

Danfoss BOCK UL-HGX12e S CO2 Reciprocating Compressor



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Danfoss BOCK UL-HGX12e S CO2 Reciprocating Compressor



Product Specifications

- Model: UL-HGX12e/20 S, UL-HGX12e/30 S, UL-HGX12e/40 S, UL-HGX12e/50 S, UL-HGX12e/60 S, UL-HGX12e/75 S
- CO2 Capacity: 0.7 to 4

Product Usage Instructions

Electrical Connection

- Follow the instructions provided in the manual for proper electrical connection.
- This includes information on contactor and motor contactor selection, connection of the driving motor, circuit diagrams for direct start, electronic trigger unit setup, oil sump heater connection, and operating compressors with frequency converters.

Safety

- **Identification of Safety**

Instructions:

- Dangerous situations are marked to prevent fatal or serious injuries.

- **General Safety Instructions:**

- Refrigerating compressors are pressurized machines that require caution during handling.
- Avoid exceeding the maximum permissible overpressure even during testing.
- CO2 is a nonflammable, acidic gas heavier than air. Avoid releasing large amounts into closed spaces to prevent suffocation.

Technical Data

- Refer to the manual for detailed technical specifications including dimensions, connections, declaration of incorporation, and UL certification of compliance.

FAQ

- **Q:** Can CO₂ be used as a general substitute for F-gases?
- **A:** No, CO₂ applications require specific systems and controls and are not a universal replacement for F-gases.
- **Q:** What should be done in case of a dangerous situation while operating the compressor?
- **A:** Immediately follow the safety instructions provided in the manual to prevent any injuries or property damage.

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!

CO₂ applications require a completely new kind of system and control. They are not a general solution for the substitution of F-gases. Therefore, we expressly point out that all information in these assembly instructions has been provided according to our current level of knowledge and may change due to further development. Legal claims based on the correctness of the information cannot be made at any time and are hereby expressly excluded.

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.

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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 immediately 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

DANGER: Risk of accident.

Refrigerating compressors are pressurized machines and therefore require particular caution and care in handling. The maximum permissible overpressure must not be exceeded, even for testing purposes.

DANGER

- The danger of suffocation!
- CO₂ is a nonflammable, acidic, colourless and odourless gas and is heavier than air.
- Never release significant volumes of CO₂ or the entire contents of the system into closed rooms!
- Safety installations are designed or adjusted under EN 378 or appropriate national safety standards.

WARNING

Risk of burns!

- Depending on the operating conditions, surface temperatures of over 140°F (60°C) on the pressure side or below 32°F (0°C) on the suction side can be reached.
- Avoid contact with refrigerant under any circumstances. Contact with refrigerants can lead to severe burns and skin irritations.

Intended use

WARNING

The compressor may not be used in potentially explosive environments!

- These assembly instructions describe the standard version of the compressors 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 and 2014/68/EU Pressure Equipment Directive, outside the EU according to the respective national regulations and guidelines).
- Commissioning is only permissible if the compressors have been installed under these assembly instructions and the entire system into which they are integrated has been inspected and approved under legal regulations.
- The compressors are intended for use with CO₂ in transcritical and/or subcritical 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 must therefore only be performed by personnel with the qualifications listed below:

- e.g., a refrigeration technician or refrigeration mechatronics engineer.
- As well as professions with comparable training, which enable 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

- Semi-hermetic two-cylinder reciprocating compressor with suction gas-cooled drive motor.
- The flow of refrigerant sucked in from the evaporator is led over the engine and provides for particularly intensive cooling. Thus the engine can be kept special during high load on a relatively low temperature level.
- Oil pump independent of the direction of rotation for reliable and safe oil supply
- One decompression valve each on the low and high-pressure side, which vents into the atmosphere when these inadmissibly high printing pressures are reached.

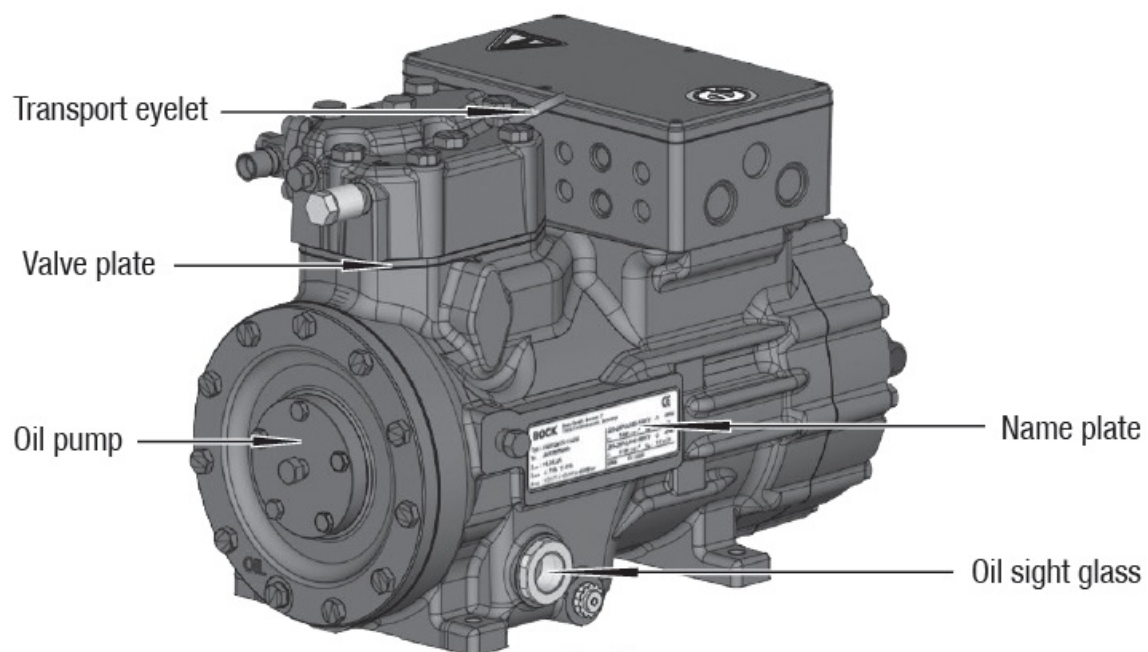


Fig. 1

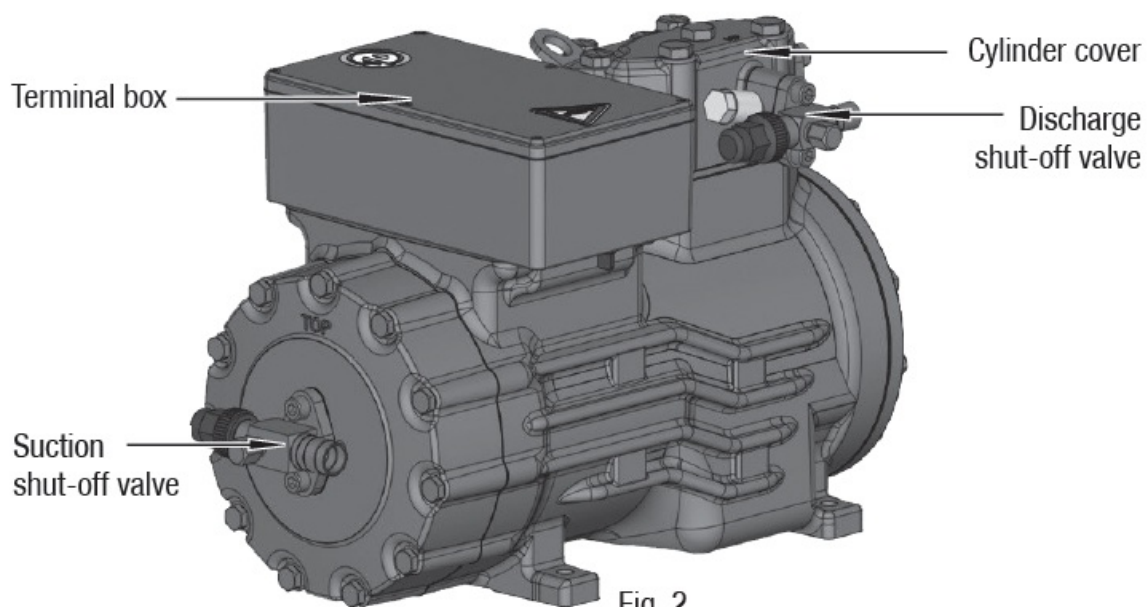


Fig. 2

Dimension and connection values can be found in Chapter 9

Nameplate (example)

BOCK		Bock GmbH, Benzstr. 7 72636 Frickenhausen, Germany		c [®] AL US CE	
				thermally protected system	
1	Type : UL-HGX12e/75 S 4 CO2	220-240VΔ/380-420VY -3- 50HZ		6	
2	No : AV33567A001	n : 1450 min ⁻¹ V _{th.} : 227 cfh		7	
3	I _{max} : 14,3/8,2A	265-290VΔ/440-480VY -3- 60HZ		8	
4	I _{block.} Δ: 71A Y: 41A	n : 1740 min ⁻¹ V _{th.} : 272 cfh		9	
5	p _{max} : LP/HP = 435/798 psig	IP66 Oil: BOCKlub E85		10	
				11	
				12	
				13	

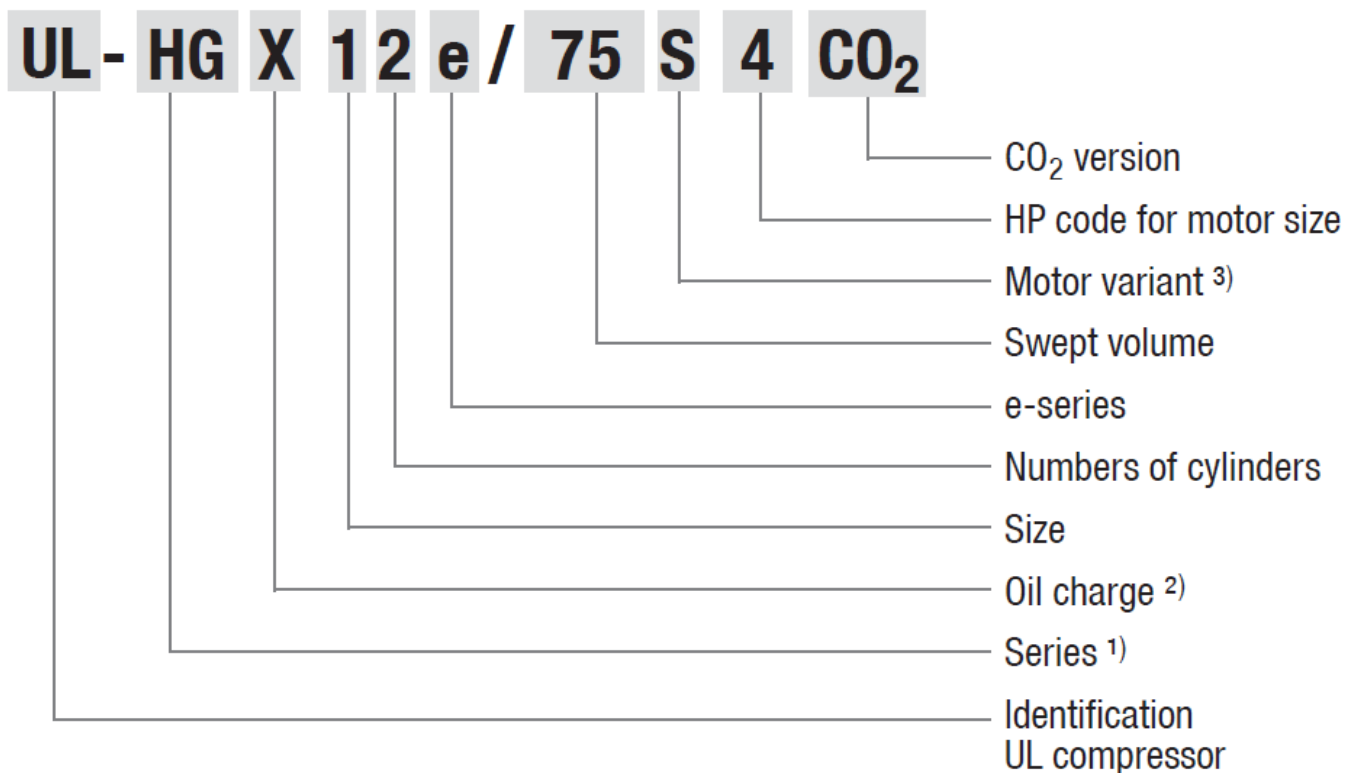
Fig. 3

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

Observe the limits of application diagrams!

Electrical accessories can change the IP protection class!

Type key (example)



1. HG – Hermetic Gas-Cooled (suction gas-cooled)
2. X – Ester oil charge
3. S – More powerful motor

Areas of application

Refrigerants

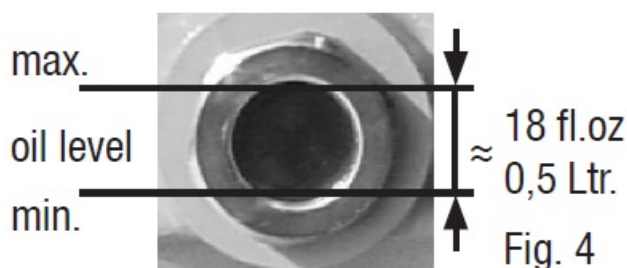
- CO₂: R744 (Recommendation CO₂ quality 4.5 (< 5 ppm H₂O))

Oil charge

- The compressors are filled at the factory with the following oil type:
- BOCK lub E85 (only these oils may be used)

NOTICE

- Property damage is possible.
- The oil level must be in the visible part of the sight glass; damage to the compressor is possible if overfilled or underfilled!



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. Observe the information given there.

- Permissible ambient temperature -4°F ... 140°F (-20 °C) – (+60 °C).
- Max. permissible discharge end temperature 320°F (160 °C).
- Min. discharge end temperature $\geq 122^{\circ}\text{F}$ (50 °C).
- Min. oil temperature $\geq 86^{\circ}\text{F}$ (30 °C).
- Max. permissible switching frequency 8x/h.
- A minimum running time of 3 min. steady-state condition (continuous operation) must be achieved.
- Avoid continuous operation in a limited range.

Max. permissible operating pressure (LP/HP)¹⁾: 435 / 798 psig (30/55 bar)


- 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 transportation



-  Storage at -22°F (-30°C) to 158°F (70°C) 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!

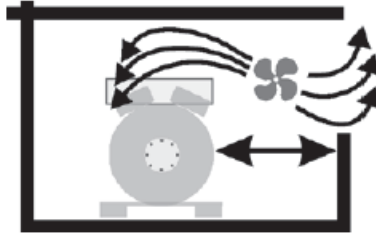
Setting up

NOTICE

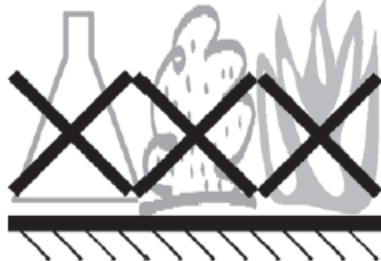
Attachments (e.g. pipe holders, additional units, fastening parts, etc.) directly to the compressor are not permissible!

- Provide adequate clearance for maintenance work.

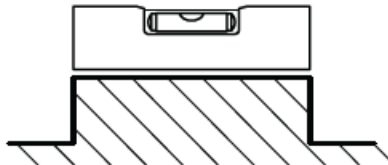
- Ensure adequate compressor ventilation.



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



- Setup on an even surface or frame with sufficient load-bearing capacity. Only erect on a slant in consultation with the manufacturer.
- Single compressor preferably on vibration damper.
- Duplex and parallel circuits are always rigid.



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



Pipe connections

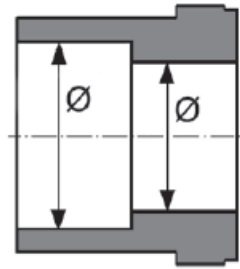
NOTICE

- Damage possible.
- 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).

Compressor assembly

- Material soldering/welding connection suction valve: S235JR
- Material soldering/welding connection discharge valve: P250GH
- 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**

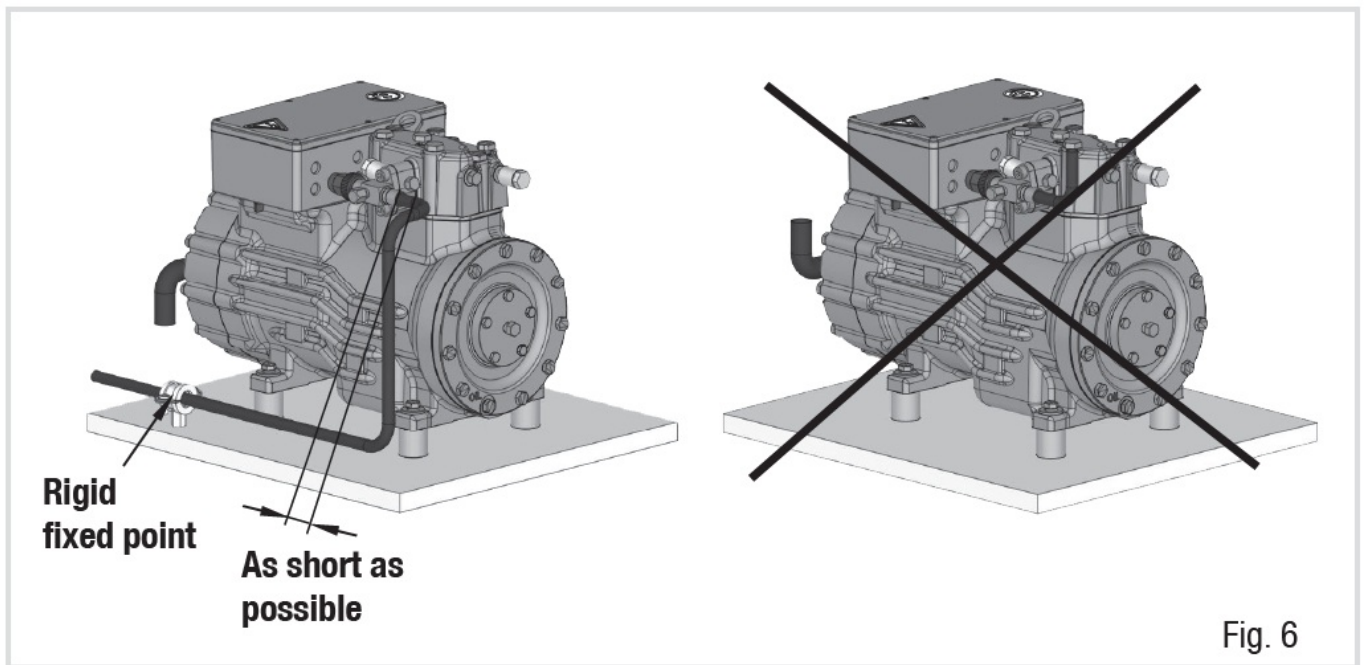
Pipes

- 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

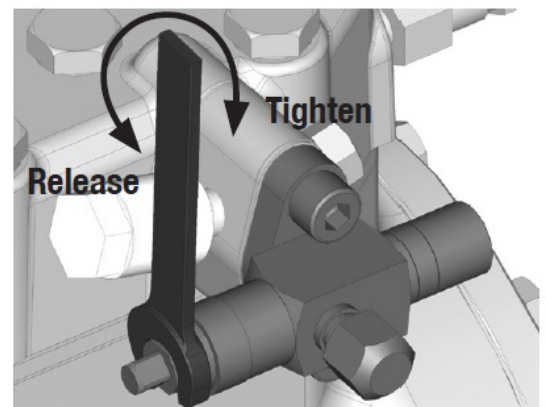
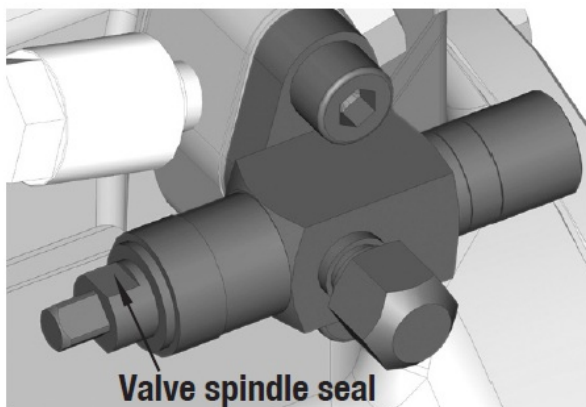
NOTICE

- Property damage is possible.
- 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. $\frac{1}{4}$ of a turn counter-clockwise.
- After activating the shut-off valve, re-tighten the adjustable valve spindle seal clockwise.



Operating mode of the lockable service connections

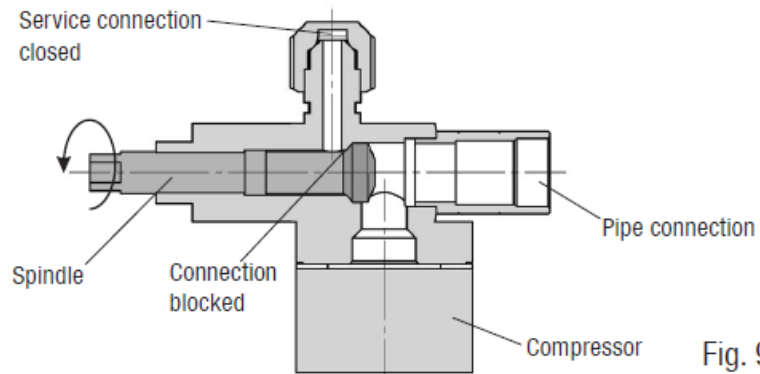


Fig. 9

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.

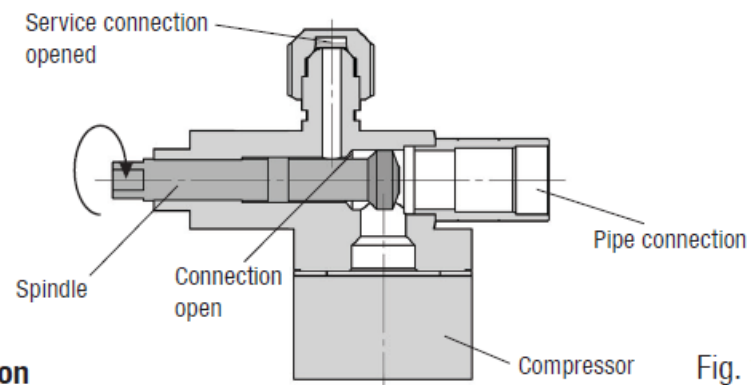


Fig. 10

Opening the service connection

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

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

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

Suction pipe filter

- 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).

Electrical connection

- **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 3x 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 reliefs 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

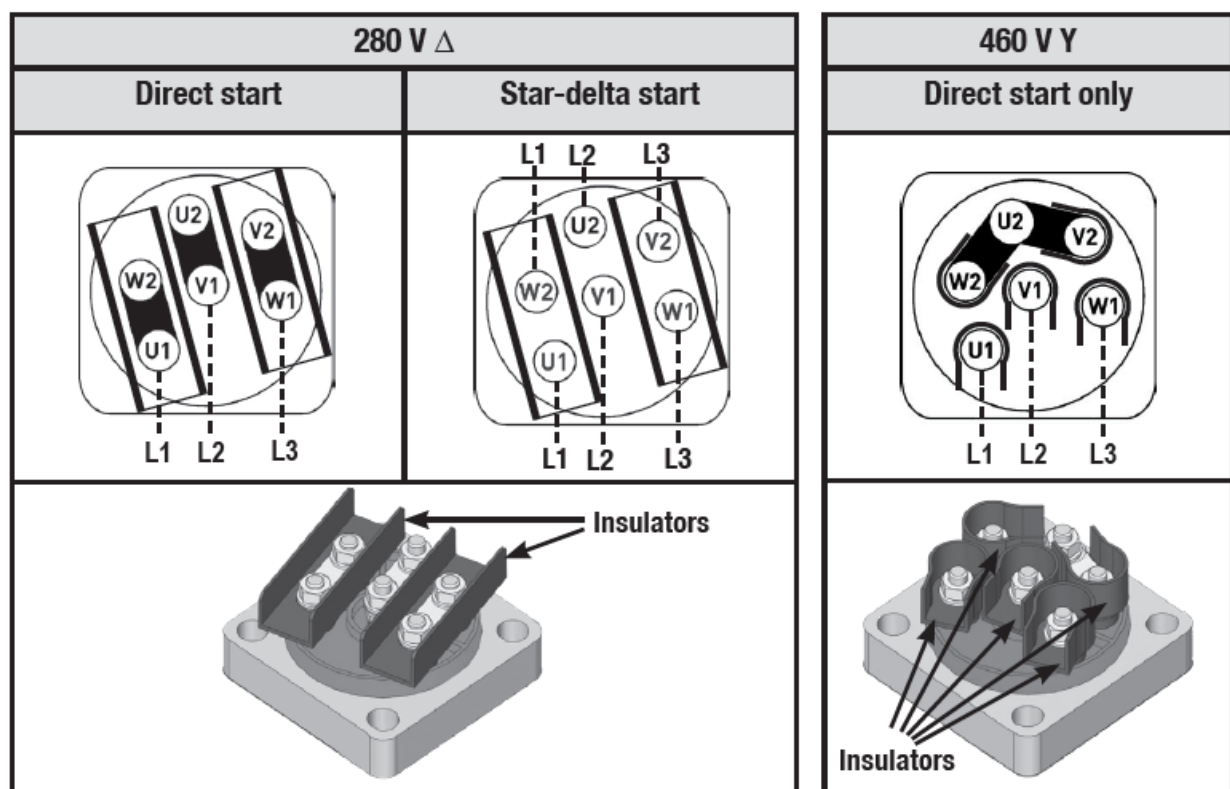
All protection equipment, switching and monitoring devices must comply with the local safety regulations and established specifications (e.g. VDE) as well as the manufacturer's specifications. Motor protection switches are required! Motor contactors, feed lines, fuses and motor protection switches must be rated according to the maximum operating current (see nameplate). For motor protection, use a current-independent, time-delayed overload protection device for monitoring all three phases. Adjust the overload protection device so that it must be actuated within 2 hours at 1.2 times the maximum working current.

Connection of the driving motor

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

Designation on the name plate
Δ / Y

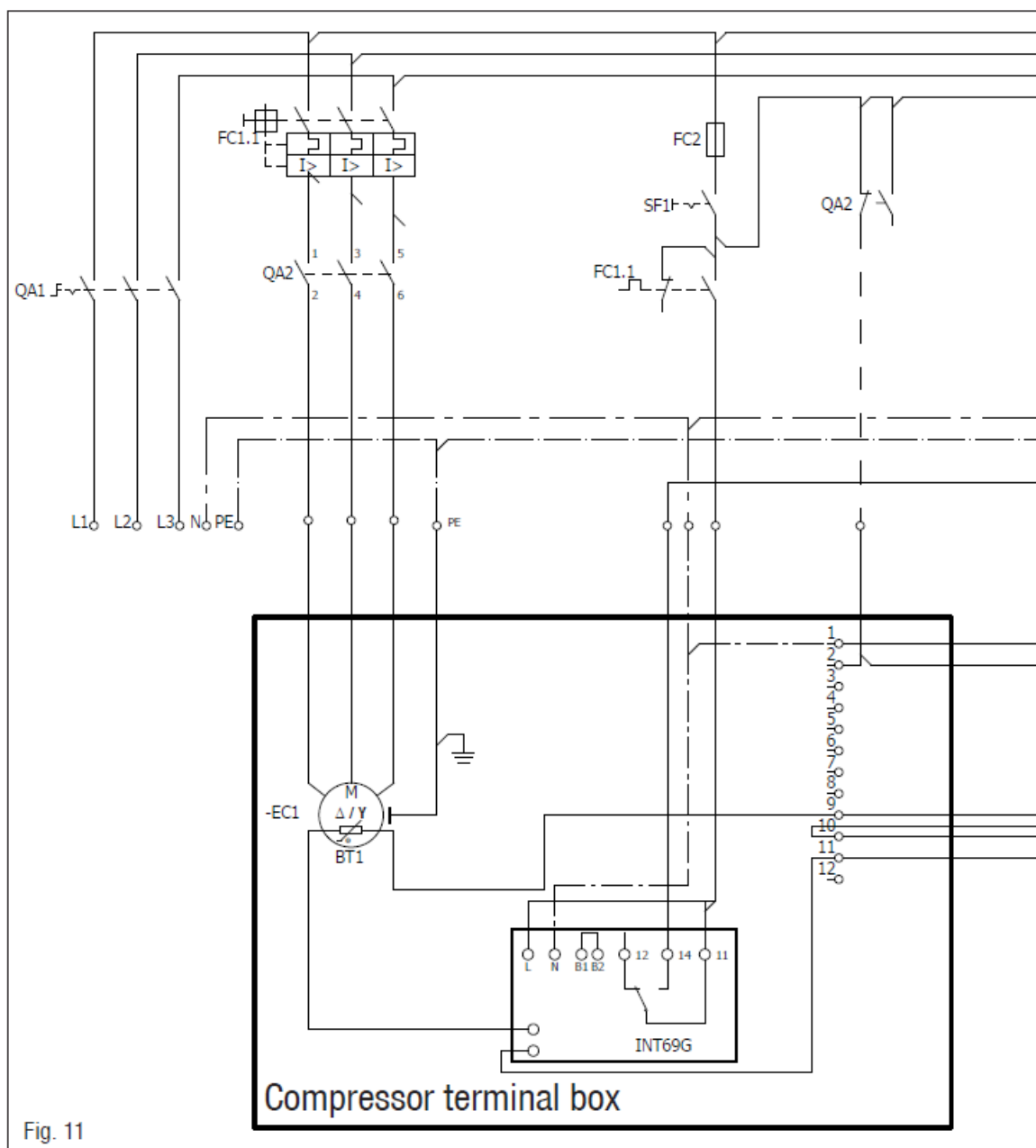
- Star-delta start-up is only possible for Δ (e.g. 280 V) power supply. Example:



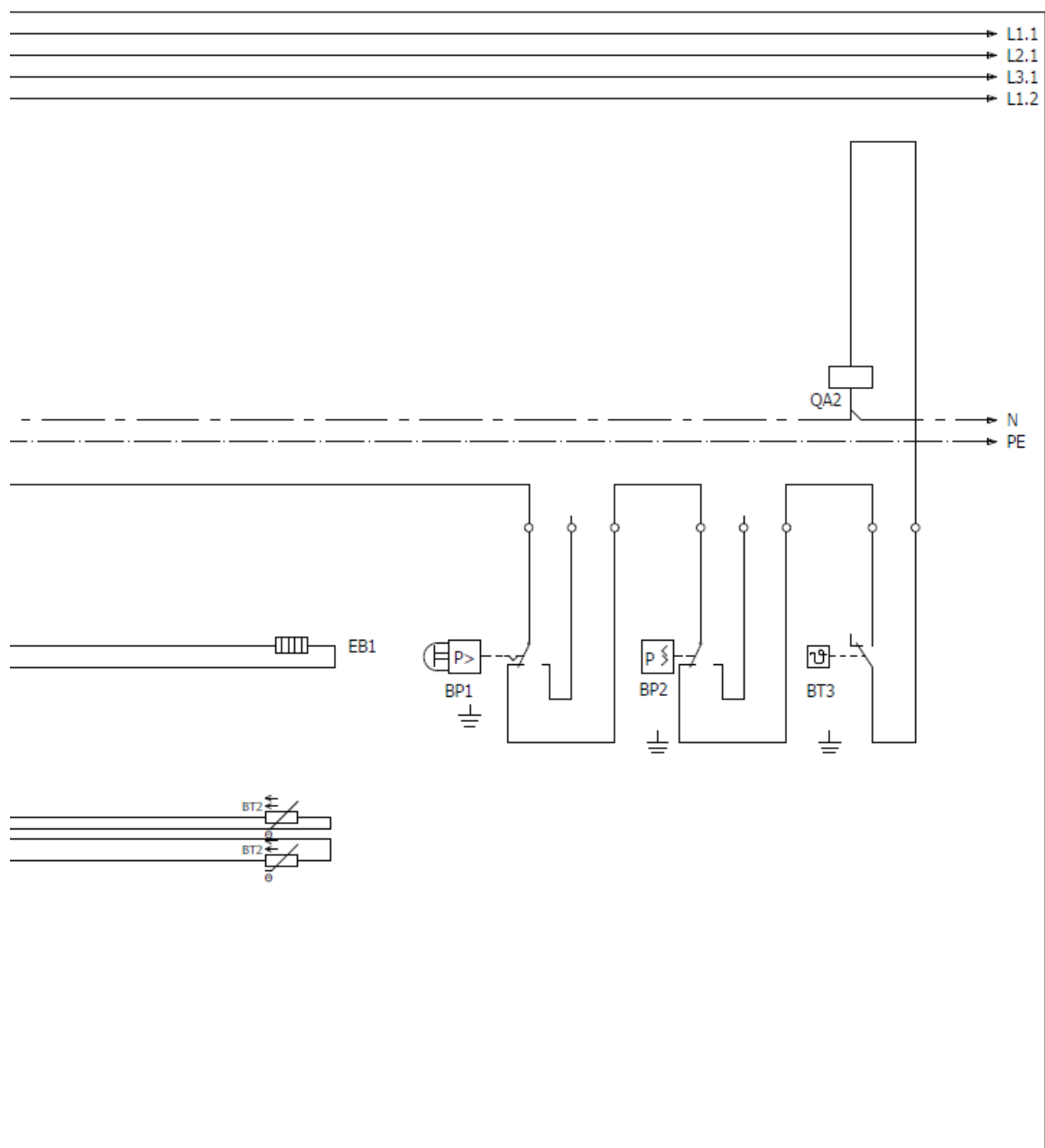
INFO

- The supplied insulators must be mounted according to the illustrations as shown.
- 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 280 V Δ / 460 V Y



BP1	High-pressure safety monitor
BP2	Safety chain (high/low-pressure monitoring)
BT1	Cold conductor (PTC sensor) motor winding
BT2	Thermal protection thermostat (PTC sensor)
BT3	Release switch (thermostat)
EB1	Oil sump heater
EC1	Compressor motor



FC1.1	Motor protection switch
FC2	Control power circuit fuse
INT69 G	Electronic trigger unit INT69 G
QA1	Main switch
QA2	Net switch
SF1	Control voltage switch

Electronic trigger unit INT69 G

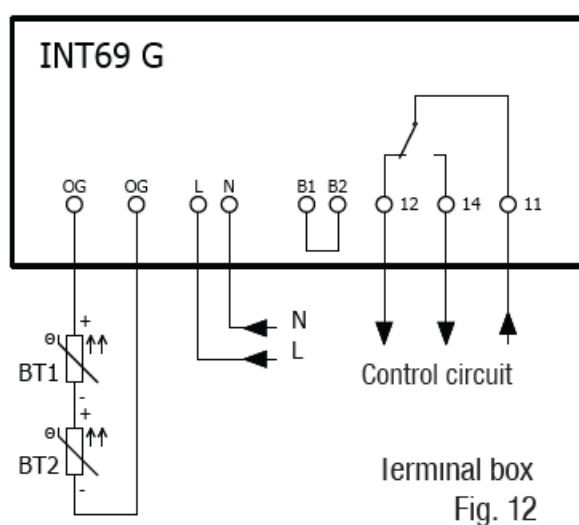
The compressor motor is fitted with cold conductor temperature sensors (PTC) connected to the electronic trigger unit INT69 G in the terminal box. In case of excess temperature in the motor winding, the INT69 G deactivates the motor contactor. Once cooled, it can be restarted only if the electronic lock 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 the 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 under 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 circuits 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.



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 gauge.

	Gauge state	Relay position
1.	Deactivated state	11-12
2.	INT69 G switch-on	11-14
3.	Remove PTC connector	11-12
4.	Insert PTC connector	11-12
5.	Reset after mains on	11-14

Relay position INT69 G

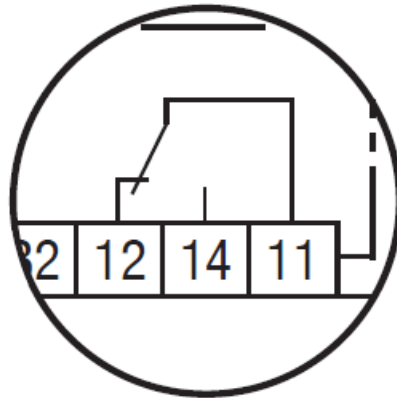


Fig. 13

Oil sump heater (accessories)

- In order to avoid damage to the compressor, the compressor must be equipped with an oil sump heater.

NOTICE: The oil sump heater must generally be connected and operated!

Connexion: 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. Electrical data: 115 V – 1 – 60 Hz, 65 – 135 W, PTC-heater adjusting.

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 160% 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 per the local safety regulations and common rules (e.g. VDE) and regulations as well as under the specifications of the frequency converter manufacturer

The permissible frequency range can be found in the technical data.

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

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

Commissioning

Preparations for start-up

- To protect the compressor against inadmissible operating conditions, high-pressure and low-pressure pressure switches 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

WARNING: When the compressor is not running, depending on ambient temperature and amount of refrigerant charge, the pressure may rise and exceed permitted levels for the compressor. Adequate precautions must be taken to prevent this happening (e.g. using a cold storage medium, a receiver tank, a secondary refrigerant system, or pressure relief devices).

Pressure strength 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 under UL-/CSAS standards or a corresponding safety standard without the inclusion of the compressor.

Leak test

- **DANGER:** Risk of bursting!
- The compressor must only be pressurised using nitrogen (N₂). Never pressurise with oxygen or other gases!
The maximum permissible overpressure of the compressor must not be exceeded at any time during the testing process (see nameplate 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 under UL-/CSA standards 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.
- Turn on the oil sump heater.
- Evacuate the suction and discharge pressure sides using the vacuum pump.
- At the end of the evacuation process, the vacuum should be < 6 mbar (0.09 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.

- Depending upon the design of the CO₂ refrigerant filling bottle (with/without tubing) CO₂ can be filled in liquid after weight or gaseously.
- Use only high-dried CO₂ quality (see Chapter 3.1)!
- Filling the liquid refrigerant: It is recommended that the system first be filled at a standstill with gas on the high-pressure side up to a system pressure of at least 75 psig (5.2 bar) (if it is filled below 75 psig (5.2 bar) with liquid, there is a risk of dry ice formation). Further filling according to the system.
- To eliminate the possibility of dry ice formation when the system is operating (during and after the filling process), the shut-off point of the low-pressure switch should be set to a value of at least 75 psig (5.2 bar).

WARNING: Never exceed the max. permissible pressures while charging. Precautions must be taken in time.

- A refrigerant supplement, which may become necessary after start-up, can be topped up in vapour form on the suction side.

NOTICE

- Avoid overfilling the machine with refrigerant!
- Do not charge liquid refrigerant into the suction side on the compressor.
- Do not mix additives with the oil and refrigerant.

Start-up

WARNING

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

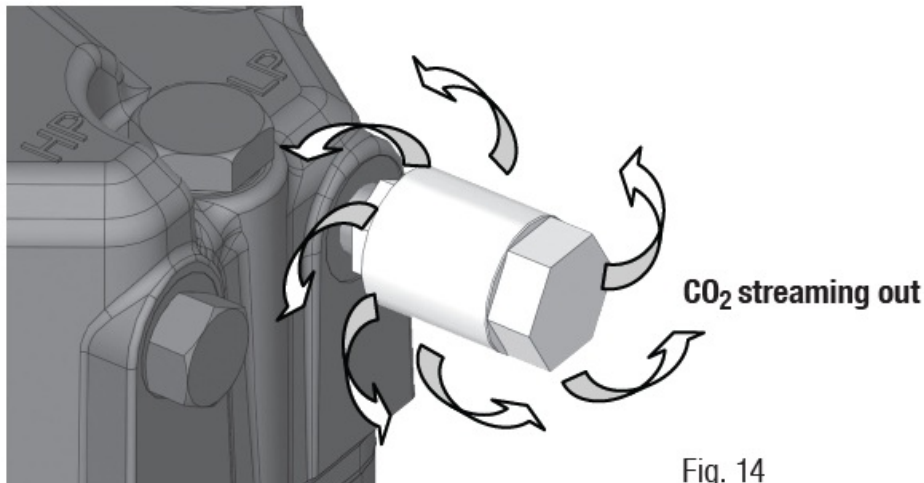
- Check that the safety and protection devices (pressure switch, motor protection, electrical contact protection measures, etc.) are functioning properly.
- Switch on the compressor and let it run for at least 1 minute at a frequency of at least 50 Hz. Only then may the speed of the compressor be reduced.
- The machine should reach a state of equilibrium.
- Check the oil level: The oil level must be visible in the sight glass.
- After a compressor is replaced, the oil level must be checked again. If the level is too high, oil must be drained off (danger of oil liquid shocks; reduced capacity of the refrigerating system).

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!

Pressure relief valves

NOTICE

- The compressor is fitted with two pressure relief valves. One valve each on the suction and discharge side. If excessive pressures are reached, the valves open and prevent further pressure increase.
- Thereby CO₂ is blown off to the ambient!
- In the event that a pressure relief valve activates repeatedly, check the valve and replace it if necessary as during blow-off extreme conditions can occur, which may result in a permanent leak. Always check the system for refrigerant loss after activation of the pressure relief valve!
- The pressure relief valves do not replace any pressure switches and the additional safety valves in the system. Pressure switches must always be installed in the system and designed or adjusted under EN 378-2 or appropriate safety standards.
- Failure to observe can result in the risk of injury from CO₂ streaming out of the two pressure relief valves!



Avoid slugging

NOTICE

Slugging can result in damage to 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 concerning output (particularly the evaporator and expansion valves).
- Suction gas superheat at the compressor input should be 15 K. (Check the setting of the expansion valve).
- Regard oil temperature and pressure gas temperature. (The pressure gas temperature has to be high enough min. 50°C (122°F), so the oil temperature is > 30°C (86°F)).
- The system must reach a state of equilibrium.
- Particularly in critical systems (e.g. several evaporator points), measures are recommended such as the replacement of liquid traps, solenoid valves in the liquid line, etc.
- There should be no movement of coolant whatsoever while the compressor is at a standstill.

Filter dryer

Gaseous CO₂ has a significantly lower solubility in water than other refrigerants. At low temperatures, it can therefore cause blocking of valves and filters due to ice or hydrate. For this reason, we recommend the use of an adequately sized filter drier and a sight glass with a moisture indicator.

Connection of oil level regulator

The connection "O" is provided for installing an oil level regulator. A corresponding adapter must be obtained from the trade.

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 the 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

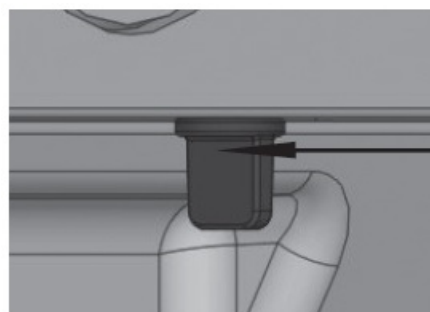
- not mandatory for factory-produced series systems.
- for field installations or when operating near the application limit: for the first time after 100 to 200 operating hours, then approx. every 3 years or 10,000 – 12,000 operating hours.
- Dispose of used oil according to the regulations; observe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

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

Condensate drainage

The terminal box has the option for Condensate drainage (see Fig. 15).

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



Condensate
drainage

Fig. 15

Recommended spare parts/accessories

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

Lubricants

For operation with CO₂, the BOCK lub E85 is necessary!

Decommissioning

Close the shut-off valves on the compressor. CO₂ does not need to be recycled and can therefore be blown off into the environment. It is essential to ensure good ventilation or conduct the CO₂ into the outdoors to avoid the danger of suffocation. When releasing CO₂, avoid a fast drop in pressure to prevent oil from exiting with it. If the compressor is unpressurized, remove the piping on the pressure and suction side (e.g. dismantling of the shut-off valve, etc.) and remove the compressor using an appropriate hoist. Dispose of the oil inside under the applicable national regulations. When decommissioning the compressor (eg. for service or replacement of the compressor) larger amounts of CO₂ in the oil can be set free. If the decompression of the compressor is not sufficient enough, closed shut-off valves may lead to intolerable excessive pressure. For this reason, the suction side (LP) and the high-pressure side (HP) of the compressor have to be secured by decompression valves.

Technical data

Type UL-HGXI2e/	No. of cylinders	Displacement 50 / 60 Hz (1450 / 1740 1/min)	Electrical data ③					Weight	Connections ④		Oil charge
			Voltage	Max. Operating current	Max. power consumption	Starting current (rotor locked)	Adjustable frequency range		Dis-charge line DV	Suction line SV	
			①	② Δ / Y	②	Δ / Y					
		cfh		A	kW (HP)	A	Hz	lb	mm (inch)	mm (inch)	Ltr.(fl.oz)
20 S 0,7 CO ₂	2	56 / 68	265-290 V Δ / 440-480 V Y - 3 - 60 Hz	4,0 / 2,3	1.5 (2)	24 / 14	30 - 70	100	12 (1/2)	16 (5/8)	0,8 (28)
30 S 1 CO ₂		91 / 109		6,0 / 3,5	2.2 (3)	40 / 23		106			
40 S 2 CO ₂		128 / 154		8,3 / 4,8	3.2 (4)	40 / 23		107			
50 S 3 CO ₂		160 / 192		9,7 / 5,6	4.0 (5)	43 / 25		108			
60 S 3 CO ₂		191 / 229		12,5 / 7,2	4.7 (6)	71 / 41		118			
75 S 4 CO ₂		225 / 270		14,3 / 8,2	5.7 (8)	71 / 41		117			

1. Tolerance (± 10%) relative to the mean value of the voltage range.

Other voltages and types of current on request.

2. The specifications for max. power consumption applies for 60Hz operation.

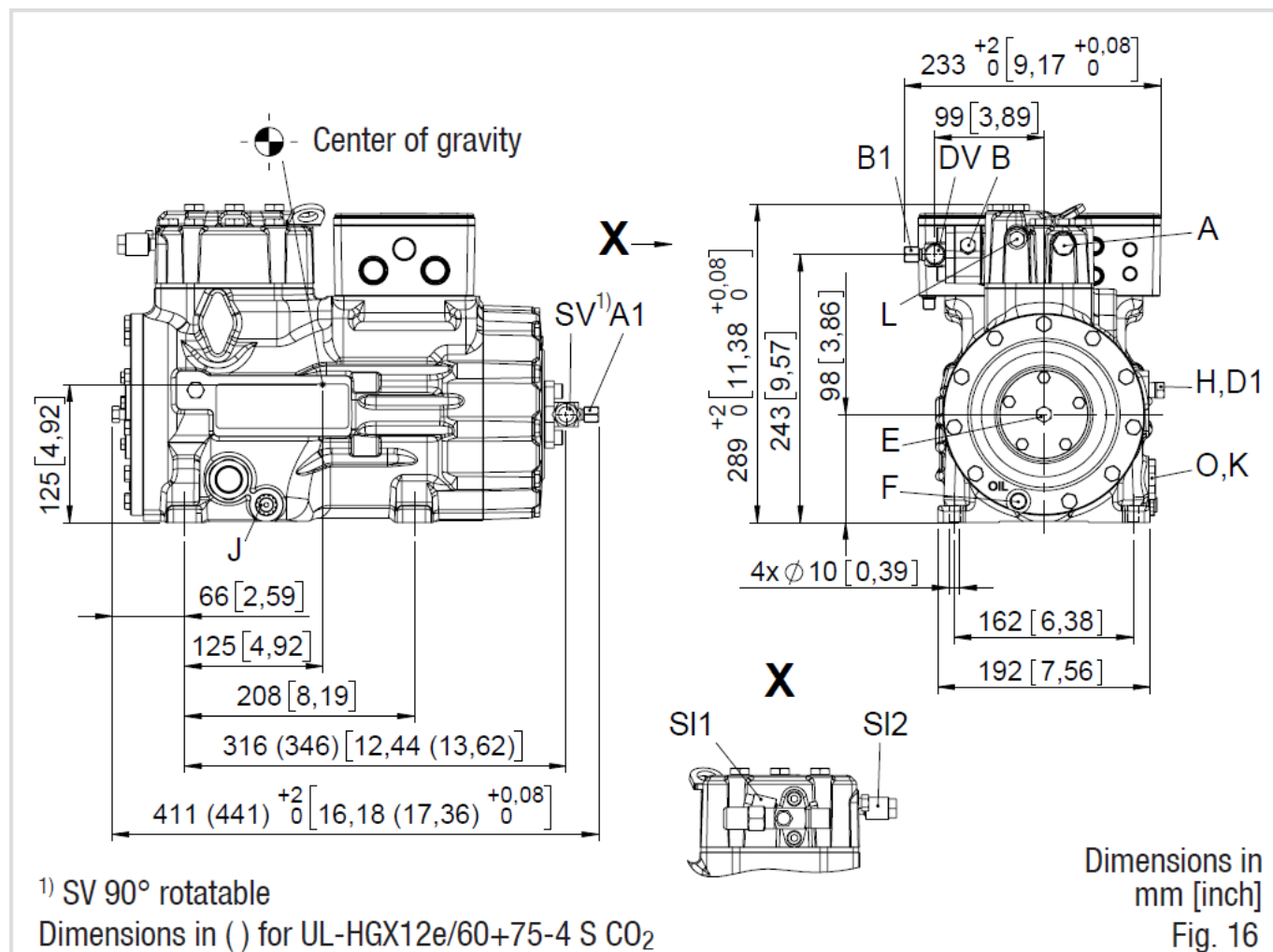
- Take account of the max. operating current / max. power consumption for the design of fuses, supply lines and safety devices.

- **Fuse:** Consumption category AC3

3. All specifications are based on the average of the voltage range

4. For solder connections

Dimensions and Connections



SV DV	Suction line see technical data, Chapter 8 Discharge line	
A*	Connection suction side, not lockable	1/8" NPTF
A1	Connection suction side, lockable	7/16" UNF
B	Connection discharge side, not lockable	1/8" NPTF
B1	Connection discharge side, lockable	7/16" UNF
D1	Connection oil return from oil separator	1/4" NPTF
E	Connection oil pressure gauge	1/8" NPTF
F	Oil filter	M8
H	Oil charge plug	1/4" NPTF
J	Connection oil sump heater	Ø 15 mm
K	Sight glass	1 1/8" - 18 UNEF
L	Connection thermal protection thermostat	1/8" NPTF
O	Connection oil level regulator	1 1/8" - 18 UNEF
SI1	Decompression valve HP	1/8" NPTF
SI2	Decompression valve LP	1/8" NPTF

Only with an additional adapter possible

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

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) CO₂ (LT) HGX44e/565-4 S CO₂
UL-HGX12e/20 (S/ML) 0,7 CO₂ (LT)... UL-HGX44e/565 S 31 CO₂
HGX12/20-4 (ML/S/SH) CO₂T..... HGX46/440-4 (ML/S/SH) CO₂ T
UL-HGX12/20 ML(P) 2 CO₂T..... UL-HGX46/440 ML(P) 53 CO₂T
HGZ(X)7/1620-4 HGZ(X)7/2110-4
HGZ(X)66e/1340 LT 22..... HGZ(X)66e/2070 LT 35
HRX40-2 CO₂ T H..... HRX60-2 CO₂ T H

Name: Open type compressor
Types: F(X)2 F(X)88/3235 (NH₃)
FK(X)1..... FK(X)3
FK(X)20/120 (K/N/TK)..... FK(X)50/980 (K/N/TK)

Serial number: BC00000A001 – BN999999Z999

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) CO₂ (LT) HGX44e/565-4 S CO₂
UL-HGX12e/20 (S/ML) 0,7 CO₂ (LT)... UL-HGX44e/565 S 31 CO₂
HGX12/20-4 (ML/S/SH) CO₂T..... HGX56/680-4 (ML/S/SH) CO₂ T
UL-HGX12/20 ML(P) 2 CO₂T..... UL-HGX46/440 ML(P) 53 CO₂T
HGZ(X)7/1620-4 HGZ(X)7/2110-4
HGZ(X)66e/1340 LT 22..... HGZ(X)66e/2070 LT 35
HRX40-2 CO₂ T H..... HR(Z)X60-2 CO₂ T (H)(V)

Name: Open type compressor
Types: F(X)2 F(X)88/3235 (NH₃)
FK(X)20/120 (K/N/TK)..... FK(X)50/980 (K/N/TK)

Serial number: BC00000A001 – BN999999Z999

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:

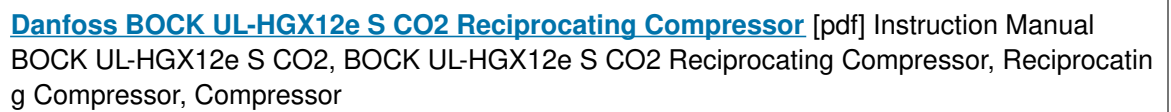
Danfoss LTD., 22 Wycombe End,
HP9 1NB, GB

Frickenhausen, 19th of January 2024

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

UL-Certificate of Compliance

- Dear customer, the Certificate of Compliance can be downloaded by the following QR-Code:
<https://vap.bock.de/stationaryapplication/Data/DocumentationFiles/COC.CO2.sub.pdf>



References

- bockshop.bock.de
- vap.bock.de
- [Danfoss BOCK® Compressors: Eco-Friendly Solutions for Refrigeration Systems | Danfoss](#)
- [User Manual](#)

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