

IMPORTANT POINTS TO OBSERVE WHEN USING A ROTARY COMPRESSOR

1 Vibration

Rotary compressors have less vibration overall than reciprocating compressors, but because the compressing mechanism and motor stator are attached directly to the housing, the vibration transmitted to the outside is usually greater. To lessen the noise transmitted via the discharge and suction piping, it is necessary that such piping be longer than in reciprocating compressors. This is the key point to observe in designing a low noise rotary compressor mounted unit.

2 Pull-Down

The pull-down time for units with rotary compressors is longer than that for those with reciprocating compressors. This is because the oil sump is located on the high pressure side, and therefore a longer time is required for the refrigerant dissolved in the oil during the compressor off period to be evaporated. This problem can be solved by using a crankcase heater.

3 Motor Cooling

The temperature of the motor coil should not exceed 120°C (248°F) at any time. If it does, oligomer from the electrical insulation will be extracted in large amounts and collect on the moving parts of the compressor during stoppage, causing compressor lock-up. There are three methods of preventing motor temperature from increasing:

■ Use of desuperheater

This is a method whereby the discharge gas from the cylinder is routed directly to a desuperheater outside the compressor, where it is cooled, then routed back to the compressor to cool the motor. However, this method cannot be used on heat pump units as heating capacity will decrease according to the amount of dissipated heat. In addition, pressure loss inside the desuperheater is great, and since this results in a considerable loss of compression efficiency, this method is seldom used.

■ Use of liquid injection

In this method, part of the liquid refrigerant at the exit end of the condenser (5 to 10% of the circulation amount) is injected directly into the cylinder to cool the compressor. Injection is effected after the suction port is closed, so there is no backflow to the suction area and no decrease in volumetric efficiency. If the injection amount is too large (over 15%), the lubrication oil will be diluted, causing possible seizure and wearing of moving parts.

■ Decreasing superheating of suction gas

When suction gas temperature is high, discharge gas temperature goes even higher, following the polytropic compression curve. Therefore, adjustments must be made by controlling the amount of refrigerant and utilizing capillary tubes, so the superheating of the suction gas will be minimal.

With this method, selection of suitable capillary tubes and determination of optimum refrigerant volume are complex operations, so it is limited to applications where load changes are kept to a minimum. It is not suitable for high ambient temperature applications.

4 Temperature Control of Lower Housing (Oil Sump Section)

When an air-conditioner is operated in relatively low-load conditions (low ambient temperature), the refrigerant is more likely to return to the compressor in a liquid state, decreasing the temperature of the compressor. When the temperature of the lower housing nears the discharge pressure saturation temperature, the solubility of the refrigeration oil increases, diluting it and decreasing its viscosity, resulting in damage to moving parts. It is therefore important to keep the lower housing temperature at least 5°C (9°F) higher than the discharge pressure saturation temperature.

5 Limitations on Refrigerant Charge

There are refrigerant charge limitations for each compressor model. When it is necessary to charge above the limitation, be sure to attach a crankcase heater to the compressor and add another separate accumulator.

6 Important Points when Using Liquid Injection

■ To keep the liquid injection amount within 5 to 10% of the refrigerant circulation amount, it is necessary to adjust the injection refrigerant flow volume using the unit's capillary tubes. But since the capillary tubes used in such cases usually have a small inner diameter of 0.8–1 mm (0.03"–0.04"), we strongly recommend placing a size 100 mesh strainer on the upper stream side of the capillary tube. Also, as capillary tubes of this size are affected by compressor vibration, precautions should be taken in the design stages.

■ When connecting the liquid injection tubing to the unit tubing by silver soldering (brazing), be sure to limit the heating time to 10 seconds. If the heating period is longer than 10 seconds, the Teflon packing inside the compressor will melt.

7 Starting Performance

The compressor can start at 85% of the rated voltage (inrush voltage measured at compressor terminals), but the following conditions apply:

1) Cold start, pressure of 9.5 kg/cm²G (135 psiG)

no pressure difference between high and low pressure sides

2) Hot start, pressure of 12 kg/cm²G (171 psiG)

no pressure difference between high and low pressure sides

3) Hot start, pressure of 10 kg/cm²G (142 psiG)

0.5 kg/cm²G (7 psiG) pressure difference between high and low pressure sides

When the compressor is restarted after overload operation, motor torque will be reduced due to high temperature. Also, the liquid refrigerant that has collected in the evaporator will enter the accumulator and overflow out of it, causing a state of liquid slugging and locking of the compressor. If such restarts are envisioned, install another separate accumulator.

8 Starting After Soak-Out

When the compressor is started after a long period of stoppage, oil dissolved in the refrigerant will cause a foaming phenomenon and oil will be held up in other parts of the unit, lowering the amount of oil in the compressor sump. However, the oil level should be kept above the cylinder center in all cases.

When long piping is required, as in a split-system air-conditioner, a crankcase heater should be used. A crankcase heater also has the effect of maintaining oil level during gas leakage.

9 Mounting

To ensure proper operation, use mounting parts recommended by THACOM.

10 Length of Piping

When a rotary compressor is used in a split-system air-conditioner, be sure that the specified oil level is maintained in the compressor oil sump. When the connecting refrigerant lines between the indoor and outdoor units are too long or too thick, return of refrigerant oil to the compressor will be hindered.

11 Motor Protector

In the RM series, a dome mount (external: Type I) Protector is used.

With a dome mount protector Type I, the motor cannot be protected during gas leadage. If the compressor is to be used in an application where there is a high possibility of gas leadage occurring, use our optional motor protector Type II.

12 Running Capacitor

Although it is not mandatory to use an MHI running capacitor, it is necessary to observe the determined microfarad capacity, the maximum voltage, and the ambient temperature limitations.

13 Refrigerant Oil

The proper amount of refrigerant oil is supplied in the unit, so do not add or remove any.

14 Where to Charge the Refrigerant

Charge the refrigerant from the piping between the capillary tube and the condenser. If the refrigerant is charged from points near the compressor, the compressor will fill with liquid refrigerant and will be damaged at start-up.

15 Moisture Content

At the time of shipment from the factory, moisture content in the compressor is controlled at 100mg or less for RM series models. When the compressor is being installed, do not keep the suction or discharge piping open for more than 15 minutes, or moisture will enter, possibly causing malfunction. Moisture content within the unit should be kept at 20ppm or lower.

16 Non-Condensable Gases

Non-condensable gases within the refrigerant should be kept to 2% or less (1% or less is most desirable) when a sample is taken from the low pressure side gas phase. To reach this level, evacuate the unit to a vacuum of 0.05mmHg (0.02mmHg is most desirable) before charging the refrigerant.

17 Foreign Matter

Take precautions so that no type of foreign matter is allowed to infiltrate into the compressor at the time of installation onto the unit.

18 Use in Unusual Environments

Please consult us if the compressor is to be used in an atmosphere with high salt content or one with highly corrosive properties. Also, do not allow condensate from the drain pan to drip onto the lower portion of the compressor.

19 Tilt Angle

Do not tilt the compressor more than 5° during operation.

20 Gas Leakage

Rotary compressor failures are attributable chiefly to gas leakage from the refrigerant circuit, so this is a vitally important point. The rotary compressor's oil charge is small compared to that of the reciprocating compressor because its inner volume is smaller. So when the compressor operates with insufficient gas, there will be a shortage of oil and this will lead to poor lubrication and wear of moving parts.

To avoid this problem, we recommend conducting air tightness checks at high pressures and checking that there are no piping vibration irregularities and that there is no loose or unclamped piping, to prevent leakage by cracks. If excessive leakage occurs, compressor temperature will increase and burnout may occur. Dome mount motor protectors (Type I) do not protect against temperature rise caused by gas leakage, so we recommend installing an external thermostat (set at 120° C/248°F) to sense the compressor discharge tubing temperature. Special type dome mount motor protectors (Type II) will protect the compressor in case of gas leakage. Please refer to no.11.

21 Miscellaneous

- 1) Do not use the compressor for pulling the vacuum of the refrigerant system.
- 2) Do not allow the compressor to suck in and compress air.
- 3) Do not apply electric current when the compressor has vacuum-pulled.
- 4) Do not damage the compressor paint.
- 5) Do not drop the compressor.

Because of our policy of continuous improvement, we reserve the right to make changes in all specifications without notice.