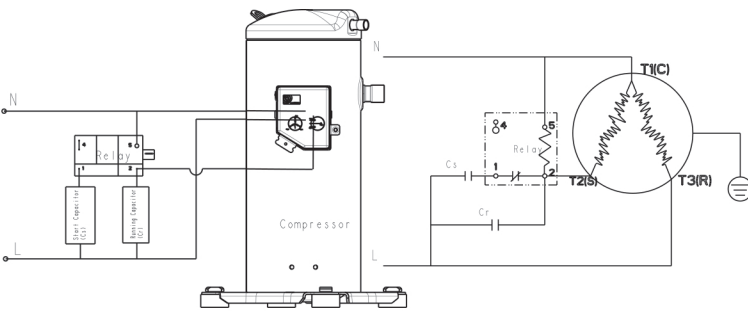


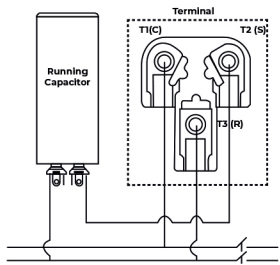
### STARTER KITS

MODEL	COMPRESSOR	START CAPACITOR (Cs)		RUNNING CAPACITOR (Cr)		RELAY
		Volume (uF)	Voltage (V)	Volume (uF)	Voltage (V)	
110-0076-00	YW75A(T)2~YW80A(T)2* YW38J2~YW55J2* YW75C2* YH69A(T)2~YH89A(T)2* YM34A(E)2~YM49A(E)2* YM13A(E)2~YM20A(E)2*	160	330	60	450	HLR3800-3E3D
110-0076-01	YW102A(T)2~YW10A(T)2* YW80J2* YH95C3* YH104A(T)2~YH128A(T)2* YH104A(T)2~YH128A(T)2* YH60A(E)2~YM70A(E)2* YF29A(E)2* YF29A(E)3*	250	330	80	450	HLR3800-3H3D
110-0076-02	YM34A(E)3~YM49A(E)3* YF13A(E)3~YF20A(E)3* YW38J3~YW55J3* YH69A(T)3~YH89A(T)3*	160	330	60	450	HLR3800-4A3D
110-0076-10	YW152A(T)2* YW152C2* YW135C2* YW135A(T)2* YF35A(E)2/3* YH119A(T)3~YH150A(T)3-100 YH119C2(3)~YH150C2(3)-100 YM86A(E)2* YM70A(E)3~YM86A(E)3* YM70A(E)3~YM86A(E)3* YM70A(E)3~YM86A(E)3*	250	330	100	500	HLR3800-3F3C



### AIR CONDITIONING

HP	MODEL	Power Input	Running Capacitor
4	YH95C3*	208 - 230V/1PH/60Hz	YH***.10N
	YH104A/T3*		60uf
	YH119A/T3*		60uf
5	YH128A/T3*		80uf
	YH133A/T3*		80uf
	YH140A/T3*		80uf
	YH150A/T3*		80uf



### MEDIUM TEMPERATURE REFRIGERATION

HP	MODEL	Power Input	Running Capacitor
3.5	YM60A/E3*	208 - 230V/1PH/60Hz	YH***.10N
4	YM70A/E3*		60uf
5	YM86A/E3*		80uf

### COMPONENTS INCLUDING INVOTECH SCROLL COMPRESSORS



Termination -210 (Includes all Components for Installation)  
Prepared for Parallel Application (Tandem Mounting)

### THREE-PHASE ROTATION DIRECTION

Scroll compressors are directional dependent: i.e., they will compress in one rotational direction only. On single phase compressors, this is not an issue since they will only start and run in the proper direction (except as described in the "Brief Power Interruptions" section). Three-phase scrolls, however, will rotate in either direction depending on the power of the phasing. So there is a 50/50 chance of connected power being "backwards." Contractors should be warned of this. Appropriate instructions or notices should be provided by the Original Equipment Manufacturer.

Verification of proper rotation can be made by observing that the suction pressure drops, and the discharge pressure rises when the compressor is energized. Additionally, if operated in reverse the compressor is noisier and its current draw is substantially reduced compared to tabulated values.

Although operation of a scroll compressor in reverse direction for brief periods of time is not harmful, continued operation could result in failure. All three-phase compressors are wired identically internally. Once the correct phasing is determined for a specific system or installation, connecting properly phased power leads to the same fuse terminals will maintain the proper rotation.

### BRIEF POWER INTERRUPTIONS

Brief power interruptions (less than 0.5 second) may result in powered reverse rotation of single-phase refrigeration scroll compressors. High-pressure discharge gas expands backward through the scrolls at power interruption causing the scroll to orbit in the reverse direction. If power is reapplied while this reversal is occurring, the compressor may continue to run noisily in the reverse direction for several minutes until the compressor internal protector trips. This has no negative effect on durability. When the protector resets, the compressor will start and run normally.

Invotech recommends the use of a timer, which can sense brief power interruptions and lock the compressor out of operation for three minutes. A three-minute time delay is also

### DEEP VACUUM OPERATION

Do not run a refrigeration scroll compressor in a vacuum. Do not run a compressor before the refrigerant charge. Failure to follow this advice can result in permanent damage to the compressor. A low-pressure controller is required for protection against vacuum operation. See the section on pressure controls for the proper set points. Scroll compressors (as with any refrigeration compressor) should never be used to evacuate refrigeration or air conditioning systems.

### SYSTEM EVACUATION

An important step in effectively cleaning a system before operation is proper evacuation. Air is very detrimental to refrigeration systems and must be removed before start up and after field service. Blowing out lines with dry nitrogen removes a major part of the air from a system. New compressors are shipped with a dry air holding charge and must be evacuated before being put in the system. Triple evacuation of the system or compressor, as required, is strongly recommended (twice to 1500 microns and finally to 500 microns), breaking the vacuum each time with 30 PSIG dry nitrogen. The vacuum pump must be connected to both the high and low sides of the system through properly sized coactions.

### CHARGING PROCESS

- Do not power on the compressor before charging refrigerant.
- Use the scale to control charge quantity.
- One liquid drier is recommended to connect between the refrigerant cylinder and manifold to prevent moisture into system during charging.
- Connect refrigerant cylinder to both high and low side of the refrigeration system. Power on the solenoid valve if possible (do not power on the compressor at this time).
- Invert refrigerant cylinder if needed to ensure only liquid can be charged into both high and low sides.
- Charge the refrigerant to the system as much as needed (at least 70% of total needed).
- Disconnect the high side charge port, turn on the compressor, and continue to charge liquid from the low side until adequate charge is met.
- Never close the suction service valve when compressor is running.

### UNBRAZING SYSTEM COMPONENTS

If the refrigerant charge is removed from a scroll unit by bleeding the high side only, it is sometimes possible for the scrolls to seal, preventing pressure equalization through the compressor. This may leave the low side shell and suction line tubing pressurized. If a brazing torch is then applied to the low side, the pressurized refrigerant and oil mixture could ignite as it escapes and contacts the brazing flame. It is important to check both the high and low sides with manifold gauges before un-brazing. In the case of an assembly line repair, remove the refrigerant from both the high and low sides.

### INVOTECH SCROLL FUNCTIONAL CHECK

Refrigeration scroll compressors do not have internal suction valves. It is not necessary to perform functional compressor tests to check how low the compressor will pull suction pressure. This type of test may damage a scroll compressor. The following diagnostic procedure should be used to evaluate whether an Invotech Scroll compressor is functioning properly.

- Verify proper unit voltage.
- Normal motor winding continuity and short to ground checks will determine if the inherent overload motor protector has opened or if an internal short to ground has developed. If the protector has opened, the compressor must cool sufficiently to reset.
- With service gauges connected to suction and discharge pressure fittings, turn on the compressor. If suction pressure falls below normal levels, the system is either low on charge or there is a flow blockage.
- Suction pressure
  - Single-Phase Compressors.
    - If the suction pressure does not drop and the discharge pressure does not rise to normal levels, the compressor is faulty.
  - Three-Phase Compressors
    - If the suction pressure does not drop and the discharge pressure does not rise, reverse any two of the compressor power leads and reapply power to make sure the compressor was not wired to run in the reverse direction.

The compressor current draw must be compared to published compressor performance curves at the compressor operating conditions (pressures and voltages). Significant deviations ( $\pm 200/o$ ) from published values may indicate a faulty compressor.

### NEW INSTALLATION

- Copper-coated steel suction, discharge, and injection tubes on scroll compressors can be brazed in approximately the same manner as any copper tube.
- Recommended brazing material - Any Silfos material is recommended, preferably with a minimum of 5% silver.
- Use of a dry nitrogen purge to eliminate the possibility of carbon buildup on internal tube surfaces is recommended. Wets rags are recommended to be used to avoid the overheating of paint and other parts not requiring brazing.
- Be sure process tube fitting I.D. and process tube O.D. are clean prior to assembly.
- Remove the discharge plug at first, then remove the suction plug.
- Apply heat in copper tube. As tube approaches brazing temperature, move torch flame to the joint.
- Heat the joint area until braze temperature is attained, moving torch up and down and rotating around tube as necessary to heat tube evenly. Add braze material to the joint while moving torch around circumference.
- After braze material flows around joint, move torch to heat fitting. This will draw the braze material down into the joint. The time spent heating area 3 should be minimal.
- As with any brazed joint, overheating may be detrimental to the final result.

### FIELD SERVICE TO DISCONNECT:

- Recover refrigerant from both the high and low side of the system.
- Cut tubing near compressor.
- Check the high and low pressure with a pressure gauge to make sure no pressure is

### TO RECONNECT:

- Recommended brazing materials - Silfos with minimum 5% silver or silver braze material with flux.
- Reinsert tubing fitting.
- Heat tube uniformly in area of copper tube, moving slowly to the joint area. When the joint reaches brazing temperature, apply brazing material.
- Heat joint uniformly around the circumference to flow braze material completely around the joint.
- Slowly move the torch around fitting to draw braze material into the joint.
- Do not overheat joint.



### Application Guidelines for Invotech YM Scroll Refrigeration Compressors



SCAN THE QR CODE TO  
REGISTER YOUR  
INVOTECH SCROLL  
COMPRESSOR  
www.invotechtexas.com



IMPORTANT

REGISTER & ACTIVATE YOUR  
12-MONTH WARRANTY FIRST



SAFETY INSTRUCTIONS

These instructions should be kept throughout the lifetime of the compressor. You are strongly advised to follow these safety instructions. The local related regulations and rules should be obeyed, too.

SAFETY STATEMENTS

- Refrigerant compressors must be employed only for their intended use.
- Only qualified and authorized HVAC/R personnel are permitted to install and maintain this equipment.
- Electrical connections must be made by qualified electrical personnel.
- All valid standards and codes for installing, servicing, and maintaining electrical and refrigeration equipment must be observed

ELECTRICAL SHOCK HAZARD

- Disconnect and lock out power before servicing.
- Discharge all capacitors before servicing.
- Use compressor with grounded system only.
- Molded electrical plugs must be used when required.
- Refer to original equipment wiring diagrams.
- Electrical connections must be made by qualified electrical personnel.
- Failure to follow these warnings could result in serious personal injury.

PRESSURIZED SYSTEM HAZARD

- System contains refrigerant and oil under pressure.
- Remove refrigerant from both the high- and low-pressure sides before uninstalling the compressor.
- Use appropriate back up wrenches on Roto lock fittings when servicing.
- Never install a system and leave it unattended when it has no charge, a holding charge, or with the service valves closed without electrically locking out the system.
- Use only approved refrigerants and refrigeration oils.
- Personal safety equipment must be used.
- Failure to follow these warnings could result in serious personal injury.

BURN HAZARD

- High temperature on the compressor surface. Do not touch the compressor until it has cooled down.
- Ensure that materials, piping and wiring do not touch high temperature areas of the compressor.
- Use caution when brazing system components.
- Personal safety equipment must be used.
- Failure to follow these warnings could result in serious personal injury or property damage.

INTRODUCTION

The YM Invotech Scroll™ compressor represents the latest generation of compliant scroll technology for the refrigeration industry. YM Scroll compressors are specially designed for the medium temperature applications.

NOMENCLATURE

The YM scroll model numbers include the nominal refrigeration capacity at standard 50HZ ARI rating conditions for medium temperature (-6.7/48.9°C). For additional information, please refer to the web site at

www.invotech.cn. / www.invotechtexas.com

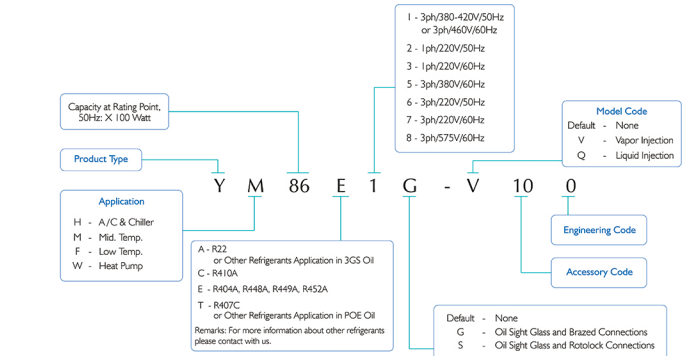
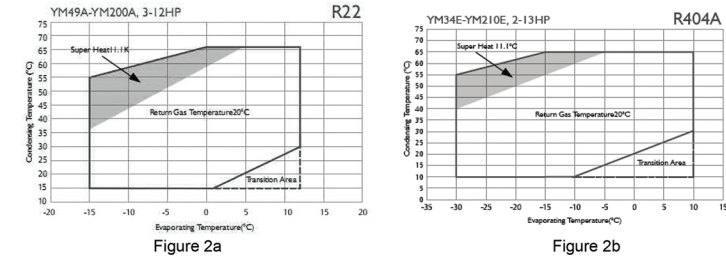


Figure 1 YM Nomenclature

OPERATING ENVELOPE

YM refrigeration scroll compressor models can be used with R22 or R404A refrigerants depending on the model selected and the lubricant used. Please check with your Invotech application engineer with any questions about suitable refrigerants.

The YM\*\*A and YM\*\*E models are intended for medium temperature refrigeration applications. The approved operating envelopes for these models are such that they are ideally suited for applications such as ice machines, bulk milk and cold room storage. The models and operating envelopes are depicted in Figures 2a and 2b.



ACCUMULATORS

Due to the inherent ability of Invotech scrolls to handle liquid refrigerant in flood-back and defrost cycle operation conditions, accumulators may not be required. An accumulator is suggested on single compressor 2-6 hp systems when the charge exceeds 4.5kg, and the single compressor 7-12 hp system when the charge exceeds 8kg. On systems with defrost schemes or transient operations that allow prolonged uncontrolled liquid return to the compressor, an accumulator is required unless a suction header of sufficient volume to prevent liquid migration to the compressor is used.

Excessive liquid flood back or repeated flooded starts will dilute the oil in the compressor causing inadequate lubrication and bearing wear. Proper system design will minimize liquid flood back, thereby ensuring maximum compressor life.

To ensure that liquid refrigerant does not return to the compressor during the running cycle, attention must be given to maintaining proper superheat at the compressor suction inlet. Invotech recommends a minimum of 8K superheat, measured on the suction line 150mm from the suction port, to prevent liquid refrigerant flood back.

Another method to determine if liquid refrigerant is returning to the compressor is to accurately measure the temperature difference between the compressor crankcase and the suction line. During continuous operation, we recommend that this difference be a minimum of 25°C. To measure oil temperature through the compressor shell, place a thermocouple on the bottom center (not the side of the suction) of the compressor shell and insulate from the ambient.

During rapid system changes, such as defrost or ice harvest cycles, this temperature difference may drop rapidly for a short period of time. When the crankcase temperature difference falls below the recommended 25°C, our recommendation is the duration should not exceed a maximum (continuous) time period of three minutes and should not go lower than a 12°C difference.

**SCREENS**  
Screens with a mesh size finer than 30 x 30 (0.6mm openings) should not be used anywhere in the system with these compressors.

CRANKCASE HEATERS

Crankcase heaters are suggested to be installed for any refrigeration application.

DISCHARGE LINE THERMOSTAT

Operation above or on the left of the operation envelope can cause high compression ratios or excessive internal compressor temperatures. This will result in overheating of the scrolls, causing excessive wear resulting in premature compressor failure. If the system is designed where operation can't guarantee to operate inside the operation envelope, then a discharge line thermostat is required in the compressor control circuit. The suggested highest cut out setting for the discharge line thermostat is 125°C. It should be installed approximately 170mm from the discharge tube outlet, or approximately 130mm from the valve outlet port.

PRESSURE CONTROLS

Both high and low-pressure switches are required on the compressors. The suggested cut out settings see table 1 below.

Control Type	R404A	R22
Low	12 PSIG min.	25 PSIG min.
High	450 PSIG max.	400 PSIG max

Table 1 high and low pressure switches setting

PUMP DOWN RECOMMENDATIONS

YM models that incorporate the low-leak check valve right at the scroll discharge port are suitable for pump-down applications. For the single phase YM compressors, there is a small balance port on the discharge check valve to balance the high and low side inside of the compressor when the compressor is not operating. If pump down is applied, an external check valve on the discharge line is suggested.

IPR VALVE

Invotech three phase refrigeration scroll compressors have internal pressure relief valves, which open at a discharge to suction differential pressure of 380 to 440 psi. This action will trip the motor protector and remove the motor from the line. There is no IPR valve built in for the single-phase compressors.

OIL TYPES

Polyolester lubricants must be provided for the YM\*\*E scroll compressors being used with HFC refrigerants. YM\*\*A compressors are intended for use with R22 and are supplied with mineral oil. POE must be handled carefully and the proper protective equipment (gloves, eye protection, etc.) must be used when handling POE lubricant. POE oil must not meet any surface or material that might be harmed by POE oil. A system with POE oil should not be open to the environment for more than 10 minutes. Do not remove the suction/discharge plugs until the compressor is ready to be brazed.

OIL CHARGE

The initial oil charge and the re-charge volume can be checked on the nameplate.

MOUNTING FOR RACK SYSTEMS

Specially designed rubber grommets are available for refrigeration scroll compressor applications. These grommets are formulated from a durometer material specifically designed for refrigeration applications. The durometer limits compressor motion, thereby minimizing potential problems of excessive tubing stress. Sufficient isolation is provided to prevent vibration from being transmitted to the mounting structure. This mounting arrangement is recommended for multiple compressor rack installations. The standard soft grommets are not recommended for most refrigeration scroll rack installations. These softer mounts allow for excessive movement that will result in tube breakage, unless the entire system is properly designed. Condensing unit mounting of Invotech YM refrigeration scroll condensing unit applications, soft mounts are recommended.

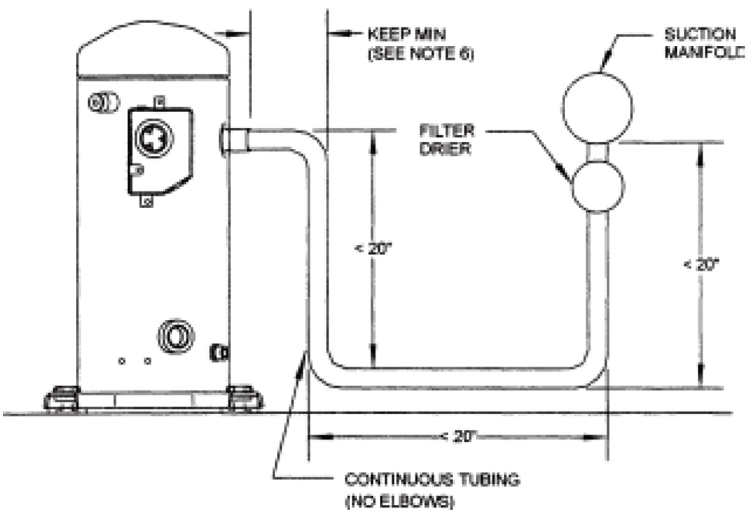


Figure 3 Typically Suction Line Arrangements

- The above tubing configurations are guidelines to minimize tube stress
- Follow similar guidelines for discharge tubing and oil return tubing as needed.
- If a run of over 500mm is required, intermediate clamps may be necessary.
- Do not hang weights on tubing (e.g. filter drier on suction tubing) except after clamps or close to the header.
- Tube runs of less than 200mm is not recommended.
- His dimension should be made as short as possible (e.g. 50mm or less) but still insuring a proper braze joint.
- The above tubing recommendations are based on "no elbow joints". The use of continuous tubing is preferred.

COMPRESSOR TUBING AND MOUNTING

Compressor mounting must be selected based on application. Consideration must be given to sound reduction and tubing reliability. Some tubing geometry or "shock loops" may be required to reduce vibration transferred from the compressor to external tubing.

MOUNTING FOR RACK SYSTEMS

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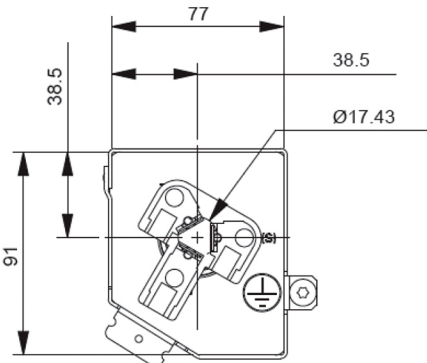
PIPING CONSIDERATIONS

Proper piping design is very important to ensure system reliability. The piping must have sufficient "flex" to allow normal compressor start-up and shutdown without placing excessive stress strain on the pipe joints. In addition, it is desirable to design piping with a natural frequency away from the compressor's normal operating frequency to avoid resonant vibrating. Figure 7 shows examples of acceptable piping configurations.

These examples are provided only as a guide to describe the requirements for flexibility in piping design. To properly determine if the design is suitable for a given application, samples should be tested and evaluated for stress under various conditions of use (including voltage, frequency and load fluctuations and transport vibrations). The above guidelines may be helpful; however, each designed system must be tested.

FUSITE

Fusite pin orientation for single-phase and three-phase refrigeration scroll compressors are shown in Figure 4 and inside the terminal box.



Wiring Diagram

Figure 4 Motor terminal connections

SHELL TEMPERATURE

System component failure may cause the top shell and discharge line to briefly reach temperatures above 150°C. Wiring or other materials, which could be damaged by these temperatures, should not come in contact with the shell.

CONNECTION FITTINGS

Scroll compressors are provided with either braze connections or rota-lock adapters depending on the bill of material selected. All YM models have copper plated steel suction and discharge fittings for a more rugged, leak resistant connection. See section on New Installation for suggestions on how to properly braze these fittings