



# Danfoss UL-HGX22e-125 ML Reciprocating Compressor Installation Guide

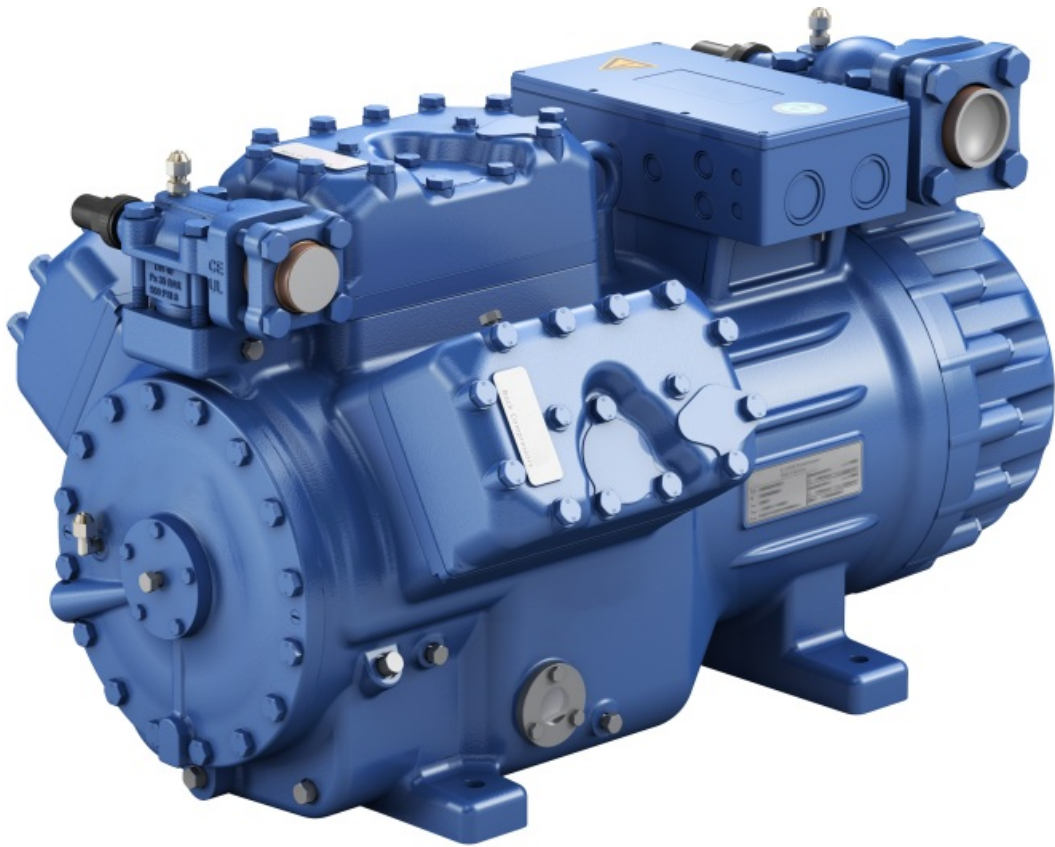
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**Danfoss UL-HGX22e-125 ML Reciprocating Compressor**



## Specifications

- **Product:** Reciprocating Compressor

## Product Usage Instructions

### Safety Precautions

- Before using the reciprocating compressor, ensure to carefully read and understand all safety instructions provided in the manual to prevent accidents or injuries.

### Commissioning

- **Preparations for start-up:** Prepare the compressor for operation according to the instructions provided in Section 6.1 of the manual.
- **Pressure integrity test:** Perform a pressure integrity test as outlined in Section 6.2 to ensure safe operation.
- **Leak test:** Conduct a leak test following the guidelines in Section 6.3 to check for any leaks in the system.
- **Evacuation:** Properly evacuate the system before use as described in Section 6.4 to remove any air or contaminants.

### Accessories

- **Capacity regulator:** If applicable, install and set up the capacity regulator as instructed in Section 8.1.

### Technical Data

- Refer to Section 9 for detailed technical data related to the compressor for accurate operation.

## Dimensions and Connections

- For information on dimensions and connections, consult Section 10 of the manual for proper installation.

## Declaration of Incorporation and Compliance

- Review Section 11 for the declaration of incorporation and Section 12 for the UL-Certificate of Compliance for regulatory purposes.

## FAQ

- **Q:** What should I do in case of a dangerous situation while using the compressor?
- **A:** In case of a dangerous situation, immediately stop using the compressor and refer to the safety instructions provided in the manual to address the issue safely.

## Foreword

### DANGER

Risk of accidents.

Refrigerating compressors are pressurized machines and as such call for heightened caution and care in handling. Improper assembly and use of the compressor can result in serious or fatal injury!

- To avoid serious injury or death, observe all safety instructions contained in these instructions before assembly and before using the compressor! This will avoid misunderstandings and prevent serious or fatal injury and damage!
- Never use the product improperly but only as recommended by this manual!
- Observe all product safety labels!
- Refer to local building codes for installation requirements!

Unauthorized changes and modifications to the product not covered by this manual are prohibited and will void the warranty!

This instruction manual is a mandatory part of the product. It must be available to the personnel who operate and maintain this product. It must be passed onto the end customer along with the unit in which the compressor is installed.

This document is subject to the copyright of BOCK GmbH, Germany. The information provided in this manual is subject to change and improvements without notice.

## Safety

Identification of safety instructions

- **DANGER:** Indicates a dangerous situation which, if not avoided, will cause immediate fatal or serious injury.
- **WARNING:** Indicates a dangerous situation which, if not avoided, may cause fatal or serious injury.
- **CAUTION:** Indicates a dangerous situation which, if not avoided, may cause fairly severe or minor injury.

- **NOTICE:** Indicates a situation which, if not avoided, may cause property damage.

Important information or tips on simplifying work.

## **General safety instructions**

### **WARNING**

#### **Risk of accidents.**

Refrigerating compressors are pressurized machines and as such call for heightened caution and care in handling. The maximum permissible overpressure must not be exceeded, even for testing purposes!

#### **Risk of burns!**

- Depending on the operating conditions, surface temperatures of over 60°C (140°F) on the discharge side or below 0°C (32°F) on the suction side can be reached.
- Contact with refrigerant must be avoided.
- Contact with refrigerant can cause severe burns and skin damage.

### **Intended use**

The compressor may not be used in potentially explosive environments!

- These assembly instructions describe the standard version of the compressor named in the title manufactured by Bock. Bock refrigerating compressors are intended for installation in a machine (within the EU according to the EU Directives 2006/42/EC
- Machinery Directive, 2014/68/ EU Pressure Equipment Directive, outside the EU according to the respective national regulations and guidelines).
- Commissioning is permissible only if the compressor has been installed under these assembly instructions and the entire system into which it is integrated has been inspected and approved under legal regulations.
- The compressors are intended for use in refrigeration systems in compliance with the limits of application.
- Only the refrigerant specified in these instructions may be used.

### **Any other use of the compressor is prohibited**

### **Qualifications required of personnel**

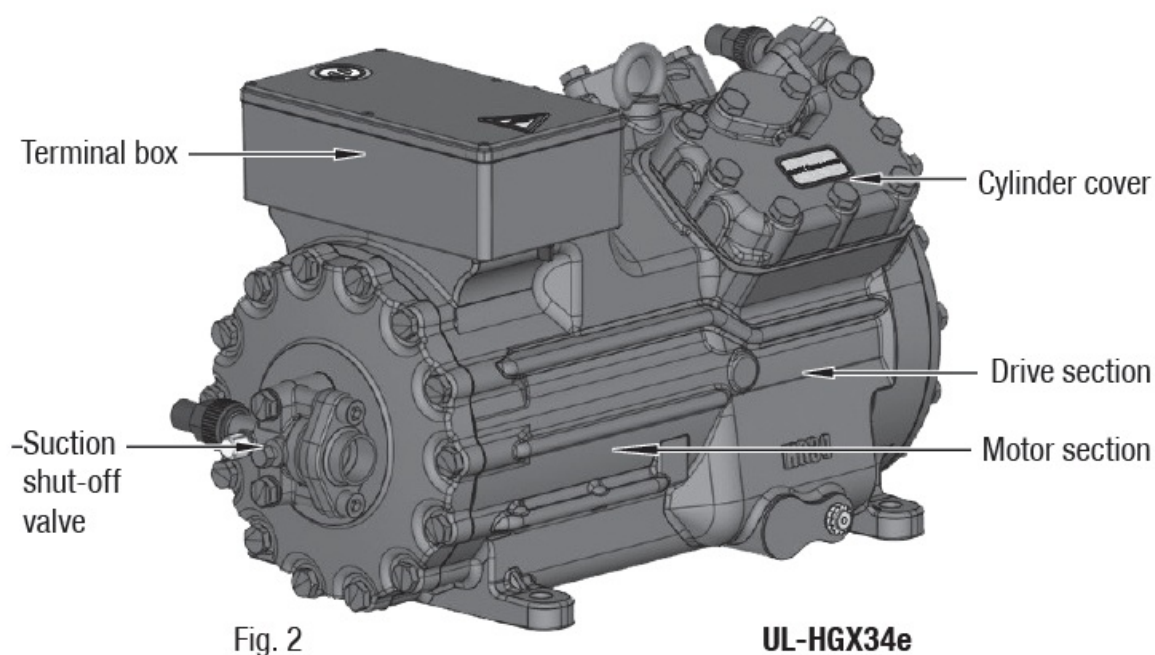
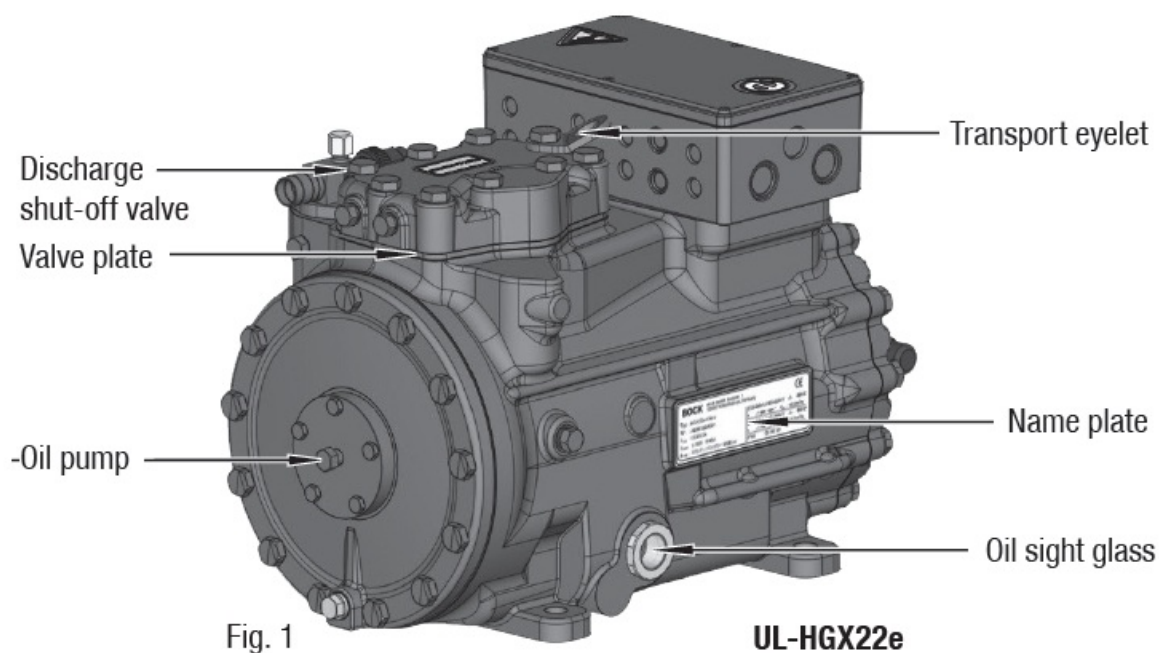
### **WARNING**

- Inadequately qualified personnel pose the risk of accidents, the consequence being serious or fatal injury. Work on compressors is therefore reserved for personnel who are qualified to work on pressurized refrigerant systems:
- For example, a refrigeration technician, a refrigeration mechatronic engineer. As well as professions with comparable training that enables personnel to assemble, install, maintain and repair refrigeration and air-conditioning systems. Personnel must be capable of assessing the work to be carried out and recognizing any potential dangers.

## Product description

### Short description

- UL-HGX22e: Semi-hermetic two-cylinder reciprocating compressor with oil pump lubrication.
- UL-HGX34e: Semi-hermetic four-cylinder reciprocating compressor with oil pump lubrication.
- Suction gas-cooled drive motor.
- The stream of refrigerant sucked out of the evaporator flows over the motor and cools it intensively. In this way, the motor can be kept at a relatively low-temperature level, particularly under high loads.



Dimension and connection values.

### Nameplate (example)

**BOCK**Bock GmbH, Benzstr. 7  
72636 Frickenhausen, Germany**c** **AL** **US****CE**

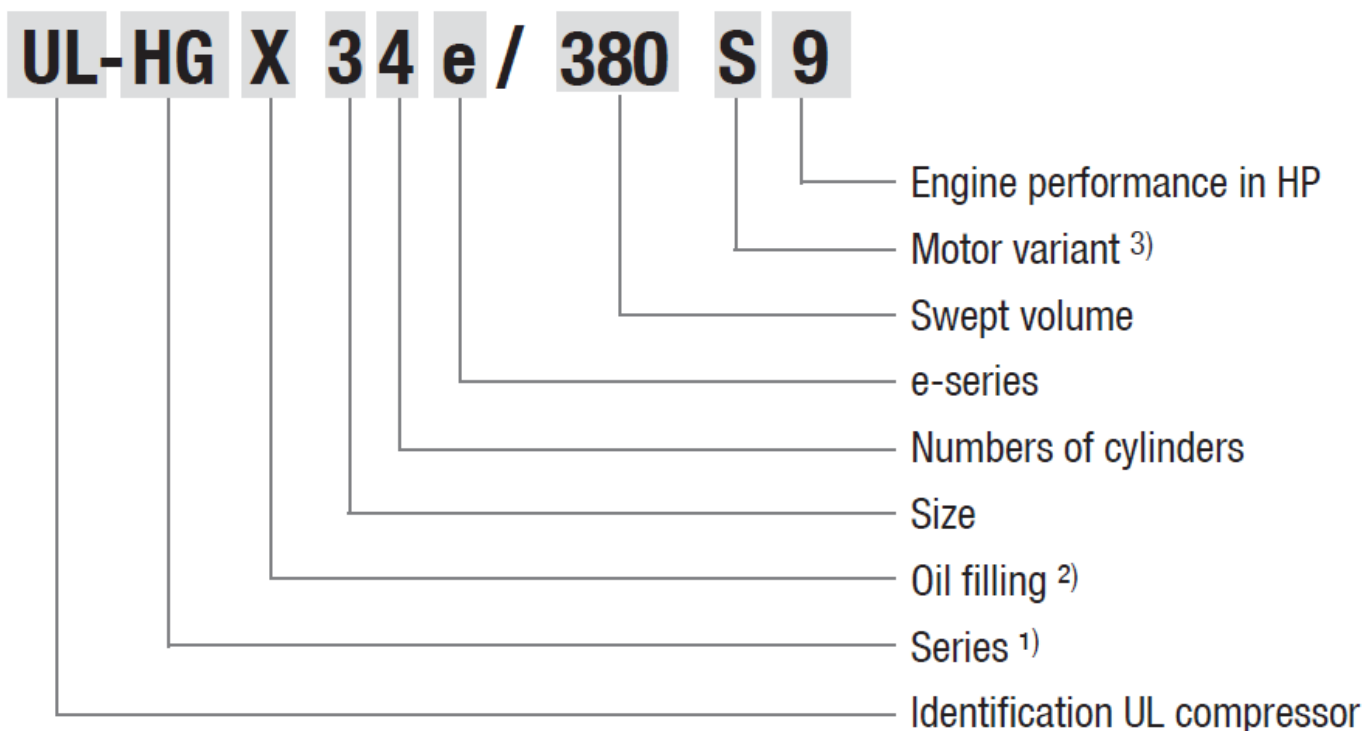
thermally protected system

1	Type : <b>UL-HGX34e/315 ML 5</b>	<b>220-240V<math>\Delta</math>/380-420VY -3- 50HZ</b>	6
2	No : <b>AS38125A001</b>	n : <b>1450</b> min <sup>-1</sup> $\dot{V}_{th}$ : <b>665 cfh</b>	7
3	I <sub>max</sub> : <b>21,1/12,2A</b>	<b>265-290V<math>\Delta</math>/440-480VY -3- 60HZ</b>	8
4	I <sub>block.</sub> $\Delta$ : <b>111A</b> : YY: <b>64A</b>	n : <b>1740</b> min <sup>-1</sup> $\dot{V}_{th}$ : <b>798 cfh</b>	9
5	p <sub>max</sub> : <b>LP/HP = 276/406 psig</b>	<b>IP66</b> <b>Oil: BOCK lub E55</b>	10
			11
			12
			13

Fig. 3

1. Type designation
2. Machine number
3. maximum operating current
4. Starting current (rotor blocked)
  - Y: Part winding 1
  - YY: Part windings 1 and 2
  - 5LP: Max. admissible operating pressure
  - (g) Low-pressure side
  - HP: Max. admissible operating pressure (q) High pressure side
5. Voltage, circuit, frequency
6. Nominal rotation speed
7. Displacement } 50 Hz
8. Voltage, circuit, frequency
9. Nominal rotation speed
10. Displacement } 60 Hz
11. Oil type filled at the factory
12. Terminal box protection type

**Type key (example)**



1. HG – Hermetic Gas-Cooled (suction gas-cooled)
  2. X – Ester oil charge
  3. S – More powerful motor
- ML – Motor for normal cooling and deep freezing

## Areas of application

### Refrigerants

HFC + blends	R134a, R404A/R507, R407F
HFC/HFO blends	R448A, R449A, R450A, R452A, R513A

### Oil charge

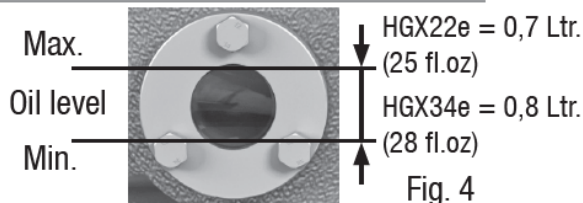
- The compressors are filled at the factory with the following oil type: BOCK lub E55
- For refilling, we recommend the above oil types. See also section 7.4.



**For refilling, we recommend the above oil types.  
See also section 7.4.**

### NOTICE

**The oil level must be in the visible part of the sight glass; damage to the compressor is possible if overfilled or under-filled!**



### Limits of application

## NOTICE

Compressor operation is possible within the operating limits. These can be found in the Bock compressor selection tool (VAP) under [vap.bock.de](http://vap.bock.de). Observe the information given there.

- Permissible ambient temperature: -20°C...+60°C (-4°F...140°F)
- Max. permissible discharge end temperature 140°C (284°F).
- Max. permissible switching frequency 8x/h.
- A minimum running time of 3 min. steady-state condition (continuous operation) must be achieved.

### For operation with supplementary cooling

- Use only oils with high thermal stability.
- Avoid continuous operation near the threshold.
- The suction gas superheat temperature may need to be reduced or set individually when operating near to the threshold.

### For operation with the capacity regulator

- Continuous operation, when the capacity regulator is activated, is not permissible and can cause damage to the compressor.
- The suction gas superheat temperature may need to be reduced or set individually when operating near to the threshold.
- When the capacity regulator is activated, the gas velocity in the system can not under certain circumstances ensure that sufficient oil is transported back to the compressor.

### For operation with a frequency converter

- The maximum current and power consumption must not be exceeded. In the case of operation above the mains frequency, the application limit can therefore be limited.
- When operating in the vacuum range, there is a danger of air entering the suction side. This can cause chemical reactions, a pressure rise in the condenser and an elevated compressed-gas temperature. Prevent the ingress of air at all costs!

### Areas of application

Maximum admissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar (276/406 psig)

- 1) LP = Low pressure
- HP = High pressure

### Compressor Assembly

- New compressors are factory-filled with inert gas.
- Leave this service charge in the compressor for as long as possible and prevent the ingress of air.



- Check the compressor for transport damage before starting any work.

## Storage and transport



- Storage at -30°C...+70°C (-22°F...+158°F), maximum permissible relative humidity 10% – 95%, no condensation
- Do not store in a corrosive, dusty, vaporous atmosphere or in a combustible environment.



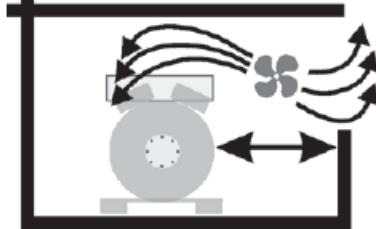
- Use transport eyelet.
- Do not lift manually!
- Use lifting gear!

## Setting up

### NOTICE

Attachments (e.g. pipe holders, additional units, fastening parts, etc.) directly to the compressor are not permissible!

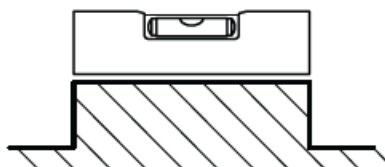
- Provide adequate clearance for maintenance work.
- Ensure adequate compressor ventilation.



- Do not use it in a corrosive, dusty, damp atmosphere or a combustible environment.



- Setup on an even surface or frame with sufficient loadbearing capacity.
- Single compressor preferably on vibration damper.
- Duplex and parallel circuits always rigid.



- Sun protection: If the compressor is set up outdoors, it has to be protected from direct sunlight.



## Pipe connections

### NOTICE

#### Damage possible

- Do not solder as long as the compressor is under pressure.
- Superheating can damage the valve. Remove the pipe supports therefore from the valve for soldering and accordingly cool the valve body during and after soldering.
- Only solder using inert gas to inhibit oxidation products (scale).
- The pipe connections have graduated inside diameters so that pipes with standard millimetre and inch dimensions can be used.
- The connection diameters of the shut-off valves are rated for maximum compressor output. The actual required pipe cross-section must be matched to the output. The same applies for non-return valves.

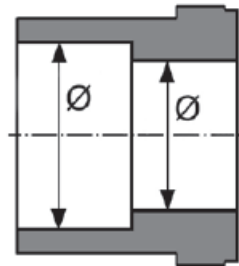


Fig. 5: graduated internal diameter

## Pipes

- Pipes and system components must be clean and dry inside and free of scale, swarf and layers of rust and phosphate. Only use air-tight parts.
- Lay pipes correctly. Suitable vibration compensators must be provided to prevent pipes from being cracked and broken by severe vibrations.
- Ensure a proper oil return.
- Keep pressure losses to an absolute minimum.

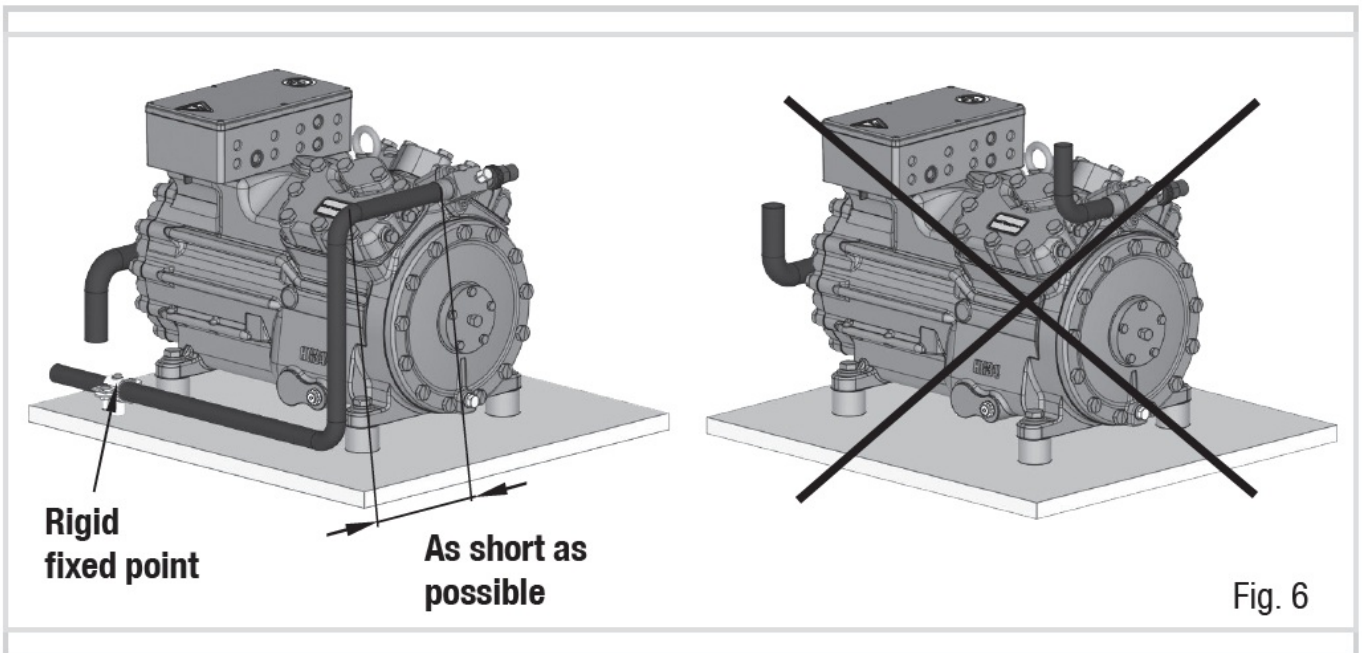
## Laying suction and pressure lines

### NOTICE

- Improperly installed pipes can cause cracks and tears, the result being a loss of refrigerant.

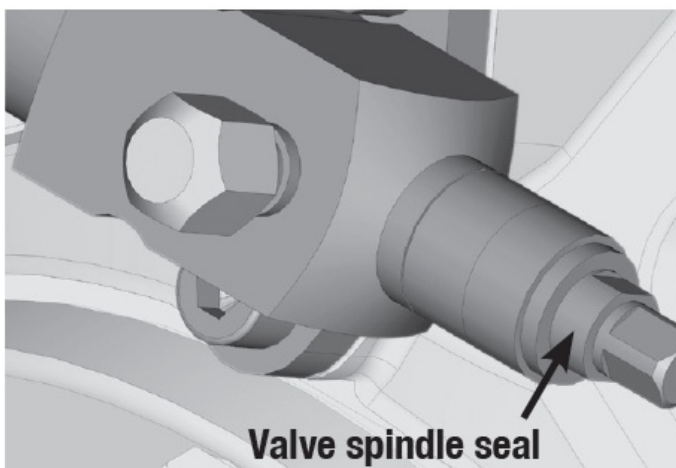
- Proper layout of the suction and discharge lines directly after the compressor is integral to the system's smooth running and vibration behaviour.

A rule of thumb: Always lay the first pipe section starting from the shut-off valve downwards and parallel to the drive shaft.

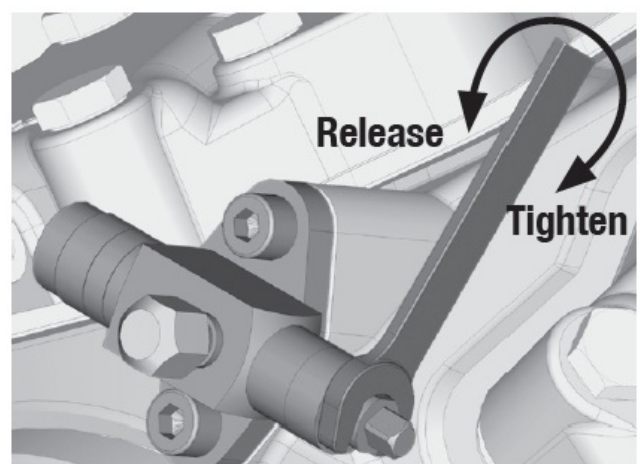


#### Operating the shut-off valves

- Before opening or closing the shut-off valve, release the valve spindle seal by approx. 1/4 of a turn counter-clockwise.
- After activating the shut-off valve, re-tighten the adjustable valve spindle seal clockwise.



**Fig. 7**



**Fig. 8**

#### Operating mode of the lockable service connections

### Opening the shut-off valve:

Spindle: turn to the left (counter-clockwise) as far as it will go.

—> Shut-off valve completely opened / service connection closed.

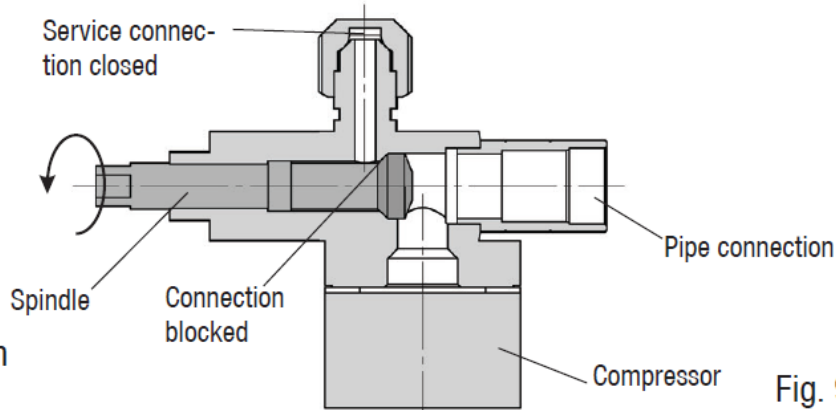


Fig. 9

### Opening the service connection

Spindle: Turn  $\frac{1}{2}$  - 1 turn to the right clockwise.

—> Service connection opened / shut-off valve opened.

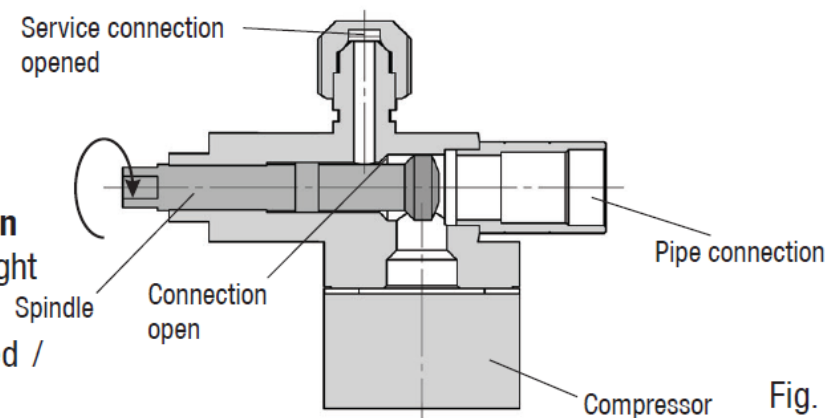


Fig. 10

- After activating the spindle, generally fit the spindle protection cap again and tighten with 14-16 Nm (10.3-11.8 lb-ft). This serves as a second sealing feature during operation.

## Suction pipe filter and filter drier

- For systems with long pipes and a higher degree of contamination, a filter on the suction-side is recommended. The filter has to be renewed depending on the degree of contamination (reduced pressure loss).
- Moisture in the refrigeration circuit can lead to crystal and hydrate formation. For this reason, we recommend using a filter drier and a sight glass with a moisture indicator.

## Electrical Connection

### General safety

#### DANGER

- Risk of electric shock! High voltage!
- Only carry out work when the electrical system is disconnected from the power supply!

#### NOTICE

- When attaching accessories with an electrical cable, a minimum bending radius of 3 x the cable diameter must be maintained for laying the cable.

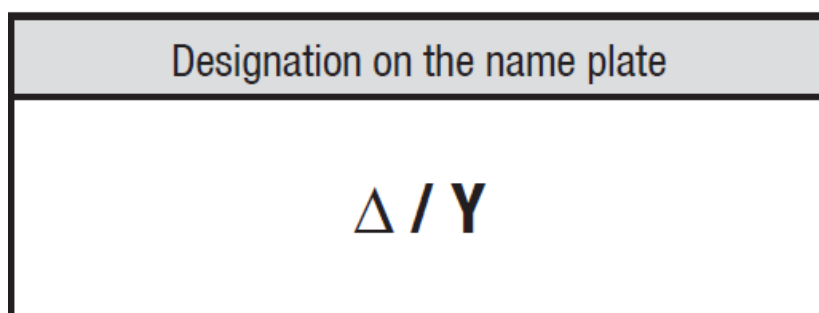
Connect the compressor motor under the circuit diagram (see inside of terminal box).  
 Use a suitable cable entry point of the correct protection type (see nameplate) for routing cables into the terminal box. Insert the strain relieves and prevent chafe marks on the cables.  
 Compare the voltage and frequency values with the data for the mains power supply.  
 Only connect the motor if these values are the same.

### Information for contactor and motor contactor selection

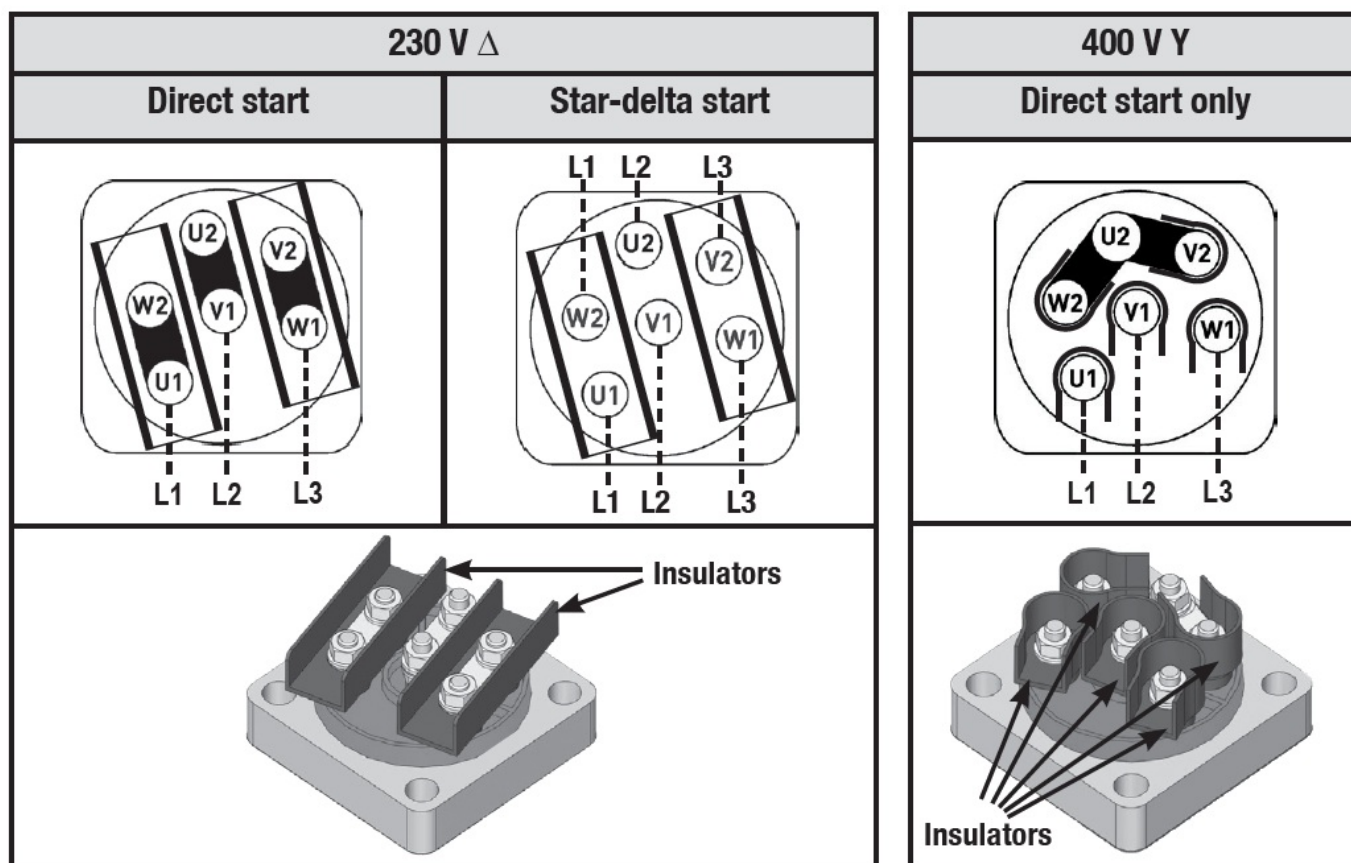
All protection devices and switching or monitoring units must be fitted under the local safety regulations and established specifications (e.g. OSHA, UL/CSA) as well as with the manufacturer's information. Motor protection switches are required! Motor contactors, feed lines, fuses and motor protection switches must be rated based on the maximum working current (see nameplate). For motor protection use a current-dependent and time-delayed overload protection device for monitoring all three phases. Set the overload protection device so that it must be actuated within 2 hours if there is 1.2 times the max. working current.

### Connection of the driving motor

- The compressor is designed with a motor for star-delta circuits.



Star-delta start-up is only possible on 230 V voltage supply. Example:



## INFO

- The connection examples shown refer to the standard version.
- In the case of special voltages, the instructions affixed to the terminal box apply.

### Circuit diagramm for direct start 230 V $\Delta$ / 400 V Y

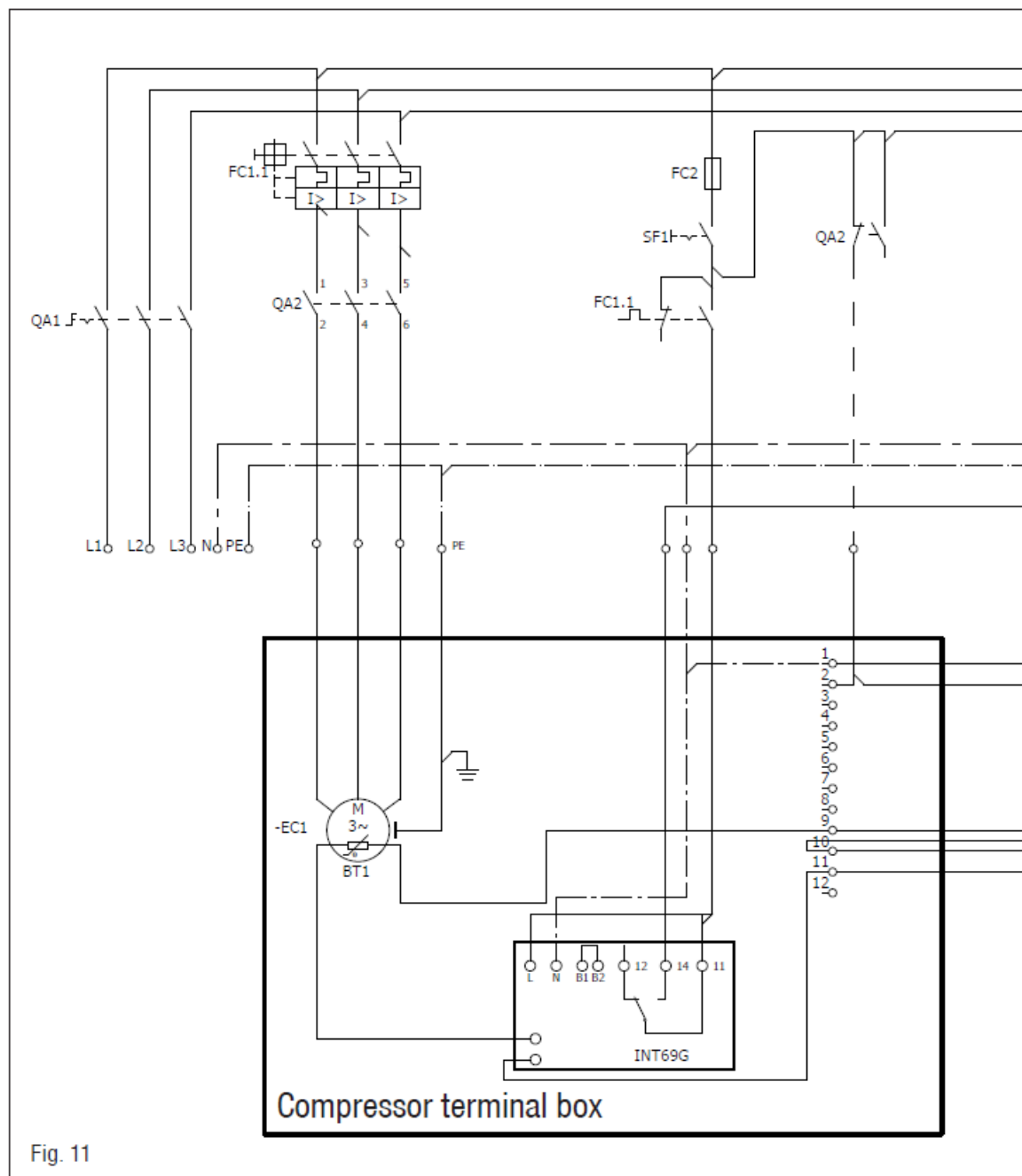
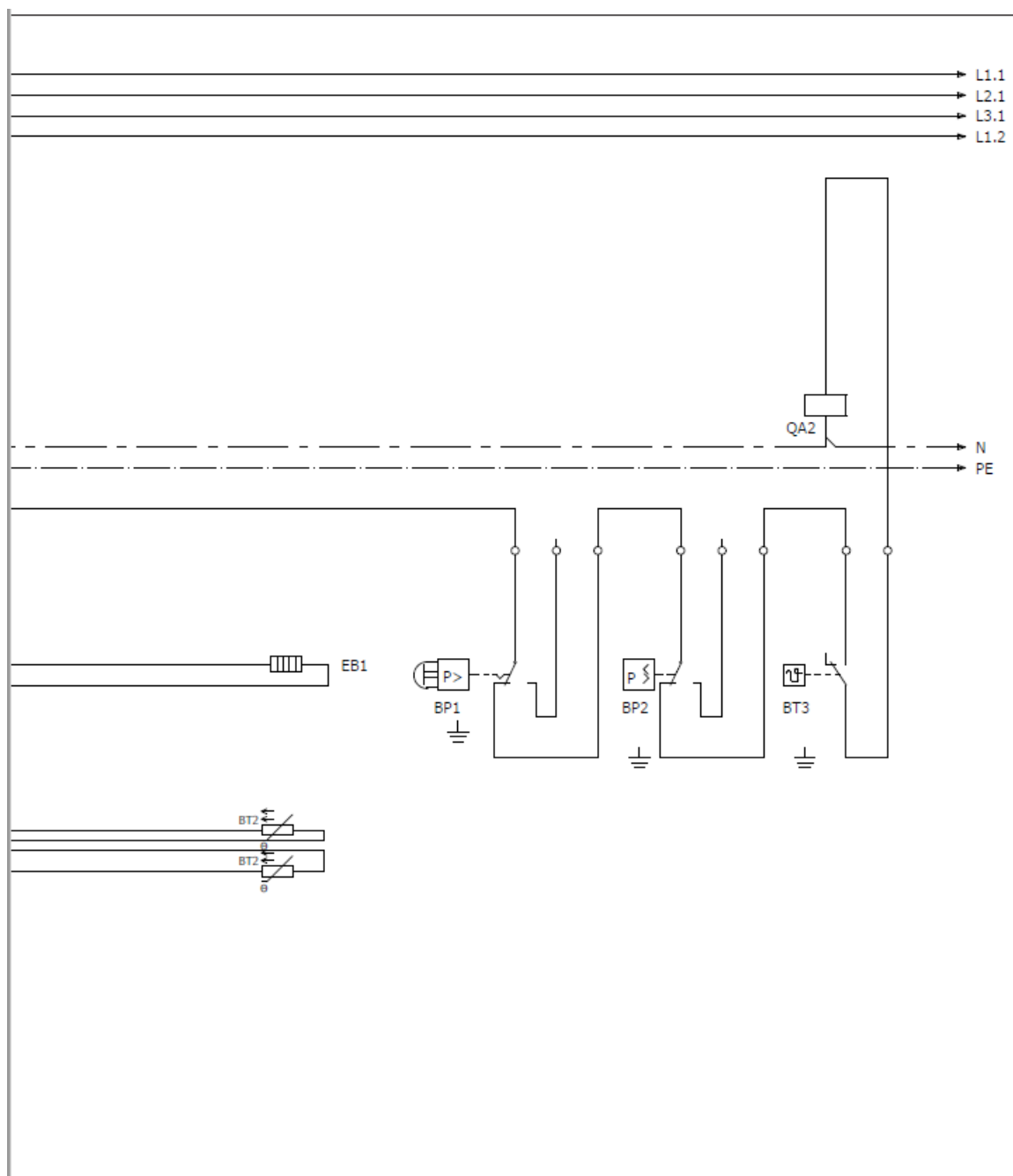


Fig. 11

BT1	Cold conductor (PTC sensor) motor winding
BT2	Thermal protection thermostat (PTC sensor)
FC1	Load circuit safety switches
FC2	Control power circuit fuse
BP1	High-pressure safety monitor
BP2	Safety chain (high/low-pressure monitoring)
BT3	Release switch (thermostat)



QA1	Main switch
SF1	Control voltage switch
EC1	Compressor motor
QA2	Compressor contactor
INT69 G	Electronic trigger unit INT69 G
EB1	Oil sump heater

### Electronic trigger unit INT69 G

The compressor motor is fitted with cold conductor temperature sensors (PTC) connected to the electronic trigger unit INT69 G in the terminal box. In case of excess temperature in the motor winding, the INT69 G deactivates the motor contactor. Once cooled, it can be restarted only if the electronic lock of the output relay (terminals B1+B2) is released by interrupting the supply voltage. The hot gas side of the compressor can also be protected against overtemperature using thermal protection thermostats (accessory).

The unit trips when an overload or inadmissible operating conditions occur. Find and remedy the cause. The relay switching output is executed as a floating changeover contact. This electrical circuit operates according to the quiescent current principle, i.e. the relay drops into an idle position and deactivates the motor contactor even in case of a sensor break or open circuit.

### Connection of the trigger unit INT69 G

- Connect the trigger unit INT69 G per the circuit diagram.
- Protect the trigger unit with a delayed-action fuse (FC2) of max. 4 A. To guarantee the protection function, install the trigger unit as the first element in the control power circuit.

### NOTICE

- Measure circuit BT1 and BT2 (PTC sensor) must not come into contact with an external voltage.
- This would destroy the trigger unit INT69 G and PTC sensors.



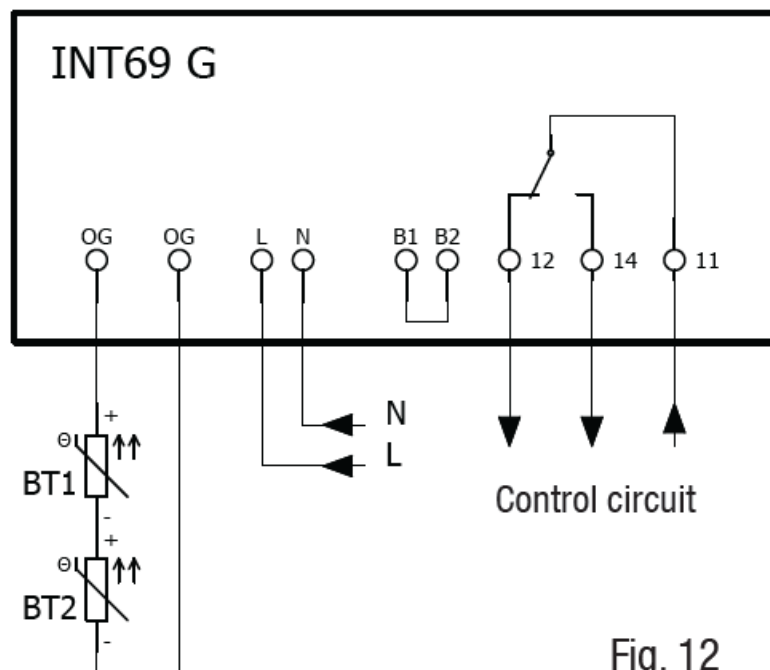


Fig. 12  
Terminal box

#### Function test of the trigger unit INT69 G

Before commissioning, after troubleshooting or making changes to the control power circuit, check the functionality of the trigger unit. Perform this check using a continuity tester or gage.

Gage state	Relay position
Deactivated state	11-12
INT69 G switch-on	11-14
Remove PTC connector	11-12
Insert PTC connector	11-12
Reset after mains on	11-14

#### Relay position INT69 G

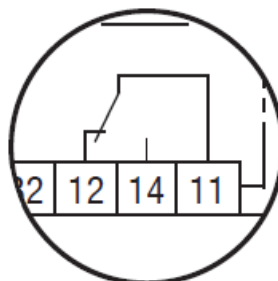


Fig. 13

#### Oil sump heater (Accessories)

- When the compressor is at a standstill, refrigerant diffuses into the lubricating oil of the compressor housing, depending on pressure and ambient temperature. This reduces the lubricating capacity of the oil. When the compressor starts up, the refrigerant contained in the oil evaporates out through the reduction in pressure. The consequences can be foaming and migration of the oil, causing oil shocks under certain circumstances.

- **Operation:** The oil sump heater operates when the compressor is at a standstill. When the compressor starts up, the oil sump heater switches off again automatically.
- **Connection:** The oil sump heater must be connected via an auxiliary contact (or parallel wired auxiliary contact) of the compressor contactor to a separate electric circuit. El. data: 115 V – 1 – 60 Hz, 65 – 135 W.

## NOTICE

- Connection to the current path of the safety control chain is not permitted.

## Capacity regulator (Accessories)

## NOTICE

A fuse (max. 3xIB under IEC 60127-2-1) corresponding to the rated current must be placed in front of every magnetic coil of the capacity regulator as short-circuit protection. The rated voltage of the fuse must be equal to or greater than the rated voltage of the magnetic coil. The ability of the fuses to switch off must be greater than or equal to the maximum assumable short-circuit current at the installation location.

## Selection and operation of compressors with frequency converters

For safe operation of the compressor, the frequency converter must be able to apply an overload of at least 140% of the compressor's maximum current (I-max.) for at least 3 seconds. When using frequency converters, the following things must also be observed:

1. The maximum permissible operating current of the compressor (I-max) (see type plate or technical data) must not be exceeded.
2. If abnormal vibrations occur in the system, the affected frequency ranges in the frequency converter must be blanked out accordingly.
3. The maximum output current of the frequency converter must be greater than the maximum current of the compressor (I-max).
4. After each compressor starts, run for at least 1 minute at a frequency of at least 50 Hz.
5. Carry out all designs and installations under the local safety regulations and common rules (e.g. VDE) and regulations as well as under the specifications of the frequency converter manufacturer.

<b>Rotational speed range</b>	0 – f-min	f-min – f-max
<b>Start-up time</b>	< 1 s	ca. 4 s
<b>Switch-off time</b>	immediately	

f-min/f-max see chapter 9: Technical data: permissible frequency range

## Commissioning

### Preparations for start-up

- To protect the compressor against inadmissible operating conditions, high pressure and low pressure pressostats are mandatory on the installation side.

- The compressor has undergone trials in the factory and all functions have been tested. There are therefore no special running-in instructions.

## **Check the compressor for transport damage!**

### **Pressure integrity test**

The compressor has been tested in the factory for pressure integrity. If however the entire system is to be subjected to a pressure integrity test, this should be carried out in accordance with UL 207 or a corresponding safety standard without the inclusion of the compressor.

### **Leak test**

## **DANGER**

### **Risk of bursting!**

The compressor must only be pressurized using nitrogen (N<sub>2</sub>).

Never pressurize with oxygen or other gases!

The maximum permissible overpressure of the compressor must not be exceeded at any time during the testing process (see name plate data)! Do not mix any refrigerant with the nitrogen as this could cause the ignition limit to shift into the critical range.

- Carry out the leak test on the refrigerating plant in accordance with UL 207 or a corresponding safety standard, while always observing the maximum permissible overpressure for the compressor.

### **Evacuation**

## **NOTICE**

Do not start the compressor if it is under vacuum. Do not apply any voltage – even for test purposes (must only be operated with refrigerant).

Under vacuum, the spark-over and creepage current distances of the terminal board connection bolts shorten; this can result in winding and terminal board damage.

- First evacuate the system and then include the compressor in the evacuation process.
- Relieve the compressor pressure.
- Open the suction and pressure line shut-off valves.
- Evacuate the suction and discharge pressure sides using the vacuum pump.
- At the end of the evacuation process, the vacuum should be < 1.5 mbar (0.02 psig) when the pump is switched off.
- Repeat this process as often as is required.

### **Refrigerant charge**

**CAUTION:** Wear personal protective clothing such as goggles and protective gloves!

- Make sure that the suction and pressure line shut-off valves are open.
- With the compressor switched off, add the liquid refrigerant directly to the condenser or receiver, breaking the vacuum.

- If the refrigerant needs topping up after starting the compressor, it can be topped up in vapor form on the suction side, or, taking suitable precautions, also in liquid form at the inlet to the evaporator.

## **NOTICE**

- Avoid overfilling the system with refrigerant!
- To avoid shifts in concentration, zeotropic refrigerant blends must always only be filled into the refrigerating plant in liquid form.
- Do not pour liquid coolant through the suction line valve on the compressor.
- It is not permissible to mix additives with the oil and refrigerant.

## **Start-up**

**WARNING:** Ensure that both shut-off valves are open before starting the compressor!

- Check that the safety and protection devices (pressure switch, motor protection, electrical contact protection measures, etc.) are all functioning properly.
- Switch on the compressor and let it run for at least 1 minute at a frequency of at least 50 Hz.
- Only then may the speed of the compressor be reduced.
- Check the oil level by: The oil must be visible in the sight glass.

**NOTICE:** If larger quantities of oil have to be topped up, there is a risk of oil hammer effects. If this is the case check the oil return!

## **Avoiding slugging**

**NOTICE:** Slugging can damage the compressor and cause refrigerant to leak.

## **To prevent slugging**

- The complete refrigeration system must be properly designed.
- All components must be compatibly rated with each other with regard to output (particularly the evaporator and expansion valves).
- Suction gas superheat at the compressor input should be min. 7 – 10 K. (check the setting of the expansion valve).
- The system must reach a state of equilibrium.
- Particularly in critical systems (e.g. several evaporator points), measures are recommended such as replacement of liquid traps, solenoid valve in the liquid line, etc.
- There should be no movement of coolant whatsoever while the compressor is at a standstill.

## **Maintenance**

### **Preparation**

## **WARNING**

- Before starting any work on the compressor:
- Switch off the compressor and secure it to prevent a restart.
- Relieve compressor of system pressure.
- Prevent air from infiltrating the system!
- After maintenance has been performed:
- Connect safety switch.
- Evacuate compressor.
- Release switch lock.

### Work to be carried out

- In order to guarantee optimum operational reliability and service life of the compressor, we recommend carrying out servicing and inspection work at regular intervals:

### Oil change

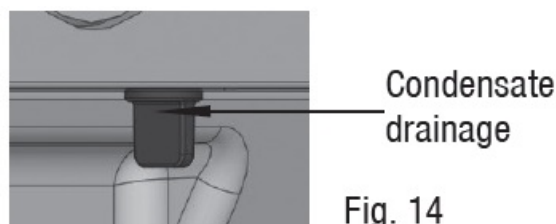
- not mandatory for factory-produced series systems.
- for field installations or when operating near the application limit: for the first time after 100 to 200 operating hours, then approx. every 3 years or 10,000 – 12,000 operating hours. Dispose of used oil according to the regulations; observe national regulations.

**Annual checks:** Oil level, leak tightness, running noises, pressures, temperatures, function of auxiliary devices such as oil sump heater, pressure switch.

### Condensate drainage

The terminal box has the option for Condensate drainage (see Fig. 14).

**ATTENTION** When the condensate drain is used, the protection rating of the terminal box is reduced from IP65 to IP32!



### Spare parts recommendation/accessories

- Available spare parts and accessories can be found on our compressor selection tool under [vap.bock.de](http://vap.bock.de) as well as at [bockshop.bock.de](http://bockshop.bock.de).
- Only use genuine Bock spare parts!

### Lubricants / oils

The oil type filled as standard in the factory is marked on the name plate, and this should always be used, even in the case of maintenance units. Alternative oil types can vary significantly in quality due to additives or inferior raw

materials by the manufacturer. Validation within the compressors entire operating limits can not be guaranteed, if such alternative oil types are used. It is for this reason, that we only recommend the use of oil from Bock! Bock assumes no liability for any damage arising from alternative oil types. Bock standard oil type: BOCK lub E55

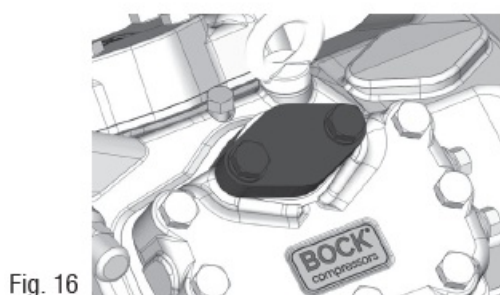
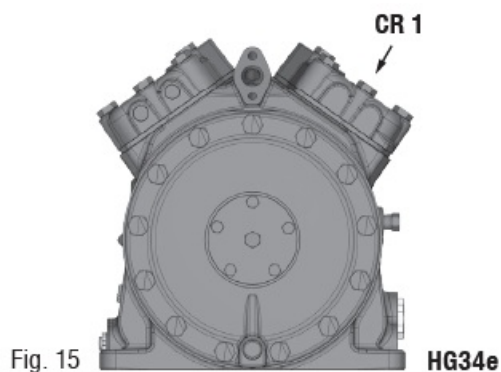
## **Decommissioning**

Close the shut-off valves on the compressor. Drain the refrigerant (it must not be discharged into the environment) and dispose of it according to the regulations. When the compressor is depressurized, undo the fastening screws of the shut-off valves. Remove the compressor using an appropriate hoist. Dispose of the oil inside in accordance with the applicable national regulations.

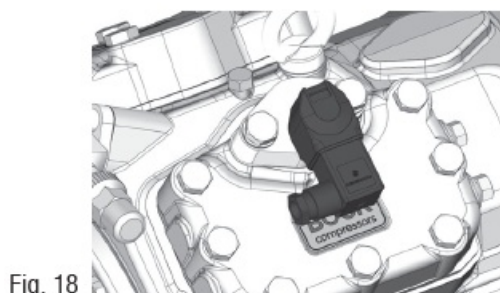
## **Accessories**

### **Capacity regulator**

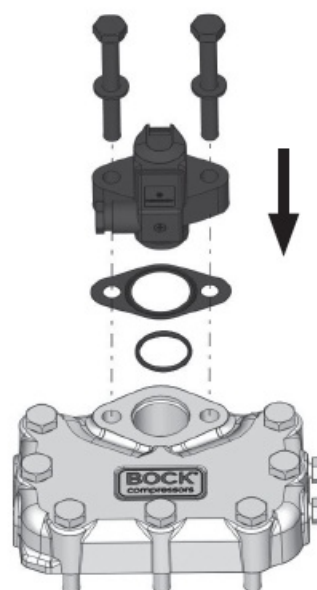
**NOTICE:** If the capacity regulator is installed at the factory, it is subsequently installed and connected by the customer.



Delivery condition 1 (from the factory):  
Cylinder cover prepared for capacity regulator.



Delivery condition 2 (from the factory):  
Connect capacity regulator in terminal box or  
switch cabinet.



Before commissioning, the blind flange with screws must be removed and replaced by the new set capacity regulator with O-ring joints and screws. Observe position and construction of the capacity regulator.

**Attention! Compressor is under pressure!  
Depressurize the compressor first.**

## NOTICE

- Capacity-regulated operation alters the gas speeds and pressure ratios of the refrigerating plant: Adjust the suction line routing and dimensioning accordingly, do not set the control intervals too close and do not let the system switch more than 12 times per hour (refrigerating plant must have reached a state of equilibrium).
- Continuous operation in the control stage is not recommended as the gas velocity in the plant system under certain circumstances does not guarantee sufficient oil return to the compressor with activated capacity regulator.
- We recommend switching to unregulated operation (100% capacity) for at least 5 minutes per capacity-regulated operating hour.
- An assured oil return can also be realised by a 100% capacity requirement after each compressor restart.
- Electrical actuation of the solenoid valve: Normally open, (corresponds to 100 % compressor capacity).
- For digital capacity regulation see document 09900.

Special accessories are only premounted in the factory if ordered specially by customer. Retrofitting is possible in full compliance with the safety instructions and repair instructions enclosed with the kits. Information about the use, operation, maintenance and servicing of the components is available in the printed literature or on the internet under [www.bock.de](http://www.bock.de).

- For the capacity regulator a step protection is optional available, Art-Nº 81449.

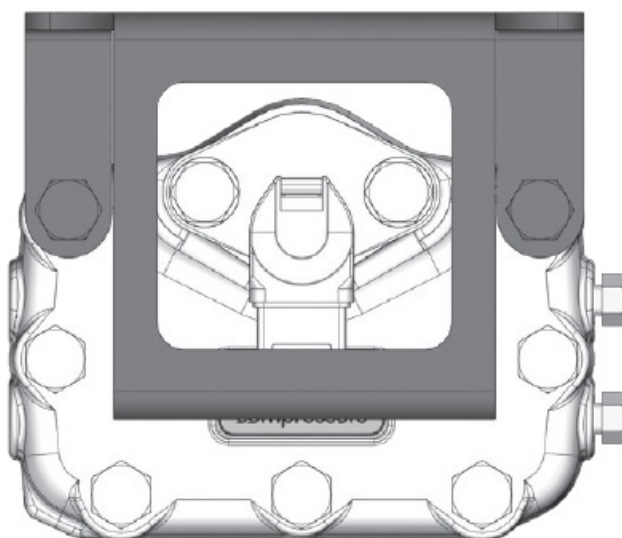


Fig. 19

## Technical data

Type	UL-HGX22e/ No. of cylinders	Displacement (1450, 1740 rpm)	Electrical data ③					Weight	Connections ④		Oil charge (ex works)	Oil charge (sight glass center)	Sound pressure level ⑤	
			Voltage ①	Max. operating current	Max. power consumption ②	Starting current (rotor locked)	permissible frequency range		Discharge line DV	Suction line SV			L / M / H	
													Δ / Y	Δ / Y
													V	A
125 ML 2	2	391 469	220-240 V Δ / 380-420 V Y - 3 - 50 Hz 265-290 V Δ / 440-480 V Y - 3 - 60 Hz	9.3 / 5.4	3.7 (5,0)	69 / 40	30 - 70	161	16 <sup>(5/8)</sup>	22 <sup>(7/8)</sup>	1.1 (39)	0.9 (32)	60 / 59 / 58	
125 S 3		391 469		10.8 / 6.2	4.4 (6,0)	69 / 40		161						
160 ML 2		483 579		11.1 / 6.4	4.5 (6,1)	69 / 40		161					61 / 60 / 59	
160 S 3		483 579		13.1 / 7.6	5.4 (7,3)	87 / 50		164						
190 ML 3		584 701		13.8 / 8.0	5.8 (7,9)	69 / 40		161					62 / 61 / 59	
190 S 4		584 701		16.2 / 9.4	6.8 (9,2)	87 / 50		164						

1. Tolerance ( $\pm 10\%$ ) relative to the mean value of the voltage range.
2. Other voltages and types of current on request.
  - The specifications for max. power consumption apply for 60Hz operation.
  - Take account of the max. operating current / max. power consumption for design of fuses, supply lines and safety devices. Fuse: Consumption category AC3
3. All specifications are based on the average of the voltage range.
4. For solder connections.

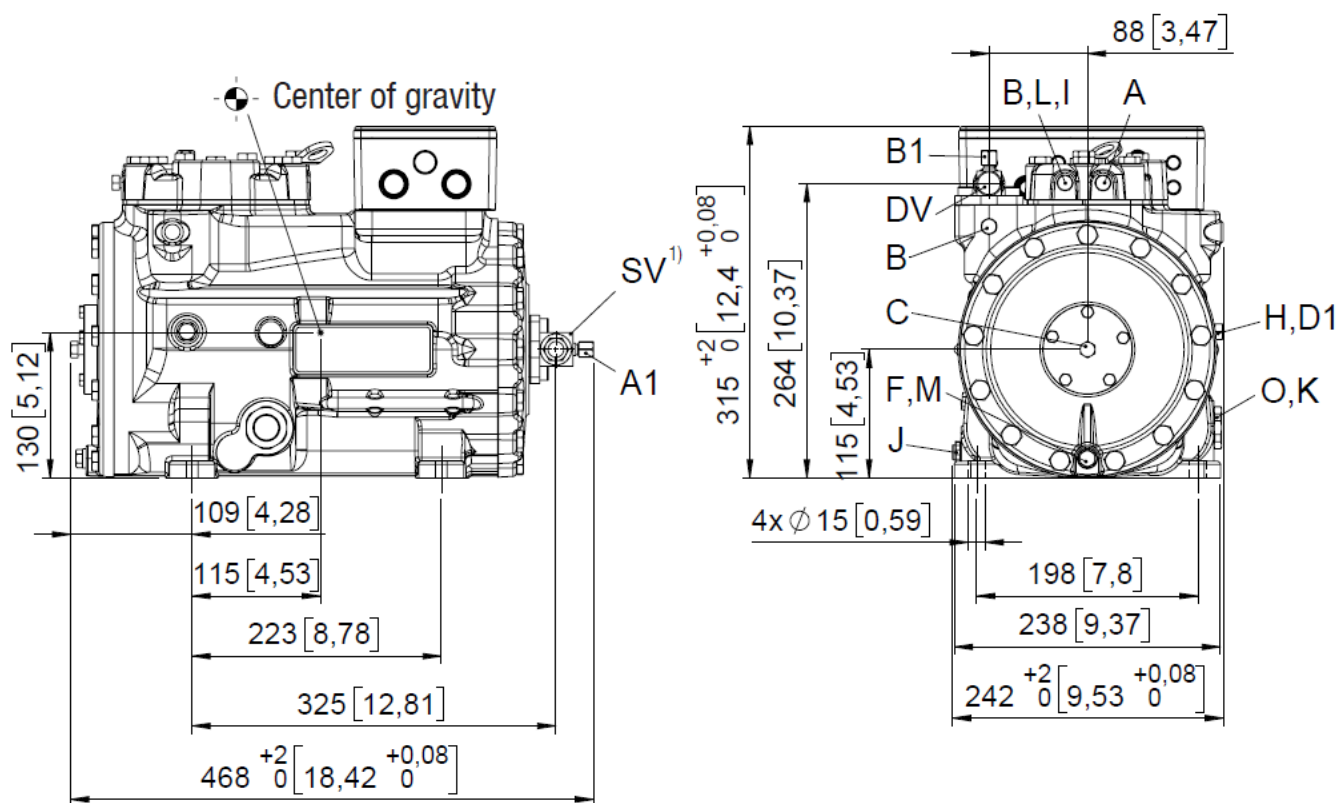


5. **L** = low temperature (-35/40 °C) (-31/104 °F), **M** = normal cooling (-10/5 °C) (14/41 °F), **H** = air conditioning (5/50 °C) (41/122 °F) sound pressure level measured in low reflection measuring area, measuring distance 1m.  
Compressor operation at 50 Hz (1450 rpm), refrigerant R404A. Values stated are average values, tolerance  $\pm 2$  dB(A).

Type	UL-HGX34e/	No. of cylinders	Displacement (1740 rpm)	Electrical data ③				Weight	Connections ④		Oil charge (ex works)	Oil charge (sight glass center)	Sound pressure level ⑤											
				Voltage ①	Max. operating current	Max. power consumption ②	Starting current (rotor locked)		permissible frequency range	Discharge line DV			Suction line SV	L / M / H										
														V	A	kW (HP)	A	Hz	lb	mm (inch)	mm (inch)	ltr (fl.oz)	ltr (fl.oz)	dB(A)
215 ML 3	4	665 798	220-240 V Δ / 380-420 V Y - 3 - 50 Hz 265-290 V Δ / 440-480 V Y - 3 - 60 Hz	14.0 / 8.1	5.8 (7,9)	87 / 50	25 - 70	201	22 (7/8)	28 (1 1/8)	1.3 (46)	1.1 (39)	62 / 59 / 58											
215 S 5		665 798		18.3 / 10.5	7.3 (9,9)	132 / 76		215					62 / 59 / 58											
255 ML 4		782 938		17.0 / 9.8	7.3 (9,9)	87 / 50		200					64 / 62 / 60.5											
255 S 6		782 938		21.1 / 12.2	8.7 (11,8)	132 / 76		214					64 / 62 / 60.5											
315 ML 5		965 1158		21.1 / 12.2	9.0 (12,2)	111 / 64		206					66 / 64 / 63											
315 S 7		965 1158		25.5 / 14.7	10.8 (14,7)	132 / 76		213					66 / 64 / 63											
380 ML 6		1168 1401		26.1 / 15.1	11.3 (15,4)	111 / 64		205					67 / 64.5 / 64											
380 S 9		1168 1401		31.2 / 18.0	13.4 (18,2)	132 / 76		212					67 / 64.5 / 64											

1. Tolerance ( $\pm 10\%$ ) relative to the mean value of the voltage range.
2. Other voltages and types of current on request.
  - The specifications for max. power consumption apply for 60Hz operation.
  - Take account of the max. operating current / max. power consumption for design of fuses, supply lines and safety devices.
  - Fuse: Consumption category AC3
3. All specifications are based on the average of the voltage range.
4. For solder connections.
5. **L** = low temperature (-35/40 °C) (-31/104 °F), **M** = normal cooling (-10/45 °C) (14/113°F),  
**H** = air conditioning (5/50°C) (41/122 °F) sound pressure level measured in low reflection measuring area, measuring distance 1m. Compressor operation at 50 Hz (1450 rpm), refrigerant R404A. Values stated are average values, tolerance  $\pm 2$  dB(A).

## Dimensions and Connections

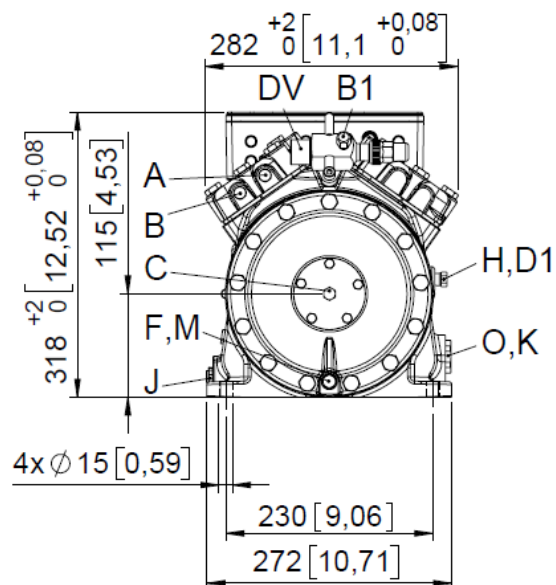
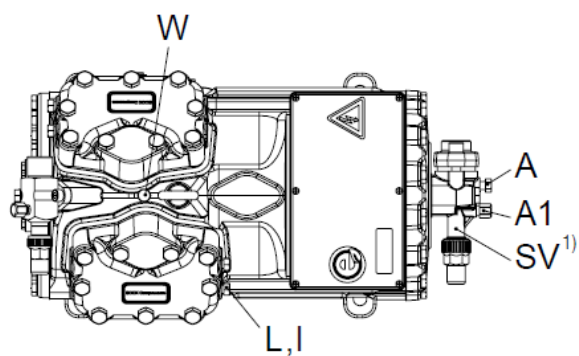
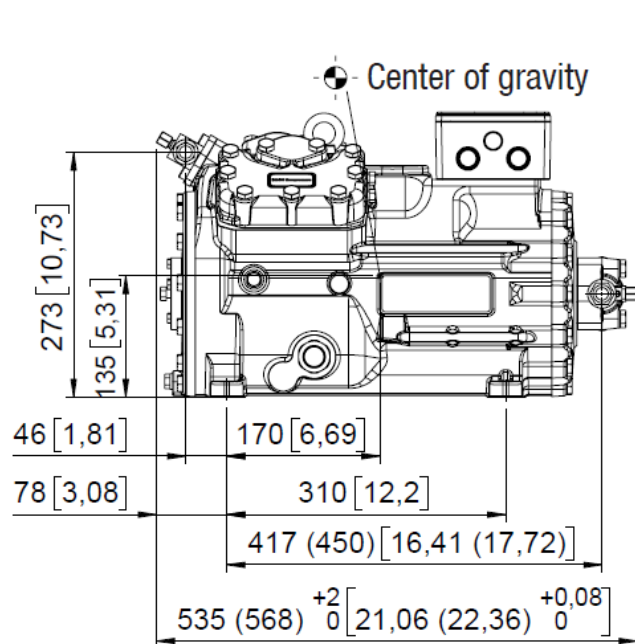


SV 90° rotatable

Dimensions in mm [inch]

Fig. 20

SV DV	Suction line	see technical data, Chapter 8 Discharge line	
<b>A</b>	Connection suction side, not lockable		1/8" NPTF
<b>A1</b>	Connection suction side, lockable		7/16" UNF
<b>B</b>	Connection discharge side, not lockable		1/8" NPTF
<b>B1</b>	Connection discharge side, lockable		7/16" UNF
<b>C</b>	Connection oil pressure safety switch		1/8" NPTF
<b>D1</b>	Connection oil return from oil separator		1/4" NPTF
<b>F</b>	Oil drain		M12 x 1.5
<b>H</b>	Oil charge plug		1/4" NPTF
<b>J</b>	Connection oil sump heater		3/8" NPTF
<b>I</b>	Connection hot gas temperature sensor		1/8" NPTF
<b>K</b>	Sight glass		1 1/8" - 18 UNEF
<b>L</b>	Connection thermal protection thermostat		1/8" NPTF
<b>M</b>	Oil filter		M12 x 1.5
<b>O</b>	Connection oil level regulator		1 1/8" - 18 UNEF



SV 90° rotatable  
Dimensions in mm [inch]

Fig. 21

<b>SV DV</b>	Suction line                      see technical data, Chapter 8 Discharge line	
<b>A</b>	Connection suction side, not lockable	1/8" NPTF
<b>A1</b>	Connection suction side, lockable	7/16" UNF
<b>B</b>	Connection discharge side, not lockable	1/8" NPTF
<b>B1</b>	Connection discharge side, lockable	7/16" UNF
<b>C</b>	Connection oil pressure safety switch	1/8" NPTF
<b>D1</b>	Connection oil return from oil separator	1/4" NPTF
<b>F</b>	Oil drain	M12 x 1.5
<b>H</b>	Oil charge plug	1/4" NPTF
<b>J</b>	Connection oil sump heater	3/8" NPTF
<b>I</b>	Connection hot gas temperature sensor	1/8" NPTF
<b>K</b>	Sight glass	1 1/8"- 18 UNEF
<b>L</b>	Connection thermal protection thermostat	1/8" NPTF
<b>M</b>	Oil filter	M12 x 1.5
<b>O</b>	Connection oil level regulator	1 1/8"- 18 UNEF
<b>W</b>	Connection for refrigerant injection	1/8" NPTF

## Declaration of incorporation

Declaration of incorporation for incomplete machinery in accordance with EC Machinery Directive 2006/42/EC, Annex II 1. B

- Manufacturer: Bock GmbH Benzstraße 7 72636 Frickenhausen, Germany
- We, as manufacturer, declare in sole responsibility that the incomplete machinery

Manufacturer: Bock GmbH  
Benzstraße 7  
72636 Frickenhausen, Germany

We, as manufacturer, declare in sole responsibility that the incomplete machinery

Name: Semi-hermetic compressor  
Types: HG(X)12P/60-4 S (HC) ..... HG(X)88e/3235-4(S) (HC)  
UL-HGX12P/60 S 0,7 ..... UL-HGX66e/2070 S 60  
HGX12P/60 S 0,7 LG ..... HGX88e/3235 (ML/S) 95 LG  
HG(X)22(P)(e)/125-4 A ..... HG(X)34(P)(e)/380-4 (S) A  
HGX34(P)(e)/255-2 (A) ..... HGX34(P)(e)/380-2 (A)(K)  
HA(X)12P/60-4 ..... HA(X)6/1410-4  
HAX22e/125 LT 2 LG ..... HAX44e/665 LT 14 LG  
HGX12e/20-4 (ML/S) CO<sub>2</sub> (LT) ..... HGX44e/565-4 S CO<sub>2</sub>  
UL-HGX12e/20 (S/ML) 0,7 CO<sub>2</sub> (LT) ... UL-HGX44e/565 S 31 CO<sub>2</sub>  
HGX12/20-4 (ML/S/SH) CO<sub>2</sub>T ..... HGX46/440-4 (ML/S/SH) CO<sub>2</sub> T  
UL-HGX12/20 ML(P) 2 CO<sub>2</sub>T ..... UL-HGX46/440 ML(P) 53 CO<sub>2</sub>T  
HGZ(X)7/1620-4 ..... HGZ(X)7/2110-4  
HGZ(X)66e/1340 LT 22 ..... HGZ(X)66e/2070 LT 35  
HRX40-2 CO<sub>2</sub> T H ..... HRX60-2 CO<sub>2</sub> T H  
  
Name: Open type compressor  
Types: F(X)2 ..... F(X)88/3235 (NH<sub>3</sub>)  
FK(X)1 ..... FK(X)3  
FK(X)20/120 (K/N/TK) ..... FK(X)50/980 (K/N/TK)  
  
Serial number: BC00000A001 – BN99999Z999

complies with the following provisions of the above-mentioned Directive:

According to Annex I, points 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.3, 1.3.7, 1.5.1, 1.5.2, 1.5.13 and 1.7.1 to 1.7.4 (excepted 1.7.4 f) are fulfilled.

Applied harmonised standards, in particular:

EN ISO 12100 :2010 Safety of machinery — General principles for design — Risk assessment and risk reduction  
EN 12693 :2008 Refrigerating systems and heat pumps — Safety and environmental requirements — Positive displacement refrigerant compressors

Remarks: We also declare that the special technical documentation for this incomplete machine has been created in accordance with Annex VII, Part B and we obligate to provide these upon reasoned request from the individual national authorities by data transfer.

Commissioning is prohibited until it has been confirmed that the machinery into which the incomplete machine above is to be incorporated complies with the EC Machinery Directive and an EC Declaration of Conformity, Annex II. 1. A exists.

Authorized person for compiling and handing over technical documentation:

Bock GmbH  
Alexander Layh  
Benzstraße 7  
72636 Frickenhausen, Germany

Frickenhausen, 04th of January 2021



i. A. Alexander Layh, Global Head of R&D

**Declaration of incorporation of partly completed machinery in accordance with UK Statutory Instrument Supply of Machinery (Safety) Regulations 2008, Annex II 1.**

Manufacturer: Bock GmbH  
Benzstraße 7  
72636 Frickenhausen, Germany



We, as manufacturer, declare in sole responsibility that the partly completed machinery

Name: Semi-hermetic compressor  
Types: HG(X)12P/60-4 S (HC) ..... HG(X)88e/3235-4(S) (HC)  
UL-HGX12P/60 S 0,7 ..... UL-HGX88e/3235 S 95  
HGX12P/60 S 0,7 LG ..... HGX88e/3235 (ML/S) 95 LG  
HG(X)22(P)(e)/125-4 A ..... HG(X)34(P)(e)/380-4 (S) A  
HGX34(P)(e)/255-2 (A) ..... HGX34(P)(e)/380-2 (A)(K)  
HA(X)22e/125-4 ..... HA(X)6/1410-4  
HAX22e/125 LT 2 LG ..... HAX44e/665 LT 14 LG  
HGX12e/20-4 (ML/S) CO<sub>2</sub> (LT) ..... HGX44e/565-4 S CO<sub>2</sub>  
UL-HGX12e/20 (S/ML) 0,7 CO<sub>2</sub> (LT) ... UL-HGX44e/565 S 31 CO<sub>2</sub>  
HGX12/20-4 (ML/S/SH) CO<sub>2</sub>T ..... HGX56/680-4 (ML/S/SH) CO<sub>2</sub> T  
UL-HGX12/20 ML(P) 2 CO<sub>2</sub>T ..... UL-HGX46/440 ML(P) 53 CO<sub>2</sub>T  
HGZ(X)7/1620-4 ..... HGZ(X)7/2110-4  
HGZ(X)66e/1340 LT 22 ..... HGZ(X)66e/2070 LT 35  
HRX40-2 CO<sub>2</sub> T H ..... HR(Z)X60-2 CO<sub>2</sub> T (H)(V)  
  
Name: Open type compressor  
Types: F(X)2 ..... F(X)88/3235 (NH<sub>3</sub>)  
FK(X)20/120 (K/N/TK) ..... FK(X)50/980 (K/N/TK)  
  
Serial number: BC00000A001 – BN99999Z999

complies with the following provisions of the above-mentioned Statutory instrument:

According to Schedule 2, part1, points 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.3, 1.3.7, 1.5.1, 1.5.2, 1.5.13 and 1.7.1 to 1.7.4 (excepted 1.7.4 f) are fulfilled.

Designated standards: EN ISO 12100 :2010 Safety of machinery — General principles for design — Risk assessment and risk reduction  
EN 12693 :2008 Refrigerating systems and heat pumps — Safety and environmental requirements — Positive displacement refrigerant compressors

Remarks: We also declare that the special technical documentation for this partly completed machine has been created in accordance with Annex II, 1. B and we obligate to provide these upon reasoned request from the individual national authorities by data transfer.

Commissioning is prohibited until it has been confirmed that the machinery into which the partly completed machine above is to be incorporated complies with the UK Statutory Instrument Supply machinery (Safety) regulations 2008 and an EC Declaration of Conformity, Annex II, 1. A exists.

Authorized representative for compiling and handing over technical documentation:

Danfoss LTD., 22 Wycombe End,  
HP9 1NB, GB

Frickenhausen, 19th of January 2024

i. A. Alexander Layh, Global Head of R&D

## UL-Certificate of Compliance

- Dear customer, the UL-Certificate of Compliance can be downloaded by the following QR-Code:  
<https://vap.bock.de/stationaryapplication/Data/DocumentationFiles/UL-Certificateofconformity.pdf>.

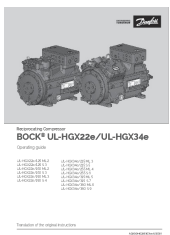
## CONTACT

- Danfoss A/S
- Climate Solutions
- [danfoss.us](http://danfoss.us)
- +1 888 326 3677
- [heating.cs.na@danfoss.com](mailto:heating.cs.na@danfoss.com)

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## Documents / Resources



[Danfoss UL-HGX22e-125 ML Reciprocating Compressor](#) [pdf] Installation Guide  
UL-HGX22e-125 ML, UL-HGX22e-125 ML Reciprocating Compressor, Reciprocating Compress  
or, Compressor

## References

- [🌐 bockshop.bock.de](https://bockshop.bock.de)
- [🌐 Danfoss - Engineering Tomorrow | Danfoss](#)
- [❄️ vap.bock.de](https://vap.bock.de)
- [🌐 Danfoss BOCK® Compressors: Eco-Friendly Solutions for Refrigeration Systems | Danfoss](#)
- **User Manual**

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