   1-1. Catalogue Contents
   1-2. Compressor Application Guide
   1-3. Specification sheet

2. Basic Classification of LGEIL Compressor
   2-1. Compressor Ranges
   2-2. Application
   2-3. Starting Torque Classification
   2-4. Motor Types
   2-5. Voltages & Frequencies
   2-6. Compressor Electrical Components
   2-7. Cooling Types
   2-8. Compressor Nameplates Identification
   2-9. Wiring Diagram

3. Supply Condition
   3-1. Electrical Safety
   3-2. Electrical Parts Safety
   3-3. Hydrostatic Strength Of Compressor Shell
   3-4. Residual Humidity
   3-5. Oil Charge
   3-6. Minimum Amount of Oil Lubricant
   3-7. Acceptable Compressor Transportation and Lay-down Position
   3-8. Inner Pressure Of Compressor
   3-9. Painting
   3-10. Compressor Packing: PAD Material Type
   3-11. Compressor Packing : Cover Type
   3-12. Compressor Packing Label
   3-13. Compressor Packing Storage
   3-14. Compressor Samples Packing
   3-15. Packing Quantity in 20" Container

4. Installation of Compressor
   4-1. Compressor Selection
   4-2. Compressor Unpacking
   4-3. Preparation of Refrigerating System Components
   4-4. R134a Guide Line
   4-5. Filter Dryer Selection
   4-6. Capillary Tubes
   4-7. Application of Rubber Grommets
   4-8 Mounting Accessory Type
   4-9. Mounting Type & Pitches
   4-10. Terminal Protector Type
   4-11. Welding of Compressor Tubes
   4-12. Cooling Of Compressor
   4-13. Vacuum Operations
   4-14. Refrigerant Charge
   4-15. Refrigerant Leaks Control
   4-16. Electric Supply
   4-17. Compressor Checking Procedures
   4-18. Disclaimer of Liability

5. How to Return Supplied Compressor to LGEIL
   5-1. Conditions
   5-2. Return of Rejected Products
   5-3. Test on the Customer Applications

The technical information about LGEIL compressor is as follows:

LGEIL compressor catalogue consist information about the refrigerants, the models in production and development, application range.

1-1. Catalogue Contents

- Information about product
- Compressor Barcode Nomenclature
- Standard performance and efficiency of R134a in ASHRAE test condition
- Basic dimensions on compressor drawing
- Mounting accessories for compressor
- Electrical components of compressor, explanatory drawings and wiring diagram
- Packing method and container storage
- Caution about compressor installation and application guide

1-2. Compressor Application Guide

Application guide of LGEIL compressor provides technical data for quick selection. LGEIL has identified applicable refrigerant in series and application guide of compressor.

1-3. Specification sheet

Specification sheet provides compressor models and their technical data.

- Information about supplied parts of compressor model
- The explanation about electrical components of compressor
- Standard performance and efficiency of R134a in ASHRAE test condition, motor type and character, the character of electrical components and wiring diagram
- Basic dimension on compressor drawing
- Mounting accessories for fixing compressor


Handbook has been identified by LGEIL, providing the detailed technical information about applicable refrigerant and compressor, LGEIL provides Compressor selection table for correctly selecting compressor.
2. Basic Classification of LGEIL Compressor

2-1. Compressor Ranges

Table-1 Shows the applicable refrigerant and its application (LBP, HBP) in series of LGEIL compressor.

Table-1. Compressor Series - Application - Refrigerant

<table>
<thead>
<tr>
<th>SEREIS</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LBP</td>
</tr>
<tr>
<td>MA</td>
<td>R134a</td>
</tr>
<tr>
<td>MC</td>
<td>R134a</td>
</tr>
<tr>
<td>MQ</td>
<td>R134a / R600a</td>
</tr>
</tbody>
</table>

2-2. Application

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBP</td>
<td>Low Back Pressure</td>
</tr>
<tr>
<td></td>
<td>Evaporating temperature range of LBP model is from -30°C to -5°C</td>
</tr>
<tr>
<td></td>
<td>Suitable applications: REFRIGERATOR, FREEZER, WATER-DISPENCER and similar application</td>
</tr>
<tr>
<td>HBP</td>
<td>High Back Pressure</td>
</tr>
<tr>
<td></td>
<td>Evaporating temperature range of HBP model is from -5°C to 15°C</td>
</tr>
<tr>
<td></td>
<td>Suitable applications: DEHUMIDIFIER, SHOWCASE, VENDING-MACHINE and similar application</td>
</tr>
</tbody>
</table>

2-3. Starting Torque Classification

Table-2 Shows motor starting torque type in LGEIL compressor.

Table-2. Motor Starting Torque Classification

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LST</td>
<td>Low Starting Torque</td>
</tr>
<tr>
<td></td>
<td>For RSIR / RSCR motor in LBP / HBP model</td>
</tr>
<tr>
<td></td>
<td>Suitable for capillary application</td>
</tr>
<tr>
<td>HST</td>
<td>High Starting Torque</td>
</tr>
<tr>
<td></td>
<td>For CSIR / CSCR motor in LBP / HBP model</td>
</tr>
<tr>
<td></td>
<td>Suitable for expansion valve application</td>
</tr>
</tbody>
</table>
2-4. Motor Types

Table-3 shows the compressor motor types produced by LGEIL.

Table-3. Electrical motor types

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| RSIR  | Resistance Start - Inductive Run  
This motor type, used in the compressor of small power, has a low starting torque (LST) and must be applied only to capillary tube systems where the pressures equalize. The motor is characterized by a start winding with high ohmic resistance and must be disconnected when it reaches the stabilized rotational speed. An electromagnetic relay, calibrated for the motor current, disconnects the start winding at the end of the start up. An alternative to the electromagnetic relay is, for some models, a PTC solid state-starting device. |
| RSCR  | Similar to RSIR motor version but uses a PTC solid state starting device and a permanent connected run capacitor to improve its efficiency. |
| CSIR  | Capacitive Start - Inductive Run  
Similar to RSIR motor, but with a different start winding in series with a start capacitor of suitable capacitance to get a high starting torque. |
| CSR   | Capacitive Start & Run  
CSR version with capacitive run and start windings. Same as PSC motor but with a start capacitor in series with the start winding. A potential starting relay, calibrated for each motor, disconnects the start capacitor at the end of the start. The motor is characterized by a high starting torque (HST) and high efficiency. |

2-5. Voltages & Frequencies

Table-4 shows the applicable voltage, frequencies and the lowest secure voltage, the code is attached.

Table-4. Voltages and Frequencies

<table>
<thead>
<tr>
<th>CODE</th>
<th>RATED VOLTAGE and FREQUENCY</th>
<th>WORKING VOLTAGE RANGE @50Hz</th>
<th>WORKING VOLTAGE RANGE @60Hz</th>
<th>MINIMUM START VOLTAGE @50Hz</th>
<th>MINIMUM START VOLTAGE @60Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100V 50/60Hz</td>
<td>90V to 110V</td>
<td>90V to 110V</td>
<td>85V</td>
<td>85V</td>
</tr>
<tr>
<td>B</td>
<td>220V 50/60Hz</td>
<td>198V to 242V</td>
<td>200V to 242V</td>
<td>187V</td>
<td>187V</td>
</tr>
<tr>
<td>C</td>
<td>115V 60Hz</td>
<td>103V to 127V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>220V 60Hz</td>
<td>200V to 242V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>220-240V 50Hz</td>
<td>198V to 254V</td>
<td></td>
<td></td>
<td>187V</td>
</tr>
<tr>
<td>F</td>
<td>127V 60Hz</td>
<td>114V to 140V</td>
<td></td>
<td></td>
<td>108V</td>
</tr>
<tr>
<td>J</td>
<td>220V 50Hz</td>
<td>198V to 242V</td>
<td></td>
<td></td>
<td>187V</td>
</tr>
<tr>
<td>K</td>
<td>110V 60Hz</td>
<td>99V to 121V</td>
<td></td>
<td></td>
<td>94V</td>
</tr>
<tr>
<td>P</td>
<td>110V 50Hz</td>
<td>99V to 121V</td>
<td></td>
<td></td>
<td>94V</td>
</tr>
<tr>
<td>Q</td>
<td>110-115V 60Hz</td>
<td>99V to 127V</td>
<td></td>
<td></td>
<td>94V</td>
</tr>
<tr>
<td>S</td>
<td>200-220V 50Hz, 220V 60Hz</td>
<td>180V to 234V</td>
<td>200V to 242V</td>
<td>170V</td>
<td>187V</td>
</tr>
<tr>
<td>T</td>
<td>220-240V 50Hz, 220V 60Hz</td>
<td>198V to 254V</td>
<td>200V to 242V</td>
<td>187V</td>
<td>187V</td>
</tr>
<tr>
<td>U</td>
<td>115-127V 60Hz</td>
<td>103V to 140V</td>
<td></td>
<td></td>
<td>98V</td>
</tr>
</tbody>
</table>
2-6. Electrical Components

TABLE-5 Shows electrical components of motor

<table>
<thead>
<tr>
<th>MOTOR TYPE</th>
<th>OVERLOAD PROTECTOR</th>
<th>STARTING DEVICE</th>
<th>CAPACITORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PTC STARTER</td>
<td>CURRENT REALYS</td>
</tr>
<tr>
<td>RSIR</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>RSCR</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>CSIR</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>CSCR</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

2-7. Cooling Types

Table-6 Shows cooling types available / applied.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>Static Cooling. Compressor cooling achieved by itself (natural convection), in ambient conditions.</td>
</tr>
<tr>
<td>FC</td>
<td>Fan Cooling. Specified cooling through fan is to be provided, As per requirement of the appliance design. Overload protector should be protected from direct air flow.</td>
</tr>
<tr>
<td>OC</td>
<td>Oil cooler. Intended for use with an oil cooler. The oil is cooled by the refrigerant and then returns to the compressor.</td>
</tr>
</tbody>
</table>

Discharge refrigerant circulates through lubricant in the bottom, in the circulating pipe.
## Chapter 2
Basic Composition Of LGEIL Compressor

### 2-8. Compressor Nameplates Identification

![Compressor Nameplate]

#### Model Name

<table>
<thead>
<tr>
<th>Series name</th>
<th>Motor type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS</td>
<td>G : RSIR, PTC</td>
</tr>
<tr>
<td>NS</td>
<td>F : CSIR, PTC</td>
</tr>
<tr>
<td>NSA</td>
<td>M : RSCR, PTC</td>
</tr>
<tr>
<td>NSB</td>
<td>H : CSR, PTC</td>
</tr>
<tr>
<td>ND</td>
<td>P : CSIR, RELAY</td>
</tr>
<tr>
<td>NDA</td>
<td></td>
</tr>
<tr>
<td>NR</td>
<td></td>
</tr>
<tr>
<td>LX</td>
<td></td>
</tr>
<tr>
<td>LA</td>
<td></td>
</tr>
<tr>
<td>LC</td>
<td></td>
</tr>
<tr>
<td>MA</td>
<td></td>
</tr>
<tr>
<td>MB</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td></td>
</tr>
</tbody>
</table>

#### Displacement

- ex) 62 = 6.2cc/rev.

#### Application category

- R12, LBP
- R134a, LBP
- R600a, LBP

#### Improvement order

- A
- B
- C
- D

#### Rated voltage & Frequency

- A : 110V~50/60Hz
- K : 110V~60Hz
- B : 220V~50/60Hz
- P : 110V~50Hz
- C : 115V~60Hz
- Q : 110-115V~60Hz
- D : 220V~60Hz
- S : 200-220V~50Hz
- E : 220-240V~50Hz
- 200V~60Hz
- F : 127V~60Hz
- 220-240V~50Hz
- J : 220V~50Hz
- 220V~60Hz
- U : 115-127V~60Hz

#### Serial number

- 69 LAEG 9 11 007201 EJ

#### Locked rotor ampere or Input power

- 110V~50Hz

#### Refrigerant designation

- R134a

#### Safety approval
Chapter 2
Basic Composition Of LGEIL Compressor

2-9. Wiring Diagram

RSIR-TYPE A COVER

RSCR-TYPE A COVER

CSIR-TYPE A COVER

CSR-TYPE A COVER
C → Winding common terminal point

S → Start winding terminal point

M → Main running winding terminal point
3. Supply Condition

3-1. Electrical Safety

LGEIL compressor fulfills the following international standard, and assure the isolation of electrical components.

- 220~240V 50Hz, 220V 50Hz: IEC 335-1, 335-2-34
  VDE 0700 Tell 1, Tell 34
  EN EN 60335-1, 60335-2-34

The aforesaid voltage and frequencies accepted by the international standard is not suitable to all LGEIL compressor model. LGIL (Marketing, R&D Center) will answer any question.

3-2. Electrical Parts Safety

Electrical components of LGEIL Compressor should be identified to fulfill the following international standard.

- OLP: EN 60730-1, 60730-2-4
  UL 2111
- PTC: EN60730-1, 60730-2-10
  UL1434
- Capacitor: UL 810
  IEC 252

3-3. Hydrostatic Strength Of Compressor Shell

Hydrostatic strength test of LGEIL compressor should fulfill the following international standard.

- 220~240V 50Hz, 220V 50Hz: IEC 335-2-34
  EN 60335-2-34

3-4. Residual Humidity

Table 7 shows the admitted maximum level of residual humidity of LGEIL compressor, maximum level of residual humidity is maximum level of humidity residual of one.

Table 7. Maximum Level Of Residual Humidity

<table>
<thead>
<tr>
<th>SERIES</th>
<th>REFRIGERANTS</th>
<th>RESIDUAL MOSITURE MAXIMUM AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA, MC</td>
<td>R134a</td>
<td>100mg</td>
</tr>
</tbody>
</table>
Chapter 3
Supply Condition

3-5. Oil Charge

When Compressor Oil has been Charged, there is a “IN” Mark on the top of COMPRESSOR Shell.

There are two kinds of charging oil supplied to customer, one is Japan Energy oil, one is ICI oil and HTS oil. They are suitable to every model. It is needed to identify this when the treaty of Spec is supplied.

Table-8. Lubricant Oils Used In The Compressors

<table>
<thead>
<tr>
<th>SERIES</th>
<th>REFRIGERANT</th>
<th>APPLICATION</th>
<th>MANUFACTURER</th>
<th>TYPE</th>
<th>OIL NAME</th>
<th>CHARGE AMOUNT (CC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA</td>
<td>R134a</td>
<td>LBP/HBP</td>
<td>JAPAN ENERGY</td>
<td>POLYOIL ESTER</td>
<td>RL 22H</td>
<td>220</td>
</tr>
<tr>
<td>MC</td>
<td>R134a</td>
<td>LBP</td>
<td>JAPAN ENERGY</td>
<td>POLYOIL ESTER</td>
<td>RL10H</td>
<td>220</td>
</tr>
<tr>
<td>MQ</td>
<td>R134a</td>
<td>LBP</td>
<td>HTS</td>
<td>MINIRAL</td>
<td>RL10H</td>
<td>220</td>
</tr>
</tbody>
</table>

NOTE: * User should not replace or add/remove oil from compressor shipped by LGEIL
3-7. Acceptable Compressor Transportation and Lay-down Position

It should be noticed that compressors should be transported and lay down at acceptable transportation and lay-down position.

<table>
<thead>
<tr>
<th>COMPRESSOR SERIES</th>
<th>POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA / MC / MQ</td>
<td>Bottom Surface of Trailer</td>
</tr>
</tbody>
</table>

3-8. Inner Pressure Of Compressor

The nitrogen gas of 0.3~0.6Kg/cm² is enveloped in the R134a compressor, and the supplied compressor should be sealed.

3-9. Painting

Painting should withstand 72 hours of salt spray test.
3-10. COMPRESSOR Packing : PAD Material Type

There are two kinds of LGEIL compressor packing. And LGEIL will collect HDPE (High Density Polyethylene) in plastic packing to reuse it.

**Wooden Packing**

3-11. COMPRESSOR Packing : Cover Type

There are three kinds of LGEIL compressor packing covers. And LGEIL will collect HDPE (High Density Polyethylene) in plastic packing to reuse it.

**Long Cover**
3-12. Compressor Packing Label

The following Label is printed on LGEIL compressor packing cover.

**TYPE “A”**

<table>
<thead>
<tr>
<th>CUSTOMER</th>
<th>MODEL</th>
<th>VOLTAGE &amp; FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CARTON</th>
<th>QTY.</th>
<th>SUFFIX</th>
<th>MFG. DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Label is attached on the packing cover/ box of accessory parts.

Accessory Parts Label

<table>
<thead>
<tr>
<th>PART</th>
<th>PART No.</th>
<th>QUANTITY</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LG Electronics
3-13. Compressor Packing Storage

The maximum stacking of LGEIL compressor packing is two pallets (90 no. compressors per pallet). When the stacking exceeds three pallets, the damage will happen. Hence three pallet stacking is prohibited.

**Wooden Packing**

3-14. Compressor Samples Packing

LGEIL compressor sample should be packed in retail packing box and be supplied to customer. There are two kinds of retail packing box, one can contains one sample, one can contain two samples.

**Single Packing Box**

 Fix Upper

 Fix Lower

 Retail Packing Box

**Double packing Box**
3-15. Packing Quantity in 20” Container

According to the control standard of the weight in transport legislation in different countries, packing quantity in 20” container is divisively supplied.

<table>
<thead>
<tr>
<th>Model</th>
<th>Array (WxDxH)</th>
<th>Carton</th>
<th>Container (below 15.3Ton)</th>
<th>Container (below 17.5Ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W (mm)</td>
<td>D (mm)</td>
<td>H (mm)</td>
<td>Qty</td>
</tr>
<tr>
<td>MA 22/45/53</td>
<td>3X6X5</td>
<td>1,100</td>
<td>800</td>
<td>1,081</td>
</tr>
<tr>
<td>MA53/57</td>
<td>3X6X5</td>
<td>1,100</td>
<td>800</td>
<td>1,081</td>
</tr>
<tr>
<td>MA62/69/72/88</td>
<td>3X6X5</td>
<td>1,100</td>
<td>800</td>
<td>1,081</td>
</tr>
</tbody>
</table>
4. Installation of Compressor

4-1. Compressor Selection

The selection and installation of compressor should be suitable to the character of system, and the following item should be fully considered.

4-1-1. Minimum Evaporating Temperature

Depend upon the refrigeration capability of compressor, condenser temperature and evaporator temperature in the running of refrigeration system.

4-1-2. Refrigeration Capacity

For determination of refrigeration capability of compressor, evaporator temperature and condenser temperature should be suitably selected in the standard condition of the running of refrigeration system. The refrigeration capability is related to compressor displacement, RPM and efficiency.

4-1-3. Refrigeration Type

When refrigerant is to be selected, it is necessary to consider the index of market, environment, and economy. And it should be decided in the potential range.

4-1-4. Ambient Temperature

Determine ambient temperature in which compressor is required to run (for example 32°C or 43°C). This should be identified.

4-1-5. Electrical Motor Starting Torque

Motor Torque selection is starting type selection. There are two types, one is LST, one is HST (refer to section 2.3). Capillary tube is used to balance the pressure of LST compressor. Expansion valve is used to balance the pressure of HST compressor.

4-1-6. Cooling Type

Static cooling is applied in small compressor with low torque motor. Compulsory cooling is needed in compressor with high torque motor. In oil cooling type compressor, cooling pipe is provided.

4-1-7. Noise Level

System noise of product should be considered. The noise of product is related to compressor and refrigeration system. Noise of product with the selected compressor should be tested.

4-1-8. Maximum Current

Product wiring should withstand Lock Rotor Ampere when pump locking happens.
4-3. Preparation of Refrigerating System Components

All system components of compressor should be cleaned without humidity and liquid. The operation of liquid should abide by rule to make compressor correctly run.

Polyester oil used by R134a compressor should be strictly ruled. The humidity in product should be minimum. LGEIL endeavors to assure polyester Oil in production and confidence. When it contains Chlorine, it can not be used in product.

Refrigerating system components are as follows tubes, condensers, evaporators, oil separators, liquid receivers, valves, capillary tube.

All components of LGEIL compressor should be kept sealed before their installation. The installation time should not exceed 15 minutes.

Oil should be prevented in welding operation, components should be blown in dry Air. In addition, R600a and R12 are not suitable to system of R134a, same is R134a.

At upright position, compressor tube cap should be removed as the sequence of discharge tube, suction tube, process (service) tube. The inner pressure of compressor will make oil let out, residual oil make tube welding difficult. The inner oil of tube also make tube welding difficult, and make system contaminated.

The compressor damage will happen when new refrigerant or new oil (other than specified) is used, LGEIL will not be responsible for such damage/failure.

If residual humidity exceeds the ruled specified amount, system will not run properly run. Residual humidity is humidity that is not fully absorbed by molecular sieve in the running system.
4-4. R134a Guide Line

1-1. Refrigerant

R (or HFC) 134a (CF₃CH₂F) is exclusively used as the refrigerant of which the purity shall be more than 99.95%.

1-2. Evaporator temperature and pressure.

Temperature of evaporator must be in the range between -30℃ (-22°F) and -5℃ (23°F). In case that evaporator temperature goes down much lower than -30℃ (-22°F), motor is overheated and the temperature of discharge gas and lubricating oil increases, finally the life of compressor can be possibly affected. If evaporator temperature is higher than -5℃ (23°F), discharge pressure increases, so compressor is under overload, which accelerates wears of the compressor components and eventually shortens the life of compressor.

< Relationship between temperature and pressure >

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30 ℃ (-22 °F)</td>
<td>-0.17 kg/cm² ( -2.39 psig)</td>
</tr>
<tr>
<td>-25 ℃ (-13 °F)</td>
<td>0.06 kg/cm² ( 0.81 psig)</td>
</tr>
<tr>
<td>-20 ℃ (-4 °F)</td>
<td>0.33 kg/cm² ( 4.62 psig)</td>
</tr>
<tr>
<td>-15 ℃ ( 5 °F)</td>
<td>0.64 kg/cm² ( 9.15 psig)</td>
</tr>
<tr>
<td>-10 ℃ (14 °F)</td>
<td>1.02 kg/cm² (14.47 psig)</td>
</tr>
<tr>
<td>- 5 ℃ (23 °F)</td>
<td>1.45 kg/cm² (20.67 psig)</td>
</tr>
</tbody>
</table>

1-3. Condensing Temperature and Pressure.

Temperature and pressure of condenser in continuous operation mode at the ambient temperature of 43℃ (110°F) should not exceed 55℃ (131°F) and 14.2 kg/cm² (202 psig), and also instant peak load should not exceed 65℃ (149°F) and 18.2 kg/cm² (259 psig) during the pull down period.

This is because shortage of compressor life possibly occurs and electricity consumption increases, if condenser temperature exceed 55℃ (131°F). In case that condenser temperature exceed 55℃ (131°F) on the design base of refrigeration system, the decline of life and the increase of electricity consumption can be prevented by applying an appropriate oil cooling or fan cooling device to the system.


Winding temperature of motor at the ambient temperature of 43℃ (110°F) must be lower than 120℃ (240°F). If exceeds this temperature, motor is overloaded, which causes shortage of motor life. Winding temperature of motor is calculated using the winding resistance as is shown in the equation below. After compressor is stopped, resistances of main winding and supplementary winding should be measured as soon as possible, which results in exact winding temperatures of motor.

* Winding temperature calculation equation.

\[ T_2 = \left( \frac{R_2}{R_1} \right) (234.5 + T_1) - 234.5 \]

- \( T_2 \) = the winding temperature at the end of test
- \( T_1 \) = the room temperature at the beginning of the test
- \( R_2 \) = the resistance at the end of the test
- \( R_1 \) = the resistance at the beginning of the test
Chapter 4

COMPRESSOR SETTING

1-5. Discharge Gas Temperature.

Discharge gas temperature at the ambient temperature of 43°C (110°F) should be such that the temperature of discharge tube about 50mm (2 inches) apart from compressor surface should be kept lower than 120°C (248°F).

Discharge gas temperature is kept as low as possible to prevent thermal degradation of oil and preserve compressor life in long term. If it exceeds 110°C (230°F), harmful sludge is accumulated on the periphery of the valves.

1-6. Compressor Shell Temperature.

Compressor shell temperature, if winding temperature of motor and discharge gas temperature are kept in the range allowed, is free from regulation.

When shell temperature of compressor is required, the temperature of top position of compressor is measured.

1-7. Suction Gas Temperature.

Suction gas temperature should be such that the temperature at periphery of suction tube about 150mm (6 inches) apart from compressor surface be maintained at the similar range of super-heating with the ambient temperature. Especially, winding temperature of motor and discharge gas temperature are kept within the temperature range allowed.

2. Compatibility of Compressor with Refrigeration System.

2-1. Supply Voltage.

Electric circuit is made such that supplying voltage to refrigeration system matches the value listed on the name plate of the compressor under working, and supplying voltage should be kept more than 90% of the listed value at start-up and also during operation.

If there is some problem in keeping the supplying voltage more than 90% of the listed value, the alternative design can be negotiated between customer and LG.

2-2. Electric Components of Compressor.

Electric components such as OLP, PTC, Capacitor of compressor should be selected inevitably according to the specification provided to the corresponding compressor.

2-2. ON-OFF Cycle of the Refrigeration System.

When compressor equipped in refrigeration system is under ON/OFF cycle so that operation and stop are controlled by control apparatus such as thermostat, compressor OFF period per cycle should last more than 5 minutes at least, and design that cycle period can be possibly maximized.

2-3. The amount of Refrigerant Charge.

The amount of refrigerant charge is recommended minimal as the proper amount, and when refrigerant amount exceeds or lacks compared to the proper amount range, which results in loss of cooling capacity, compressor inefficiency and also damage to compressor life, it is strongly recommended to charge refrigerant with the proper amount.

2-4. The amount of Oil Charge.

In case of no extra negotiation, compressor is supplied to customers with oil charge with the proper amount.

3-1. Materials compatible to R134a should be used in refrigeration system.

3-2. Equipments for refrigerant charging and vacuuming exclusively designed for R134a application should be needed.

In order not to mix-up other refrigerants such as R12 with R134a, charging equipment exclusively designed for R134a application must be prepared separately. When vacuuming the whole cycle system, for air or other hazardous gases not to contaminate the cycle, evacuate it sufficiently using the high efficient vacuum pump and manage to keep the final vacuum level less than 0.5 Torr.

3-3. Leakage test equipment exclusively designed for R134a application should be prepared separately.

3-4. Cleanness of the each components of refrigeration system be kept higher than the cleanness level of R12 system. (It is recommended the total allowable dirt shall be kept less than 50% of that of R12 system.)

3-5. Maximum water content in refrigeration system must not exceed 150 mg. As molecular sieve, drier exclusively used to R134a such as XH-7 or XH-9 be prepared separately. Excessive water content generates acid or sludge in the system that can cause blockage in capillary tube. The weight of molecular sieve when R134a is used is 10~15% more than that R12 is used in the same cooling system. The filter dryer must be protected by suitable method to keep from absorbing water in the process of welding. The filter without cap could never be used and must be kept in the box to keep away from water before welding. The molecular sieve will absorb water not absolutely when low-absorbing ability dryer is used, the water will cycle inside the system as a result, these will be phenomena given below:

<table>
<thead>
<tr>
<th>ICE BUILD UP</th>
<th>Any breakage in capillary tube or expansion valve will interrupt the cooling ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACID BUILD UP</td>
<td>Fatal defect will occur with the molecular sieve of the filter for compressor the valve plate, valve, crankshaft and bearing will be damaged due to corrosion. the motor winding will be corroded together with the other parts. Molecular sieve for filter will break up in to dirt.</td>
</tr>
<tr>
<td>OIL CONTAMINATION</td>
<td>Any acid in oil will reduce the luster of all parts which sometimes is fatal, and it will also reduce the activity of the compressor</td>
</tr>
</tbody>
</table>

3-6. When compressor is attached to refrigeration system, give attention to the following notices.

1) Nitrogen is charged and sealed before compressor is shipped. A compressor should be handled carefully not to be unplugged or damage sealing caps during transportation or in warehouse.

2) Compressor with rubber cap removed must not be left in the air more than 5 minutes and be attached to the cycle as soon as possible.

3) Purchased compressor with oil charged and sealed be used within 6 months from the production date shown on the name plate.

4) During deposition or transportation, keep compressors in upright position and be cautious not to drop it.

5) When compressor is attached to cycle, clean and ventilate the vicinity so that pollutants such as dust, steel tip or flux are not included. If pollutants exist inside compressor, excessive wear on compressor bearing, damage to the valves, and blockage in refrigeration system can be occurred, be cautious for pollutant not to penetrate through the compressor tube.

6) Since the paint of compressor is made of epoxy polyamide resin, when the paint peels off, by accident repaint it using the similar one.

4-6. Capillary Tubes

Which kind of capillary tube is used for LGEIL electronic compressor is fully determined by the result of the experiments.
4-7. Application of Rubber Grommets

Suitable Mounting Accessories (provided with compressor) should be used for mounting.

VIBRATION AND ITS TRANSFER

The vibration of the compressor will be more intense at the time of start and stop comparing to when it is running normally. It is needed to find proper components to support the comp, such as rubber grommet, sleeve, bolts, plain washers and nut etc.

The rubber grommet and washer should fit for the sleeve and nut, which is very important in damping the vibration of the base plate.

4-8. Mounting Accessory Type

There are four types of mounting accessory suiting for LGEIL’s compressor.

<table>
<thead>
<tr>
<th>Type</th>
<th>Grommet</th>
<th>Sleeve Bolt</th>
</tr>
</thead>
<tbody>
<tr>
<td>4A (10) type</td>
<td><img src="image1" alt="Grommet Diagram" /></td>
<td><img src="image2" alt="Sleeve Bolt Diagram" /></td>
</tr>
<tr>
<td>5A type</td>
<td><img src="image3" alt="Grommet Diagram" /></td>
<td><img src="image4" alt="Sleeve Bolt Diagram" /></td>
</tr>
<tr>
<td>7A type</td>
<td><img src="image5" alt="Grommet Diagram" /></td>
<td><img src="image6" alt="Sleeve Bolt Diagram" /></td>
</tr>
<tr>
<td>4A snap on type</td>
<td><img src="image7" alt="Grommet Diagram" /></td>
<td><img src="image8" alt="Sleeve Bolt Diagram" /></td>
</tr>
</tbody>
</table>
4-9. Mounting Type And Pitches

There are 2 types of pitch can be selected on the basis compressor fitment in the Appliance.

**TYPE “A” (One Pitch)**

**TYPE “B” (Two Pitch)**

4-10. Terminal Protector Type

The cover of LG's compressor is installed to prevent the terminal pin damage. There are three types protector for terminal pin can be supplied.
4-11. Welding of COMPRESSOR Tubes

WELDING OF CONNECTION TUBES

During brazing of the connectors on the compressor’s copper tubes, the following instructions must be observed:

• DO NOT ALLOW the flame from the torch to reach the housing during the welding of the compressor tube in order to avoid overheating, damages to welding, and oil carbonization on the compressor’s internal walls.

• DO NOT ALLOW the flame from the torch to approach the “hermetic terminal” in order to avoid the cracking of the glass insulating material of the three pins and subsequent gas leaks. The welding of the connections on copper tubes can be done with welding material with low silver contents, or, exclusively for “copper/copper” connections. It can be advantageous to use the “phosphorous copper”.

Proper welding is characterized by a good penetration of weld material, to guarantee a good mechanical resistance, and a lack of leaks from the connection. These characteristics are obtained with the use of suitable materials and a perfectly performed welding, as well as with a correct sizing of the tubes to be coupled in order to guarantee the optimum clearance. “Tight clearance” determines a bad penetration of weld material, while “large clearance” causes penetration of weld material and de-oxidizers inside the tube and compressor.

To limit the internal contamination by the de-oxidizing flux, we suggest applying small quantities of de-oxidizer on the connection tube after connecting it to the compressor tube.

During the welding operation, avoid overheating of the connection. This reduces the formation of oxide contaminants inside of the tubes. It is suggested, during the welding operation, to blow nitrogen through the tubes.

With the use of R134a, the possibility of refrigerant gas leaks through defective welds is increased due to the smaller size of the molecule of R134a.

We also suggest taking particular care in performing the welding and leak detection, which must be carried out with equipment sensitive to the refrigerant type used.

4-12. COMPRESSOR COOLING

COMPRESSOR COOLING

Throughout the LGEIL compressor range, there are compressors with different cooling requirements:

• The static cooling (without fan cooler) compressor requires that the compressor is positioned in the application in order to be cooled directly by an air current at ambient temperature, through sufficient openings placed in the application body.

• The fan cooling compressor requires the use of a fan cooler (normally inlet type) positioned in such a way that the flow is introduced to the compressor sideways (on the longer side opposite to that where it is placed the thermal protector).

The thermal protector, if cooled by the air flow, may not trip, and may not protect the compressor properly.

We suggest to maintain a distance of 0.2 ~ 0.3 m from compressor fan blades.

4-13. Vacuum Operations

VACUUM OPERATIONS

It is fundamental to perform a proper evacuation of the refrigeration system to ensure proper running of the refrigerating machine, and to preserve the life of the compressor. A proper evacuation process assures that the air and moisture contents are below the allowed limits.

The introduction of new refrigerants require the use of new polyester oils with characteristics of high hygroscopicity which require the greatest care in system evacuation. There are various methods to evacuate a refrigeration system: one-side (low pressure side), two-side (low and high pressure sides), at different times, with phases of refrigerant pre-charge, etc. We must aim to reach a vacuum value (measured at its stabilization on both the low and high pressure sides), better than 0.14 mbar (100 µHg), and the maximum level of non-condensable must not exceed 0.3%.
4-14. Refrigerant Charge

After the vacuum operation, the system must be charged with the refrigerant type indicated on the compressor nameplate or one of the alternate allowed types, in the pre-determined quantity. For a correct charge we suggest, after carrying out the vacuum, to pump part of the refrigerant into the compressor to "break" the vacuum; then start the compressor to draw the remaining part of the charge.

In the small refrigerating systems utilizing few grams of charge, the refrigerant is usually pumped into the compressor through the service tube. In this case you must wait 5 to 10 minutes (time depending on the refrigerant quantity and on the ambient temperature), before starting the compressor. This to allow partial refrigerant evaporation and to avoid the suction of liquid refrigerant into the compressor cylinder.

Maximum Refrigerant Charge

In case the refrigerant charge should exceed the max values allowed for the compressor, take care that the circuit is equipped with liquid receiver, and, for larger systems, an oil heater in the compressor housing to avoid mixing of refrigerant in the oil, foaming with subsequent liquid suction and pumping. If it becomes necessary for a technician to recharge the system in the field, he should first remove all of the remaining original charge, and then recharge the system in accordance with the refrigerant quantity indicated on the data plate.

PLEASE NOTE: The use of the compressor outside the intended working range cannot make use of the warranty.

4-15. Refrigerant Leaks Control

A refrigeration system can work normally for the entire life of the compressor, only if attention is given to the proper installation. One of the most important aspects is the absence of refrigerant leaks.

We estimate that a 10% leak of the refrigerant charge over 15 years of running the compressor; will still allow for proper running of the refrigerating system.

With the new refrigerants (R134a and mixtures), the possibility of refrigerant leaks through improper welding increase due to the reduced molecular size of the refrigerants. This adds to the increase in the percentage of leaks, due to the reduced charge compared to traditional refrigerants. For above reasons, it is essential that accurate controls of leaks are performed on the welds with methods and equipment suitable to the applied refrigerant type.

For the leak test of R134a, use equipment designed exclusively for that refrigerant.

4-16. Electric Supply

The compressor assembled in the refrigeration system must be connected to a voltage supply within the limits indicated in Table 5 - Voltages & Frequencies on page 15. Due to voltage drops on the supply circuit, the voltage must be that measured at the compressor hermetic terminal. On the same table, indicated are the minimum starting voltages at which the compressor can start without load. In paragraph 7.1 - COMPRESSOR RUNNING LIMITS - 7.1.6 - Start conditions - are indicated, for compressor start, the limit values of suction pressure, discharge pressure and supply voltage.

The correct sizing of the cables is important to guarantee low voltage drops on running and during the phases of compressor start, and it must be determined according to the locked rotor cur-rent indicated on the "Electric Components List". A subsequent protection fuse can also be sized:
• 225% of the compressor running current plus 100% of current input of all other electric motors employed.
• For three-phase models, use remote control, so sized switches that each contactor can with-stand the current input value of compressor.

PLEASE NOTE: The electrical wiring must be performed according to the laws and regulations in the country in which the refrigeration system will operate.
4-17. COMPRESSOR Checking Procedures

4-17-1. COMPRESSOR Running Limits

The sizing of the system components must be performed in a way that the limits of the characteristics indicated below are not exceeded. During operation in the field, the system can encounter some factors worsening the working conditions, such as gas leaks, reduction of the effectiveness on the condenser due to clogging, etc. Because of these factors, it is recommend to size the system with a good margin of safety, to allow the system to operate within the prescribed limits.

4-17-2. Maximum Temperature of Electric Motor windings

120°C : temperature of the motor winding when it is running normally.
135°C : temperature of the motor winding when it is in overload

Test the temperature of the compressor after the motor being prevented for a while when the electricity is cut off, and then rest the ohm and the resistance by digital and Wheatstone.

4-17-3. Suction Gas Overheating

Maintain the suction gas temperature overheating as low as possible (min 5 °C), taking care that there is no return of liquid.

Overheating of the suction gas returned to the compressor may cause the temperature around and of the oil too high.

4-17-4. Evaporating Temp Range

Refer to application range section: 2.2

4-17-5. Start Condition

The voltage of power source should be more than 90% of the rated values.
If starting problem occur, customer can communicate with LGEIL to resolve it.

4-17-6 Cycle

- The systems must be sized for max 5 cycles / hour (average cycling).
- Compressors with PTC starting devices must be re-started after a minimum time of 5 minutes from their off cycle.
- The trip of thermal/current protection requires that the compressor re-start occurs after the necessary time for the protector to reset.
4-18. Disclaimer of Liability

All of the LGEIL's compressor is designed with good using ability.

The customer should always conform to the introduction when the specialty is changed or not, any bad result caused by wrong using should be undertook by the customer themselves.

Using wrong means:

1) The designing of all the specialty all does not coincide with the circumstance.
2) The case that the compressor is used in defiance of the the security alarm.

If you have got any doubt, please refer to the compressor technical book, and you can also enquiry LGEIL for more If it is necessary.
5. Compressor and how to return supplied products to LGEIL

5-1. Conditions

For the warranty on products supplied by LGEIL, refer to what is indicated in the sales conditions. The validity of the warranty is subject to the following conditions and to the results of the Technical Report sent to the Customer by the Sales and Marketing Department. The Customer must advise the Sales and Marketing Department about the defect found on the product and supply all useful data for a preliminary analysis.

5-2. Return of rejected products

Do analysis to the rejected product

If necessary, it can be agreed upon with the Customer that the return of defective material can be sent to LGEIL Product Quality Assurance Laboratory with detailed information on the defect, which is necessary for a rapid and accurate analysis. The Bill of Lading accompanying the material should report the following description:

1. “Return of rejected product”: defective material to be returned for analysis. In this case, depending upon the warranty conditions and the analysis results, the material can be replaced with new components.
2. “Sending for destructive tests”: for material to be submitted to destructive tests, without warranty conditions. In this case, all or some of the defective material can be returned to the customer, if required.

In case of incorrectly shipped material, the customer, with reference to the LGEIL Bill of Lading, must inform the Sales Department, who will see to correct the error. The Bill of Lading accompanying the material should report the following description:

1. “Returned material not corresponding to the order”, for the material shipped not in accordance to the order.
2. “Returned material in quantity exceeding the order”, for the material supplied in greater quantity versus the order.

The defective material sent to LGEIL by the Customer, must comply to the following conditions:

• be provided with nameplate and sealed with original plugs.
• not be emptied of the oil remaining after the disassembling from the system.
• be handled and transported in order not to suffer strong shocks, falls and possible damages.
• be equipped with electrical components, properly marked (compressor and electrical components) to allow their correct coupling.
• All materials must be properly packaged according to the type of shipment and in order not to suffer damages during transport.
• The material returned for analysis must be accompanied by a detailed description of the failure, how it happened and all useful data for a correct diagnosis of the defect.

• Do not return defective compressors as a consequence of mishandling.
• Do not return open compressors or tampered components. (To avoid erroneous diagnosis, the compressors must be opened with suitable tools, available only at LGEIL).

The material that does not correspond to the above requirements may be considered not valid for analysis and may void the warranty.

All the material that, after analysis, may appear to be working and are free of quality problems, can neither be returned nor replaced (the complete analysis involves the opening of the compressor and its disassembling).

The analyzed product, before its dismantling, remains at the customer’s disposal for a minimum period of 30 days starting from the date in the Technical Report issued by the Sales and Marketing Department.
5-3. Test on the customer applications

LGEIL puts at the customer’s disposal the “Application Tests Laboratory”, to perform the tests for verifying the running of their equipment; for defining the compressor and the main components of the refrigeration system (condenser, evaporator, capillary) and other special tests.

The customer can request from the “Technical Liaison - Sales & Marketing Department” to agree on the feasibility of the requested test, the delivery of the equipment and the terms, according to the development program of the laboratory tests.

The equipment must be sent to the “Application Tests Laboratory” with the Bill of Lading reporting the following description:

1. “For destructive tests” The equipment will not to be returned to the Customer unless agreed differently.

The test results will be given to the customer, who can use them as information or to define or modify his application.

PLEASE NOTE: THE TRANSPORT EXPENSES ARE CHARGED TO THE CUSTOMER