Application Data

CONTENTS

GENERAL

This application guide is for the Carlyle 06M R-410A reciprocating air conditioning compressor. 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 R-410A in air conditioning (high temperature) applications. The Carlyle 06M semi-hermetic compressor is ideally suited for air conditioning, process cooling, 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 one cylinder. The compressor can be configured and applied with no unloading, unloading, SMART PWM valve unloading, and variable frequency drive (VFD).

The 06M compressor is listed with UL (Underwriters' Laboratories) and CSA (Canadian Standards Association) and complies with the low voltage directive of the European Community to carry the CE mark.

See Fig. 1 for key features of the 06M compressor. For model number nomenclature, see Fig. 2.

High Efficiency Valve System

The valve 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.

Contoured Pistons and Vented Connecting Rods

The pistons are contoured, allowing the pistons to mate up with both the suction valves and the discharge ports in the valve plate, resulting in reduced clearances that increase both capacity and efficiency. The connecting rods are also vented to provide premium bearing lubrication and longer life.

Auto-reversing High Flow Oil Pump

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

Oil Pressure Protection

The 06M compressors have a low oil pressure safety switch (OPSS) factory-installed and leak tested.

Large Oil Sump

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

High Efficiency Heavy Duty Motors

All 06M compressors have motors with robust insulation systems that help to prevent motor burnouts, especially during hot weather periods when operating pressures, temperatures, and currents (amps) are high. The compressors are manufactured with an overcurrent protection module installed in the terminal box and connected to the embedded sensors in the motor windings.

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.

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. The 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 — Steel Backed PTFE

Teflon[1] (PTFE) material is used on bearing surfaces to provide greater load carrying ability than other types of materials and is also less susceptible to damage from overheating or liquid refrigerant.

Crankcase Oil Heater

This field-installed accessory warms crankcase oil to reduce refrigerant migration that occurs during shutdown periods.

Capacity Control Flexibility

The 06M compressor can be applied in many different capacity control systems, ranging from non-unloading, mechanical cylinder head unloading, suction line PWM valve modulation, and variable speed from 20 Hz to 80 Hz.

1. Third-party trademarks and logos are the property of their respective owners.

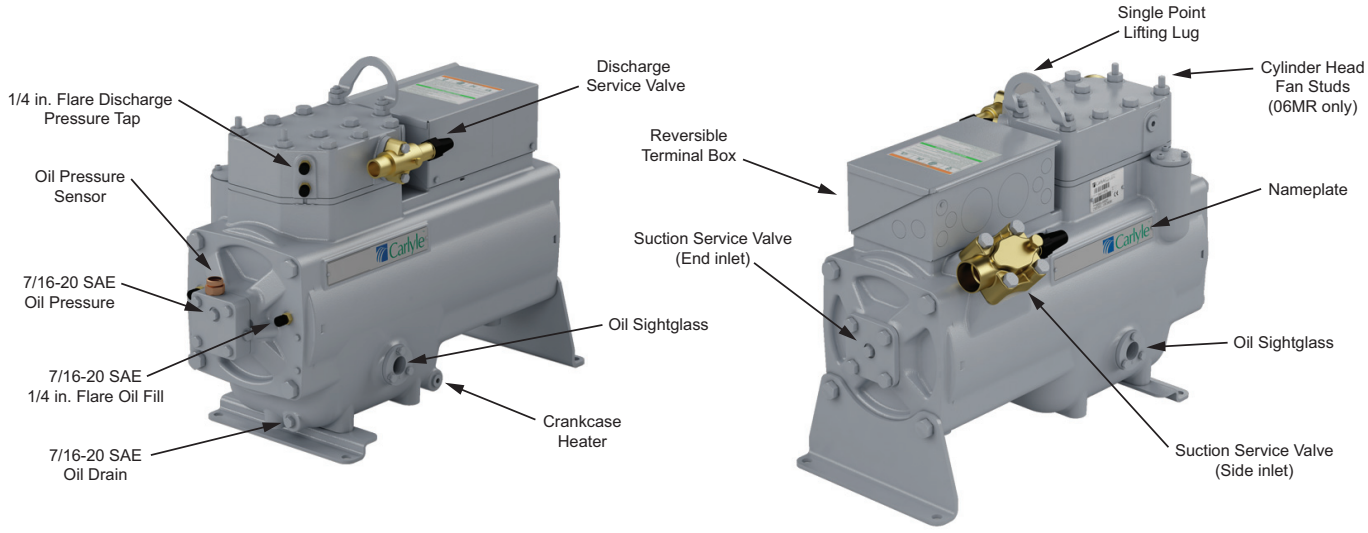
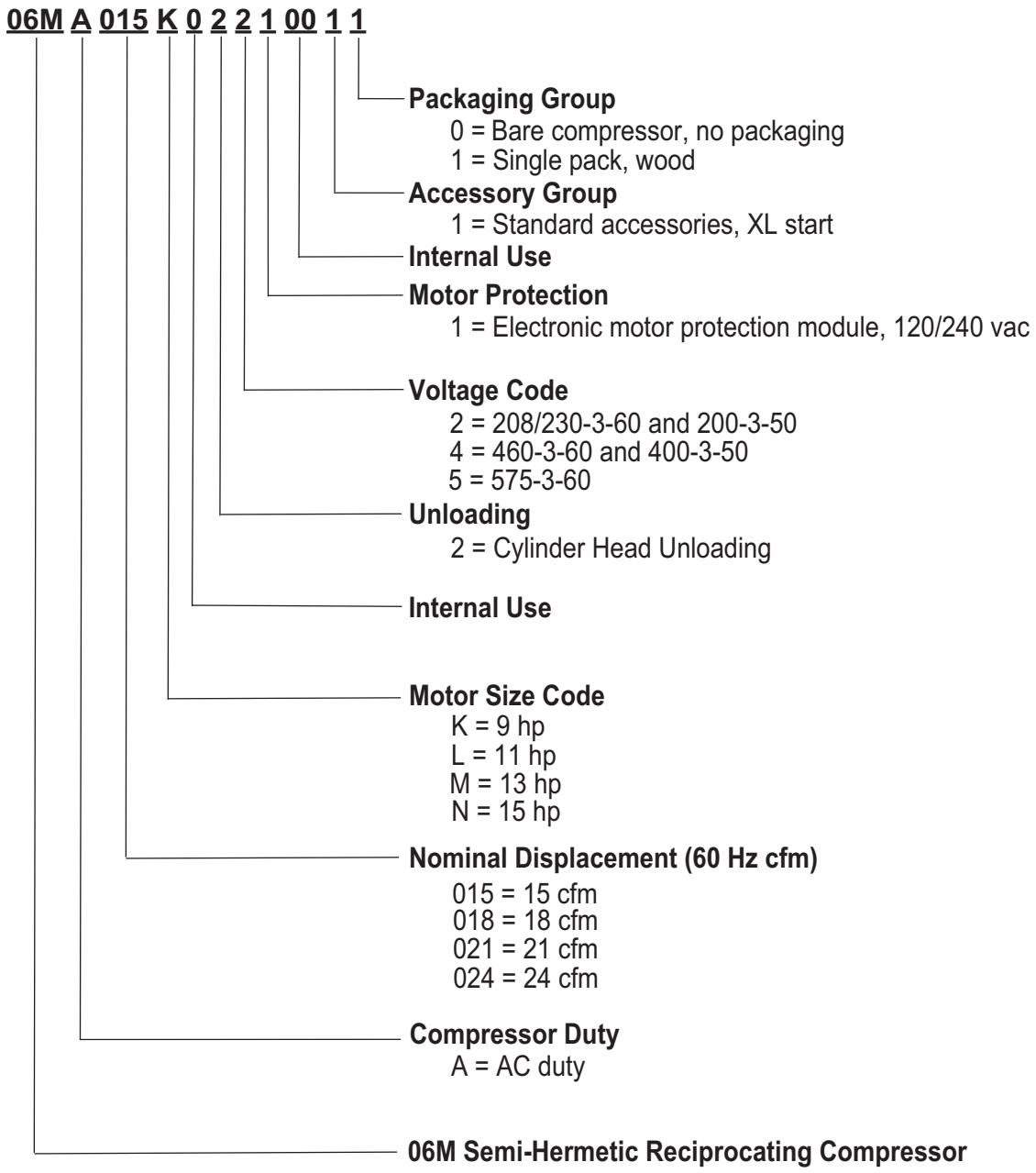


Fig. 1 — Key Features, 06M Compressor Models



NOTE: Digits 15 and 16 are not shown on compressor nameplate.

Fig. 2 — 06M Model Nomenclature

SYSTEM DESIGN CONSIDERATIONS

This guide provides recommendations and requirements for applying the 06M compressors in air conditioning, process cooling, and heat pump applications.

Compressor Ratings

Performance data is available using Carlyle's CARWIN performance rating software at www.carwin.carlylecompressor.com. As with all reciprocating compressors, a "run-in" period of 50 to 100 hours may be required to obtain the published performance. Operating envelopes will vary by compressor model and refrigerant. These can be found within the CARWIN rating software.

Environmental Considerations

DESIGN PRESSURES

Table 1 shows the relevant design pressures for the 06M compressor applications.

OPERATING AMBIENT TEMPERATURE

All 06M compressors have a non-operating (storage, no refrigerant in compressor) temperature range of –40°F to 180°F (–40°C to 82°C). The 06M compressor is designed to operate in an ambient temperature range of –25°F to 130°F (–32°C to 54°C). These are ambient air temperature ranges only; the Design Pressures section defines the pressure limitations that correspond to standstill temperatures.

Code Agency Listings

The 06M compressors have both UL and CSA Recognition under the file number SA4936. All UL-recognized 06M compressors have IP44 terminal enclosures that are suitable for outdoor use as a sole enclosure.

Certain models comply with the European Union's Low Voltage Directive and Machinery Directive. The CE mark is included on the nameplates of those compressors. These models also comply with the UK Electrical Equipment Safety Regulation and Machinery Safety Regulation. The UKAC mark is included on the nameplates of those compressors.

For the code agency listings to be valid, the compressor may only use approved refrigerants listed in the Installation Instructions and all requirements listed in the Installation Instructions and this Application Guide must be followed.

Suction and Discharge Pressure Limits

The operating envelopes for the 06M compressors are provided in the CARWIN rating program.

During pulldown, the compressor should not be subjected to low suction pressures for any extended time. Where an extended pulldown period is expected (i.e., for large systems), the suction pressure must be limited by some positive means.

Discharge Temperature Limits

The discharge gas temperature at the compressor discharge service valve must trip at a maximum temperature of 295°F (146°C). The maximum recommended discharge temperature during operation is 285°F (141°C). This discharge temperature depends upon the refrigerant, operating compression ratio, and the suction return gas temperature.

Thermal Protection

All 06M compressors are built with factory-installed overcurrent protection systems that also provide thermal protection for the compressor using a PTC (positive temperature coefficient) triplet sensor. Fixed speed applications use this thermal protection. Variable speed applications do not use this overcurrent protection system and do not require thermal protection.

Table 1 — Design Pressures

PRESSURE TYPE	COMPRESSOR APPLICATION	DISCHARGE PRESSURE psia (bar)	SUCTION PRESSURE psia (bar)
Maximum Operating Pressure[a]	All 06M compressors R-410A	666 psia (45.9 bar)	251 psia (17.3 bar)
Maximum Allowable Pressure[b]		845 psia (58.6 bar)	380 psia (26.1 bar)
Proof Test Pressure[c]		945 psia (65.2 bar)	417 psia (28.8 bar)
Leak Test Pressure[d]		240 psia (16.5 bar)	

NOTES:
a. Maximum operating pressure is the maximum pressure permissible under normal operation.
b. Maximum allowable pressure is the maximum pressure permissible under atypical circumstances, including but not limited to the following:
   1. Maximum ambient temperature
   2. Setting of any over-pressure relief devices
   3. Operating, standby, and shipping conditions
   4. System component failure (fan motor, condensing, cooling water, etc.)
c. Proof test pressure is the pressure to which the compressor is tested at the factory to validate its integrity.
d. Leak test pressure is the pressure to which the compressor is leak tested at the factory.

Start/Stop Limits

Compressor start transients are known to place higher stress on the motors and running gear of a compressor. Carlyle has proven a correlation between excessive starts and higher failure rates. Carlyle 06M compressors must not start more than 12 times per hour. Carlyle also recommends that the compressors run for at least 5 minutes after each start to aid in proper oil return. Where feasible, Carlyle recommends adding cycle counters that can be used in system diagnostics and troubleshooting.

Refrigerant Migration and Flooding

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 06M compressors has shown that they can withstand substantial flooded starts and floodback, prolonged excessive flooding will eventually cause any compressor to fail.

During compressor "off" cycles, gravity, thermal action, and refrigerant absorption will result in a refrigerant and oil mixture in the compressor crankcase. Gravity flow can be prevented using reverse traps in the piping, but thermal action and the absorption of refrigerant by lubricating oil cannot be eliminated solely by piping design. To minimize the absorption of refrigerant into the oil, Carlyle requires the use of crankcase heaters. It is important, however, never to energize the crankcase heater while the compressor is running, because this may overheat the compressor oil.

Suction Piping

Suction lines and suction risers must be sized to ensure adequate velocity for oil return, taking into account the potential reduction in mass flow associated with changes in operating condition and unloading of the compressors. The lack of proper line sizing may result in premature compressor failure due to oil slugging. Improper suction line sizing can also cause oil loss to the system, causing oil starvation and premature failure of the compressors.

To avoid problems related to refrigerant and/or oil control, piping design is crucial. Carlyle requires suction designs that do not allow free draining of refrigerant or oil into an off compressor. This avoids liquid refrigerant and oil accumulation in off compressors or suction line traps. For that reason, suction manifolds are recommended to be located below their respective compressor inlet locations, as shown in Fig. 3.

Alternately, if the manifolds are located above the inlets, then reverse traps must be installed in each compressor inlet feeder, as shown in Fig. 4. In both situations, each compressor feeder line should include a dip tube into the header that facilitates oil return to each compressor.

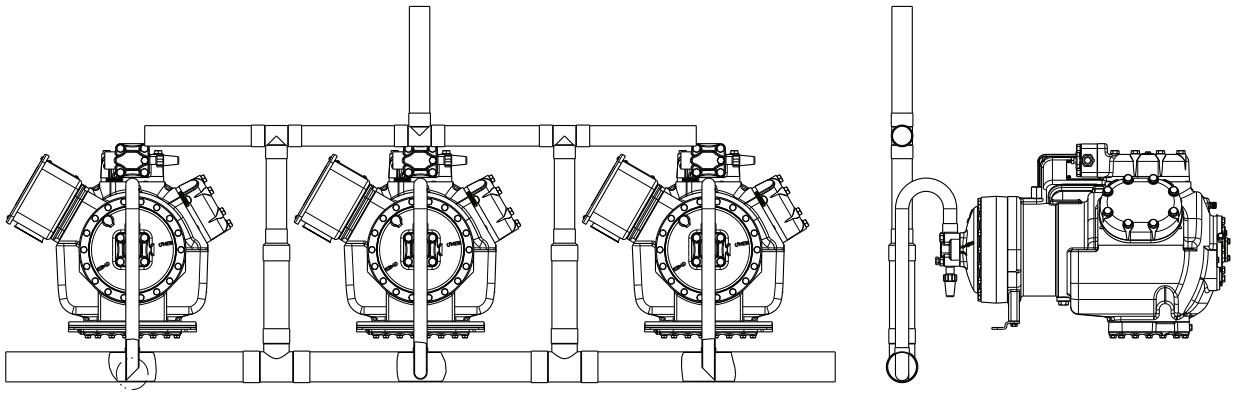


Fig. 3 — Suction Header BELOW Compressors (06E compressors shown in example)

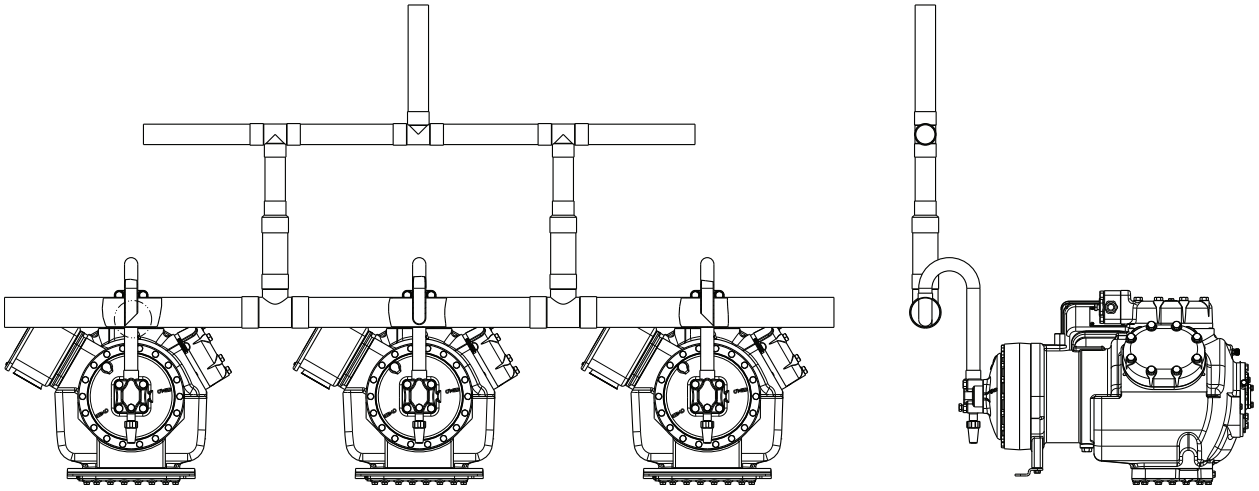


Fig. 4 — Suction Header ABOVE Compressors (06E compressors shown in example)

The end of these dip tubes should be beveled and configured as shown in Fig. 5. Alternate means for oil return should be reviewed with Carlyle Application Engineering prior to installation.

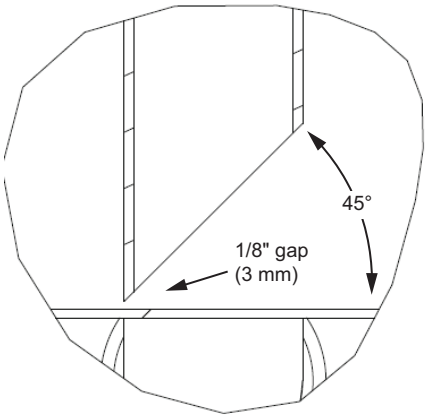


Fig. 5 — Pickup Tube Details

Consult the Carrier System Design Manual (Part 3 — Piping Design) or the ASHRAE Manual — Systems Volume for more details of good system piping practices.

Discharge Piping

Discharge should be piped to avoid logging oil and excessive vibration and protect against leaks from fatigue cracking in the joints. Care should be taken when connecting 2 or more compressors in parallel. It is best to connect each parallel compressor into the branch connection of a "Tee." Compressor discharge lines should never be setup in a bullhead fashion. See Fig. 6. Note that the muffler should be located as close as possible to the compressor connection and that the flex connector should be parallel to the crankshaft axis.

Consult the Carrier System Design Manual (Part 3 - Piping Design) or the ASHRAE Manual - Systems Volume for more details of good system piping practices.

Vibration Isolation

All 06M compressors must be solid mounted. The compressor is equipped with factory-installed mounting brackets. 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 to 35 lb-ft. Proper torque will reduce the transmission of excessive vibration to the base.

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

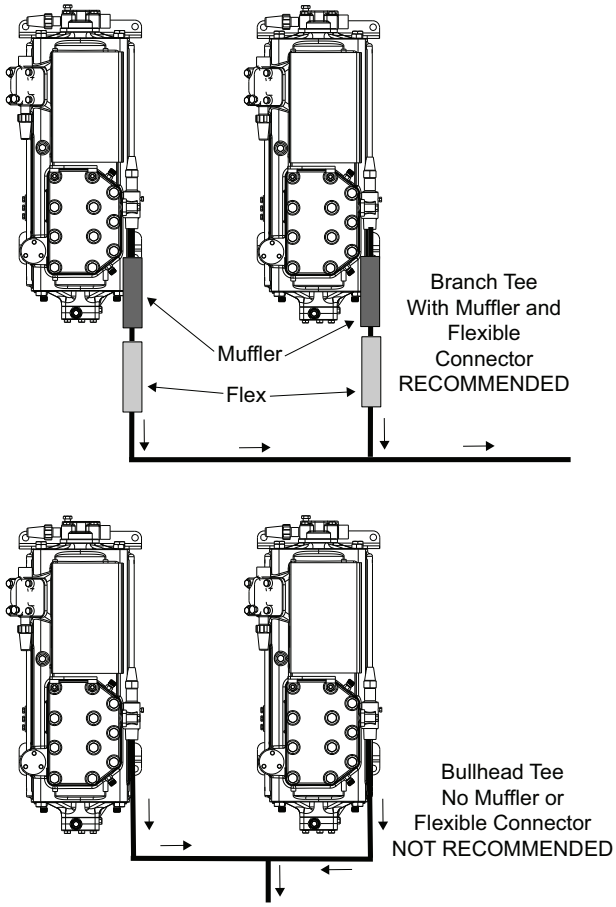


Fig. 6 — Discharge Header Layout

Proper precautions must be taken to prevent the transmission of compressor vibration through the piping system. Follow the guidelines published in the Carlyle literature 574-933, "Guidelines for Minimizing Refrigerant Line Vibration."

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.

System Cleanliness and Dehydration

Clean and dry systems are essential for long compressor and motor life and satisfactory operation. Excessive moisture, when combined with heat and refrigerant, can form damaging acids. Compressor lubricants require special attention. For compressors lubricated with polyolester (POE) lubricants, the allowable moisture level should be less than 100 ppm.

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 system. Liquid line moisture indicators are recommended in all systems to provide a continuous check on the system's moisture content.

LUBRICATION SYSTEM

Recommended Oils

The 06M compressors are shipped without oil. Table 2 details the Carlyle approved oils for use in 06MA applications. All POE oils will readily absorb and retain moisture from ambient air and should be used immediately upon opening the factory-sealed container.

Table 2 — Recommended Oils

MANUFACTURER	BRAND NAME
For 06MA Models:	
Totaline (POE)	P903-1701
Castrol (POE)	E68
ICI Emkarate (POE)	RL68H
Lubrizol Lubrikuhl (POE)	2916S
Texaco Capella (POE)	HFC 68NA
Totaline (POE)	P903-1001
Castrol (POE)	SW68
Mobil Arctic (POE)	EAL68

LEGEND

POE — Polyolester-Based Oil

Oil Pressure Protection

Differential oil pressure (oil minus suction pressure) is important for good compressor reliability. Carlyle recommends a 120-second time delay in the oil safety switch. The oil safety switch protects the compressor when lubrication is lost for more than 120 seconds. The switch closes the control circuit at start-up, allowing the compressor to run for 120 seconds. Operating oil pressure must reach the minimum required start pressure above suction pressure within 120 seconds for the switch to remain closed, which allows the compressor to run. If the operating oil pressure falls below the minimum stop pressure above suction for longer than 120 seconds, the switch will open the control circuit, shutting down the compressor. Oil pressure protect devices must be manual reset type.

Use of oil pressure protection is recommended for any fixed speed 06M compressor applications where there is only a single compressor in the circuit. Oil pressure protection is required for any fixed speed 06M compressor applications where more than one compressor operates in parallel with other compressors and for all variable speed 06M compressor applications.

The 06M compressors are manufactured with factory-installed oil pressure protection. (See Fig. 7.) This factory-installed sensor eliminates the need for any field piping connections. The electronic portion of this oil pressure protection is available as a separate accessory for integrating into the system controls.

Fig. 7 — Factory-Installed Oil Pressure Protection

Oil Temperature Limits

The oil temperature in the sump must not exceed 160°F (71°C).

Oil Level

All 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 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. Excessively high oil charges can shorten compressor life by increasing oil circulation rates, which may result in oil slugging as it returns to the compressor.

Figure 8 shows the minimum and maximum recommended oil levels for the 06M compressor. The 06M compressor has two sightglasses that may show different levels during operation. This difference is due to the rotation of the crankshaft.

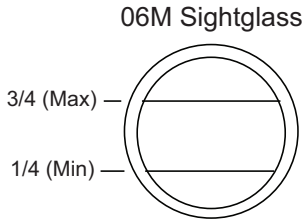


Fig. 8 — Oil Sightglass Level

The oil level should be observed in the sightglass only when the compressor is warmer than the evaporator, i.e., immediately after shutdown or when the crankcase heater has been energized. 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.

Oil Equalization — Parallel Compressors

When only two 06M compressors of the same displacement 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 less than 4 ft (1.2 m) long. When using a single equalizer line, the compressors must be installed level with one another, and the equalizer line must not contain any vertical runs.

When more than 2 compressors are to be connected in parallel, or if 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 to control the oil levels, as described in the Oil Pressure Protection section.

CAPACITY CONTROL

Unloaded Operating Guidelines and Limits

All system piping, especially the suction line, must consider oil return for both full and part load operation. See the Refrigerant Migration and Flooding and the Suction Piping sections on page 5 for additional piping recommendations.

To increase gas velocities and help return oil to the compressors, Carlyle recommends that the system controls bring the compressor to its nominal flow rate for at least 60 seconds after any 2 hours of continuous unloaded operation. For variable speed systems, this nominal condition means 60 Hz speed; for cylinder head unloading, this means running all cylinders loaded; and for suction line flow modulation, this means allowing full uninterrupted flow for the 60 seconds. Given the higher risks of oil loss in systems using either variable speed or cylinder head unloading, or suction line flow modulation, Carlyle requires the use of oil pressure protection with these unloading systems.

Mechanically unloading the cylinder heads will also result in moderate increases to the discharge gas and motor winding temperatures. As with the piping design, the system design must consider the impact of full and part operation on the discharge and motor winding temperatures. Carlyle recommends that the suction superheat not exceed 25°F when the compressors are running in the unloaded state. Discharge temperature limits provided in this guide apply to both loaded and unloaded operation.

Figure 9 shows the approximate limitations for unloaded operation within the full operating envelope.

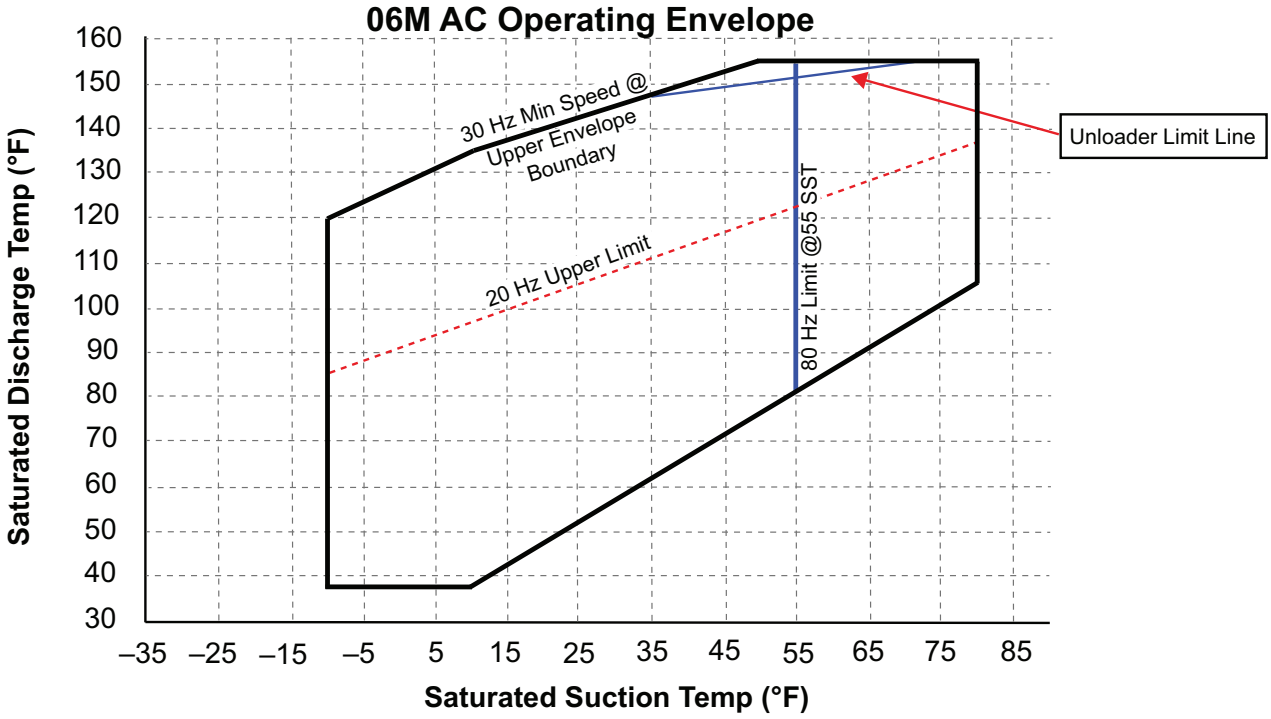


Fig. 9 — 06MA R-410A Operating Envelope

Variable Speed Unloading

Carlyle 06M compressors are approved for variable speed applications. All compressors applied in variable speed applications must use the factory-installed oil pressure protection switch. The use of alternate oil pressure protection must be approved by Carlyle Application Engineering.

The 06MA compressors are approved for a speed range of 20 to 80 Hz. At the lower end of the speed range, the system design should take care to manage return gas temperatures to avoid excessive superheat or liquid floodback. Either can adversely affect the oil viscosity, oil pressure, and bearing life. Carlyle recommends that suction superheats be maintained in the range of 10°F to 25°F (5.6K to 13.9K).

Vibration in system components should be carefully evaluated in variable speed systems. The fundamental frequency of the discharge gas pulsations will be 3 times the shaft speed (60-240 Hz). During the design and/or commissioning phase of a new installation, the entire system must be checked for excessive vibrations, with a particular focus on these frequency ranges and multiples thereof. Any system resonance issues that cannot be resolved by clamping must be avoided within the programming of the variable speed drive.

At a constant suction and discharge pressure condition, the current draw of the motor will not change as the shaft speed changes. Motor current draw changes only as the shaft torque changes based on the operating condition.

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. This linear Volts/Hz relation must pass through the nameplate motor voltage. This requires that the motor voltage be properly selected when running motor frequencies above the input line frequency, as shown in Table 3.

Cylinder Head Unloading

The cylinder head unloading features on the 06M compressors are approved for all refrigerants and applications. Energizing the electric solenoid will unload the compressor from 3 to 2 cylinders. This yields approximately 67% of nominal capacity (and mass flow) and will draw 71% of nominal power when unloaded.

The electric actuated unloading requires a minimum system pressure differential of 68 psid (4.7 bar) to actuate the hardware from the unloaded to loaded state. The unloader also has a maximum pressure differential of 450 psid (31.0 bar).

The cylinder head unloader is designed such that the solenoid coils must be energized to unload the compressor. The cylinder head design will automatically unload when the compressor is not running. When the compressor is started and the solenoid coil is de-energized, the compressor will load up as soon as the minimum pressure differentials are met.

Compressors with the cylinder head capacity may be applied with continuous or automatic pumpdown control. For systems with continuous pumpdown control, Carlyle recommends a minimum of 30 psid (2.1 bar) between the suction pressure cut-in and cut-out points to avoid compressor short cycling.

Pressure actuation is not allowed on the 06M cylinder head unloading.

Suction Line PWM Flow Modulation

The 06MA compressors can be applied with a suction line PWM valve for capacity control. Suction line PWM flow modulation allows continuous modulation of the compressor capacity down to 20% using a solenoid valve installed in the suction line of the compressor. The controller will cycle the valve once every 30 seconds between the open and closed positions. The relative duration of the open versus closed times creates a time average flow rate to the compressor that can be continuously varied. See Carlyle literature 574-078, SMART PWM Valve Application Guide, for more details.

Table 3 — Motor Voltage Selection for VFD Applications

<table>
<tr><th rowspan="2">INPUT LINE POWER TO VFD (V-Ph-Hz)</th><th colspan="2">COMPRESSOR MOTOR VOLTAGE FOR 80 Hz MAXIMUM SPEEDS[a]</th><th colspan="2">COMPRESSOR MOTOR VOLTAGE FOR MAXIMUM SPEEDS EQUAL TO OR LESS THAN NOMINAL 50/60 Hz LINE FREQUENCY</th></tr>
<tr><th>MODEL NUMBER DIGIT 12</th><th>MOTOR VOLTAGE (V-Ph-Hz)</th><th>MODEL NUMBER DIGIT 12</th><th>MOTOR VOLTAGE (V-Ph-Hz)</th></tr>
<tr><td>200-3-50</td><td colspan="2" rowspan="2">These models may not be applied above their 50/60 Hz nameplate frequencies.</td><td rowspan="2">2</td><td rowspan="2">208/230-3-60, 200-3-50</td></tr>
<tr><td>208/230-3-60</td></tr>
<tr><td>380-3-60</td><td rowspan="3">2</td><td rowspan="3">208/230-3-60, 200-3-50</td><td>3</td><td>380-3-60</td></tr>
<tr><td>400-3-50</td><td rowspan="2">4</td><td rowspan="2">460-3-60, 400-3-50</td></tr>
<tr><td>460-3-60</td></tr>
<tr><td>575-3-60</td><td>3</td><td>380-3-60</td><td rowspan="3">5</td><td rowspan="3">575-3-60</td></tr>
<tr><td>690-3-50</td><td rowspan="2">4</td><td rowspan="2">460-3-60, 400-3-50</td></tr>
<tr><td>690-3-60</td></tr>
</table>

NOTES:
a. 06MA compressors maybe applied up to 80 Hz maximum speed. Consult Carlyle Application Engineering for maximum speeds above electrical line frequencies but less than 80 Hz.

ELECTRICAL DATA

Allowable Voltage Range

See Table 4 for allowable voltage range.

Table 4 — Allowable Voltage Ranges

06M MODELS	60 Hz			50 Hz		
DIGIT 12	NOMINAL (V-Ph-Hz)	MIN	MAX	NOMINAL (V-Ph-Hz)	MIN	MAX
2	208/230-3-60	187-v	253-v	200-3-50	180-v	230-v
3	380-3-60	342-v	440-v	—		
4	460-3-60	396-v	528-v	400-3-50	342-v	440-v
5	575-3-60	518-v	633-v	—		

Overcurrent Protection —06MA

The 06MA models are manufactured with sensors embedded in the motor windings and a protection module factory-installed in the compressor's electrical box. (See Fig. 10.) The module has a set of normally open contacts to control the compressor contactor and a set of normally closed contacts that will revert to their normal status upon an overcurrent fault. This overcurrent fault will occur when the temperature of the embedded sensor exceeds 158°F (70°C). The motor is protected against locked rotors, running overload, primary and secondary single phasing, and a loss of refrigerant condition. The module auto-resets when the fault condition is resolved.

The 06MA control module is pre-wired at the factory to the terminal connections for the embedded temperature sensors. The module must be connected to 120/240 vac control power. The module has 2 relays sharing a common leg (pin 11). One relay is normally open (pin 14) and will be closed when the module is powered up and there is no fault detected on the thermal sensors. The normally closed relay (pin 12) is intended to indicate an alarm condition. This normally-closed relay will open on the loss of power or upon the detection of a fault condition. The relays are rated for up to 240 vac (2.5A) and can be applied in 24 vac and 24 vdc circuits where there is a minimum of 20 mA.

The wiring diagrams for the 06MA compressors are shown in Fig. 10 (fixed speed) and Fig. 11 (variable speed).

Variable speed 06MA compressors may use the overcurrent protection features of the variable speed drive, provided that the drive is listed with UL for this purpose. The overcurrent setting of the drive must be consistent with the MCC value as defined in the 06M Electrical Data section.

The electronic overcurrent protection module is pre-programmed in the factory with the maximum continuous current (MCC) value as listed in the 06M Electrical Data section.

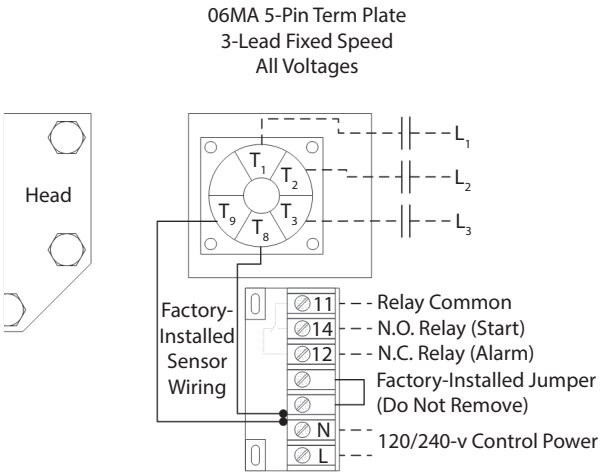
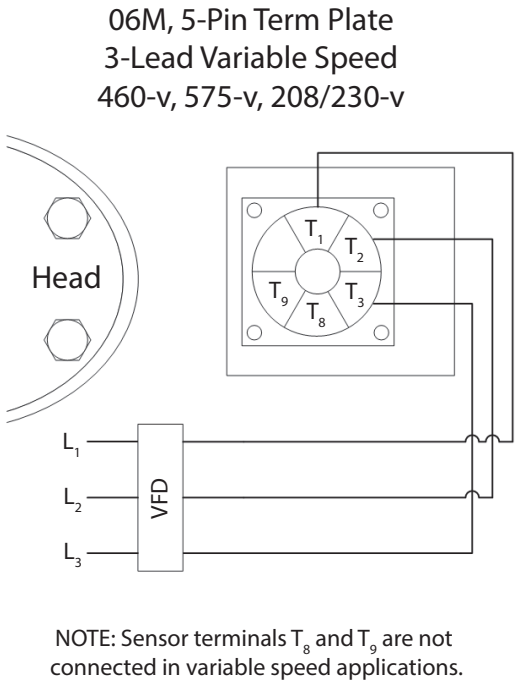


Fig. 10 — 06MA Fixed Speed Wiring Diagram



NOTE: Sensor terminals T_8 and T_9 are not connected in variable speed applications.

Fig. 11 — 06M Variable Speed Wiring Diagram

06M Electrical Data

Table 5 provide locked rotor current for across the line starting and MCC ratings for the 06M compressors. MCC rating is a limitation of the compressor that is independent of both the refrigerant and application range.

For fixed speed applications, the 06M factory-installed overloads are set to trip at this MCC value. Rated Load Amps (RLA) is based on the trip value of the overload device. Because the 06M compressor is considered to be thermally protected, the RLA for compressors using these factory-installed overloads will be:

$$\left.\text{RLA} = \frac{\text{MCC}}{1.56}\right\} \text{For 06M with Factory Overloads}$$

Table 5 — 06MA Electrical Data

COMPRESSOR MODEL	VOLTAGE (V-Ph-Hz)	MCC	LRA	MAX. kW	HP
06MA015K022200	208/230-3-60	54.4	215	14.1	9
06MA015K024200	460-3-60	27.2	180		
06MA015K025200	575-3-60	21.8	86		
06MA018L022200	208/230-3-60	62.3	269	16.7	11
06MA018L024200	460-3-60	31.1	135		
06MA018L025200	575-3-60	24.9	108		
06MA021M022200	208/230-3-60	75.5	305	20.1	13
06MA021M024200	460-3-60	37.8	153		
06MA021M025200	575-3-60	30.2	122		
06MA024N022200	208/230-3-60	88.9	366	24.0	15
06MA024N024200	460-3-60	44.9	183		
06MA024N025200	575-3-60	34.8	146		

NOTE: Digits 15 and 16 are not shown on compressor nameplate.

Rated Load Amps for Variable Speed

In variable speed applications, the variable speed drives provide the overcurrent protection for the compressor. The variable speed drive must have the appropriate code agency listings for this purpose. The factory-installed overloads on the 06M compressors must be removed, or compressor models must be purchased without these.

The current trip setting must be set per the drive manufacturer's instructions and may not exceed the MCC listed for the compressor. The system designer may elect to use a lower trip value (and thus smaller drive), but doing something may impact the overall operating range of the compressor. This can reduce the cost of the drive in cases where the full range of the compressor is not required for the system's intended application. In this type of control system, the RLA for the compressor is:

$$RLA = \left.\frac{\text{VFD Trip Setting}}{1.4}\right\} \text{For Variable Speed 06M}$$

COMPRESSOR ACCESSORIES

Variable Speed Drives

Variable frequency drives must not be selected based upon the nominal horsepower of the motor. The variable speed drive must be carefully selected based on the maximum expected current draw of the compressor and the rating factors used by the drive manufacturer.

Suction Inlet 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.

Discharge Mufflers

Mufflers can reduce discharge gas pulsation and effectively eliminate vibration problems downstream. They should be placed as close to the compressor as possible to maximize efficiency and minimize vibration.

Mufflers should be used on all 06M compressor applications.

Mufflers should be installed per the supplier's direction but are generally able to be mounted in either horizontal or vertical piping runs. When mounted horizontally, care should be taken to ensure oil does not accumulate within the muffler housing.

Crankcase Heaters

Carlyle requires the use of crankcase heaters in any application that has access to electrical power when the compressors are not running. The heater should be energized only when the compressor is not operating. For all 06M compressor models, the heater will be inserted into a blind hole in the bottom of the crankcase body. (See Fig. 12.) These heaters should use thermal grease to enhance heat transfer and be constrained such that they do not move out of position during compressor operation.

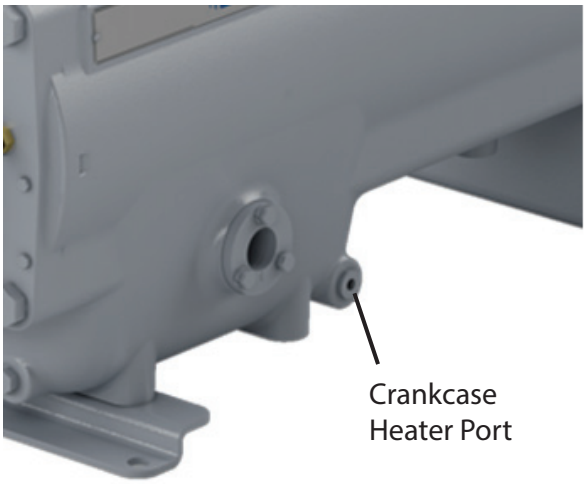


Fig. 12 — Crankcase Heater Port

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.

Compressor Mounts

The 06M compressor is approved only for rigid mounts.

Compressor Service Valves

Recommendations for suction and discharge service valves for fixed speed applications can be found in Table 6. For variable speed applications, Carlyle recommends choosing the largest valve, standard or alternate, that is identified for the compressor model.

Table 6 — Service Valves

MODEL NUMBER	SUCTION SERVICE VALVE		DISCHARGE SERVICE VALVE	
	RECOMMENDED	ALTERNATE	RECOMMENDED	ALTERNATE
06M015	1-1/8 in. ODF 06DA660063	1-3/8 in. ODF 06DA660065	7/8 in. ODF 06DA660062	1-1/8 in. ODF 06DA660064
06M018				
06M021	1-3/8 in. ODF 06DA660065	1-5/8 in. ODF 06EA660090	1-1/8 in. ODF 06DA660064	—
06M024				
All models installed in PWM applications.	1-5/8 in. ODF 06EA660090	1-1/8 in. ODF 06DA660063 1-3/8 in. ODF 06DA660065	Selections for these applications should defer to recommended values above.	