45	3.24	5.50
3	6	22.8	1-1/8	0.49	2.18	4.85	8.25*
4	8	30.4	1-1/8	0.65	2.91	6.47	11.00*
5	10	38	1-3/8	0.33	1.49	3.30	5.61

40 Ft Manifold Length

Number of Compressors	Assumed		Manifold O.D. (in.)	Delta P (PSI)			
	GPM	LPM		at 10 cSt	at 45 cSt	at 100 cSt	at 170 cSt
1	2	7.6	1-1/8	0.25	0.91	2.42	3.67*
2	4	15.2	1-1/8	0.43	1.94	4.32	7.34*
3	6	22.8	1-1/8	0.65	2.91	6.47	11.00*
4	8	30.4	1-1/8	0.35	1.50	3.52	5.99
5	10	38	1-3/8	0.44	1.98	4.40	7.48*

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LEGEND
LPM - Litres per minute
cSt - Centistrokes
* If 170 POE oil is used, Carlyle recommends use of the next larger size copper line if pressure drop is greater than 5.0 psi. This will typically reduce pressure drop to 30% of value shown.

NOTES:
1. Viscosity of 10 cSt is based on 130 F (54 C) oil with 10% refrigerant dilution.
2. Viscosity of 45 cSt is based on 130 F (54 C) oil, no refrigerant dilution or 80 F (27 C) oil with 10% refrigerant dilution.
3. Viscosity of 100 cSt is based on 100 F (38 C) oil, no refrigerant dilution.
4. Viscosity of 170 cSt is based on 100 F (38 C) oil, with no refrigerant dilution.

Section 5 — Electrical Specifications

5.1 Thermal Protection

The compressor motor windings are protected from extreme temperatures by the LonCEM Module and the Carlyle Electronic Module (CEM) in older systems. All compressors are supplied with two 5K NTC (Negative Thermal Coefficient) thermistors in the motor windings.The module will limit the maximum motor temperature to 240 F (116 C) and is an auto-reset device. Only one 5K sensor is used; the other is a spare. The temperature vs. resistance characteristics of the 5K thermistors are shown below. Additionally, the DC voltage across the thermistors may be measured at the module while the compressor is running and compared to the Temperature vs. DC voltage table. **(WARNING: DO NOT MEASURE THE DC VOLTAGE INSIDE THE TERMINAL BOX.)**

Note that while the resistance of the sensors does not change, the measured DC voltage will be different depending on which protection module is used.

See the "Motor and Discharge Thermistors" table in Appendix A for the conversion when using the newer LonCEM module, and the "Temperature VS. DC Voltage" table in Appendix B for older applications with the CEM module.

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TEMPERATURE vs. RESISTANCE TABLE

TEMPERATURE		RESISTANCE
C	F	OHMS
0	32	16352.4
1	33.8	15515.2
2	35.6	14750
3	37.4	14027.1
4	39.2	13343.8
5	41	12697.8
6	42.8	12086.3
7	44.6	11508
8	46.4	10960.8
9	48.2	10442.6
10	50	9951.8
11	51.8	9486.8
12	53.6	9046.3
13	55.4	8628.7
14	57.2	8232.5
15	59	7857
16	60.8	7500.6
17	62.6	7162.3
18	64.4	6841.3
19	66.2	6526.4
20	68	6246.8
21	69.8	5971.6
22	71.6	5710
23	73.4	5461.3
24	75.2	5225
25	77	5000
26	78.8	4786
27	80.6	4582.4
28	82.4	4388.5
29	84.2	4203.9
30	86	4028
31	87.8	3860.5
32	89.6	3700.8
33	91.4	3548.5
34	93.2	3403.5
35	95	3265.1
36	96.8	3133.1
37	98.6	3007.1

TEMPERATURE		RESISTANCE
C	F	OHMS
38	100.4	2886.9
39	102.2	2772.1
40	104	2662.4
41	105.8	2557.8
42	107.6	2457.7
43	109.4	2362.1
44	111.2	2270.8
45	113	2183.45
46	114.8	2099.93
47	116.5	2020.04
48	118.4	1943.6
49	120.2	1870.5
50	122	1800.49
51	123.8	1733.46
52	125.6	1669.66
53	127.4	1607.81
54	129.2	1548.95
55	131	1492.54
56	132.8	1438.46
57	134.6	1386.62
58	136.4	1336.93
59	138.2	1289.26
60	140	1243.53
61	141.8	1199.7
62	143.6	1157.59
63	145.4	1117.18
64	147.2	1078.37
65	149	1041.15
66	150.8	1005.38
67	152.6	971.03
68	154.4	938.02
69	156.2	906.3
70	158	875.81
71	159.8	846.5
72	161.6	818.31
73	163.4	791.21
74	165.2	765.14
75	167	740.06

TEMPERATURE		RESISTANCE
C	F	OHMS
76	168.8	715.93
77	170.6	692.68
78	172.4	670.34
79	174.2	648.82
80	176	628.09
81	177.8	608.11
82	179.6	588.88
83	181.4	570.36
84	183.2	552.5
85	185	535.29
86	186.8	518.7
87	188.6	502.7
88	190.4	487.28
89	192.2	474.4
90	194	458.06
91	195.8	444.2
92	197.6	430.85
93	199.4	417.96
94	201.2	405.51
95	203	393.49
96	204.8	381.89
97	206.6	370.69
98	208.4	359.87
99	210.2	349.41
100	212	339.32
101	213.8	329.55
102	215.6	320.12
103	217.4	311
104	219.2	302.18
105	221	293.65
106	222.8	285.41
107	224.6	277.43
108	226.4	269.72
109	228.2	262.26
110	230	255.03
111	231.8	248.04
112	233.6	241.28
113	235.4	234.72

TEMPERATURE		RESISTANCE
C	F	OHMS
114	237.2	228.38
115	239	222.24
116	240.8	216.29
117	242.6	210.53
118	244.4	204.95
119	246.2	199.54
120	248	194.3
121	249.8	189.22
122	251.6	184.3
123	253.4	178.5
124	255.2	174.89
125	257	170.41
126	258.8	166.06
127	260.6	161.83
128	262.4	157.74
129	264.2	153.77
130	266	149.91
131	267.8	146.17
132	269.6	142.54
133	271.4	139.02
134	273.2	136.6
135	275	132.27
136	276.8	129.04
137	278.6	125.91
138	280.4	122.87
139	282.2	119.91
140	284	117.04
141	285.8	114.25
142	287.6	111.54
143	289.4	108.9
144	291.2	106.34
145	293	103.86
146	294.8	101.43
147	296.6	99.074
148	298.4	95.785
149	300.2	94.559
150	302	92.393

5.2 Screw Compressor Motor Protection

06T Screw compressors must be applied with properly sized calibrated circuit breakers or Furnas "958" series solid-state overload relays to protect the motor against overcurrent fault conditions. Approved selections are shown in section 5.3 for the 06TR and 06TA compressors. Use of motor protection devices other than those shown in this Application Manual must be approved by Carlyle Application Engineering. The use of authorized overcurrent protection is part of the basis of UL recognition. Selection of alternate overcurrent protection without Carlyle's approval will void warranty. For proper overcurrent protection, the must trip setting of the protection device must not exceed the compressor Maximum Must Trip Amps shown in the tables. The selected compressor overcurrent device must trip in 2 to 6 seconds at the LRA value shown for the compressor.

The circuit breakers and overload relays selected by Carlyle are manually reset and have been sized to protect the compressor against running overcurrent, locked rotor, primary and secondary single phasing. These devices also offer the additional advantage of protecting the compressor against malfunctions of the compressor contactor (which may not be possible with pilot duty motor protection).

Compressor overcurrent protection devices for part winding applications must trip the first 3 legs in 2 to 6 seconds and the second 3 legs in 1 to 3 seconds. Carlyle recommends a 1 to 1.25 second time delay between energizing the first and second legs. Consult Carlyle Application Engineering for part winding circuit breakers. Part winding circuit breakers are stocked in limited quantities by Carlyle and may require special order.

ALLOWABLE OPERATING VOLTAGE RANGES

Name Plate Voltage	Frequency (Hz)	Min. Voltage	Max. Voltage
208–230	60	187	264
200	50	180	230
230	50	198	264
460	60	396	528
400	50	342	456
575	60	495	660
400	60	342	460

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06TR – ELECTRICAL SPECIFICATIONS

COMPRESSOR INFORMATION					RECOMMENDED OVERCURRENT PROTECTION							
COMPRESSOR MODEL	**VOLTAGE**	**HP**	**MAX MTA** (See Note #1)	**LRA XL**	**CIRCUIT BREAKER PART #**	**MH**	**MTA**	**LRA**	**CARLYLE FURNAS PART #** (See Note 4)	**MH**	**MTA**	**RLA** (See Note 3)
06TRC033C	575	15	33.5	114	HH83XA460	29	33.5	97	HN76JZ015	29	32.5	23.2
06TRC033B	400/460		46	142	HH83XA463	40	46	150	HN76JZ022	40	44.8	32
06TRC033F	208/230		90	286	HH83XB626	78	90	250	HN76JZ050	80	89.6	64
06TRD039C	575	20	39	138	HH83XA461	33	38	124	HN76JZ022	34	38.1	27.2
06TRD039B	400/460		49	173	HH83XA424	42	49	175	HN76JZ022	43	48.2	34.4
06TRD039F	208/230		104	348	HH83XB625	91	104	350	HN76JZ050	92	103	73.6
06TRD044C	575	20	39	138	HH83XA461	33	38	124	HN76JZ022	34	38.1	27.2
06TRD044B	400/460		49	173	HH83XA424	42	49	175	HN76JZ022	43	48.2	34.4
06TRD044F	208/230		104	348	HH83XB625	91	104	350	HN76JZ050	92	103	73.6
06TRE048C	575	25	53	172	HH83XA469	46	53	164	HN76JZ022	44	49.3	35.2
06TRE048B	400/460		64	215	HH83XA426	55	64	210	HN76JZ033	56	62.7	44.8
06TRE048F	208/230		128	433	HH83XC509	110	127	420	HN76JZ075	114	127.7	91.2
06TRE054C	575	25	53	172	HH83XA469	46	53	164	HN76JZ022	44	49.3	35.2
06TRE054B	400/460		64	215	HH83XA426	55	64	210	HN76JZ033	56	62.7	44.8
06TRE054F	208/230		128	433	HH83XC509	110	127	420	HN76JZ075	114	127.7	91.2
06TRF065C	575	30	62	219	HH83XB617	54	61	219	HN76JZ033	55	61.6	44
06TRF065B	400/460		76	253	HH83XA474	67	78	274	HN76JZ033	66	73.9	52.8
06TRF065F	208/230		154	611	HH83XC573	134	154	611	HN76JZ075	136	152.3	108.8
06TRG078C	575	35	72	258	HH83XB618	63	72	258	HN76JZ033	64	71.7	51.2
06TRG078B	400/460		89	323	HH83XA475	74	89	323	HN76JZ050	78	87.4	62.4
06TRG078F	208/230		181	721	HH83XC574	158	181	721	HN76JZ090	160	179.2	128
06TRH088C	575	40	81	296	HH83XB619	71	81	296	HN76JZ050	72	80.6	57.6
06TRH088B	400/460		101	370	HH83XA476	88	101	370	HN76JZ050	90	100.8	72
06TRH088F	208/230		203	825	HH83XC575	179	203	825	HN76JZ090	180	201.6	144
06TRK108B	400-3-50	50	114	440	HH83XA477	100	115	439	HN76JZ050	100	112	80

LEGEND

RLA=Rated Load Amps
LRA=Locked Rotor Amps
XL=Across-the-Line Start
PW=Part-Winding Start
MH=Must Hold Amps
MTA=Must Trip Amps

NOTES:

1. Compressor must trip amps are maximum figures. Overcurrent protection must trip at or below this value.
2. LRA value for PW 2nd winding = 1/2 the LRA XL value.
3. Recommended RLA value = Crt Brk must trip value / 1.4. Use this recommended RLA value to determine minimum contactor sizing and wiring sizing. See also detail on Compressor Amperage Ratings on Unit Rating Plate.
4. Alternate over current protection device which can be used in place of calibrated circuit breaker.
5. Carlyle 06TR 400-3-50 units have the same circuit breaker table ratings as 460-3-60. Refer to 460-3-60 data for 50Hz information.

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06TA – ELECTRICAL SPECIFICATIONS

COMPRESSOR INFORMATION					RECOMMENDED OVERCURRENT PROTECTION							
COMPRESSOR MODEL	**VOLTAGE**	**HP**	**MAX MTA** (See Note #1)	**LRA XL**	**CIRCUIT BREAKER PART #**	**MH**	**MTA**	**LRA**	**CARLYLE FURNAS PART #** (See Note 4)	**MH**	**MTA**	**RLA** (See Note 3)
06TAD033C	575	20	39	138	HH83XA461	33	38	124	HN76JZ022	34	38.1	27.2
06TAD033B	400/460		49	173	HH83XA424	42	49	175	HN76JZ022	43	48.2	34.4
06TAD033F	208/230		104	348	HH83XB625	91	104	350	HN76JZ050	92	103	73.6
06TAE039C	575	25	53	172	HH83XA469	46	53	164	HN76JZ022	44	49.3	35.2
06TAE039B	400/460		64	215	HH83XA426	55	64	210	HN76JZ033	56	62.7	44.8
06TAE039F	208/230		128	433	HH83XC509	110	127	420	HN76JZ075	114	127.7	91.2
06TAF044C	575	30	62	202	HH83XA430	50	58	168	HN76JZ033	52	58.2	41.6
06TAF044B	400/460		76	253	HH83XA478	67	76	274	HN76JZ033	65	72.8	52
06TAF044F	208/230		163	510	HH83XC539	142	163	507	HN76JZ075	144	161.3	115.2
06TAF048C	575	30	62	202	HH83XA430	50	58	168	HN76JZ033	52	58.2	41.6
06TAF048B	400/460		76	253	HH83XA478	67	76	274	HN76JZ033	65	72.8	52
06TAF048F	208/230		163	510	HH83XC539	142	163	507	HN76JZ075	144	161.3	115.2
06TAG054C	575	35	78	242	HH83XA453	68	78	236	HN76JZ050	69	77.3	55.2
06TAG054B	400/460		88	305	HH83XA547	77	88	283	HN76JZ050	78	87.4	62.4
06TAG054F	208/230		182	610	HH83XC532	158	182	590	HN76JZ090	162	181.4	129.6
06TAG065C	575	35	72	258	HH83XB618	63	72	258	HN76JZ050	69	77.3	55.2
06TAG065B	400/460		89	323	HH83XA475	74	89	323	HN76JZ050	78	87.4	62.4
06TAG065F	208/230		181	721	HH83XC574	158	181	721	HN76JZ090	161	180.3	128.8
06TAH078C	575	40	81	296	HH83XB619	71	81	296	HN76JZ050	72	80.6	57.6
06TAH078B	400/460		101	370	HH83XA476	88	101	370	HN76JZ050	90	100.8	72
06TAH078F	208/230		203	825	HH83XC575	179	203	825	HN76JZ090	180	201.6	144
06TAK088C	575	50	92	351	HH83XB610	74	89	323	HN76JZ050	78	87.4	62.4
06TAK088B	400/460		114	440	HH83XA477	100	115	439	HN76JZ050	100	112	80
06TAK088F*	208/230		230	974	HH83XC576	200	230	979	HN76JZ050*	100	112	160

LEGEND

RLA=Rated Load Amps
LRA=Locked Rotor Amps
XL=Across-the-Line Start
PW=Part-Winding Start
MH=Must Hold Amps
MTA=Must Trip Amps

* To use Furnas overload w/06TAK088F2EA-A00, compressor must be wired for part-winding start and 2 overloads wired in parallel with 2 contactors. Furnas must hold setting = 100. MTA Setting = 112.

NOTES:

1. Compressor must trip amps are maximum figures. Overcurrent protection must trip at or below this value.
2. LRA value for PW 2nd winding = 1/2 the LRA XL value.
3. Recommended RLA value = Crt Brk must trip value / 1.4. Use this recommended RLA value to determine minimum contactor sizing and wiring sizing. See also detail on Compressor Amperage Ratings on Unit Rating Plate.
4. Alternate over current protection device which can be used in place of calibrated circuit breaker.
5. Carlyle 06TA 400-3-50 units have the same circuit breaker table ratings as 460-3-60. Refer to 460-3-60 data for 50Hz information.

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Section 6 — Motor and Discharge Temperature Control

6.1 Carlyle Electronic Module (CEM)

The Carlyle solid-state electronic module (115v-1-50/60 or 240v-1-50/60) is used for primary control of the compressor contactor, oil and economizer line solenoids, and unloader and Vi coils. It also provides compressor thermal safety protection.

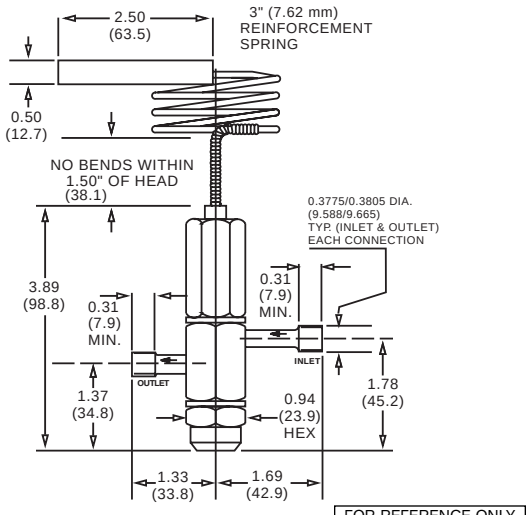
Two versions of this module have been used. The original Carlyle Electronic Module (CEM) and the LonCEM Module. Both versions are covered in detail in Appendix A and Appendix B of this manual.

6.2 Discharge Temperature Control

Discharge temperature control and high temperature protection are supplied by the CEM. There are some applications where the discharge temperature becomes so hot that it is necessary to inject liquid directly into the screw rotors. This is accomplished through the use of a constant temperature desuperheating valve. Refer to section 3.7 for selection and application of this valve.The desuperheating valve bulb must be strapped to the discharge line (as close to the service valve as possible) and insulated. The valve will maintain a discharge temperature of 190°F (88°C). A normally closed solenoid with an inlet strainer is required upstream of the expansion valve.

The liquid feed header must be sized for the entire desuperheating and motor cooling load. Failure to do so can lead to compressor overheating during high ambient operation.

DESUPERHEATING VALVE

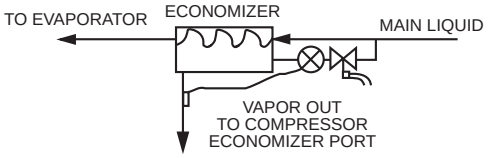


FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

6.3 Motor Cooling Control

Motor cooling control and high temperature protection are supplied by the LonCEM/CEM. Carlyle 06T screw compressors utilize an economizer cooled motor. Screw compressor technology allows access to intermediate pressure part way through the compression cycle. The Carlyle screw compressor uses this intermediate pressure access to pull vapor through a subcooler and over the compressor motor. This process (called an economizer cycle) provides liquid subcooling and motor cooling (reducing the need for liquid injection). Due to both these processes being done at an intermediate pressure versus suction pressure, significant increases in energy efficiency are realized.

A typical economizer arrangement is shown below. The flow to the screw compressor motor is governed by an expansion valve that is set to maintain 10 to 20°F (6 to 11°C) superheat above intermediate pressure. A liquid line solenoid is required in front of the expansion valve and must be normally closed (this valve must be off when all compressors are off and on when any compressor is on).



For parallel applications, an intermediate header is required to distribute economizer gas to each compressor. A solenoid valve is required in the feed line to each compressor. This valve must be normally closed and off when the compressor is off to eliminate intermediate to suction pressure leak back during any compressor off cycle. This solenoid can be controlled by the CEM.

If an economizer is not used, motor cooling control is still required. Two cooling valves should be installed in parallel, feeding the economizer port to eliminate thermal shock. One EF28BZ005 (1 ton) valve is wired to be on any time the compressor is on and the LonCEM controls one EF28BZ007 (1.5 ton) valve.

Motor barrel insulation is recommended on compressors with suction temperatures below -15°F (-26°C) to prevent frost build-up and condensation on the compressor motor barrel.

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Section 7 — Subcooler Selection and Performance Data Adjustment

7.1 Subcooler Selection

The use of an economizer is highly recommended and provides the high capacities and energy efficiencies shown in the screw compressor tabular rating tables. The subcooling load may be calculated by taking the total compressor mass flow of the rack and multiplying it by the change in enthalpy across the subcooler (liquid main in minus liquid main out). To estimate the liquid temperature leaving the subcooler, take the saturated intermediate temperature (at the design condition) from the performance tables and add 10°F (5°C). The subcooler should now be sized based on the subcooling load calculated. Carlyle recommends sizing and piping the subcooler for parallel flow. Parallel flow through the subcooler results in better control of the subcooler TXV (reduces TXV hunting).

7.2 Subcooling Correction

The economized performance data supplied is based on liquid temperature that is 10°F (6°C) above saturated intermediate temperature. The capacity may be varied for other than rated liquid temperature by either of two methods. For the most accurate adjustment, Method #2 should be used.

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METHOD 1

Vary compressor capacity by 3% for each 10°F (6°C) difference between actual and rated liquid temperature. For example, if the actual liquid temperature was 50°F (10°C) and the rated liquid temperature was 40°F (5°C), divide the rated capacity by 1.03. This method is specifically for R-22.

METHOD 2

Using the mass flow rates published in the rating tables, a thermodynamic correction may be used by calculating the new change in enthalpy across the evaporator and multiplying it by the evaporator mass flow rate.

7.3 Superheat Correction

The screw compressor tabular data is rated with 65°F (18°C) return gas temperature (all useful superheat) for low and medium temperature applications. The suction gas does not pass over the motor, but goes directly to the compressor rotors. Utilizing R-22 the compressor capacity will have no significant change with lower return gas temperatures based on all useful superheat at the compressor. However, the actual *evaporator capacity* will increase with lower return gas temperature due to the higher gas density entering the compressor which will result in larger compressor mass flow rates. Mass flow rates are published in the compressor performance tables and may be used to calculate compressor performance at any approved operating condition. The Carlyle screw compressor suction gas goes directly into the rotors and therefore does not incur additional (inefficient) suction gas superheating from passing over the motor. There is a required minimum of 20°F (11°C) discharge superheat. The system should sound an alarm if the superheat reaches 20°F (11°C). Long periods of run time with low discharge superheat will reduce compressor bearing life.

7.4 Carlyle Software

The Carlyle Compressor Selection program **"CARWIN"** will select compressors, calculate subcooler load, oil-cooler load, and perform superheat and subcooling corrections. This software is available through Carlyle Compressor Company, at **www.carlylecompressor.com.**

The tabular performance data presented in this catalog is at 65°F(18.3°C) return gas temperature and SIT+10°F(5.5°C) liquid temperature. Performance at actual operating conditions may vary significantly from these rating conditions. Our Carwin selection software can be used to estimate the performance at the actual operating conditions.

For systems that have mechanical subcooling, as with the economizer cycle on our 74mm compressors, there can be a substantial difference between the performance at the standard rating conditions and the applications actual operating conditions. These differences are generally only significant in low temperature applications. For low temperature applications (SST<0°F/4.4°C), compressor performance should be based on design liquid temperature (typically maintained at or above 40°F(4.4°C) and the maximum return gas temperature expected (typically 25°F-35°F (-3.8°C-1.7°C) for low temperature applications). The evaporator refrigeration effect (ERE reported in Carwin) capacity should then be used to size against the required load.

Section 8 — 05T Open Drive Application Information

8.1 General Information

The 05T compressor is a compact and lightweight open drive screw compressor which delivers high capacity for its size. It is very similar to the 06T semi-hermetic screw compressor. With the exception of an internal motor, the 05T and 06T are virtually identical. In place of the internal motor, the open drive is supplied with a gear casing and jack shaft to connect an external C-Face motor or other device. The compression end of the compressor is identical to the 06T semi-hermetic screw compressor.

The compressor is designed for operation at both 1750 rpm at 60 Hz (1450 rpm @ 50 Hz) and 3500 rpm at 60 Hz (2900 rpm @ 50 Hz). With the exception of electrical information and motor cooling requirements of the 06T compressor, all the information in this application guide also applies to the 05T models. An external oil cooler is required on all applications where the discharge temperature is above 170 F. The model numbering system, however, is slightly different. The cross reference can be found in the table below.

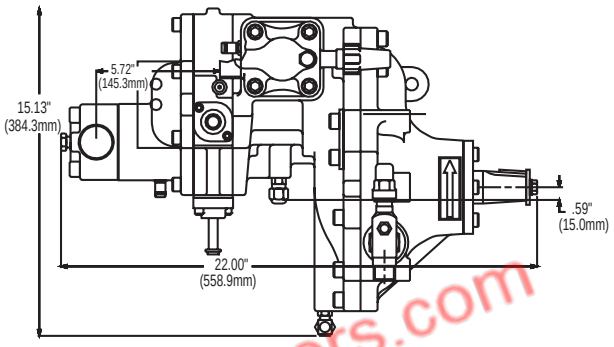
06T Model #	05T Model #	RPM 60Hz (50Hz)	Ft³/min @ 60Hz	m³/min @ 50Hz
06T**033	05TRQ033	1750 (1450)	33	.78
06T**039	05TRQ039	"	39	.92
06T**044	05TRQ044	"	44	1.04
06T**048	05TRQ048	"	48	1.13
06T**054	05TRQ054	"	54	1.28
06T**065	05TRQ033	3500 (2900)	65	1.53
06T**078	05TRQ039	"	78	1.84
06T**088	05TRQ044	"	88	2.08

Model Number Cross Reference

The 05T compressor has been designed for direct drive duty and should not be used in a belt drive application.

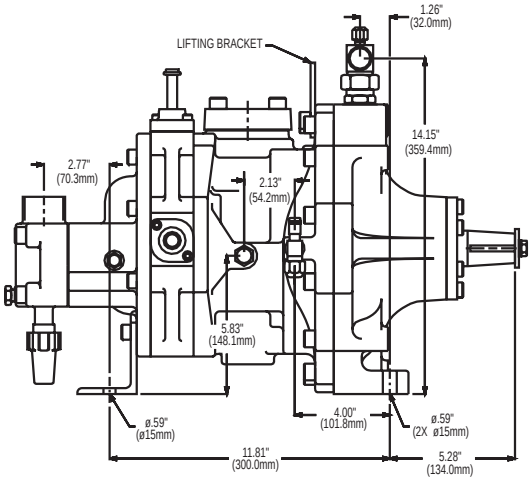
8.2 Compressor Dimensions

Like the 06T, the 05T models have all the same physical dimensions. Please review dimensional drawings for external dimensional information on the compressor.



FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

Dimensions (Top View)



FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

Dimensions (Side View)

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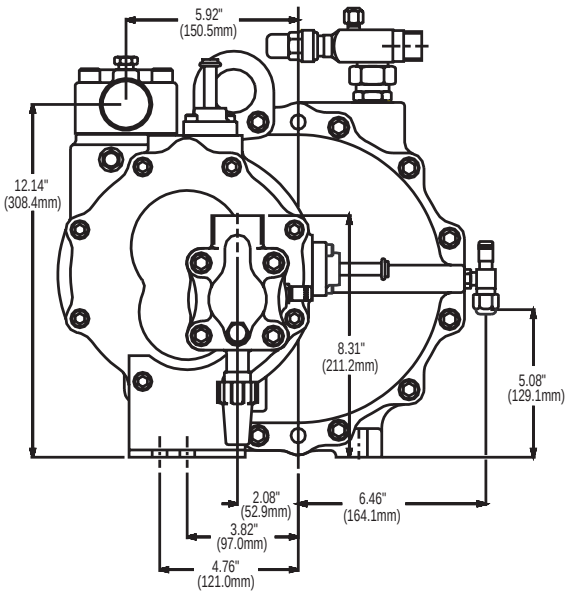

FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

Dimensions (Bottom View)

Motor Selection	Speed	C-Flange Package Required	Dimensions
15Hp (254TC) 20Hp (256TC) 25Hp (284TC) 30Hp (286TC)	1750 rpm @ 60Hz 1450 rpm @ 50Hz	0TA0929	C-flange drawing A
40Hp (324TC) 50Hp (326TC)	1750 rpm @ 60Hz 1450 rpm @ 50Hz	0TA0930	C-flange drawing B
30Hp (286TSC) 40Hp (324TSC) 50Hp (326TSC) 60Hp (364TSC) 75Hp (365TSC)	3500 rpm @ 60Hz 2900 rpm @ 50Hz	0TA0931	C-flange drawing C

Please review C-Flange dimension drawings for all dimensional information on the C-Flanges.

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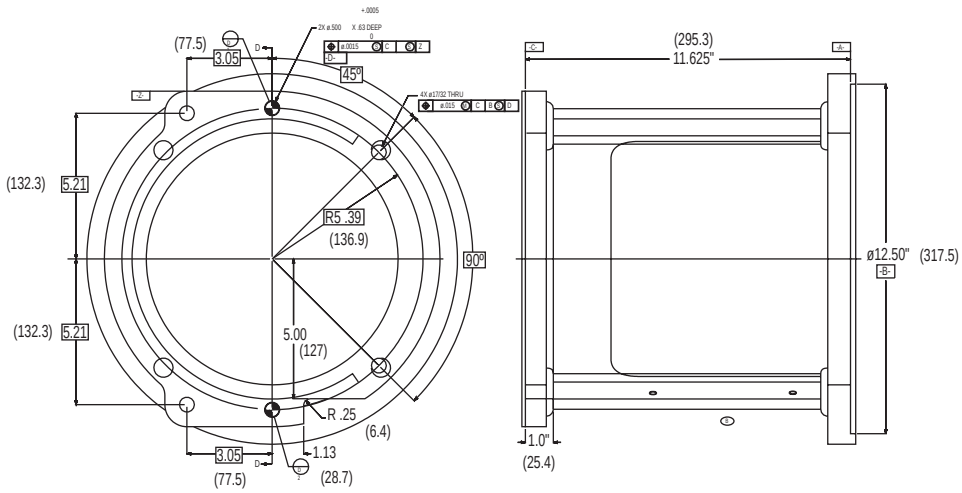
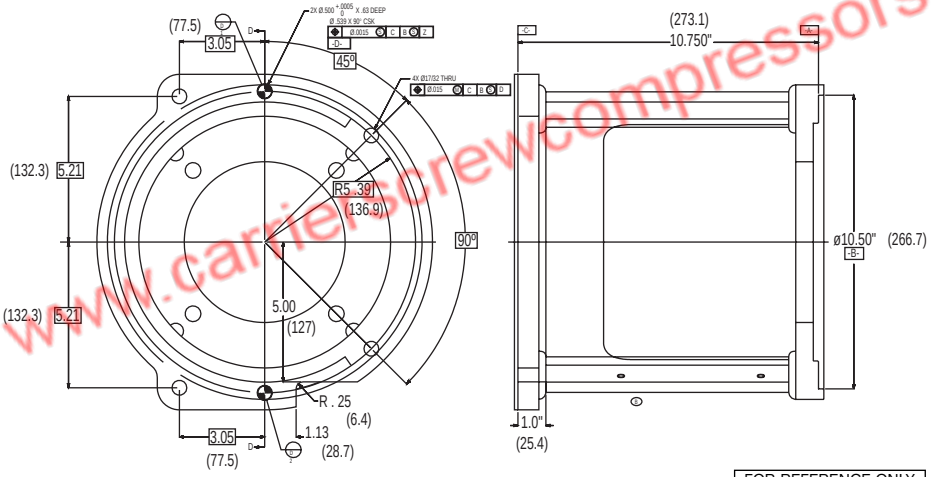
8.3 Compressor C-Flange

Several compressor C-Flanges have been designed by Carlyle. The C-Flange bolts to both the compressor and a C-Face motor for easy self aligning (within ± 0.005" [.127mm] TIR) of the coupling. There are three distinct C-Flanges, two for 1750 (1450) RPM motors and one for 3500 (2900) RPM motors. The C-Flange selections can be found in the following table.



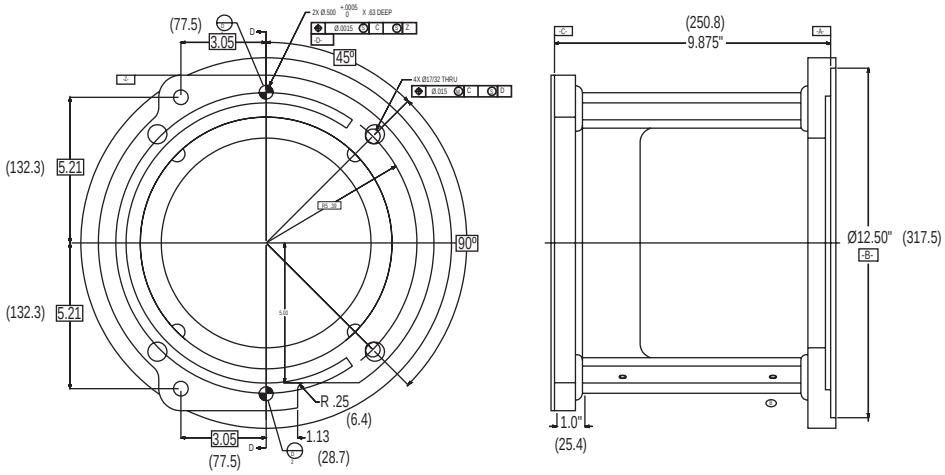
FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

C-Flange Dimensions (A)



FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

C-Flange Dimensions (B)



FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

C-Flange Dimensions (C)

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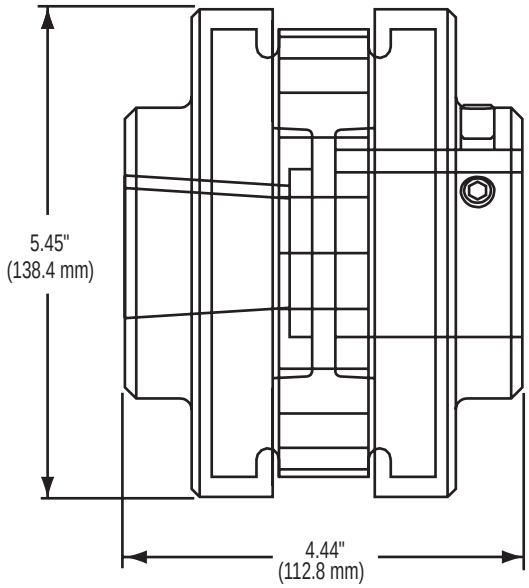
8.4 Compressor Coupling

A flexible Dodge coupling is used to direct couple the compressor to the motor shaft. To properly assemble the C-Flange and coupling onto the compressor, follow the installation instructions for C-Flange and coupling supplied with the C-Flange packages.

The required coupling for each different motor size can be found in the following table. The coupling dimensions can be found in the figure below.

Motor Selection	Speed	Motor Shaft Dia. (Inch)	Coupling Package Required
15Hp (254TC) 20Hp (256TC)	1750 rpm @ 60Hz 1450 rpm @ 50Hz	1-5/8	8TA0868B
25Hp (284TC) 30Hp (286TC)	1750 rpm @ 60Hz 1450 rpm @ 50Hz	1-7/8	8TA0869B
40Hp (324TC) 50Hp (326TC)	1750 rpm @ 60Hz 1450 rpm @ 50Hz	2-1/8	8TA0870B
30Hp (286TSC)	3500 rpm @ 60Hz 2900 rpm @ 50Hz	1-5/8	8TA0868B
40Hp (324TSC) 50Hp (326TSC) 60Hp (364TSC) 75Hp (365TSC)	3500 rpm @ 60Hz 2900 rpm @ 50Hz	1-7/8	8TA0869B



FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

Coupling Dimensions

8.5 Overall Dimensions

All the 05T compressors have the same external physical dimensions, therefore the variables that will affect the overall dimensions of the assembly are the motor and C-Flange. The dimensional drawing shown in the 05T dimension drawing supplies the assembly dimensions with the different C-Flanges and motors.

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C-Flange Package	HP	Motor RPM.	NEMA Frame	A		B		C		D		E	
				in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.	cm.
	15	1750	254TC	8.25	20.96	5.00	12.70	27.29	69.32	.106	.28	.56	1.42
0TA0929	20	1750	256TC	10.00	25.40	5.00	12.70	27.29	69.32	.106	.28	.56	1.42
	25	1750	284TC	9.50	24.13	5.50	13.97	27.48	69.80	.858	2.18	.56	1.42
	30	1750	286TC	11.00	27.94	5.50	13.97	27.48	69.80	.858	2.18	.56	1.42
0TA0930	40	1750	324TC	10.50	26.67	6.25	15.88	28.86	73.30	1.86	4.72	.69	1.75
	50	1750	326TC	12.00	30.48	6.25	15.88	28.86	73.30	1.86	4.72	.69	1.75
	30	3500	286TSC	11.00	27.94	5.50	13.97	26.42	67.11	.858	2.18	.56	1.42
	40	3500	324TSC	10.50	26.67	6.25	15.88	27.11	68.86	1.86	4.72	.69	1.75
0TA0931	50	3500	326TSC	12.00	30.48	6.25	15.88	27.11	68.86	1.86	4.72	.69	1.75
	60	3500	364TSC	11.25	28.58	7.00	17.78	27.73	70.43	2.86	7.26	.69	1.75
	75	3500	365TSC	12.25	31.12	7.00	17.78	27.73	70.43	2.86	7.26	.69	1.75

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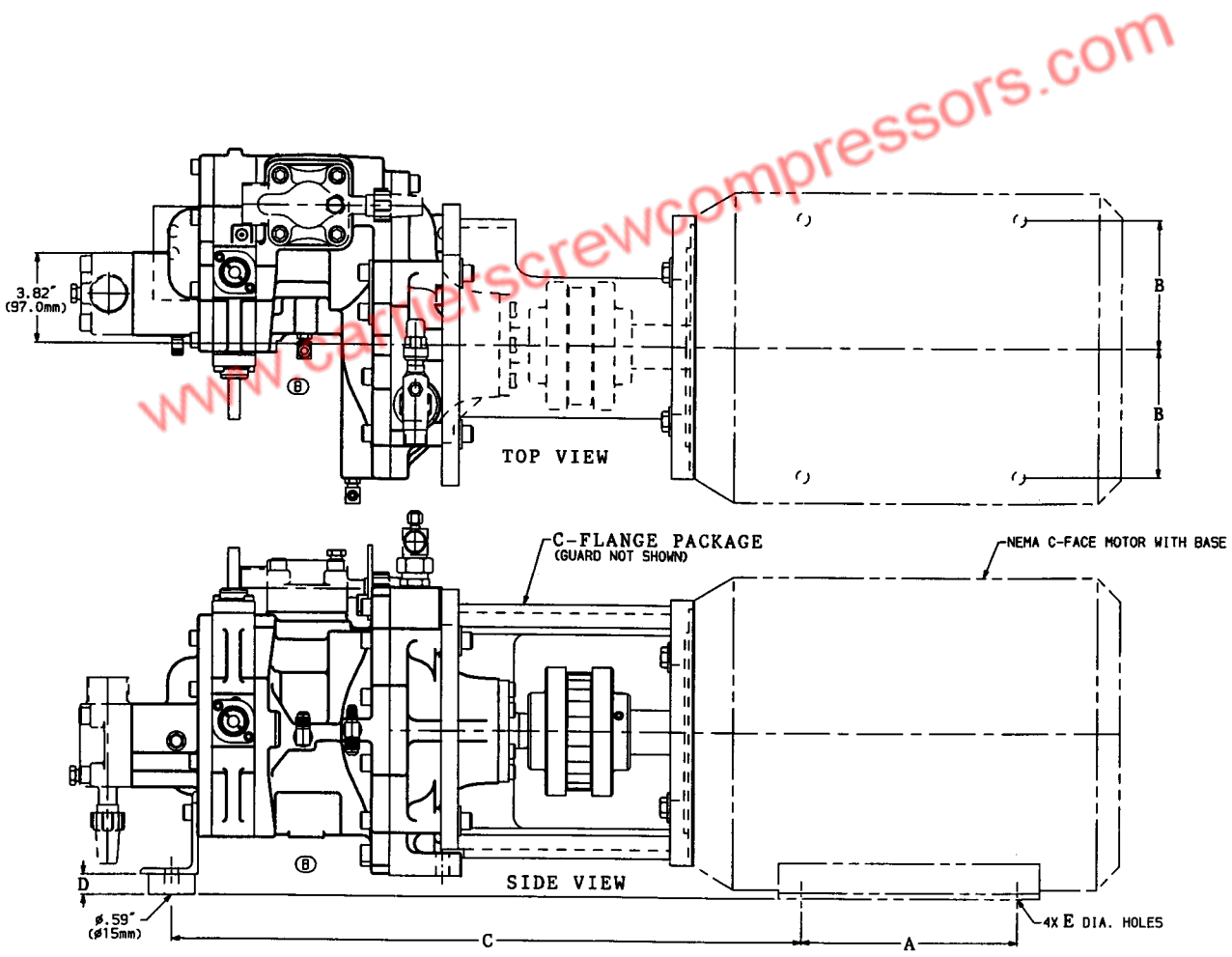

FOR REFERENCE ONLY
INCHES
[MILLIMETERS (mm)]

05T Dimensions