

## 06D/E APPLICATION GUIDE

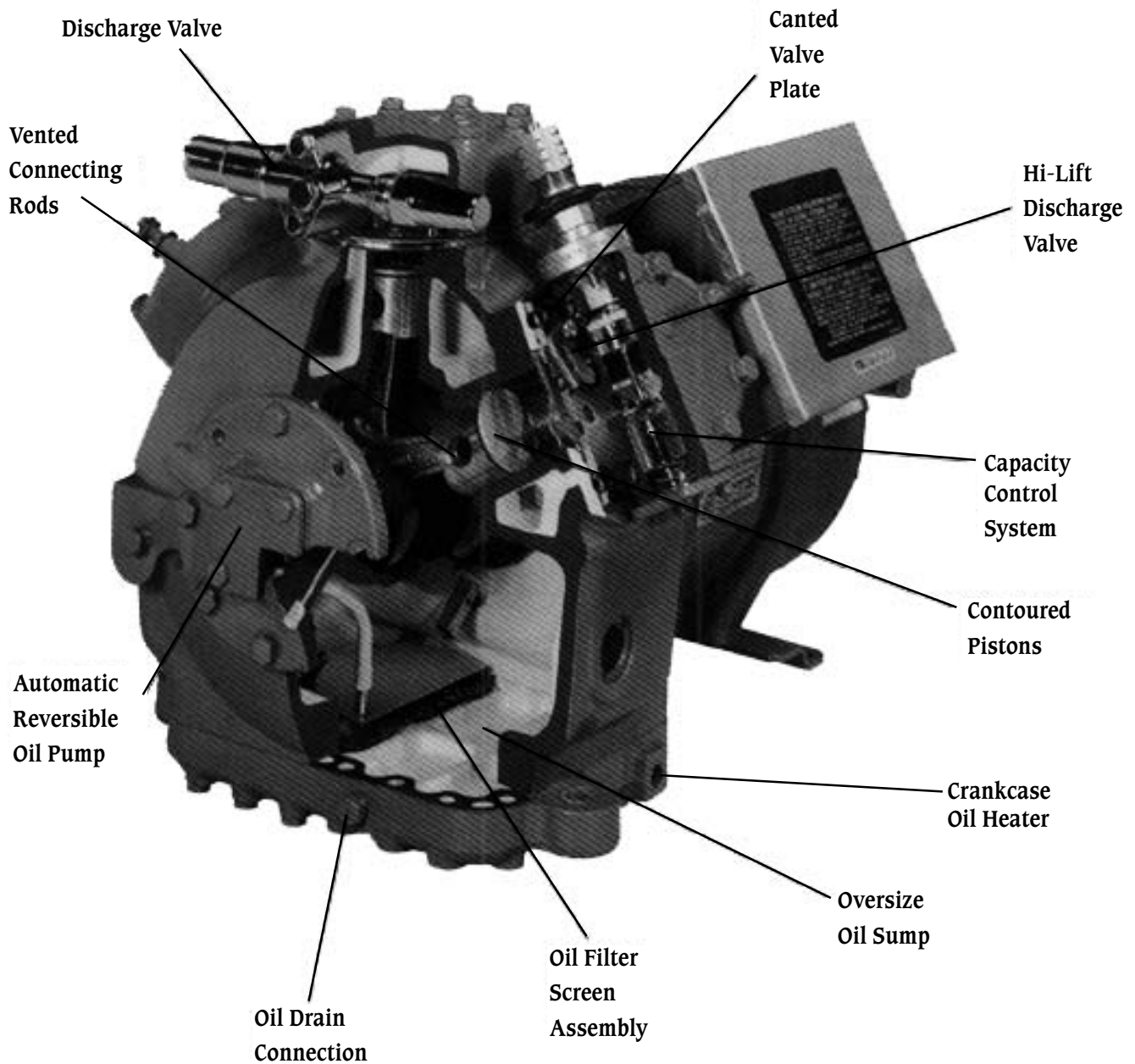


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## General Information

### Features of Carlyle 06D/E Compressors



Carlyle 06D/E semi-hermetic compressors are ideally suited for commercial refrigeration, air conditioning, process cooling, and environmental chambers. They are extremely flexible and may be used with many of the new HFC refrigerants such as R-507, R-404A, R-407C and R-134a, in addition to the conventional refrigerants (R-12, R-22, and R-502). The compressors may be operated at 50 or 60 hertz and are UL (Underwriters' Laboratories), CSA (Canadian Standards Association), and ISO 9002 approved. Many of the prominent features of the 06D/E compressors are listed below. 06D and 06E compressors comply with the CE Mark requirements and will have the CE Mark logo added to the appropriate compressor nameplates.

### **High Efficiency Valving System**

The valving system utilizes low lift valves and high flow ports to reduce valve losses, maximize efficiency, and reduce valve stress. Carlyle's valves are made of Swedish steel, the finest material available for this application. Valve design has been qualified for HFC/POE applications and redesigned to avoid affects of "stiction".

### **Contoured Pistons and Vented Connecting Rods**

The pistons are contoured allowing the suction valves to mate up with the recess in the pistons, resulting in reduced clearances which increases both capacity and efficiency. The connecting rods are also vented to provide premium bearing lubrication and longer life.

### **Automatic Reversible High Flow Oil Pump**

The positive displacement vane type oil pump is extremely durable and produces a high volume of oil flow. With the new HFC refrigerants and POE (polyolester) oils (which are more soluble), the 06D/E oil pump will produce oil pressure quickly, reducing the potential for nuisance oil pressure trips.

### **Override Oil Sump**

On start-up, oil level can temporarily drop too low, causing unnecessary wear in other compressor designs when on shut-down, the oil is diluted by refrigerant. The Carlyle override oil sump holds extra oil in crankcase to prevent normal oil migration from dropping the oil level below the safe lubrication range.

### **High Efficiency Heavy Duty Motors**

These motors have the latest insulation systems which helps to prevent motor burnouts, especially during hot weather periods, when operating pressures, temperatures, and currents (amps) are high.

### **Suction Inlet Screen**

The suction inlet screen prevents installation scale or abrasives from entering the compressor and shortening the life of the motor and compressor.

### **Override Suction Gas Passages**

The override suction gas passages generate less turbulence, lower pressure drops and more efficient motor cooling by suction gas, thereby producing a cooler motor that has a more economical operation and longer life.

### **Main Bearings and Running Surface of Aluminum or Steel Backed Babbitt**

Aluminum or tin based babbitt material is used on bearing surfaces to provide greater load carrying ability than other types of materials and are also less susceptible to damage from overheating or liquid refrigerant.

### **Crankcase Oil Heater**

This optional accessory warms crankcase oil to reduce refrigerant migration which occurs during shutdown periods.

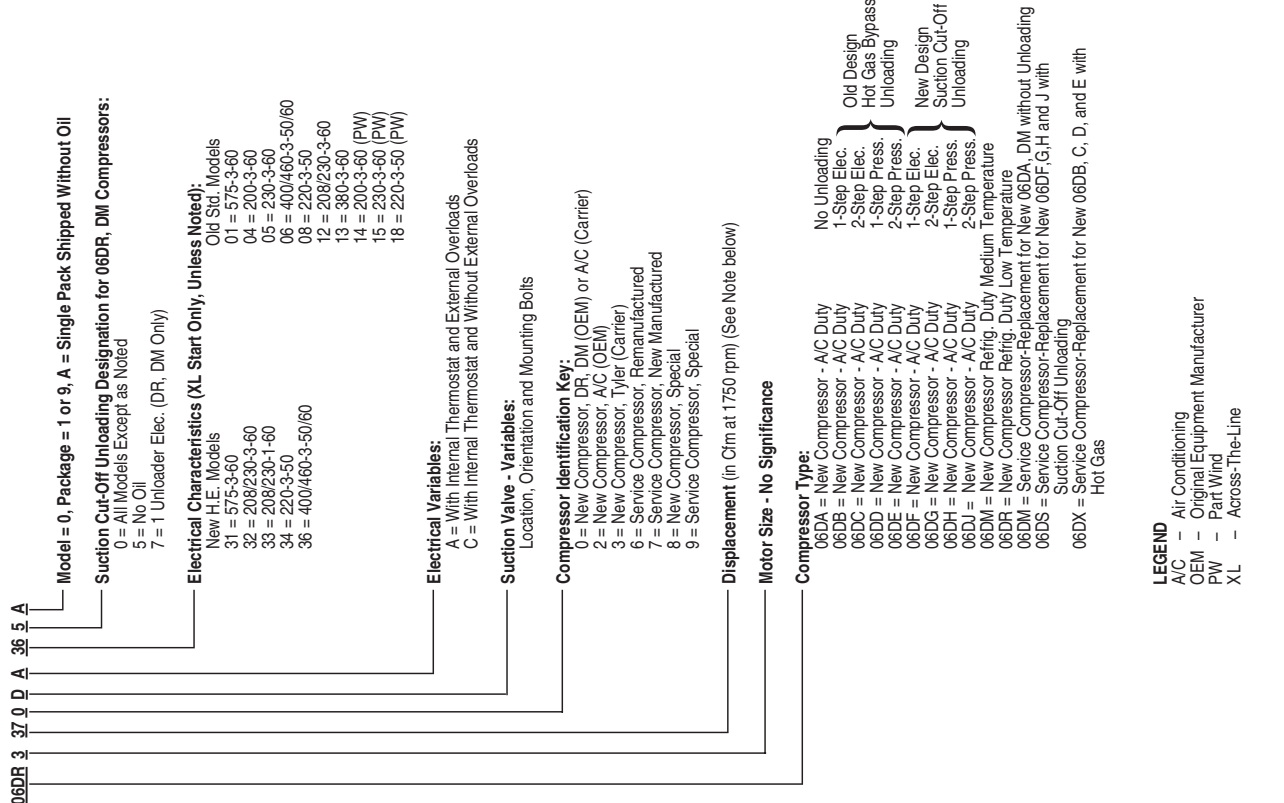
### **Capacity Control System**

Suction cut-off unloading is an option on all four and six cylinder Carlyle 06D/E compressors. Suction cut-off unloading is an efficient method of capacity control that literally blocks off the suction of two cylinders at a time. This method is not only efficient, but results in much cooler operating temperatures than hot gas bypass style designs.

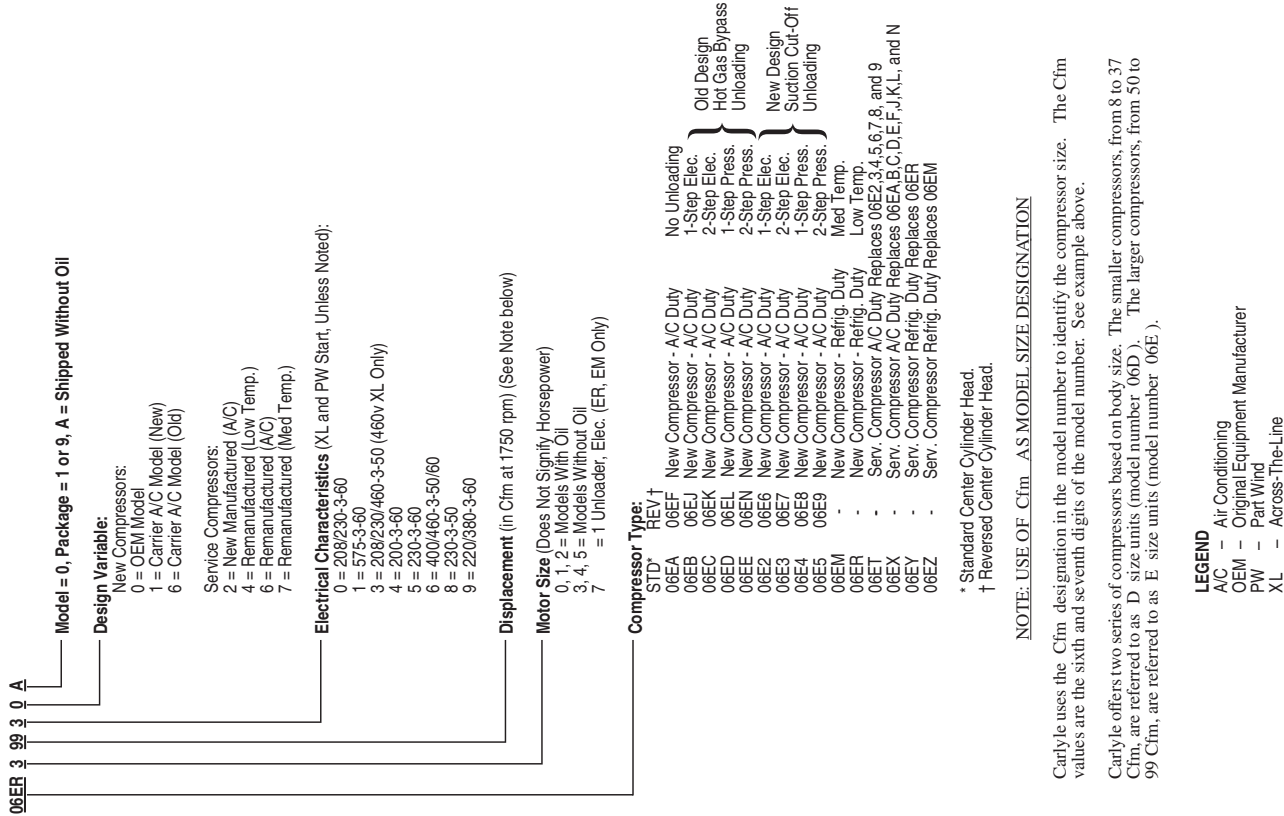
### **ISO 9002 Registration**

Carlyle Compressor has ISO 9002 Registration by Underwriters' Laboratories, Inc. to manufacture 06D/E semi-hermetic reciprocating compressors ranging in size from 2 to 40 tons of refrigeration capacity. That means we have a top quality system in place and will be continually working to improve it. So you can be assured you will always be getting the highest quality compressors with Carlyle.

06D Compressor Model Number Significance



06E Compressor Model Number Significance



MODEL NUMBER	DIMENSIONS INCHES (CM)			MOUNTING CENTERS	SERVICE VALVES <sup>2</sup>		ELECTRICAL DATA <sup>1</sup>					
					SUCTION CONN. (IN) SWEAT	DISCH. CONN. (IN) SWEAT	208/230-3-60			400-3-50, 460-3-60		
	LENGTH	WIDTH	HEIGHT				MCC	*RLA	LRA	MCC	*RLA	LRA
06DM808	18.53 (47.07)	10.00 (25.40)	15.00 (38.10)	8.88 x 12.88 (22.55 x 32.71)	7/8	5/8	17.4	11.2	71	8.7	5.6	35.5
06DR109	18.53 (47.07)	10.00 (25.40)	15.00 (38.10)	8.88 x 12.88 (22.55 x 32.71)	7/8	5/8	12.1	7.6	53.3	5.5	3.5	26.3
06DM313	22.17 (56.31)	14.78 (37.54)	15.10 (38.35)	8.88 x 14.88 (22.55 x 37.79)	7/8	5/8	27.0	17.3	100	13.5	8.6	50
06DR013	22.17 (56.31)	14.78 (37.54)	15.10 (38.35)	8.88 x 14.88 (22.55 x 37.79)	1-1/8	5/8	17.4	11.2	71	8.7	5.6	35.5
06DM316	22.17 (56.31)	14.78 (37.54)	15.10 (38.35)	8.88 x 14.88 (22.55 x 37.79)	1-1/8	5/8	27.0	17.3	100	13.5	8.6	50
06DR316	22.17 (56.31)	14.78 (37.54)	15.10 (38.35)	8.88 x 14.88 (22.55 x 37.79)	1-1/8	5/8	27.0	17.3	100	13.5	8.6	50
06DA818	22.17 (56.31)	14.78 (37.54)	16.72 (42.47)	8.25 x 13.88 (20.96 x 35.26)	1-1/8	7/8	44.0	28.2	160	22.0	14.1	80
06DR718	23.62 (59.99)	14.78 (37.54)	16.72 (42.47)	8.25 x 13.88 (20.96 x 35.26)	1-3/8	7/8	27.0	17.3	100	13.5	8.6	50
06DR820	23.62 (59.99)	14.78 (37.54)	16.72 (42.47)	8.25 x 13.88 (20.96 x 35.26)	1-3/8	7/8	44.0	28.2	160	22.0	14.1	80
06DA824	23.60 (59.94)	16.46 (41.81)	15.49 (39.34)	8.88 x 12.78 (22.5 x 32.46)	1-3/8	1-1/8	55.5	35.6	198	27.8	17.8	99
06DA825	24.30 (61.72)	17.50 (44.45)	16.08 (40.84)	8.88 x 12.78 (22.5 x 32.46)	1-3/8	1-1/8	55.5	35.6	198	27.8	17.8	99
06DR725	24.30 (61.72)	17.50 (44.45)	16.08 (40.84)	8.88/11.38 x 12.78 (22.5/28.90 x 32.46)	1-3/8	7/8	44.0	28.2	160	22.0	14.1	80
06DR724	23.60 (59.94)	16.46 (41.81)	15.49 (39.34)	8.88/11.38 x 12.78 (22.5/28.90 x 32.46)	1-3/8	7/8	44.0	28.2	160	22.0	14.1	80
06DA328	24.30 (61.72)	17.50 (44.45)	16.08 (40.84)	8.88 x 12.78 (22.5 x 32.46)	1-3/8	1-1/8	62.0	39.7	228	31.0	19.9	114
06DR228	24.30 (61.72)	17.50 (44.45)	16.08 (40.84)	8.88/11.38 x 12.78 (22.5/28.90 x 32.46)	1-5/8	7/8	55.5	35.6	198	27.8	17.8	99
06DA537	24.30 (61.72)	17.50 (44.45)	16.08 (40.84)	8.88 x 12.78 (22.5 x 32.46)	1-5/8	1-1/8	89.0	57.1	266	40.0	25.6	120
06DM337	24.30 (61.72)	17.50 (44.45)	16.08 (40.84)	8.88/11.38 x 12.78 (22.5/28.90 x 32.46)	1-5/8	1-1/8	62.0	39.7	228	31.0	19.9	114
06DR337	24.30 (61.72)	17.50 (44.45)	16.08 (40.84)	8.88/11.38 x 12.78 (22.5/28.90 x 32.46)	1-5/8	1-1/8	62.0	39.7	228	31.0	19.9	114
06DR541	24.30 (61.72)	17.50 (44.45)	16.08 (40.84)	8.88/11.38 x 12.78 (22.5/28.90 x 32.46)	1-5/8	1-1/8	89.0	57.1	266	40.0	25.6	120
06EA550	31.22 (79.30)	21.49 (54.58)	21.14 (53.70)	8.88/11.38 x 15.31 (22.5/28.9 x 38.88)	1-5/8	1-1/8	104.0	74.3	345	49.0	35.0	173
06EM450	31.22 (79.30)	21.49 (54.58)	21.14 (53.70)	8.88/11.38 x 15.31 (22.5/28.9 x 38.88)	2-1/8	1-1/8	90.0	64.3	283	46.0	33.9	142
06ER450	31.22 (79.30)	21.49 (54.58)	21.14 (53.70)	8.88/11.38 x 15.31 (22.5/28.9 x 38.88)	2-1/8	1-1/8	90.0	64.3	283	46.0	33.9	142
06EA565	33.38 (84.79)	23.68 (60.15)	20.32 (51.61)	8.88/11.38 x 17.44 (22.5/28.9 x 44.15)	1-5/8	1-3/8	127.0	90.7	446	64.0	45.7	223
06ER465	33.38 (84.79)	23.68 (60.15)	20.32 (51.61)	8.88/11.38 x 17.44 (22.5/28.9 x 44.15)	2-1/8	1-3/8	104.0	74.3	345	49.0	35.0	173
06EA575	33.38 (84.79)	23.68 (60.15)	20.32 (51.61)	8.88/11.38 x 17.44 (22.5/28.9 x 44.15)	2-1/8	1-3/8	163.0	116.4	506	76.0	54.3	253
06EM475	33.38 (84.79)	23.68 (60.15)	20.32 (51.61)	8.88/11.38 x 17.44 (22.5/28.9 x 44.15)	2-1/8	1-3/8	127.0	90.7	446	64.0	45.7	223
06ER475	33.38 (84.79)	23.68 (60.15)	20.32 (51.61)	8.88/11.38 x 17.44 (22.5/28.9 x 44.15)	2-1/8	1-3/8	104.0	74.3	345	49.0	35.0	173
06EA599	33.38 (84.79)	23.68 (60.15)	20.32 (51.61)	8.88/11.38 x 17.44 (22.5/28.9 x 44.15)	2-1/8	1-5/8	215.0	153.6	690	106.0	75.7	345
06EM499	33.38 (84.79)	23.68 (60.15)	20.32 (51.61)	8.88/11.38 x 17.44 (22.5/28.9 x 44.15)	2-1/8	1-5/8	182.0	130.0	610	88.0	62.9	305
06ER399	33.38 (84.79)	23.68 (60.15)	20.32 (51.61)	8.88/11.38 x 17.44 (22.5/28.9 x 44.15)	2-1/8	1-3/8	163.0	116.4	506	76.0	54.3	253

<sup>1</sup>Electrical Characteristics:

Models listed are available for the following power supplies: 208/230-3-60, 460/400-3-60/50, 575-3-60

\* RLA based on MCC ÷ 1.56 for 06D

\* RLA based on Must Trip of Recommended Circuit Breaker ÷ 1.40 for 06E

**LEGEND**

LRA - Locked Rotor Amps

RLA - Rates Load Amps

MCC - Maximum Continuous Current

<sup>2</sup>Alternative service valve model available in most cases.

MODEL NUMBER	HP	CFM @1750 RPM	SUCTION TEMPERATURE RANGE (DEGREES F)						NUMBER OF CYLINDERS	BORE (INCHES)	STROKE (INCHES)	OIL CHARGE (PINTS)	NET WEIGHT (LBS)
			R-502, 404A/507 MIN      MAX		R-12, R-134a MIN      MAX		R-22 MIN      MAX						
06DR109	2.0	8.7	-40	0	-10	55	-35	0	2	2.00	1-3/8	3.00	160
06DM808	3.0	8.0	0	50	—	—	0	55	2	2.00	1-1/4	3.00	160
06DR013	3.0	13.1	-40	0	-10	55	-35	0	4	2.00	1	4.50	230
06DM313	5.0	13.1	0	50	—	—	0	55	4	2.00	1	4.50	235
06DR316	5.0	15.9	-40	25	-10	55	-35	25	4	2.00	1-1/4	4.50	235
06DM316	5.0	15.9	0	25	—	—	0	45	4	2.00	1-1/4	4.50	235
06DR718	5.0	18.3	-40	0	-10	55	-35	0	4	2.00	1-7/16	5.50	250
06DA818	6.5	18.3	0	50	—	—	0	55	4	2.00	1-7/16	5.50	250
06DR820	6.5	20.0	-40	40	-10	55	-35	45	4	2.00	1-9/16	5.50	260
06DR724	6.5	23.9	-40	25	-10	55	-35	45	6	2.00	1-1/4	8.00	310
06DR725	6.5	23.9	-40	25	-10	55	-35	45	6	2.00	1-1/4	8.00	310
06DA825	7.5	23.9	0	50	—	—	0	55	6	2.00	1-1/4	8.00	315
06DA824	7.5	23.9	0	50	—	—	0	55	6	2.00	1-1/4	8.00	310
06DR228	7.5	28.0	-40	25	-10	55	-35	45	6	2.00	1-15/32	8.00	315
06DA328	10.0	28.0	0	50	—	—	0	55	6	2.00	1-15/32	8.00	315
06DR337	10.0	37.1	-40	25	-10	55	-35	45	6	2.00	1-15/16	8.00	325
06DM337	10.0	37.1	0	25	—	—	0	45	6	2.00	1-15/16	8.00	325
06DA537	15.0	37.1	0	50	—	—	0	55	6	2.00	1-15/16	8.00	325
06DR541	15.0	41.0	-40	25	-10	55	-35	25	6	2.00	2.15	8.00	325
06ER450	15.0	50.3	-40	0	—	—	-35	0	4	2-11/16	2-3/16	14.00	430
06EM450	15.0	50.3	0	25	-10	55	0	45	4	2-11/16	2-3/16	14.00	430
06EA550	20.0	50.3	0	50	—	—	0	50	4	2-11/16	2-3/16	14.00	430
06ER465	20.0	68.3	-40	0	—	—	-35	0	6	2-11/16	1-63/64	19.00	480
06EA565	25.0	68.3	0	50	-10	55	0	50	6	2-11/16	1-63/64	19.00	485
06ER475	20.0	75.4	-40	0	—	—	-35	0	6	2-11/16	2-3/16	19.00	490
06EM475	25.0	75.4	0	40	-10	55	0	45	6	2-11/16	2-3/16	19.00	490
06EA575	30.0	75.4	0	50	—	—	0	50	6	2-11/16	2-3/16	19.00	490
06ER399	30.0	99.0	-40	0	—	—	-35	0	6	2-11/16	2-7/8	19.00	500
06EM499	35.0	99.0	0	40	-10	55	0	45	6	2-11/16	2-7/8	19.00	505
06EA599	40.0	99.0	0	50	—	—	0	50	6	2-11/16	2-7/8	19.00	520

## Notes:

1. The cylinder head cooling fan section of this application guide details where this accessory is required.
2. The compressor performance tables reflect the operational envelope limitations for each model by refrigerant.

# 06D/E Compressor Specifications (50 Hz Units)

MODEL NUMBER	HP	CFM @1450 RPM	SUCTION TEMPERATURE RANGE (DEGREES F)								NUMBER OF CYLINDERS	BORE (CM)	STROKE (CM)	OIL CHARGE (LITERS)	NET WEIGHT (KG)
			R-502, 404A/507		R-12, R-134a		R-22		MAX						
			MIN	MAX	MIN	MAX	MIN	MAX							
06DR109	2.0	0.21	-40	-18	-23	12	-37	-18	2	5.08	3.49	1.42	73		
06DM808	3.0	0.19	-18	10	-	-	-18	12	2	5.08	3.18	1.42	73		
06DR013	3.0	0.31	-40	-18	-23	12	-37	-18	4	5.08	2.54	2.13	104		
06DM313	5.0	0.31	-18	10	-	-	-18	7	4	5.08	2.54	2.13	107		
06DR316	5.0	0.38	-40	-4	-23	12	-37	-4	4	5.08	3.18	2.13	107		
06DM316	5.0	0.38	-18	-4	-	-	-18	7	4	5.08	3.18	2.13	107		
06DR718	5.0	0.43	-40	-18	-23	12	-37	-18	4	5.08	3.65	2.60	113		
06DA818	6.5	0.43	-18	10	-	-	-18	12	4	5.08	3.65	2.60	113		
06DR820	6.5	0.47	-40	4	-23	12	-37	7	4	5.08	3.97	2.60	118		
06DR724	6.5	0.56	-40	-4	-23	12	-37	7	6	5.08	3.18	3.79	141		
06DR725	6.5	0.56	-40	-4	-23	12	-37	7	6	5.08	3.18	3.79	141		
06DA825	7.5	0.56	-18	10	-	-	-18	12	6	5.08	3.18	3.79	143		
06DA824	7.5	0.56	-18	10	-	-	-18	12	6	5.08	3.18	3.79	141		
06DR228	7.5	0.66	-40	-4	-23	12	-37	7	6	5.08	3.73	3.79	143		
06DA328	10.0	0.66	-18	10	-	-	-18	12	6	5.08	3.73	3.79	143		
06DR337	10.0	0.88	-40	-4	-23	12	-37	7	6	5.08	4.92	3.79	147		
06DM337	10.0	0.88	-18	-4	-	-	-18	7	6	5.08	4.92	3.79	147		
06DA537	15.0	0.88	-18	10	-	-	-18	12	6	5.08	4.92	3.79	147		
06DR541	15.0	0.97	-18	-4	-23	12	-37	-4	6	5.08	5.46	3.79	147		
06ER450	15.0	1.19	-40	-18	-	-	-37	-18	4	6.83	5.56	6.62	195		
06EM450	15.0	1.19	-18	-4	-23	12	-18	7	4	6.83	5.56	6.62	195		
06EA550	20.0	1.19	-18	10	-	-	-18	10	4	6.83	5.56	6.62	195		
06ER465	20.0	1.61	-40	-18	-	-	-37	-18	6	6.83	5.04	8.99	218		
06EA565	25.0	1.61	-18	10	-23	12	-18	10	6	6.83	5.04	8.99	220		
06ER475	20.0	1.78	-40	-18	-	-	-37	-18	6	6.83	5.56	8.99	222		
06EM475	25.0	1.78	-18	4	-23	12	-18	7	6	6.83	5.56	8.99	222		
06EA575	30.0	1.78	-18	10	-	-	-18	10	6	6.83	5.56	8.99	222		
06ER399	30.0	2.34	-40	-18	-	-	-37	-18	6	6.83	7.30	8.99	227		
06EM499	35.0	2.34	-18	4	-23	12	-18	7	6	6.83	7.30	8.99	229		
06EA599	40.0	2.34	-18	10	-	-	-18	10	6	6.83	7.30	8.99	236		

Notes:

1. The cylinder head cooling fan section of this application guide details where this accessory is required.
2. The compressor performance tables reflect the operational envelope limitations for each model by refrigerant.



# 1.0 System Design Considerations

## 1.1 General Application Information

Compressors are available for operation in low temperature R-502, medium temperature R-12, and air conditioning R-22 applications. Design modifications allow the use of HFC refrigerants R-134a, R-404A, R-407C, and R-507. This guide provides information and recommendations for the successful application of compressors in A/C and refrigeration systems.

Maximum operating conditions of the compressor models are generally defined in the performance curves and will differ with each model. Operating conditions should be controlled so that the discharge gas does not exceed 275°F (135°C) at the discharge service valve and that oil temperature does not exceed 160°F (71°C). For HFC/POE applications the maximum recommended discharge temperature is 250°F (121°C).

## 1.2 Compressor Rating Notes

Performance for most standard conditions are plotted in tabular data or rating curves. For special requests, contact Carlyle Application Engineering. Carlyle also provides computer software data that allows system designers access to Carlyle compressor performance. Carlyle's "CARWIN" software allows customers to determine individual compressor and multiple compressor selections. It gives performance data on various refrigerants in low, medium and high temperature applications. It also allows performance adjustments with superheat and subcooling changes. This software can be accessed at Carlyle's website:

[www.carlylecompressor.com/technical info/Carwin.html](http://www.carlylecompressor.com/technical%20info/Carwin.html).

The compressor capacity and power ratings found in the 06D/E refrigeration compressor specification sheets are based on the following conditions:

Compressor ratings are based on nominal voltage, 60 hertz (1750 rpm) operation and 50 hertz (1450 rpm) operation, with 0°F (0°C) subcooling.

Note: Some Carlyle air conditioning ratings are at ARI (Air Conditioning & Refrigeration Institution) rating conditions and with 15°F subcooling. Ratings may be interpolated but not extrapolated.

Liquid subcooling increases system capacity by approximately 1/2 of 1% for each degree Fahrenheit (.5°C) of subcooling for R-12, R-22, and R-502. With HFC refrigerants R-134a, R-404A, and R-507, the subcooling cor-

rection is higher and in most cases a correction of 6/10 of 1% for each degree Fahrenheit (.5°C) can be used. When correcting for subcooling, power input to the compressor motor does not change.

Refrigerant temperatures (suction and condensing or discharge) are saturation temperatures corresponding to pressures indicated at the compressor service valves. Actual gas temperatures are higher because of superheat.

Capacities are based on the actual suction gas temperatures to the compressor of 65°F (18°C) for refrigerants 12, 502, 134a, 404A, and 507. It assumes superheating occurs in the evaporator and in the suction line within the refrigerated space, or in a liquid-suction heat exchanger so that all the superheat produces useful cooling. Superheating that occurs outside the refrigerated space is a loss, but is a compressor load. If increases in return gas temperatures are obtained outside of the refrigerated space or if the compressor is operated at a lower return gas temperature than 65°F (18°C), a capacity correction is required. For R-22, ratings at 65°F (18°C) return gas temperature, the same adjustments as noted above with R-502 should apply. For R-22 ratings based on a suction gas superheat of 20°F (-11°C), it is assumed that all the superheat is useful and the capacity can be used without adjustment.

Capacity corrections for superheat changes involve a number of variables and change from compressor to compressor. In the past correction tables were used to estimate these performance changes. Today our "CARWIN" software makes adjustments for compressor performance differences when the compressor return gas temperature is changed or the system superheat is modified. This software can be downloaded from our website as noted earlier in this section.

Performance data for most refrigerants is based on the saturated suction and saturated condensing conditions. This includes refrigerants such as R-12, R-22, R-502, R-134a and R-404A. Some refrigerants are a mixture and have a different saturated temperature as a vapor and liquid at the same pressure. This property is called "glide". Refrigerant 404A has what is called a low glide and is typically treated as an azeotrope refrigerant. Refrigerant 407C though is considered as having a high glide and has significantly different saturation pressure between the vapor and liquid state. When in a vapor

state the refrigerant is referred to as the saturated dew temperature. When in the liquid state the refrigerant is referred to as the saturated bubble temperature. Carlyle's 06D and 06E compressor performance data with R-407C is based on the compressor suction and discharge at the saturated dew pressures. Because the compressor suction and discharge pressures will be at saturated dew conditions this is our preferred method of presenting this data. Compressor performance will be lower than calculations based on "mean coil temperatures" which may be used by other compressor manufacturers.

All R-502 capacity ratings, except for the 06DR109 compressor, are based on the use of cylinder head cooling fans at saturated suction temperatures of -20°F (-29°C) or below, and -25°F (-32°C) or below for R-404A and R-507. All low temperature (-30°F to 0°F, -34°C to -18°C) R-22 capacity ratings are based on the use of a cylinder head cooling fan. When the compressor is operated at higher return gas temperatures (for example 65°F, 18°C), the use of an external desuperheating valve is also required to maintain discharge temperatures below 275°F (135°C) and 250°F (121°C) for HFC/POE applications. For R-22 low temperature applications, bulletin 02T-3 should be carefully reviewed.

Total heat of rejection (THR) in tons from the compressor equals adjusted compressor capacity (in tons) + .285 x kW input (of the compressor motor), or the THR in kilowatts equals the compressor's capacity in kilowatts + kW input (of the compressor motor). This heat rejection calculation gives the maximum value possible for condenser selection. Because of heat losses at the compressor (especially is a cooling fan is moving air across it) and at the discharge line, the actual heat of rejection will be lower.

Unless otherwise specified on the compressor specification and performance sheets, the 06D and 06E compressors are suitable for continuous operation within the following limits:

<b>LOW TEMPERATURE*</b>		
<b>Refrigerant</b>	<b>Saturated Suction Temperature</b>	<b>Saturated Condensing Temperature</b>
R-502, R-404A, R-507	-40 to 0°F (-40 to -18°C)	70 to 120°F (21 to 49°C)
R-22	-30 to 0°F (-34 to -18°C)	70 to 120°F (21 to 49°C)

\*Minimum operating pressure ratio in these applications is limited to 2.25:1.

<b>MEDIUM TEMPERATURE</b>		
<b>Refrigerant</b>	<b>Saturated Suction Temperature</b>	<b>Saturated Condensing Temperature</b>
R-502, R-404A, R-507	-10 to 40°F (-23 to 4°C)	70 to 120°F (21 to 49°C)
R-12*	-10 to 40°F (-23 to 4°C)	80 to 130°F (27 to 54°C)
R-134a*	-10 to 50°F (-23 to 10°C)	70 to 150°F (21 to 66°C)
R-22*	0 to 50°F (-18 to 10°C)	70 to 130°F (21 to 54°C)

\*Minimum operating pressure ratio in these applications is limited to 2.25:1.

<b>HIGH TEMPERATURE*</b>		
<b>Refrigerant</b>	<b>Saturated Suction Temperature</b>	<b>Saturated Condensing Temperature</b>
R-12	0 to 55°F (-18 to 13°C)	70 to 150°F (21 to 66°C)
R-134a	0 to 55°F (-18 to 13°C)	70 to 150°F (21 to 66°C)
R-22 R-407C	0 to 50°F (-18 to 10°C)	70 to 150°F (21 to 66°C)

\*Minimum operating pressure ratio in these applications is limited to 2.25:1.

Maximum operating conditions of the compressor models are generally defined in the performance curves and differ with each model. Operating conditions should be controlled so that the discharge gas does not exceed 275°F (135°C) and oil temperature (in the sump) does not exceed 160°F (71°C). For HFC/POE applications the maximum recommended discharge temperature is 250°F (121°C). The motors are thermally protected so that unsafe winding temperatures are prevented. Oil pressure switches are available for system protection (see Accessories Section 5.3).

### **Requirements for Proper Compressor Operation**

Semi-hermetic compressor application requires good system design for proper compressor performance to ensure against compressor damage.

### 1.3 Refrigerant Piping

Good system piping designs will minimize the possibility of lubrication failure, flooded starts, and refrigerant floodback problems. Refrigerant piping systems must therefore be designed to protect the compressor by:

1. Preventing excessive lubricating oil from being trapped in the system. Refrigerant piping must be sized for proper velocity, especially in suction lines, to return oil under all conditions. If capacity control is utilized, piping must be sized for full and part load conditions. With the increased use of mechanical subcooling in refrigeration conditions, the system designer must also consider the lower refrigerant mass flow that results in systems that are designed to operate with large amounts of subcooling (30°F to 70°F, 16°C to 39°C). With the new HFC refrigerants, this is especially important in low temperature applications using large amounts of subcooling (for example liquid subcooled from 110°F to 40°F, (43°C to 4°C). This can result in a 40% reduction in mass flow over a system without subcooling. The lower mass flow will result in lower refrigerant velocities and can result in inadequate oil return if not considered during the system piping design.
2. Minimizing the loss of lubricating oil from the compressor at all times.
3. Preventing liquid refrigerant from entering the compressor during operation and shut down.

To properly cover the subject of piping design would be too lengthy to treat here, especially since many excellent guides to piping design are presently available. For complete details of good system piping practices, the Carrier System Design Manual (Part 3 Piping Design) is recommended.

### 1.4 Vibration Isolation

On installations where noise and vibration must be kept to a minimum, it is desirable to use vibration mounts under the compressor unit, even though the compressors may be spring mounted. Proper precautions must be taken to prevent the transmission of compressor vibration through the piping system. It is also recommended to design the suction line with sufficient “spring” so the suction service valve can be moved aside for access to the suction strainer. Compressors applied in spring-mounted systems should also have adequate flexibility in the suction and discharge piping to avoid

the excessive stresses caused by the start and stop “kick” of the compressor. These excessive stresses can typically be avoided by adding bends in the piping in different directions. Many systems have been designed with compressors mounted to the bases. In these cases, it is important that the compressors be properly torqued to the base or the compressor may produce a “rattle” or transmit excessive vibration to the base.

For a more complete review of the system vibration and piping recommendations, see Carlyle OEM Bulletin #118.

### 1.5 Refrigerant Migration and Floodback

Liquid refrigerant, or even excessive amounts of entrained liquid particles in the suction gas, must be kept out of the compressor by proper system design and compressor control. Under running conditions, the presence of liquid refrigerant in the compressor tends to break down the oil film on the cylinder walls, resulting in increased wear to the cylinder walls and piston rings, and possible compressor damage. Furthermore, excessive liquid in the cylinders causes hydraulic compression, which can create cylinder pressures as high as 1500 psi (103 bar). This hydraulic loading can cause suction and discharge valve and gasket failures to occur while also subjecting the connecting rod, piston, and main bearings to excessive loading. Although laboratory testing of 06D and 06E compressors has shown that they can withstand substantial flooded starts and floodback, prolonged excessive flooding will eventually cause any compressor to fail.

Therefore, special care should be taken to ensure that liquid refrigerant is kept out of the compressor especially in systems where large quantities of refrigerants are often used. During compressor operation, the expansion valve must be properly adjusted to prevent liquid from entering the compressor.

During compressor shutdown, gravity, thermal action and refrigerant absorption will result in a refrigerant and oil mixture in the compressor crankcase. Gravity flow can be prevented by the use of recommended loops in the piping, but thermal action and the absorption of refrigerant by lubricating oil cannot be prevented by piping design. To minimize the absorption of refrigerant into the oil, the use of crankcase heaters is strongly recommended. Because oil dilution is more critical with HFC refrigerants and POE lubricants, Carlyle requires the

use of crankcase heaters in these applications. It is important, however, to never energize the crankcase heater while the compressor is running because this may overheat the compressor oil. (See Accessory Section 5.4 for applicable heaters.) Carlyle's experience indicates that many compressor failures occur during the first several months of operation. Many of these failures occurred during the initial start-up of the unit, and inspection reports indicate flooding was the probable cause of failure in many of these compressor returns. It is believed that many of these failures could have been avoided by using more care during the initial start-up of the compressors. Refer to the recommended start-up procedure in Carlyle's Refrigeration Compressor Service Guide (Lit. No. 020-611).

### **1.6 Proper Compressor Control and Protection**

An important consideration to maintain good compressor reliability is a proper control and protection strategy. It is extremely important that the compressor controls do not allow operation outside the compressor's approved application envelope. This may require the addition of low-pressure switches to avoid too low of a suction pressure and a high-pressure switch to limit the allowable discharge pressure. In many refrigeration applications an oil safety switch is required to avoid a loss of lubrication.

It is also important to limit compressor start and stops. Each time a compressor motor is energized a high inrush current is reached, if only for a fraction of a second. In addition the compressor bearing system is stressed, and Carlyle has found a direct correlation between excessive starts and higher failure rates. For that reason Carlyle does not recommend more than 12 starts per hour for these semi-hermetic compressors. In addition in refrigeration rack systems Carlyle has found that compressors properly applied will typically be limited to less than 75 cycles per day in low temperature systems and 150 cycles per day in medium temperature systems. Applications with much higher cycles per day have typically been related to poorly adjusted controls. Where possible it is recommended to add cycle counters that will allow monitoring of the cycles per day.

### **1.7 Clean and Dry System**

Clean and dry systems are essential for long compressor and motor life, and satisfactory operation. This cannot be over-emphasized. It is even more critical with the introduction of new HFC refrigerants and POE lubricants.

The new POE lubricants are excellent cleaning agents that will deposit system contaminants into the system or compressor filters and screens, causing excessive pressure drop or clogging, if the system is not kept clean. The moisture levels of all systems must be kept within acceptable limits. Excessive moisture when combined with heat and refrigerant can form damaging acids. One component that requires special attention is the compressor lubricant. With compressors applied with mineral oil (MO) or alkaline-benzene (AB) lubricants, the recommended limit for moisture is maintaining levels less than 50 PPM. With Polyol-Ester lubricants (POE) the allowable moisture level is higher at 100 PPM but it is much more difficult to maintain because of the very high affinity for moisture. Special care must be taken with POE oils to avoid moisture getting into the oil.

Compressors with POE should only be opened for very short periods. POE oil containers should be maintained with a dry nitrogen holding charge to keep out moisture.

Liquid line refrigerant filter-driers maintain low moisture content, and in the event of a motor burnout, prevent contamination of the evaporator and other parts of the refrigeration system. These filter-driers should be compatible with the new HFC refrigerants and POE oils if used.

Liquid line moisture indicators are recommended in all systems that use semi-hermetic compressors because they provide a continuous check on the system's moisture content. Excessive moisture in combination with a high operating temperature can lead to motor winding breakdown and burnout. When moisture is indicated, prompt corrective action, such as changing the filter-drier core or dehydrating the system, can prevent serious compressor damage.

### **1.8 Prevent Excessive Discharge Temperatures**

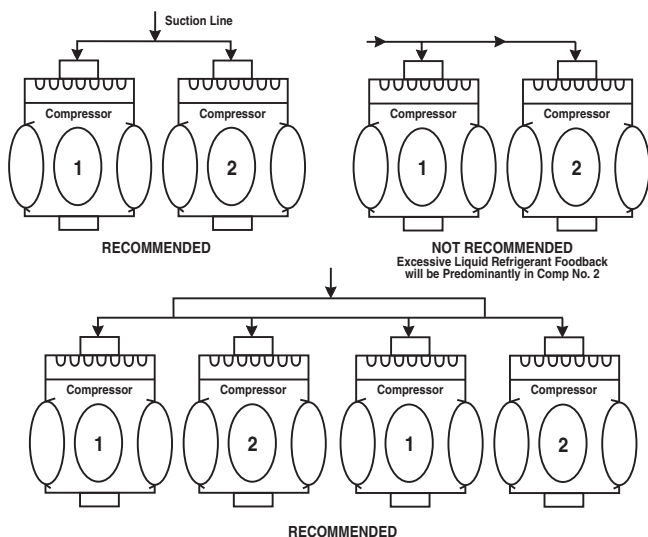
The actual discharge gas temperature at the compressor discharge service valve must not exceed 275°F (135°C). For HFC/POE applications the maximum recommended discharge temperature is 250°F (121°C). For a given refrigerant, this discharge temperature depends upon the compression ratio as well as the temperature of the superheated suction gas. Since an increase in either the compression ratio or suction gas temperature causes the discharge temperature to increase, both must be kept within allowable limits. In low temperature R-22 applications, external desuperheating is required. See Bulletin 02T-3 for these application recommendations.

## 1.9 Compressor Interconnection

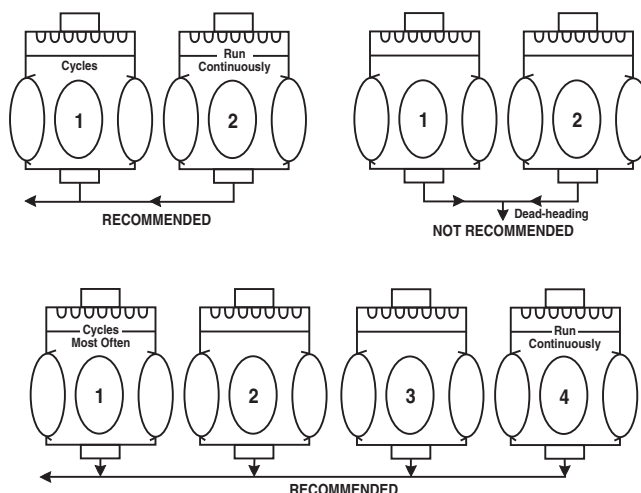
All 06D and 06E compressors are suitable for interconnection on common refrigerant circuits. General suction and discharge line piping recommendations are shown in Figures 1 and 2, respectively. For a complete guide to system piping practices, the Carrier System Design Manual (Part 3 Piping Design) is again recommended.

When only two 06D or 06E compressors of the same size are to be connected in parallel, the oil equalization can be accomplished with a single oil equalization line. This line can equalize both oil and gas. This method of equalization is only recommended when there are two compressors of the same size and the oil equalization line is short (2 to 4 feet, .6 to 1.2 meters long). In this case, a single 1-1/8" line can be used. Since this line equalizes both oil and gas, it is important that it be level to permit the lower half as an oil equalizer and the upper half as a gas equalizer.

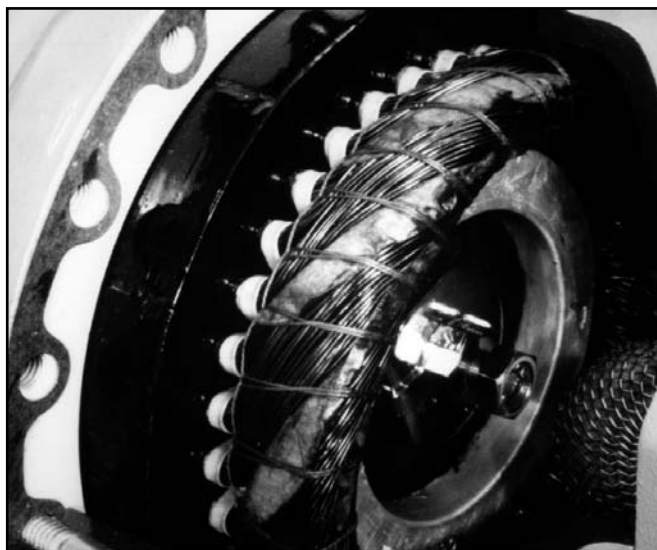
The 06E compressors have two sightglass connections, either of which may be removed for installation of the equalizer line. A small oil equalization check valve must also be added to those 06E compressors used in parallel. This check valve is part of the 06EA900101 compressor interconnection package and must be installed in the rotor locking bolt (torqued to 13-16 lb-ft, 1.8-2.2 kg-m) of each compressor (see Figure 3). The 06E rotor bolt is accessible by removing the suction strainer from the motor end cover. Installation of the check valve is best accomplished just prior to mounting the suction service valve.



**Figure 1 – Suction Piping**



**Figure 2 – Discharge Piping**



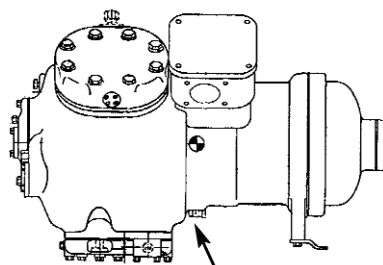
**Figure 3 – Rotor Locking Bolt**

The 06D compressors have only one sightglass and provision must be made for a sightglass in the oil equalizer line when the 06D compressors are interconnected using an oil equalization line. The 06D oil equalizer interconnection package is 06DA900092. The 06D compressors do not utilize or require the check valve in the rotor lock bolt.

When more than two compressors are to be connected in parallel or if 06D/E compressors of different displacements are to be connected in parallel, an oil control system utilizing an oil separator, oil reservoir, and floats is recommended. Several manufacturers supply this type of oil management system. It is important that floats are properly selected for Carlyle's 06D and 06E compressors. For the 06D compressor, a special adapter is

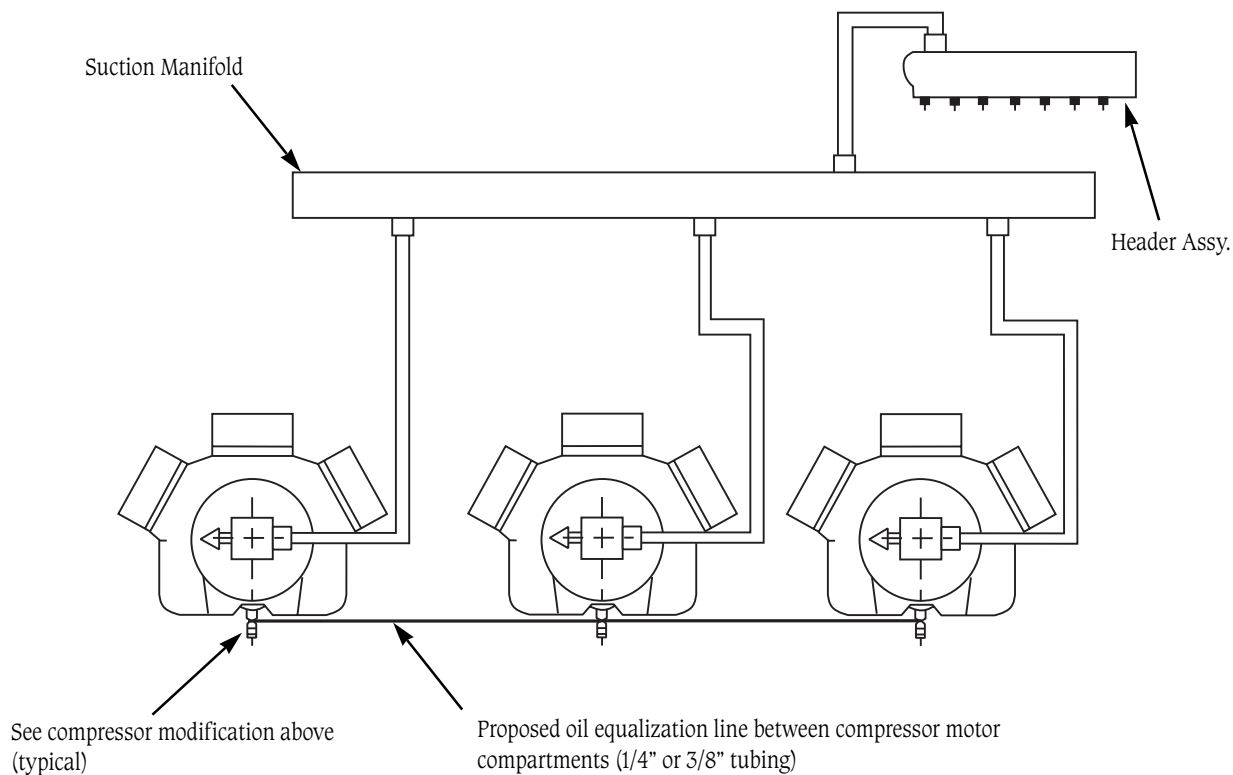
required to connect the float. For the 06E compressor, the float is required to control the oil level at 1/8 to 3/8 up the sightglass.

One of Carlyle's major concerns on multiple **06E compressor** applications is to avoid accumulating large quantities of oil in "off" compressors. To minimize this potential problem, Carlyle recommends the oil levels be kept at a 1/8 to 3/8 sightglass level. Even with this recommendation, Carlyle has found that many system manifold piping arrangements can allow excessive oil to drain into the motor compartment of "off" 06E compressors. To avoid this potential problem, Carlyle recommends the motor barrels of 06E compressors be equalized as shown in Figures 4 and 5. This motor barrel equalization is recommended in addition to either a float system or an oil compartment equalization line. Motor barrel equalization is recommended for 06E compressors only, the 06D compressors do not have this connection.



Remove existing 5/8-18 SAE oil plug at location indicated. Using same capscrew gasket, assemble adapter (Part No. 5F20-1311) and angle valve into crankcase as shown.

**Figure 4 – Compressor Equalization**



**Figure 5 – Oil Equalization Between Compressor Motor Compartments**

## 1.10 Motor-Compressor Selection

When selecting any compressor, proper allowance should also be made for abnormal conditions that may result in motor overloading. These conditions might include high suction temperature during pulldown or low voltage at compressor motor terminals.

During pulldown, the compressor cannot be subjected to loading rates higher than the maximum kW shown in the electrical data tables for more than short periods of time. Where an extended pulldown period is expected, the suction pressure must be limited by some positive means especially in refrigeration applications where motor overloading is more likely during pulldown conditions.

## 1.11 Outdoor Use

All UL recognized 06D and 06E compressors have terminal enclosures with corrosion protection specified that is suitable for outdoor use equipment as a sole enclosure. The 06D drawn steel terminal boxes used on 2 cylinder 06D compressors do not require any caulking for sole outdoor use, and are UL recognized as "Equal Alternate" to all caulked boxes previously used. Drawn steel boxes are available only for units requiring zero to two overloads.

## 1.12 Code Approvals

The 06D/E, 60 hertz compressors are UL recognized and CSA approved. Both the UL recognition and the CSA approval are covered in the UL File shown below, due to harmonized codes between the United States and Canada. The compressor certification is under UL 984 in the U.S. and under CSE Standard C22.2 No. 140.2-96 in Canada. All 06D/E 50 and 60 hertz compressors manufactured in Syracuse are ISO 9002 registered. The 06D/E code approvals are shown in the following files:

UL File# - SA4936

CSA File# - SA4936

ISO 9002 Certificate #A2899 (Carlyle - Syracuse)

06D and 06E compressors comply with the CE Mark requirements and will have the CE Mark logo added to the appropriate compressor nameplates. Effective May 29, 2002, all pressure equipment marketed and installed into service within the European Union must comply with the requirements imposed by the European Pressure Directive (PED) 97/23/EC. There are certain exclusions from compliance with this directive. The mechanical design of Carlyle 06D and 06E semi-hermetic compressors provides for exclusion from the scope of the PED based on criteria indicated in Article 1, Paragraph 3.10 of the directive.

## 1.13 Compressor Wiring Procedures

It is important that 06D and 06E compressors be properly wired and all electric connections are properly tightened. Carlyle Bulletins 98T-1 and 03T-1 should be reviewed and recommendations followed.

In addition most 06D OEM model compressors are supplied with overload relays in the compressor terminal box for overcurrent protection. All of these overloads have 1/4" quick connect terminals for customer control circuit and / or power connections. It is important that properly sized quick connect terminals be used when connecting to the overload terminals. Carlyle recommends the 1/4" electrical connectors be selected so they can withstand a 4 lb pull load before they begin to separate. Flag style connectors also generally allow for easier installation due to the orientation of the overloads in the terminal box.

## 2.0 Compressor Lubrication System

### 2.1 Compressor Lubrication

All refrigeration compressors must have adequate lubrication to ensure trouble-free operation and a long life. When starting up any new system, some oil will be lost to coat the inside of the piping, some oil will be lodged in low velocity areas of the system, and some will be kept in circulation. This loss must be made up by adding oil to the system after the initial start-up. Very low compressor oil levels can cause complete loss of lubrication and may result in an immediate compressor failure if not protected against.

The loss of oil can also be caused by flooded starts or refrigerant migrating into the oil during an off period and pulling the oil out of its sump during the sudden pressure drop of a start-up.

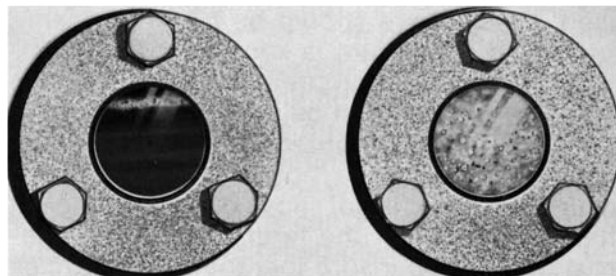
While it has always been apparent that very low oil levels can cause compressor damage, it has also become apparent that excessive oil charges can shorten the compressor's life. Oil levels above the center of the 06E compressor sightglass cause elevated crankcase and oil temperatures, increased power consumption, and possible valve plate gasket failures. This problem of excessive oil charges has been mainly evident on 06E multiple compressor applications and does not appear to have caused any difficulties with the application of 06D compressors.

The oil level should be observed in the sightglass immediately after the compressor shutdown, while it is still warm. The level observed when the compressor is not running for a long period may be a mixture of oil and refrigerant which would not be a true indication of the oil level when the compressor is running.

If the oil level in the sightglass of an 06E compressor is less than one-eighth ( $1/8$ ) up from the bottom of the glass, this indicates a low oil level. If the oil level is up more than one-half ( $1/2$ ) from the bottom, this indicates a high oil level. Therefore, the oil level should be  $1/8$  to  $1/2$  up the sightglass when the compressor is running for 06E compressors.

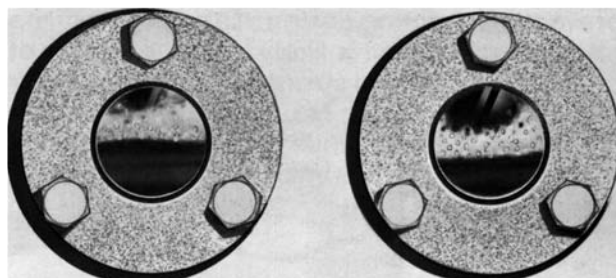
Figures 6, 7, and 8 show different oil levels when a single 06E compressor is running. The photos in each figure show the right and left sightglass of the same compressor (only one sightglass is factory supplied). If the level is not the same in each glass, consider the true oil level to be the lower level. The difference in levels is due to the rotation of the crankshaft. The crankshaft and

running gear are producing the windage required to push the oil down on one side while raising it on the other. Reversing the direction of rotation of the motor will reverse this relationship.



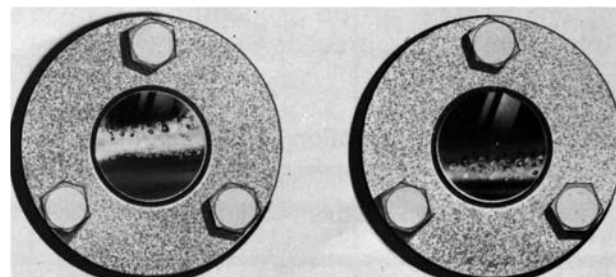
**Figure 6 – High Oil Level**

The oil level in Figure 6 is at least  $7/8$  of a sightglass. Note the high oil level in the left sightglass, and solid foam in the right sightglass. Whenever the glass is filled with foam, excessive oil is indicated and oil should be removed.



**Figure 7 – Better Running Oil Level**

The oil level in Figure 7 is  $3/8$ - $1/2$  of a sightglass. This is an acceptable oil level on a single compressor system, but does not always give a true indication of an excessive oil charge on multiple compressor systems.



**Figure 8 – Preferred Running Oil Level**

The oil level in Figure 8 is  $1/8$ - $1/4$  of a sightglass. The sightglasses are showing a different level because of the crankshaft rotation. Note the amount of clear glass above the levels. These levels will ensure against the possibility of excessive oil in the system.

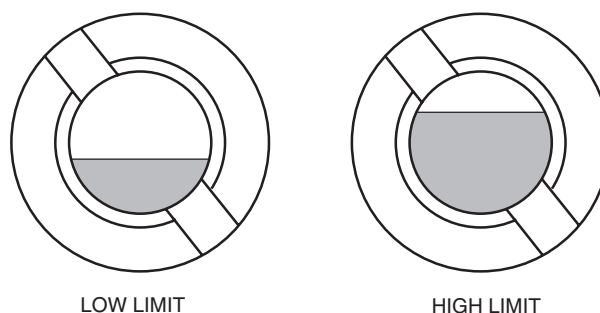


Another effect which has been noted, especially in multiple compressor systems, is the increased probability of blown valve plate gaskets when excessive oil is in the system. When the system is grossly overcharged (several gallons too much), the oil levels in the compressor sumps will only rise 1/2 to 3/4 level in the sightglass of 06E compressors. The remainder of the oil will be kept in circulation or will accumulate somewhere in the system. A likely point is in the suction manifold (depending on the method of returning oil), and in the compressor motor compartment. This is especially troublesome in an idle compressor in a multiple compressor system that has an opportunity to accumulate oil in the motor compartment; but excessive oil in the motor compartment at start-up will not alone fail gaskets. Some liquid refrigerant must also be present which will bring enough oil with it into the cylinders on a start-up to cause gasket failures. These circumstances have apparently occurred in a number of installations, and their relationship to gasket failures has been well confirmed by test.

To check for excessive system oil charges in 06E compressors, it is recommended that the oil levels of the compressors in the system be brought down to approximately 1/4 of the sightglass. If the system is overcharged, the oil levels will rise to a 1/2 sightglass level within a short time (usually within an hour). Continue removing oil until the oil level does not rise after removal. It is also recommended that the oil levels be kept at this 1/4 level, or between the levels shown in Figure 8. This is especially true if any compressors have experienced any repeated gasket failures. To summarize the advantages of keeping the oil at this level:

1. It ensure that excessive oil is not being lodged in the system. This will eliminate gasket, valve, and running gear failures.
2. The compressor, oil, and motor run cooler, approximately 20°F (11°C) or more in many cases.

As noted above, the oil level control in 06D compressors is less critical than 06E models. Motor barrel equalization is not required and oil level in the compressor sightglass should be controlled between 1/4 to 3/4 of the sightglass (See Figure 9). If the oil level in the sightglass is less than one-quarter (1/4) up from the bottom of the glass, this indicated a low oil level. If the oil level is up more than three-quarters (3/4) from the bottom, this indicates a high oil level. Again, the oil level should be checked immediately after the compressor is shut down.



**Figure 9 – 06D Oil Level Limits**

## 2.2 The Oil Pump

The 06D and 06E oil pump is a positive displacement vane type that produces high volume oil flow at a low oil pressure. The compressor utilizes an internal pressure regulator valve to maintain oil pressure at a constant 12 to 36 psi (.83 to 2.5 bar) above suction pressure.

## 2.3 Recommended Oils

When additional oil or a complete oil change is required, use only the listed Carlyle approved oils.

**For CFC and HCFC refrigerants use:**

MANUFACTURER	BRAND NAME
Totaline	150
Witco Suniso	3GS
Shrieve Chemical	Zerol 150*
Texaco Ind.	WFI-32-150
IGI Petroleum Ind.	Cryol-150

\*Alkyl Benzene Oil.

Use of oil adhesives is not allowed without written approval from the Carlyle Engineering Department.

For application with HFC refrigerants R-134a, R-507, and R-404A, Carlyle recommends an ISO 68 cST viscosity polyolester oil.

**Shown below are POE-68 oils that are approved for use in Carlyle compressors.**

MANUFACTURER	BRAND NAME
Castrol	E68
ICI EMKARATE	RL68H
CPI	Solest 68
Mobil Artic <sup>†</sup>	EAL 68
Castrol <sup>†</sup>	SW 68

<sup>†</sup>Medium temperature applications only.

Carlyle does not recommend the use of POE lubricants with R-22.

## 2.4 06D/E Oil Pressure History

All current 06D/E compressors are provided with the connections for an oil safety switch. The 06D/E compressors use the same basic oil pump design, however recent changes in the oil pressure regulator design have resulted in slightly different operating oil pressures. Shown below in Table 2 is a brief history of the 06D/E operating oil pressure.

While Table 2 can be used as a guide there are a number of variables that can affect the oil pressure in compressors. They include:

1. The CFC and HCFC MO or AB lubricants have lower viscosities than the heavier POE lubricants recommended. The lower viscosities will result in lower oil pressures than POE lubricants in the same compressor operated at identical conditions.

2. Oil temperature will also affect oil pressure. Hot oil will result in lower viscosities and lower oil pressures. Some of the variables that will result in higher oil temperature are: refrigerant type – especially R-22, high compression ratio that result in higher overall compressor temperatures and if the compressor is operated unloaded for long periods.

3. Carlyle 06DA and 06DF air conditioning models use a different oil pressure regulator than refrigeration duty 06DR or 06DM models. In 50 or 60 hertz applications the A/C models oil pressure will be equal or higher than the refrigeration duty models. This 06D A/C regulator though can result in lower oil pressure in variable speed applications. The regulator may require replacement in 06D A/C models if applied with variable speed. Review Carlyle Bulletin 95T-8 for modification recommendations. Note: the same oil pressure regulator is used in all 06E A/C and refrigeration models.

	06D MODELS PSI (Bar)	06E MODELS PSI (Bar)
<b>Before May 1984 (Prior S/N 2084J...)</b>	12 to 18 (.83 to 1.24)	12 to 18 (.83 to 1.24)
<b>May 1984 to March 1994 (Between S/N 2084J &amp; 1094J)</b>	16 to 22 (1.1 to 1.52)	16 to 22 (1.1 to 1.52)
<b>Starting March 1994* (Starting S/N 1094J...)</b>	18 to 26 (1.24 to 1.8)	18 to 34 (1.24 to 2.3)

\*06D/E refrigeration duty service models started using new high flow oil pumps in June 1994 (starting S/N 2994M (D/E) 5315).

**Table 2 – Oil Pressure History**

## 3.0 Capacity Control

### 3.1 Suction Cut-Off Capacity Control

Carlyle's compressor suction cut-off capacity control system has been approved for R-502, R-404A, and R-507 applications down to -40°F (-40°C) suction and for R-12, R-134a, R-407C, and R-22 medium and high temperature applications, but the system designer must carefully consider certain system design criteria when applying this new feature.

### 3.2 Design for Proper Oil Return to Compressor

When the 06D/E compressors are unloaded, the compressor and system capacity are reduced by 1/3, 1/2, or 2/3 of full load capacity. These capacity reductions result in the same large percent reduction in refrigerant flow rates through the system piping. Oil that is entrained and carried with refrigerant requires a certain gas velocity to properly return it back to the compressor and as this refrigerant flow drops, this may not be possible. This is especially true of the sizing of the suction line where oil return is most critical.

All system piping, but especially the suction line, must consider both full load and part load capacities and refrigerant velocities when being sized. For complete details of good system piping practices, the Carrier System Design Manual (Part 3 - Piping Design) or the ASHRAE Manual (Systems Volume) is recommended.

Unloading can decrease refrigerant velocities especially in the compressor and related piping. To help ensure excessive oil does not accumulate it is recommended to use a compressor control strategy that loads up a compressor for 60 seconds after 2 hours of continuous unloaded operation.

To protect the compressor against possible oil return problems, all 06D and 06E refrigeration duty compressors applied with capacity control must utilize oil safety switch protection. This requirement may be waived by Carlyle Application Engineering for certain high temperature, single compressor circuit applications (contact Carlyle Application Engineering for approval).

### 3.3 Capacity Control Application Ranges

**Low Temperature R-502, R-404A, and R-507**

**Application: -40°F to 0°F (-40°C to -18°C)**

**Saturated Suction Temperatures.**

Condensing temperature limits:

For all 4-cylinder 06D and 06E compressors - See

Figure 10. All 6-cylinder 06D and 06E compressors can be unloaded at all condensing temperatures below 120°F (49°C) with 1 bank of capacity control. Do not unload more than 1 bank on 6-cylinder 06D or 06E compressors in this low temperature application.

Note: In low temperature booster applications see differential pressure limits (DP) (Table 4, Page 20) for minimum condensing pressures required to load up.

**For low temperature R-22 applications:**

Unloaded operation is limited to the 0°F (-17.8°C) to -25°F (-31.7°C) saturated section temperature range and saturated condensing must be below 120°F (49°C). The use of unloaders is limited to 1 bank on all the 4 or 6 cylinder 06DR or 06ER models.

**Medium Temperature R-12, R-134a, R-502, and R-507 Application: 0°F to 40°F (-18°C to 4°C) Saturated Suction Temperatures.**

Unloading application limits at saturated condensing temperatures below 130°F (54°C): Can unload 1 bank on any 4-cylinder 06D or 06E compressor. Can unload 1 or 2 banks on any 6-cylinder 06D or 06E compressor.

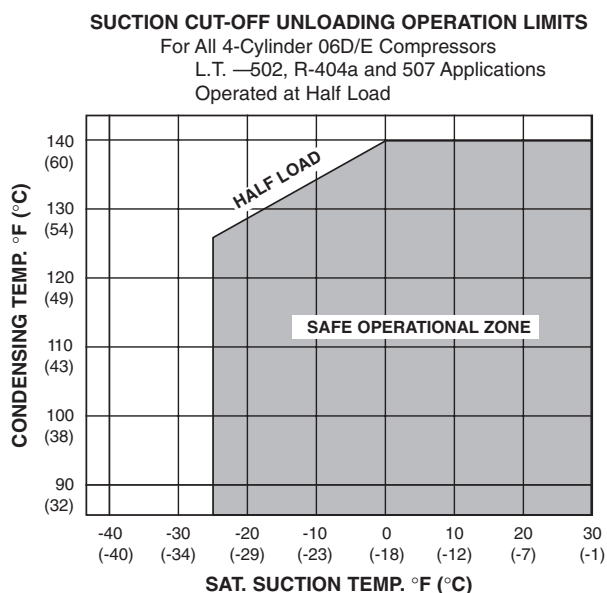
Note: With R-134a or R-12 see DP limits (Table 4, Page 20) for loading requirements.

**Medium Temperature R-22 Applications: 0°F to 25°F (-18°C to -4°C) Saturated Suction Temperatures.**

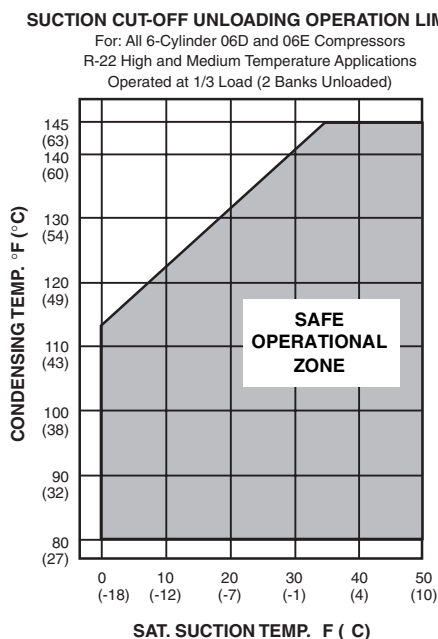
Unloading application limits at saturated condensing temperatures below 130°F (54°C): Can unload 1 bank on any 4 or 6-cylinder 06D or 06E compressor. Unloading more than 1 bank on any 6-cylinder 06D or 06E compressor in this medium temperature application is not recommended.

**High Temperature R-22 Applications: 25°F to 55°F (-4°C to 13°C) Saturated Suction Temperatures.**

Unloading application limits at SCT's below 145°F (63°C) and maximum superheat of 25°F (14°C). Can unload 1 bank on any 4-cylinder 06D or 06E compressor. Can unload 1 or 2 banks on any 6-cylinder 06D or 06E compressor per Figure 11.



**Figure 10 – Suction Cut-Off Operation Limits  
For 4-Cylinder 06D and 06E Compressors  
with R-502, R-404A, R-507**



Allow 1/3 load at 0 SST/115 SCT.

**Figure 11 – Suction Cut-Off Operation Limits  
For 6-Cylinder 06D and 06E Compressors  
with R-22**

### 3.4 Pump-Down Control

Compressors with suction cut-off unloading have inherently greater internal leak paths than compressors without this capacity control feature installed on them. Compressors with the electric capacity control have been successfully applied with continuous or automatic pump-down control. To avoid compressor short-cycling, the system designer should avoid continuous pump-down control when the suction pressure cut-in and cut-out points are within 30 psi (2.1 bar) of each other. Because the pressure actuated unloaders have a small built-in high to low pressure path, short-cycling will occur if continuous or automatic pump-down control is applied. **Do not use continuous or automatic pump-down control on any compressor equipped with pressure actuated capacity control.** Use single pump-out or solenoid drop (minimum protection) control.

### 3.5 Unloader Differential Setting

The unloader differential setting is the suction pressure difference at which the controller loads and unloads the particular cylinder bank. A differential setting that is too low could cause the unloader mechanism to short cycle. For example, when an 06D or 06E compressor unloads, the suction pressure rises because the compressor capacity has decreased by one-third or one-half. If the differential setting is too close, this rise in suction pressure may be enough to load the compressor back-up. For this reason, Carlyle recommends a minimum differential setting of 6 to 10 psi (.4 to .7 bar). The final setting should be evaluated for the final application because many variables are involved:

- Single or multiple compressor application
- Low or medium temperature application
- Unloading 4 or 6 cylinder (1/2 vs. 1/3 load reduction)
- Refrigerant 12, 22, 502, 507, 404A, or 134a

### 3.6 Part Load Performance Factors

To estimate part load performance of 06D/E compressors, use Table 3 below. The factors can be applied to the full load published Carlyle capacity and power data for all refrigerants and conditions. The system designer should ensure the conditions are within the safe operating range of the compressor.

The table below shows multiplication factors that apply to the compressor ratings when operating with suction cutoff unloading.

For example: You have a 6-cylinder 06E compressor with full load capacity = 100,000 Btu/hr (29.3 kW), full load power = 10 kW, and full load efficiency = 10 Btu/wHr (COP = 2.92). To calculate the capacity, power and efficiency at 2/3 load (one bank unloaded) use the factors from the table as shown.

2/3 load capacity	= .67 x 100,000 Btu/Hr
	= (.67 x 29.3 kW)
Btu/Hr	= 67,000 Btu/Hr
	= (19.63 kW)
2/3 load power	= .71 x 10 kW
	= 7.1 kW
2/3 load efficiency	= .94 x 10.0 Btu/wHr
COP	= (.94 x 2.92)
Energy Efficiency Ratio	= 9.4 Btu/wHr
COP	= 2.7

### 3.7 Location and Size of Capacity Control Head Assembly

The capacity control head assembly cannot be installed and will not function on the center cylinder head of any 06D or 06E 6-cylinder compressor. This unloader cannot be installed on Carlyle's 2-cylinder 06D models.

Capacity control heads can be installed on either side bank of any 6-cylinder 06D or 06E compressor.

A capacity control head can be installed on either side bank of 4-cylinder 06E compressor.

Capacity control heads will unload either side bank of any 4-cylinder 06D compressor but installation on the side opposite the terminal box is recommended. This avoids possible interference between the suction and discharge pressure connections on the compressor and the unloader coil assembly.

The suction cut-off unloader assembly has a cylinder head which is slightly larger than a plain side cylinder head. This results in a compressor which may be unloaded that is slightly wider (approximately 1/2" (1.3 cm) on 06D models and 3/8" (.95 cm) on 06E models) than a compressor without unloading capability.

COMPRESSOR MODEL	MULTIPLICATION FACTOR FOR 1 BANK UNLOADED			MULTIPLICATION FACTOR FOR 2 BANK UNLOADED		
	CAPACITY	POWER	EER	CAPACITY	POWER	EER
ALL 4 CYLINDER MODELS	.49	.57	.86	-	-	-
ALL 6 CYLINDER MODELS	.67	.71	.94	.32	.46	.70

Table 3 – Part Load Performance Multipliers

APPLICATION	SUCTION PRESSURE RANGE PSI (BAR)	ΔP REQUIRED-DISCHARGE MINUS SUCTION PRESSURE PSI (BAR)	
		06D	06E
L.T. R-502, 404A, 507	10-25 (1.7-2.7)	30 (2.1)	30 (2.1)
M.T. R-502, 404A, 507	30-60 (3.1-5.2)	40 (2.8)	45 (3.1)
M.T. R-12, 134a	10-30 (1.7-3.1)	30 (2.1)	35 (2.4)
M.T. R-22 or H.T. R-22	30-90 (3.1-7.2)	50 (3.5)	55 (3.8)

Table 4 – Required Differential Pressure for Unloader Operation

### 3.8 Pressure Differential ( $\Delta P$ ) Required to Load Compressor

A minimum  $\Delta P$  between the discharge and suction pressure is required to compress the unloader valve spring to load up the cylinder bank. While this differential pressure is low, it should be evaluated for certain low head pressure applications such as R-12, R-134a, air conditioning applications or the low stage of booster applications. The discharge pressure must be higher than the suction pressure in Table 4 (Page 20) for the unloader assembly to load up.

Suction cut-off unloading is an option for all four and six cylinder Carlyle 06D/E compressors. The capacity control operation and application requirements are found in the System Design section (Section 1.0) of this manual and should be carefully reviewed.

### 3.9 Electric Solenoid Capacity Control Operation

The electrically operated control valve is actuated by remote signal to the electric solenoid coil. Each valve controls 2 cylinders (1 bank). No manual adjustments to the electric unloader valve are necessary. When the solenoid is “de-energized”, the passageways in the valve are aligned for “loaded” conditions. When the solenoid is “energized”, the valve passageways are aligned for unloading.

This capacity control valve is controlled by an electric solenoid. When the solenoid is de-energized, the valve loads the cylinder bank (2 cylinders) as shown in Figure 12.

When full capacity is desired, an external controller de-energizes the solenoid coil, allowing the discharge pressure to build-up behind the unloader piston assembly. This will compress the unloader valve spring, opening the unloader suction port. Suction gas can now be drawn into the cylinders, running the bank fully loaded.

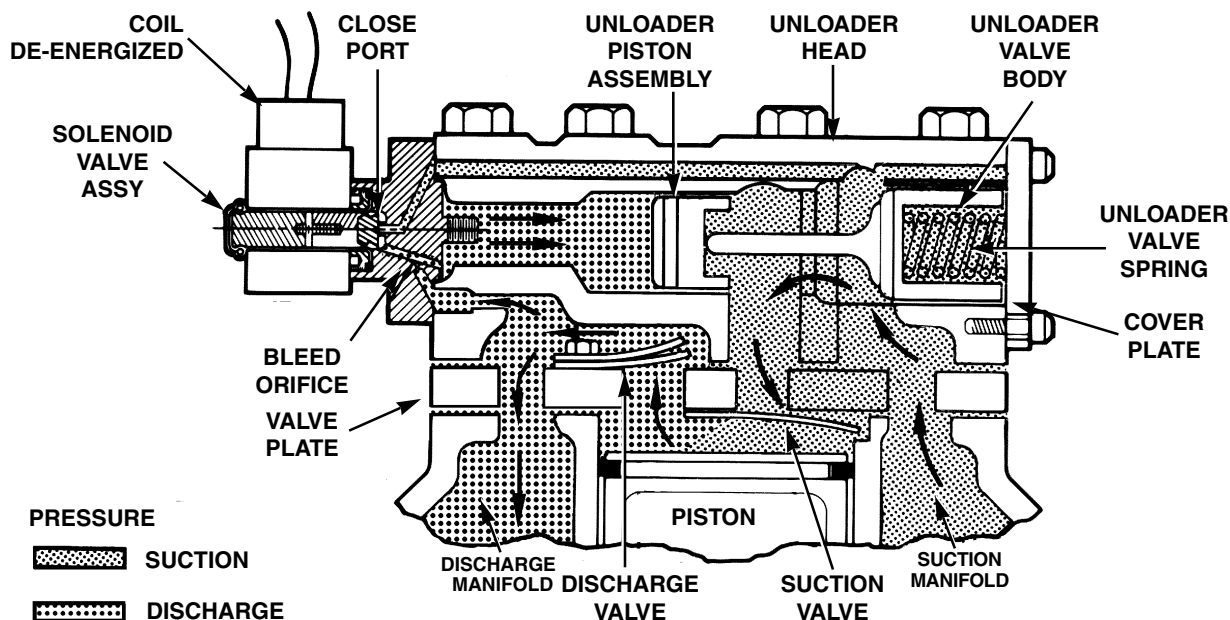
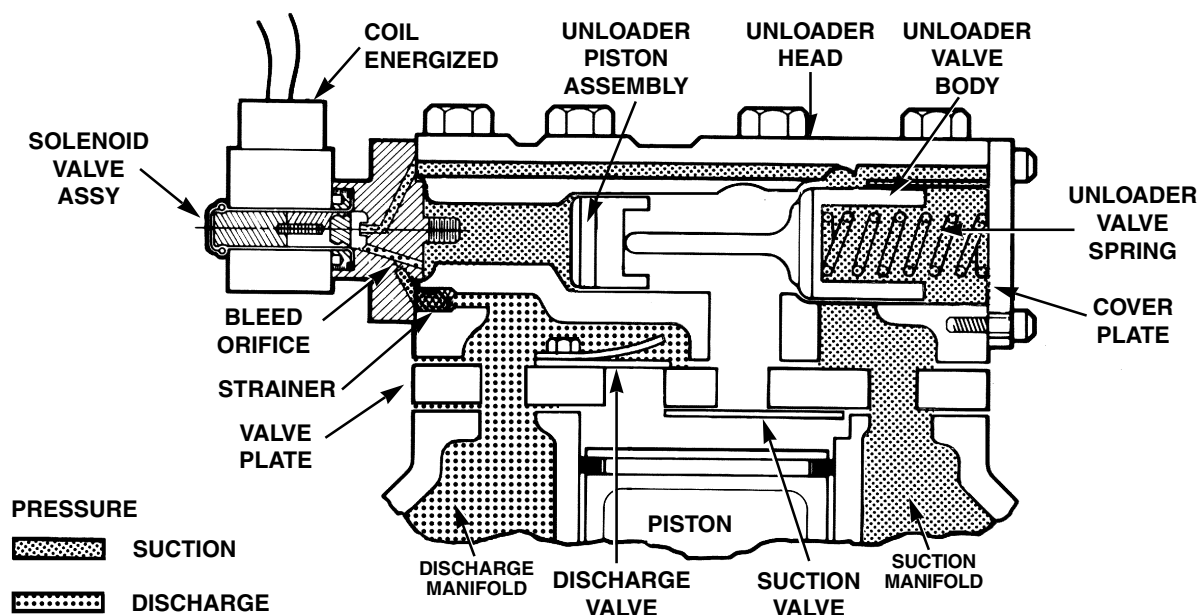


Figure 12 – Electric Loaded Operation



**Figure 13 – Electric Unloaded Operation**

As reduced capacity is desired an external controller energizes the solenoid coil. This opens the capacity control valve port, allowing the discharge gas behind the unloader piston assembly to vent back to the suction side as shown in Figure 13. The unloader valve spring at this point can move the unloader valve body to the left, blocking the unloader suction port. The cylinder bank is now isolated from the compressor suction manifold, unloading these two cylinders. No refrigerant is allowed into the cylinders and no compression takes place.

### 3.10 Suction Pressure Capacity Control

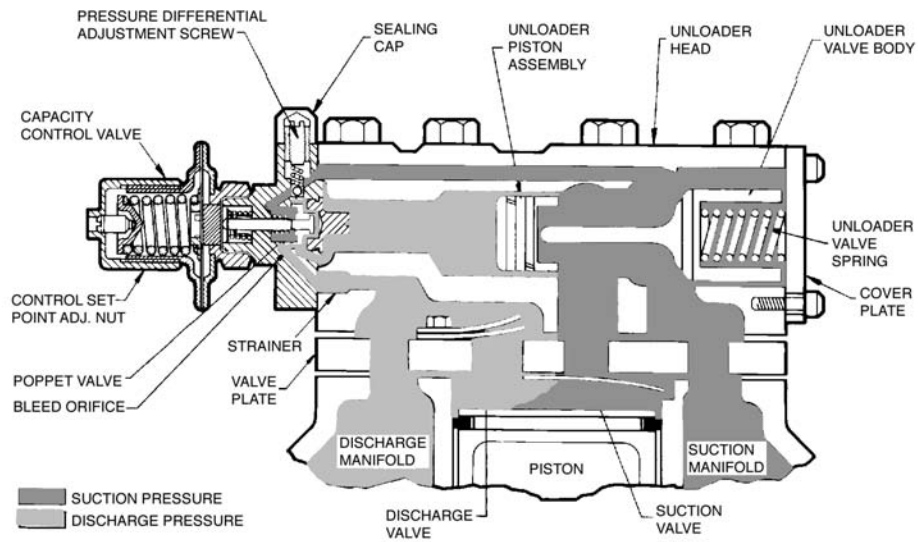
#### Operation

Pressure-operated control valve is controlled by suction pressure and actuated by discharge pressure. Each valve controls 2 cylinders (1 bank). On start-up, controlled cylinders do not load up until the differential between suction and discharge pressures is approximately 25 psi (1.7 bar) for 06D compressors and 35 psi (2.4 bar) for 06E models. See Table 4, page 20.

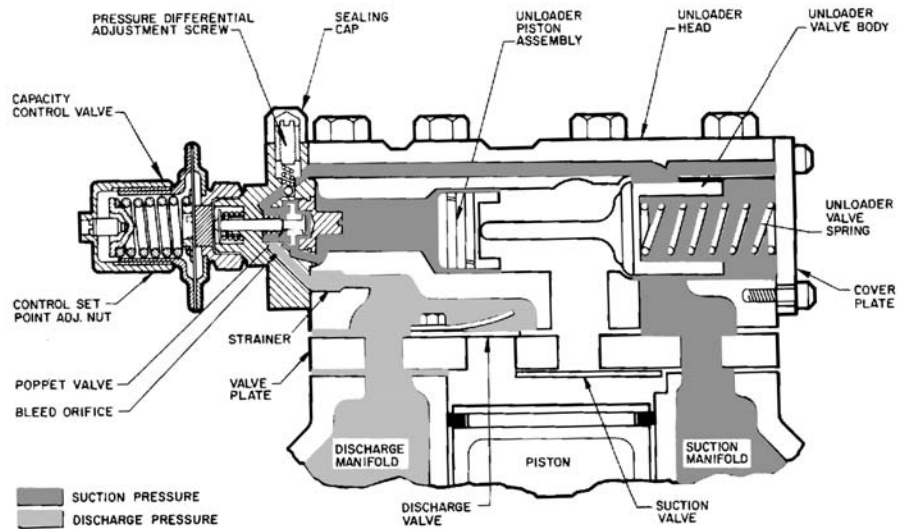
When suction pressure rises high enough to overcome set point spring, the diaphragm snaps to the left and relieves pressure against the poppet valve. The drive spring moves the poppet valve to the left and it seats in the closed position.

With the poppet valve closed, discharge gas is directed into the unloader piston chamber and pressure builds up against the piston. When pressure against the unloader piston is high enough to overcome the unloader valve spring, the piston moved the valve to the right, opening the suction port. Suction gas can now be drawn into the cylinders and the bank is running fully loaded (as shown in Figure 12A).

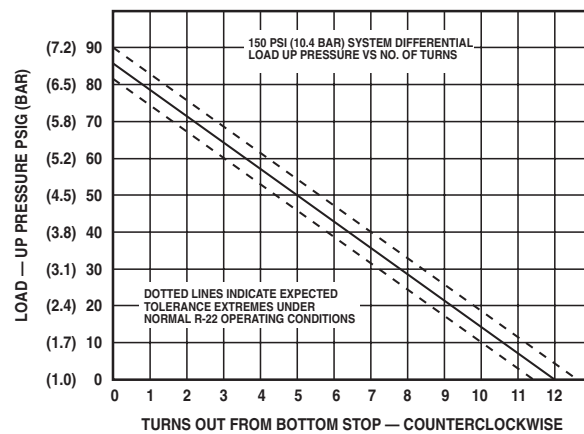
As suction pressure drops below the set point, the control spring expands, snapping the diaphragm to the right. This forces the poppet valve open and allows gas from the discharge manifold to vent through the base control valve to the suction side. Loss of full discharge pressure against the unloaded piston allows the unloader valve spring to move the valve left to the closed position. The suction port is blocked, isolating the cylinder bank from the suction manifold. The cylinder bank is now unloaded (as shown in Figure 13A).



**Figure 12A – Pressure Loaded Operation**

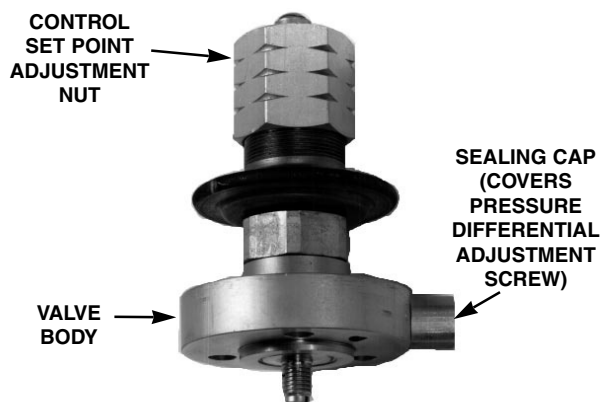


**Figure 13A – Pressure Unloaded Operation**



**Figure 14 – Control Set Point - Bypass & Suction Cut-Off**



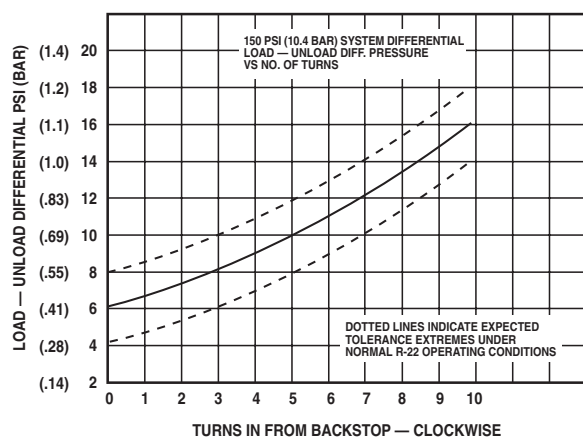


**Pressure Actuated Unloader Valve**

### 3.11 Pressure Actuated Capacity Control

#### Adjustment

**Control Set Point** - The cylinder load-up point is adjustable from 0 psig to 86 psig (1 bar to 6.9 bar). Refer to Figure 14. Turn the adjustment nut clockwise to the bottom stop. In this position, the cylinder load-up pressure is 86 psig (6.9 bar). Control set point is regulated to desired pressure by turning the adjustment nut counterclockwise. The number of turns can be determined from the curve in Figure 14. Each full turn counterclockwise decreases the load-up point by approximately 7.2 psi (.5 bar). Approximately 12 turns changes the pressure from 86 psig to 0 psig (6.9 bar to 1 bar). Pressure differential between cylinder load-up point and unload point is adjustable from 6 psi to 16 psi (.41 bar to 1.1 bar). Refer to Figure 15.



**Figure 15 – Differential Set Point**

Turn the adjustment screw counterclockwise to the back-stop. In this position, the differential is 6 psi (.41 bar). Differential is set by turning the adjustment screw clockwise. The number of turns to the desired differen-

tial can be determined from the curve. Each full turn clockwise increases the differential by approximately 0.8 psi (.06 bar). Approximately 5 turns changes the differential from 6 psi to 10 psi (.41 bar to .69 bar).

### 3.12 Variable Frequency Drives

Variable Frequency Drives (VFD's) may be used with Carlyle 06D/E refrigeration duty compressors and provide optimum capacity control while maximizing the compressor efficiency. Some of Carlyle's 06D air conditioning models may require modification of the internal lubrication system to operate properly. The changes required for the 06D A/C models are noted in Carlyle Bulletin 95T-8 or contact Carlyle Application Engineering if additional clarification is required. VFD's, when properly applied, provide very stable suction pressure control and minimize compressor cycling. Additionally, Carlyle reciprocating compressors attain their peak efficiency at approximately 900 - 1100 rpm. Therefore, the use of VFD's versus simply unloading or cycling compressors will typically result in significant energy savings. The limitations on the allowable speed ranges when using VFD's are 30 to 60 hertz. Application of Carlyle 06D/E compressors below 30 hertz may result in nuisance oil safety switch trips due to reduced oil pressure levels. Operation above 60 hertz may result in increased oil circulation rates and compressor valve failures.

Due to the low discharge gas pulsation frequency of reciprocating compressors (typically 30 to 180 hertz), after system start-up the operational frequency band should be swept to identify any high vibration areas due to the compressor exciting frequency matching a natural frequency of the piping or base. Any frequency bands that result in excessive vibration must be programmed to skip over.

Variable frequency drives should not be selected on nominal HP but based on the maximum KW of the compressor motor shown in Tables 5 thru 9 on pages 25 thru 28.

## 4.0 Compressor Features and Accessories

### 4.1 06D Compressor Motor Protection

The 06D compressors, when purchased with overloads installed in the compressor terminal box, are protected from motor overcurrent and overtemperature. The motor is completely protected against locked rotor, running overload, primary and secondary single phasing, and loss of refrigerant conditions. These compressors also comply with UL, CSA, and NEC (National Electrical Code) requirements for inherent motor protection.

These compressors also comply with the "CE Mark" requirements for European applications.

### Primary Motor Protection

Texas Instruments supplementary overloads are normally supplied with 06D compressors. These relays trip at or below the maximum continuous current (MCC) listed in the electrical data tables. These current sensitive, pilot duty relays are located inside the terminal box and will automatically reset after tripping (See Table 5). Load terminals of the overloads are 1/4 inch quick connect for ratings of 30 amps and below, and #10 screw terminals for ratings over 30 amps. Control circuit terminals are 1/4 inch quick connects. See section 1.13 for wiring recommendations.

COMPRESSOR MODEL	ELECTRICAL DATA					
	VOLT	HP	MAX. kW	MCC	RLA	LRA
06DR1090GA31*0	575			4.4	2.8	21.3
GA32*0	208/230	2	3.1	12.1	7.8	53.3
GA36*0	460			5.5	3.5	26.3
06DR0130CA31*0	575			7.0	4.5	28.4
CA32*0	208/230	3	4.3	17.4	11.2	71.0
CA36*0	460			8.7	5.6	35.5
06DR3160CA31*0	575			10.8	6.9	40.0
CA32*0	208/230	5	6.25	27.0	17.3	100.0
CA36*0	460			13.5	8.6	50.0
06DR7180DA31*0	575			10.8	6.9	40.0
DA32*0	208/230	5	6.25	27.0	17.3	100.0
DA36*0	460			13.5	8.6	50.0
06DR8200DA31*0	575			17.6	11.3	64.0
DA32*0	208/230	6.5	9.8	44.0	28.2	160.0
DA36*0	460			22.0	14.1	80.0
06DR7250DA31*0	575			17.6	11.3	64.0
DA32*0	208/230	6.5	9.8	44.0	28.2	160.0
DA36*0	460			22.0	14.1	80.0
06DR2280DA31*0	575			22.2	14.2	79.0
DA32*0	208/230	7.5	12.8	55.5	35.6	198.0
DA36*0	460			27.8	17.8	99.0
06DR3370DA31*0	575			25.0	16.0	91.0
DA32*0	208/230	10	16.5	62.0	39.7	228.0
DA36*0	460			31.0	19.9	114.0
06DR5410DA01*0	575			32.0	20.5	96.0
DA12*0	208/230	15	20.7	89.0	57.1	266.0
DA06*0	460			40.0	25.6	120.0

\* 0 or 5.

COMPRESSOR MODEL	ELECTRICAL DATA					
	VOLT	HP	MAX. kW	MCC	RLA	LRA
06DM8080GA31*0	575			7.0	4.5	28.4
GA32*0	208/230	3	4.1	17.4	11.2	71.0
GA36*0	460			8.7	5.6	35.5
06DM3130CA31*0	575			10.8	6.9	40.0
CA32*0	208/230	5	6.25	27.0	17.3	100.0
CA36*0	460			13.5	8.6	50.0
06DM3160CA31*0	575			10.8	6.9	40.0
CA32*0	208/230	5	6.25	27.0	17.3	100.0
CA36*0	460			13.5	8.6	50.0
06DM3370DA31*0	575			25.0	16.0	91.0
DA32*0	208/230	10	16.5	62.0	39.7	228.0
DA36*0	460			31.0	19.9	114.0
06DA8182AA31*0	575			17.6	11.3	64.0
AA32*0	208/230	6.5	9.8	44.0	28.2	160.0
AA36*0	460			22.0	14.1	80.0
06DA8252BA31*0	575			22.2	14.2	79.0
BA32*0	208/230	7.5	12.8	55.5	35.6	198.0
BA36*0	460			27.8	17.8	99.0
06DA3282BA31*0	575-3-60			25.0	16.0	91.0
BA32*0	208/230	10	16.5	62.0	39.7	228.0
BA36*0	460			31.0	19.9	114.0
06DA537BA01*0	575			32.0	20.5	96.0
BA12*0	208/230	15	20.7	89.0	57.1	266.0
BA06*0	460			40.0	25.6	120.0

\* 0 or 5.

**LEGEND**  
**LRA** — Locked Rotor Amps  
**MCC** — Maximum Continuous Current  
**RLA** — Rated Load Amps

ALLOWABLE OPERATING RANGE		
NOMINAL VOLTAGE	MAXIMUM	MINIMUM
208/230	254	187
460	529	414
575	661	518
400 (50Hz)	460	342
200 (50Hz)	230	180

**Table 5 – Electrical Specifications**

In cases where an 06D compressor is applied without the supplementary overloads, the use of approved calibrated circuit breakers is required. These circuit breakers must trip at or under the maximum continuous current (MCC) level listed in Table 5 on Page 36, and under the locked rotor conditions within 2 to 6 seconds. Carlyle-approved circuit breakers can use the 140% or 156% factor to determine RLA values. When approved circuit breakers are used, the must trip ampere value of the circuit breaker becomes the MCC value of the compressor branch circuit. This can be used to determine the new compressor branch circuit RLA value.

### Thermal Protection

Internal thermostats are also supplied with all 06D compressors with the only exception being part-winding start models. These thermostats are embedded in the motor windings with contacts rated at 240VA that open on temperature rise and close on temperature fall. When wired into the control circuit the 240VA rating should not be exceeded. Due to its small mass and the low temperature rise rate of the 06D motors, these thermostats follow motor temperatures closely and provide complete thermal protection. Thermostat connections are made at terminals #8 and #9 on the compressor terminal block in the terminal box. The thermostats are pilot duty, automatic reset devices.

### Branch Circuit Protection

Branch circuit protection may be obtained by use of time delay fuses as noted in the electrical table or by circuit breakers selected at 110% to 125% of compressor motor overload trip current or maximum continuous current values shown in Table 5. These circuit breakers or fuses should not be selected at trip settings less than the MCC (Maximum Continuous Current) values shown in Table 5.

## 4.2 06E Compressor Motor Protection

The 06E compressors must be applied with properly sized calibrated circuit breakers to protect the motor against overcurrent fault conditions.

### Primary Motor Protection

Calibrated circuit breakers must be provided for overcurrent protection. Approved circuit breaker selections are shown in Tables 6 - 9 (Page 27 and 28) for the 06EA, 06ER and 06EM compressors. **Use of circuit breakers other than those shown in this Application Manual, or any other alternate overcurrent protection must be approved by Carlyle Application Engineering - otherwise compressor warranty will be voided.** For proper overcurrent protection, the must trip setting of the calibrated circuit breaker must not exceed the compressor Maximum Must Trip Amps shown in Tables 6 - 9. The selected compressor overcurrent device must trip in 2 to 6 seconds at the LRA value shown for the compressor.

The circuit breakers 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 circuit breakers 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).

Table 9 shows the part winding (PW) 6 pole circuit breakers selected for 208/230 volt, three phase, 60 hertz applications. The selected compressor overcurrent protection device for part winding 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. These circuit breakers are stocked in limited quantities by Carlyle. Other 6 pole, part winding circuit breakers with different trip settings or for other voltages are also available but may require special order.

COMPRESSOR MOTOR DATA								CIRCUIT BREAKER DATA				
COMPRESSOR MODEL*	VOLT	HP	MAX. kW	MAX. MUST TRIP AMPS	MAX. RLA	LRA XL	LRA PW (1ST WINDING)	RECOMMENDED CIRCUIT BREAKER PART NO.	MUST HOLD AMPS	MUST TRIP AMPS	LRA	RECOMM. RLA
06ER(1/4)50100	575	15	22.0	38	27.1	96	59	HH83XA460	29	33.5	97	23.9
(1/4)50600	400/460			46	32.9	142	85	HH83XA463	40	46	150	33.9
(1/4)50300	208/230			90	64.3	283	170	HH83XB626	78	90	250	64.3
(1/4)50300	460			46	32.9	142	85	HH83XA463	40	46	150	33.9
06ER(1/4)65100	575	20	25.3	45	32.1	120	72	HH83XA461	33	38	124	27.1
(1/4)65600	400/460			54	38.6	173	104	HH83XA424	42	49	175	35.0
(1/4)65300	208/230			108	77.1	345	207	HH83XB625	91	104	350	74.3
(1/4)65300	460			54	38.6	173	104	HH83XA424	42	49	175	35.0
06ER(1/4)75100	575	20	25.3	45	32.1	120	72	HH83XA461	33	38	124	27.1
(1/4)75600	400/460			54	38.6	173	104	HH83XA424	42	49	175	35.0
(1/4)75300	208/230			108	77.1	345	207	HH83XB625	91	104	350	74.3
(1/4)75300	460			54	38.6	173	104	HH83XA424	42	49	175	35.0
06ER(0/3)99100	575	30	39.1	65	46.4	176	106	HH83XA430	50	58	168	41.4
(0/3)99600	400/460			84	60	253	152	HH83XA478	65	76	274	54.3
(0/3)99300	208/230			168	120	506	304	HH83XC539	142	163	507	116.4
(0/3)99300	460			84	60	253	152	HH83XA478	65	76	274	54.3

**Table 6 – Low Temperature - Across the Line Start**

COMPRESSOR MOTOR DATA								CIRCUIT BREAKER DATA				
COMPRESSOR MODEL*	VOLT	HP	MAX. kW	MAX. MUST TRIP AMPS	MAX. RLA	LRA XL	LRA PW (1ST WINDING)	RECOMMENDED CIRCUIT BREAKER PART NO.	MUST HOLD AMPS	MUST TRIP AMPS	LRA	RECOMM. RLA
06EM(1/4)50100	575	15	22.0	38	27.1	98	59	HH83XA460	29	33.5	97	23.9
(1/4)50600	400/460			46	32.9	142	85	HH83XA463	40	46	150	33.9
(1/4)50300	208/230			90	64.3	283	170	HH83XB626	78	90	250	64.3
(1/4)50300	460			46	32.9	142	85	HH83XA463	40	46	150	33.9
06EA(2/5)65100	575	25	33.6	57	40.7	164	98	HH83XA469	46	53	164	37.9
(2/5)65600	400/460			70	50	223	134	HH83XA426	55	64	210	45.7
(2/5)65300	208/230			140	100	446	268	HH83XC509	110	127	420	90.7
(2/5)65300	460			70	50	223	134	HH83XA426	55	64	210	45.7
06EM(1/4)75100	575	25	33.6	57	40.7	164	98	HH83XA469	46	53	164	37.9
(1/4)75600	400/460			70	50	223	134	HH83XA426	55	64	210	45.7
(1/4)75300	208/230			140	100	446	268	HH83XC509	110	127	420	90.7
(1/4)75300	460			70	50	223	134	HH83XA426	55	64	210	45.7
06EM(1/4)99100	575	35	47.6	77	55	212	127	HH83XA453	68	78	236	55.7
(1/4)99600	400/460			96	68.6	305	183	HH83XA547	77	88	283	62.9
(1/4)99300	208/230			193	137.9	610	366	HH83XC532	158	182	590	130.0
(1/4)99300	460			96	68.6	305	183	HH83XA547	77	88	283	62.9

**Table 7 – Medium Temperature - Across the Line Start**

\*The last two digits of the compressors model number may vary. See page 4. The fifth digit in ( ) of the compressor model number represents models with or without oil. 0, 1, 2 signifies older models with oil; 3, 4, 5 signifies newer models without oil. See page 4.

Max RLA = Max must trip amps ÷ 1.40

Recommended RLA = Circuit breaker must trip amps ÷ 1.40

#### LEGEND

LRA — Locked Rotor Amps

MCC — Maximum Continuous Current

RLA — Rated Load Amps

COMPRESSOR MOTOR DATA								CIRCUIT BREAKER DATA				
COMPRESSOR MODEL*	VOLT	HP	MAX. kW	MAX. TRIP AMPS	MAX. RLA	LRA XL	LRA PW (1ST WINDING)	RECOMMENDED CIRCUIT BREAKER PART NO.	MUST HOLD AMPS	MUST TRIP AMPS	LRA	RECOMM. RLA
06EA(2/5)50100 (2/5)50600 (2/5)50300 (2/5)50300	575 400/460 208/230 460	20	25.3	45 54 108 54	32.1 38.6 77.1 38.6	120 173 345 173	72 104 207 104	HH83XA461 HH83XA424 HH83XB625 HH83XA424	33 42 91 42	38 49 104 49	124 175 350 175	27.1 35.0 74.3 35.0
06EA(2/5)65100 (2/5)65600 (2/5)65300 (2/5)65300	575 400/460 208/230 460	25	33.6	57 70 140 70	40.7 50 100 50	164 223 446 223	98 134 268 134	HH83XA469 HH83XA426 HH83XC509 HH83XA426	46 55 110 55	53 64 127 64	164 210 420 210	37.8 45.7 90.7 45.7
06EA(2/5)75100 (2/5)75600 (2/5)75300 (2/5)75300	575 400/460 208/230 460	30	39.1	65 84 168 84	46.4 60 120 60	176 253 506 253	106 152 304 152	HH83XA430 HH83XA478 HH83XC539 HH83XA478	50 65 142 65	56 76 163 76	188 274 507 274	41.4 54.3 116.4 54.3
06EA(2/5)99100 (2/5)99600 (2/5)99300 (2/5)99300	575 400/460 208/230 460	40	54.0	94 118 236 118	67.1 84.3 168.6 84.3	276 345 690 345	165 207 414 207	HH83XA551 HH83XA550 HH83XC537 HH83XA550	74 92 187 92	85 106 215 106	236 295 636 295	60.7 75.7 153.6 75.7

\*The last two digits of the compressors model number may vary. See page 4. The fifth digit in ( ) of the compressor model number represents models with or without oil. 0, 1, 2 signifies older models with oil; 3, 4, 5 signifies newer models without oil. See page 4.

**Table 8 – High Temperature - Across the Line Start**

COMPRESSOR MOTOR DATA								CIRCUIT BREAKER DATA					
COMPRESSOR MODEL*	FOR 3 PHASE 60HZ VOLTAGE	HP	MAX. kW	MAX. TRIP AMPS	MAX. RLA	LRA XL	LRA PW (1ST WINDING)	RECOMMENDED CIRCUIT BREAKER PART NO.	1/2 WINDING		LRA 1ST WIND	LRA 2ND WIND	RECOMM. RLA
									MUST HOLD AMPS	MUST TRIP AMPS			
06ER(1/4)50	208/230	15	22.0	90	64.3	283	170	HH83XE633	38	44	152	120	62.8
06ER(1/4)65	208/230	20	25.3	108	77.1	345	207	HH83XE622	46	53	212	171	75.8
06ER(1/4)75	208/230	20	25.3	108	77.1	345	207	HH83XE622	46	53	212	171	75.8
06ER(0/3)99	208/230	30	39.1	168	120	506	304	HH83XE652	69	80	332	243	114.2
06EM(1/4)50	208/230	15	22.0	90	64.3	283	170	HH83XE633	38	44	152	120	62.8
06EM(1/4)75	208/230	25	33.6	140	100	446	268	HH83XE621	55	64	255	205	91.4
06EM(1/4)99	208/230	35	47.6	193	137.9	610	366	HH83XE609	78	90	380	300	128.6
06EA(2/5)50	208/230	20	25.3	108	77.1	345	207	HH83XE622	46	53	212	171	75.8
06EA(2/5)65	208/230	25	33.6	140	100	446	268	HH83XE621	55	64	255	205	91.4
06EA(2/5)75	208/230	30	39.1	168	120	506	304	HH83XE652	69	80	332	243	114.2
06EA(2/5)99	208/230	40	54.0	236	168.6	690	414	HH83XE660	100	115	414	345	164.2

\*The fifth digit in ( ) of the compressor model number represents models with or without oil. 0, 1, 2 signifies older models with oil; 3, 4, 5 signifies newer models without oil. See page 4.

**Table 9 – Part Winding**

## Thermal Protection

A discharge gas thermostat is supplied to provide overtemperature protection. These sensors are supplied with low and medium temperature 06ER and 06EM compressors. The sensor is factory installed into one cylinder head to sense discharge gas temperature. The sensor will open on temperature rise and close on temperature fall. The thermostat pilot duty contacts are rated for a 125 sealed VA and for an inrush of 1250 VA. They are automatically resetting and provide complete thermal protection.



**Figure 16 – Discharge Temperature Sensor**

Shown in Figure 16 is the discharge temperature sensor. Figures 17 and 18 show the discharge temperature sensor installed on a typical 4 and 6-cylinder 06E compressor. This control device is a temperature switch that opens on rising temperature and automatically closes with falling temperature.

06ER/EM* (Prior 1998) °F (°C)	06EA/ER/EM °F (°C)
OPENS 325° ±8° (163° ±4°)	295° ±5° (146° ±3°)
CLOSES 250° ±12° (121° ±7°)	235° Min. (113°) Min.

\* Standardized in 1998 on 06EA sensor.

The sensor wire leads located in the compressor terminal box are to be connected in series with the unit-control circuit wiring.

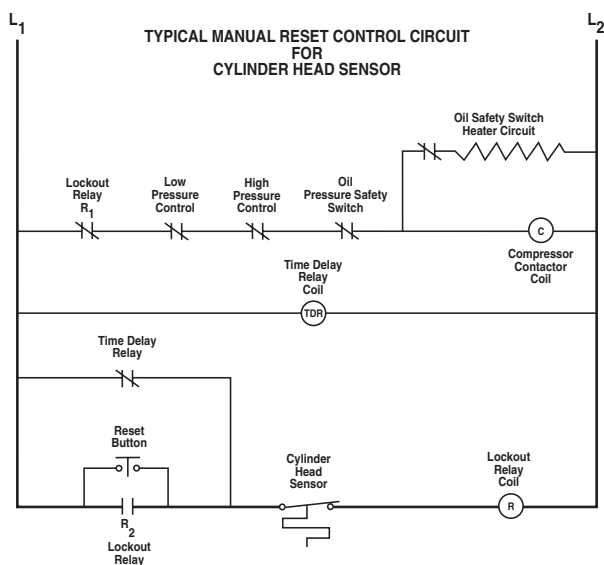


**Figure 17 – Typical Installation of Cylinder Head Sensor in 4 Cylinder 06E Compressor**



**Figure 18 – Typical Installation of Cylinder Head Sensor in 6 Cylinder 06E Compressor**

This discharge temperature sensor will operate as an automatic reset device. However, because the trip setting is at a high enough value, any trips should be investigated by service personnel. For that reason, Carlyle recommends the discharge temperature thermostat be wired into the control circuit in a manual reset mode. While a number of alternate wiring arrangements for manual reset are possible, one possible alternate is shown in Figure 19.



**Figure 19 – Alternative Wiring Diagram**

### Branch Circuit Protection

Branch circuit protection may be obtained by use of time delay fuses or by circuit breakers selected at 110% to 125% of compressor motor overload trip current.

### 4.3 Rated Load Amperes (RLA) and Maximum Continuous Current (MCC)

Rated Load Amperes or Rated Load Current is defined in Paragraph 440.3 of the National Electrical Code which states: "The rated-load current for a hermetic refrigerant motor-compressor is the current resulting when the motor-compressor is operated at the rated load, rated voltage and rated frequency of the equipment it serves." It is also stated that: "The Rated Load Current in amperes of the motor-compressor shall be marked by the equipment manufacturer on either or both the motor-compressor nameplate and the nameplate of the equipment in which the motor-compressor is used." The relevant UL Standards also reflect this position.

The above RLA value is established by the equipment manufacturer at their standard rating condition or on a calorimeter test with the unit's compressor at or near the condition representative of unit operation. In unitary equipment, that condition has been defined as the ARI Standard Rating Condition for the class of product involved. These products require the tests be run with the complete unit: compressor, condenser and evaporator. In refrigeration systems that are not completely defined (i.e., compressor or condensing units that can be applied with various evaporators), the calorimeter conditions have been arbitrarily selected and appear in UL 303 in classes of high, medium or low suction pressure applications. In these refrigeration applications, UL will allow the equipment manufacturer to use the compressor manufacturer's determination of maximum continuous current (MCC) as the basis for calculating minimum RLA values.

As a compressor manufacturer, Carlyle does not publish certified RLA values. We publish a maximum continuous current value (MCC) which UL certifies. This is verified by operating a compressor at a specified condition with a specific refrigerant. The voltage is then lowered until the compressor's protection system trips. The amperage value just before the point at which the protection trips is considered the MCC value.

### Determining RLA From MCC

The UL standards provide the equipment manufacturer with the option of using a motor-compressor Rated Load Amperage established by testing the equipment or determining the RLA value based on a certain percentage of the MCC value.

The percentage of the MCC value used is a function of the type of motor protection device, as outlined in Paragraph 440.52 of the National Electrical Code. Briefly, the National Electrical Code allows:

A separate overload relay that trips in response to motor-compressor current and selected to trip at not more than 140% of the marked motor-compressor Rated Load Current.

A thermal protector or protective system which will not permit a continuous current in excess of 156% of the marked Rated Load Current.

A fuse or inverse time circuit breaker response to motor-compressor current and rated at not more than 125% of the marked motor-compressor Rated Load Current.

#### 4.4 06D Compressor MCC Values

Carlyle 06D compressors are provided with overcurrent and over-temperature protection that comply with UL and NEC definitions of inherent motor protection. The overcurrent protection for 06D compressors is provided by supplementary overloads and these compressors have now had MCC values approved by the appropriate Code organization (UL, CSA). The UL Standard allows the MCC testing to be done in five different suction temperature ranges (in addition to different refrigerants); from refrigeration conditions (-40°F to +10°F, -40°C to -12°C) to normal air conditioning evaporator ranges (+32°F to +53°F, 0°C to 12°C). While changes in suction ranges and refrigerants will result in slight changes in MCC values, Carlyle's policy is to certify with UL only the largest MCC value for each individual 06D compressor. Therefore, there is only one MCC value independent of the suction range or refrigerant used.

#### 4.5 06E Compressor MCC Values

On larger 06E compressors, Carlyle requires that the system manufacturer utilize an approved and UL recognized overcurrent device to protect the 06E compressor against overcurrent conditions. These overcurrent devices may be magnetic overload relays or circuit breakers where the must trip setting is in effect, the maximum continuous current at which the compressor can operate. Since the overcurrent device can be selected to match the load, this policy gives the systems manufacturer greater flexibility in selecting and sizing the overcurrent device and the associated electrical compo-

nents. Since the overcurrent device can vary, there is no single MCC value which Carlyle lists with UL. Therefore, Carlyle will not be listing any MCC values with UL on any of the 06E compressors. Carlyle does specify the maximum must trip current which can be used with the 06E compressors and these values are shown on the 06E electrical tables (see Pages 27 and 28, Tables 6 - 9).

#### 4.6 06D Compressor Contactor Selection

Because contactors are not tested to determine their life performance acceptability under the above 156% rule, Carlyle does not recommend that contactors be sized to this rule. Carlyle recommends that contactors be sized to a current determined by dividing the MCC by 1.40.

As an example, for the 06DR228, 208/230 volt model, the minimum contactor sizing amperage equals:

$$\text{MCC}/1.40 = 55.5/1.40 = 39.6 \text{ amps.}$$

It is obvious that using the 140% rule results in more conservative contactor selections, therefore enhancing contactor and compressor reliability.

The RLA value that is stamped on the compressor or unit nameplate is left to the system manufacturer's discretion. Carlyle does not stamp RLA values on their compressor nameplates, thus allowing the system manufacturer the greatest flexibility in optimizing contactor, branch circuit conductor (wire) and disconnect sizes. In the above example, the 208/230 volt 06DR228 compressor could be stamped with an RLA value of 35.6 amperes, providing you meet Carlyle's contactor sizing requirements shown above.

#### 4.7 06D Compressors: Wire Sizing

The standard external overloads and internal thermostats currently supplied with all 06D compressors are considered a combination overcurrent and thermal protection system which complies with UL and NEC definitions of inherent thermal protection. Carlyle compressors that comply with this definition have the statement "Thermally Protected" stamped or printed on their nameplates. This would allow a system manufacturer to use 156 as the specified percent to determine the compressor minimum rated load current. The minimum RLA can be computed by dividing the MCC by 156% or 1.56. For the same 06DR228, 208/230 volt model:

$$\text{Min. RLA (to meet codes)}$$

$$\text{MCC}/1.56 = 55.5/1.56 = 35.6 \text{ amps}$$



## 4.8 06E Compressors: Contactor Selection and Wire Sizing

On our larger 06E compressors, Carlyle requires that the equipment manufacturer utilize an approved and UL recognized overcurrent device to protect the 06E compressor. In this case, the must trip setting of the overcurrent device is equivalent to the MCC for the compressor.

For the 06E example, an 06ER475, 208/230 volt model, in combination with a Heinemann calibrated circuit breaker, HH83XB625 was selected. This circuit breaker has a must trip setting of 104 amperes and this ampere value now becomes equivalent to the MCC value for this compressor/protection combination.

This type of compressor protection combination is classified by UL as an overload relay and, therefore, the minimum RLA value can be determined by using the 140% rule. Therefore, the minimum allowable RLA for this 06ER475, 208/230 volt compressor application would be 104 divided by 1.40 or 74.3 amperes. This value would also be the minimum ampere value Carlyle would allow for contactor and wire sizing. This RLA value only applies to the 06ER475 compressor protected by the HH83XB625 circuit breaker. If other circuit breakers or overload protection devices are used, different MCC and RLA values would result as dictated by the must trip setting of the protection device used.

The compressor Must Trip Ampere value shown in Table 6 (108 amperes for the 06ER475, 208/230-3-60 volt model) is the maximum ampere value at which the 06ER475 (208/230 volt) compressor motor can be operated, and the must trip setting of any circuit breaker or overload relay must be at or below 108 amperes. The 140% rule is used to determine a maximum compressor RLA value of 77.1 (108/1.40).

## 4.9 Compressor Nameplate Data

The compressor nameplate specifies voltage, phase, frequency, and locked rotor current. The rated load current shown in our specification charts may vary depending on the overcurrent device chosen, and for that reason is not typically printed in the space shown on the nameplate. If required, the OEM manufacturer can stamp the appropriate value. The locked rotor inrush current for the first step of part-winding start motors is shown in Tables 6 - 9 on Pages 38 and 39 for the 06E compressors. The 06D compressors are currently not available with part-winding start motors. The allowable voltage variation at the compressor terminals for all 06D and 06E compressors is typically within +10 of the nominal nameplate rating and is shown in Table 5, page 25.

## 5.0 Compressor Features and Accessories

### 5.1 Safety Relief Valves

All 06E compressors are equipped with built-in safety relief valves that are factory set to relieve from the discharge to the suction side of the compressor at a pressure differential of 400 psi (27 bar). On the 4-cylinder 06E compressor, the relief valve is located below the discharge service valve in the compressor crankcase. On the 6-cylinder 06E compressors, it is located in the center bank (below the valve plate) of the crankcase. The 06D compressors do not have a relief valve, since they are only required in compressors greater than 50 cfm (1.42 m<sup>3</sup>/min). During factory or field leak testing discharge side pressures should not exceed 350 psi to avoid inadvertently causing the relief valve to open. If this opens the relief valve may require replacement. System problems that result in the compressor operating at elevated head pressures (for example – cycling on the high pressure switch) may also cause the relief valve to subsequently open at lower operating pressures and thus require replacement.

### 5.2 Suction Strainers

Each 06D and 06E compressor is equipped with a suction strainer located in the suction manifold of the motor end bell (except on 2-cylinder models where it is located on the compressor side of the suction service valve).

### 5.3 Oil Safety Switch

Carlyle has approved the following oil safety switches for use with all 06D and 06E compressors:

1. Danfoss: (see Table 10 below)
2. Penn: P45-NCA-82(STD) or 45-NCB-14 with alarm circuit.
3. Johnson Controls: P445 (see Table 10 below)

Table 10 below shows the specifications for the Carlyle approved Danfoss Type series oil safety switches that are currently stocked by Carlyle.

The oil safety switch is designed to protect the compressor against loss of lubrication. The switch will close the control circuit at start-up (within the 120 second time delay), when the compressor operating oil pressure is at a maximum of 11 psi (.75 bar) above suction pressure. The switch will open the control circuit and shut the compressor off when the oil pressure drops to a minimum of 4 psi (.27 bar) above suction pressure and remains for the allotted 120 seconds. Carlyle's new higher flow oil pump has been found to improve lubrication during abuse conditions. As a result, for compressors built with the new higher flow oil pump (starting S/N1094J...), the allowable time delay has been increased from 45 to 120 seconds.

Carlyle Part No.	Danfoss Part No.	Time Delay	Connections	Pressure Diff. psi (bar)		Volts	Reset	Remote Alarm Circuit Capability
				Cut-In	Cut-Out			
P529-2430	060B2109	120 sec.	1/4" Male Flares	8-11 (.55-.76)	4-8 (.28-.55)	115/ 230	Manual	Yes
P529-2410	060B2164		3/8" Lg. (91 CM) Cap. Tube 1/4" SAE Nuts					

Carlyle Part No.	Johnson Part No.	Time Delay	Connections	Pressure Diff. psi (bar)		Volts	Reset	Remote Alarm Circuit Capability
				Cut-In	Cut-Out			
06DA660115	P445-NCB-826	120 sec.	Electronic	8-11 (.55-.76)	4-8 (.28-.55)	115/ 230	Manual	Yes

Table 10 – Oil Safety Switch Specifications

The use of an oil safety switch is recommended/required by Carlyle as noted below.

TYPE OF SYSTEM	USING 06D COMPRESSORS	USING 06E COMPRESSORS
Single Compressor without Unloading	Recommended	Required
Single Compressor with Unloading	Recommended	Required
Multiple Compressors without Unloading	Required	Required
Multiple Compressors with Unloading	Required	Required

## 5.4 Crankcase Heaters

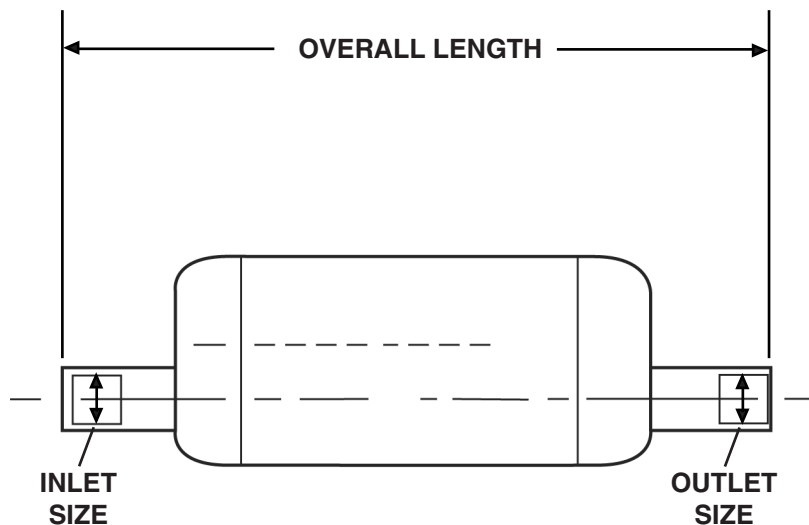
CRANKCASE HEATER PKG.	TYPE	HEATER NUMBER	VOLTAGE	WATTS	USAGE
06DA660091	Strap-on	HT33BK300	115	50	06D 2 & 4 Cyl. (Steel Bottom Covers) (See Note1)
06DA660092	Strap-on	HT33BK310	230	50	06D 2 & 4 Cyl. (Steel Bottom Covers) (See Note1)
06EA660148	Insertion	HT36FZ379	115	180	06D & 06E (4 & 6 Cyl.) (See Notes 2 & 3)
06EA660149	Insertion	HT36FZ479	230	180	06D & 06E (4 & 6 Cyl.) (See Notes 2 & 3)
06DA660076	Insertion	HT36DL480	480	125	06D & 06E (4 & 6 Cyl.) (See Notes 2 & 3)

- Notes: 1. See Carlyle Bulletin OEM-129 for installation recommendations.  
2. See Carlyle Bulletin 00T-2 for additional information.  
3. These packages are supplied with thermal grease that must be applied between the heater & bottom cover to give adequate heat transfer away from the heater.

## 5.5 Mufflers

PACKAGE NO.	QTY/ PKG	WEIGHT LBS. (KG)	USAGE	CONNECTION SIZES		OVERALL LENGTH
				OUTLET	INLET	
06DA605594	1	5 (2.3)	06D ( ) 808, 109, 013, 313, 316	5/8" ODM	5/8" ODM	11-1/4"
06DA605604	1	5 (2.3)	06D ( ) 718, 818, 820, 724, 824	7/8" ODF	7/8" ODF	11-1/4"
06DA605614	1	5 (2.3)	06D ( ) 228, 328, 337, 537	1-1/8" ODF	1-1/8" ODF	11-1/4"
06EA500302	1	10 (4.5)	06E ( ) 150, 250	1-3/8" ODF	1-3/8" ODF	15-5/8"
LM10HH100	1	6 (2.7)	06E ( ) 165, 265, 175, 275, 099	1-3/8" ODF	1-3/8" ODF	13-7/8"
06EA500712	1	7 (3.2)	06E ( ) 199, 299	1-5/8" ODF	1-5/8" ODF	13-7/8"

Mufflers can be mounted horizontally or vertically.



Typical Muffler

## 5.6 Baffle Plates

Baffle plates are an effective way to easily reduce gas pulsation; however, they have several limitations. They can result in a pressure drop that is too large when the suction pressure is too far above, or the discharge pressure is too far below, design conditions. Carlyle, therefore, recommends applying baffle plates in a manner that avoids high pressure drops. They are best used in service applications where occasionally excessive line vibration is found. Also see Carlyle Bulletin 99T-4 for additional application information.

### Carlyle Baffle Plate Recommendations – Low and Medium Temperature Applications

COMPRESSOR MODEL	LOW TEMPERATURE R-22/404A/507			MEDIUM TEMPERATURE R-22/404A/507		
	Part No.	Orifice Diameter (in.)	No. of Orifice Holes	Part No.	Orifice Diameter (in.)	No. of Orifice Holes
06DR109	Not Set Up	3/16	2	N/A	—	—
06DR013	Not Set Up	3/16	2	N/A	—	—
06DR316	06DA660103	3/16	3	N/A	—	—
06DR718	06DA660103	3/16	3	N/A	—	—
06DR820	06DA660103	3/16	3	06DA660103	3/16	3
06DR725	06DA660104	3/16	4	06DA660105	3/16	6
06DR228	06DA660104	3/16	4	06DA660105	3/16	6
06DR337/541	06DA660104	3/16	4	06DA660105	3/16	6
06ER(1/4)50	06DA660105*	3/16	6	N/A	—	—
06ER(1/4)65	06EA660146	3/16	6	N/A	—	—
06ER(1/4)75	06EA660146	3/16	6	N/A	—	—
06ER(0/3)99	06EA660145*	3/16	9	N/A	—	—

\*These selections have changed.

### Carlyle Baffle Plate Recommendations – Medium and High Temperature Applications

COMPRESSOR MODEL	MEDIUM TEMPERATURE R-22/404A/507			HIGH TEMPERATURE R-22/404A/507		
	Part No.	Orifice Diameter (in.)	No. of Orifice Holes	Part No.	Orifice Diameter (in.)	No. of Orifice Holes
06DM808	Not Set Up	3/16	2	Not Set Up	3/16	2
06DM313	Not Set Up	3/16	2	Not Set Up	3/16	2
06DM316	06DA660103	3/16	3	06DA660103	3/16	3
06DA818	06DA660103	3/16	3	06DA660103	3/16	3
06DR820	06DA660103	3/16	3	06DA660103	3/16	3
06DR725	06DA660105	3/16	6	06DA660105	3/16	6
06DA825	06DA660105	3/16	6	06DA660105	3/16	6
06DR228	06DA660105	3/16	6	06DA660105	3/16	6
06DA328	06DA660105	3/16	6	06DA660105	3/16	6
06DM337	06DA660105	3/16	6	06DA660105	3/16	6
06DA537	06DA660105	3/16	6	06DA660105	3/16	6
06EM(1/4)50	06DA660105	3/16	6	Not Set Up	7/16	3
06EA(2/5)50	06DA660105	3/16	6	Not Set Up	7/16	3
06EA265	06EA660145	3/16	9	Not Set Up	3/8	7
06EM(1/4)75	06EA660145	3/16	9	Not Set Up	3/8	7
06EA(2/5)75	06EA660145	3/16	9	Not Set Up	3/8	7
06EM(1/4)99	06EA660145	3/16	9	Not Set Up	3/8	7
06EA(2/5)99	06EA660145	3/16	9	Not Set Up	3/8	7

## 5.7 Discharge Line Check Valves

Under certain conditions a discharge line check valve is a valuable means for preventing condensed refrigerant from migrating into the cylinder heads of an idle compressor.

## 5.8 Suction Cut-Off Capacity Control

Suction cut-off unloading is an option for all four and six cylinder Carlyle 06D/E compressors. The capacity control operation and application requirements are found in the Section 1 of this manual and should be carefully reviewed. Shown below are the capacity control packages available.

## 5.9 Cylinder Head Cooling Fans

CYLINDER HEAD COOLING FAN PARTS		
	06D	06E
Complete fan package	06DR660014	06ER660011
Replacement motor (208/230-1-60)	HC27GB230	HC27GB230
CFM Air Flow (CMM Air Flow)	750 (21.24)	1000 (28.32)

Cylinder head cooling fans are required in certain low temperature, high compression ratio applications to keep internal compressor temperatures within limits.

### Capacity Control Packages – Suction Cut-Off Unloading

PACKAGE NO.	TYPE	QTY/PKG	USAGE
06DA660089	Electric*	1	All 06D 4 & 6 Cylinder Models
06DA660090	Pressure	1	
06EA660138	Electric*	1	All 06E Compressors
06EA660139	Pressure	1	

\*Electric coil is NOT included with 06DA660089 & 06EA660138 electric capacity control package – see coil packages below.

### Capacity Control Coil Packages

PACKAGE NO.	QTY.	VOLTAGE	WEIGHT LBS. (KG)
EF19ZE120	1	120-1-50/60	1 (0.5)
EF19ZE240	1	208/240-1-50/60	1 (0.5)
EF19ZE024	1	24-1-50/60	1 (0.5)

## 5.10 Spring Mounting

### 06D Spring Mounting Package

PACKAGE NO.	QTY/PKG	WEIGHT LBS. (KG)	USAGE
06DA660058†	1 Set	1 (0.5)	All 06D 2 Cylinder
6D44-492*	12 Sets	7 (3.2)	All 06D 2 & 4 Cylinder
06EA660056†	1 Set	1 (0.5)	
6D63-492*	12 Sets	8 (3.6)	All 06D 6 Cylinder
06DA660057†	1 Set	1 (0.5)	

\*The 6D44 & 6D68 packages consist of springs, spring guides and spring cups in quantities sufficient to mount (12) compressors. The spring guide requires a welded attachment in this design.

†The 06DA660056, 057 & 058 packages consist of mounting springs, retainer, stud flange nut, lock nut, snubber and snubber cap to mount one compressor. This design uses a flange nut that **does not** require welding.

### 06E Spring Mounting Package

PACKAGE NO.	QTY/PKG	WEIGHT LBS. (KG)	USAGE
06EA660089*	1 Set	2 (0.9)	All 06E Compressors
06EA900023†	2 Sets	4 (1.8)	

\*The 06EA900023 package consists of springs, spring guides and spring cups in quantities sufficient to mount (2) compressors. The spring guide requires a welded attachment in this design.

†The 06DA660089 package consists of mounting springs, retainer, stud flange nut, lock nut, snubber and snubber cap to mount one compressor. This design uses a flange nut that **does not** require welding.

## 5.11 Solid Mounting

All 06D/E compressors may be solid mounted. Carlyle offers the 30HR070-1071 solid spacer with four spacers required for each 06D or 06E compressor. The spacers are 1-1/8" O.D. x 1" high with a 1/2" diameter through the hole.

## 5.12 Electrical Terminal Parts

Special wire terminations are necessary for use with the 06E compressors and must be ordered separately for proper wire size. These crimp type connectors are available in the following sizes:

TERMINAL PARTS	WIRE SIZE
06EA900132	#6
06EA900102	#4
06EA900112	#2
06EA900122	#1/0

## 5.13 Conduit Adapter Plates

Electrical conduits are mounted to the 06E terminal box, by use of an adapter plate. Each compressor is supplied with conduit adapter plates for the appropriate size conduit based on the RLA of the particular compressor. Table 11 shows the conduit plate size provided with each compressor model.

COMPRESSOR MODEL	VOLTAGE	
	208/230/460	460/575
06ER150	1"	1"
06ER165	1"	1"
06ER175	1"	1"
06ER099	1" & 1-1/4"	1" & 1-1/4"
06EM150	1"	1"
06EM175	1" & 1-1/4"	1"
06EM199	1-1/4" & 1-1/2"	1-1/4" & 1-1/2"
06EA250	1-1/4" & 1-1/2"	
06EA265	1-1/4" & 1-1/2"	
06EA275	1-1/4" & 1-1/2"	
06EA299	1-1/4" & 1-1/2"	

**Table 11 – 06E Conduit Sizes Supplied**

## 5.14 SAE Adapter Fitting

PART NO.	WEIGHT LBS. (KG)	DESCRIPTION	USAGE
DE14CA126	1 (0.5)	To adapt compressor oil drain plugs from SAE fitting to 1/4 NPT	All 06D 4 and 6 cylinder and 06E compressors

## 5.15 Service Valves

06D - SERVICE SHUT-OFF VALVES					
COMPRESSOR	SUCTION VALVE	ODF (INCHES)	DISCHARGE VALVE	ODF (INCHES)	SELECTION
06DR109 06DM808 (3ø only)	06DA660061	7/8	06DA660060	5/8	Standard
	06DA660060	5/8	06DA660061	7/8	Optional
06DR109 06DM808 (1ø only)	06DA660062	7/8	06DA660060	5/8	Standard
	06DA660064	1-1/8	06DA660061	7/8	Optional
06DR013 06DR316 06DM316	06DA660064	1-1/8	06DA660060	5/8	Standard
	06DA660062	7/8	06DA660061	7/8	Optional
06DM313	06DA660062	7/8	06DA660060	5/8	Standard
	06DA660064	1-1/8	06DA660061	7/8	Optional
06DR718 06DR820	06DA660065	1-3/8	06DA660061	7/8	Standard
	06EA660090	1-5/8	06DA660060	5/8	Optional
	06DA660063	1-1/8	–	–	Optional
06DA818	06DA660064	1-1/8	06DA660061	7/8	Standard
	06DA660062	7/8	06DA660060	5/8	Optional
06DR724 06DR725	06DA660065	1-3/8	06DA660062	7/8	Standard
	06EA660090	1-5/8	06DA660064	1-1/8	Optional
	06DA660063	1-1/8	–	–	Optional
06DA824 06DA328 06DA825	06DA660065	1-3/8	06DA660064	1-1/8	Standard
	06EA660090	1-5/8	06DA660062	7/8	Optional
	06DA660063	1-1/8	–	–	Optional
06DR228	06EA660090	1-5/8	06DA660062	7/8	Standard
	06DA660065	1-3/8	06DA660064	1-1/8	Optional
	06DA660063	1-1/8	–	–	Optional
06DR337 06DM337 06DA537 06DR541	06EA660090	1-5/8	06DA660064	1-1/8	Standard
	06DA660065	1-3/8	06DA660062	7/8	Optional
	06DA660063	1-1/8	–	–	Optional

06D - SERVICE SHUT-OFF VALVES					
COMPRESSOR	SUCTION VALVE	ODF (INCHES)	DISCHARGE VALVE	ODF (INCHES)	SELECTION
06ER450 06EM450	06EA660091	2-1/8	06DA660064	1-1/8	Standard
	–	–	06DA660062	7/8	Optional
06EA550	06EA660090	1-5/8	06DA660064	1-1/8	Standard
	06DA660065	1-3/8	06DA660062	7/8	Optional
	06DA660063	1-1/8	–	–	Optional
06ER465 06ER475 06ER399 06EM475 06EA575	06EA660091*	2-1/8	06DA660065	1-3/8	Standard
	–	–	06EA660090	1-5/8	Optional
	–	–	06DA660063	1-1/8	Optional
06EA565	06EA660090	1-5/8	06DA660065	1-3/8	Standard
	06DA660065	1-3/8	06EA660090	1-5/8	Optional
	06DA660063	1-1/8	06DA660063	1-1/8	Optional
06EM499 06EA599	06EA660091*	2-1/8	06EA660090	1-5/8	Standard
	–	–	06DA660065	1-3/8	Optional
	–	–	06DA660063	1-1/8	Optional

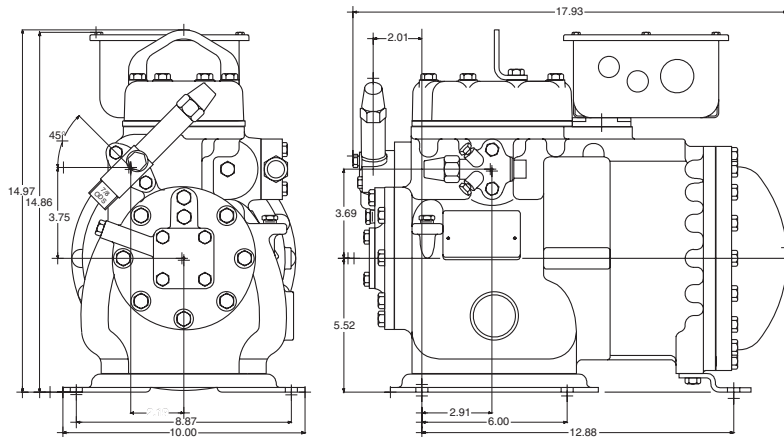
\*06DA660164 - 2-1/8" Service valve package also available in brass as alternative.

## Appendix A: Compressor Outline Drawings

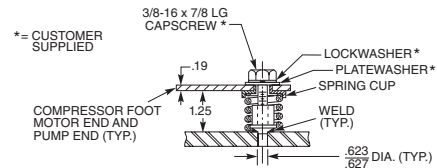
<b>Model Compressor</b>	<b>Application</b>	<b>Page</b>
06DR109	Low Temperature	40
06DM808 & 06DA808	Medium & High Temperature	40
06DR013	Low Temperature	41, 42
06DR316	Low Temperature	41, 42
06DM313 & 06DA313	Medium & High Temperature	43, 44
06DM316	Medium Temperature	43, 44
06DR718	Low Temperature	45, 46
06DA818	Medium & High Temperature	47, 48
06DR820	Low & Medium Temperature	45, 46
06DR725	Low & Medium Temperature	49, 50
06DA825	Medium & High Temperature	51, 52
06DR228	Low & Medium Temperature	49, 50
06DA328	Medium & High Temperature	51, 52
06DR337	Low & Medium Temperature	49, 50
06DM337	Medium Temperature	49, 50
06DA537	Medium & High Temperature	51, 52
06DR541	Low & Medium Temperature	49, 50
06ER450	Low Temperature	53, 54
06EM450	Medium Temperature	55, 56
06EA550	Medium & High Temperature	57, 58
06ER465	Low Temperature	59, 60
06EA565	Medium & High Temperature	61, 62
06ER475	Low Temperature	59, 60
06EM475	Medium Temperature	63, 64
06EA575	Medium & High Temperature	65, 66
06ER399	Low Temperature	59, 60
06EM499	Medium Temperature	67, 68
06EA599	Medium & High Temperature	69, 70



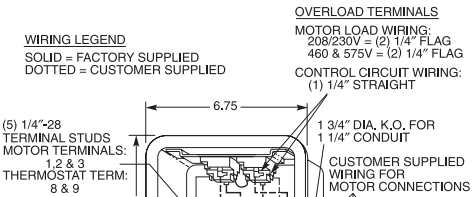
## 06D Low Temperature Compressors



CYLINDERS: 2  
CFM: 9  
MODELS: 06DR109  
UNLOADING AVAIL: NO  
STEPS: 0

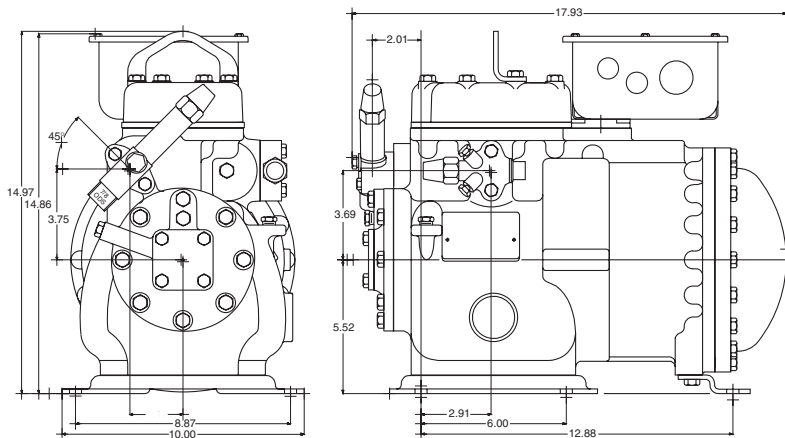


**SPRING MOUNTING ARRANGEMENT**

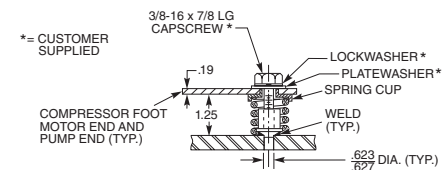


**TERMINAL BOX DATA**

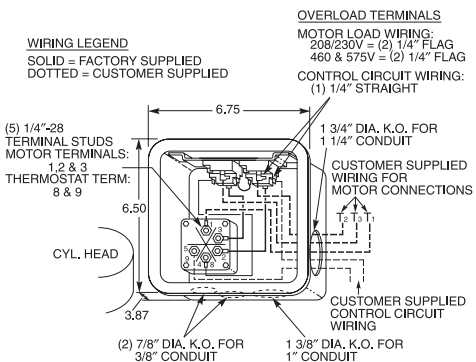
## 06D Medium/High Temperature Compressors



CYLINDERS: 2  
CFM: 8  
MODELS: 06DA808  
06DM808  
UNLOADING AVAIL: NO  
STEPS: 0



**SPRING MOUNTING ARRANGEMENT**

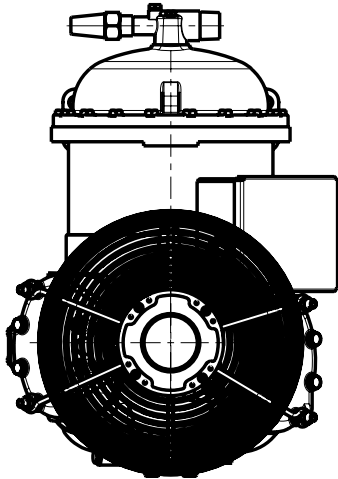


**TERMINAL BOX DATA**

NOTE: ALL DIMENSIONS ARE IN INCHES  
Multiple service valve orientations are possible

MODELS REPRESENTED	CFM	HP
06DR013	13.1	3.0
06DR316	15.9	5.0

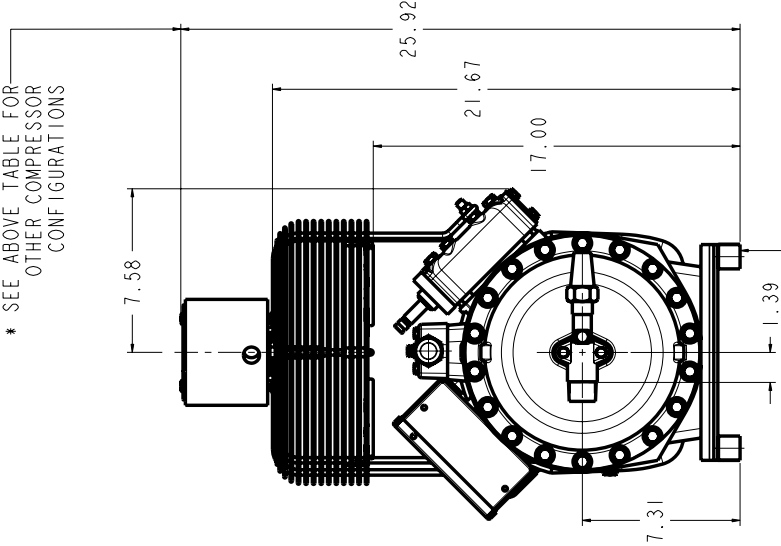
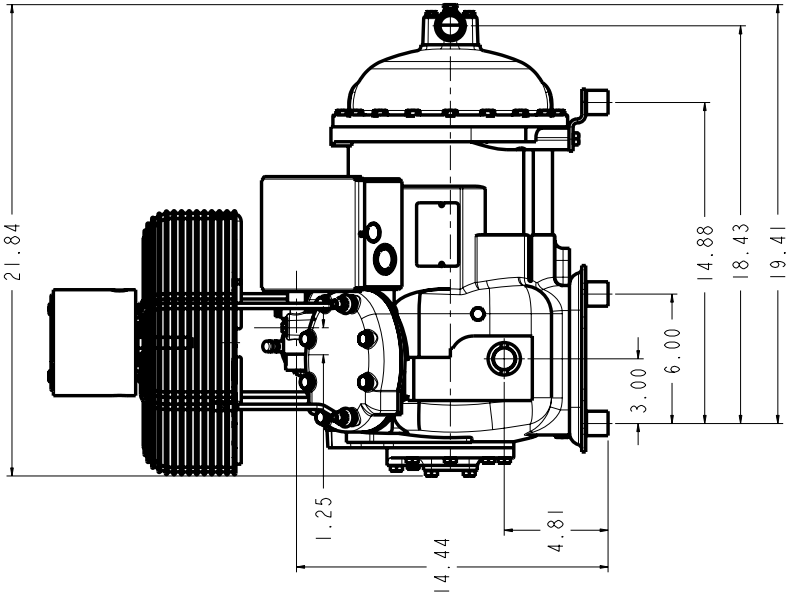
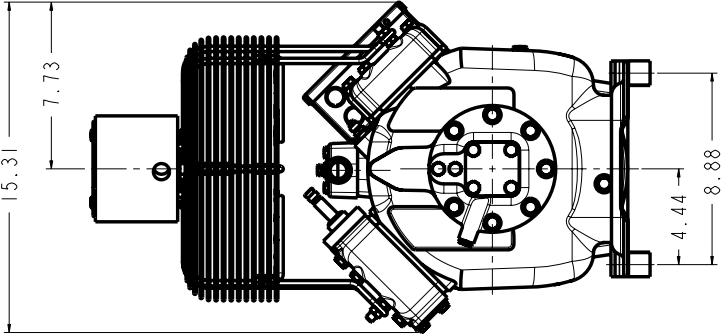
\* ALL DIMENSIONS SHOWN IN INCHES



MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	16.06
ELECTRIC	NO	16.06
PRESSURE	NO	16.98
N/A	YES	25.92

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS

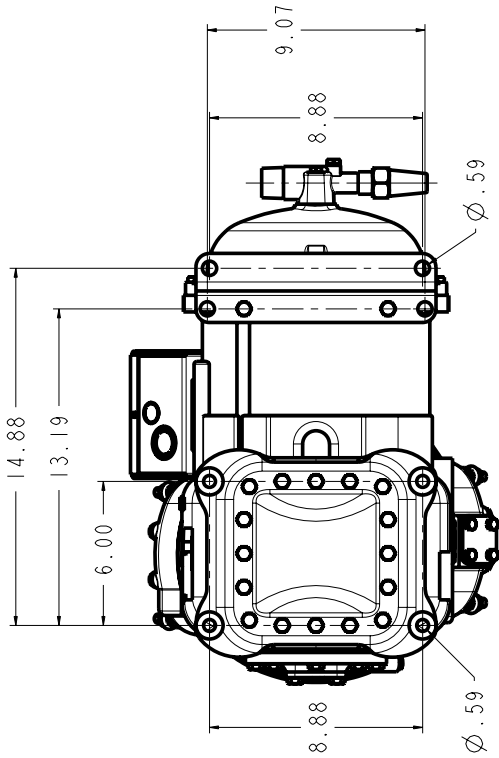


\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATIONS

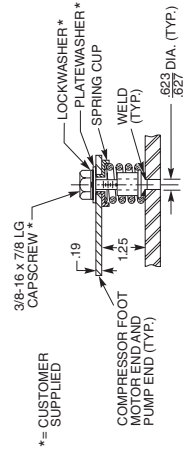
SOLID MOUNT SPACER (4X)  
30HR070-1071 AS SHOWN  
SEE DETAIL ON SHEET 2

MODELS REPRESENTED	CFM	HP
06DR013	13.1	3.0
06DR316	15.9	5.0

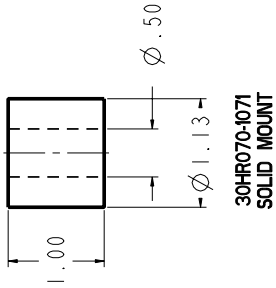
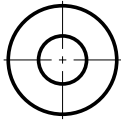
\* ALL DIMENSIONS SHOWN IN INCHES



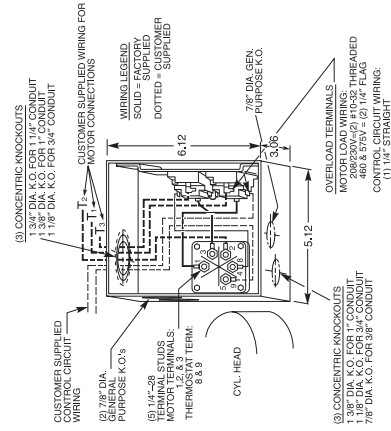
**BOTTOM VIEW  
MOUNTING BOLT PATTERN**



**SPRING MOUNTING ARRANGEMENT**



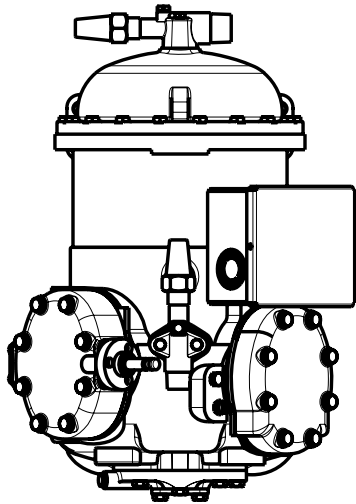
**30-HR070-1071  
SOLID MOUNT**



**TERMINAL BOX DATA**

MODELS REPRESENTED	CFM	HP
06DM313	13.1	5.0
06DM316	15.9	5.0

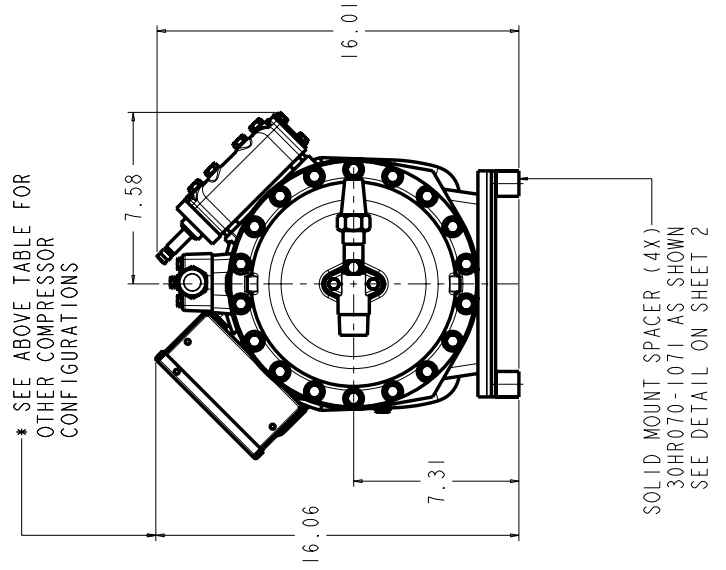
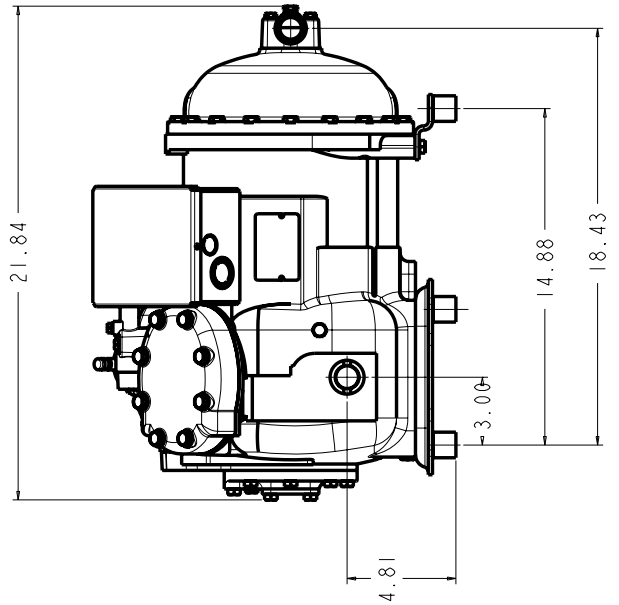
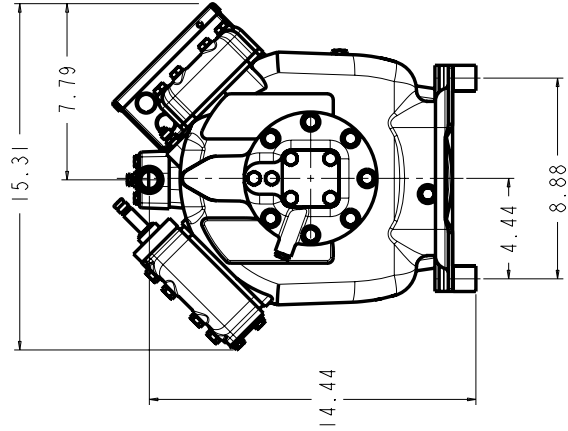
\* ALL DIMENSIONS SHOWN IN INCHES



MAX HEIGHT SUMMARY TABLE

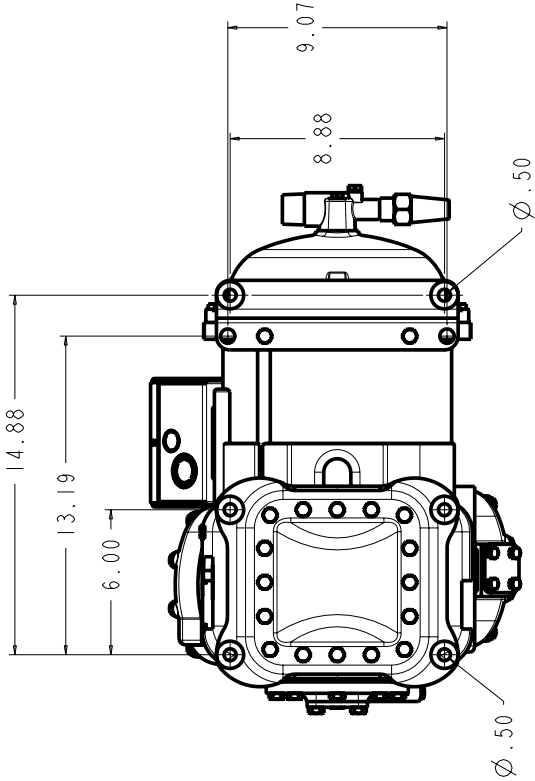
UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	16.06
ELECTRIC	NO	16.06
PRESSURE	NO	16.98

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS

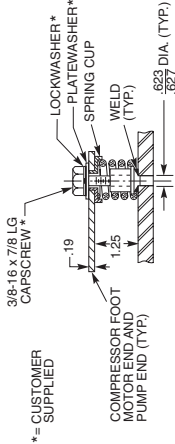


MODELS REPRESENTED	CFM	HP
06DM313	13.1	5.0
06DM316	15.9	5.0

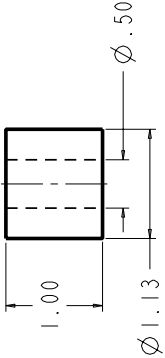
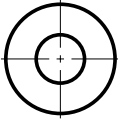
\* ALL DIMENSIONS SHOWN IN INCHES



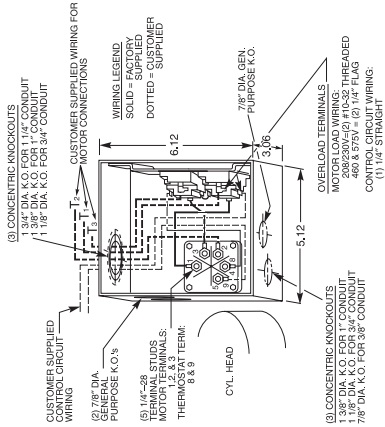
BOTTOM VIEW  
MOUNTING BOLT PATTERN



SPRING MOUNTING ARRANGEMENT

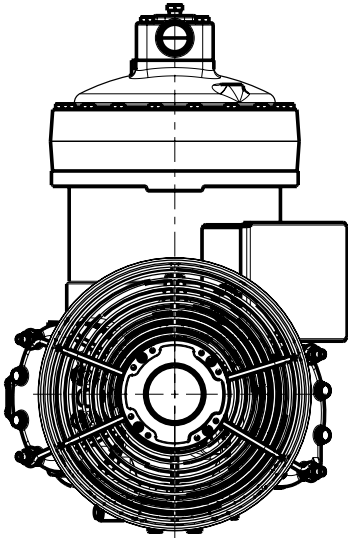


30HR070-1071  
SOLID MOUNT



MODELS REPRESENTED	CFM	HP
06DR718	18.3	5.0
06DR820	20.0	6.5

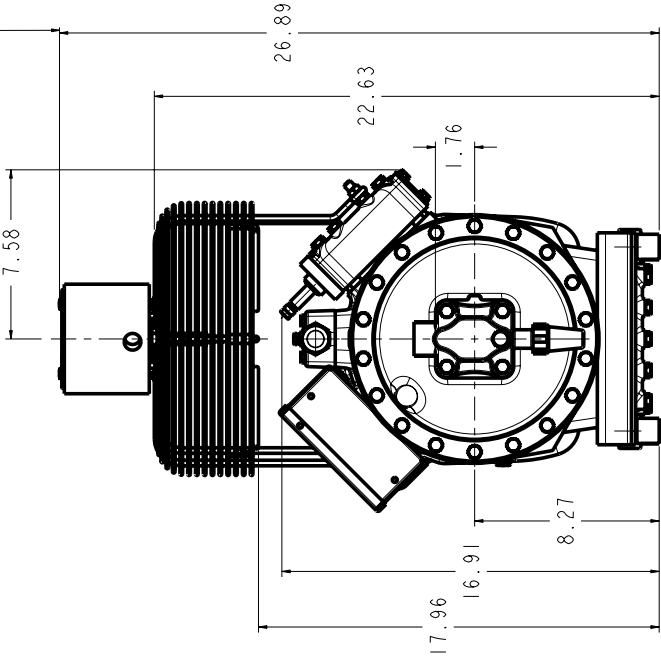
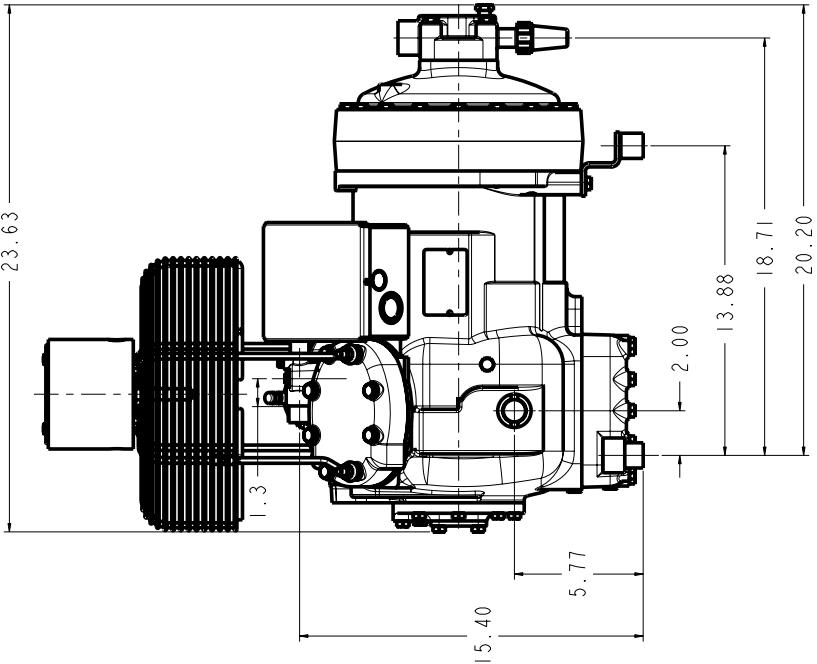
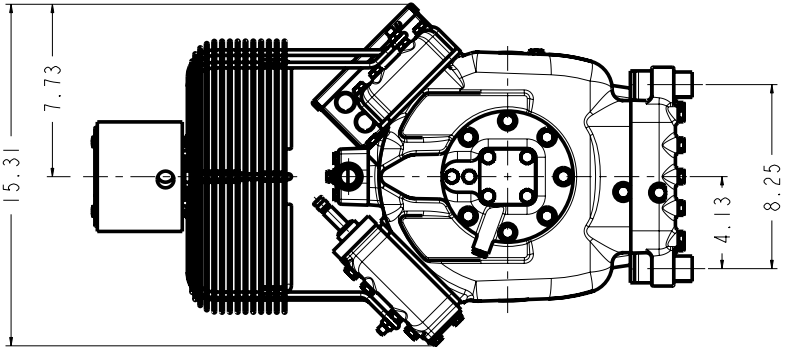
\* ALL DIMENSIONS SHOWN IN INCHES



MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	16.97
ELECTRIC	NO	17.02
PRESSURE	NO	17.92
N/A	YES	26.89

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS



\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATIONS

SOLID MOUNT SPACER (4X)  
30HR070-1071 AS SHOWN  
SEE DETAIL ON SHEET 2



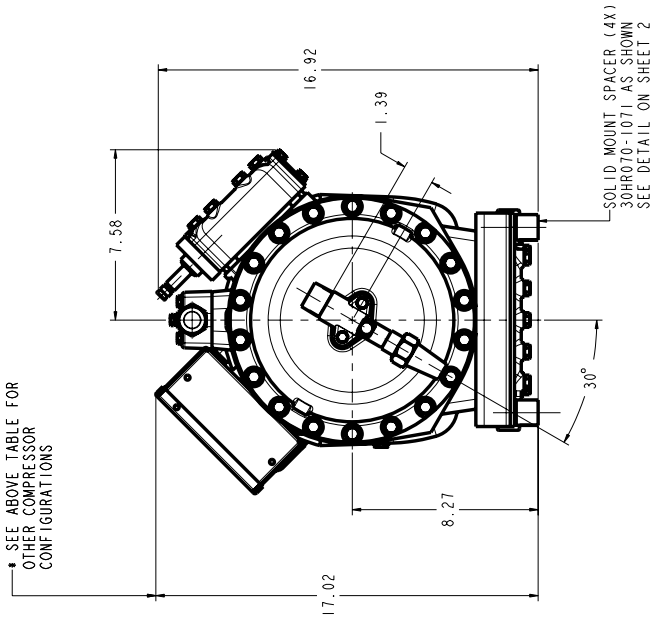
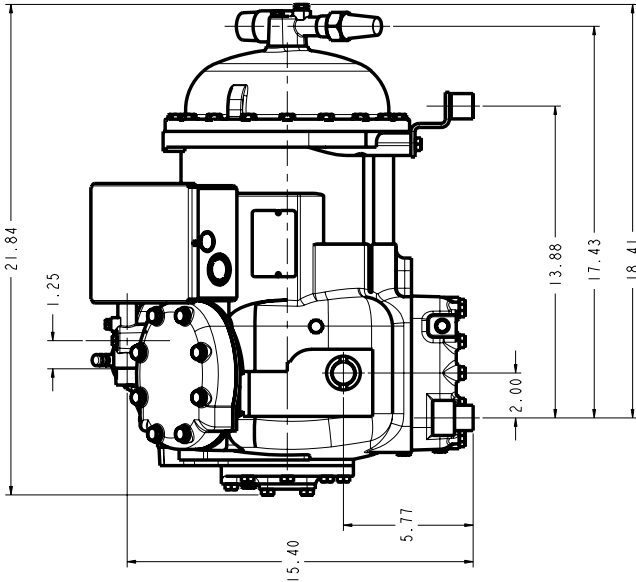
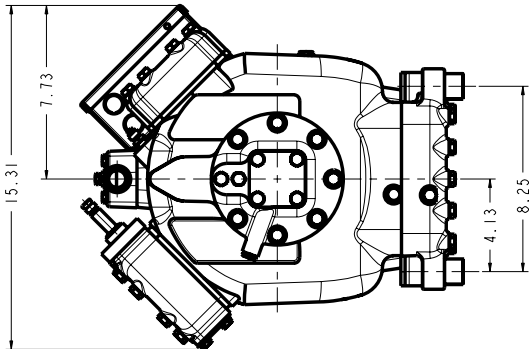
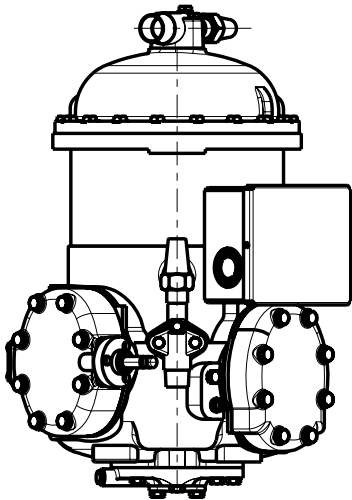
MODELS REPRESENTED	CFM	HP
06DA818	18.3	6.5

\* ALL DIMENSIONS SHOWN IN INCHES

MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
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ELECTRIC	NO	17.02
PRESSURE	NO	17.97

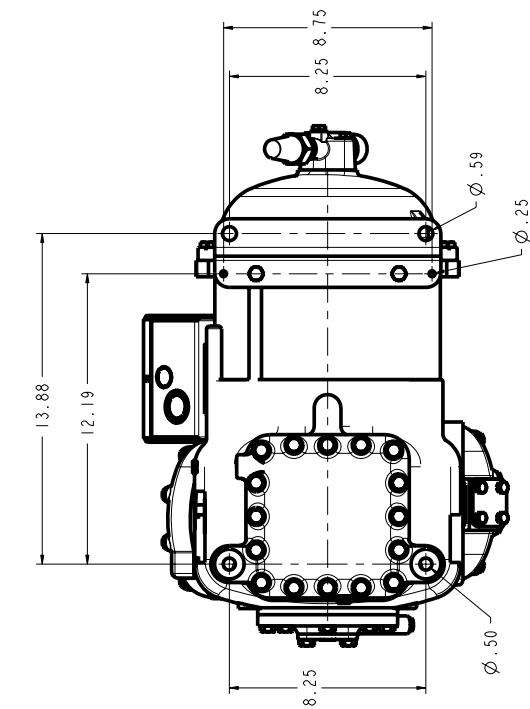
\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS



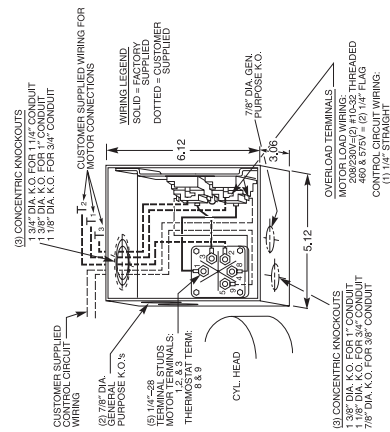


<u>MODELS REPRESENTED</u>	<u>CFM</u>	<u>HP</u>
06DA818	18.3	6.5

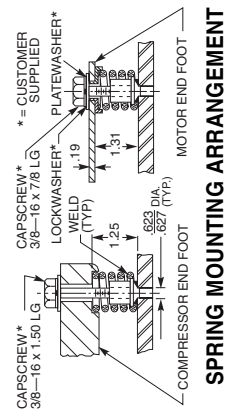
\* ALL DIMENSIONS SHOWN IN INCHES



**BOTTOM VIEW  
MOUNTING BOLT PATTERN**

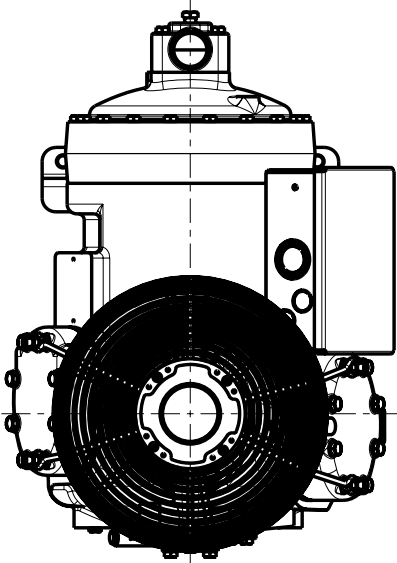


## TERMINAL BOX DATA



MODELS REPRESENTED	CFM	HP
06DR725	23.9	6.5
06DR228	28.0	8.0
06DM337	37.1	10.0
06DR337	37.1	10.0
06DR541	41.0	15.0

\* ALL DIMENSIONS SHOWN IN INCHES

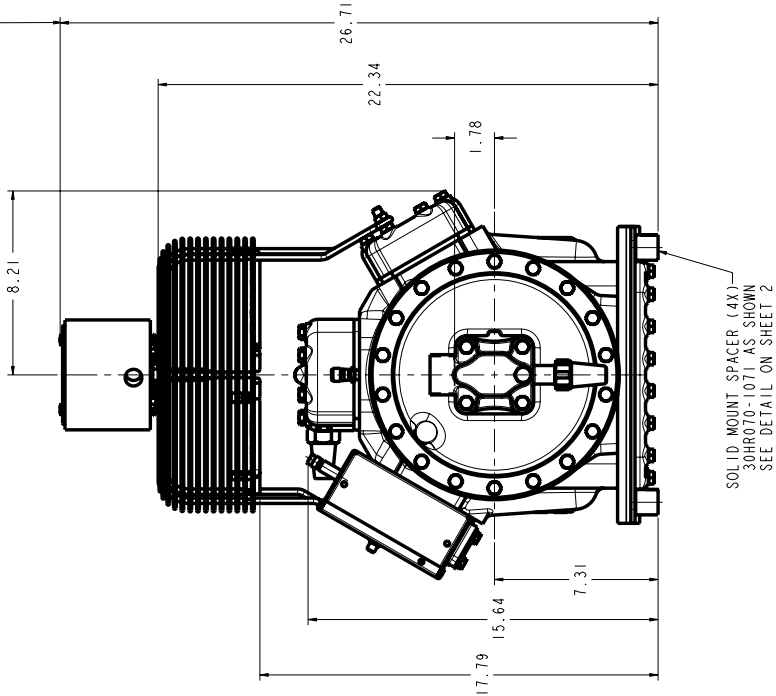
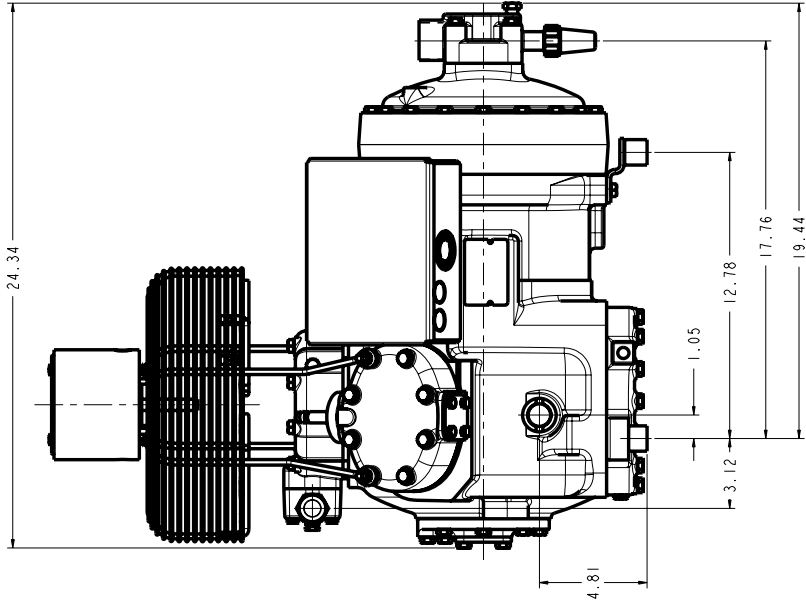
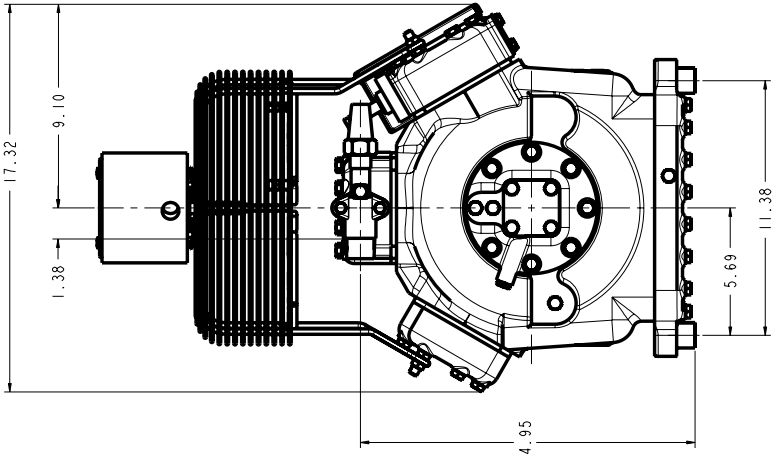


MAX HEIGHT SUMMARY TABLE

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ELECTRIC	NO	16.23
PRESSURE	NO	16.81
N/A	YES	26.71

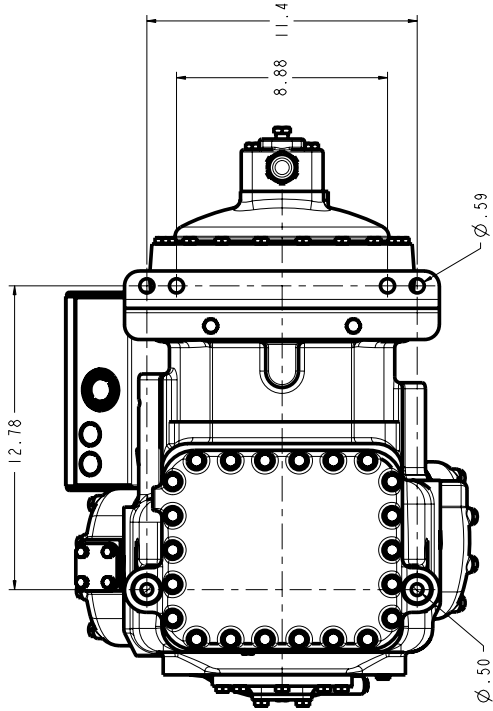
\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS

\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATIONS

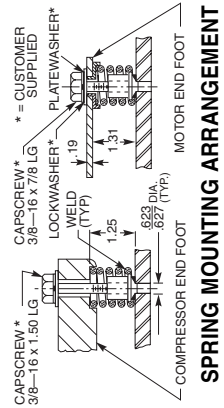


MODELS REPRESENTED	CFM	HP
06DR725	23.9	6.5
06DR228	28.0	8.0
06DM337	37.1	10.0
06DR337	37.1	10.0
06DR541	41.0	15.0

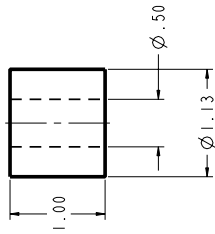
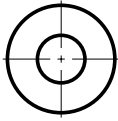
\* ALL DIMENSIONS SHOWN IN INCHES



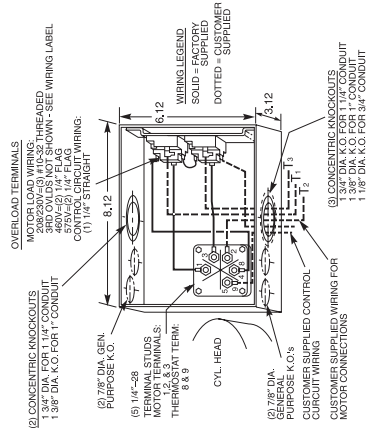
**BOTTOM VIEW  
MOUNTING BOLT PATTERN**



**SPRING MOUNTING ARRANGEMENT**



**30HR070-1071  
SOLID MOUNT**

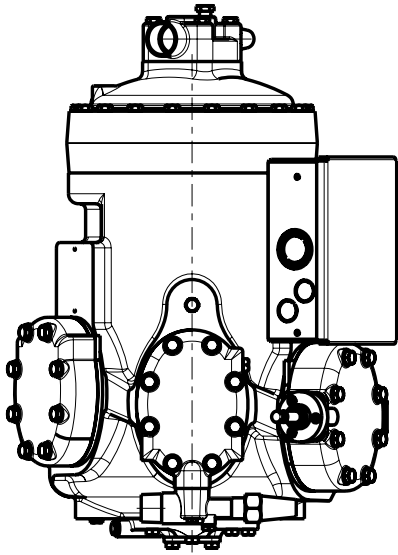


**TERMINAL BOX DATA**

NOTE: 10 Hp, 208/230v models use 3 overloads.

MODELS REPRESENTED	CFM	HP
06DA825	23.9	8.0
06DA328	28.0	10.0
06DA537	37.1	15.0

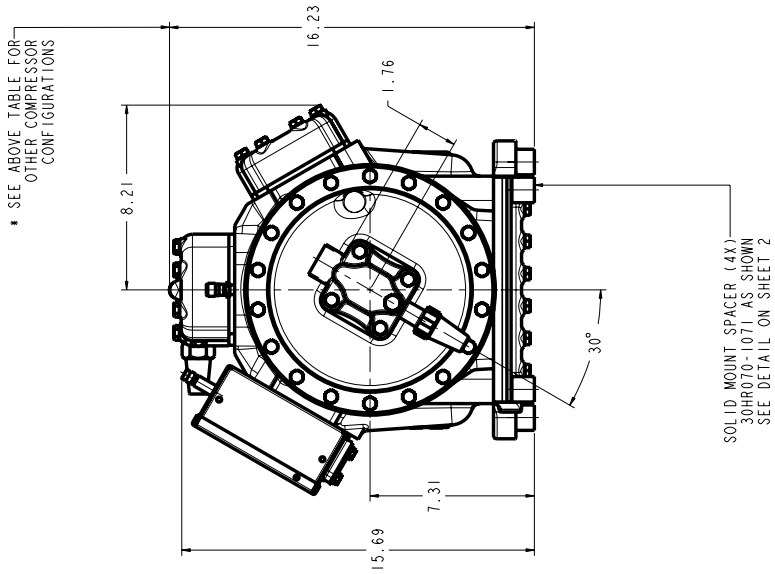
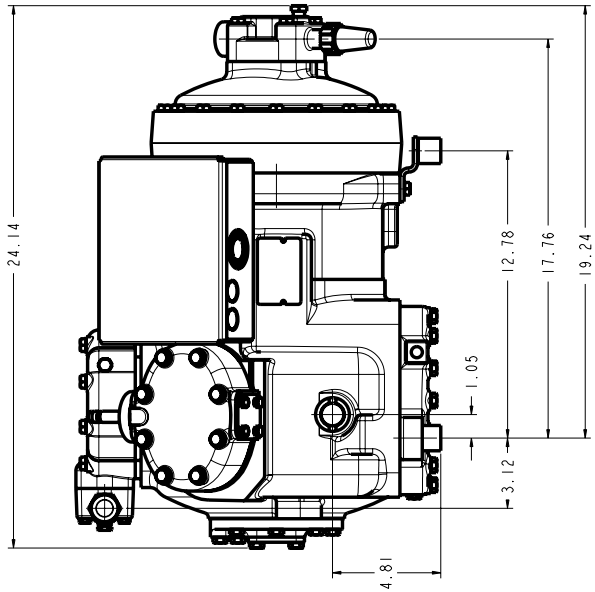
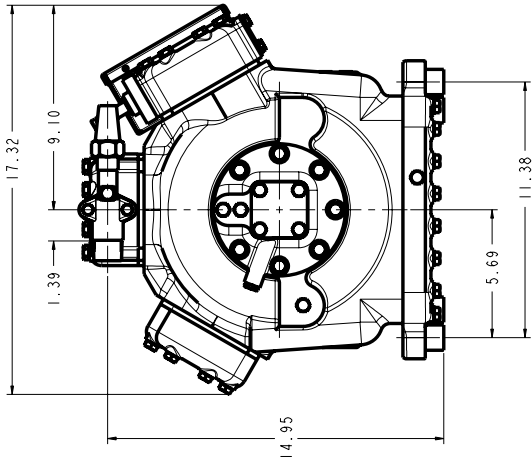
\* ALL DIMENSIONS SHOWN IN INCHES



**MAX HEIGHT SUMMARY TABLE**

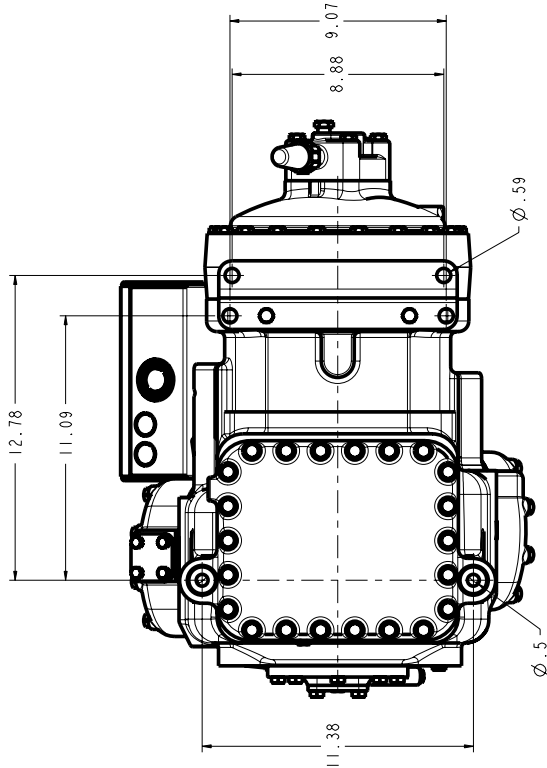
UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	16.23
ELECTRIC	NO	16.23
PRESSURE	NO	16.81

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS

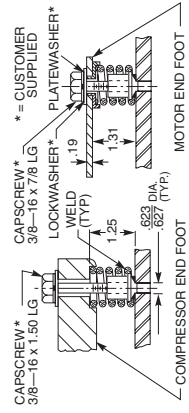


MODELS REPRESENTED	CFM	HP
06DA825	23.9	8.0
06DA328	28.0	10.0
06DA537	37.1	15.0

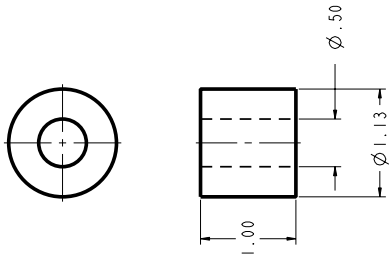
\* ALL DIMENSIONS SHOWN IN INCHES



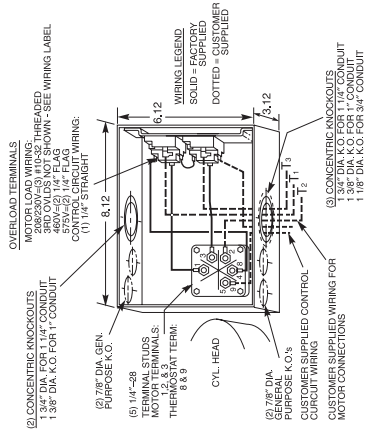
BOTTOM VIEW  
MOUNTING BOLT PATTERN



SPRING MOUNTING ARRANGEMENT



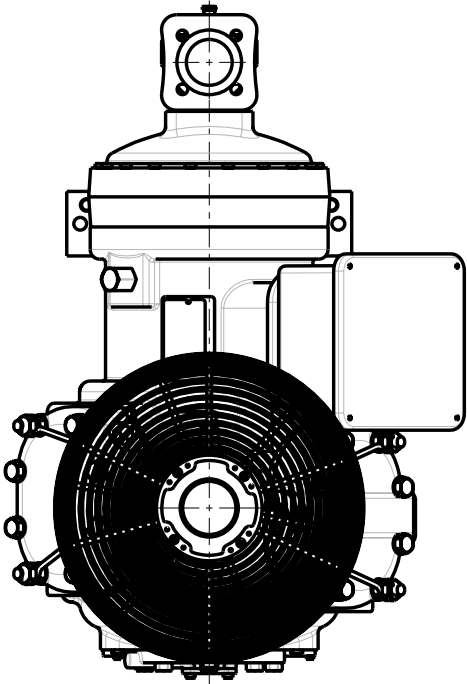
30HR070-1071  
SOLID MOUNT



TERMINAL BOX DATA

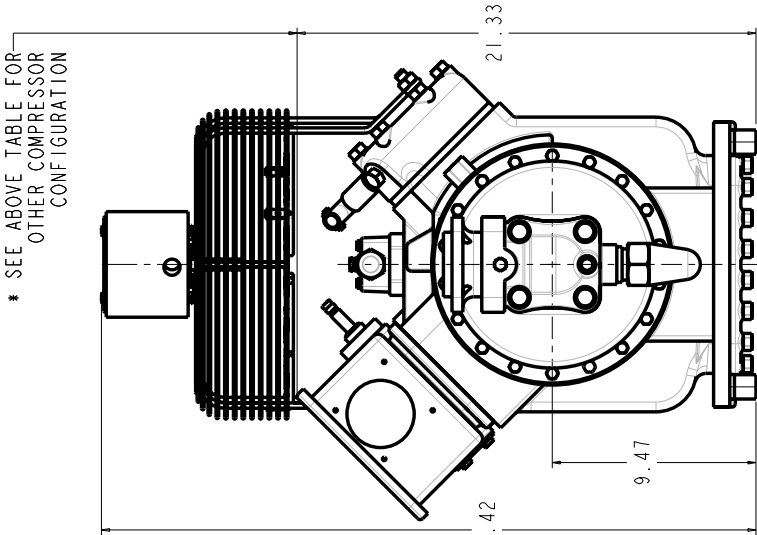
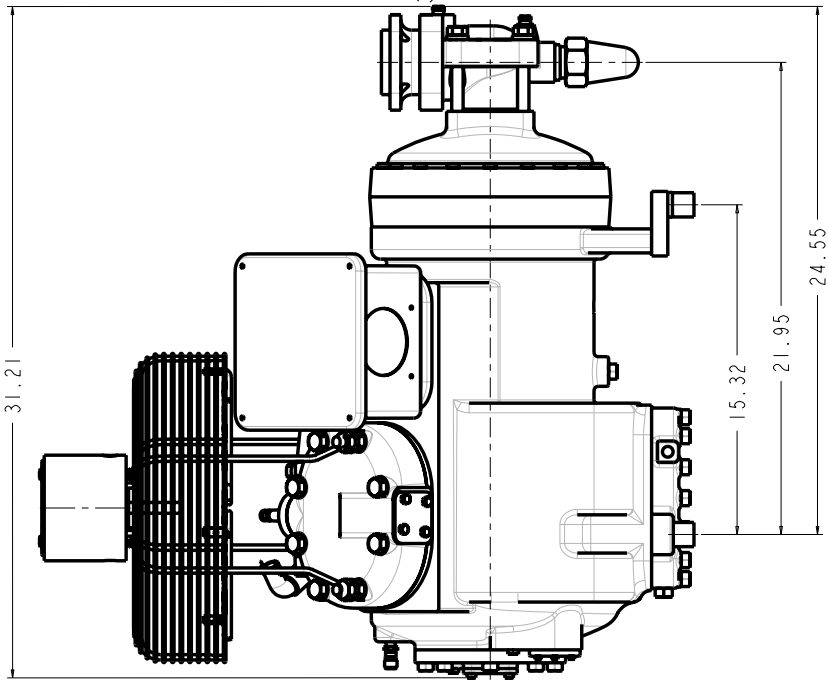
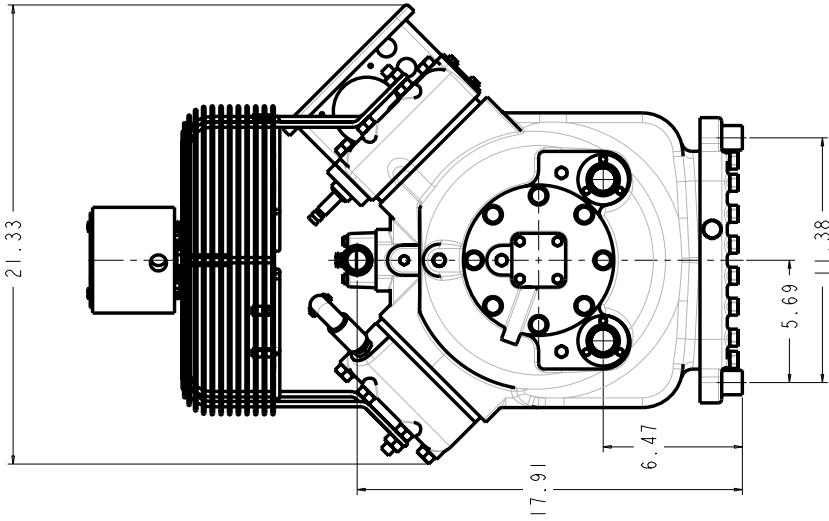
MODELS REPRESENTED	CFM	HP
06ER450	50.3	15

\* ALL DIMENSIONS SHOWN IN INCHES



MAX HEIGHT SUMMARY TABLE		
UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	21.33
ELECTRIC	NO	21.33
PRESSURE	NO	21.37
N/A	YES	30.42

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS

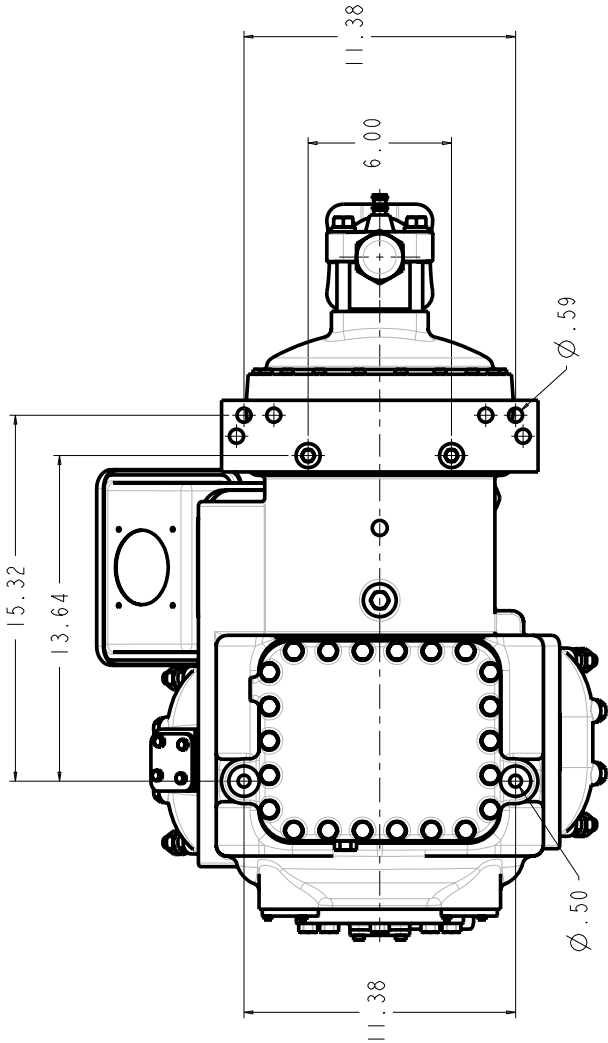


\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATION

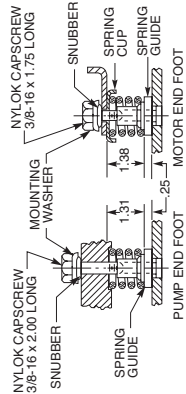
SOLID MOUNT SPACER (4X)  
30HR070-1071 AS SHOWN  
SEE DETAIL ON SHEET 2

MODELS REPRESENTED	CFM	HP
06ER450	50.3	15

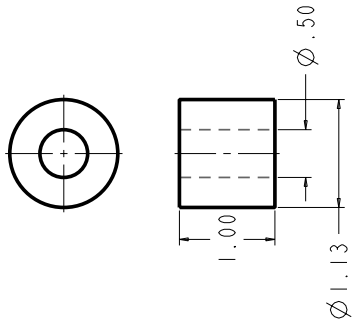
\* ALL DIMENSIONS SHOWN IN INCHES



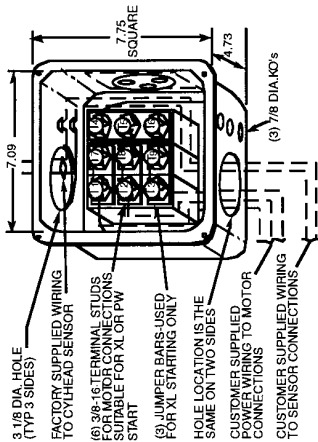
BOTTOM VIEW  
MOUNTING BOLT PATTERN



SPRING MOUNTING ARRANGEMENT



SOLID MOUNT  
30HR070.1071



WIRING SHOWN IS FOR 208/230 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

TERMINAL BOX DATA

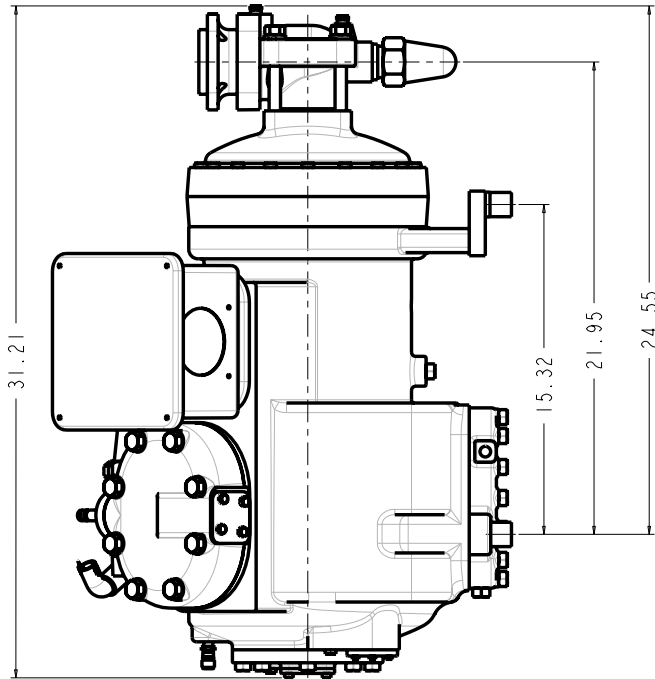
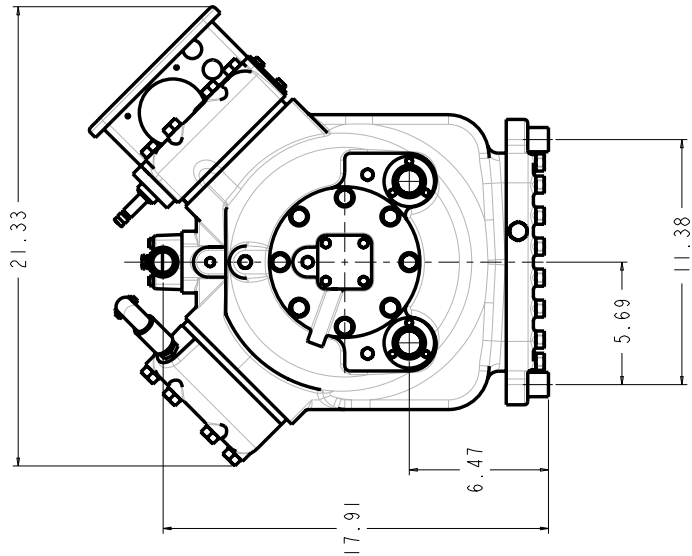
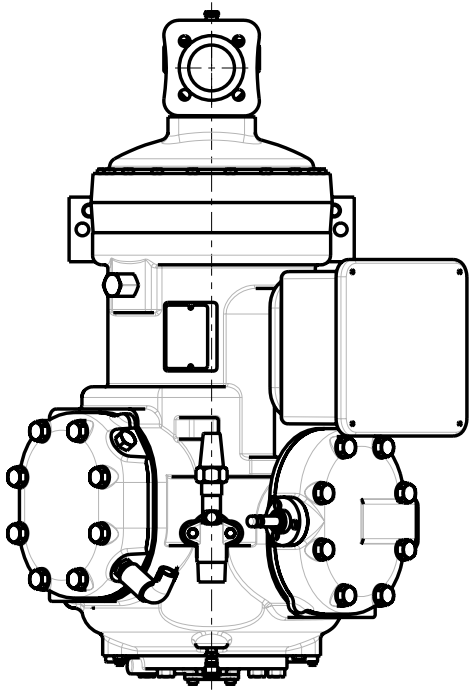
MODELS REPRESENTED	CFM	HP
06EM450	50.3	15

\* ALL DIMENSIONS SHOWN IN INCHES

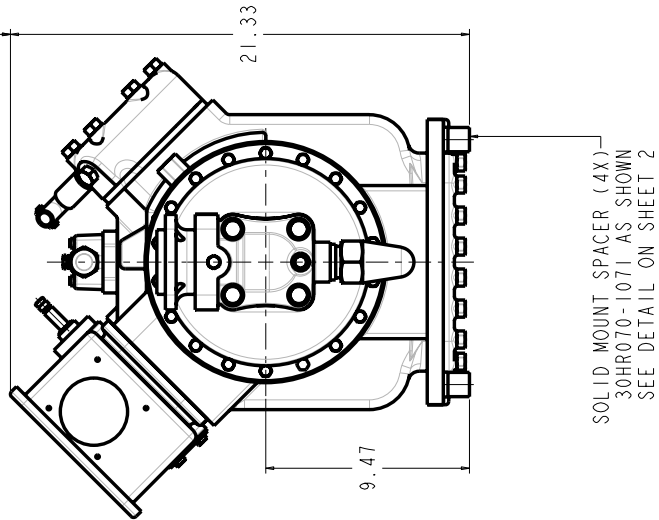
MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	21.33
ELECTRIC	NO	21.33
PRESSURE	NO	21.37

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS



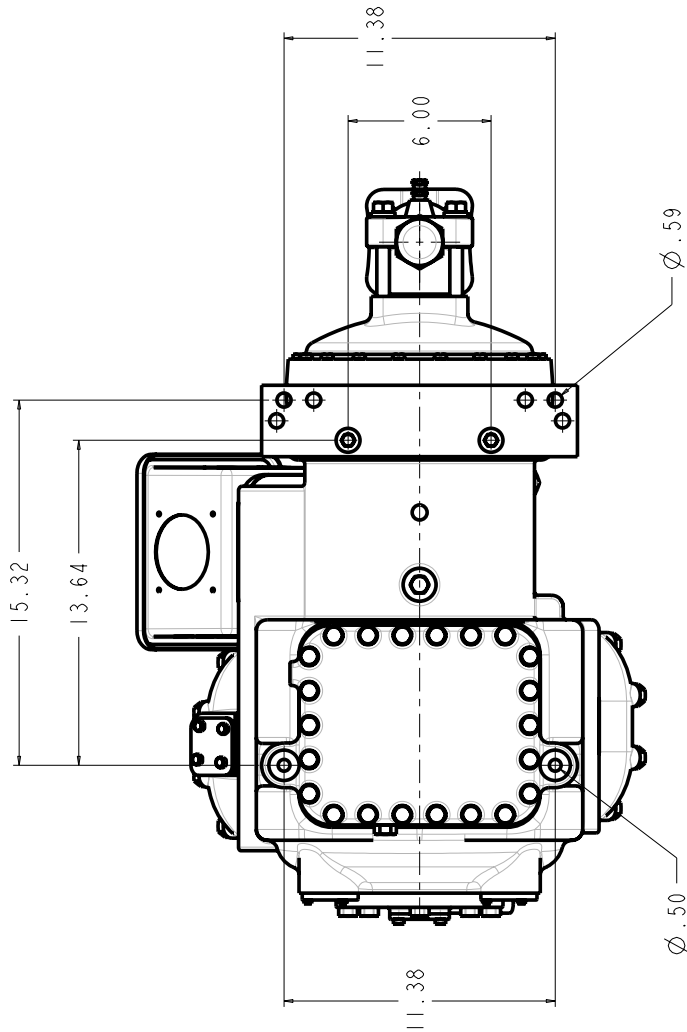
\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATION



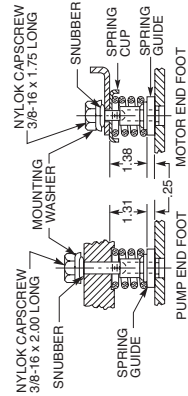


MODELS REPRESENTED	CFM	HP
06EM450	50.3	15

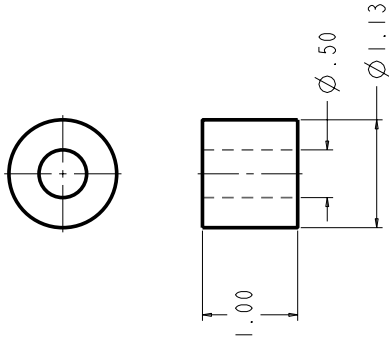
\* ALL DIMENSIONS SHOWN IN INCHES



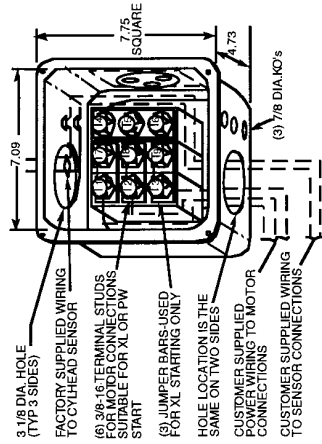
**BOTTOM VIEW  
MOUNTING BOLT PATTERN**



**SPRING MOUNTING ARRANGEMENT**



**SOLID MOUNT  
30HR070\_1071**



WIRING SHOWN IS FOR 208/230 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

**TERMINAL BOX DATA**

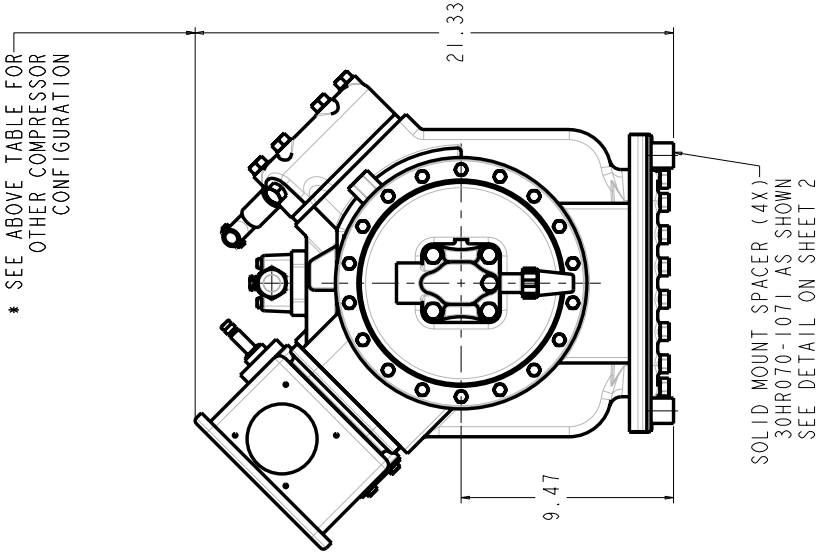
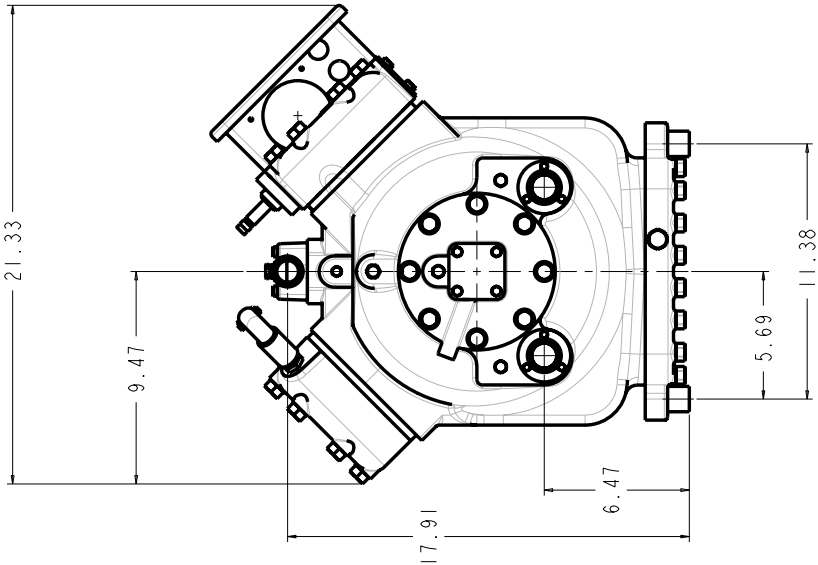
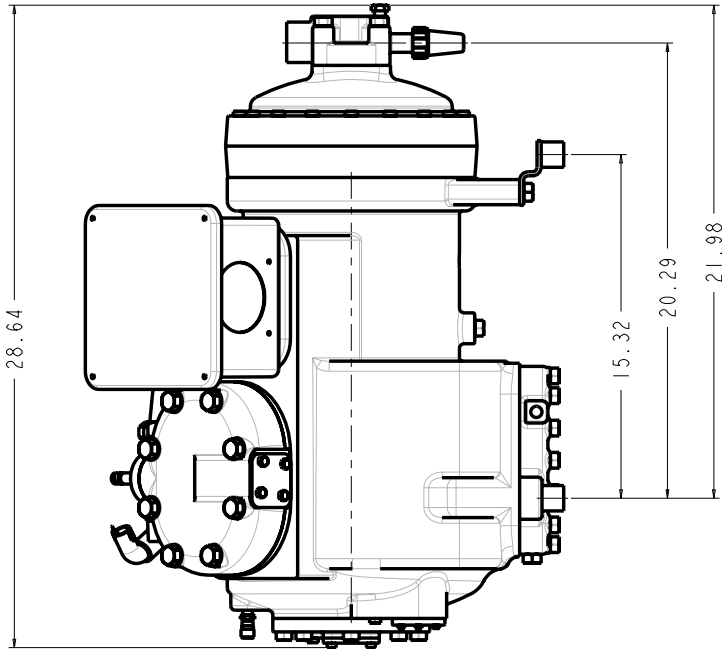
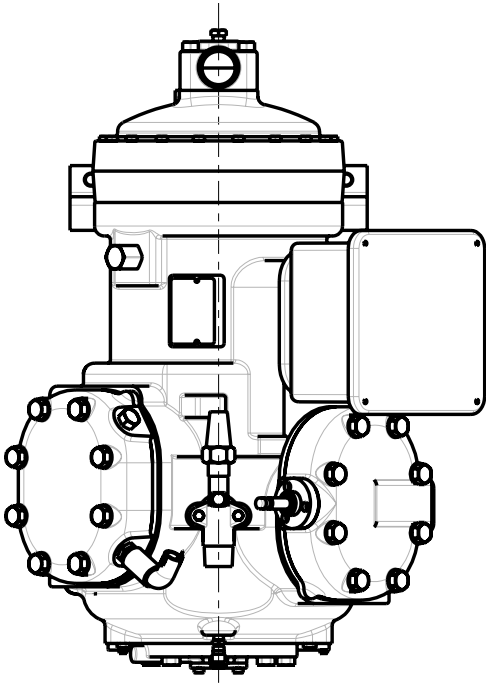
MODELS REPRESENTED	CFM	HP
06EA550	50.3	20

\* ALL DIMENSIONS SHOWN IN INCHES

MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	21.33
ELECTRIC	NO	21.33
PRESSURE	NO	21.37

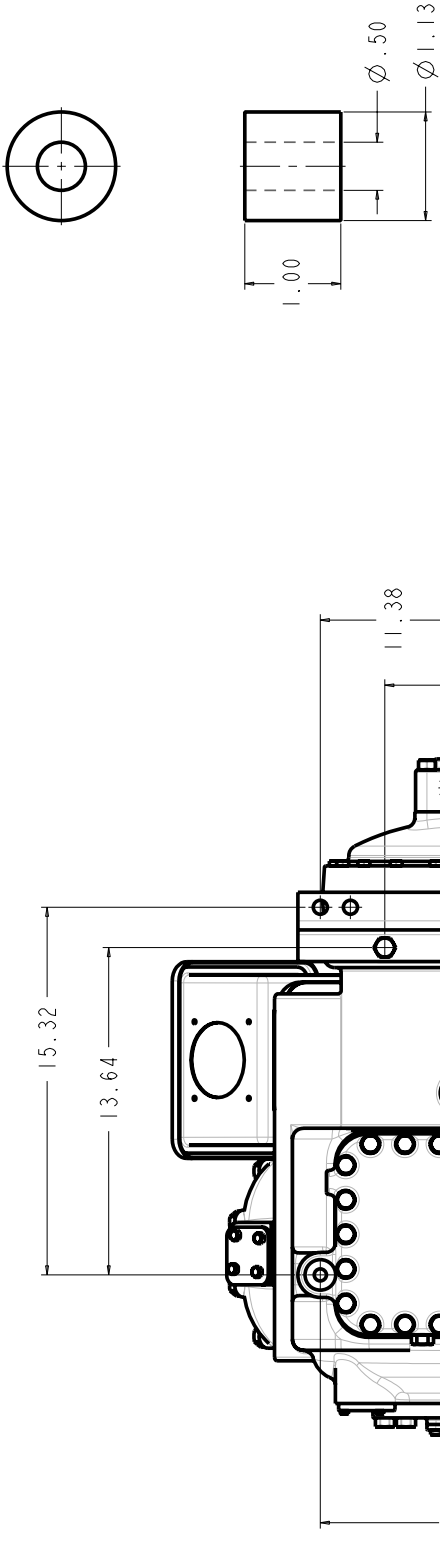
\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS



\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATION

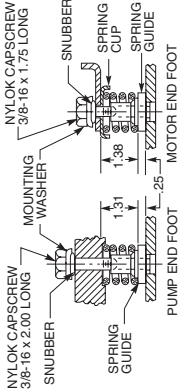
MODELS REPRESENTED	CFM	HP
06EA550	50.3	20

\* ALL DIMENSIONS SHOWN IN INCHES

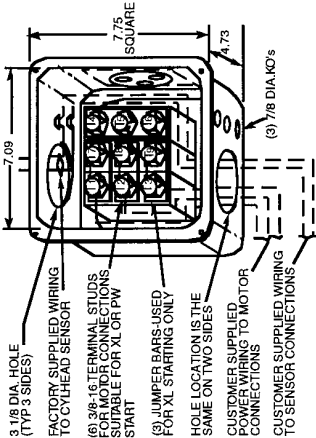


SOLID MOUNT  
30HR070.1071

BOTTOM VIEW  
MOUNTING BOLT PATTERN



SPRING MOUNTING ARRANGEMENT



WIRING SHOWN IS FOR 208/230 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

TERMINAL BOX DATA

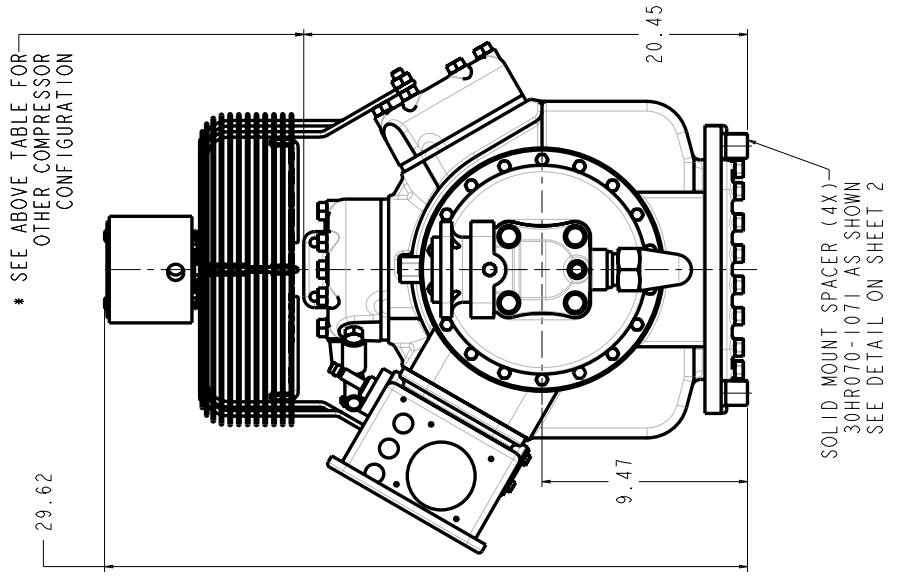
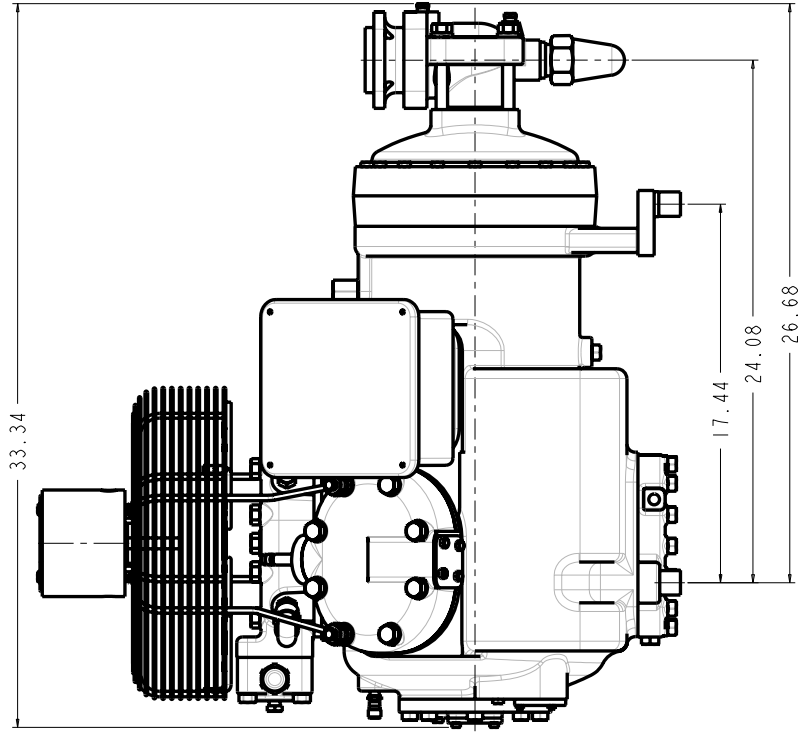
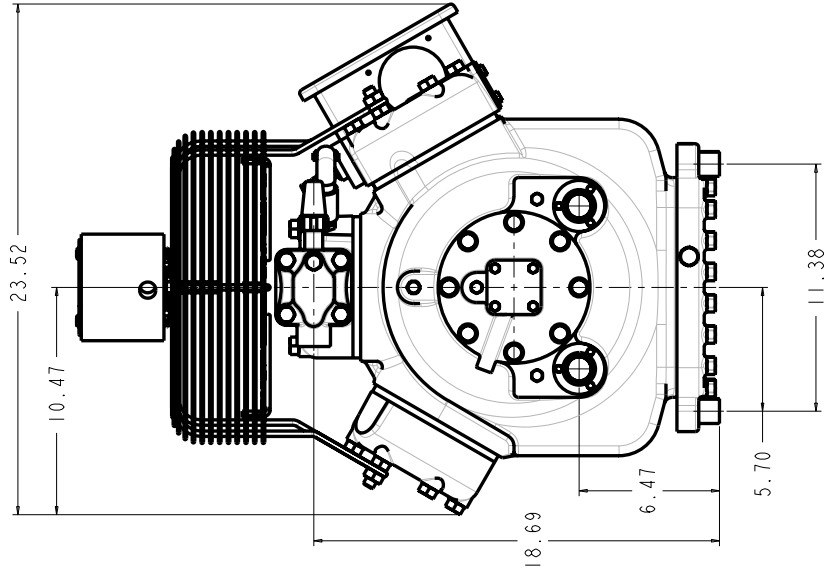
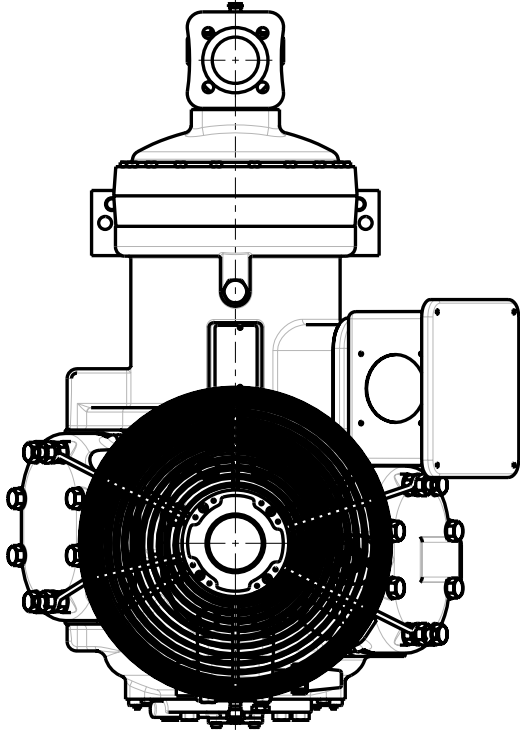
MODELS REPRESENTED	CFM	HP
06ER465	68.3	20
06ER475	75.4	20
06ER399	99.0	30

\* ALL DIMENSIONS SHOWN IN INCHES

MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	20.45
ELECTRIC	NO	20.45
PRESSURE	NO	20.50
N/A	YES	29.62

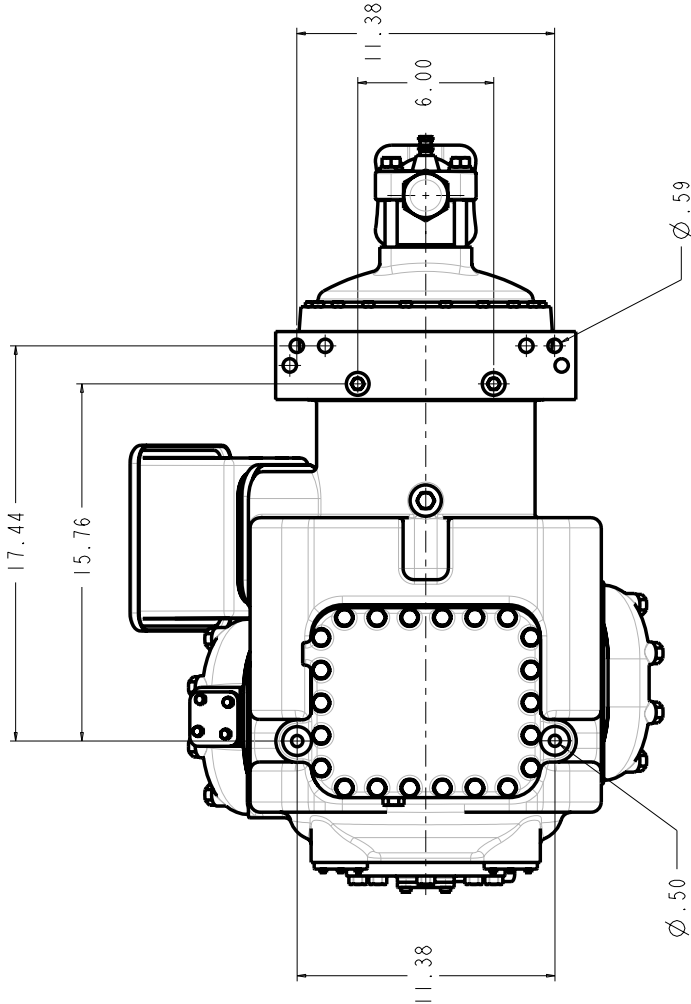
\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS



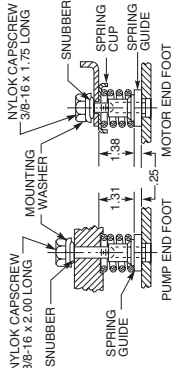
\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATION

MODELS REPRESENTED	CFM	HP
06ER465	68.3	20
06ER475	75.4	20
06ER399	99.0	30

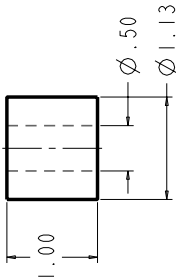
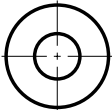
\* ALL DIMENSIONS SHOWN IN INCHES



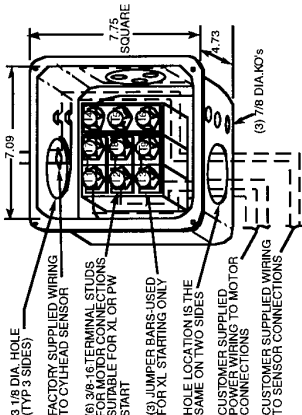
BOTTOM VIEW  
MOUNTING BOLT PATTERN



SPRING MOUNTING ARRANGEMENT



SOLID MOUNT  
30HR070\_1071



WIRING SHOWN IS FOR 208/230 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

TERMINAL BOX DATA

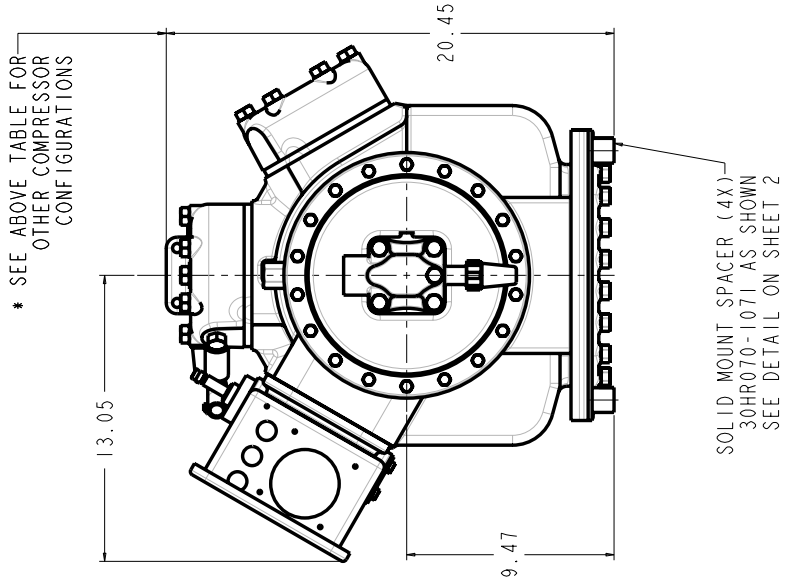
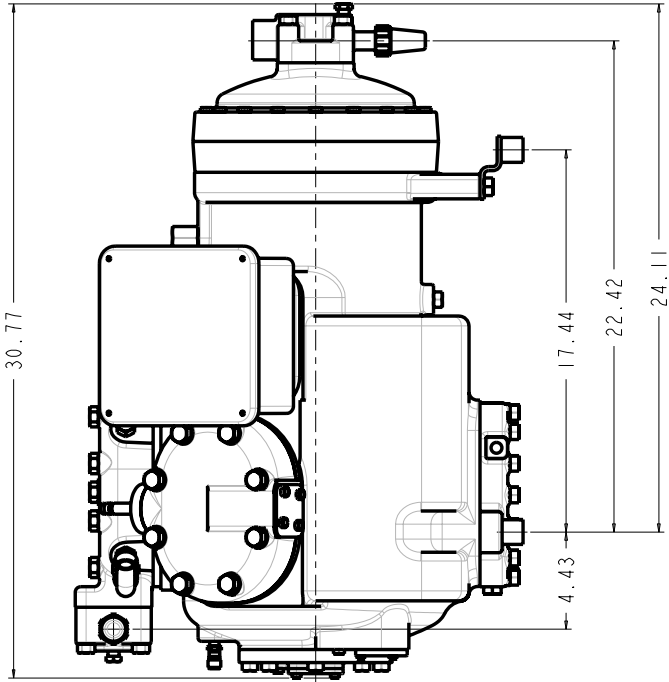
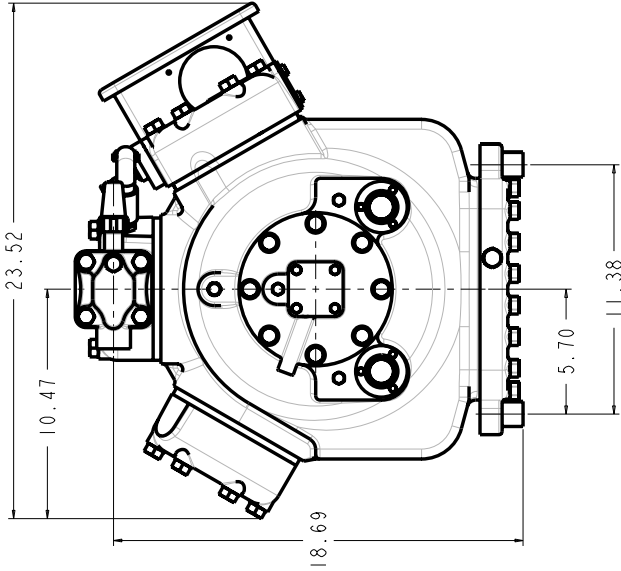
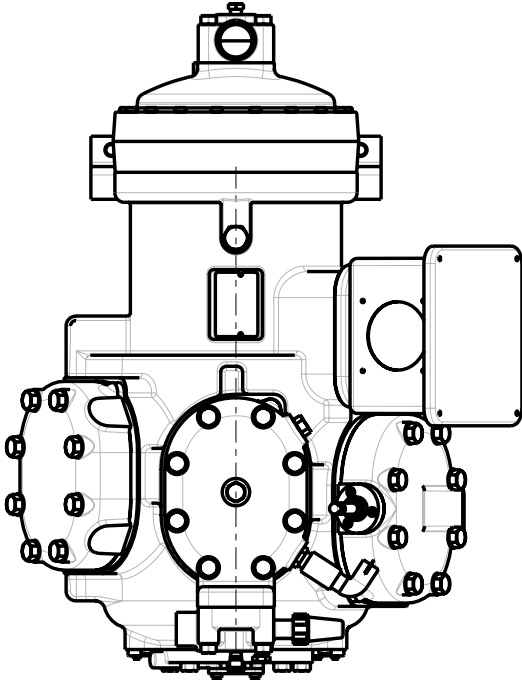
MODELS REPRESENTED	CFM	HP
06EA565	68.3	25

\* ALL DIMENSIONS SHOWN IN INCHES

MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	20.45
ELECTRIC	NO	20.45
PRESSURE	NO	20.50

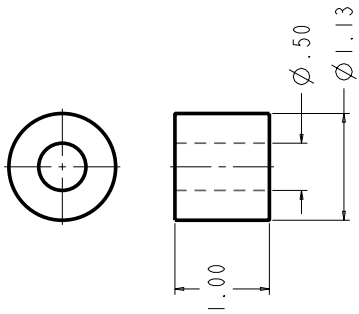
\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS



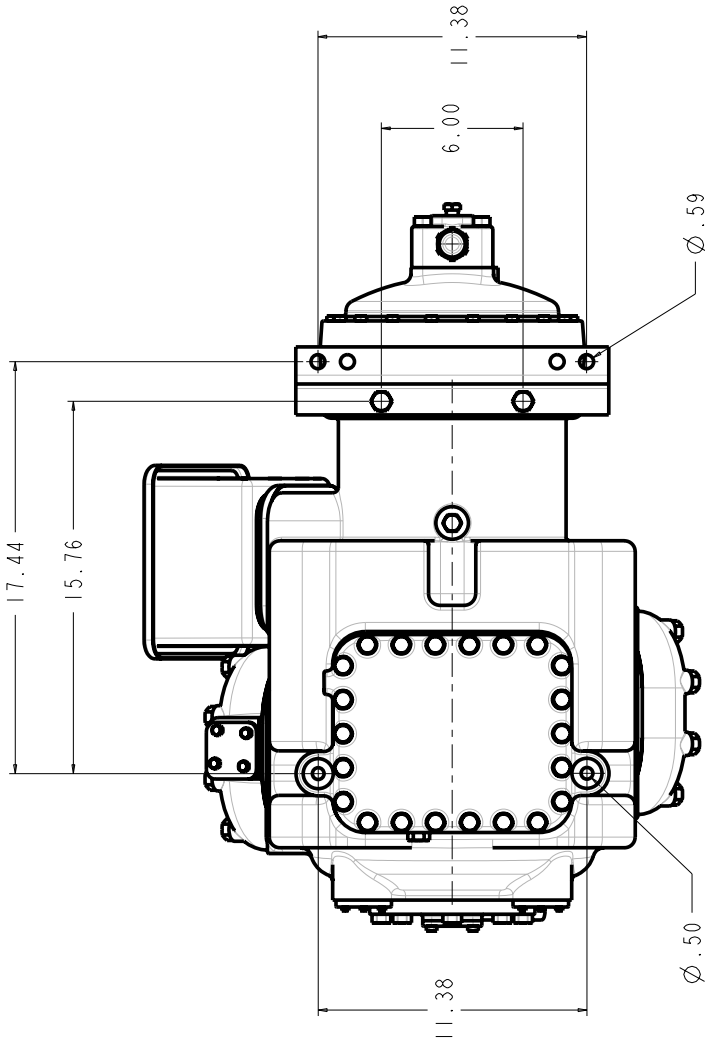
\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATIONS

MODELS REPRESENTED	CFM	HP
06EA565	68.3	25

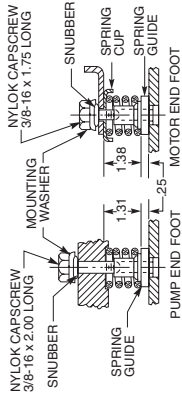
\* ALL DIMENSIONS SHOWN IN INCHES



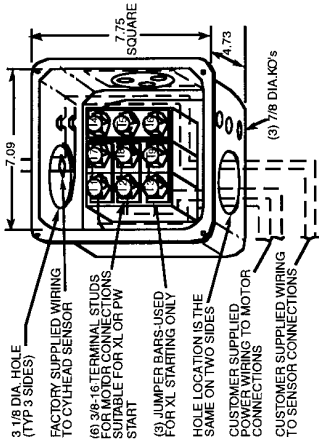
SOLID MOUNT  
30HR070\_1071



BOTTOM VIEW  
MOUNTING BOLT PATTERN



SPRING MOUNTING ARRANGEMENT



WIRING SHOWN IS FOR 208/230 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

TERMINAL BOX DATA

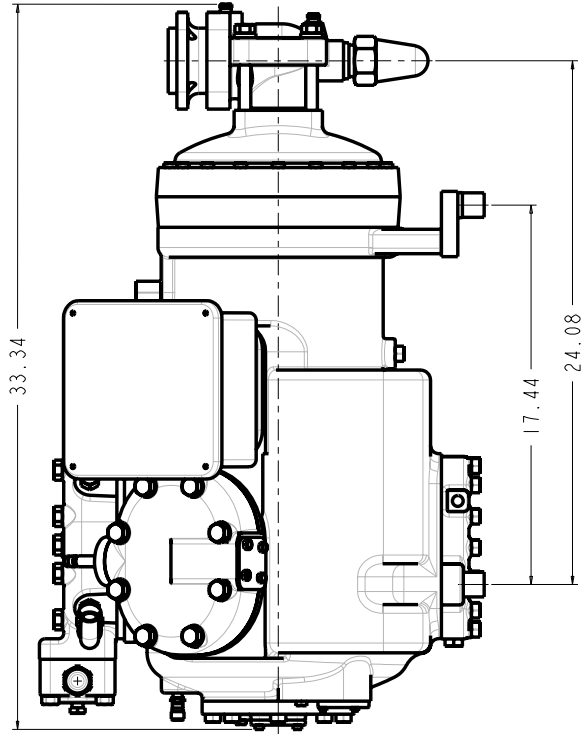
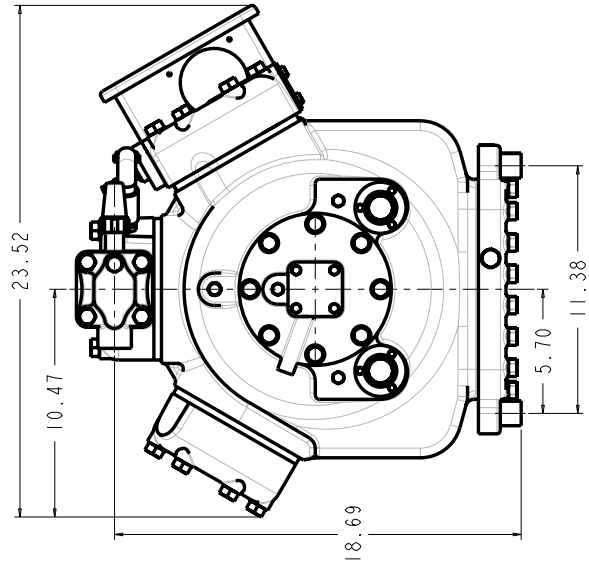
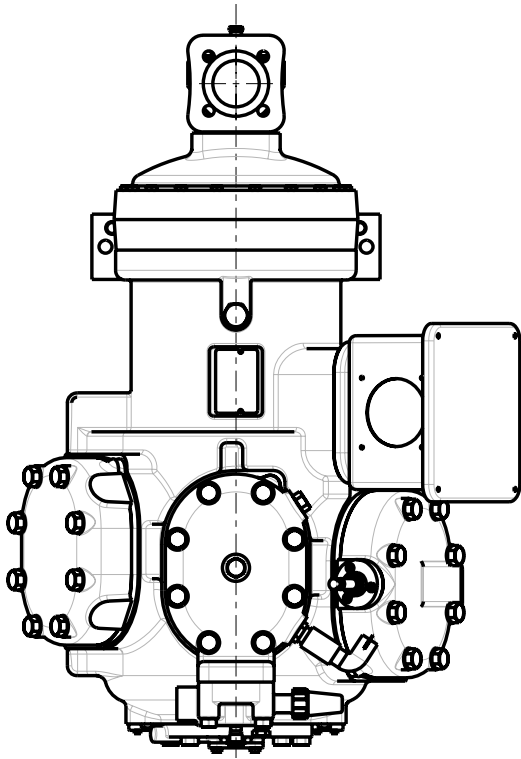
MODELS REPRESENTED	CFM	HP
06EM475	75.4	25

\* ALL DIMENSIONS SHOWN IN INCHES

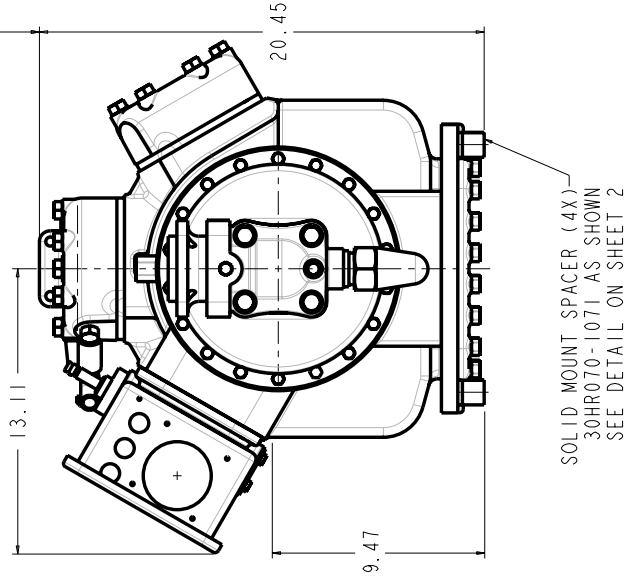
MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	20.45
ELECTRIC	NO	20.45
PRESSURE	NO	20.50

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS



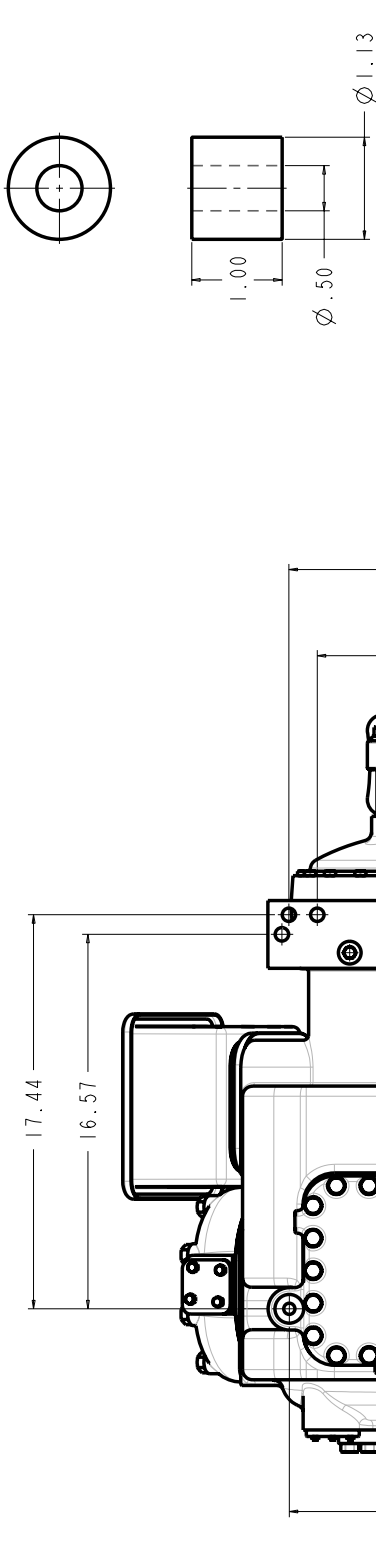
\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATIONS



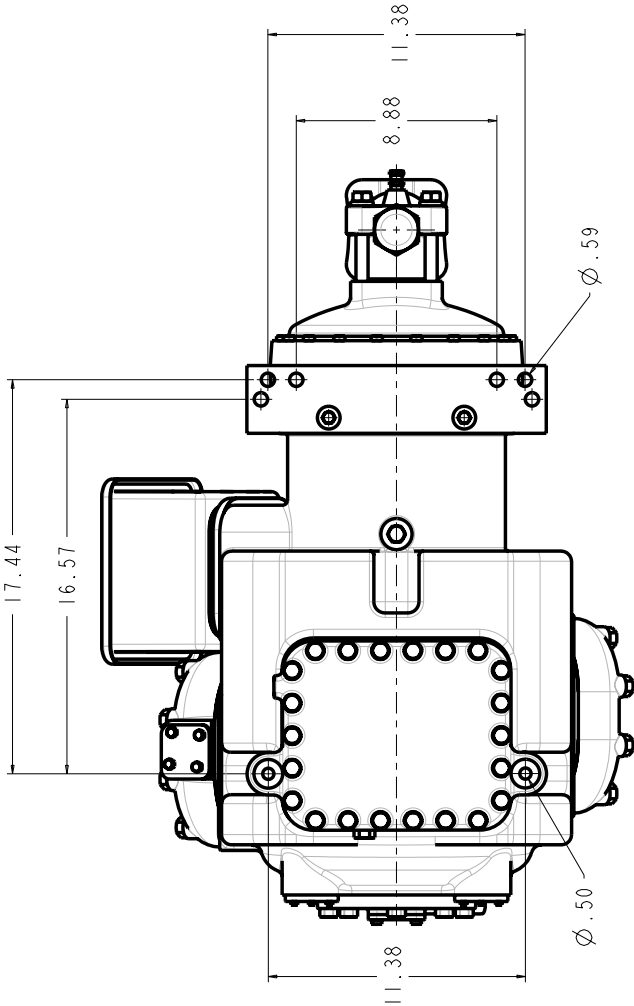


MODELS REPRESENTED	CFM	HP
06EM475	75.4	25

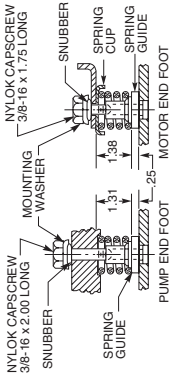
\* ALL DIMENSIONS SHOWN IN INCHES



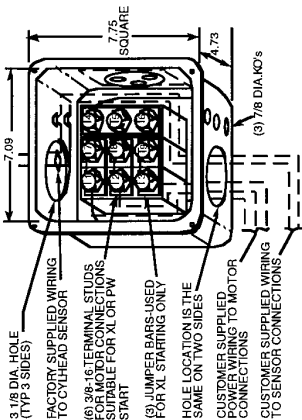
SOLID MOUNT  
30HR070 1071



BOTTOM VIEW  
MOUNTING BOLT PATTERN



SPRING MOUNTING ARRANGEMENT



WIRING SHOWN IS FOR 298/290 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

TERMINAL BOX DATA

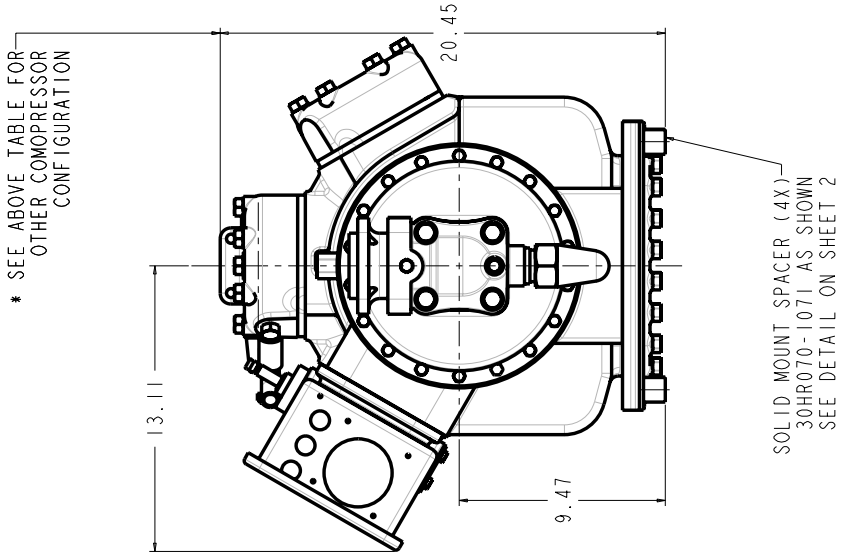
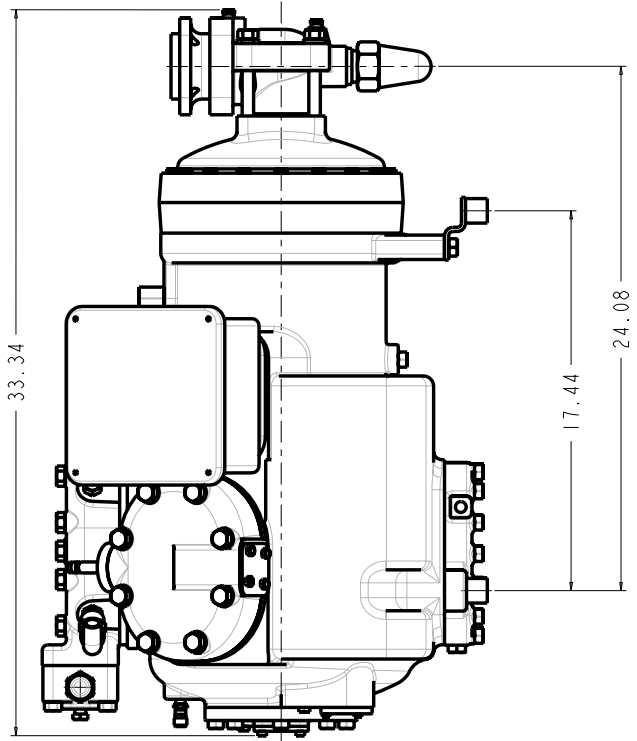
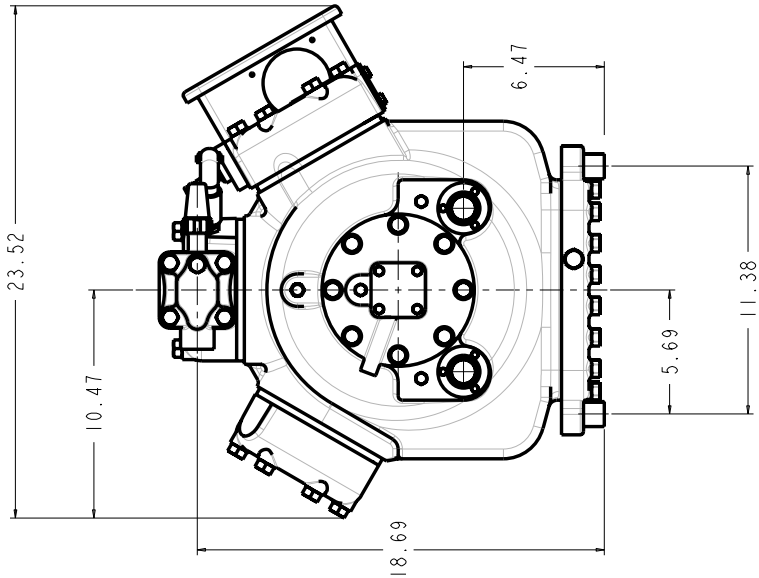
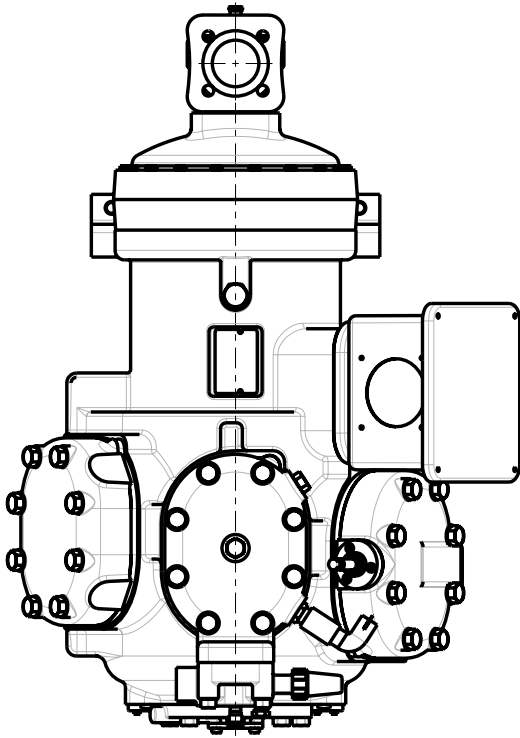
MODELS REPRESENTED	CFM	HP
06EA575	75.4	30

\* ALL DIMENSIONS SHOWN IN INCHES

MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	20.45
ELECTRIC	NO	20.45
PRESSURE	NO	20.50

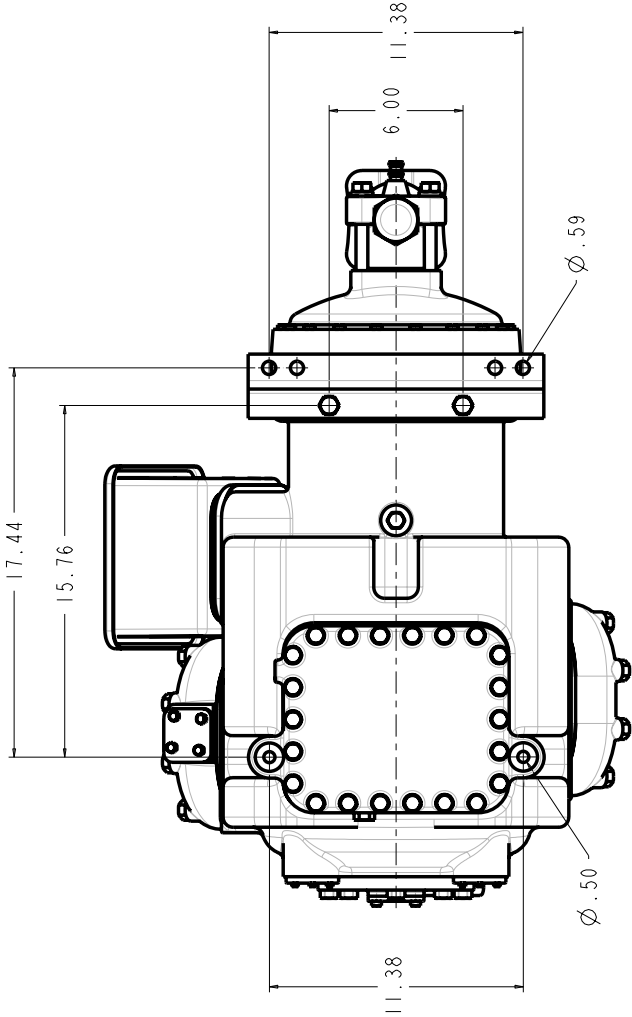
\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS



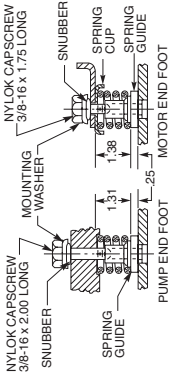
\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATION

MODELS REPRESENTED	CFM	HP
06EA575	75.4	30

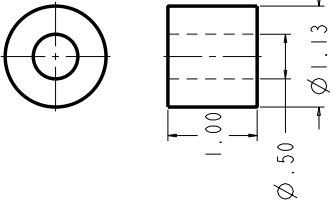
\* ALL DIMENSIONS SHOWN IN INCHES



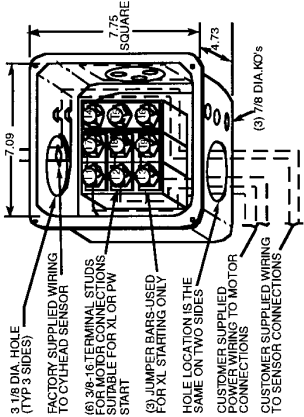
**BOTTOM VIEW  
MOUNTING BOLT PATTERN**



**SPRING MOUNTING ARRANGEMENT**



**SOLID MOUNT  
30HR070\_1071**

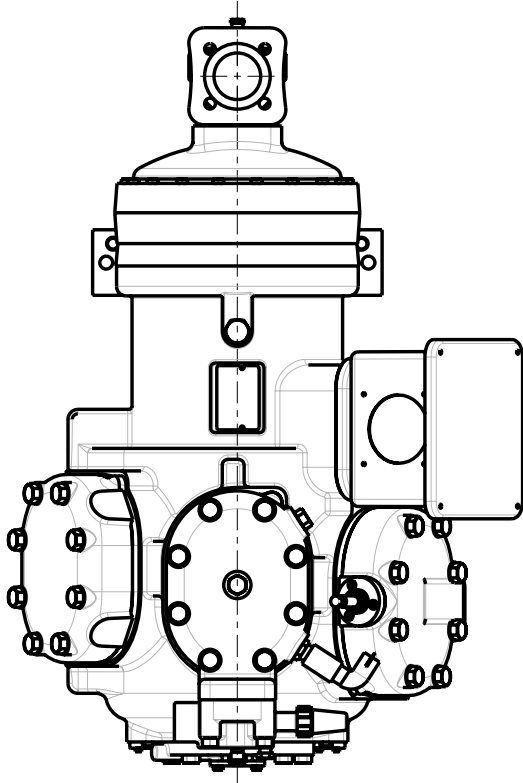


WIRING SHOWN IS FOR 208/230 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

**TERMINAL BOX DATA**

MODELS REPRESENTED	CFM	HP
06EM499	99.0	35

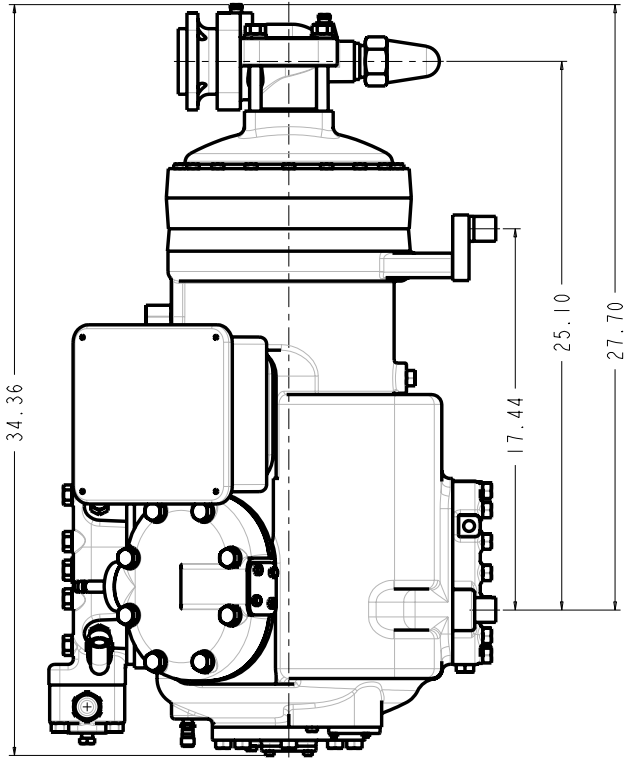
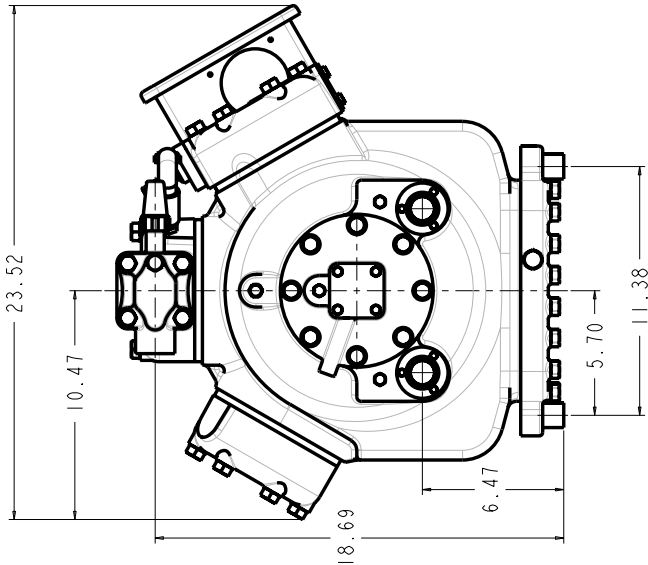
\* ALL DIMENSIONS SHOWN IN INCHES



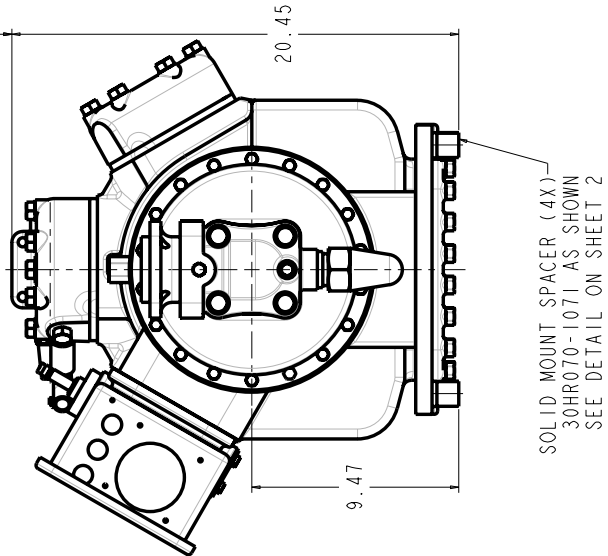
MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	20.45
ELECTRIC	NO	20.45
PRESSURE	NO	20.50

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS

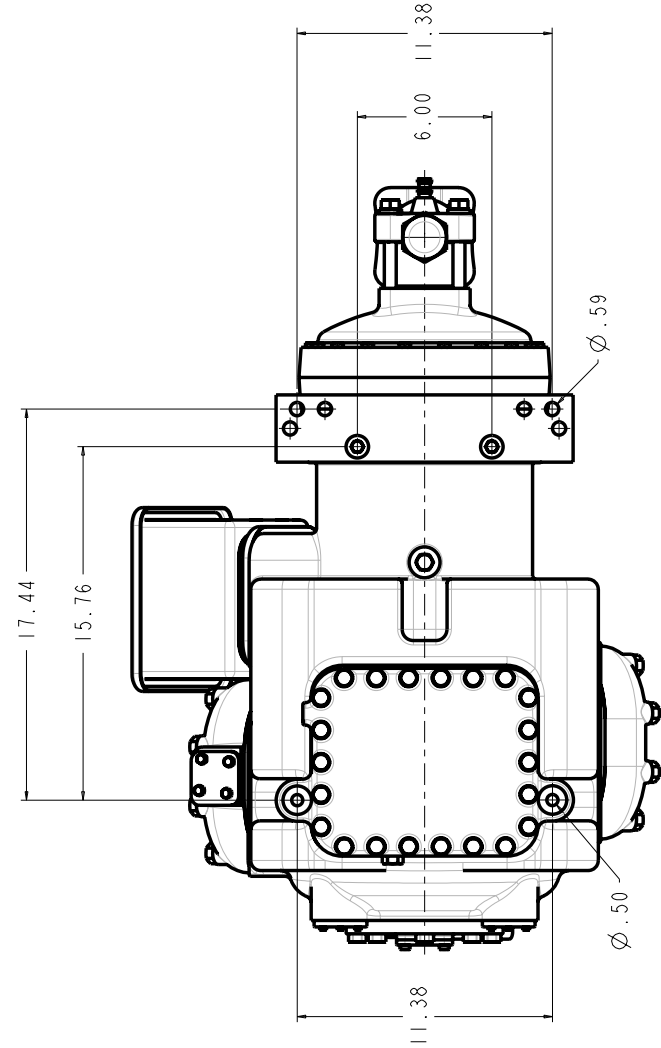


\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATION

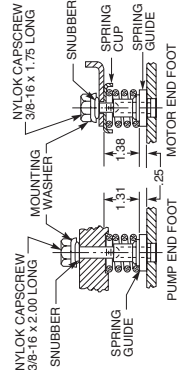


MODELS REPRESENTED	CFM	HP
06EM499	99.0	35

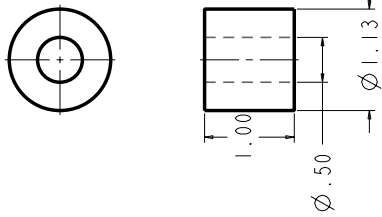
\* ALL DIMENSIONS SHOWN IN INCHES



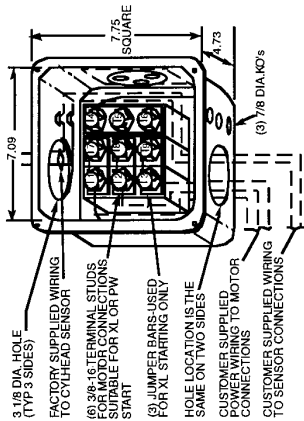
**BOTTOM VIEW  
MOUNTING BOLT PATTERN**



**SPRING MOUNTING ARRANGEMENT**



**SOLID MOUNT  
30HR070\_1071**



WIRING SHOWN IS FOR 208/230 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

**TERMINAL BOX DATA**

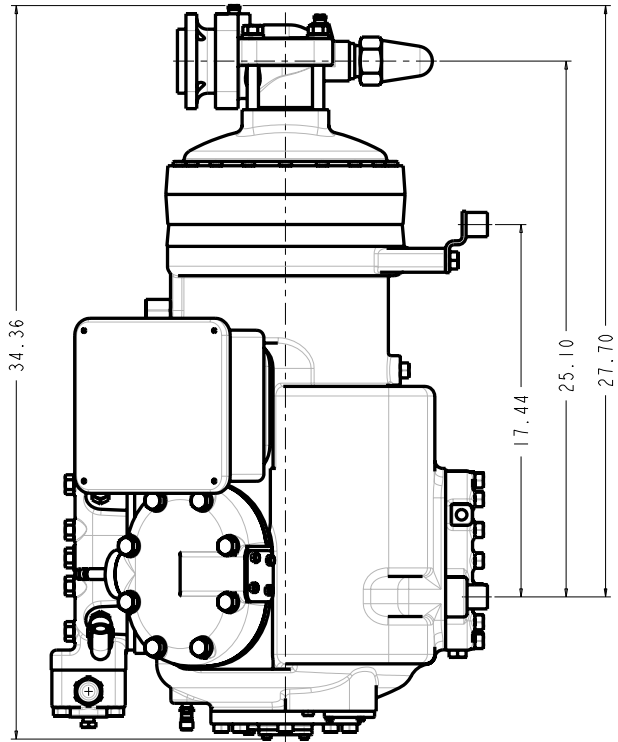
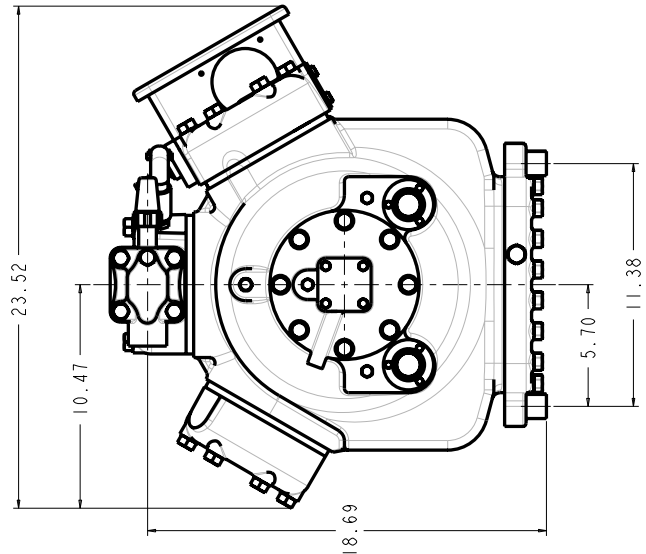
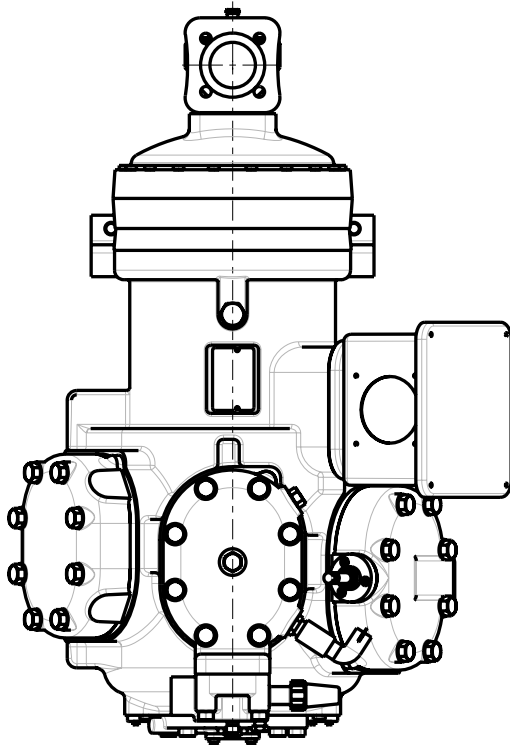
MODELS REPRESENTED	CEM	HP
06EA599	99.0	40

\* ALL DIMENSIONS SHOWN IN INCHES

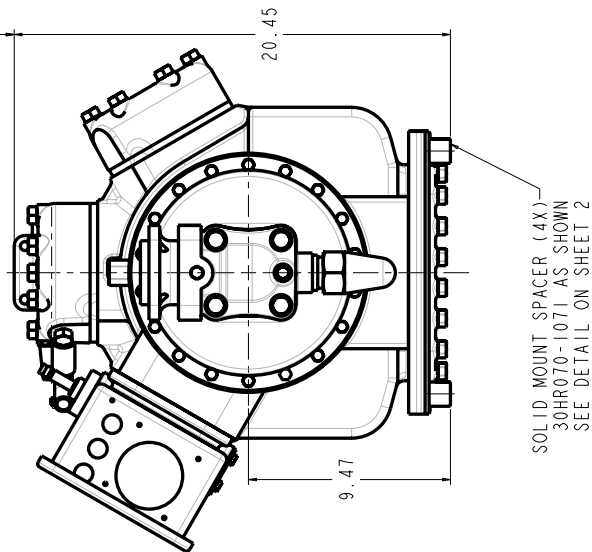
MAX HEIGHT SUMMARY TABLE

UNLOADER	HEAD FAN	MAX HEIGHT(INCHES)
NONE	NO	20.45
ELECTRIC	NO	20.45
PRESSURE	NO	20.50

\* MAXIMUM HEIGHT SHOWN FOR VARIOUS COMPRESSOR CONFIGURATIONS

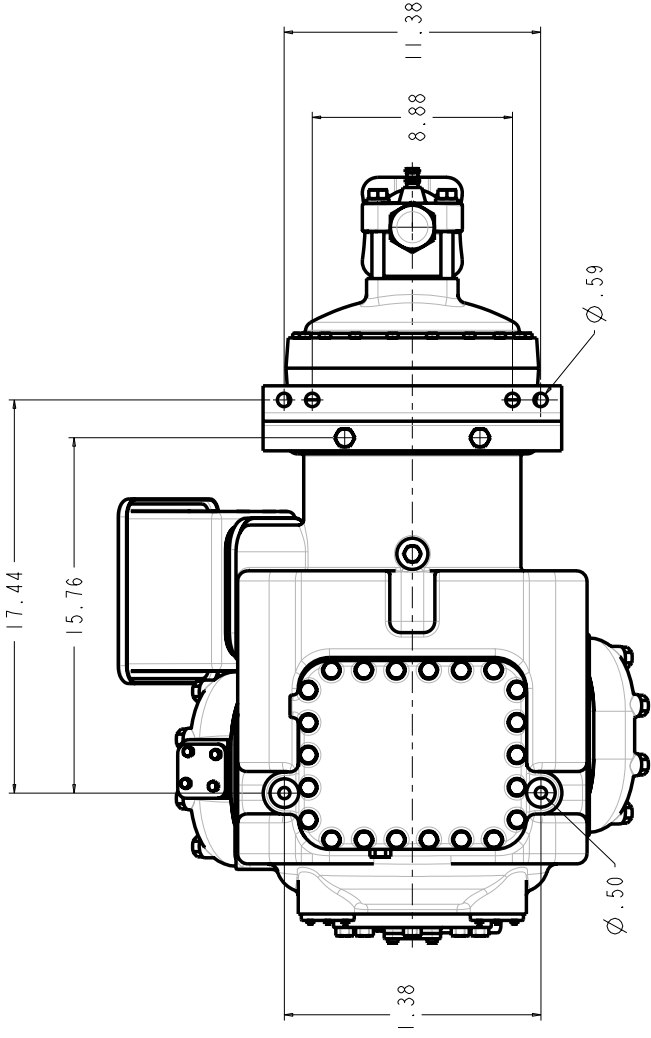


\* SEE ABOVE TABLE FOR OTHER COMPRESSOR CONFIGURATION

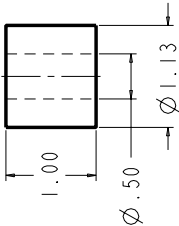
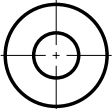


MODELS REPRESENTED	CFM	HP
06EA599	99.0	40

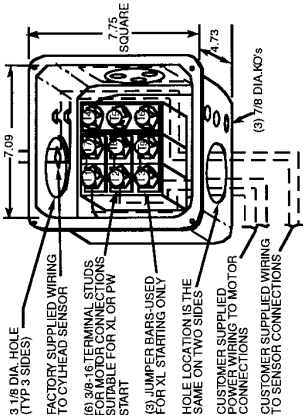
\* ALL DIMENSIONS SHOWN IN INCHES



BOTTOM VIEW  
MOUNTING BOLT PATTERN



SOLID MOUNT  
30HR070\_1071



WIRING SHOWN IS FOR 208/230 XL  
SEE OEM BULLETIN 13 FOR DETAILS OF OTHER ARRANGEMENTS

TERMINAL BOX DATA



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Manufacturer reserves the right to discontinue, or change at any time, specifications or designs and prices without notice and without incurring obligations.

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