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Carlyle Compressor Division
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Syracuse, NY 13221

06M APPLICATION GUIDE
R410A and R744 (Sub-Critical)
15 – 24 CFM Models

TABLE OF CONTENTS

Introduction

This manual is for the Carlyle **R410A & CO2 subcritical (R744)** reciprocating compressor product line (06M). The 06M R410A product line is comprised of 3 unique compressor families (06MR, 06MM, and 06MA), optimized for low, medium, and high temperature applications. The CO2 subcritical (R744) product line is comprised of one compressor family 06MC for low temperature application. The operational limits, required accessories, and operational guidelines contained in this manual must be complied with to stay within the compressors warranty guidelines.

The 06M reciprocating compressor has been specifically designed and optimized for R410A & R744C refrigerants in single and or parallel rack refrigeration (Low/Medium Temp) and Air Conditioning (High Temp) applications. The Carlyle 06M semi-hermetic compressor is ideally suited for commercial refrigeration, air conditioning, process cooling, environmental chambers, and heat pump applications.

The 06M compressor is an inline 3 cylinder compressor with a single head configuration. The single head is a 3 cylinder, with the capability to unload 1 cylinder. The compressor can be configured and applied with no unloading, unloading, smart unloading, and variable frequency drive (VFD).

Scope

This application guide is intended to familiarize system designers with the 06M compressor and to provide technical information necessary to assure safe and reliable compressor operation.

Certifications

UL and CSA Recognition has been obtained for the 06MR, 06MM, 06MA, 06MC compressor models described in this document for refrigerant R410A and R744 only. The compressor Recognition is under UL60335-2-34 Fourth Edition and C22.2, No. 140.2 for CSA. Both the UL and CSA recognition are shown in the following files:

UL File #: SA4936 Vol. 1 Section 16

For the UL and CSA recognition it is essential that the factory installed motor protection be used as part of the stop/start control circuitry. Specific PTC sensors are embedded in the compressor motor windings and specifically designed to protect the motor from over-temperature.

Both UL and CSA recognition have been obtained for all voltage combinations shown in Section 5.0.

These compressors comply with the EU Machinery Directive 2006/42/EC, the EU Low Voltage Directive 2014/35/EU and with the safety requirements of harmonized standards EN 60335-2-34 and/or EN 12693. The CE mark is included on the compressor nameplate.

Compressor Displacements

Model Numbers	Nominal Horsepower	Displacement @ 60Hz
Low Temperature (R410A)	**HP**	**CFM**
06MR015	5	15
06MR018	6	18
06MR021	7	21
06MR024	9	24
Medium Temperature (R410A)	**HP**	**CFM**
06MM015	7	15
06MM018	9	18
06MM021	11	21
06MM024	13	24
AC Temperature (R410A)	**HP**	**CFM**
06MA015	9	15
06MA018	11	18
06MA021	13	21
06MA024	15	24
CO2 Low Temperature R744 (Sub-critical)	**HP**	**CFM**
06MC015	13	15
06MC018	15	18
06MC021	15	21
06MC024	15	24

Standard Features

See Outline Drawings for physical data and connection information.

Capacity Control Options

The 06M compressor can be factory configured for the following capacity control options:

- No unloading (standard 3 cylinder head).
- Suction Unloading (unloads 1 of 3 cylinders reducing capacity to 67%)
- Smart Unloading :
  - Use step unloading, modulate the compressor linearly from 67 to 100% capacity
  - Install PWM valve upstream of compressor and modulate the compressor linearly from 20 to 100% capacity.
- Variable Frequency Drive (VFD capable from 20 to 80 Hz, R410A)
- Variable Frequency Drive (VFD capable from 20 to 60 Hz, R744)

Motor Protection

All 06M compressors come with a motor protection module installed in the electrical box and wired to the motor PTC's embedded in the motor windings. The following types of motor protection are offered:

R410A

- Standard motor over-temperature protection, PTC's is factory installed.

R744

- Standard factory preset motor over-current and over-temperature protection. The PTC's and a Current Transformer (CT) is factory installed.

Refer to section 5.0 for specific motor protection requirements.

Dual Suction Ports

To facilitate installation of the 06M, dual suction ports are provided and located on the motor end back cover and a motor end side mount location.

Low Oil Safety Switch

The standard 06M compressor model will have a low oil pressure safety switch (OPSS) factory installed and leak tested. The OPSS is mounted to the oil pump end of the compressor as shown in the outline drawings.

Reversible High Flow Oil Pump

The positive displacement Gerotor oil pump is extremely durable and produces a high volume of oil flow, allowing for low speed VFD operation down to 20Hz.

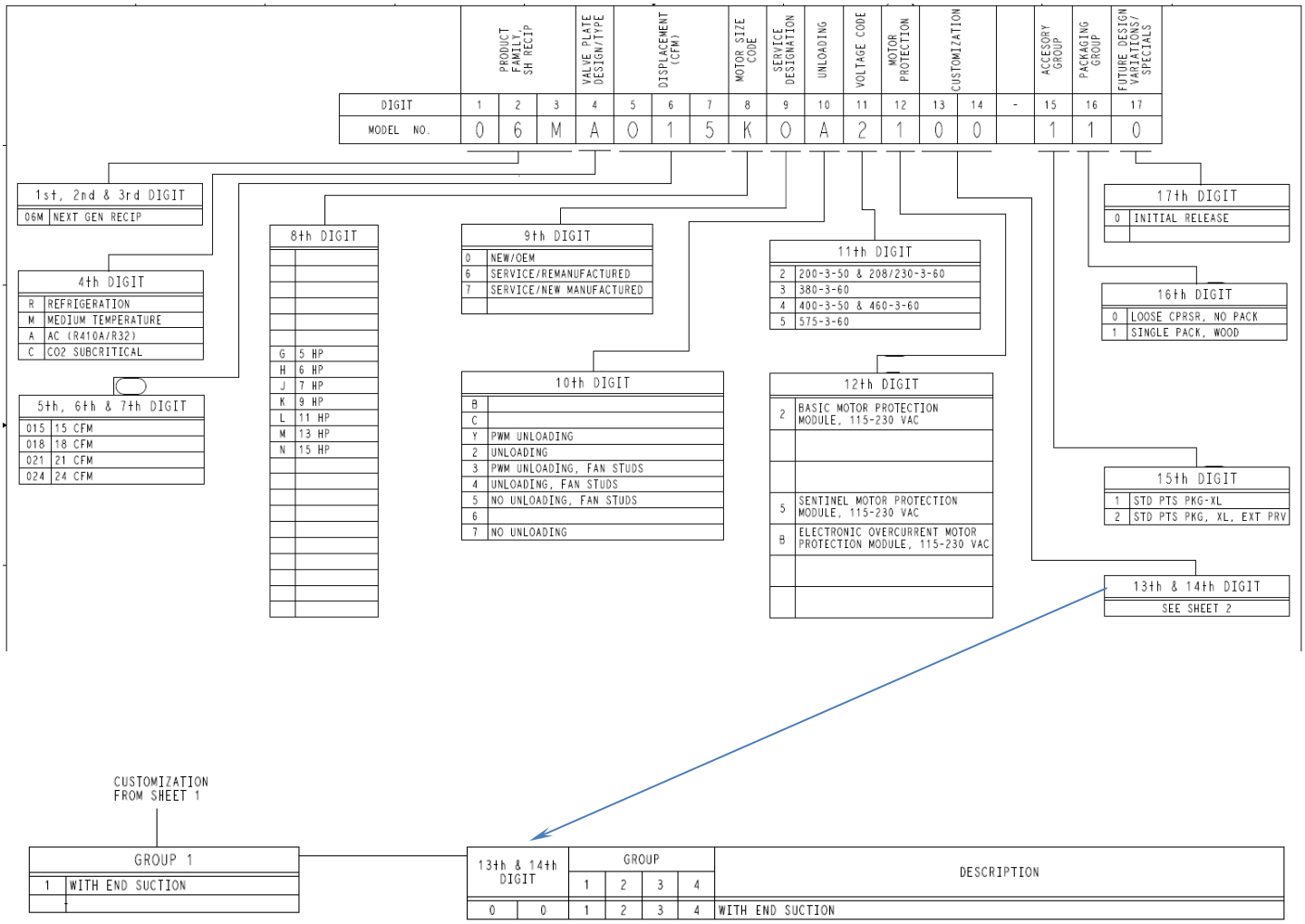
Approved Application Range

The 06M compressor has a wide operating range from -60F SST to plus 80F SST, with condensing temperatures as high as 155F SDT. This vast operating range allows for insertion into a large scope of product applications for all Low, Medium, and High temperature applications. See section 1.3 for operating envelop.

Optimum Operation Ranges:

- Low Temperature R410A (-30F to +10F SST)
- Low Temperature R744 (-60F to +5F SST)
- Medium Temperature (-10F to 40F SST)
- High Temperature (-10F to 80F SST)

06M Customer Model Number Significance Chart

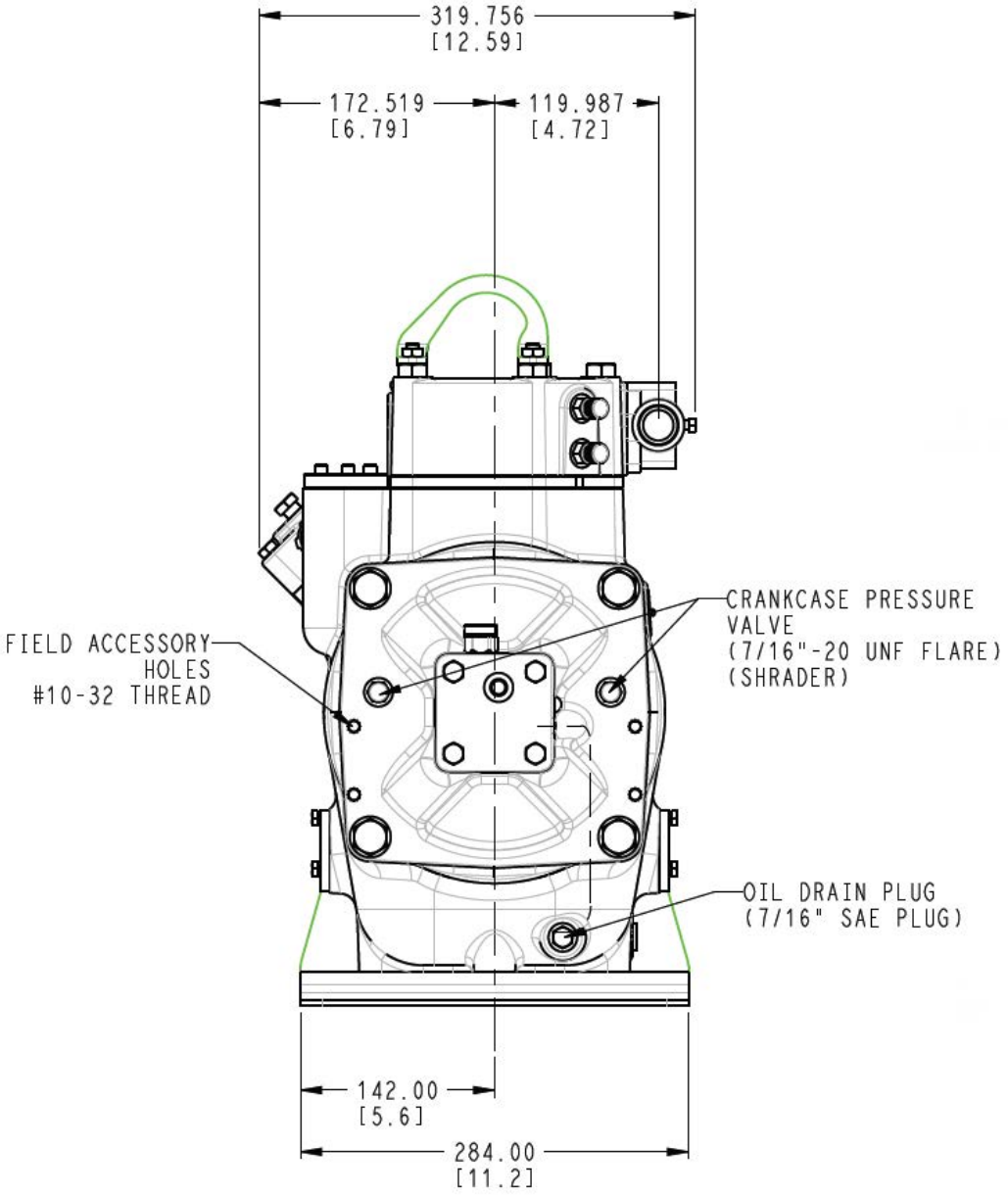


06M Outline Drawings (Standard Head, No Unloading)

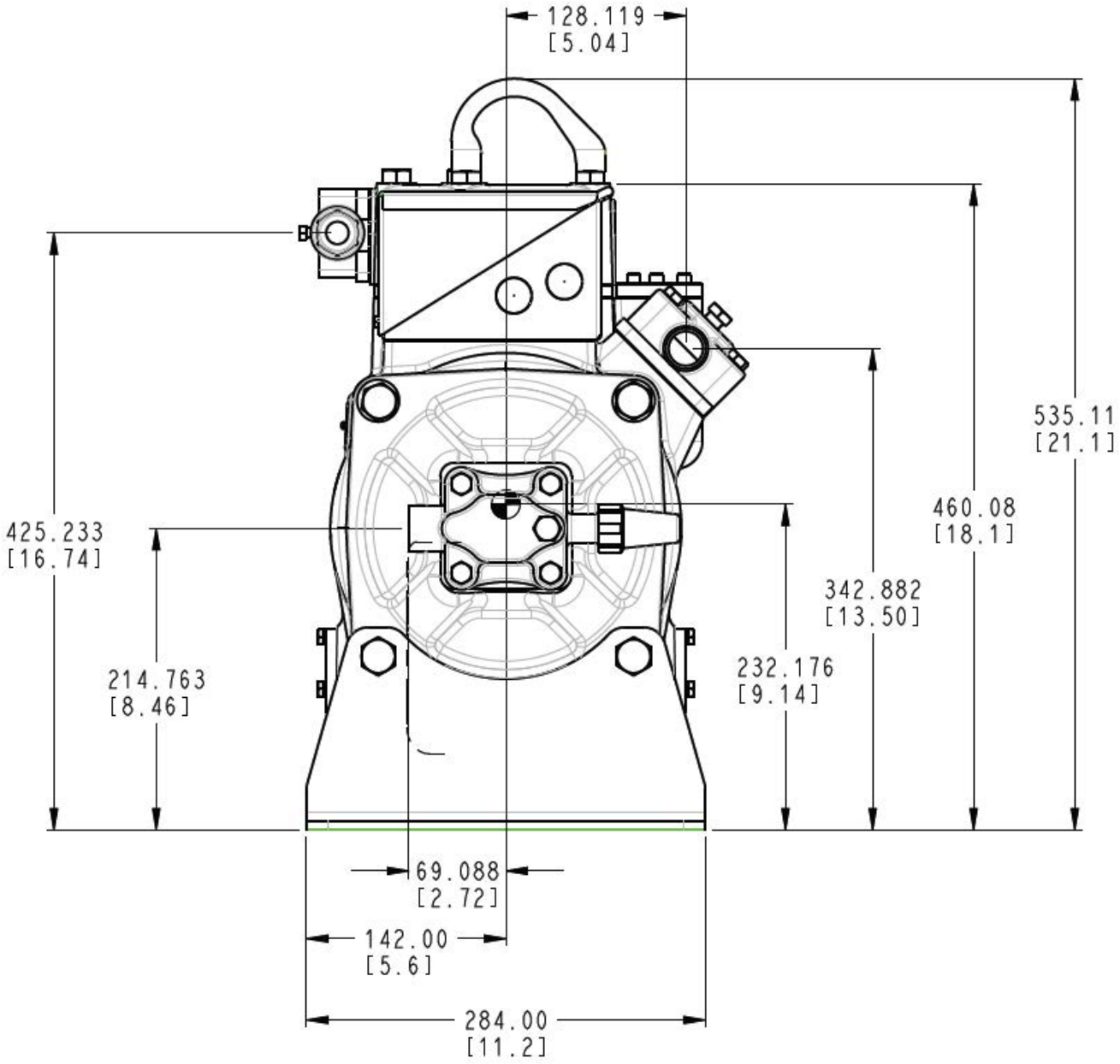
Models	CFM	Application	Service Connections		Dry Weight	Oil Charge
			Suction Line Size	Discharge Line Size		
06M*015	15.5	LT,M,AC, CO2	1-1/8"	7/8"	379 lbs	5.8 pints
06M*018	18.4		1-1/8"	7/8"	384 lbs	5.8 pints
06M*021	21.2		1-3/8"	1-1/8"	387 lbs	5.8 pints
06M*024	24.1		1-3/8"	1-1/8"	392 lbs	5.8 pints

*** R, M, A, C**

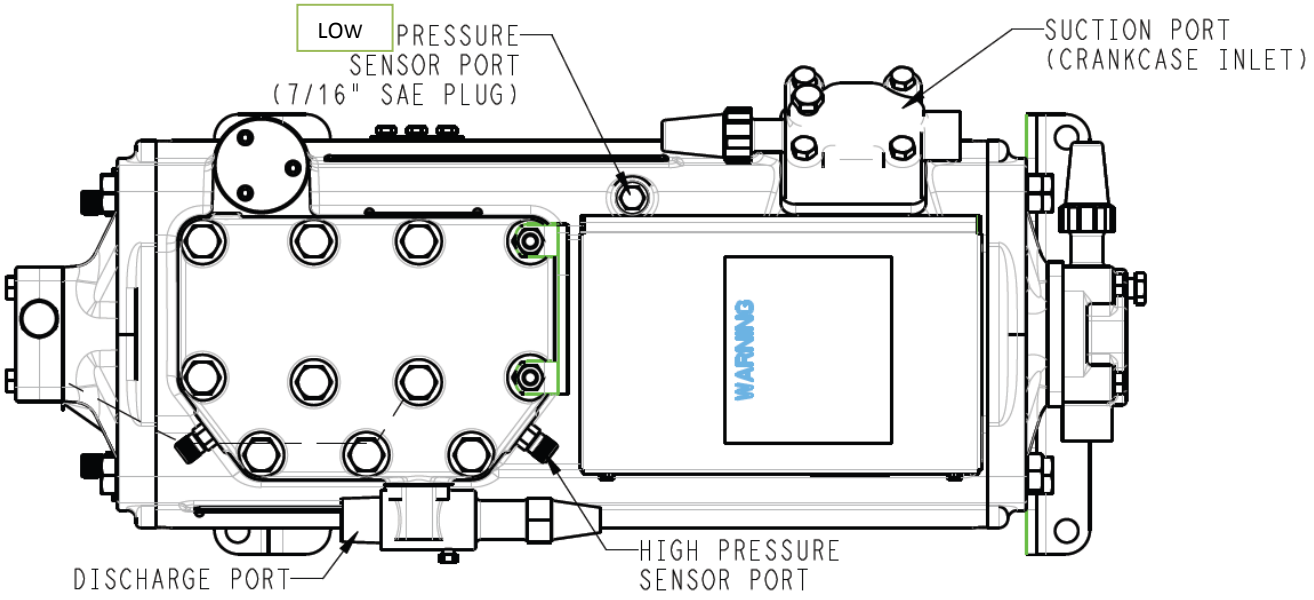
Oil Pump End



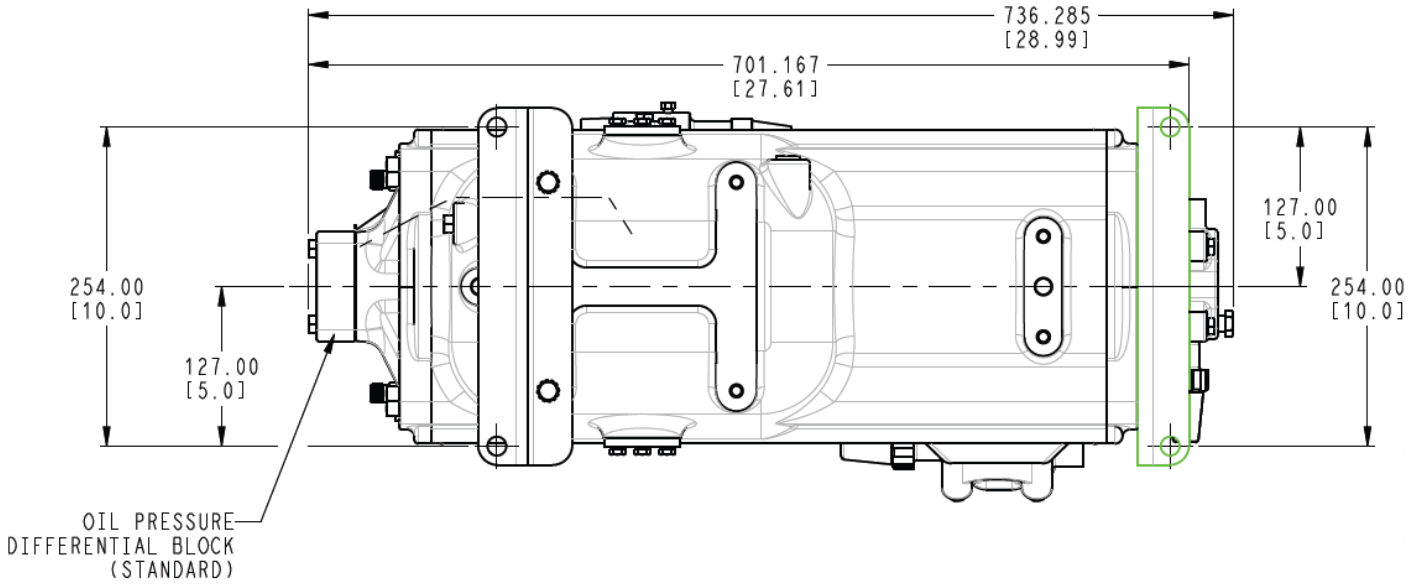
Motor Suction Port End



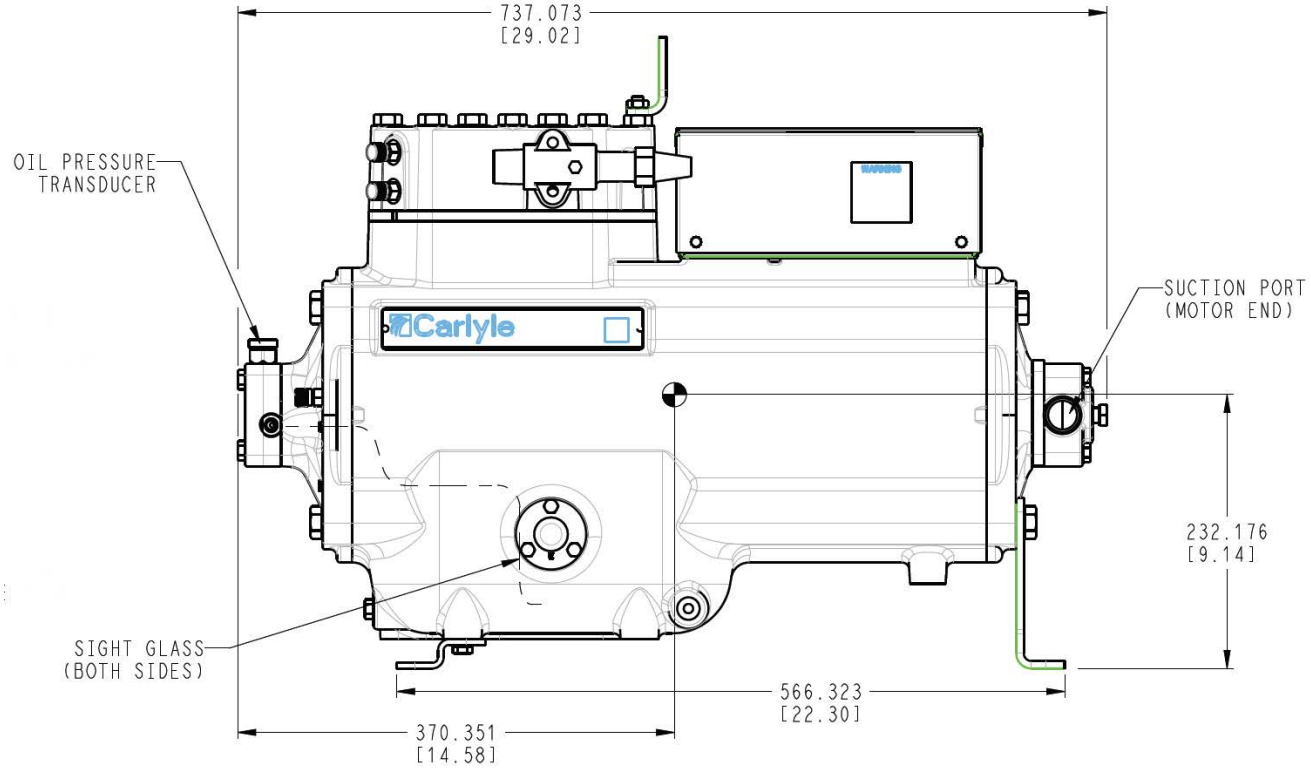
Top View



Bottom View

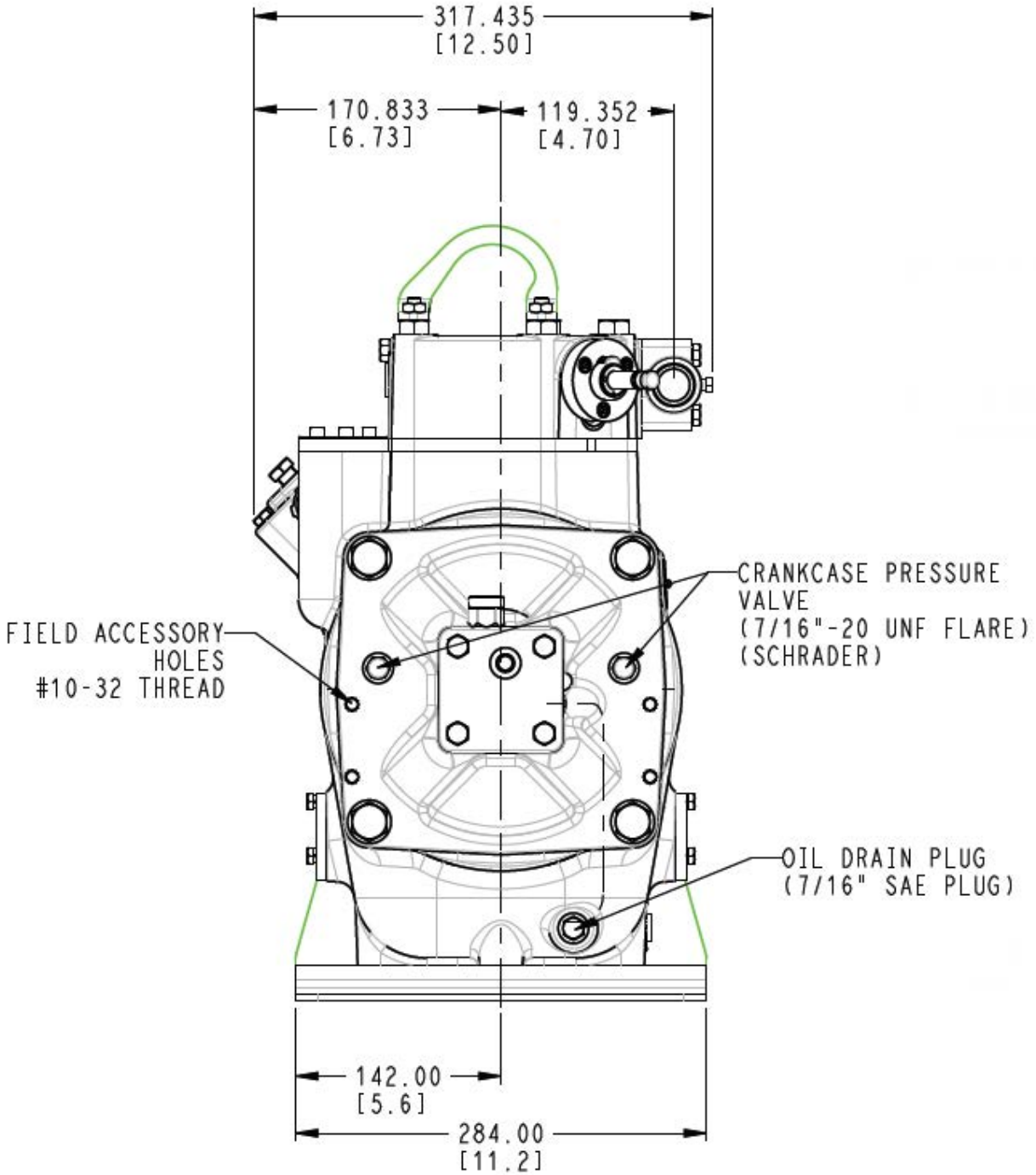


Side View

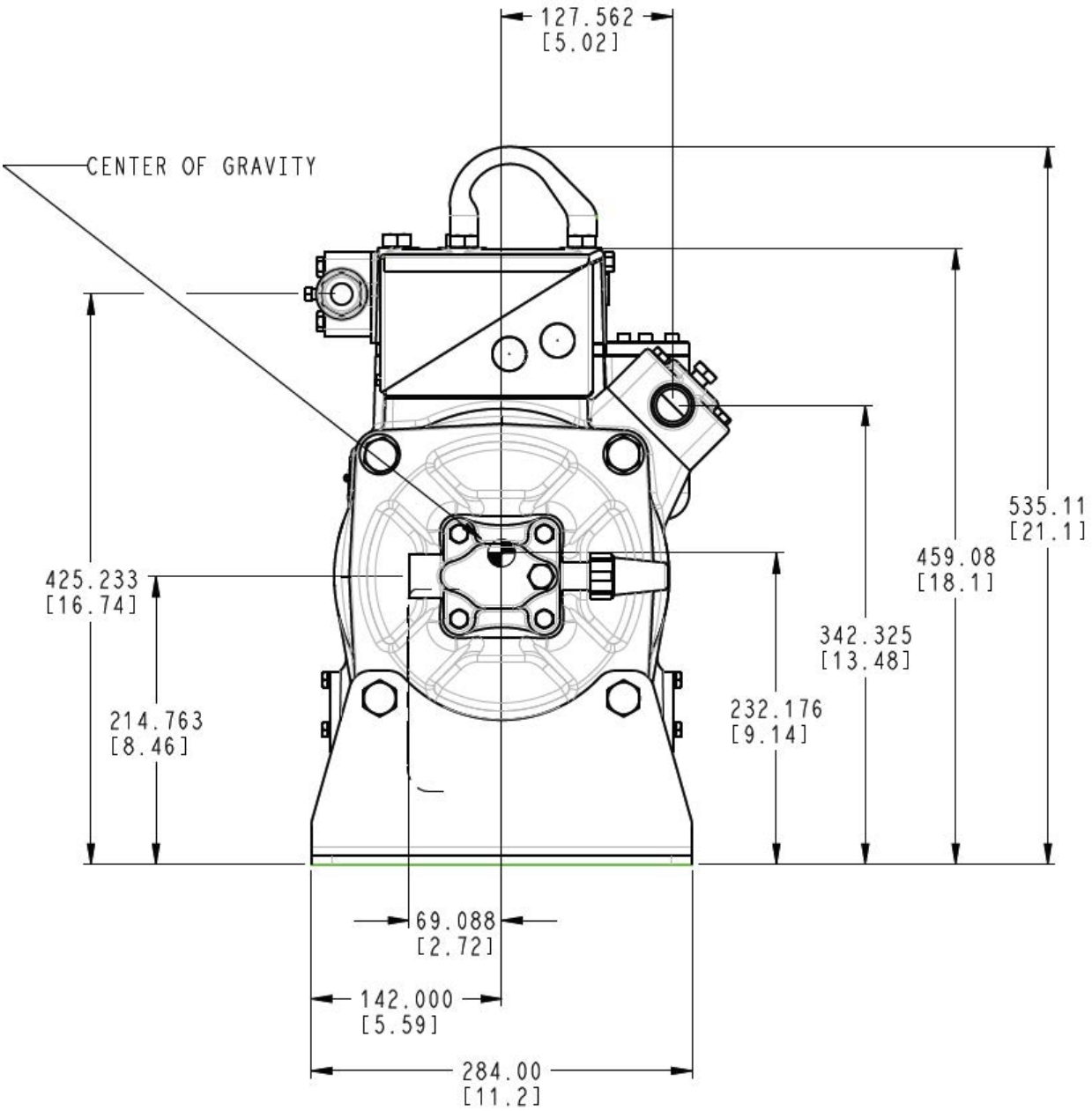

737.073
[29.02]
OIL PRESSURE
TRANSDUCER
SUCTION PORT
(MOTOR END)
232.176
[9.14]
SIGHT GLASS
(BOTH SIDES)
566.323
[22.30]
370.351
[14.58]

06M Outline Drawings (Suction Unloading Head)

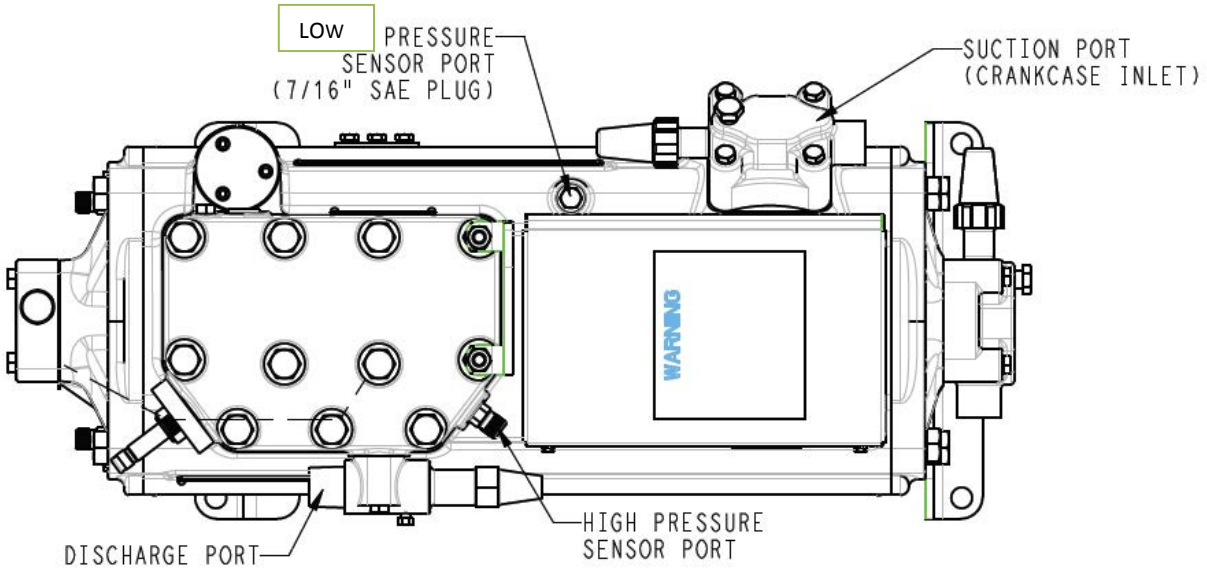
Oil Pump End



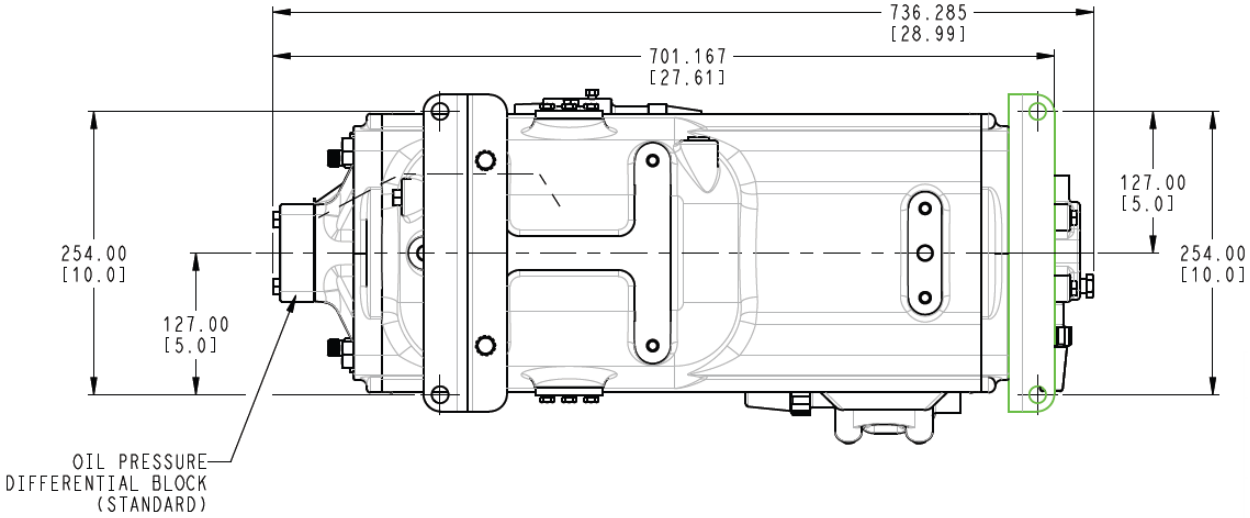
Motor Suction Port End



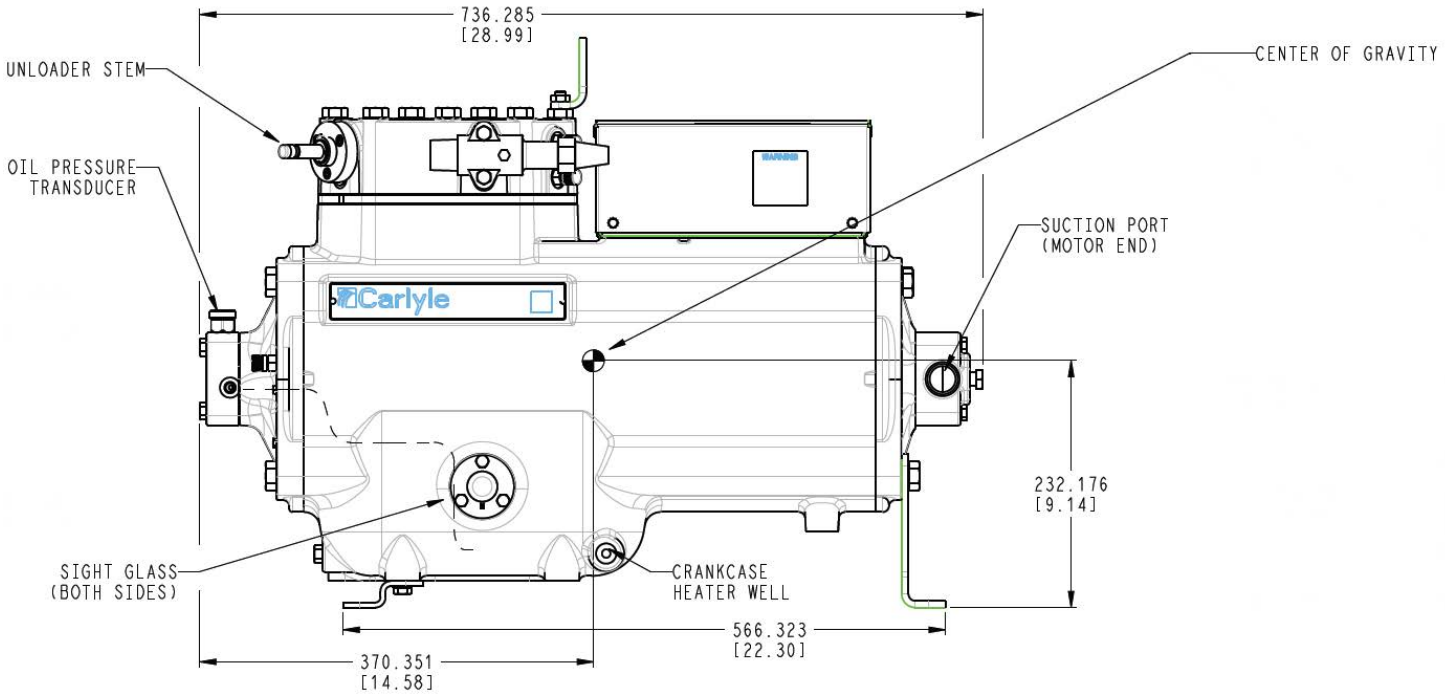
Top View



Bottom View



Side View


736.285
[28.99]
UNLOADER STEM
OIL PRESSURE
TRANSDUCER
CENTER OF GRAVITY
SUCTION PORT
(MOTOR END)
Carlyle
232.176
[9.14]
SIGHT GLASS
(BOTH SIDES)
CRANKCASE
HEATER WELL
566.323
[22.30]
370.351
[14.58]

1.0 System Design Considerations

1.1 Refrigerants and Lubricants

Approved Refrigerants

The 06M recip compressor is specifically designed for use in R-410A & R-744 systems. The 06M has not been qualified with the use of other HFC refrigerants. Approval by Carlyle Application Engineering is recommended prior to operating the 06M compressor with other refrigerants than R-410A & R-744.

See section 2.3 for approved POE and PVE lubricants.

1.2 Environmental Considerations

Operating Ambient Temperature

The 06M semi-hermetic compressor is designed for the following ambient temperature ranges:

Non-Operating with R410A refrigerant in the compressor: -40F to 80F (-40C to 27C)

Non-Operating with R744 refrigerant in the compressor: -40F to 10F (-40C to -12C)

Non-Operating (storage, no refrigerant in the compressor): -40F to 158F (-40C to 80C)

Salt –Spray Requirements

The compressor has been tested through 500 hours of salt-spray in compliance with ASTM specification B-117 and can be applied in outdoor applications.

Electrical Box

The compressor's electrical box is tested to be compliant to the IP44 rating. The 06M terminal box is suitable for outdoor use equipment as a sole enclosure.

1.3 Operating Limits and Controls

General Application Information

The 06M compressor is available for operation in low, medium and high temperature application ranges. The following R410A/R744 operating envelopes show where the compressor can reliably operate for the application duty. The compressor's unloading limitations have been established and are defined within the operating envelope.

It is extremely important the compressor does not operate outside the approved Operating Envelope. Implementing the necessary pressure and temperature controls will provide reliable operation of the compressor in maintaining envelope integrity. **Table 1** provides a list of control points and ranges for R410A and R744.

Table 1

Compressor Parameter	Operating Range
Discharge Temperature	285F Max Operating, 295F Trip
Oil Temperature	80F - 160F
*Oil Level in sight-glass	1/4 - 3/4 (visual)
Oil amount	92 oz (5.8 pints)
Return Gas Temperature	20F to 105F
**Compressor Speed Range	**20Hz - 80 Hz R410A** **20Hz – 60Hz for R744**
Oil Pump Pressure > Suction Pressure	12 psid @ 20 Hz & 45 psid @ 60 Hz
Low Oil Pressure cut-out ***(DP)	8-10 psid (Trip), 12-14 psid (Reset)
***Unloader Maximum DP allowable	475 psid
Unloader Minimum DP required	35 psid (Discharge minus Suction pressure)

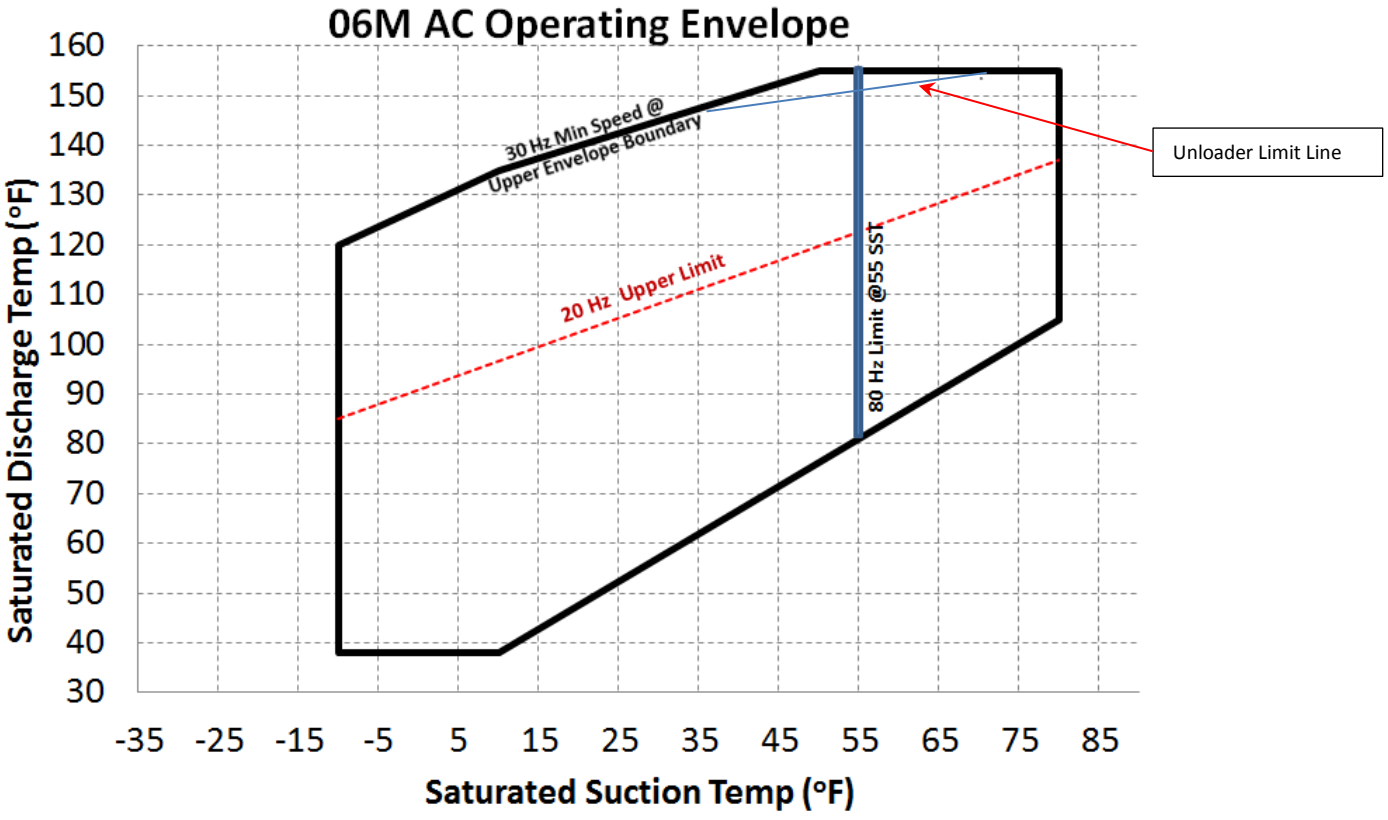
* Oil level in the sight glass is recommend to be ½ level

** The Compressor speed range is **not** applicable for the entire operating envelop. See envelope for Operating limitations.

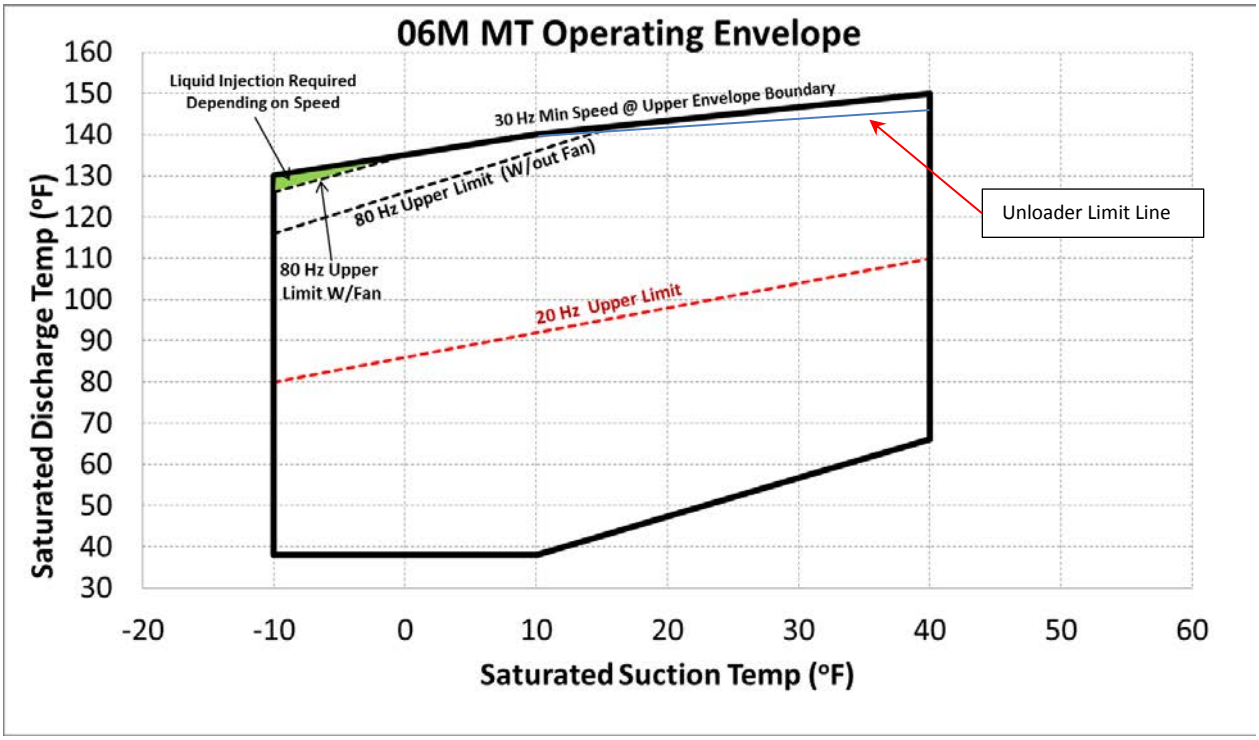
*** DP = Differential Pressure

**** The unloader valve is limited to 475 psid differential.

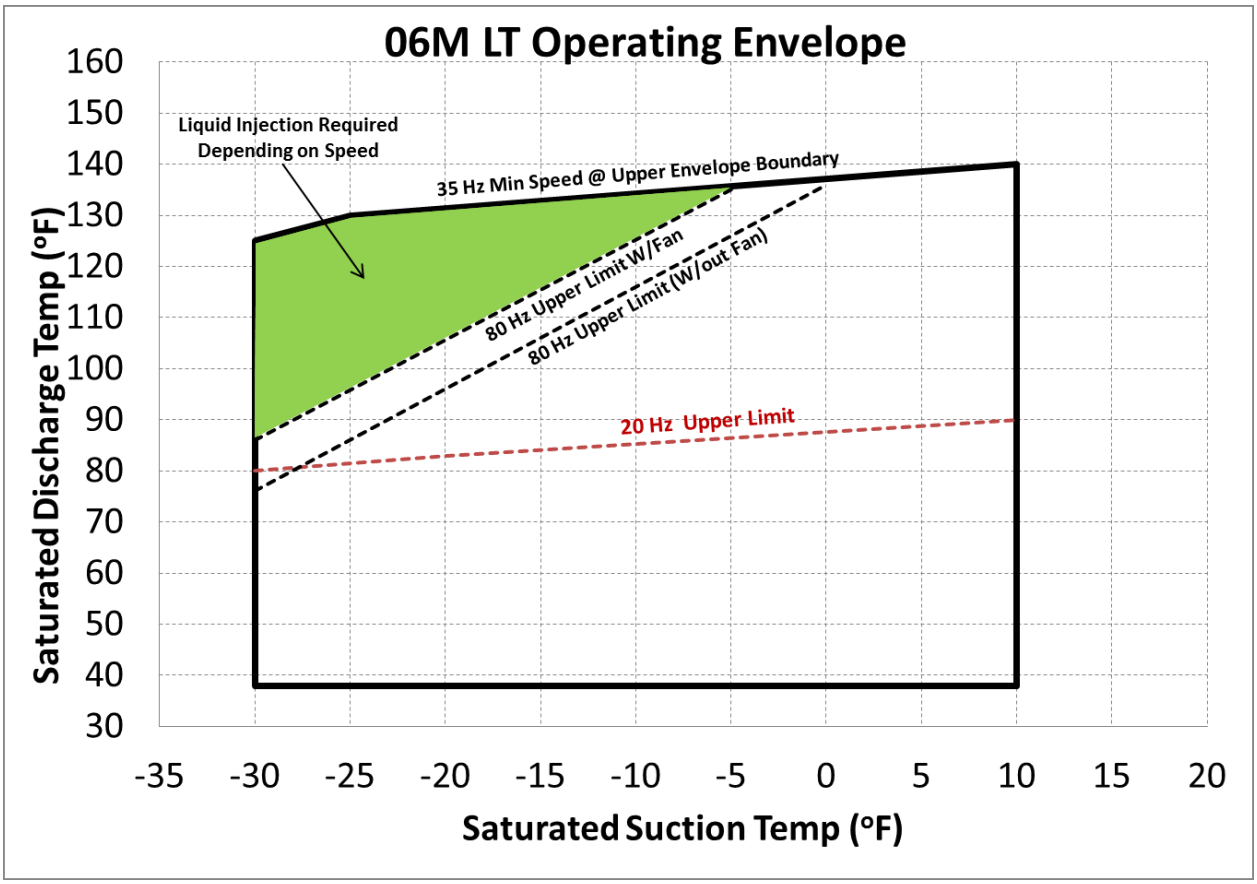
Operating Envelope R410A (High Temperature Models)



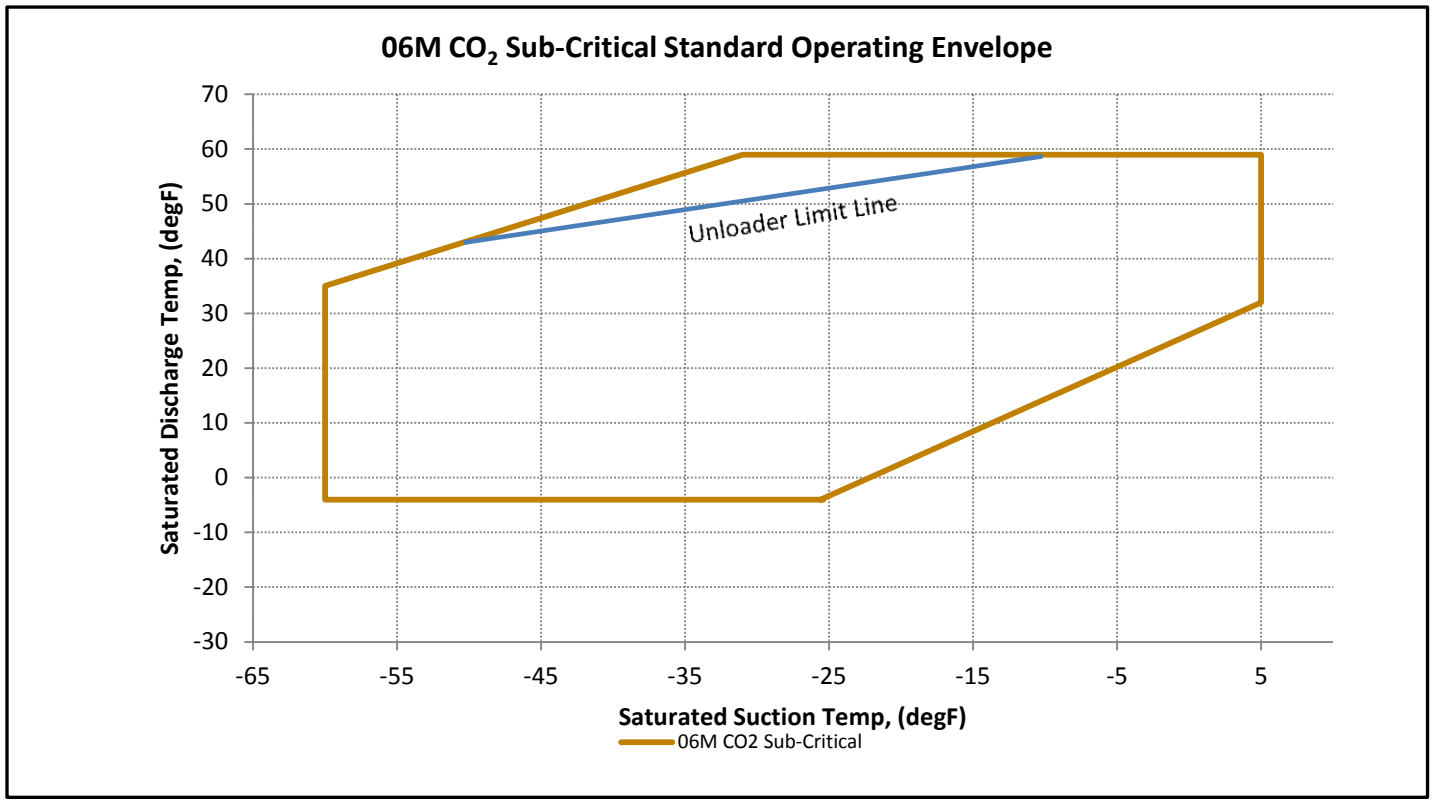
Operating Envelope R410A (Medium Temperature Models)

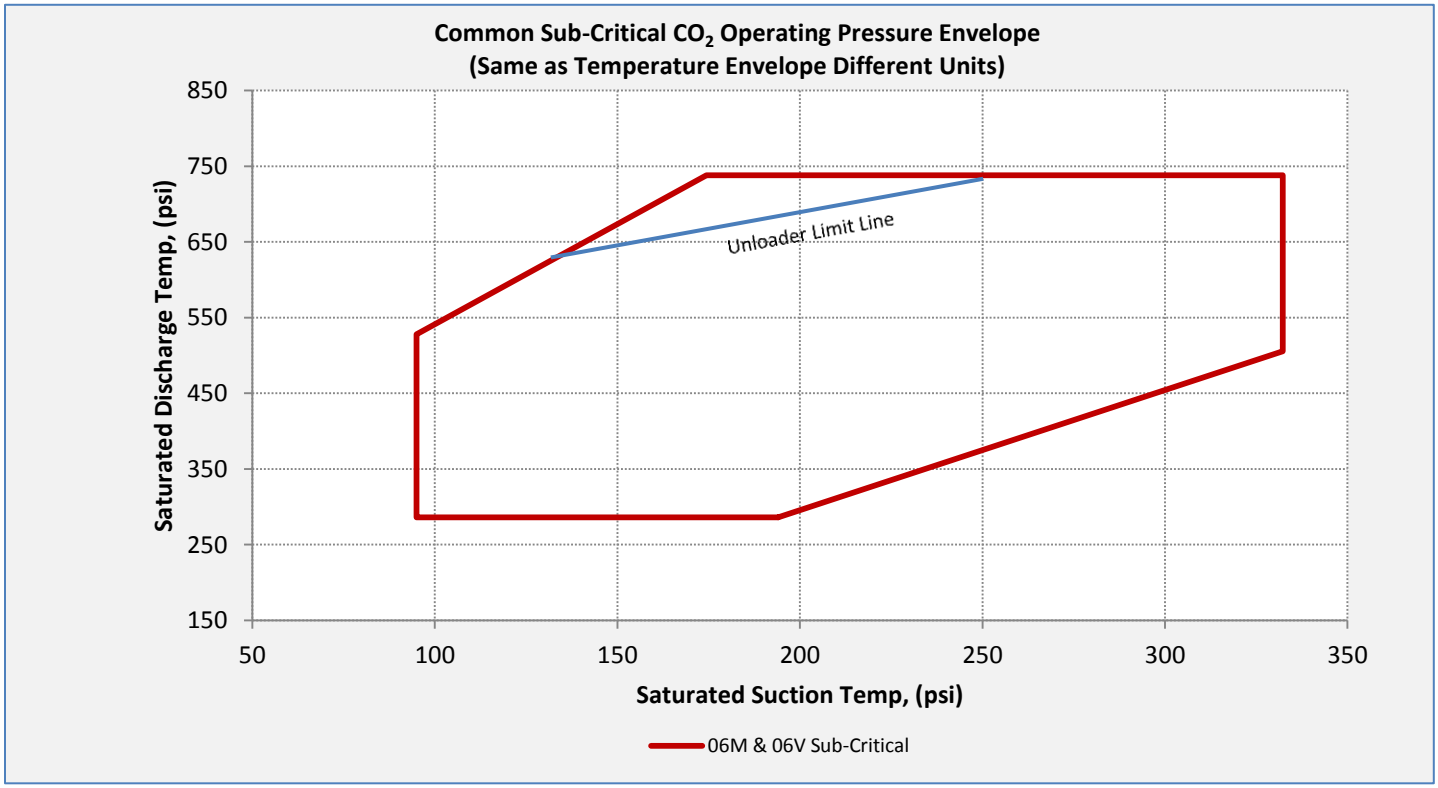


Operating Envelope R410A (Low Temperature Models)



Operating Envelope R744 (Low Temperature Models)





Discharge/Suction Temperatures

06M operating conditions should be controlled so that the discharge gas temperature does not exceed 285F at the outlet of the discharge service valve. Increases in either the compression ratio or suction gas temperature will cause the discharge temperature to increase. Both must be kept within allowable limits as shown in Table 1. Options, such as a cylinder head fan and/or a liquid injection are available to reduce discharge gas temperatures and typically only required for low temperature applications were compression ratios are highest.

Unloading

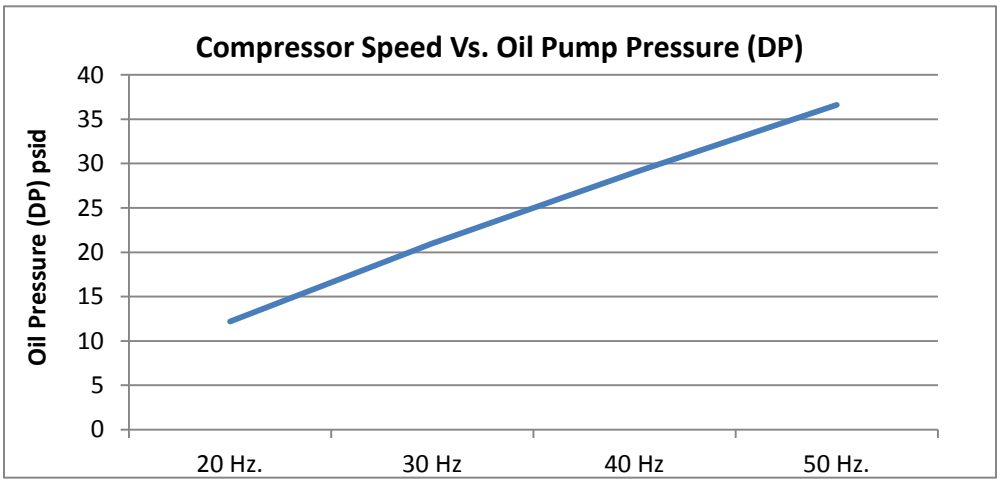
Compressor unloading can be performed generally in all regions of the operating envelope, with some exceptions, as noted in the operating envelop for R410A and R744. The 06M compressor has the capability to unload 1 of 3 cylinders, reducing compressor capacity by 33%.

Oil Level

Compressor oil level should be maintained between 1/4 to 3/4 within the sight-glass. When starting up any new system, 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. Oil levels below the recommended compressor oil level can cause a complete loss of lubrication, resulting in an immediate compressor failure if not protected against.

Oil Pressure

The 06M oil pump is a positive displacement gerotor type that produces high volume oil flow at a low oil pressure. The compressor utilizes an internal pressure regulator valve to maintain oil pressure 15 to 45 psid above the suction pressure over the speed range of the compressor (20-60Hz).



An oil pressure safety switch must be applied to protect the compressor if a loss of lubrication were to occur. All 06M models have an oil differential pressure switch factory installed set to trip the compressor at 9 psid on oil differential pressure decrease.

1.4 Refrigerant Piping

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

1.0) 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 condition. If capacity control is utilized, piping must be sized for full and part load conditions. Unloading will decrease refrigerant velocities in the compressor and related system piping.

2.0) Minimizing the loss of lubrication oil from the compressor at all times. This is best accomplished by applying a Carlyle oil pressure safety switch that will shut the compressor down on loss of oil pump pressure and an oil level regulator that will maintain adequate oil level in the compressor sump and shut the compressor down if proper oil level is not maintained (**see section 6.0 Compressor Accessories**).

3.0) Prevent liquid refrigerant from entering the compressor during operation and shut down. Using a liquid line solenoid valve and a discharge check valve will support compressor isolation during lengthy compressor shut-down periods and will reduce liquid refrigerant migration back to the compressor oil sump.

1.5 Refrigerant Migration / Flood-back

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 pistons rings, and possible compressor damage. Furthermore, excessive liquid in the cylinder causes hydraulic compression, which can create cylinder pressures as high 1500 psi. This hydraulic loading can cause suction and discharge valve and gasket failures to occur while also subjecting the connecting rod, piston, and main bearing to excessive loading. Therefore, application steps 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.

- System expansion valve should be set and adjusted to ensure the refrigerant returning back to the compressor is superheated a minimum 20F above saturation temperature.
- During compressor shutdown, refrigerant will migrate back to the compressor and absorb/mix with the oil in the compressor crankcase. Oil dilution is more critical with HFC refrigerant and POE lubricants. To minimize the absorption of refrigerant in the oil, the use of a <u>crankcase heater is strongly recommended.</u>
- Do not energize the crankcase heater while the compressor is operating because this may overheat the compressor oil.

1.6 Compressor Interconnection

When only two 06M compressors of the same size are to be connected in parallel, the oil equalization can be accomplished with a single oil equalization line installed. The 06M compressors have two sight-glass connections, either of which may be removed for installation of the equalizer 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 equalization line short (< 2 feet). In this case, a single 1-1/8" line can be used. Since the 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. See the Accessory Section 6.0 for the compressor equalization kit.

When more than two compressors are to be connected in parallel or if the compressors are of different displacements, then an oil control system utilizing an oil separator, oil reservoir, and an oil level regulator should be applied. Carlyle does provide accessory selections for an oil level regulator that will install over one of the compressor's sight-glass. See accessory section 6.0 for more details.

1.7 Compressor Mounting

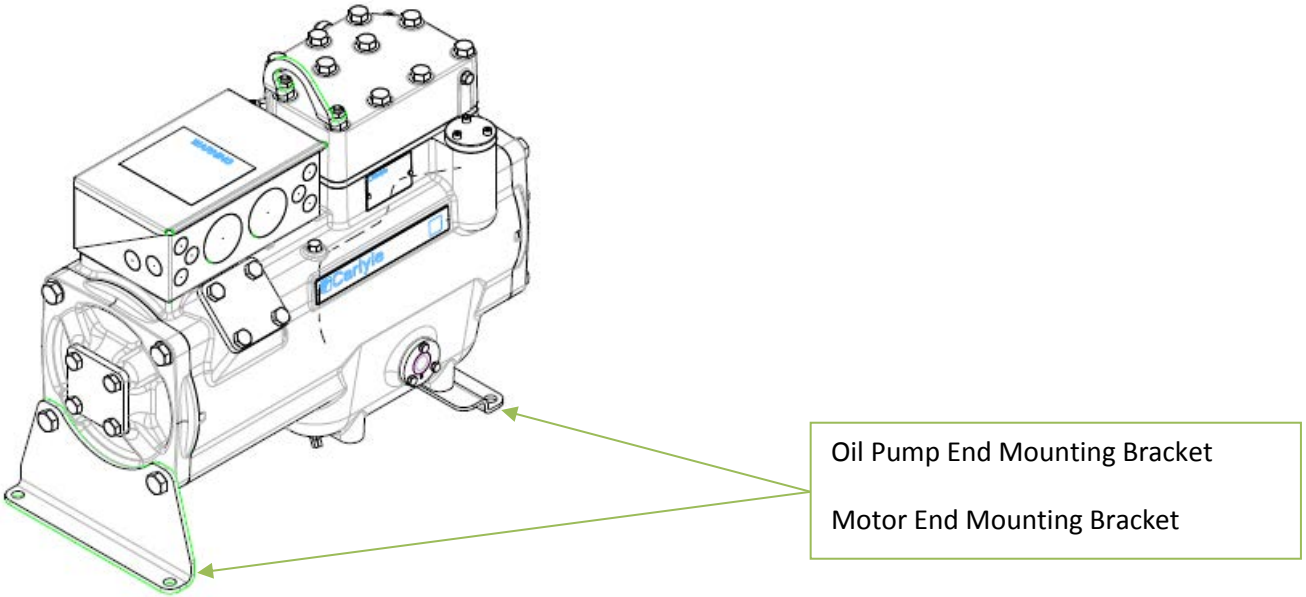
All 06M compressor must be solid mounted. The compressor is equipped with mounting brackets factory installed. These mounting brackets have been specifically designed and tested to provide minimal compressor vibration at the mounting feet, suction, and discharge refrigerant lines. No additional hardware, such as spacers, is required to mount the compressor. Mount the compressor at 4 places with 3/8-16 grade 8 bolts; equally torque the mounting feet to 30-35 ft-lbs. Proper torque will reduce transmitting excessive vibration to the base.

Note: Do not remove the mounting feet and substitute other installation brackets. Doing so may result in higher than normal running vibrations.

Proper precautions must be taken to prevent the transmission of compressor vibration through the piping system. Follow the guidelines published in the **Carlyle OEM Bulletin 118 "Recommendations to Minimize Refrigerant Line Vibrations"**.

R410A is a high density, high pressure refrigerant, resulting in higher discharge gas pulsations as compared to low pressure HFC refrigerants. A discharge line muffler is required for proper installation of the compressor. Failure to install a discharge line muffler may result in higher than normal discharge line vibrations and may result in refrigerant line leakage.

It is also recommend designing the suction line with sufficient "spring" so the suction service valve can be moved aside for access to the suction strainer.



2.0 Compressor Lubrication System

2.1 Compressor Lubrication

All 06M compressors are shipped without oil and have an inert gas charge factory set to 20 psig when shipped from the Stone Mountain manufacturing facility in Georgia, USA.

The recommended oil charge for all 06M models is 92 ounces (5.8 pints), which correlates to 1/2 oil level in the sight-glass. Use only Carlyle approved POE and PVE oil. Adding oil to the compressor should be done when the compressor is mounted on a level surface. POE and PVE oil is highly hydroscopic (moisture absorption) and the compressor should not be exposed for long periods open to the atmosphere.

All refrigerant compressors must have adequate lubrication to ensure trouble-free operation and long-term reliability. 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 refrigerant 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. For normal compressor operation, an oil level between 1/4 to 3/4 level in the sight-glass is acceptable (see figure 1). The oil level should be observed in the sight-glass immediately after the compressor is shutdown. Oil level should not be observed if the compressor has been off for a long period of time because the indicated level may be a mixture of oil and refrigerant, which is not an indication of true oil level.

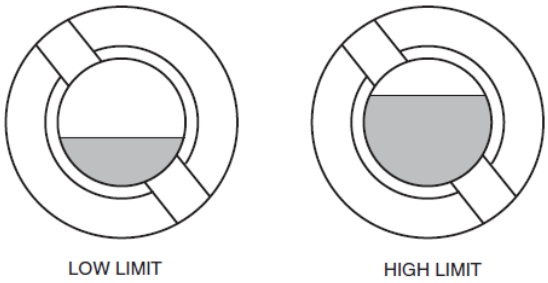


Figure 1 – 06M Oil Level Limits

Very low compressor oil levels, below sight-glass level, 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 cause 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.

2.2 Design for Proper Oil Return

When the 06M compressor is unloaded, the compressor and system capacity are reduced by 1/3 of full load capacity. This capacity reduction result in the same percent reduction in refrigerant flow rate through the system piping. Oil that is entrained and carried with refrigerant requires a certain gas velocity to properly return oil 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.

2.3 Approved Lubricants

The 06M reciprocating compressor is approved for use with the following lubricants for R410A and R744.

Approved Oils for R410A medium/AC duty and CO2 Subcritical:

- Castrol E68
- Castrol SW68 (Use only for medium and high temperature applications)
- ICI Emkarate RL68H
- CPI Solest 68
- CPI CP-2916S
- Mobil Artic EAL 68 (Medium temperature applications only)

Approved Oils for Low Temp R410A:

- Idemitsu FVC100D (100 PVE) for Low Temperature applications (Recommended).
- Idemitsu FVC68D (68 PVE) for Low Temperature applications (Alternative).

PVE oil is <u>recommended</u> for all Low Temperature applications (SST < 0F), where higher discharge temperatures and motor temperatures are expected due to reduced refrigerant mass flow providing cooling to the compressor's motor.

PVE is also recommended for some medium temperature applications with high condensing temperatures. See operating envelop section 1.3 for details.

POE and PVE oils are very hygroscopic and will readily absorb moisture, which in turn forms damaging acids. Using the incorrect type of oil weight will cause premature compressor failure. Consult Carlyle Application Engineering if not using any of the oils listed in this guide as approved for use with the 06M compressor.

2.4 Oil Pump

The 06M oil pump is a positive displacement gerotor type that produces high volume oil flow at a low oil pressure. The compressor utilizes an internal pressure valve to maintain oil pressure at a generous 15 to 45 psid above suction pressure.

3.0 Capacity Control

The 06M compressor utilizes a 4 pole motor that has been qualified to be controlled and modulated per the following:

- Suction Unloading (unloads 1 of 3 cylinders reducing capacity to 67%)
- Smart Unloading (In conjunction with Carlyle Smart Controller, the 06M compressor will modulate capacity linearly from 67 to 100%).
- **R401A - Variable Frequency Drive (VFD capable from 20 - 80 Hz).**
- **R744 - Variable Frequency Drive (VFD capable from 20 - 60 Hz).**
- Suction Modulation Valve (not released to production).

3.1 Suction Unloading

The 06M compressor suction unloading system has been approved for R410A refrigerant. The compressor can unload 1 of 3 cylinders reducing compressor capacity by 33%. To unload the compressor, the solenoid coil mounted on the unloader valve stem, must be energized. De-energizing the unloader solenoid coil will allow the compressor to load back to full capacity.

Capacity Control Application Range

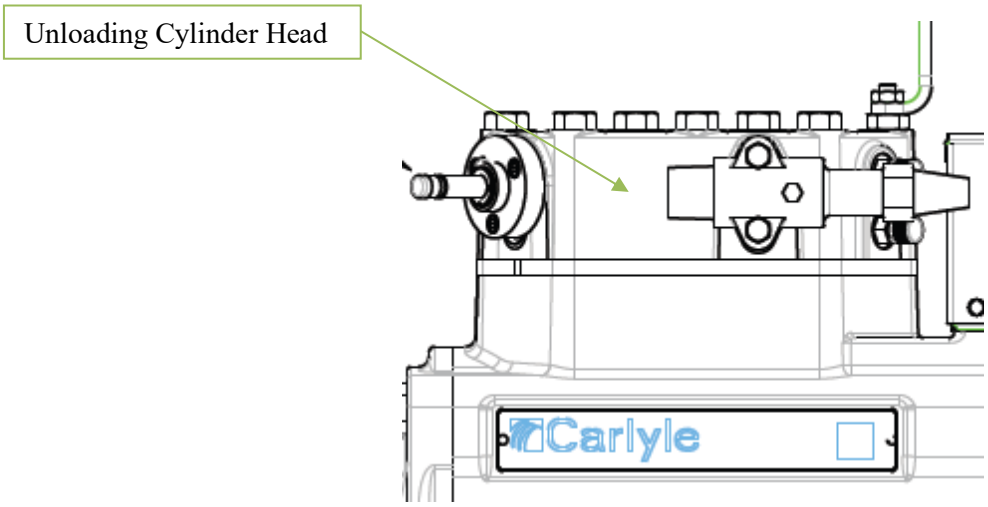
See Operating Envelopes in section 1.3.

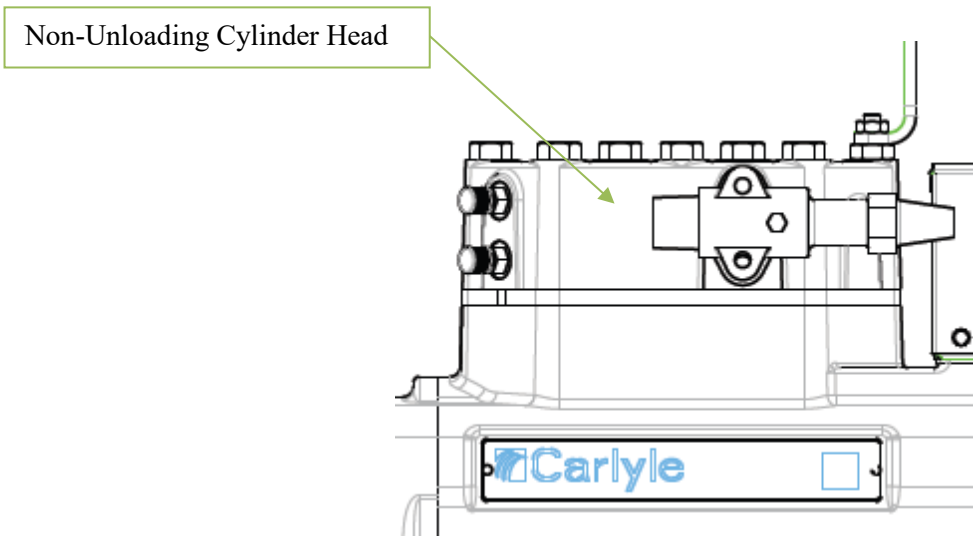
Pressure Differential Required to Load Compressor

A minimum delta pressure between the discharge and suction pressure is require to extend the unloader valve spring to load up the cylinder bank. If compressor differential pressure, discharge minus suction, is less than 68 psid, the compressor unloading valve will not function properly and will remain in an unloaded state. Adequate differential pressure is required to build-up behind the unloader piston assembly to extend the unloader valve spring, closing the unloader discharge to suction port, thus fully loading the compressor.

Capacity Control Head Assembly

A standard 06M compressor model, with no unloading, **can** be field retrofitted with an unloading cylinder head assembly. An accessory kit consisting of a cylinder head and unloader valve is available through Carlyle.





Pump-Down Control

Compressors with suction unloading have inherently greater internal leak paths then compressors without this capacity control feature installed on them. The 06M, with an electrically actuated unloader valve, can be applied with continuous or automatic pump-down control.

Electric Solenoid Capacity Control Operation

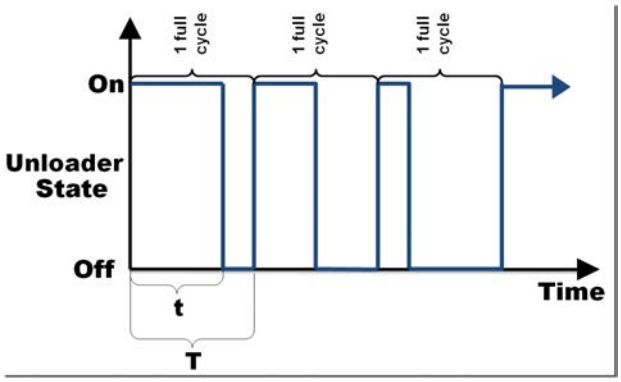
The electrically operated unloader control valve is actuated by a remote signal to the electric solenoid coil. When the solenoid coil is "de-energized", the passageways in the unloader valve are aligned for "loaded" cylinder head operation (all 3 cylinder are compressing refrigerant). When the solenoid coil is "energized", the passageways in the unloader valve are aligned for "unloaded" cylinder head operation (only 2 of the 3 cylinders are compressing refrigerant).

3.2 Smart Unloading

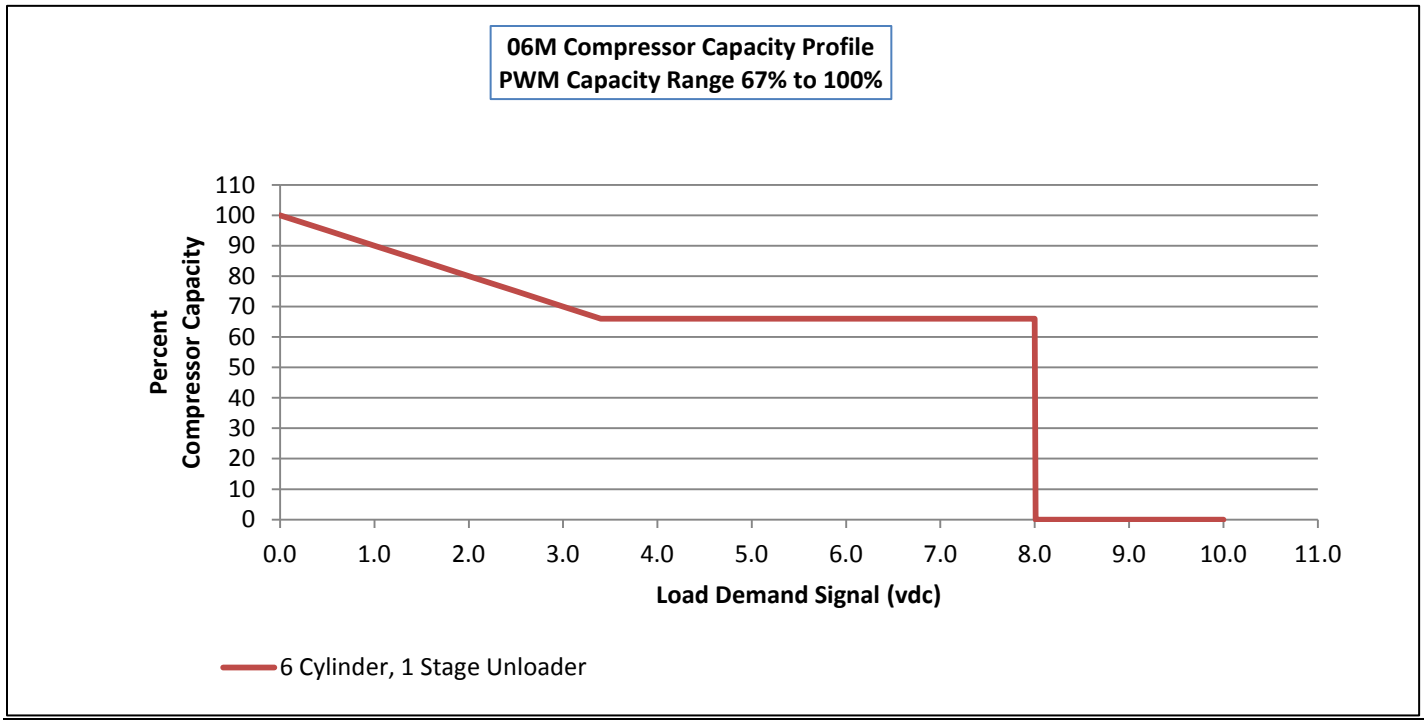
The 06M compressor has been qualified to be applied with the Carlyle Smart Unloading Controller for capacity control. The Carlyle Smart Controller is designed to operate the compressor unloader using Pulse Width Modulation (PWM). See the Smart Controller application guide 574-078 for application details.

Smart Unloading, when properly applied, will provide stable suction pressure control and minimized compressor cycling. Therefore, the use of smart unloading versus simply unloading or cycling compressors will typically result in significant energy savings.

PWM will cycle the compressor unloader or PWM Valve once every 30 seconds between loaded and unloaded positions. The capacity modulation is achieved by energizing the unloader solenoid coil for (t) seconds over a 30 second cycle (T). For example, if the *SMART* controller receives a load demand signal to operate at 90% compressor capacity, the Smart Controller will energize the unloader coil or close the PWM Valve for 9 seconds, and then de-energize the unloader coil or open the PWM Valve for 21 second. This 30 second PWM cycle will not change unless the system's capacity demand signals change.

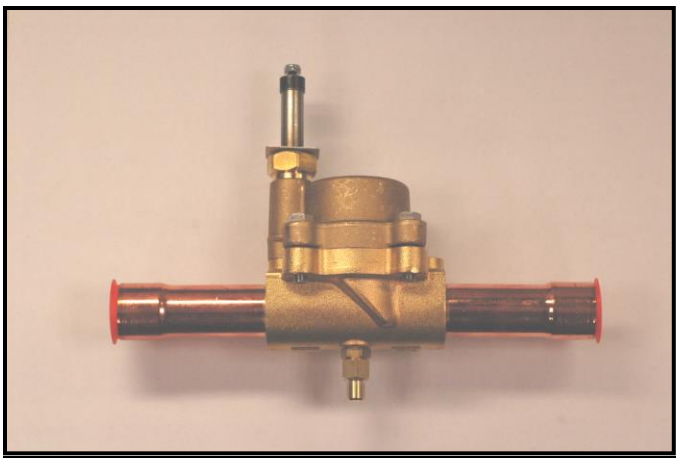


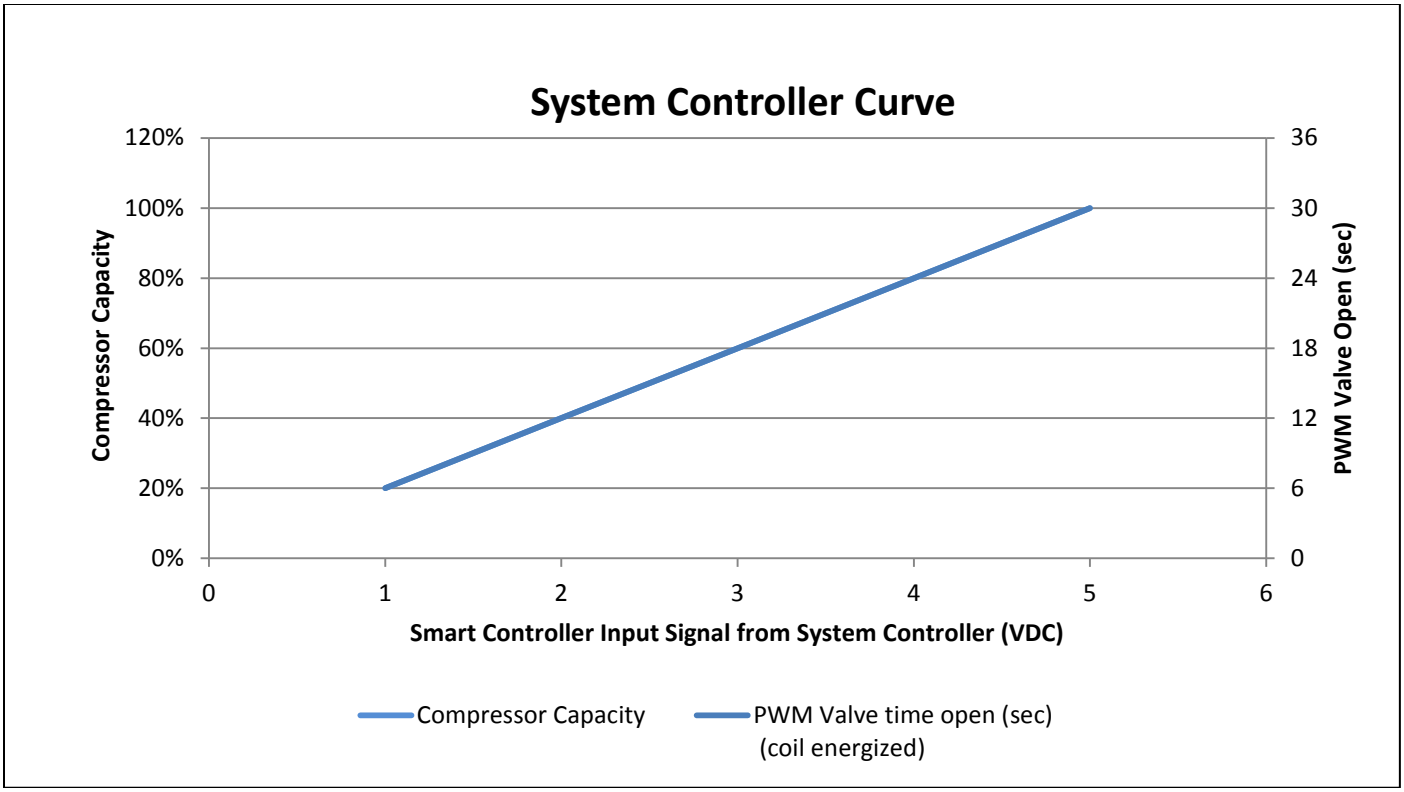
The 06M, with Smart Unloading, has the capability to linearly control compressor capacity from 67% to 100% for low, medium, and high temperature applications.



The 06M compressor is qualified to be used with the PWM Valve for capacity control. The PWM valve (all models), when applied with the Smart Controller, has the ability to module compressor capacity down to 20% of full load. The PWM valve installs in the compressor suction line just upstream of the compressor.

Carlyle PWM Valve – P/N 8ADB000690 & 907





3.3 Variable Frequency Drives

Variable frequency drives may be used with the 06M compressor to provide optimum capacity control while maximizing the compressor efficiency. VFD's, when properly applied, provide very stable suction pressure control and minimized compressor cycling. Therefore, the use of VFD's versus simply unloading or cycling compressors will typically result in significant energy savings.

VFD Speed Range – R410A

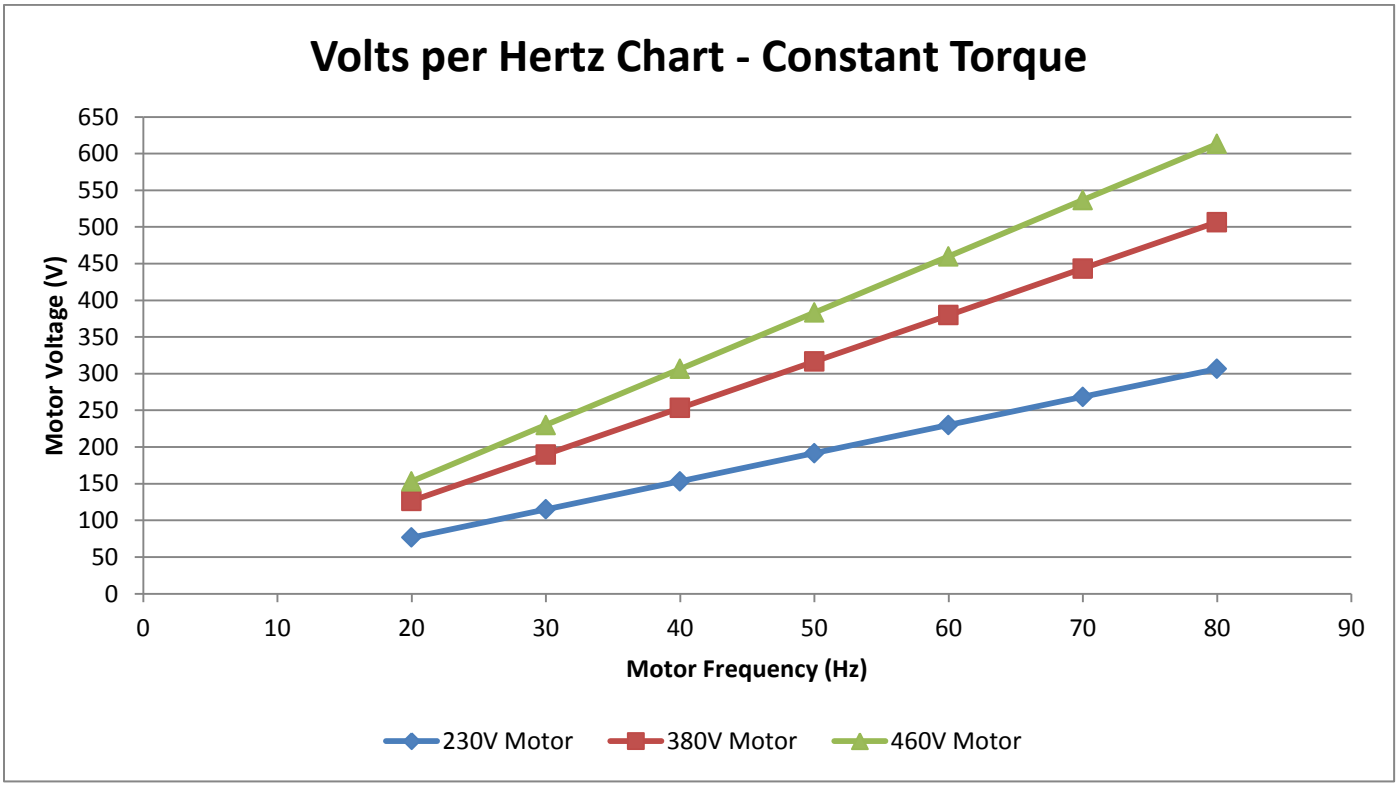
The 06M compressor has been qualified to operate from 20 to 80 Hertz. Operating the compressor below 20Hz will result in nuisance oil safety switch trips due to reduced oil pressure levels. Operating the compressor above 60Hz is limited to a 55F SST. See compressor operating envelope in figure 1 for compressor operating limitations.

VFD Speed Range – R744

The 06M compressor has been qualified to operate from 20 to 60 Hertz with R744. Operating the compressor below 20Hz will result in nuisance oil safety switch trips due to reduced oil pressure levels

VFD Sizing Consideration

The 06M compressor, when applied with an inverter, should be programmed to maintain a constant volts to frequency ratio (Volts/Hz = Constant). Maintaining this linear relationship is defined as a Constant Torque application. Maintaining a constant Volts/Hz will result in a constant compressor torque over the entire compressor speed range.



In order to maintain this linear relationship for compressor speeds above the rated 60Hz a voltage mismatch is necessary between the Bus or Line voltage and the compressor motor voltage. See the VFD motor voltage selection table to select the proper motor voltage for the associated line voltage and compressor speed range.

VFD Motor Voltage Selection Table		
VFD Line Voltage	**Compressor Motor Voltage**	**Compressor Speed Range**
230	230	20-60 Hz
380	380	20-60 Hz
460	460	20-60 Hz
575	575	20-60 Hz
380	230	20-80 Hz
460	230	20-80 Hz
575	380	20-80 Hz
690	460	20-80 Hz

Variable frequency drives should **not** be selected on nominal HP, but instead selected based on the maximum KW of the compressor motor as shown in **Table 4**.

06M Models	Compressor Maximum KW (nominal HP for Reference)			
CFM	Low Temperature 06MR	Medium Temperature 06MM	High Temperature 06MA	Low Temperature 06MC (R744)
15	10.5 (5 hp)	12.8 (7 hp)	14.1 (9 hp)	16.6 (13 hp)
18	12.6 (6)	15.7 (9)	16.7 (11)	20.1 (15)
21	14.7 (7)	18.8 (11)	20.1 (13)	23.3 (15)
24	17.2 (9)	21.9 (13)	24.1 (15)	26.6 (15)

Table 4

VFD System Start-up

Due to low discharge gas pulsation frequency of reciprocating compressors, 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.

4.0 Design Pressures

4.1 Compressor Requirements

The compressor is designed to meet the UL and ASHRAE safety code for refrigerant compressors. The manufacturing facilities for the compressor conduct pressure burst tests in accordance with ASHRAE-15, UL 60335-2-34 and EC standards EN 60335-2-34 and EN 12693.

4.2 Design Pressures

The 06M compressor 15-24 cfm models do not have an internal relief valve. The system relief valve pressure set-point should not exceed the maximum allowable compressor pressure.

Hydrostatic Design Pressures

Pressure Type	Application	Discharge (PSIG)	Suction (PSIG)
Proof Test pressure	R410A / R744	930	402
Maximum Operating Pressure	R410A	653	236
	R744	723	335
Leak Test Pressure	R410A / R744	225	225
**Maximum Allowable Pressure	R410A / R744	835	365

** Do not set system relief valve above Maximum Allowable Pressure

The Maximum Allowable Pressure is the maximum pressure permissible under atypical circumstances including, but not limited to, the following:

- Maximum ambient temperature
- Setting of any over-pressure relief devices
- Operating, standby, and shipping conditions
- System component failure (fan motor, condenser cooling water, etc.)

5.0 Compressor Electrical Data and Motor Protection

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

Carlyle does not publish certified Rated Load Amperes (RLA) values; instead a Maximum Continuous Current (MCC) value is obtained 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. Contactors, wiring, and other electrical components must be sized in accordance with local codes.

Compressor Circuit Protection

Compressor circuit protection must be used when applying the 06M compressor. Use the MCC values in **Table 5** to size wiring and appropriate circuit breaker or fuse protection based on local codes. The standard motor protection installed in the compressor's terminal box is not sufficient by itself for compressor circuit protection.

5.1 Electrical Data

The 06M Voltage Code is defined in the 11th digit of the compressor model number listed on the compressor's nameplate. The following voltages are available for all compressor models.

Model Significance #	Allowable Voltage Range		
11th Digit	Nominal Voltage	Minimum	Maximum
2	200-3-50	180	230
	208/230-3-60	187	253
3	380-3-60	342	440
4	400-3-50	342	440
	460-3-60	396	528
5	575	518	633

High Temperature Model Electrical Data (R410A)

Compressor Model	Volt	MCC	RLA (1.4)	RLA (1.56)	LRA	Max KW	HP
06MA015K0*2200	208/230	54.4	38.9	34.9	215	14.1	9
06MA015K0*3200	380	32.9	23.5	21.1	130		
06MA015K0*4200	460	27.2	19.4	17.4	108		
06MA015K0*5200	575	21.8	15.6	14.0	86		
06MA018L0*2200	208/230	62.3	44.5	39.9	269	16.7	11
06MA018L0*3200	380	37.7	26.9	24.2	163		
06MA018L0*4200	460	31.1	22.2	19.9	135		
06MA018L0*5200	575	24.9	17.8	16.0	108		
06MA021M0*2200	208/230	75.5	53.9	48.4	305	20.1	13
06MA021M0*3200	380	45.7	32.6	29.3	185		
06MA021M0*4200	460	37.8	27.0	24.2	153		
06MA021M0*5200	575	30.2	21.6	19.4	122		
06MA024N0*2200	208/230	88.9	63.5	57.0	366	24	15
06MA024N0*3200	380	55.7	39.8	35.7	222		
06MA024N0*4200	460	44.9	32.1	28.8	183		
06MA024N0*5200	575	34.8	24.9	22.3	146		

Medium Temperature Model Electrical Data (R410A)

Compressor Model	Volt	MCC	RLA (1.4)	RLA (1.56)	LRA	Max KW	HP
06MM015J0*2200	208/230	44.2	31.6	28.3	183	12.8	7
06MM015J0*3200	380	26.8	19.1	17.2	111		
06MM015J0*4200	460	22.1	15.8	14.2	91		
06MM015J0*5200	575	17.7	12.6	11.3	73		
06MM018K0*2200	208/230	51.5	36.8	33.0	215	15.7	9
06MM018K0*3200	380	31.2	22.3	20.0	130		
06MM018K0*4200	460	25.8	18.4	16.5	108		
06MM018K0*5200	575	20.6	14.7	13.2	86		
06MM021L0*2200	208/230	59.8	42.7	38.3	269	18.8	11
06MM021L0*3200	380	36.2	25.9	23.2	163		
06MM021L0*4200	460	29.9	21.4	19.2	135		
06MM021L0*5200	575	23.9	17.1	15.3	108		
06MM024M0*2200	208/230	70	50.0	44.9	305	21.9	13
06MM024M0*3200	380	42.4	30.3	27.2	185		
06MM024M0*4200	460	35	25.0	22.4	153		
06MM024M0*5200	575	28	20.0	17.9	122		

Low Temperature Model Electrical Data (R410A)

Compressor Model	Volt	MCC	RLA (1.4)	RLA (1.56)	LRA	Max KW	HP
06MR015E0***2**200	208/230	33.4	23.9	21.4	123	10.5	5
06MR015E0***3**200	380	20.2	14.4	12.9	75		
06MR015E0***4**200	460	16.7	11.9	10.7	62		
06MR015E0***5**200	575	13.4	9.6	8.6	49		
06MR018G0***2**200	208/230	38.3	27.4	24.6	153	12.6	6
06MR018G0***3**200	380	23.2	16.6	14.9	93		
06MR018G0***4**200	460	19.1	13.6	12.2	77		
06MR018G0***5**200	575	15.3	10.9	9.8	61		
06MR021J0***2**200	208/230	43	30.7	27.6	183	14.7	7
06MR021J0***3**200	380	26	18.6	16.7	111		
06MR021J0***4**200	460	21.5	15.4	13.8	91		
06MR021J0***5**200	575	17.2	12.3	11.0	73		
06MR024K0***2**200	208/230	50.5	36.1	32.4	215	17.2	9
06MR024K0***3**200	380	30.6	21.9	19.6	130		
06MR024K0***4**200	460	25.3	18.1	16.2	108		
06MR024K0***5**200	575	20.2	14.4	12.9	86		

Low Temperature Model Electrical Data (R744 Subcritical)

Compressor Model	Volt	MCC	RLA (1.40)	RLA (1.56)	LRA	Max KW	HP
06MC015K0***2**B00	208/230	67.0	47.9	30.7	305	16.6	13
06MC015K0***3**B00	380	36.2	25.9	16.6	185		
06MC015K0***4**B00	460	31.2	22.3	14.3	153		
06MC015K0***5**B00	575	23.9	17.1	10.9	122		
06MC018L0***2**B00	208/230	84.0	60.0	38.5	366	20.1	15
06MC018L0***3**B00	380	45.5	32.5	20.8	222		
06MC018L0***4**B00	460	39.0	27.9	17.9	183		
06MC018L0***5**B00	575	30.1	21.5	13.8	146		
06MC021M0***2**B00	208/230	103.5	73.9	47.4	366	23.3	15
06MC021M0***3**B00	380	55.3	39.5	25.3	222		
06MC021M0***4**B00	460	48.1	34.4	22.0	183		
06MC021M0***5**B00	575	36.6	26.1	16.8	146		
06MC024N0***2**B00	208/230	125.6	89.7	57.5	366	26.6	15
06MC024N0***3**B00	380	64.0	45.7	29.3	222		
06MC024N0***4**B00	460	57.5	41.1	26.3	183		
06MC024N0***5**B00	575	42.3	30.2	19.4	146		

*The 10th digit in the Model# is Capacity Control for 06MA, 06MM, & 06MC:

2 = 1 step ESCO
7 = No Unloading
Y = Smart Unloading

*The 10th digit in the Model# is Capacity Control for 06MR, R410A (Low Temp):

3 = Smart Unloading, with cylinder head fan studs
4 = 1 step ESCO, with cylinder head fan studs
5 = No Unloading, with cylinder head fan studs

*The 12th digit in the Model# is Motor Protection:

2 = Standard Motor Protection **(See Section 5.2, 06MA, 06MM, 06MR models)**

B = Standard Over-Current Motor Protection **(See section 5.4, 06MC models)**

5.2 Standard Motor Protection (06M R410A models only)

The 06M comes with a standard motor protection module factory installed in the compressor's electrical box to protect the motor from over-temperature. The compressor has 3 PTC (positive temperature coefficient) sensors embedded in the motor windings. The PTC is designed to work with a factory installed electronic motor protection module. The module has a set of normally open and normally closed contacts that will cycle upon a motor over-temperature situation. The motor is protected against locked rotor, running overload, primary and secondary single phasing, and loss of refrigerant condition.

The Motor PTCs are factory wired to the motor protection module through terminal plate pin positions #8 and #9. See figure 1.

Field wiring (see figure 1)

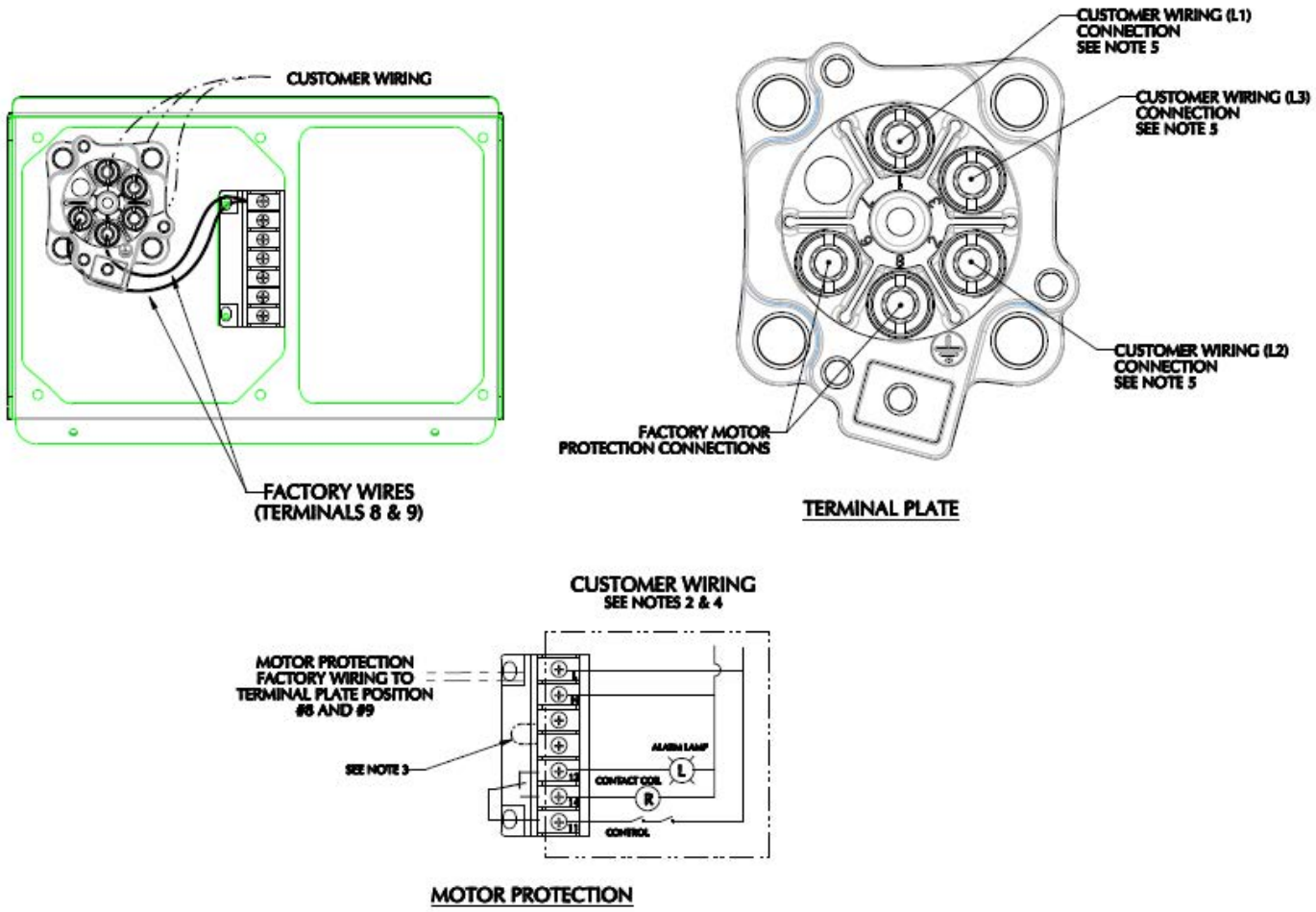
- Field wire the protection module supply voltage to terminal positions "L" and "N". Verify supply voltage matches module label voltage. Applying an incorrect supply voltage will result in motor protection module failure to function.
- The compressor's motor protection module is equipped with a set of Normally Open (NO) and Normally Closed (NC) contacts.
    - Terminals 11 & 12 are open during compressor operation. The contacts will close during a motor over temperature situation. And should be used as an alarm output signal to the main controller.
    - Terminals 11 & 14 are closed during compression operation. The contacts will open during a motor over temperature situation, turning the compressor off, provided Terminals 11 & 14 are wired into the compressor's start/stop circuitry.
- Field connect (3) power leads L1, L2, L3 to the compressor at terminals studs #1, #2, and #3. Field wiring to the 1/4-28 terminal studs must be provided with ring terminals sized to accommodate the 1/4-28 studs. Tighten terminal nuts to 30 in-lbs maximum. See startup and installation instruction 574-601.

Notes:

1. The motor protection module is factory pre-set.
2. Do not remove the factory installed jumper (115/230 Vac only).
3. The motor protection module is available in three voltages. Check the motor protection label for correct supply voltage.
    - 115/230 Vac dual voltage (manual trip reset)
    - 24 VAC (automatic trip reset)
    - 24 VDC (automatic trip reset)

WARNING:

The motor protection module has an automatic reset for the 24 vac and 24 vdc modules and the compressor may restart at any time. Appropriate steps must be taken by the user to ensure that this does not result in a hazardous situation. The 115/230 vac dual voltage module requires a manual reset and will not automatically restart the compressor.



1. DO NOT ATTEMPT TO REMOVE, INSPECT OR RE-INSTALL ANY OF THE INTERNAL PARTS WITHOUT REFERRING TO SERVICE MANUAL.
2. TERMINALS 11 & 12 ARE NORMALLY CLOSED (NC). THESE CONTACTS ARE OPEN DURING NORMAL COMPRESSOR OPERATION AND WILL CLOSE DURING A MOTOR OVER TEMPERATURE SITUATION. TERMINALS 11 & 14 ARE NORMALLY OPEN (NO). THESE CONTACT ARE CLOSED DURING NORMAL COMPRESSION OPERATION AND WILL OPEN DURING A MOTOR OVER TEMPERATURE SITUATION.
3. FACTORY INSTALLED JUMPER. DO NOT REMOVE.
4. SUPPLY VOLTAGE IS 115/230 VAC, 24 VAC, OR 24 VDC. CHECK MOTOR PROTECTION LABEL FOR CORRECT VOLTAGE.
5. 1/4-28 TERMINAL STUDS CUSTOMER WIRING TO THE TERMINAL PLATE MUST BE PROVIDED WITH RING TERMINALS TO ACCOMODATE THE 1/4-28 STUDS. TIGHTEN TERMINAL NUTS TO 30 IN-LBS MAX (5) PLACES.

Fig 1 – Three phase across-the-line Start

WARNING:

The motor protection module has an automatic reset for the 24 vac and 24 vdc modules and the compressor may restart at any time. Appropriate steps must be taken by the user to ensure that this does not result in a hazardous situation. The 115/230 vac dual voltage module requires a manual reset and will not automatically restart the compressor.

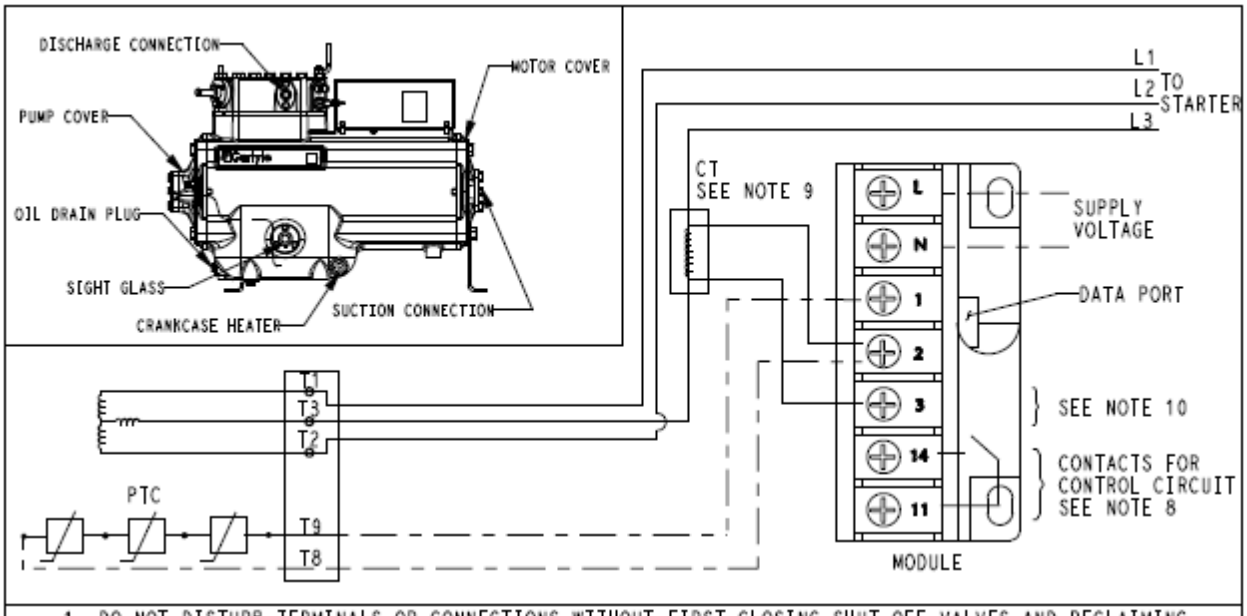
5.3 Hybrid Current/Temperature Motor Protection (06MC, R744 models only)

The 06MC, R744 compressor incorporates the same motor over-current/over-temperature protection as the Carlyle 06D compressor and is not the same as the 06M R410A compressor models defined in section 5.2 and 5.3.

The electronic overcurrent protection module and current transformer is factory installed, with a preprogrammed MCC value based on the compressor model number for over-current protection. In addition there are three PTC sensors embedded in the motor windings for over-temperature protection.

The electronic module control voltages115/230 Vac and is defined by the 12th digit in the customer model number (example: 06MC024N054B00). The 115/230 vac dual voltage module requires a manual reset and will not automatically restart the compressor.

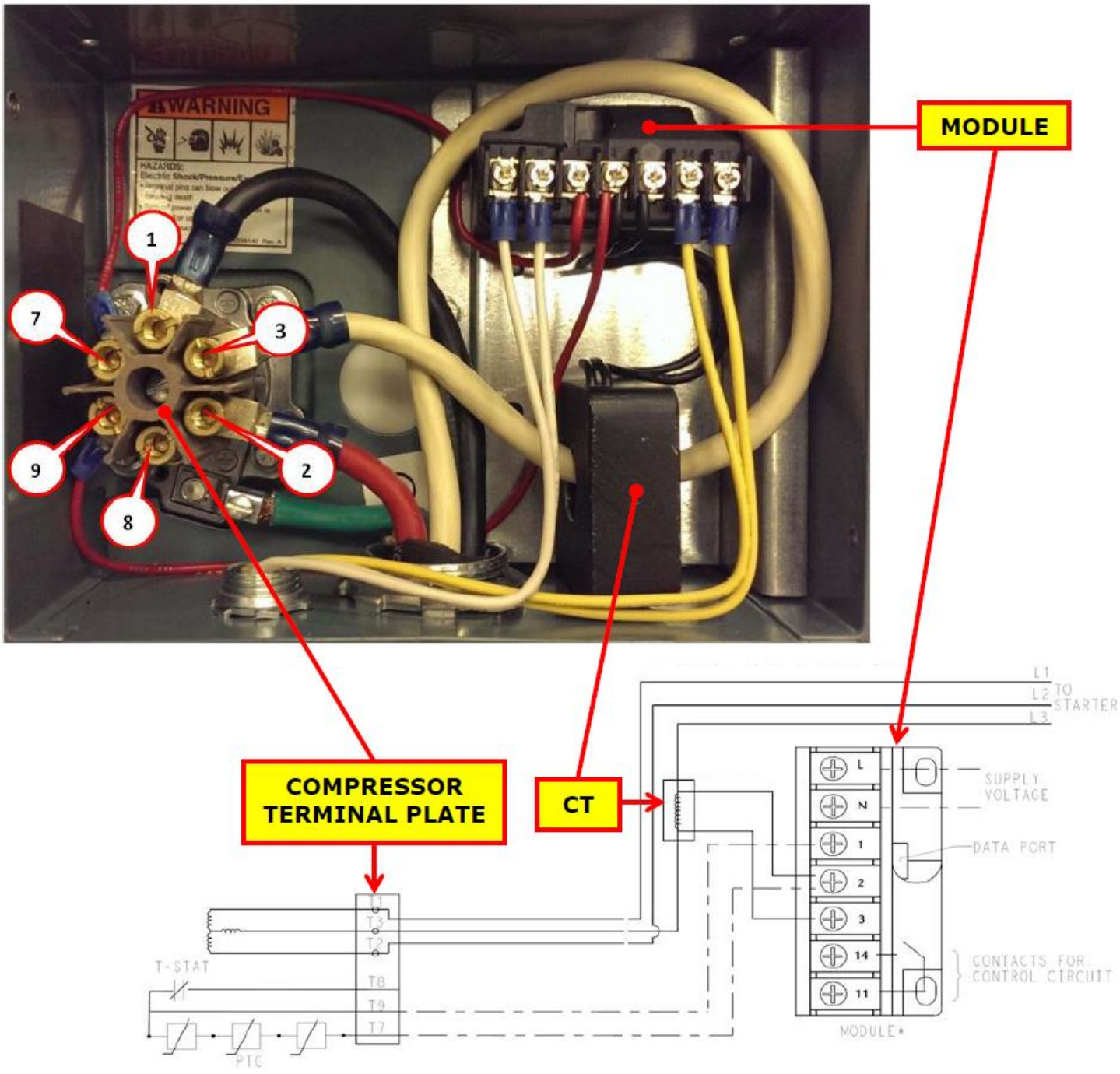
See diagrams below that show factory and field wiring, part description, and layout:



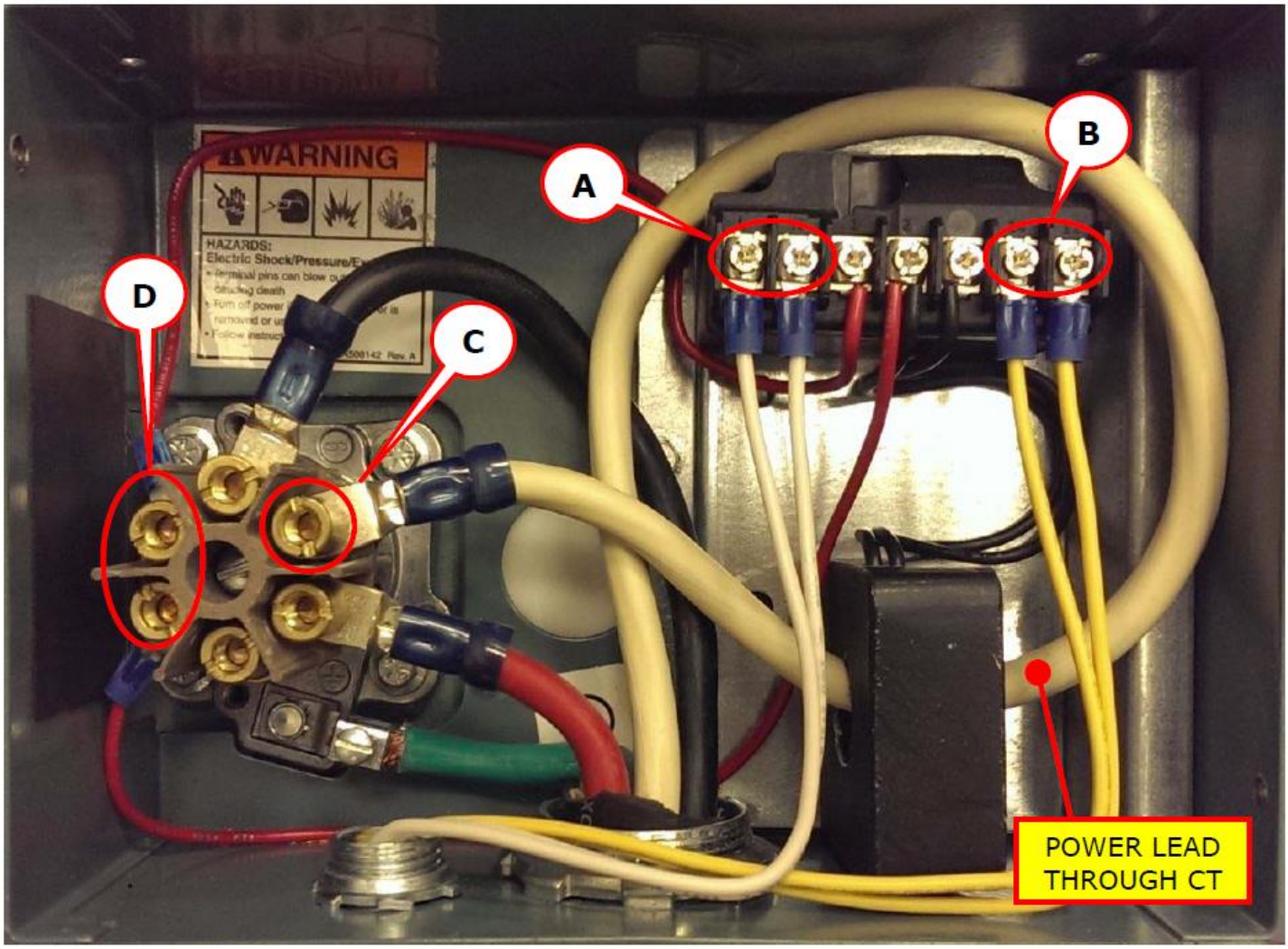
1. DO NOT DISTURB TERMINALS OR CONNECTIONS WITHOUT FIRST CLOSING SHUT-OFF VALVES AND RECLAIMING REFRIGERANT FROM THE COMPRESSOR. TERMINAL NUTS TO BE TIGHTENED TO 18-30 IN-LBS.
2. OPEN SUCTION & DISCHARGE SHUT-OFF VALVES BEFORE STARTING COMPRESSOR.
3. MOTOR ROTATION OPTIONAL, OIL PUMP AUTOMATICALLY REVERSIBLE.
4. NORMAL OIL PRESSURE: 45-60 PSI ABOVE SUCTION PRESSURE. NORMAL OIL LEVEL 1/2 VISIBLE IN SIGHT GLASS.
5. OIL CHARGE: 3 CYL- FILL TO CENTER OF SIGHT GLASS. SEE SERVICE MANUAL FOR OIL FILL PLUG LOCATIONS.
6. DO NOT ATTEMPT TO REMOVE, INSPECT OR RE-INSTALL ANY OF THE INTERNAL PARTS WITHOUT REFERRING TO SERVICE MANUAL.
7. PTC TRIPLET ONE SENSOR PER PHASE.
8. TERMINALS 11 AND 14 ARE NORMALLY OPEN (NO). CONTACT RATED AT 240V, 2.5A AC, C300.
9. POWER LEAD TO T3 MUST BE ROUTED THROUGH CURRENT TRANSFORMER (CT).
10. MODULE CONNECTION 3 NOT EMBOSSED ON THE MODULE MOLDING. SHOWN ONLY FOR REPRESENTATION; HOWEVER, IT'S REPRESENTED ON THE LABEL.
11. THE MOTOR-COMPRESSOR IS FOR USE WITH R-744 (CARBON DIOXIDE) SYSTEM COMPONENTS, WHERE THE MAXIMUM ALLOWABLE PRESSURE OF THE MOTOR-COMPRESSOR IS NOT LESS THAN THE MAXIMUM ALLOWABLE PRESSURE OF THE ASSOCIATED COMPONENTS. REFER TO 06M GUIDE 574-602.
12. A SUFFICIENT NUMBER OF PRESSURE RELIEF VALVES OR PRESSURE REGULATING RELIEF VALVES, HAVING A CAPACITY DEEMED ADEQUATE, SHALL BE INSTALLED ON THE REFRIGERATION SYSTEM.

NOTE: WHEN ORDERING PARTS, SPECIFY MODEL, SERIAL & MOTOR NO'S APPEARING ON NAMEPLATE.

PART NO. 2AMB003641, REV.C

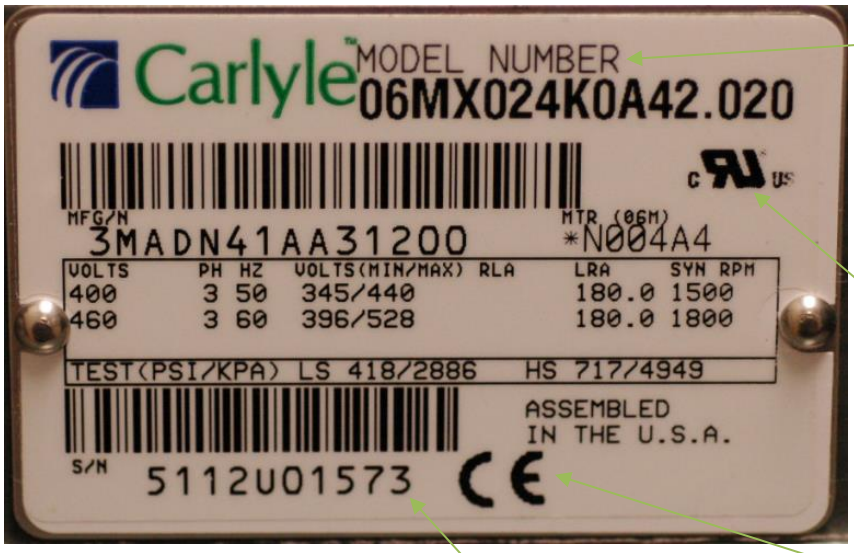

MODULE
WARNING
1
7
3
9
2
8
COMPRESSOR TERMINAL PLATE
CT
L1
L2
L3
TO STARTER
L
N
1
2
3
14
11
SUPPLY VOLTAGE
DATA PORT
CONTACTS FOR CONTROL CIRCUIT
MODULE*
T-STAT
T8
T9
T7
PTC

A) Control Power to the module (Terminals "L" & "N" on the module)
B) Module connections for the control circuit (Terminal "11" & "14" on the module)
C) Power Lead that is monitored by the CT (Current Transformer) @ the terminal plate
D) PTC connections @ the terminal plate (Terminals "7" & "9" on the compressor)



5.4 Compressor Nameplate Data

The compressor nameplate specifies the following electrical information; voltage (min/max), phase, frequency, nominal operating speed, and locked rotor current. Low side (LS) and high side (HS) proof test pressures are noted.



The compressor model number defines the customer configuration of the compressor as shown in the Number Significance Chart on page 6. This number is used when selecting and ordering a compressor for replacement.

06M is UL and CSA certified and meets all requirements regarding Underwriter's Laboratory and Canadian Standards Association.

06M is CE compliant with the European CE Mark requirements.

Compressor Serial Number: The first 4 digits represent the fiscal week and year the compressor was manufactured. A serial number bar code is provided for internal Carlyle tracking.

6.0 Compressor Features and Accessories

6.1 Pressure Relief Valve (PRV)

Settings of system overpressure protection, including relief valves, shall not exceed the rated Maximum Allowable Pressure of the compressor.

A. R410A Applications

A sufficient number of pressure relieving devices and/or pressure relief valves, having capacity deemed adequate for the system, may need to be provided. They are to be located such that no stop valve is located between the relief valve or regulating valve and the parts or section of the system being protected.

B. Subcritical CO2 (R744) Applications

A sufficient number of Pressure Relief Valves and/or Pressure Regulating Relief Valves, having capacity deemed adequate for the system, shall be field-installed on the refrigeration system. They are to be located such that no stop valve is located between the relief valve or regulating valve and the parts or section of the system being protected.

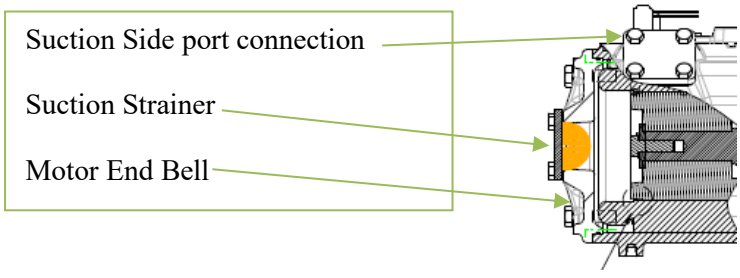
- System Relief Valve Start-to-Discharge Pressure
  High side: 845 psig Max.
  Low side: 365 psig Max.
- System Pressure Regulating Valve Start-to-Discharge Pressure
  High side: 761 psig Max.
  Low side: 329 psig Max.

⚠WARNING

A pressure relief valve (PRV), physically installed on the compressor crankcase, for all R-744 subcritical CO_2 15-24 cfm models is required because the compressor can be isolated from the system via the suction and discharge service valves, thus creating a high pressure condition that could potentially exceed the maximum allowable crankcase pressure of 365 psig. An appropriately sized safety relief valve must be installed in order to protect the compressor shell from excessive pressure if the compressor is isolated from the system's pressure relief valve by system stop valve(s), compressor service valves, or other means. The System Designer is responsible to size an appropriate pressure relief valve.

6.2 Suction Strainer

The 06M compressor is supplied with a suction strainer located in the compressor's electrical box. The suction strainer must be installed in the working suction refrigerant line. This is either the suction manifold of the motor end bell or in the suction side port.



6.3 Service Valves

The available service valve packages, which include bolts and gasket, are provided in the table:

R410A Applications

PART NUMBER	ODF	BOLT HOLE SPACING	NUMBER BOLTS	Type	USAGE
06DA660062	7/8	1-3/4	2	Discharge	06M, 15-24 CFM
06DA660063	1 1/8	2-1/2	4	Suction	06M, 15-24 CFM
06DA660064	1 1/8	1-3/4	2	Discharge	06M, 15-24 CFM
06DA660065	1 3/8	2-1/2	4	Suction	06M, 15-24 CFM

R744 Subcritical Applications

PART NUMBER	ODF	BOLT HOLE SPACING	NUMBER BOLTS	Type	USAGE
06M660022	7/8	1-3/4	2	Discharge	06M, 15-24 CFM
06DA660063	1 1/8	2-1/2	4	Suction	06M, 15-24 CFM
06M660023	1 1/8	1-3/4	2	Discharge	06M, 15-24 CFM
06DA660065	1 3/8	2-1/2	4	Suction	06M, 15-24 CFM

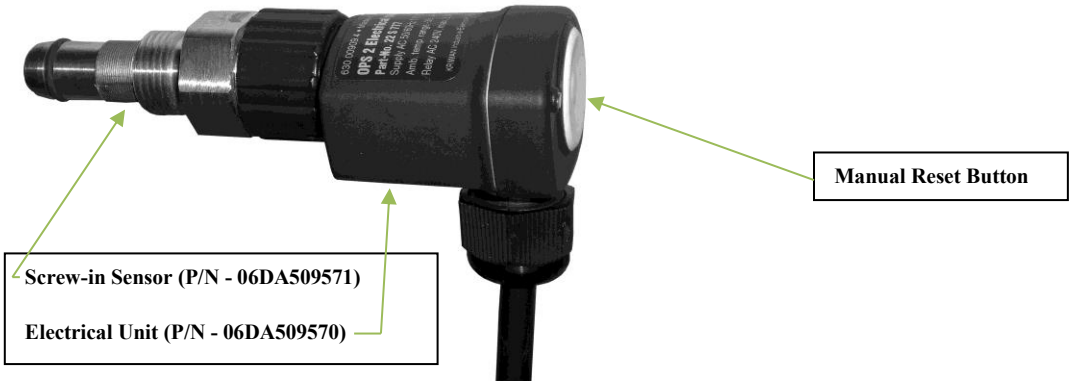
6.4 SAE Adapter Fitting

PART NUMBER	QTY/PKG	WEIGHT (LBS.)	USAGE
DE14CA126	1	1	All 06M

To adapt compressor oil drain plug, in compressor bottom case, from SAE fitting (7/16-20) to 1/4" NPT.

6.5 Oil Pressure Safety Switch (OPSS)

Carlyle has approved the following oil pressure safety switch with the 06M compressor. The OPSS consists of a screw-in sensor and electrical unit. All 06M compressor have the screw-in sensor installed and leak tested at the factory. The electronic unit is provided as an accessory item that is installed by the OEM. **See Carlyle Technical Bulletin 11T-2** for OPSS specifications and operation.



The oil safety switch is designed to protect the compressor against the loss of lubrication. The OPSS switch will close the control circuit at compressor startup and allow 120 second oil pressure transitional time delay. The switch will open the control circuit and shut the compressor off when:

- The oil pump pressure drops to a minimum 9 psig above the oil sump pressure after 120 seconds.
- Or, a time integrated low differential oil pressure (9 psig) between the oil pump and oil sump pressure that is fluctuating 60% of the time <= to 9 psig over a 5 minute rolling window.

The OPSS will not reset automatically, but must be manual reset provided the differential pressure between the oil sump and pump pressure is above 13 psig.

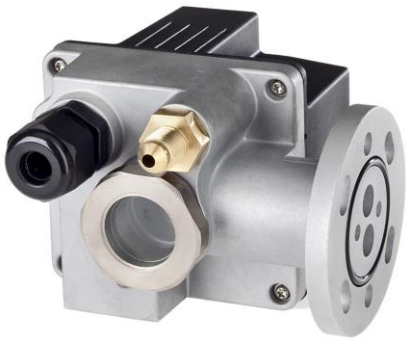
Carlyle P/N	Time Delay	Pressure Diff		Volts	Reset	Remote Alarm Circuit Capability
		Cut-out	Cut-in			
06DA509570	120 sec	9-11 psid	12-14 psid	115/230	Manual	Yes

6.6 Oil Level Regulator

For oil management systems with a single or parallel compressor application the following oil level regulators are available for use with the 06M compressor as an accessory item installed by the OEM.

- INT280 (120/240 VAC), Optical Sensor, internal solenoid oil-fill valve, no mechanical float.
- S9090, Mechanical Float Oil level Regulator.

The INT280 uses an optical sensor to control compressor oil to 1/2 the sight-glass. The regulator has a built-in normally closed solenoid oil-fill valve that is designed to port oil into the compressors sump to maintain the oil level set-point. **See Carlyle Technical Bulletin 12T-2** for Oil level regulator specifications and operation.



Oil Level Regulators	Carlyle Part No.	Compressor Models
INT280 **120** VAC OIL REG	06DA609572	All 06M
INT280 **240** VAC OIL REG	06DA609573	All 06M
Mechanical Float Regulator	S9090	All 06M

6.7 Compressor Interconnection Package

Use when two compressors, of the same cfm size, are installed in parallel on the same HVAC system. This kit has adapters and gaskets for two compressors. OEM must supply all other needed fittings and all interconnecting tubing. This package is not required if using an oil level regulator installed on the compressor, such as Carlyle oil level regulators, 06DA609572 and or S9090.

PART NUMBER	QTY/PKG	WEIGHT (LBS.)	USAGE
06EA660127	2	2	ALL 06M

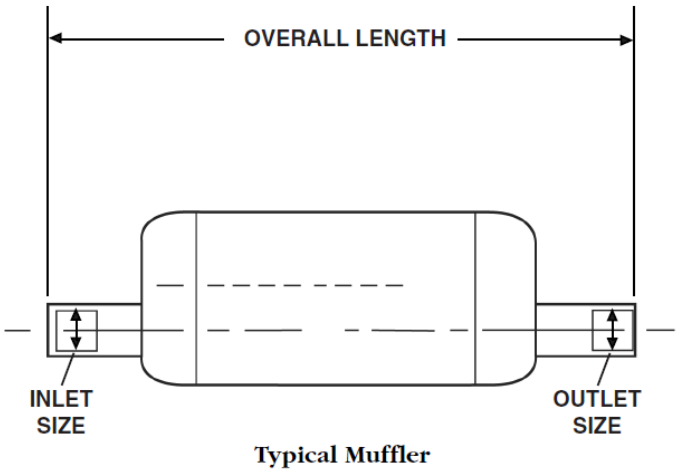
6.8 Muffler (R410A and R744)

R410A and R744 are rated to different pressures; therefore the R410a and R744 mufflers are not interchangeable. Therefore select the appropriate muffler per the noted refrigerant in the table below.

The 06M compressor must have a muffler installed downstream of the discharge service valve line to reduce the discharge gas pulsations. Failure to install a muffler may result in discharge line joint refrigerant leakage. The following mufflers have been approved for the 06M compressor. These mufflers have been UL approved and rated for R410A pressures.

Note: Only install a muffler rated for R-410A & R744. Failure to do so may result in muffler rupture.

PART NUMBER	QTY/PKG	WEIGHT (LBS.)	OUTLET	INLET	Refrigerant	Overall Length
2AMC000543	1	5	7/8" ODF	7/8" ODF	**R410A**	12.3”
2AMC000544	1	5	1-1/8" ODF	1-1/8" ODF	**R410A**	12.3”
DK46SA088	1	8.6	7/8" ODF	7/8" ODF	**R744**	12.3”
DK46SA122	1	8.8	1-1/8" ODF	1-1/8" ODF	**R744**	12.3”



Typical Muffler

6.9 Capacity Control Coil Packages

An unloader solenoid coil is required for all 06M models with unloading capability. The table below is a list of qualified solenoid coils that can be applied with the 06M compressor.

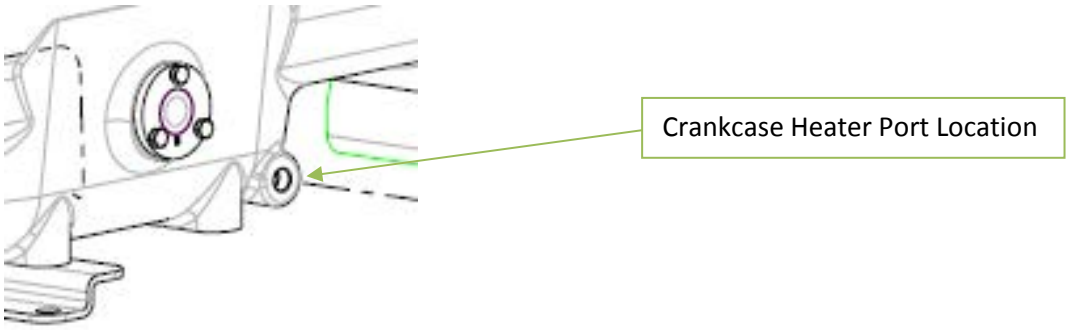
PART NUMBER	QTY/PKG	VOLTAGE	WEIGHT (LBS.)
EF19ZZ001	1	24-1-50/60	1
EF19ZZ002	1	120-1-50/60	1
EF19ZZ003	1	208/240-1-50/60	1
06DA509584	1	24VDC	1

6.10 Crankcase Heaters

A crankcase heater is recommended for all 06M installations to prevent refrigerant migration back to the compressor and absorbing into the oil when the compressor is off. Heater should be installed with the thermal grease provide for in the kit. This condition will lead to a compressor flooded start and potentially a loss of adequate lubrication for the compressor. It is important, however, to never energize the crankcase heater while the compressor is running because this may overheat the compressor oil.

Note: The crankcase heater is typically energized when the compressor is off. If the compressor will be out of service for a long duration, it is recommended that a service valve be opened to prevent high static pressures from occurring inside the compressor's crankcase.

PART NUMBER	QTY/PKG	WEIGHT (LBS.)	VOLTS	WATTS	USAGE
06DA660076	1	2	460	125	15 – 24 cfm
06EA660167	1	2	120	180	15 – 24 cfm
06EA660168	1	2	240	180	15 – 24 cfm



6.11 Cylinder Head Fan and Liquid Injection

For all low temperature 06MR models, liquid injection may be required based on the operating condition defined by the low temp operating envelope in Section 1.3.

ITEM	Carlyle Part Number
Fan Motor Assembly (115 VAC).....	0AMB001016
Fan Motor Assembly (230 VAC).....	0AMB001015

Liquid Injection Valves: Contact Carlyle Engineering for sizing requirements.

PART NUMBER	SUPPLIER PART NUMBER	SIZE
2AMB000635	Y1037-FV-1/2-270 60" 3 X 3	1/2 TON
2AMB000636	Y1037-FV-1/3-270 30" 3 X 3	1/3 TON