

# SERVICE MANUAL

## TME 34



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**Valeo**

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# PRODUCT PRESENTATION - INTRODUCTION

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## 1 -COMPRESSOR MAIN FUNCTION

The main function of the electrical compressor is to compress refrigerant in an automotive air conditioning system. The electrical power delivered by the battery is converted to a mechanical power by an inverter and an electrical motor. The mechanical power is needed to compress the refrigerant from the suction to the discharge pressure.

## 2-ROLE OF THE COMPRESSOR IN THE A/C LOOP

The compressor is the main component of the cooling/heating loop. It is a volumetric organ which converts the electrical energy supplied by the vehicle through an inverter into the motor into mechanical power. Mechanical energy itself converted into compressing power. The compressor causes circulation of refrigerant fluid by sucking low pressure and cold gas at the evaporator outlet and then discharging it through the condenser after increasing pressure and temperature.

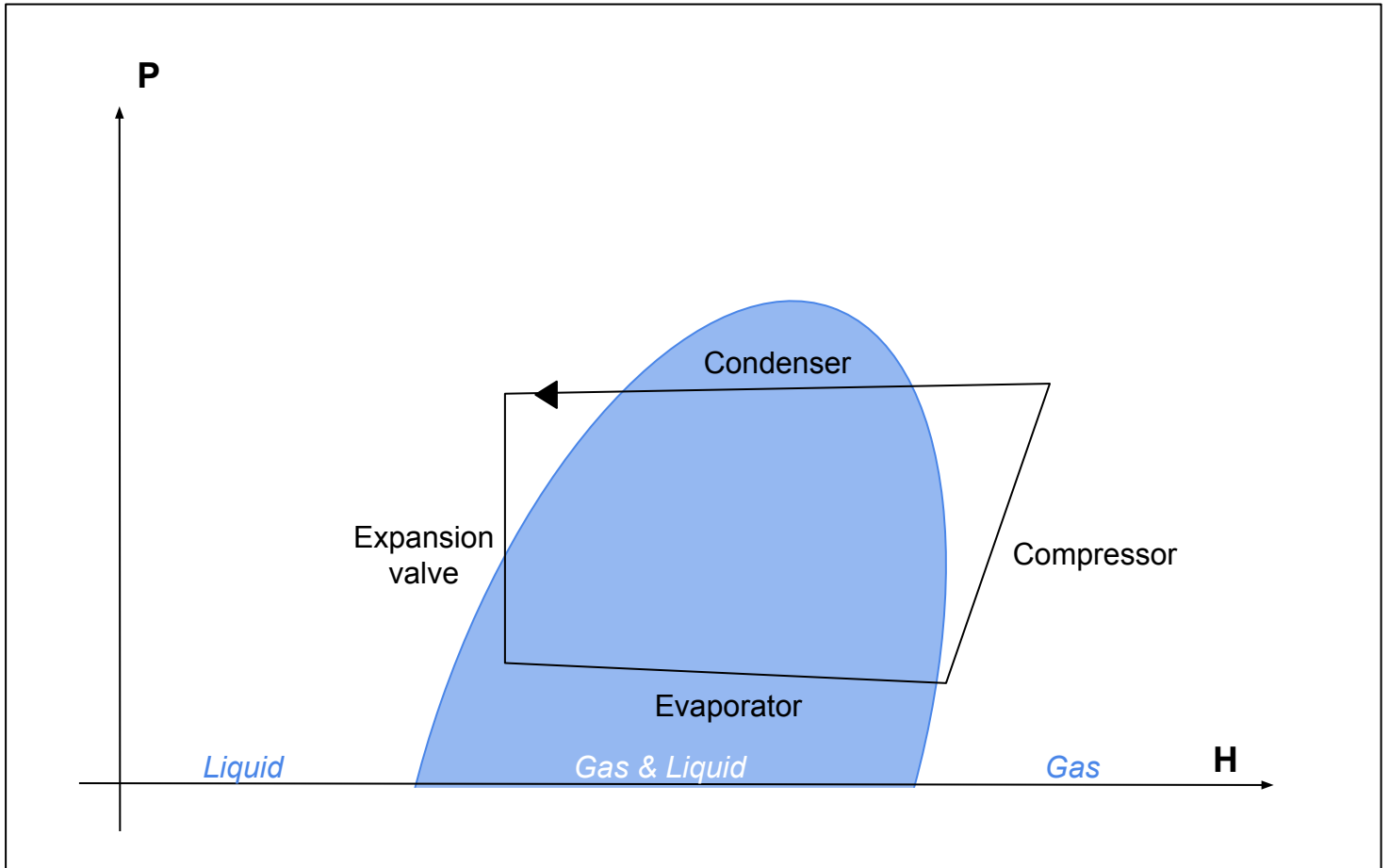
Main advantage of this technology is the adjustable rotation speed completely independent from the car speed. It is possible to adapt compressor speed to generate the heating or the cooling power needed by air conditioning system to reach the comfort level with the lowest possible power consumption.

The Figure 1 (next page) represents the operating cycle of the air conditioning mode. This cycle is common for both cooling and heating modes. Only the evaporating and the condensing pressure can be different from the cooling to the heating mode. In the heating mode the suction pressure can be close to 1 bar abs because of the low evaporating pressure linked the external temperature which can below -20 °C.

The compressor compresses the refrigerant at the suction pressure and temperature to the discharge pressure. The discharged refrigerant at a high pressure and temperature is going across the condenser to be cooled than condensed and sub cooled. The refrigerant leaves the condensing module (external condenser AC mode/ inner condenser in heating mode) to the expansion device where it's expanded to the evaporating pressure before being sent to the evaporator. The refrigerant cools the air going across the evaporator (in the HVAC in case of AC mode/in the fontal heat exchanger in heating mode) and leaves the evaporator at vapor state before being sucked again by the compressor.

# PRODUCT PRESENTATION - INTRODUCTION

Figure 1: A/C Operating Cycle



# PRODUCT PRESENTATION - GENERAL

## General Items :

COMPRESSOR TYPE	Horizontal Scroll
MOTOR TYPE	Brushless DC Motor
USAGE	Cabin / Battery Cooling & Heat Pump
SCROLL TIGHTNESS	Wear plate and top seal
DISPLACEMENT	33.5 cc
SHELL TYPE	Low pressure
SPEED	600-9000 rpm
WEIGHT	6.3 kg
SIZE	ø=123mm L=205mm
MOUNTING	VDA-L and multiple possibilities
VOLTAGE RANGE	Min 200V - Max 470V
CONTROL VOLTAGE	Min 8V - Max 16V
OPERATING TEMPERATURE	-30°C / +125°C ( Start -25°C / +105°C)
COMMUNICATION	LIN
EMC	CISPR 25 – Radiated emission Class 5 above 2MHz
REFRIGERANT	R134a / R1234yf / R404A
OIL	R134a / R1234yf : POE/PAG (VC100YF) R404A : POE (RG100EV) Standard oil amount : 150cc

## Safety Items :

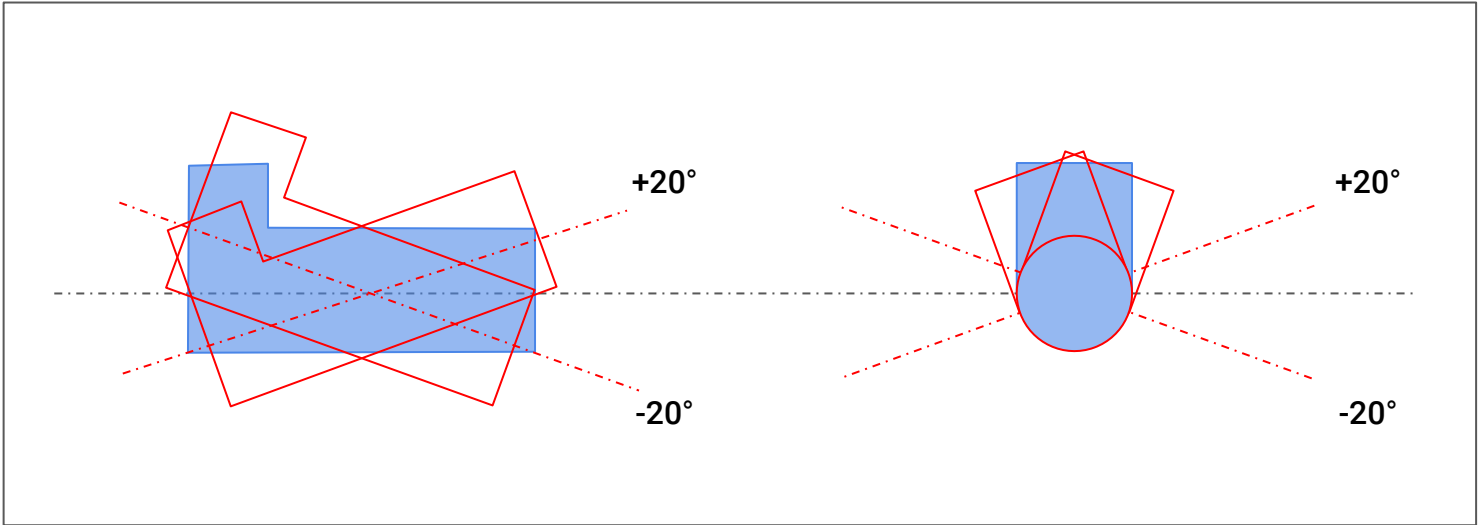
BURST PRESSURE	Discharge = 99 bar abs Suction = 45 bar abs
SAFETY VALVE PRESSURE	37 bar abs

## Others:

WORKING PRESSURE	0.11 MPaG < > 3.0 MPaG
DISCHARGE TEMPERATURE	Max = 130degC
MOUNTING ANGLE	+/- 20° Max (see illustration p6)

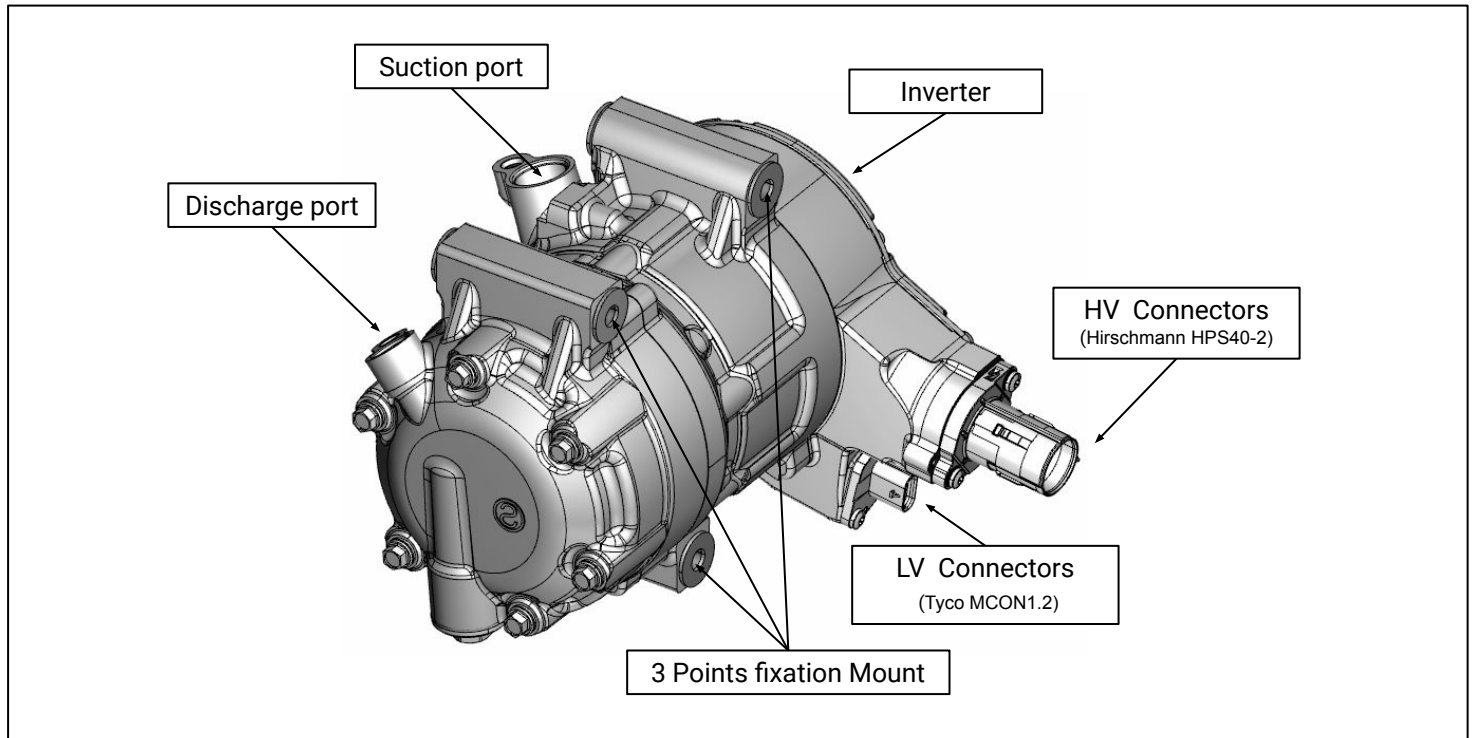
# PRODUCT PRESENTATION - GENERAL

Figure 1: Max Mounting Angles



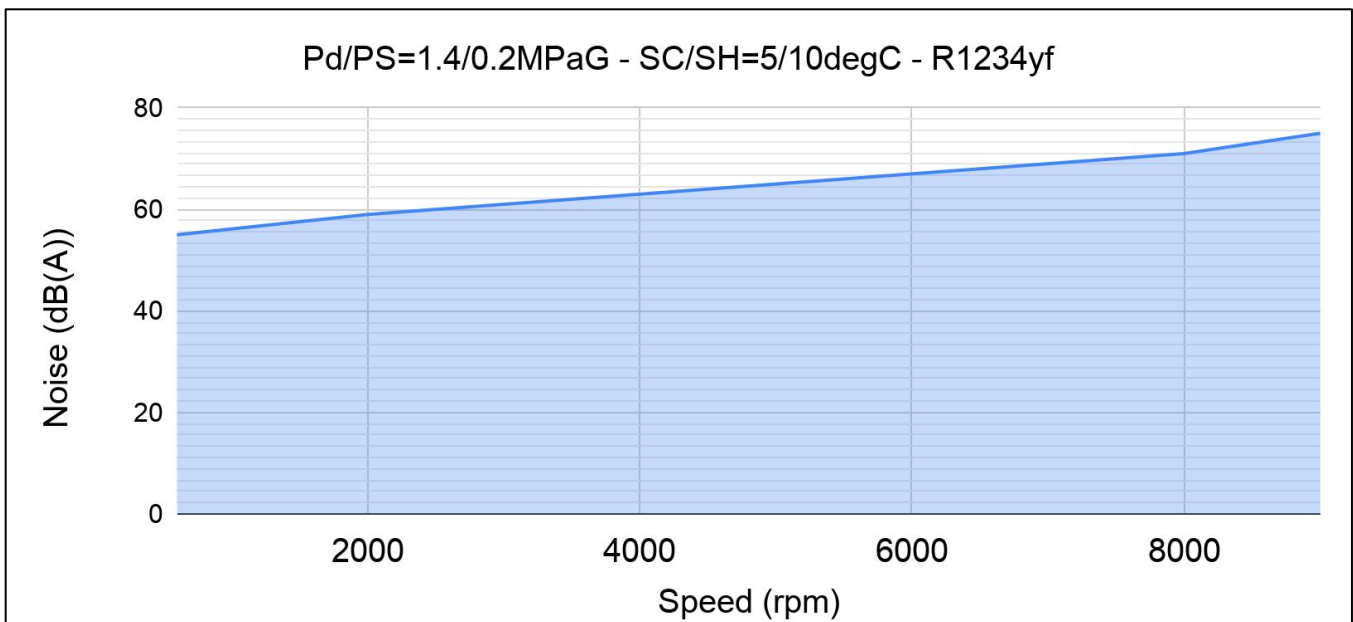
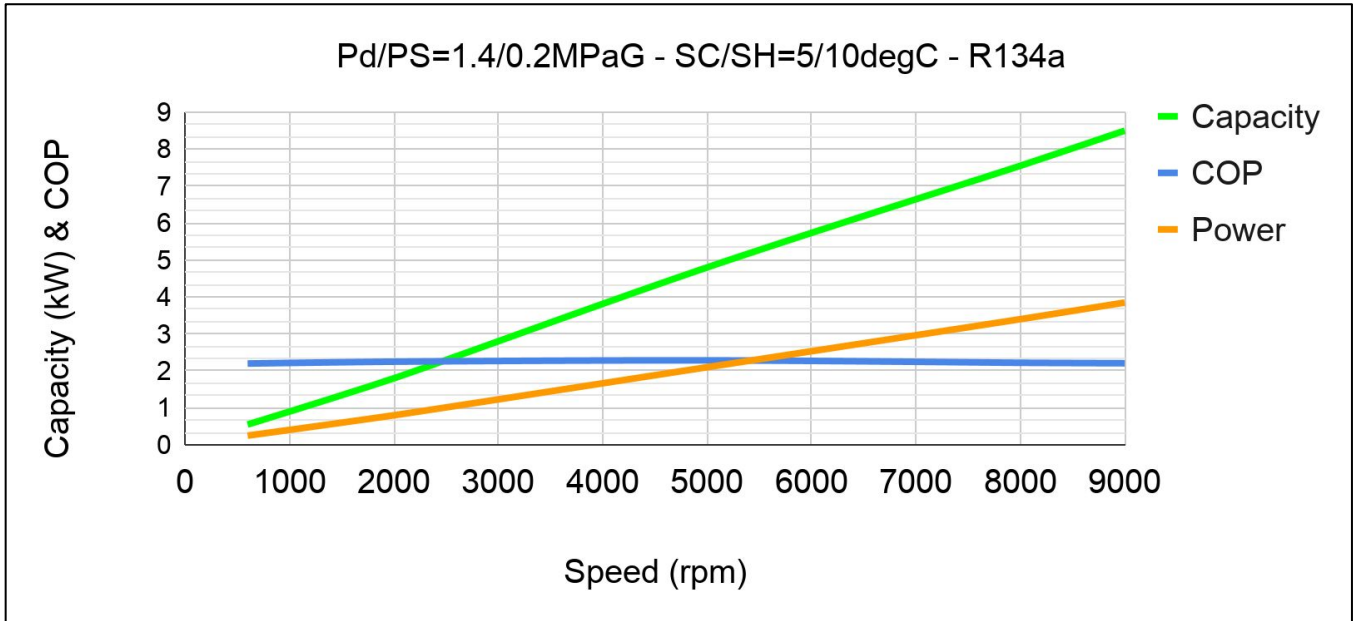
# PRODUCT DESCRIPTION - MAIN COMPONENTS

Valeo **TME 34** main components:



# PRODUCT PRESENTATION - PERFORMANCES

Valeo **TME 34** performance data graph:

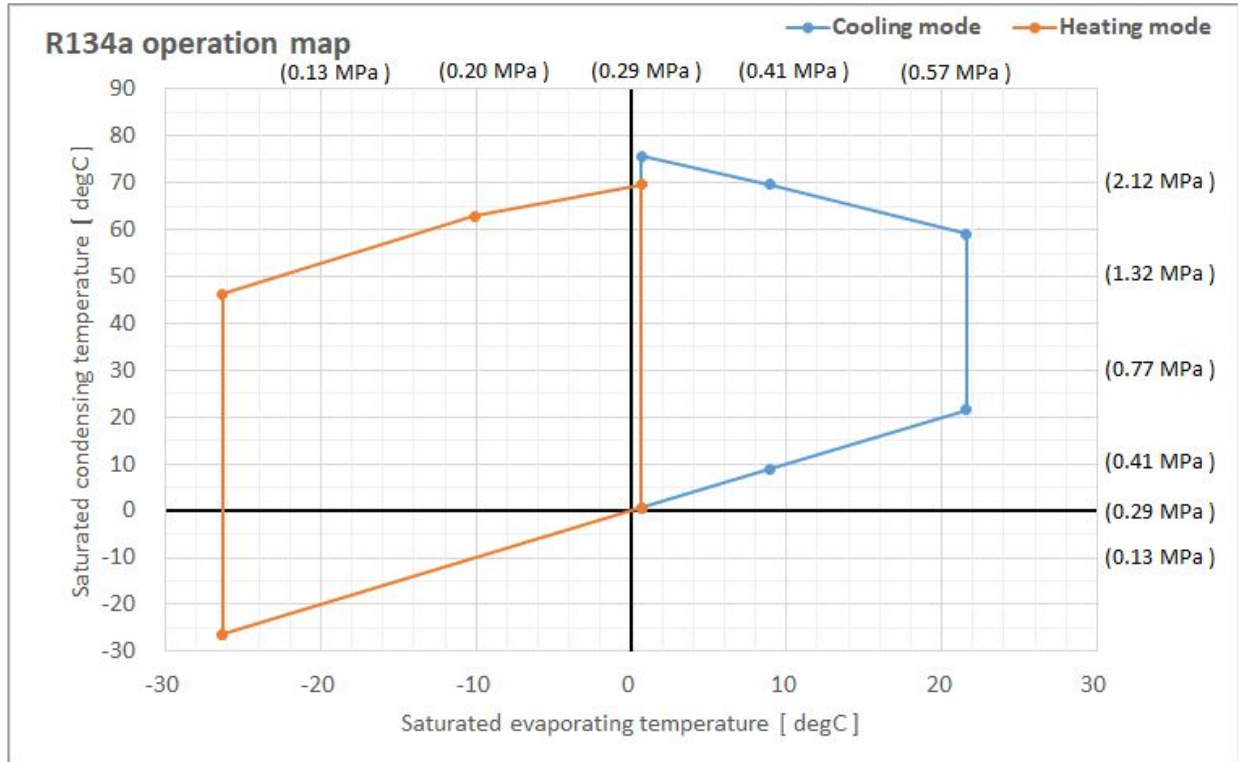




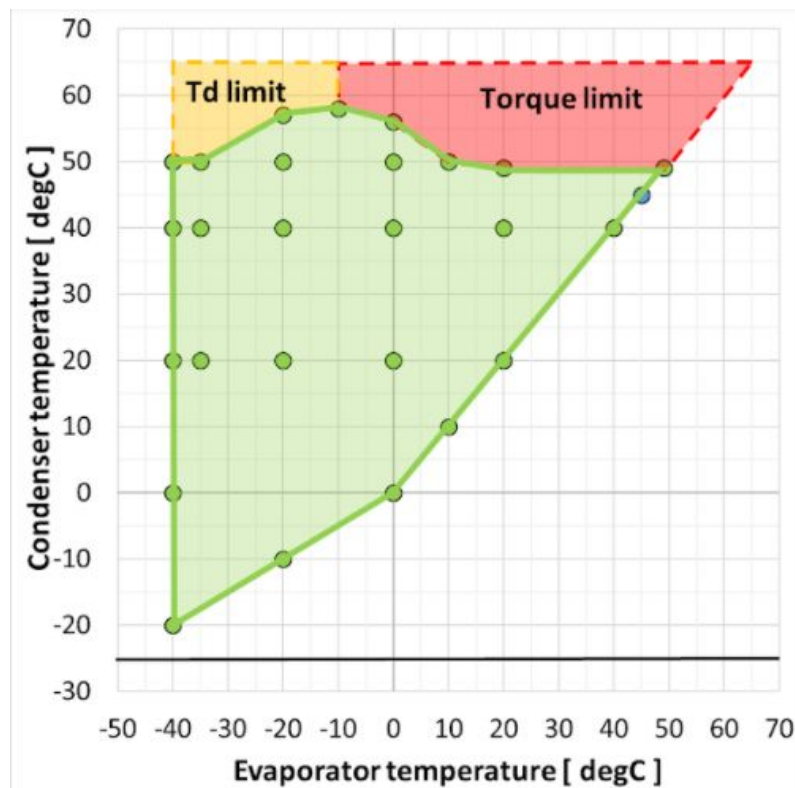
# 1 - PRODUCT DESCRIPTION - OPERATING MAPS

The Valeo **TME 34** must be operated within the green area shown on **Table 1 (R134a)** and **Table 2 (R404a)**.

**Table 1:**

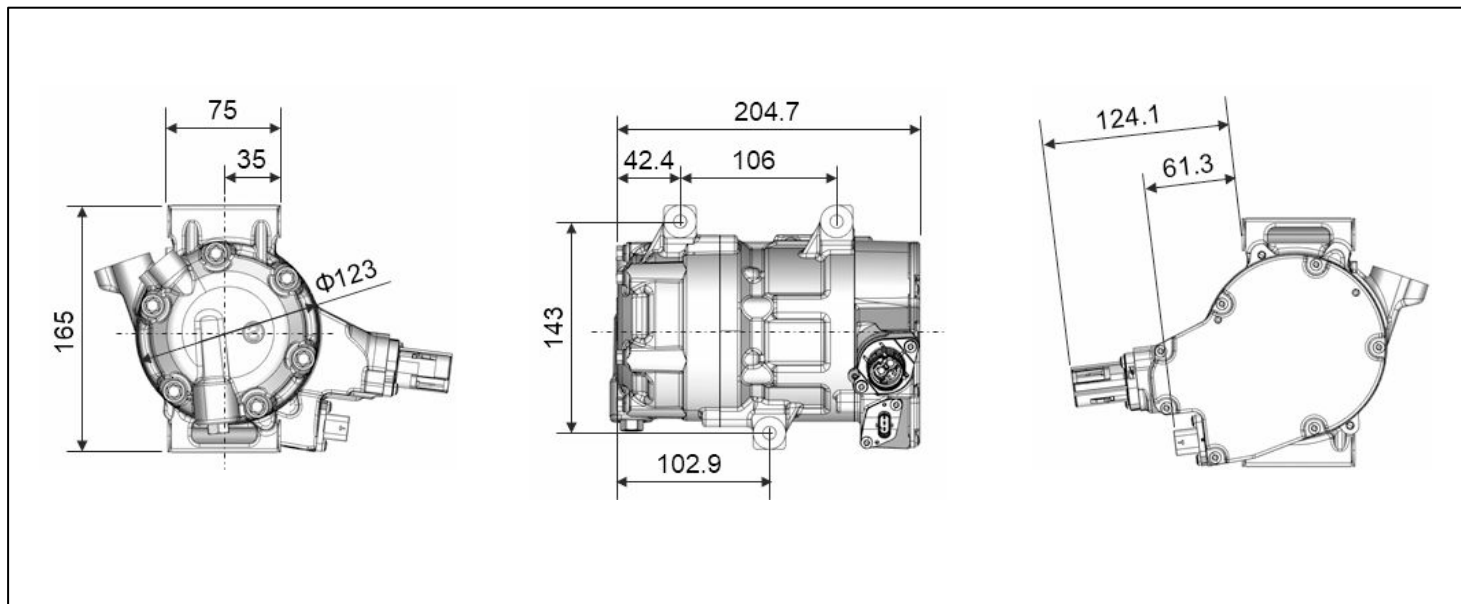


**Table 2:**



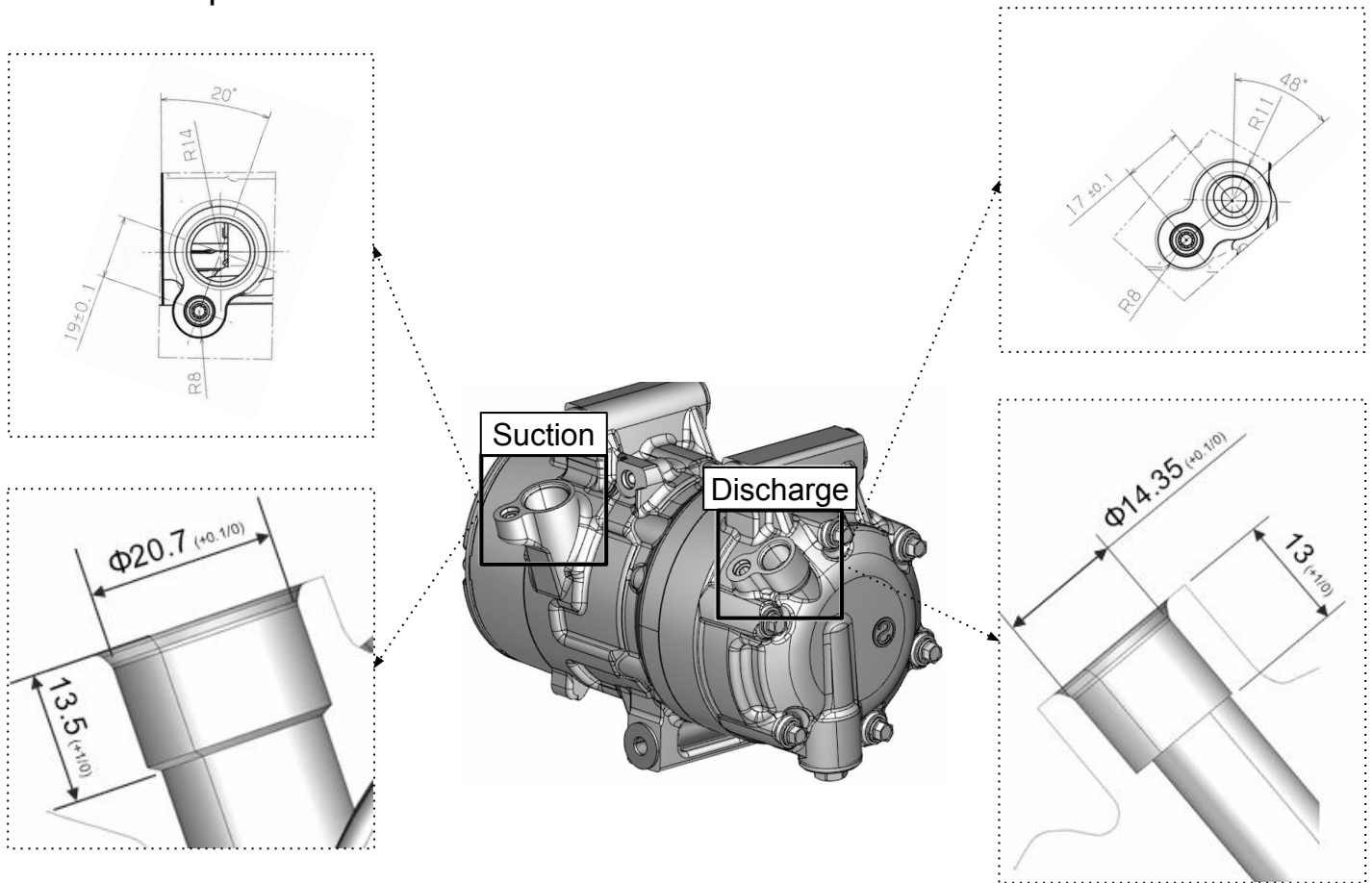
# 1 - PRODUCT DESCRIPTION - DIMENSIONS

Valeo **TME 34** general dimensions:

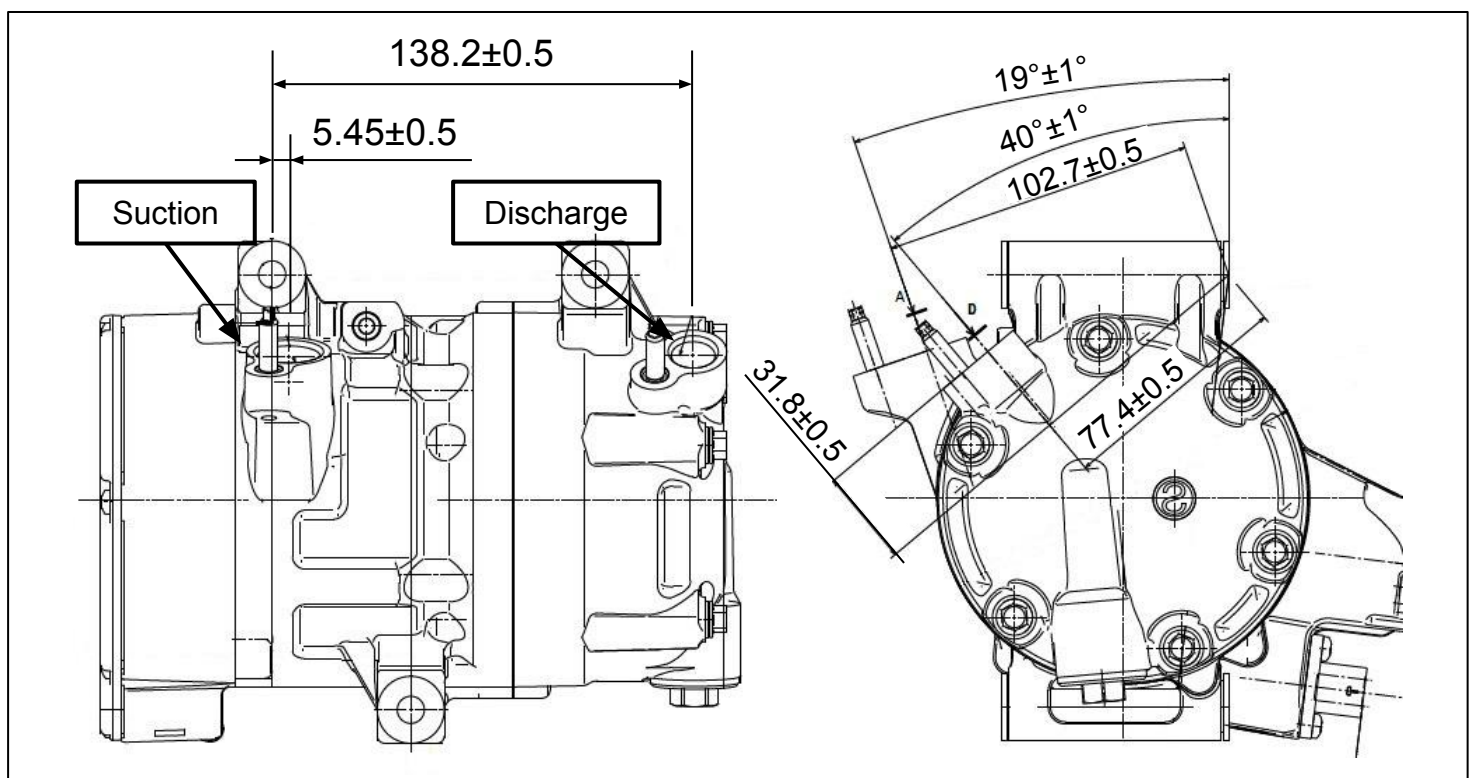


# PRODUCT DESCRIPTION - REFRIGERANT PORT

Valeo **TME 34** ports dimensions:



Valeo **TME 34** ports layout:



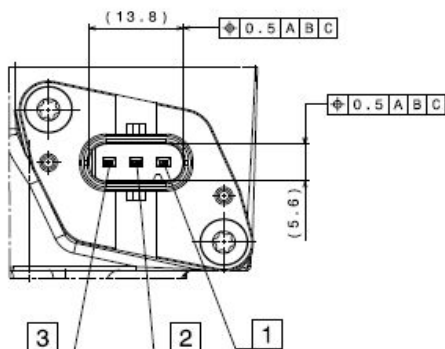
# ELECTRICAL SPECIFICATIONS - GENERAL

## General items:

HV DC VOLTAGE	V	Min 200 - Max 470
LV DC VOLTAGE	V	Min 8 - Max 16
AC PHASE CURRENT	A rms	26 Max
DC BATTERY CURRENT	A	30 Max
SWITCHING FREQUENCY	kHz	10
EMC FILTER	-	LV & HV
REVERSE BATTERY	-	LV only
CONTROL	-	Space Vector Modulation (3d harmonic injection ) Sensor-less
PHASE CURRENT MEASUREMENT	-	3-shunts
DC CURRENT MEASUREMENT	-	1-shunt
COMMUNICATION	-	LIN 2.1
MOTOR PROTECTION CLASS		IP6K9K

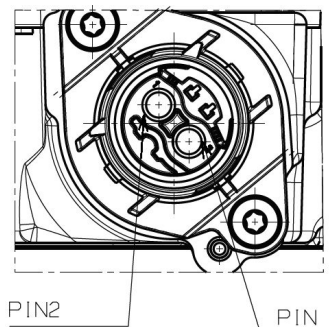
## Connectors:

**LV connector**  
TYCO MCON1.2

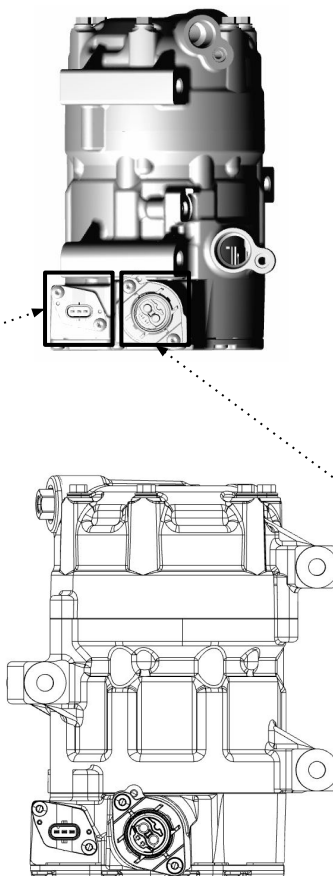


PIN Number	Designation
1	ALIM ELV
2	LIN NETWORK
3	GROUND ELV

**HV connector**  
Hirschmann HPS40-2

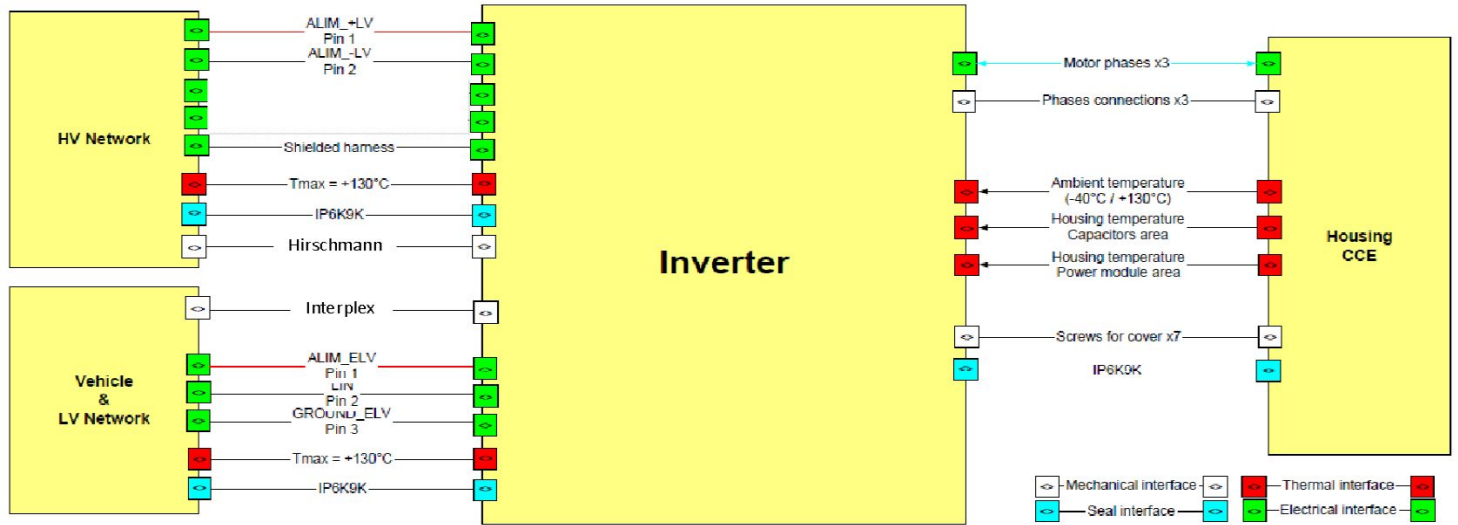


PIN Number	Designation
1	ALIM + LV
2	ALIM - LV



# ELECTRICAL SPECIFICATION - LIN ↔ LAN CONVERTER

## Electric Diagram:



# OPERATION PRECAUTIONS

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## 1-COMPRESSOR HANDLING

### 1.1. DO NOT STRIKE OR DROP THE COMPRESSOR

Careful handling is needed in order to avoid hitting marks on low voltage and extra low voltage connectors. In case of the compressor hit, strike or drop , don't install it on vehicle.

### 1.2. REFRIGERANT CAPS

Caps must be removed just before the connecting of the pressure pipes. This prevents the entry of the dirt, dust, moisture If the compressor has not the 2 caps on suction and discharge ports don't install it on vehicle. There is risk of contamination.

### 1.3. ELECTRICAL CONNECTORS CAPS

Caps of low voltage and Extra low voltage connectors must be removed just before the connecting the compressor to ca electrical network

## 2-INSTALLATION PROCEDURE OF THE COMPRESSOR

### (A) TIGHTEN THE BOLTS FOR COMPRESSOR BRACKET

Take care washers are always plugged on each side of each brackets.

Fix them temporarily by hand

### (B) TIGHTEN THE BOLTS FOR COMPRESSOR

Fix them temporarily by hand

### (C) TIGHTEN THE BOLTS ( M8 -8.8 ) WITH TORQUE: max 22 Nm

### (D) DO NOT REMOVE THE CAPS AT HOSE CONNECTION AREA

For both suction and discharge pressures ports, cap must be removed just before the connecting refrigerant pipe.

### (E) CONNECT THE ECV

Clip the wiring connector to the LV and ELV connectors by pushing until a click noise (locked)

# OPERATION PRECAUTIONS

## 3-A/C SYSTEM EVACUATION AND REFRIGERANT CHARGING

### REFRIGERANT CHARGING TO A/C LOOP

- Refrigerant to be charged to place between condenser and liquid tank
- Charging of A/C loop with adequate refrigerant HFC134a or R1234yf at high pressure side with COMPRESSOR "off"

Nota : the Compressor can be used with refrigerant R134a and R1234yf

- The charge ports on the pipes and hoses are different for R134a and R1234yf
- The oil must be "V100YF" from Valeo
- The oil charge amount depends of the A/C System usage
- The oil is common for both refrigerants

## 4-START UP PROCEDURE

The purpose of the requests is smooth initial compressor running, steady distribution of refrigerant and oil in the A/C system

### (A) STARTING THE COMPRESSOR

Initial starting of A/C system after refrigerant charging should be at low speed rotation. The compressor can start at 2750 rpm during 1 minute.

Reason:

- a) Not enough oil lubricated sliding portions of compressor
- b) High speed starting of compressor may cause abnormally high pressure in the scroll due to oil in chambers, as well as temperature increase at fixed and orbital scrolls might become so high that locking may occur.

### (B) RUNNING CONDITIONS

1. A/C OFF: Airflow at minimum level and Engine rpm: 800 - 1200
2. Running time: More than or equal to 2 minutes
3. A/C ON: Full cooling and blower speed 2 or higher (75% of max. blower perf.)
4. Start compressor at 2750 rpm during 1 minute.

# OPERATION PRECAUTIONS

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## 5-COMPRESSOR REMOVAL

### (A) WHEN THE COMPRESSOR IS OPERABLE

1. Perform the oil return operation (see below).
2. Perform the refrigerant recovery operation.
3. Remove the compressor.
4. Drain the oil from the compressor suction and discharge port
5. Insert a photo with oil removal from crankcase
6. Check the oil quantity and the degree of contamination

### (B) WHEN THE COMPRESSOR IS INOPERABLE

1. Perform the refrigerant recovery operation.
2. Remove the compressor.
3. Drain the oil from the compressor suction and discharge ports.
4. Check the oil quantity and the degree of contamination

### (C) OIL RETURN OPERATION

The oil is mixed with refrigerant in the refrigeration system. Perform the oil return operation to return this oil to the compressor before removing components from the system.

1. Open the doors and operate the blower motor at maximum speed
2. Operate the compressor at minimum speed (blower min, and temperature setting at 22 °C) at least 20 minutes.

Note:

The maximum amount of oil cannot be recovered at other speeds.

### (D) OIL INSPECTION INTERVAL

There is no particular need for frequent inspection or replacement, although the oil must be inspected or replaced in the following cases:

- When gas leaks from hoses or pipes.
- When gas or oil leaks from the compressor.
- When there is any malfunction other than the above.
- When the evaporator, condenser-receiver-dryer is replaced.
- When refrigerant is suddenly discharged from the system (relief valve etc.).



# OPERATION PRECAUTIONS

## (E) CLEANING OF THE AC LOOP

In case that compressor is inoperable (locked, seized etc.) and contaminates the AC loop, it is necessary to clean up the complete AC loop (Condenser, Expansion valve, Evaporator, pipes and hoses).

- There is a risk of repetitive contamination of compressor and following seizure
- This must be performed according state of the art knowledge
- The filter dryer must be exchanged, in case of not exchangeable of the filter -dryer the condenser must be exchange

Note:

The AC loop has to be cleaned up by flushing the complete system. During the cleaning the expansion valve must be opened.

Flushing to be done via pipe connection at compressor on high side and low side.

## 6-PIPE CONNECTING

**Requirement:** Bolt or Nut for the connecting of A/C pipe and compressor port shall be tightened after the complete fitting of them.

Precaution of use	Potential failure
In case of the connecting of pipe and compressor, connecting bolt or nut shall be tightened after the complete assembly of pipe (see the illustration on the next page).	Installation without complete fitting often causes slanted installation, pinched O-ring, or scratches on seal surface.

To instruct control items, values, and precautions when installing A/C parts, charging refrigerant and completing installation, in order to secure quality of A/C component installed at the plants.

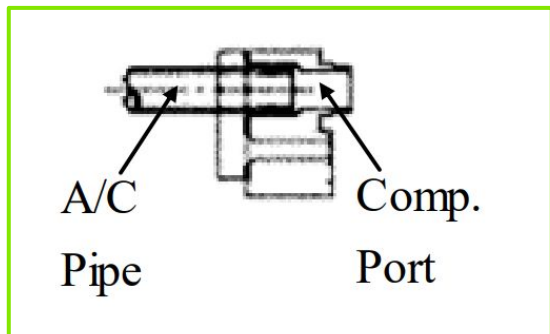
## (A) PIPE JOINTS PRECAUTIONS

- 1) When connecting pipes, after complete the assembly/pre-assembly (see the illustration below) tighten bolts or nuts → Installation without complete mating often causes slanted installation, pinched O-ring, or scratches on seal surface

# OPERATION PRECAUTIONS

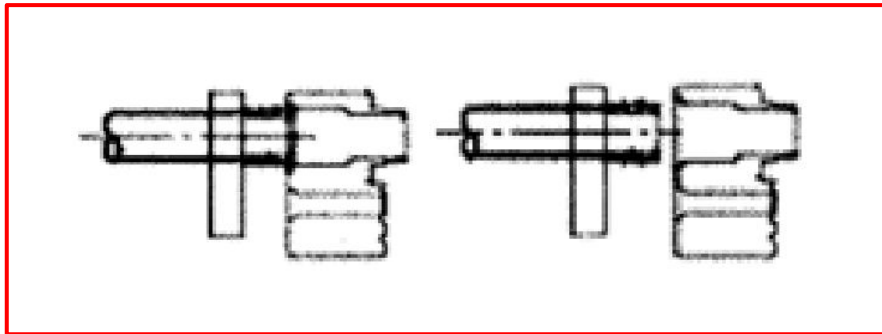
**OK**

Complete fitting



**NOT OK**

Incomplete fitting



- 2) Check that an O-ring is installed correctly before assembly of the joints.
- 3) When it is difficult to install and assemble the joints completely, apply the specified compressor oil to o-ring before installing it.
- 4) Check that there is no dust on the O-ring mating parts. Also do not touch O-ring.
- 5) Do not use excessive force to the pipes, to avoid deforming them.
- 6) Arrange hoses to be freely in place, and do not allow them to be bent or twisted when assembled to vehicle. However temporary (short time) bending is allowed for the reason of pre-mounting of hoses to the engine in the assembly operation or other purpose.
- 7) Remove a shipping cap just before connection pipes.
- 8) Considering installation and vehicle parts deviations, confirm there is proper clearance.

## (B) GENERAL PRECAUTIONS DURING ASSEMBLY

- 1) Be careful to keep parts, service tools and other equipment (including O-rings) out of unspecified oil or dust. Remove the shipping cap mounted to an O-ring portion just before connecting parts, without touching the portion with gloves on.
- 2) Never use unspecified oil.

# OPERATION PRECAUTIONS

## 7. COMPRESSOR RE-ACTIVATING PROCEDURE

To protect the A/C compressor from oil wash out phenomena, secure to get oil back to the A/C compressor after long time storage:  $\geq 8$  weeks.

- 1) Set blower at min speed
- 2) Set temperatures setting at 22 °C.
- 3) Turn on A/C

Keep timing below to get oil back to the A/C compressor

- 1st stage (liquid refrigerant evaporates): 70sec
- 2nd stage (oil starts to return): 60sec
- 3rd stage (AC cycle stabilizing): 60sec
- 4th stage (get stabilized, 2~4 circulation): 120sec

- 4) Repeat this procedure once per two months.

During transport and unloading keep A/C off !

### 7.1-STARTING OPERATION

Procedure:

- (1) Compressor target speed: 2000 rpm
- (2) Running time: More than or equal to 2 minutes.
- (3) A/C Mode: REC, Full Cool, Blower Speed: 2

This procedure allows oil to migrate in the A/C system.

Precaution of use	Potential failure
Charge liquid refrigerant only from high pressure line.	Decrease of the oil in the compressor due to being washed the inside of compressor by liquid refrigerant. → Seizure of sliding portion, Abnormal noise
Independence for Engine start timing and EDC start.	Sudden high-speed-starting may cause an abnormal high pressure in compressor. Poor lubrication on the sliding portions due to long term storage. → Seizure of sliding portion, Abnormal noise

# OPERATION PRECAUTIONS

## 7.2-RESTARTING OPERATION

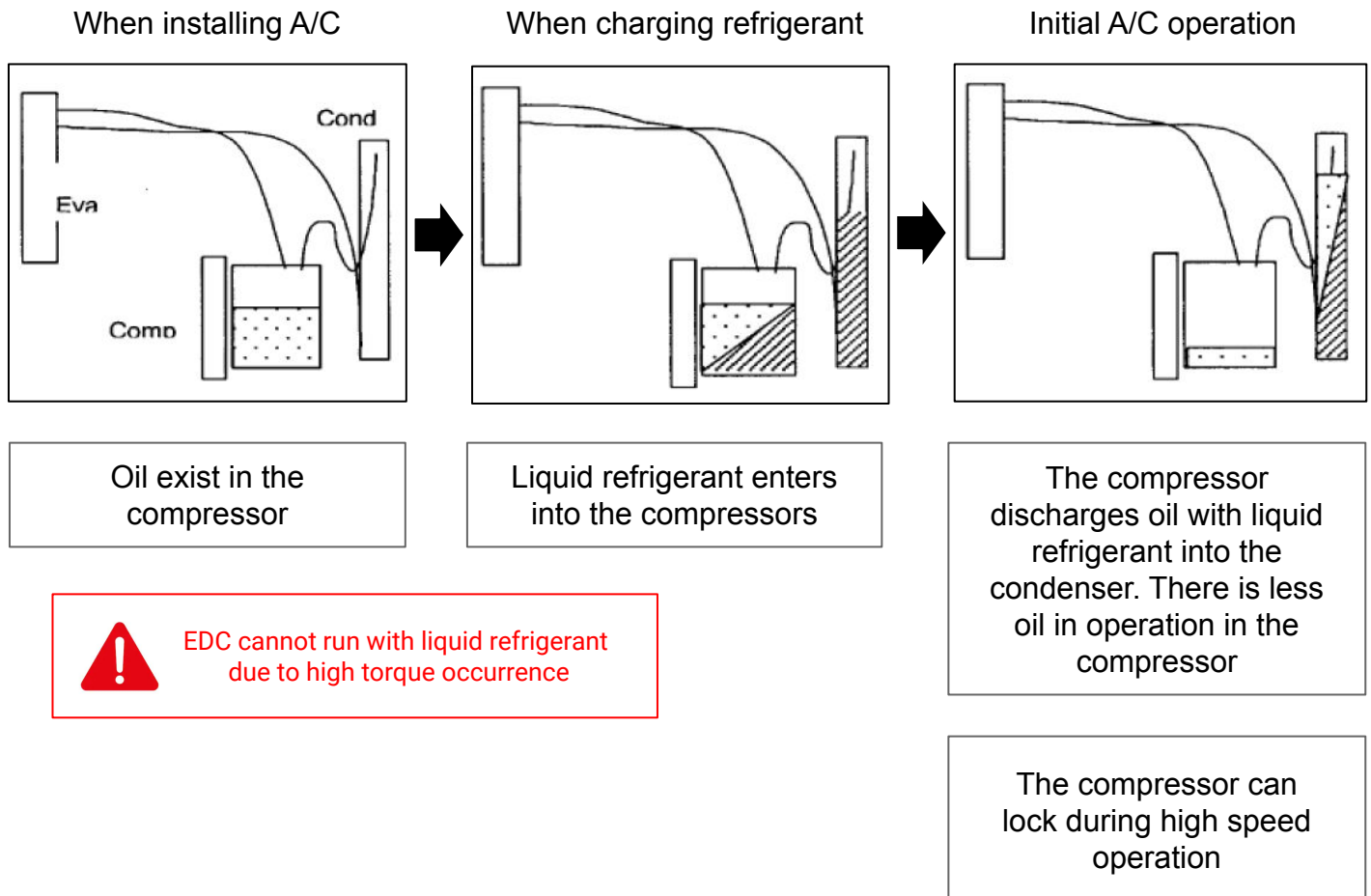
Requirement condition

1. Turn off A/C
2. Once engine reached working temperature, implement the following sequence
  - a. Engine Speed: 800~1,100 rpm (for BED). Compressor target speed: 2,000 rpm (for EDC)
  - b. Running time: More than or equal to 2 minutes.
  - c. A/C Mode: Rec., Full Cool., Blower Speed: 2

This procedure allows oil to migrate in the A/C system again.

Precaution of use	Potential failure
Don't start the compressor directly after restarting a vehicle parked in a long time without driving, or after shipping overseas	Sliding surface does not have enough oil → Seizure of sliding surface, Abnormal noise

Oil migration:



# OPERATION PRECAUTIONS

## 7.3-COMPRESSOR OIL

**Requirement:** The specified oil for each type of compressor and refrigerant as shown on the standard ZKSP00417 has to be used. Non-specified oil must not be used. Oil mixing is prohibited. Any additives except for the validated leak detector must not be mixed in the compressor oil.

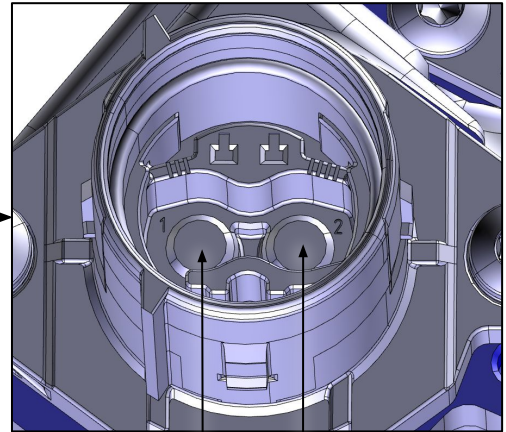
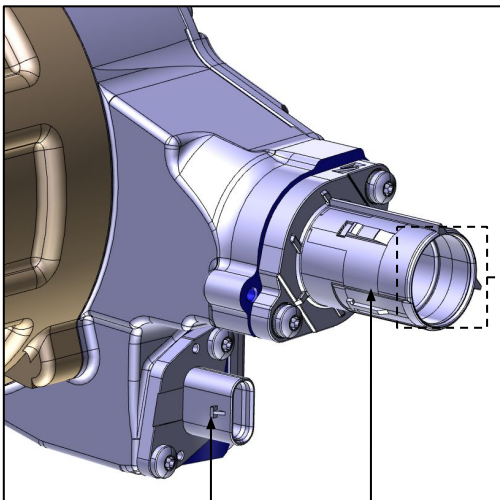
Precaution of use	Potential failure
Don't use a non-specified oil	Poor lubrication on the sliding portions in the compressor. → Seizure of sliding surface, Abnormal noise
Don't use a mixed oil	
Don't add an additive to the compressor oil	

# OPERATION PRECAUTIONS

## 7.4-HANDLING AFTER OPERATION

**Caution :** Do not touch terminal pin of high voltage electrical connector within 60sec after EDC stopped. (see figure on next page)

Precaution of use	Potential failure
Don't touch terminal pin of high voltage electrical connector	Poor lubrication on the sliding portions in the compressor. → Seizure of sliding surface, Abnormal noise
Don't touch terminal pin of high voltage electrical connector even if high voltage electrical power supply is stopped.	
Don't touch terminal pin of high voltage electrical connector even if high voltage electrical connector is pulled out.	



Low voltage connector  
*Communication*

High voltage connector  
*Power*

2 terminal pins of high voltage connector

 **Do not touch those terminal pins**

# Valeo TME 34 Electric Compressor

## TME 34 compressor benefits

- Staggering value through innovation
- Reduced noise and vibration
- Improved field serviceability
- Compact & robust design
- Lower fuel consumption
- Enhanced performance
- Higher cooling capacity
- Integration flexibility
- High reliability

Customer satisfaction



**Valeo**

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