



# **BOCK EX-HG Compressors** for explosion-risk environments

Semi-hermetic compressors  
for zone 1+2

# **BOCK**

colour the world  
of tomorrow

# Semi-hermetic compressors for explosion-risk environments

Use in zone 1+2

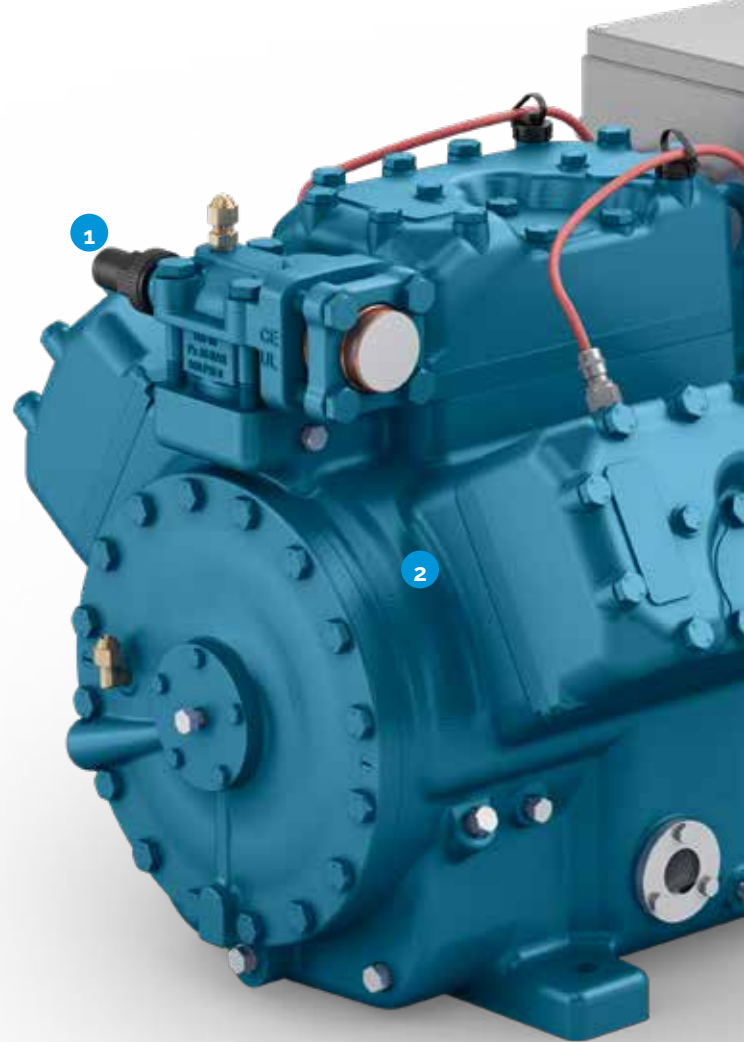
Electrical as well as mechanical devices operated in explosive atmospheres must fulfill what are known as ATEX (ATmospheres EXplosibles) or IECEx conditions. The system builder must use correspondingly labeled, conforming components for this type of use. Bock is the first European manufacturer to offer compressors conforming to the ATEX/IECEx requirements.

## Information on the compressors

The semi-hermetic Bock compressors of the HG model series are used as the basic compressor for use inside explosion-risk environments. Detailed descriptions and information on the standard compressors can be found in the brochure "Semi-hermetic Bock compressors" and online at [vap.bock.de](http://vap.bock.de).

Bock maintains a quality management system in accordance with EN 80079-34 conforming to the ATEX and IECEx requirements.

Our solutions are customer-oriented and user-friendly, because they are reliable, energy-efficient, durable and tailored to your specific needs.





## Differences to the standard compressor

- 1 Monitoring of all cylinder covers with special thermal protection thermostat (zone 1: in scope of supply)
- 2 Special coatings:
  - ESD coating (explosion sub-group IIC)
  - Polyurethane-free offshore paint (explosion sub-group IIB)
- 3 Classification of the compressor in temperature class T3
- 4 Special explosion-proof design of the electric components
- 5 Connection potential compensation
- 6 Special explosion-proof terminal box
- 7 Special explosion-proof accessories available



Electronic motor protection INT69 EX2 supplied separately for installation in the switchboard (outside the EX zone)



Safety barrier supplied separately for installation in the switchboard (outside the EX zone)

# BOCK EX-HG Compressors for explosion-risk environments

## Special features



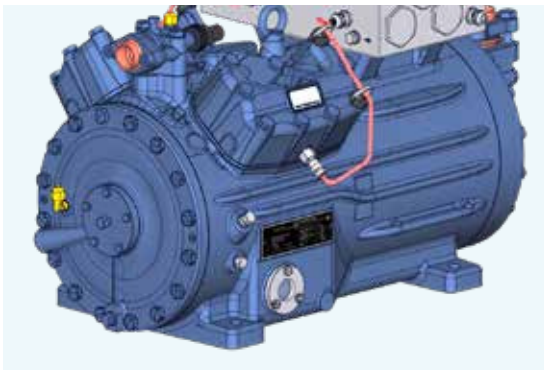
### Ambient temperature and power supply

- Permissible ambient temperature  $-20\text{ }^{\circ}\text{C}$  to  $+60\text{ }^{\circ}\text{C}$ .  
When a capacity regulator is used, the ambient temperature range can be partially limited
- All models are approved for power supplies of 400–690 V



### Oil sump heater

- Optional for all models
- Ex d heating element, self-regulating (EX-HG22-88)
- Ex d/e heating element, power-limited (EX-HG12)
- Oil sump heater generally required with HC compressor designs

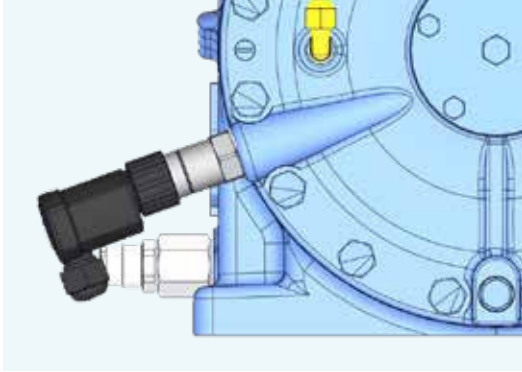


### Offshore coating

- Optional for all models
- Corrosion-resistant, multi-layered offshore coating, polyurethane-free (explosion sub-group IIB)

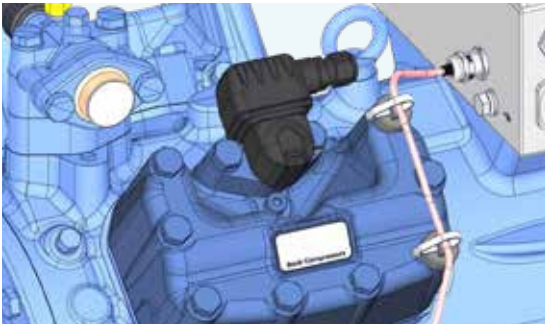
# BOCK EX-HG Compressors for explosion-risk environments

## Special features



### Oil differential pressure sensor (INT250 EX by Kriwan)

- Optional for EX-HG44, EX-HG56, EX-HG66 and EX-HG88



### Capacity regulator

- Optional for all 4-, 6- and 8-cylinder models



### COMPRESSOR SELECTION PROGRAM

Current information on technical data, performance data, operating limits and much more can be done online via the BOCK compressor selection program (VAP): [vap.bock.de](http://vap.bock.de)



# General Information on EX

## Explosion protection

According to the dictionary, an explosion is "a sudden expression of force that is based on the expansion efforts of gases and vapors." In explosions, temperature and pressure go up suddenly and mostly simultaneously. Values of above 2000 °C and above 10 bar can be reached thereby. The workers' compensation board of the chemical industry estimates that, on average, three small to medium explosions occur in Germany alone.

The danger of explosion exists in almost all process-technology systems: in the chemical and petrochemical industry, in mining, in oil and gas production. In many branches, combustible gases, vapors and mists are created in production processes, machining, transportation and storage (e.g. paint shops, refineries, chemical companies, research operations, hydrogen production).

For a potentially explosive atmosphere to exist, oxygen and combustible materials must normally be present in a corresponding mix ratio. To cause an explosion, all that is needed is a corresponding ignition source. We immediately think of open flames, hot surfaces, and visible electrical or mechanical sparks.

But even the discharges of static electricity (e.g. even with very low ignition energies from the workers' clothing), electrical compensating currents, ultrasound, electromagnetic radiation, shock waves, and adiabatic compression can trigger explosions. The origins of the rules for prevention of explosion hazards go back to mining. With the expansion of electricity, electrical explosion protection then developed more and more. Today, explosion protection in Europe is regulated by a European guideline (ATEX) and in most of the rest of the world by IECEx.

## General protection principles for EX areas

- 1) The safest systems are those in which the possibility of forming explosive atmospheres is excluded in advance. Primary explosion protection means, for example, the use of non-combustible replacement materials. But prevention of corresponding mixtures through additional ventilation or changes in concentration are also possibilities.
- 2) Unfortunately, the primary explosion protection is often not possible in practice. Therefore, avoidance of potentially explosive atmospheres is necessary in such cases as secondary explosion protection. This occurs through the use of corresponding devices, components and materials. But corresponding instructions and procedures must be observed for work in such areas as well.
- 3) As the last measure, all that remains is to limit the effects of an explosion to a harmless level. This can be done, for example, through appropriate encapsulating or through the choice of where to set it up.

# BOCK EX-HG Compressors for explosion-risk environments

## General information

### General measures for potentially explosive areas

- The operator must create an explosion protection document
- Employers must instruct employees sufficiently and appropriately regarding explosion protection
- Before starting work, a written work release by the operator is required for dangerous activities
- Potentially explosive areas must be marked with warning signs at their access points
- Sources of ignition (smoking, open fire, soldering, ...) must be prohibited
- Unauthorized persons must be prohibited by clear and permanently recognizable signs
- Tools must meet the requirements for EX protection
- The tests and inspections specified in the explosion protection document and operating instructions must be performed and logged as specified
- Systems with defects cannot be operated

### Zone classification

An evaluation of explosion risks by the operator is also included in preparing a so-called explosion protection document. A zone classification must be performed accordingly.

Potentially explosive areas are divided into zones and labeled accordingly, depending on the frequency and duration of the occurrence of explosive atmospheres:

#### Zone 0

Explosive atmospheres are present constantly or frequently over long periods of time.

#### Zone 1

Explosive atmospheres are occasionally present in normal operation.

#### Zone 2

Explosive atmospheres are not present or only briefly present in normal operation.

### Example of zone classification for gases, vapors and mists

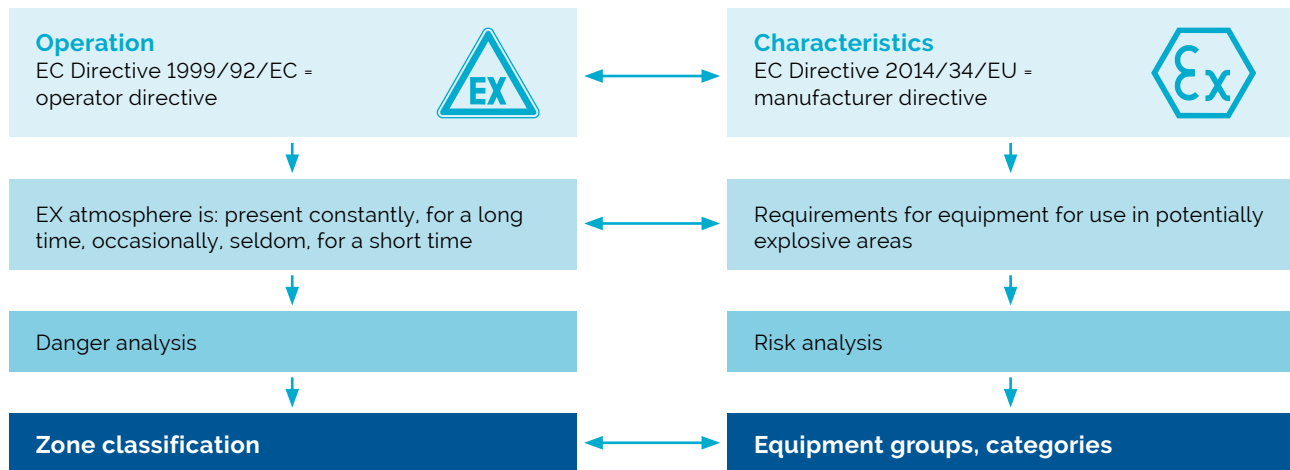


# What is ATEX?

To create uniform minimum standards Europe-wide, the so-called ATEX Directive (ATEX is derived from the French ATmosphères EXplosibles) was created. Despite a seven-year transition period, many were surprised when it became mandatory on July 1, 2003. ATEX now includes

dust explosion protection, which was previously neglected in many national regulations, as well as mechanical explosion protection. And so today, even non-electric equipment (mechanical components) must be tested or at least evaluated.

## ATEX general conditions in EU explosion protection



### 1. EC Directive 1999/92/EC (ATEX 137)

This contains the "minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres". There, requirements are established especially for workplaces, such as:

- The creation of explosion-protection documents with a comprehensive risk evaluation
- Zone classification (zone 0, 1, 2, 20, 21, 22) and labeling
- Safety measures
- Requirements for workers
- Rules for work approval and authorization of work
- Equipment selection

This directive is therefore oriented primarily on the operators. This ATEX directive took effect on January 28, 2000. Existing workplaces must meet the new requirements since the end of the transition period on June 30, 2006.



# BOCK EX-HG Compressors for explosion-risk environments

## General information

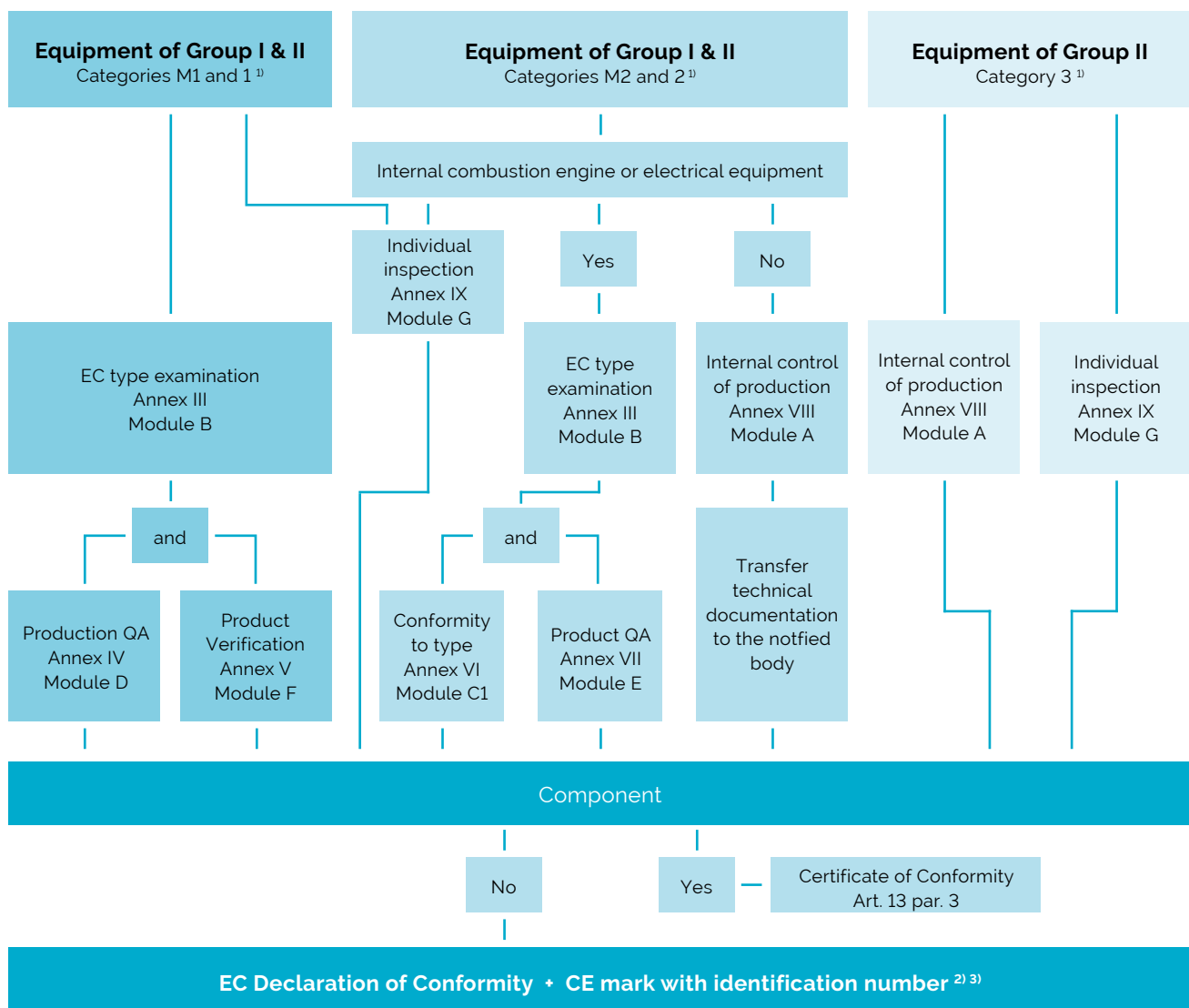
### 2. EC Directive 2014/34/EU

This directive establishes the requirements for the products used in potentially explosive areas. These are:

- o Equipment and protected systems for intended use in potentially explosive areas
- o Safety, control and regulation devices that contribute to safe operation of the equipment and protective systems
- o All electrical, mechanical, hydraulic and pneumatic equipment with its own source of ignition

This directive is oriented primarily on the manufacturers. It has replaced the EC Directive 94/9/EC since April 20, 2016. The 94/9/EC directive has been mandatory since July 1, 2003, and does not differ significantly from the now valid directive 2014/34/EU. The certificates issued under the 94/9/EC directive remain valid without restriction.

### ATEX conformity evaluation procedure for devices, including their fixtures and components



<sup>1)</sup> And their components, when separately certified.

<sup>2)</sup> Identification of the notified body that certified the QA system or checked the products.

<sup>3)</sup> CE mark without identification number for Annex VIII (Module A).

Source: BARTEC 'Basic concepts for explosion protection'

# What is IECEx?

The physical and chemical principles for occurrence of explosions, like the technical and organizational processes and measures that can be used to avoid explosion hazards, are valid worldwide, despite slight differences.

It therefore makes sense to subject the approval conditions for electrical devices to a worldwide set of rules and so promote global free trade in goods through certificates that are country- or region-neutral. As part of this, the IEC has set up a procedure whose target is precisely this uniformity: The IEC-Ex system.

The International Electrotechnical Commission (IEC) is responsible for worldwide standards in the electrotechnical area. IEC publications that discuss explosion protection of electrical devices and systems are worked out by the Technical Committee TC31 and are equivalent to recommendations. The requirements for gas-explosion-endangered areas and for areas with combustible dust are treated in the IEC 60079 series of standards.

Worldwide, there are numerous recognized IECEx certification offices (ExCB = certification body) and correspondingly many recognized IECEx test laboratories (ExTLs) that are accredited according to high, uniform standards and are monitored regularly.

For IECEx, a certificate is awarded only when the type inspections on test samples have passed and the presence of an effective quality management system has been proved by audit. But there are currently still regional and national approval processes everywhere in the world that have to be considered, such as the ATEX directive in the European Union area or national certifications in the USA (UL, FM).

But these national regulations can deviate from these standards. For this reason, the extent to which the IEC standards can be used in the individual countries must be investigated.

## IECEx conformity

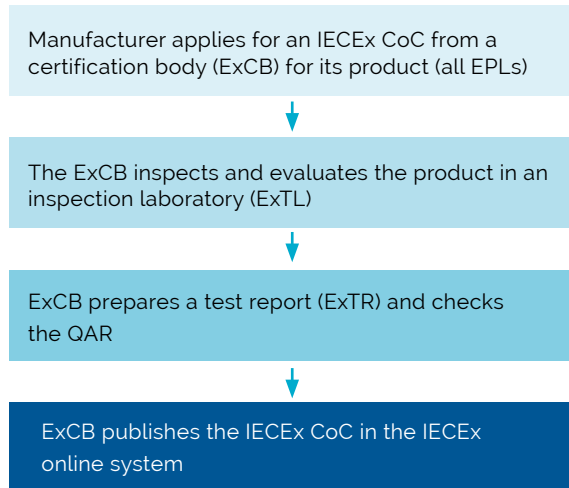
The IECEx system establishes the process for evaluation and certification of electrical devices for use in Ex areas. All devices of a certification body must be checked, regardless of the level of device protection. The result is summarized in a technical report. At the same time, the

manufacturer must have its quality management system checked and audited by a certification body. In combination with the manufacturer's audit for quality monitoring (QAR), IEC issues a certificate of conformity (CoC) through an authorized certification body.

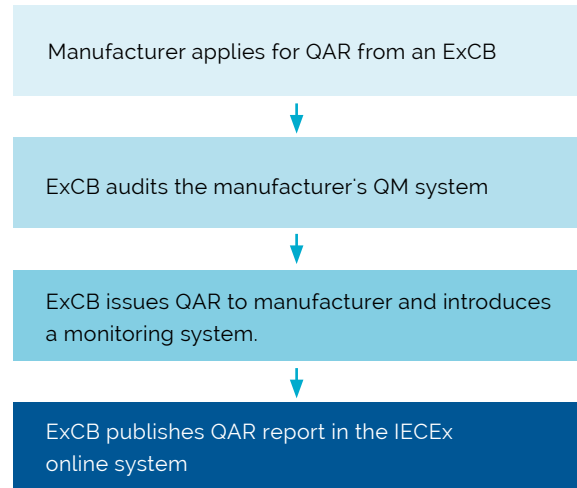
# BOCK EX-HG Compressors for explosion-risk environments

## General information

### IECEX conformity certificate (IECEX CoC)



### Recognized quality management system (QAR)



**ExCB** (Ex Certification Body)  
Subject to audit; issues QAR and CoC

**ExTL** (Ex Testing Laboratory)  
Subject to audit; checks compliance with the IEC standards

**ExTR** (IECEX Test Report)  
Prepared by ExTL on the basis of uniform forms, approved by ExCB

**QAR** (IECEX Quality Assessment Report)  
Issued by ExCB following the audit of the manufacturer's QMS

**CoC** (IECEX Certificate of Conformity)  
Design corresponds to IEC standards (ExTR); Production takes place with recognized QMS (QAR)



### COMPRESSOR SELECTION PROGRAM

Current information on technical data, performance data, operating limits and much more can be done online via the BOCK compressor selection program (VAP): [vap.bock.de](http://vap.bock.de)

# Comparison of ATEX and IECEx systems

<b>Certification</b>	<b>ATEX</b> Legally required in the EU	<b>IECEx</b> Voluntary in the EU Varied acceptance worldwide
Testing and conformity of <b>electrical devices</b>	<p><b>Device category 1 and 2</b></p> <ul style="list-style-type: none"> <li>• Recognized QA sQS-System</li> <li>• EC type examination certification</li> <li>• EU Declaration of Conformity</li> <li>• CE mark</li> </ul>	<p><b>Device category 3</b></p> <ul style="list-style-type: none"> <li>• Internal production control</li> <li>• EU Declaration of Conformity</li> <li>• CE mark</li> </ul>
		<p><b>Equipment protection level (EPL a, b, c)</b></p> <ul style="list-style-type: none"> <li>• Quality Assessment Report (QAR)</li> <li>• Test Report (ExTR)</li> <li>• Certificate of Conformity (CoC)</li> </ul>
Testing and conformity of <b>non-electrical devices</b>	<p><b>Device category 1</b></p> <ul style="list-style-type: none"> <li>• Recognized QA system</li> <li>• EC type examination</li> <li>• EU Declaration of Conformity</li> <li>• CE mark</li> </ul>	<p><b>Device category 2<sup>1)</sup> and 3</b></p> <ul style="list-style-type: none"> <li>• Internal production control</li> <li>• EU Declaration of Conformity</li> <li>• CE mark</li> </ul> <p><sup>1)</sup> Submission of the technical documentation to a notified body</p>
		<p><b>Equipment protection level (EPL a, b, c)</b></p> <ul style="list-style-type: none"> <li>• Quality Assessment Report (QAR)</li> <li>• Test Report (ExTR)</li> <li>• Certificate of Conformity (CoC)</li> </ul>
<b>Certificates</b>	Manufacturer (often online)	IECEx online database
<b>Repair facilities</b>	No EU-certified workshops (regulated on a national level)	Certified Service Facilities
<b>Service personnel</b>	No EU-certified persons (regulated on a national level)	Certified Competent Persons
<b>Zone classification</b>	No EU-certified bodies (regulated on a national level)	Certified Service Facilities (in progress)

Source: BARTEC 'Basic concepts for explosion protection'

# BOCK EX-HG Compressors for explosion-risk environments

## General information

### What does this mean for refrigerating systems?

Equipment in explosive atmospheres must fulfill the EX conditions.

Referred to, all electrical and mechanical devices must be considered in accordance with the EX directives.

Devices are defined as: machines, tools, stationary or movable fixtures, control and equipment parts as well as warning and prevention systems that, individually or combined, are intended for generation, transfer, storage, measurement, regulation and conversion of energy and/or for processing of materials that have their own potential ignition sources and so can cause an explosion.

Thus almost all components (compressors, evaporators and condensers – but also valves, manometers, sensors,...) of a refrigerating plant must be looked at and evaluated.

The operator will undertake a corresponding zone classification. This must be recorded in the explosion protection document.

For explosion protection reasons all material characteristics have to be declared. The results of this are the requirements for the components to be used (group, category, gas group, temperature class).

### Combustible refrigerant

If no special protective measures are taken for refrigeration or air conditioning systems with refrigerant in safety group A2, or especially with refrigerant in safety group A3, it must be expected that an explosive atmosphere can occur at least temporary, e.g. due to leaks, filling, repair or maintenance work. Accordingly, a zone

Accordingly, the system builder must use correspondingly labeled components equipped with the required documentation (e.g. manufacturer or conformity declaration).

The declarations of the component manufacturer only refer to the product itself.

It is thereby assumed that the applicable installation standards and mounting and operating instructions are followed during installation and operation.

As most manufacturers offer serial products for diverse application ranges, only the product itself can be evaluated.

The system builder must evaluate the interactions with other devices and components of the system and with the surroundings, especially regarding potential ignition sources.

If the result is positive, the system builder must make a corresponding declaration for the equipment group or system.

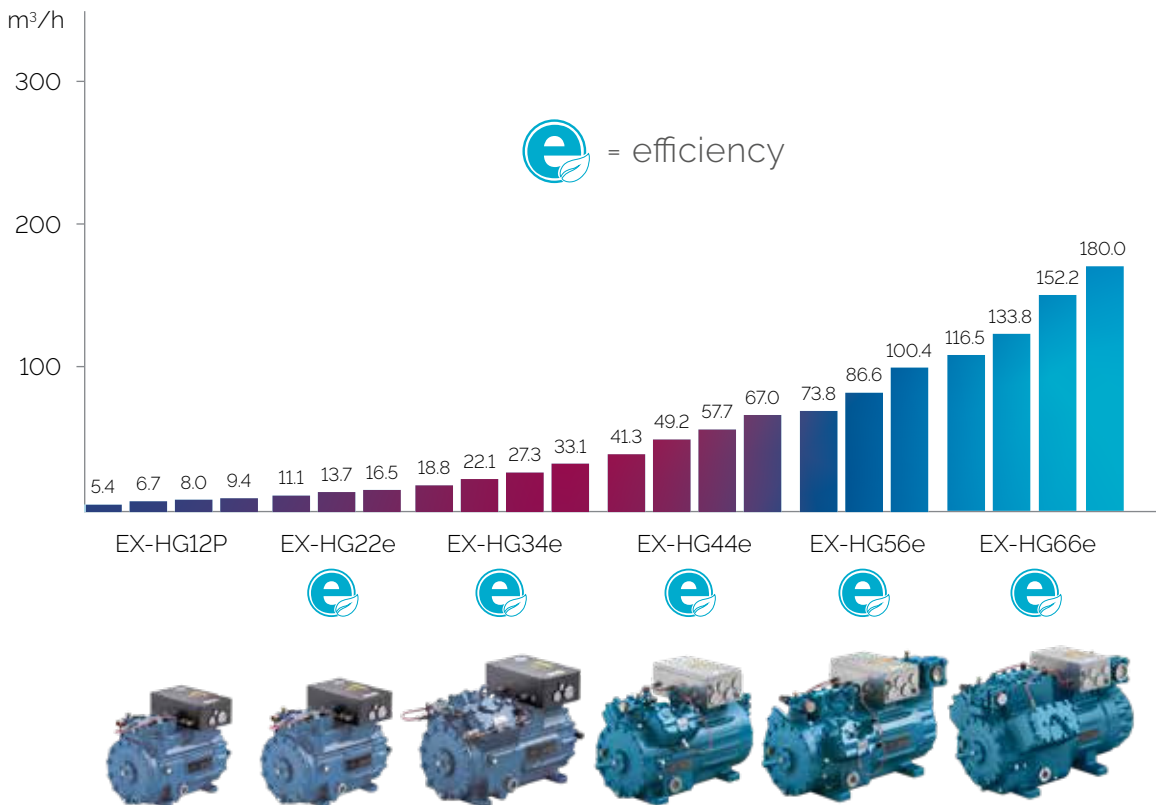
The operator will report the systems to the supervising office and request an acceptance inspection, if necessary.

classification must be made for the set-up location of such systems in accordance with EC Directive 1999/92/EC, and the refrigerant compressors must also meet the requirements of the EC Directive 2014/34/EU.

# BOCK HG compressors for zone 1

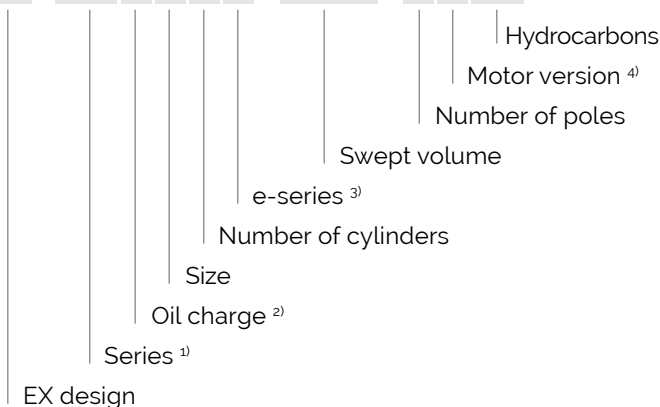
## The current program

6 model sizes with 22 capacity stages from 5.4 to 180.0 m<sup>3</sup>/h (50 Hz)



## Type code – EX compressor

**EX-HG X 6 6 e / 2070 - 4 S HC**



- <sup>1)</sup> HG = Compressor Hermetic Gas-cooled (suction gas-cooled)
- <sup>2)</sup> X = Ester oil filling (HFC refrigerants e.g. R134a, R404A, R507, R407C)
- <sup>3)</sup> e = Additional specification for e-series compressor
- P = Additional specification for Pluscom compressor
- <sup>4)</sup> S = More powerful motor, e.g. air conditioning applications



# Compressors for zone 1

## At a glance

### ATEX identification

**II 2G Ex d e ia mb IIB/IIC T3 Gb**

- Explosion group II for EX-endangered areas (not underground buildings)
- Device category 2 (= zone 1)
- Suitability for gas-explosive area
- Europ. explosion protection acc. to Directive 2014/34/EU
- Pressure-resistant encapsulation, heating element (option)
- Increased safety
- Intrinsically safe equipment
- Encapsulation, magnetic coil (option), only EX-HG34e to EX-HG66e
- Explosion sub-group  
IIB - Offshore coating, IIC - ESD coating
- Temperature class T3 (max. 200 °C)
- Equipment protection level

### IECEx identification

**Ex d e ia mb IIB/IIC T3 Gb**

- International explosion protection
- Pressure-resistant encapsulation, heating element (option)
- Increased safety
- Intrinsically safe equipment
- Encapsulation, magnetic coil (option), only EX-HG34e to EX-HG66e
- Explosion sub-group  
IIB - Offshore coating, IIC - ESD coating
- Temperature class T3 (max. 200 °C)
- Equipment protection level

# The new 6-cylinder compressor: BOCK EX-HG66e

After the successful market launch of the standard HG66e series, the portfolio of EX-HG compressors for explosion-risk environments has now been expanded as well. With the BOCK EX-HG66e series, it is a case of entirely new compressors – these combine state-of-the-art technology with the BOCK design features that have been proven for decades. They are equipped with the MexxFlow 2.0 valve plate system and replace the previous 4- and 6-cylinder series EX-HG6 and EX-HG7. MexxFlow is already known and proven in HG88e for its high efficiency and reliability in operation with high capacities. Four sizes cover the range from 116.5 m<sup>3</sup>/h to 180.0 m<sup>3</sup>/h displacement (at 50 Hz).

A modern, BOCK developed valve plate system, the latest generation of electric motors and an improved gas flow in the compressor increase the overall level of efficiency. The proven oil pump lubrication is used in all compressors, and this enables a greater range of speed control to be achieved in the operation of the frequency converter. The emergency running properties have also been optimised – this is particularly important for operation with natural refrigerants. As usual, ease of servicing was one of the main priorities in the development of the new EX-HG66e compressors: the stators can be changed on site without special tools.



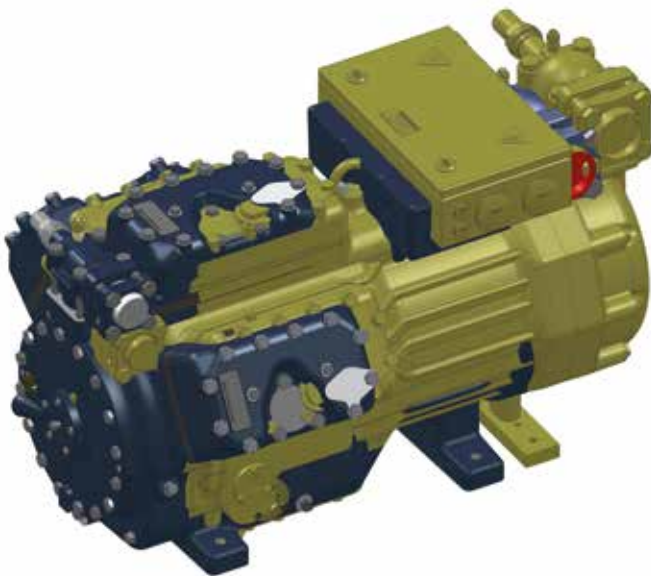
# Compressors for zone 1

## At a glance

### Replacement for predecessor models

HG66e		vs.	HG6 / HG7	
Models	Displacement at 50 Hz		Models	Displacement at 50 Hz
HG66e/1340-4 (S)	116.5 m <sup>3</sup> /h		HG6/1410-4 (S)	122.4 m <sup>3</sup> /h
HG66e/1540-4 (S)	133.8 m <sup>3</sup> /h		HG7/1620-4 (S)	140.6 m <sup>3</sup> /h
HG66e/1750-4 (S)	152.2 m <sup>3</sup> /h		HG7/1860-4 (S)	161.4 m <sup>3</sup> /h
HG66e/2070-4 (S)	180.0 m <sup>3</sup> /h		HG7/2110-4 (S)	183.6 m <sup>3</sup> /h

### Comparison of the dimensions of the HG66e vs. HG7



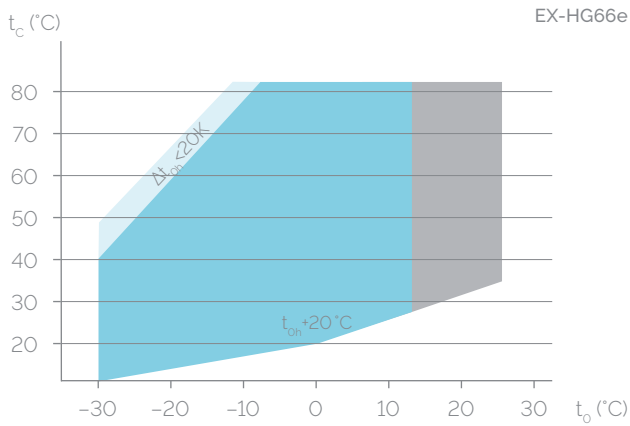
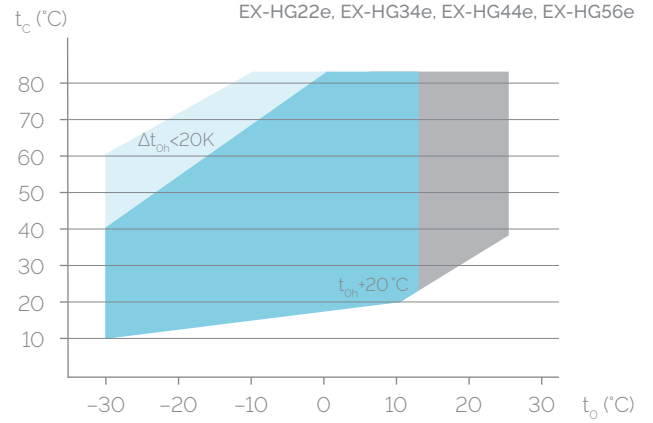
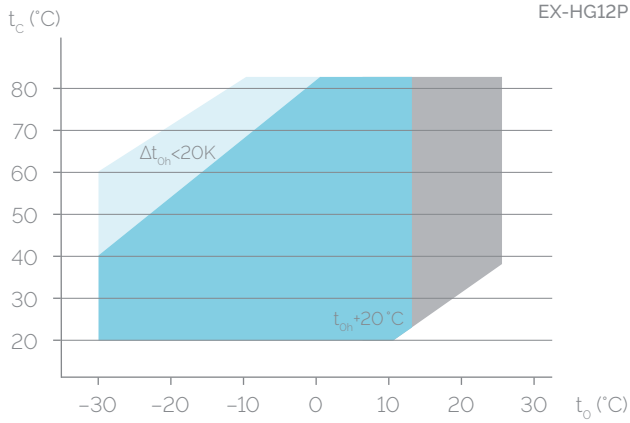
Blue: Bock HG66e  
 Yellow: Bock HG7

Length (mm)	Width (mm)	Height (mm)
-29	+51	-35

# Compressors for zone 1

## Operating limits

### R134a

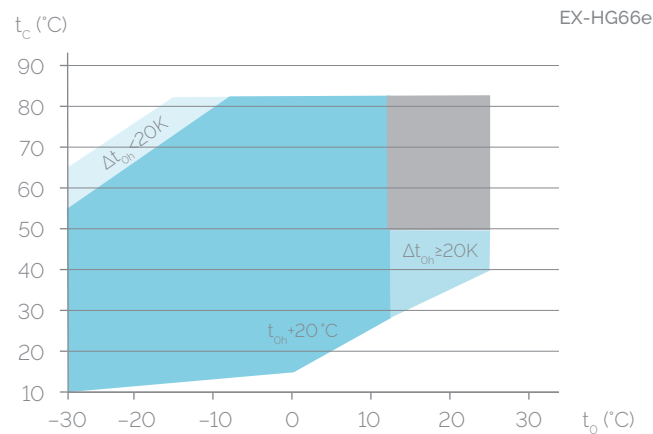
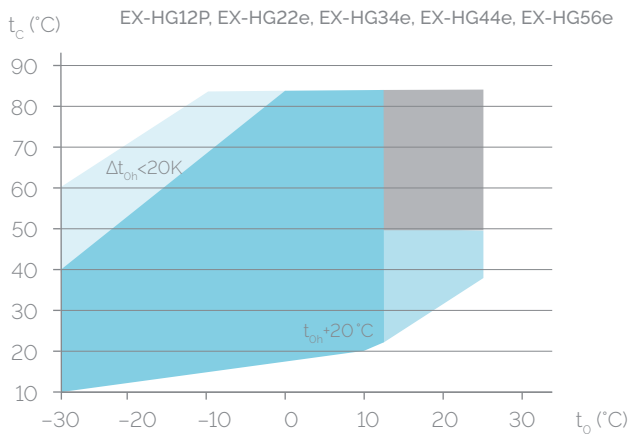


- $t_0$  Evaporating temperature (°C)
- $t_c$  Condensing temperature (°C)
- $\Delta t_{oh}$  Suction gas superheat (K)
- $t_{oh}$  Suction gas temperature (°C)

Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

- Unlimited application range
- Motor version -S- (more powerful motor)
- Reduced suction gas temperature

### R513A



- $t_0$  Evaporating temperature (°C)
- $t_c$  Condensing temperature (°C)
- $\Delta t_{oh}$  Suction gas superheat (K)
- $t_{oh}$  Suction gas temperature (°C)

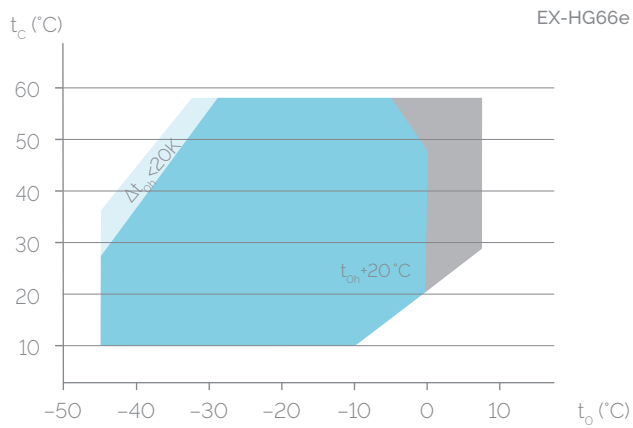
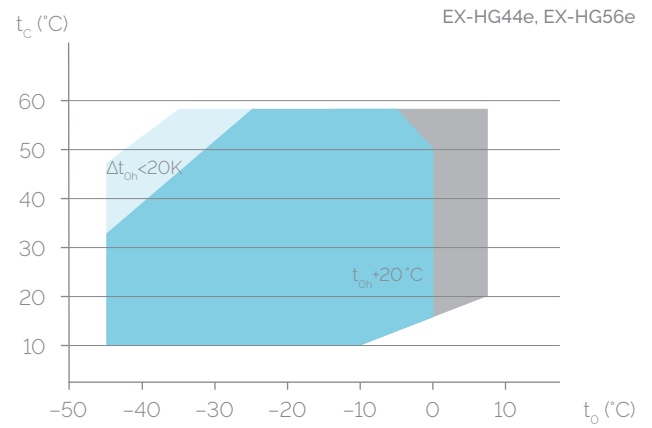
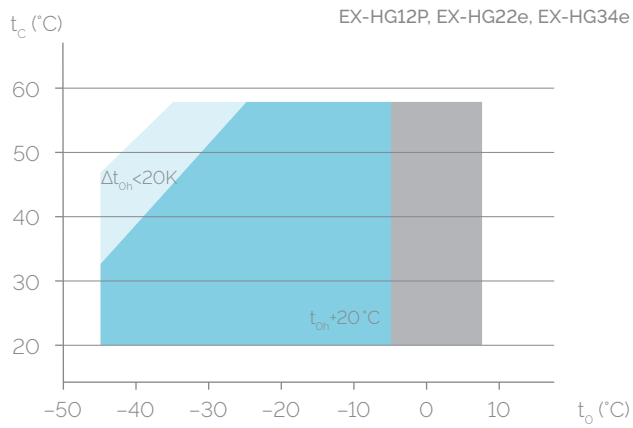
Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

- Unlimited application range
- Motor version -S- (more powerful motor)
- Reduced suction gas temperature
- Required minimum superheating  $\Delta t_{oh} \geq 20K$

# Compressors for zone 1

## Operating limits

### R404A/R507



- $t_0$  Evaporating temperature (°C)
- $t_c$  Condensing temperature (°C)
- $\Delta t_{oh}$  Suction gas superheat (K)
- $t_{oh}$  Suction gas temperature (°C)

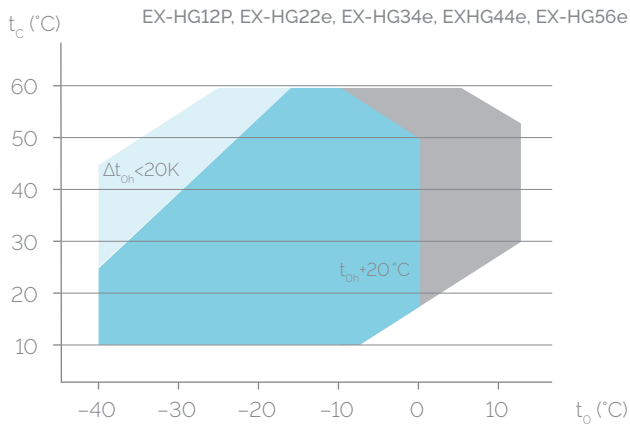
Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

- Unlimited application range
- Motor version -S- (more powerful motor)
- Reduced suction gas temperature

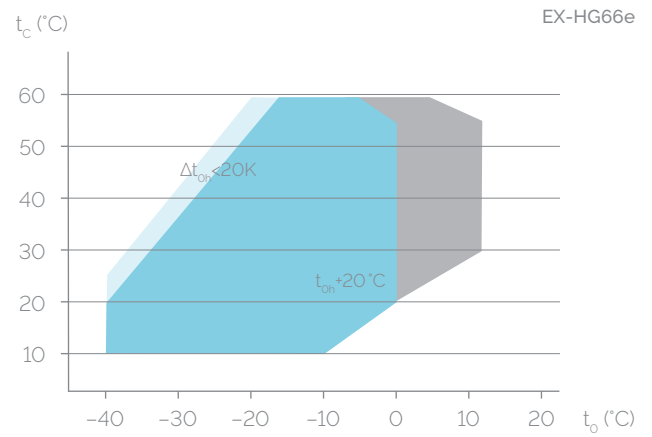
# Compressors for zone 1

## Operating limits

### R448A/R449A



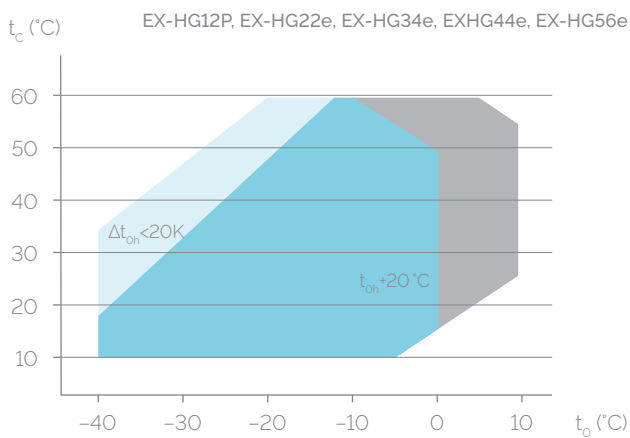
$t_o$  Evaporating temperature (°C)  
 $t_c$  Condensing temperature (°C)  
 $\Delta t_{oh}$  Suction gas superheat (K)  
 $t_{oh}$  Suction gas temperature (°C)



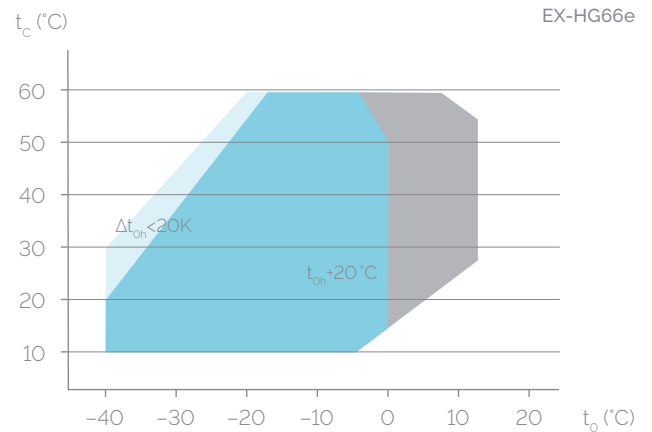
Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

- Unlimited application range
- Motor version -S- (more powerful motor)
- Reduced suction gas temperature

### R407A



$t_o$  Evaporating temperature (°C)  
 $t_c$  Condensing temperature (°C)  
 $\Delta t_{oh}$  Suction gas superheat (K)  
 $t_{oh}$  Suction gas temperature (°C)



Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

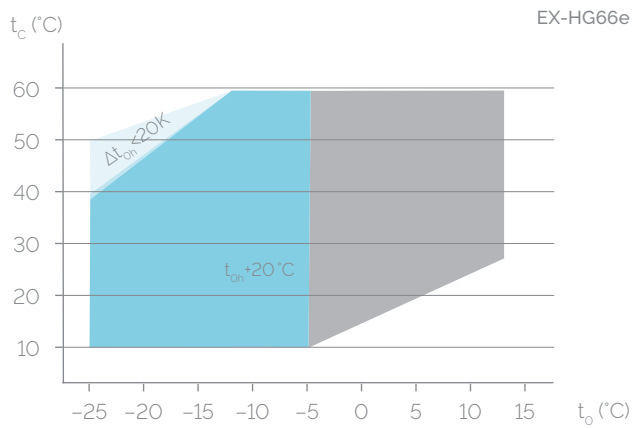
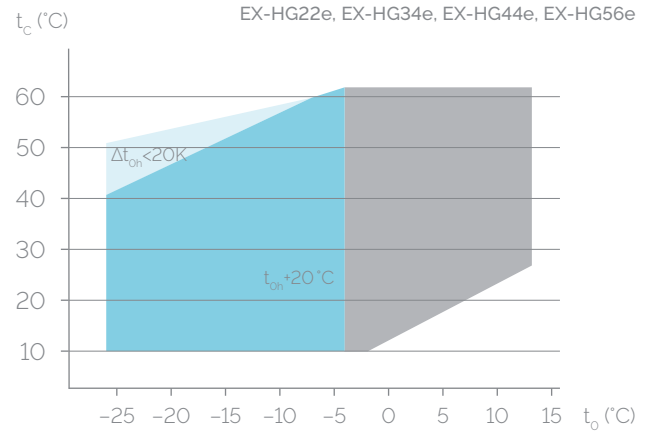
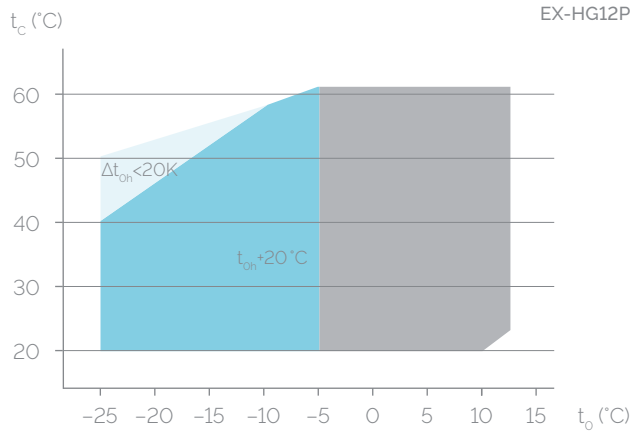
- Unlimited application range
- Motor version -S- (more powerful motor)
- Reduced suction gas temperature



# Compressors for zone 1

## Operating limits

### R407C



- $t_o$  Evaporating temperature (°C)
- $t_c$  Condensing temperature (°C)
- $\Delta t_{oh}$  Suction gas superheat (K)
- $t_{oh}$  Suction gas temperature (°C)

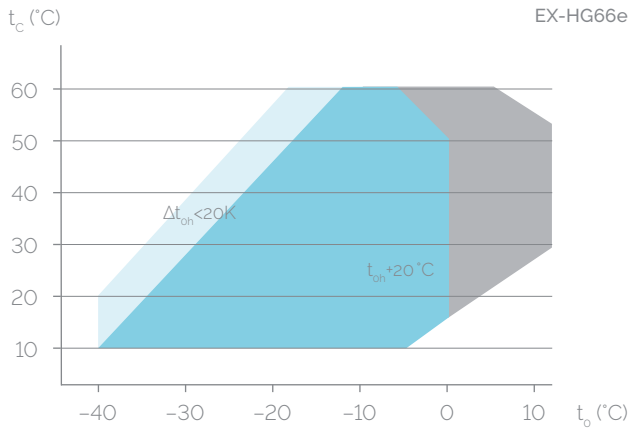
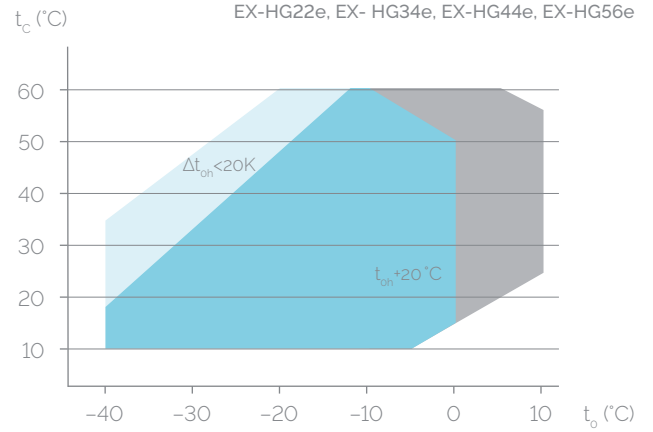
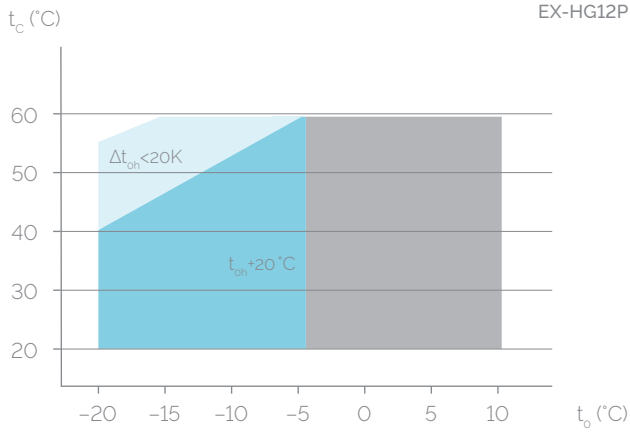
Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

- Unlimited application range
- Motor version -S- (more powerful motor)
- Reduced suction gas temperature

# Compressors for zone 1

## Operating limits

### R407F

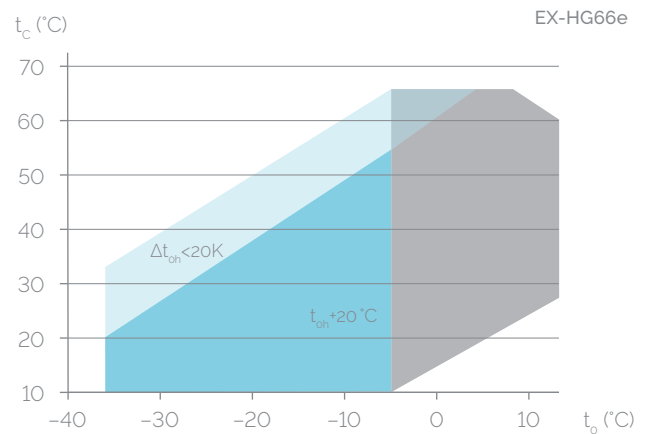
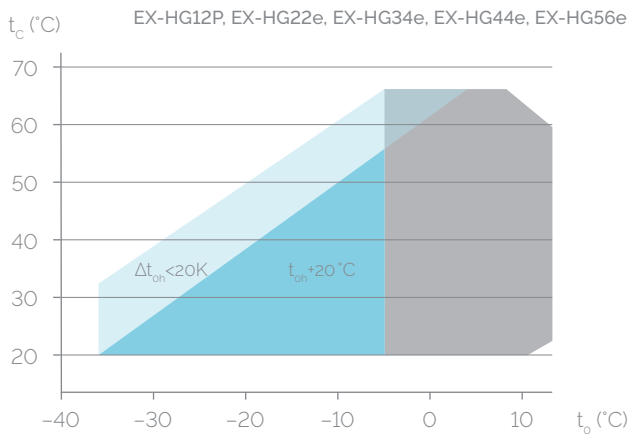


- $t_o$  Evaporating temperature (°C)
- $t_c$  Condensing temperature (°C)
- $\Delta t_{oh}$  Suction gas superheat (K)
- $t_{oh}$  Suction gas temperature (°C)

Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

- Unlimited application range
- Motor version -S- (more powerful motor)
- Reduced suction gas temperature

### R22



- $t_o$  Evaporating temperature (°C)
- $t_c$  Condensing temperature (°C)
- $\Delta t_{oh}$  Suction gas superheat (K)
- $t_{oh}$  Suction gas temperature (°C)

Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

- Unlimited application range
- Motor version -S- (more powerful motor)
- Reduced suction gas temperature

# Compressors for zone 1

## Operating limits

### Notes

#### Operating limits

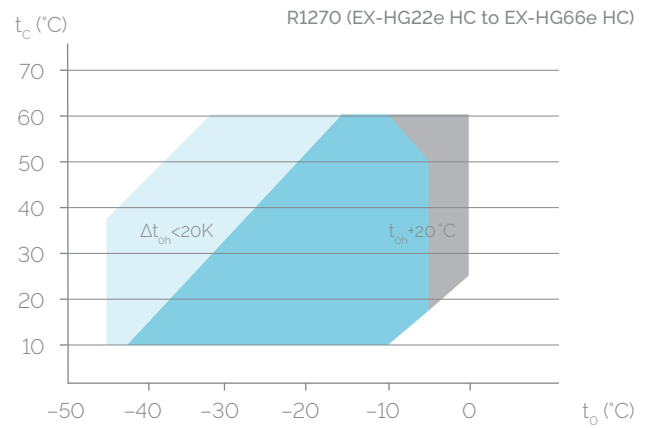
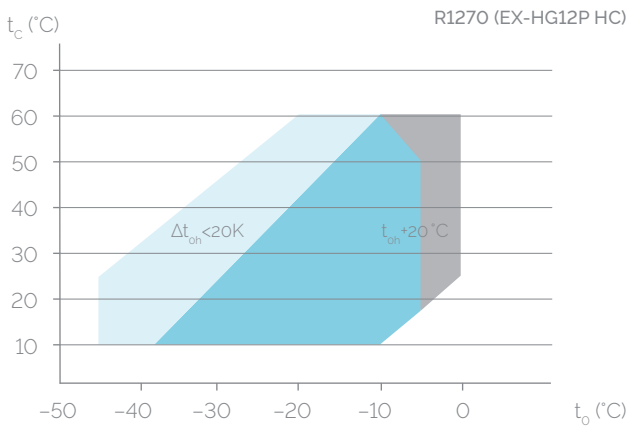
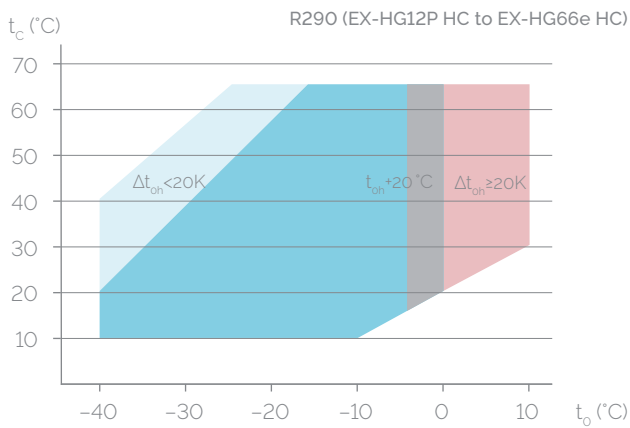
Compressor operation is possible within the limits shown on the application diagrams. Please note the colored areas. Compressor application limits should not be chosen for

design purposes or continuous operation.

Further information can be found online at [vap.bock.de](http://vap.bock.de)



#### Operating limits: hydrocarbons



Design for other ranges on request

The use of other hydrocarbons is permitted only following prior written approval from Bock

$t_o$  Evaporating temperature (°C)  
 $t_c$  Condensing temperature (°C)  
 $\Delta t_{oh}$  Suction gas superheat (K)  
 $t_{oh}$  Suction gas temperature (°C)

- Required minimum superheating  $\Delta t_{oh} \geq 20$  K
- Motor version -S- (more powerful motor)  
Required minimum superheating  $\Delta t_{oh} \geq 20$  K
- Required minimum superheating  $\Delta t_{oh} \geq 20$  K, the suction gas temperature must be adapted accordingly
- Reduced suction gas temperature ( $\Delta t_{oh} < 20$  K)

Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

### Notes

#### Operating limits

The compressor can be operated within the operating limits shown in the diagram. The meaning of the color-shaded areas should be observed. A minimum superheating of  $\Delta t_{oh} = 20$  K

must be maintained for the dark-blue and gray application range. An internal IHX heat exchanger must be provided for this, if necessary. Thresholds should not be selected as the design point or the continuous operating point.

# Compressors for zone 1

## Technical data

### EX-HG, EX-HG... HC

Type	Number of cylinders	Displacement 50 / 60 Hz (1.450 / 1.740 rpm)  m <sup>3</sup> /h	Voltage <sup>1)</sup>	Electrical data			Weight  kg	Connections <sup>5)</sup>		Oil-charge  Ltr.
				Max. working current <sup>2)</sup>  A (Y)	Max. power consumption <sup>2)</sup>  kW	Starting current (rotor locked)  A (Y)		Discharge line DV  mm   inch	Suction line SV  mm   inch	
EX-HG12P/60-4 S (HC)	2	5.40 / 6.40	3 <sup>3)</sup>	3.9	2.2	23	48.0	12   1/2	16   5/8	0.8
EX-HG12P/75-4 (HC)	2	6.70 / 8.10	3 <sup>3)</sup>	4.1	2.3	23	48.0	12   1/2	16   5/8	0.8
EX-HG12P/75-4 S (HC)	2	6.70 / 8.10	3 <sup>3)</sup>	4.6	2.6	25	49.0	12   1/2	16   5/8	0.8
EX-HG12P/90-4 (HC)	2	8.00 / 9.60	3 <sup>3)</sup>	4.9	2.8	25	49.0	12   1/2	16   5/8	0.8
EX-HG12P/90-4 S (HC)	2	8.00 / 9.60	3 <sup>3)</sup>	5.3	3.0	26	49.0	12   1/2	16   5/8	0.8
EX-HG12P/110-4 (HC)	2	9.40 / 11.30	3 <sup>3)</sup>	5.3	3.1	25	48.0	12   1/2	16   5/8	0.8
EX-HG12P/110-4 S (HC)	2	9.40 / 11.30	3 <sup>3)</sup>	6.1	3.6	26	48.0	12   1/2	16   5/8	0.8
EX-HG22e/125-4 (HC)	2	11.10 / 13.30	3 <sup>3)</sup>	5.4	3.0	40	73.0	16   5/8	22   7/8	0.9
EX-HG22e/125-4 S (HC)	2	11.10 / 13.30	3 <sup>3)</sup>	6.2	3.6	40	74.0	16   5/8	22   7/8	0.9
EX-HG22e/160-4 (HC)	2	13.70 / 16.40	3 <sup>3)</sup>	6.5	3.8	40	74.0	16   5/8	22   7/8	0.9
EX-HG22e/160-4 S (HC)	2	13.70 / 16.40	3 <sup>3)</sup>	7.6	4.5	50	75.0	16   5/8	22   7/8	0.9
EX-HG22e/190-4 (HC)	2	16.50 / 19.80	3 <sup>3)</sup>	8.0	4.8	40	74.0	16   5/8	22   7/8	0.9
EX-HG22e/190-4 S (HC)	2	16.50 / 19.80	3 <sup>3)</sup>	9.4	5.6	50	75.0	16   5/8	22   7/8	0.9
EX-HG34e/215-4 (HC)	4	18.80 / 22.60	3 <sup>3)</sup>	8.1	4.8	50	94.0	22   7/8	28   1 1/8	11
EX-HG34e/215-4 S (HC)	4	18.80 / 22.60	3 <sup>3)</sup>	10.5	6.0	76	96.0	22   7/8	28   1 1/8	11
EX-HG34e/255-4 (HC)	4	22.10 / 26.60	3 <sup>3)</sup>	9.8	6.0	50	94.0	22   7/8	28   1 1/8	11
EX-HG34e/255-4 S (HC)	4	22.10 / 26.60	3 <sup>3)</sup>	12.2	7.2	76	96.0	22   7/8	28   1 1/8	11
EX-HG34e/315-4 (HC)	4	27.30 / 32.80	3 <sup>3)</sup>	12.2	7.4	64	93.0	22   7/8	28   1 1/8	11
EX-HG34e/315-4 S (HC)	4	27.30 / 32.80	3 <sup>3)</sup>	14.7	8.9	76	96.0	22   7/8	28   1 1/8	11
EX-HG34e/380-4 (HC)	4	33.10 / 39.70	3 <sup>3)</sup>	15.1	9.3	64	91.0	22   7/8	28   1 1/8	11
EX-HG34e/380-4 S (HC)	4	33.10 / 39.70	3 <sup>3)</sup>	18.0	11.1	76	94.0	22   7/8	28   1 1/8	11



#### COMPRESSOR SELECTION PROGRAM

Current information on technical data, performance data, operating limits and much more can be done online via the BOCK compressor selection program (VAP): [vap.bock.de](http://vap.bock.de)



# Compressors for zone 1

## Technical data

### EX-HG, EX-HG... HC

Type	Number of cylinders	Displacement 50 / 60 Hz (1.450 / 1.740 rpm)  m <sup>3</sup> / h	Voltage <sup>1)</sup>	Electrical data			Weight  kg	Connections <sup>5)</sup>		Oil-charge  Ltr.
				Max. working current <sup>2)</sup>  A	Max. power consumption <sup>2)</sup>  kW	Starting current (rotor locked)  A		Discharge line DV  mm   inch	Suction line SV  mm   inch	
				PW 1+2*		PW1 / PW 1+2*				
EX-HG44e/475-4 (HC)	4	41.30 / 49.60	4 <sup>3)</sup>	19.0	11.0	65 / 109	164.0	28   1 <sup>1</sup> / <sub>8</sub>	35   1 <sup>3</sup> / <sub>8</sub>	2.3
EX-HG44e/475-4 S (HC)	4	41.30 / 49.60	4 <sup>3)</sup>	23.0	13.1	87 / 149	168.0	28   1 <sup>1</sup> / <sub>8</sub>	35   1 <sup>3</sup> / <sub>8</sub>	2.3
EX-HG44e/565-4 (HC)	4	49.20 / 59.00	4 <sup>3)</sup>	22.0	13.2	65 / 109	164.0	28   1 <sup>1</sup> / <sub>8</sub>	35   1 <sup>3</sup> / <sub>8</sub>	2.3
EX-HG44e/565-4 S (HC)	4	49.20 / 59.00	4 <sup>3)</sup>	26.0	15.6	101 / 174	170.0	28   1 <sup>1</sup> / <sub>8</sub>	42   1 <sup>5</sup> / <sub>8</sub>	2.3
EX-HG44e/665-4 (HC)	4	57.70 / 69.20	4 <sup>3)</sup>	26.0	15.4	87 / 149	171.0	28   1 <sup>1</sup> / <sub>8</sub>	42   1 <sup>5</sup> / <sub>8</sub>	2.3
EX-HG44e/665-4 S (HC)	4	57.70 / 69.20	4 <sup>3)</sup>	30.0	18.3	101 / 174	168.0	28   1 <sup>1</sup> / <sub>8</sub>	42   1 <sup>5</sup> / <sub>8</sub>	2.3
EX-HG44e/770-4 (HC)	4	67.00 / 80.40	4 <sup>3)</sup>	30.0	17.8	101 / 174	168.0	28   1 <sup>1</sup> / <sub>8</sub>	42   1 <sup>5</sup> / <sub>8</sub>	2.3
EX-HG44e/770-4 S (HC)	4	67.00 / 80.40	4 <sup>3)</sup>	35.0	21.4	101 / 174	168.0	28   1 <sup>1</sup> / <sub>8</sub>	42   1 <sup>5</sup> / <sub>8</sub>	2.3
EX-HG56e/850-4 (HC)	6	73.80 / 88.60	4 <sup>3)</sup>	32.6	19.7	101 / 174	194.0	35   1 <sup>3</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	2.7
EX-HG56e/850-4 S (HC)	6	73.80 / 88.60	4 <sup>3)</sup>	39.4	23.5	125 / 209	211.0	35   1 <sup>3</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	2.7
EX-HG56e/995-4 (HC)	6	86.60 / 103.90	4 <sup>3)</sup>	38.9	23.2	125 / 209	208.0	35   1 <sup>3</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	2.7
EX-HG56e/995-4 S (HC)	6	86.60 / 103.90	4 <sup>3)</sup>	46.4	27.7	149 / 246	211.0	35   1 <sup>3</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	2.7
EX-HG56e/1155-4 (HC)	6	100.40 / 120.50	4 <sup>3)</sup>	46.9	28.0	149 / 246	212.0	35   1 <sup>3</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	2.7
EX-HG56e/1155-4 S (HC)	6	100.40 / 120.50	4 <sup>3)</sup>	58.3	33.3	196 / 335	221.0	35   1 <sup>3</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	2.7
EX-HG66e/1340-4 (HC)	6	116.50 / 139.80	4 <sup>3)</sup>	53.7	31.9	170 / 275	282.0	42   1 <sup>5</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	4.4
EX-HG66e/1340-4 S (HC)	6	116.50 / 139.80	4 <sup>3)</sup>	65.3	38.1	196 / 335	287.0	42   1 <sup>5</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	4.4
EX-HG66e/1540-4 (HC)	6	133.80 / 160.50	4 <sup>3)</sup>	62.1	37.2	170 / 275	280.0	42   1 <sup>5</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	4.4
EX-HG66e/1540-4 S (HC)	6	133.80 / 160.50	4 <sup>3)</sup>	75.0	44.4	196 / 335	285.0	42   1 <sup>5</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	4.4
EX-HG66e/1750-4 (HC)	6	152.20 / 182.60	4 <sup>3)</sup>	71.9	42.4	196 / 335	280.0	42   1 <sup>5</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	4.4
EX-HG66e/1750-4 S (HC)	6	152.20 / 182.60	4 <sup>3)</sup>	86.8	50.7	222 / 361	282.0	42   1 <sup>5</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	4.4
EX-HG66e/2070-4 (HC)	6	180.00 / 216.00	4 <sup>3)</sup>	85.1	50.7	196 / 335	276.0	42   1 <sup>5</sup> / <sub>8</sub>	64   2 <sup>5</sup> / <sub>8</sub>	4.4
EX-HG66e/2070-4 S (HC)	6	180.00 / 216.00	4 <sup>3)</sup>	103.0	60.7	222 / 361	278.0	42   1 <sup>5</sup> / <sub>8</sub>	64   2 <sup>5</sup> / <sub>8</sub>	4.4

\* PW - Part Winding, motors for part winding start 1 - 1st part winding 2 - 2nd part winding

### Explanations

- 1) Tolerance ( $\pm 10\%$ ) relates to the mean value of the voltage range. Other voltages and current types on request.
- 2) The specifications for max. power consumption apply for 50 Hz operation. For 60 Hz operation, the specifications have to be multiplied by the factor 1.2. The max. working current remains unchanged.  
Take account of the max. operating current / max. power consumption when designing contactors, leads and fuses.  
Switches: Service category AC3
- 3) 380-420 V Y - 3 - 50 Hz  
440-480 V Y - 3 - 60 Hz
- 4) 380-420 V Y/YY - 3 - 50 Hz PW  
440-480 V Y/YY - 3 - 60 Hz PW  
PW = Part Winding, motors for part winding start (no start unloaders required)  
Winding ratios:  
EX-HG44e, EX-HG56e, EX-HG66e = 50% / 50%
- 5) For soldering connections

# Compressors for zone 1

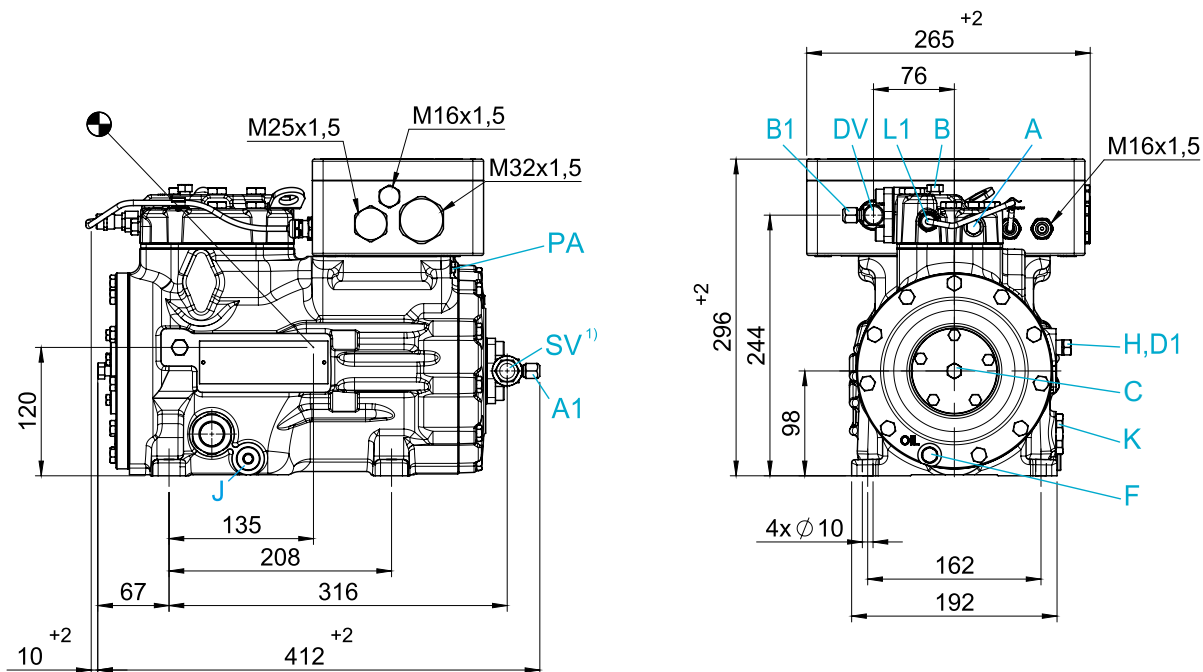
## Dimensions and connections

EX-HG12P

» EX-HG12P/60-4 S » EX-HG12P/75-4 » EX-HG12P/75-4 S » EX-HG12P/90-4

EX-HG12P... HC

» EX-HG12P/90-4 S » EX-HG12P/110-4 » EX-HG12P/110-4 S

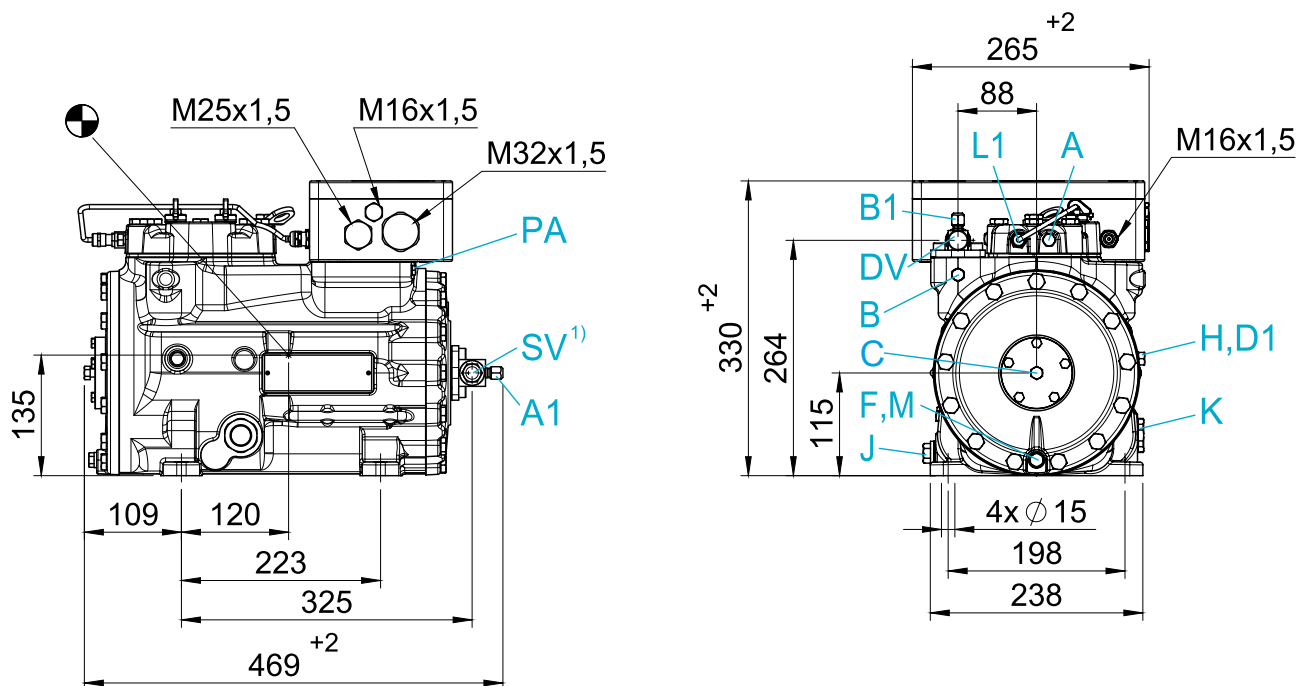


EX-HG22e

» EX-HG22e/125-4 » EX-HG22e/125-4 S » EX-HG22e/160-4

EX-HG22e... HC

» EX-HG22e/160-4 S » EX-HG22e/190-4 » EX-HG22e/190-4 S



Dimensions in mm

1) Position SV see table on page 29

☉ Center of gravity

For connections see page 30

Dimensions for anti-vibration pad, see page 29



# Compressors for zone 1

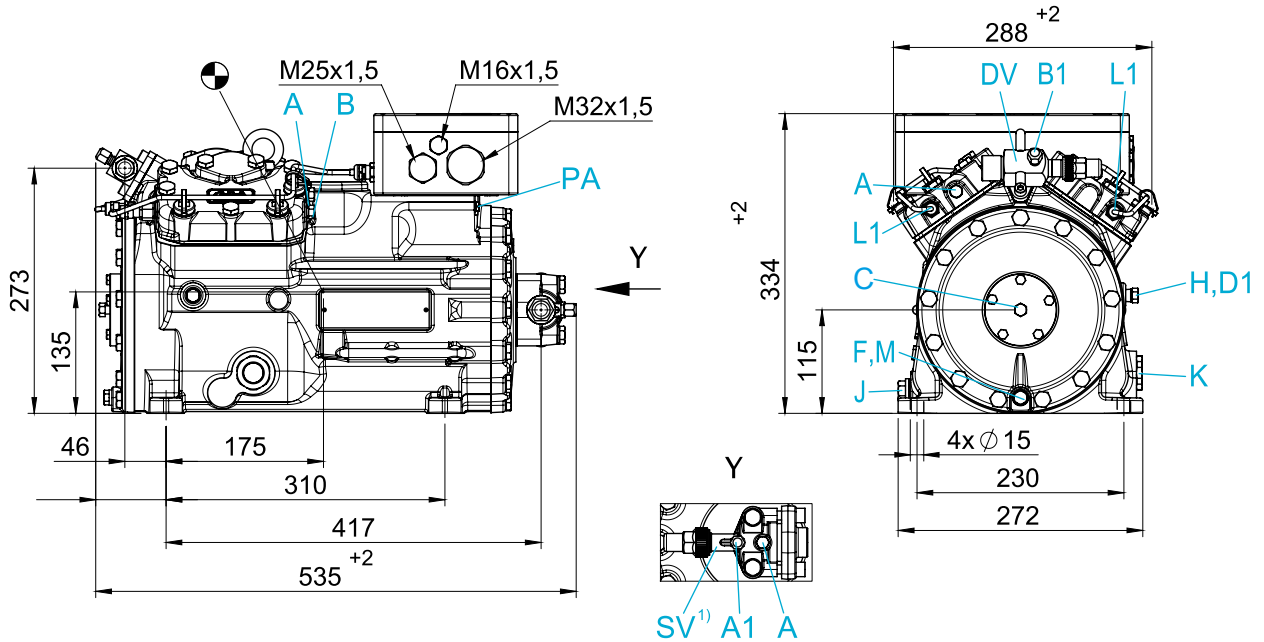
## Dimensions and connections

**EX-HG34e**

» EX-HG34e/215-4 » EX-HG34e/215-4 S » EX-HG34e/255-4 » EX-HG34e/255-4 S

**EX-HG34e... HC**

» EX-HG34e/315-4 » EX-HG34e/315-4 S » EX-HG34e/380-4 » EX-HG34e/380-4 S

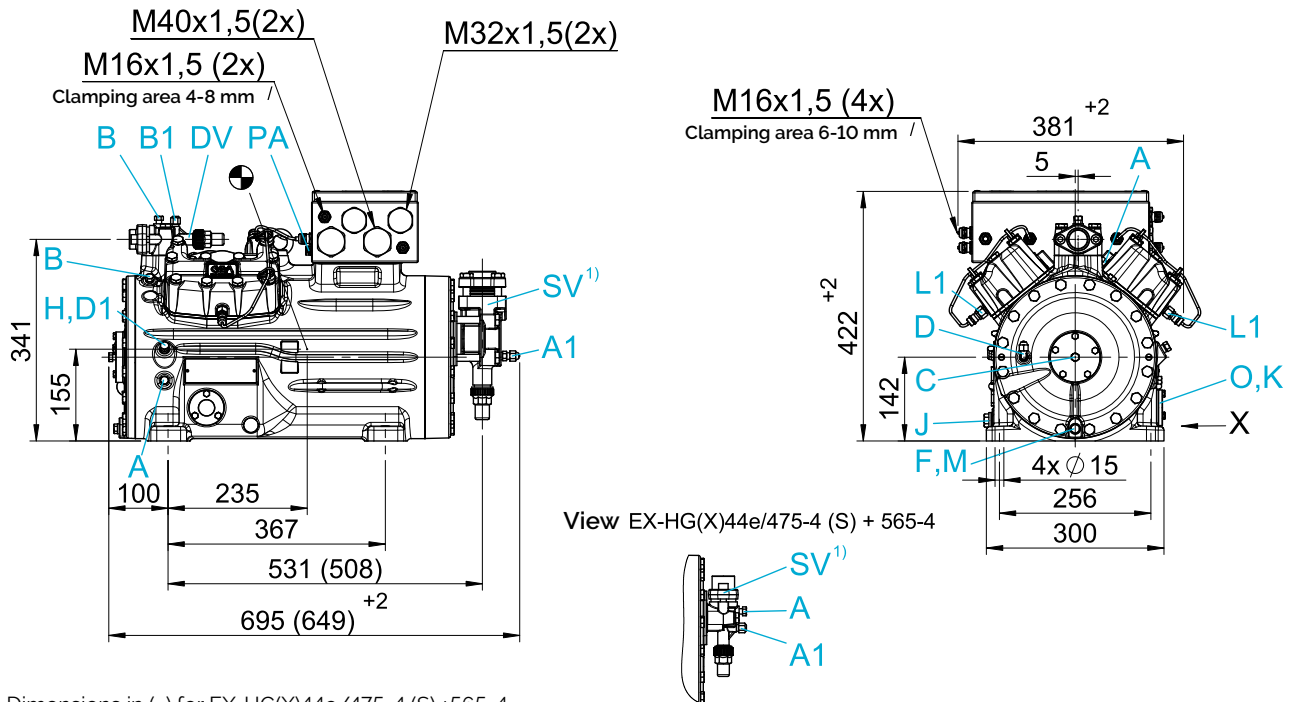


**EX-HG44e**

» EX-HG44e/475-4 » EX-HG44e/475-4 S » EX-HG44e/565-4 » EX-HG44e/565-4 S

**EX-HG44e... HC**

» EX-HG44e/665-4 » EX-HG44e/665-4 S » EX-HG44e/770-4 » EX-HG44e/770-4 S



Dimensions in ( ) for EX-HG(X)44e/475-4 (S) +565-4

Dimensions in mm

1) Position SV see table on page 29

● Center of gravity

For connections see page 30

Dimensions for anti-vibration pad, see page 29

Dimensions for view X, see page 29

# Compressors for zone 1

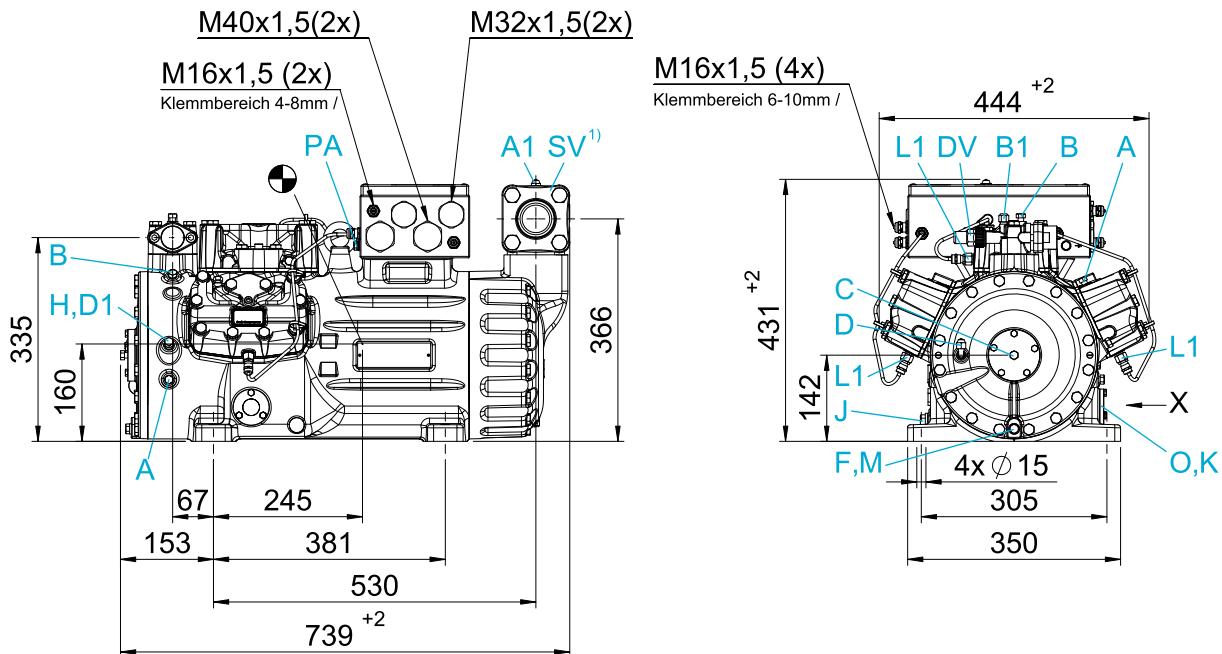
## Dimensions and connections

EX-HG56e

» EX-HG56e/850-4 » EX-HG56e/850-4 S » EX-HG56e/995-4

EX-HG56e...HC

» EX-HG56e/995-4 S » EX-HG56e/1155-4 » EX-HG56e/1155-4 S

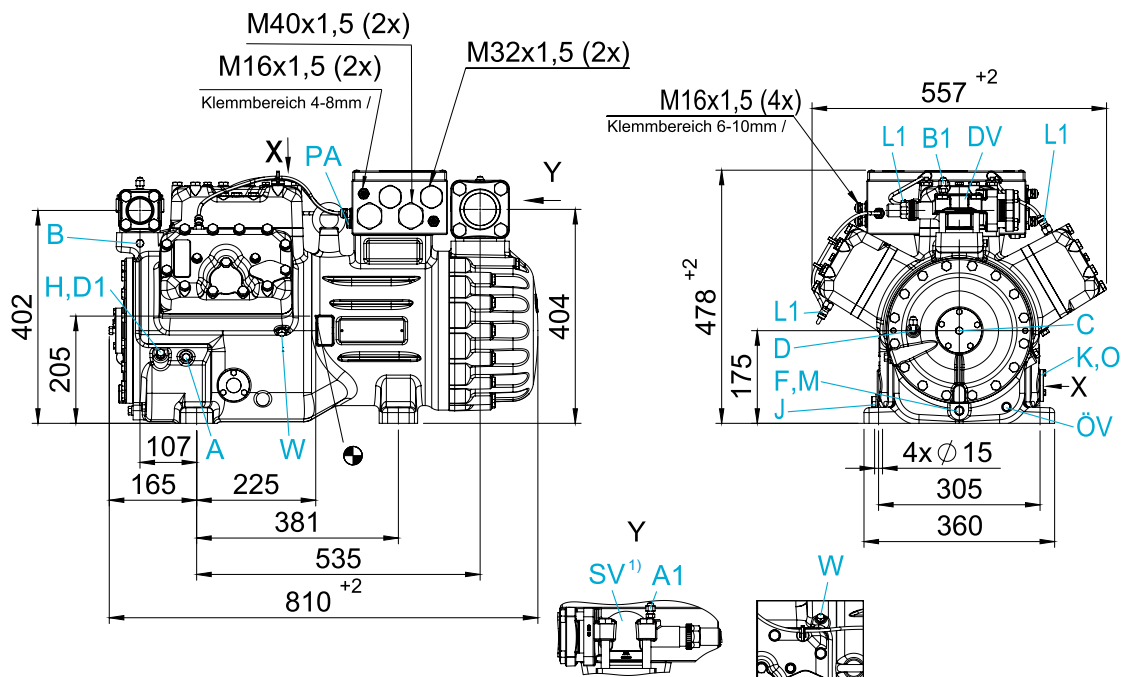


EX-HG66e

» EX-HG66e/1340-4 » EX-HG66e/1340-4 S » EX-HG66e/1540-4 » EX-HG66e/1540-4 S

EX-HG66e...HC

» EX-HG66e/1750-4 » EX-HG66e/1750-4 S » EX-HG66e/2070-4 » EX-HG66e/2070-4 S



Dimensions in mm

1) Position SV see table on page 29

☉ Center of gravity

For connections see page 30

Dimensions for anti-vibration pad, see page 29

Dimensions for view X, see page 29

# Compressors for zone 1

## Dimensions and connections

### View X

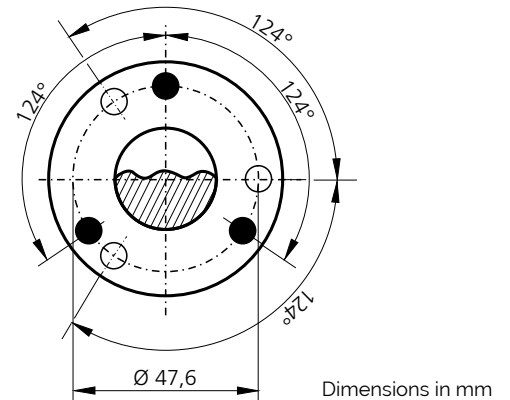
#### Possibility to connect to oil level regulator

##### EX-HG44e, EX-HG56e, EX-HG66e

● Three-hole connection for oil level regulator  
Products ESK, AC+R, CARLY (3 × M6 × 10 deep)<sup>1)</sup>

○ Three-hole connection for oil level regulator  
Product TRAXOIL (3 × M6 × 10 deep)<sup>1)</sup>

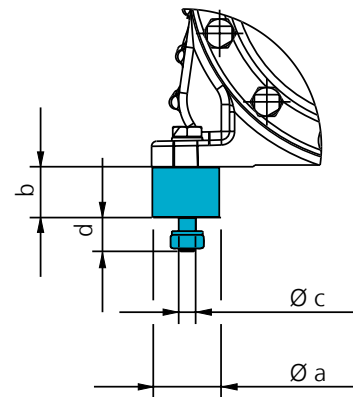
<sup>1)</sup> Operation of these components only with suitable ignition protection.



#### Dimensions for anti-vibration pad

Type	Ø a	b	c	d
EX-HG12P (HC)	30	30	M8	20
EX-HG22e (HC)	40	30	M10	20
EX-HG34e (HC)	40	30	M10	20
EX-HG44e (HC)	50	30	M12	25
EX-HG56e	50	30	M12	25
EX-HG66e	50	30	M12	25

Dimensions in mm



#### Variable suction line valve position



- 1 Shut-off valve can be rotated 90°
  - 2 The suction cover can be rotated 90°
- 1+2 Flexible connection positioning of the suction line

	Suction line valve position	Suction cover position
EX-HG12P, EX-HG22e, EX-HG34e, EX-HG44e	90°	-
EX-HG56e	180°	90°
EX-HG66e	180°	90°

# Compressors for zone 1

## Dimensions and connections

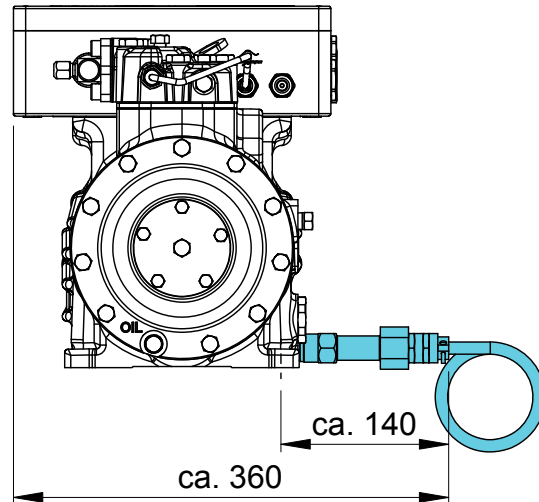
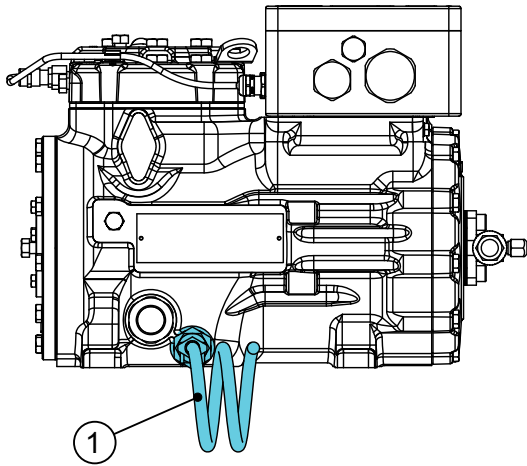
Connections		EX-HG12P	EX-HG22e	EX-HG34e	EX-HG44e	EX-HG56e	EX-HG66e
		HC	HC	HC	HC	HC	HC
SV	Suction line	See technical data page 24 and 25					
DV	Discharge line	See technical data page 24 and 25					
A	Connection suction side, not lockable	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF
A1	Connection suction side, lockable	7/16" UNF	7/16" UNF	7/16" UNF	7/16" UNF	7/16" UNF	7/16" UNF
B	Connection discharge side, not lockable	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF
B1	Connection discharge side, lockable	7/16" UNF	7/16" UNF	7/16" UNF	7/16" UNF	7/16" UNF	7/16" UNF
C	Connection oil pressure safety switch HP <sup>1)</sup>	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF
D	Connection oil pressure safety switch LP <sup>1)</sup>	-	-	-	7/16" UNF	7/16" UNF	7/16" UNF
D1	Connection oil return from oil separator	1/4" NPTF	1/4" NPTF	1/4" NPTF	1/4" NPTF	1/4" NPTF	1/4" NPTF
F	Oil drain	M 8	M 12 x 15	M 12 x 15	M 12 x 15	M 12 x 15	M 12 x 15
H	Oil charge plug	1/4" NPTF	1/4" NPTF	1/4" NPTF	1/4" NPTF	1/4" NPTF	1/4" NPTF
J	Connection oil sump heater <sup>1)</sup>	M 16 x 15	M 22 x 15	M 22 x 15	M 22 x 15	M 22 x 15	M 22 x 15
K	Sight glass	1 1/8" -18 UNEF	1 1/8" -18 UNEF	1 1/8" -18 UNEF	3 x M 6	3 x M 6	3 x M 6
L1	Thermal protection thermostat	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF
M	Oil filter	-	M 12 x 15	M 12 x 15	M 12 x 15	M 12 x 15	M 12 x 15
O	Connection oil level regulator <sup>1)</sup>	1 1/8" -18 UNEF	1 1/8" -18 UNEF	1 1/8" -18 UNEF	3 x M 6	3 x M 6	3 x M 6
ÖV	Connection oil service valve	-	-	-	-	-	1/4" NPTF
PA	Connection potential compensation	M 6	M 6	M 6	M 8	M 8	M 8
W	Connection liquid injection <sup>1)</sup>	-	-	-	-	-	2 x 1/8" NPTF

<sup>1)</sup> Operation of this component is permissible only with the appropriate type of protection

# Compressors for zone 1

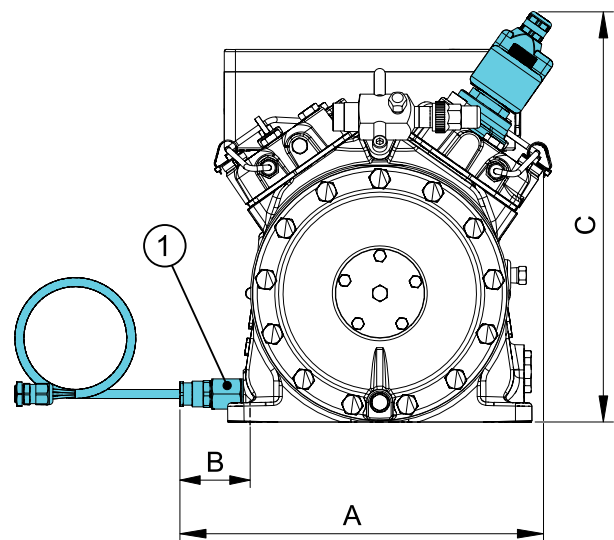
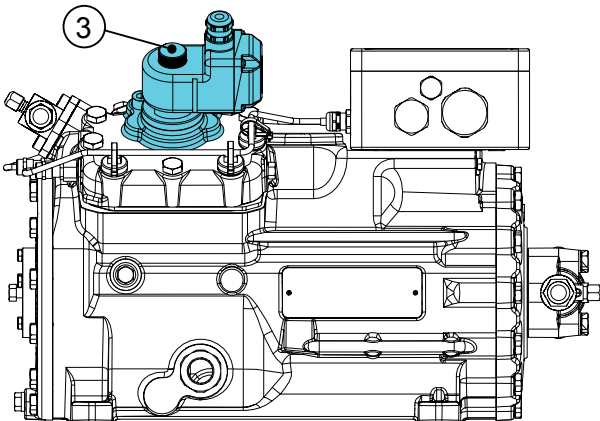
## Dimensions with accessories

### EX-HG12P



① Oil sump heater

### EX-HG22e / EX-HG34e



① Oil sump heater    ③ Capacity regulator

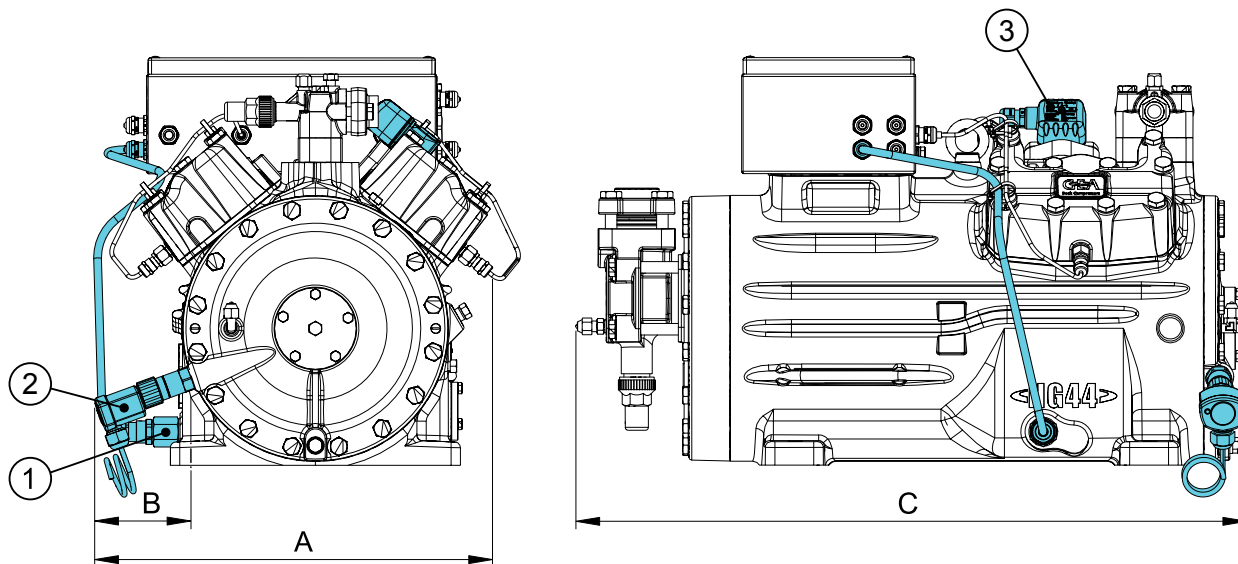
#### Dimensions

Type	A (mm)	B (mm)	C (mm)
EX-HG22e	ca. 289	ca. 71	-
EX-HG34e	ca. 325	ca. 64	ca. 367

# Compressors for zone 1

## Dimensions with accessories

EX-HG44e / EX-HG56e

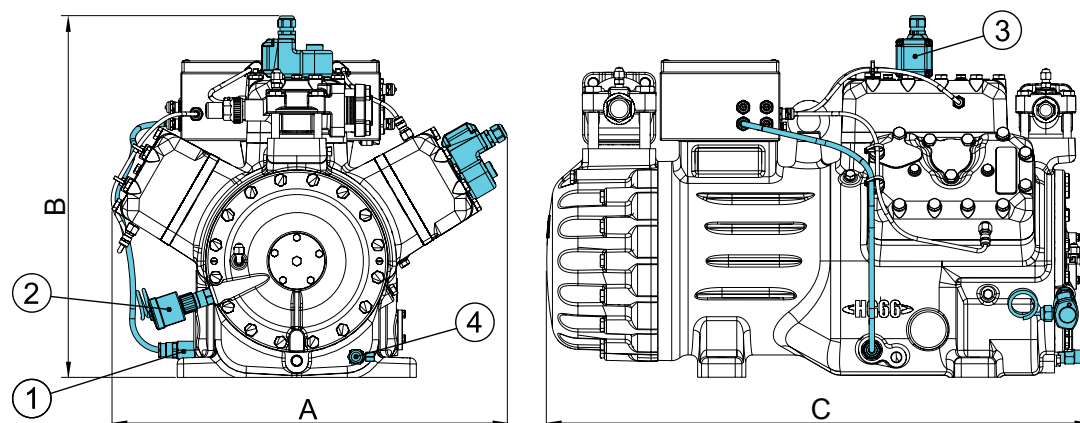


① Oil sump heater    ② Oil differential pressure sensor    ③ Capacity regulator

### Dimensions

Type	A (mm)	B (mm)	C (mm)
EX-HG44e	ca. 420	ca. 105	ca. 695
EX-HG56e	ca. 448	ca. 105	ca. 740

EX-HG66e



① Oil sump heater    ② Capacity regulator    ③ Oil differential pressure sensor    ④ Oil service valve

### MDimensions

Type	A (mm)	B (mm)	C (mm)
EX-HG66e	ca. 595	ca. 545	ca. 817



# Compressors for zone 1

## Scope of supply and accessories

	EX-HG12P	EX-HG22e	EX-HG34e	EX-HG44e	EX-HG56e	EX-HG66e
	HC	HC	HC	HC	HC	HC
Semi-hermetic two-cylinder reciprocating compressor with drive motor for direct start 380-420 V Y - 3 - 50 Hz 440-480 V Y - 3 - 60 Hz Single-section compressor housing with integrated electric motor	●	●				
Semi-hermetic four-cylinder reciprocating compressor with drive motor for direct start 380-420 V Y - 3 - 50 Hz 440-480 V Y - 3 - 60 Hz Single-section compressor housing with integrated electric motor			●			
Semi-hermetic four-cylinder reciprocating compressor with drive motor for partial winding start 380-420 V Y/YY - 3 - 50 Hz 440-480 V Y/YY - 3 - 60 Hz Single-section compressor housing with integrated electric motor				●		
Semi-hermetic six-cylinder reciprocating compressor with drive motor for partial winding start 380-420 V Y/YY - 3 - 50 Hz 440-480 V Y/YY - 3 - 60 Hz Single-section compressor housing with integrated electric motor					●	●
Special voltage and/or special frequency (on request)	○	○	○	○	○	○
Winding protection with PTC sensors and electronic trigger device INT69 EX2 for control cabinet installation	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
Thermal protection thermostat (PTC Sensor)	●	●	●	●	●	●
Two-channel safety barrier as energy limiter in the intrinsically safe circuit for avoidance of ignition through sparks or thermal effects. For control cabinet installation.	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
Oil pump	●	●	●	●	●	●
Oil charge: HG: FUCHS Reniso SP 46 HGX: FUCHS Reniso Triton SE 55 HG...HC: FUCHS Reniso SYNTH 68	●	●	●	●	●	●
Inert gas charge	●	●	●	●	●	●
Four anti-vibration pads enclosed	●	●	●	●	●	●
Pressure relief valve	–	–	–	●	●	●
Suction and pressure shutoff valve	●	●	●	●	●	●
Sight glass	●	●	●	●	●	●
Oil sump heater 230 V - 1 - 50/60 Hz, 80 W, explosion-proof, conforming to the ATEX/IECEX requirement	○ <sup>1) 2)</sup>	–	–	–	–	–
<b>1</b> Oil sump heater 230 V - 1 - 50/60 Hz, 120 W, explosion-proof, conforming to the ATEX/IECEX requirement	–	○ <sup>2) 4)</sup>	○ <sup>2) 4)</sup>	–	–	–
Oil sump heater 230 V - 1 - 50/60 Hz, 180 W, explosion-proof, conforming to the ATEX/IECEX requirement	–	–	–	○ <sup>2) 4)</sup>	○ <sup>2) 4)</sup>	○ <sup>2) 4)</sup>
Oil pump cover with screw-in option for oil differential pressure sensor INT250 EX	–	–	–	○ <sup>5)</sup>	○ <sup>5)</sup>	○ <sup>5)</sup>
Possibility to connect to oil level regulator of makes ESK, AC+R, CARLY	● <sup>3) 5)</sup>	● <sup>3) 5)</sup>	● <sup>3) 5)</sup>	● <sup>5)</sup>	● <sup>5)</sup>	● <sup>5)</sup>
Possibility to connect to oil level regulator Product TRAXOIL	● <sup>3) 5)</sup>	● <sup>3) 5)</sup>	● <sup>3) 5)</sup>	● <sup>3) 5)</sup>	● <sup>3) 5)</sup>	● <sup>3) 5)</sup>
Oil differential pressure (INT250 EX, product Kriwan), including switching amplifier	–	–	–	○ <sup>1)</sup>	○ <sup>1)</sup>	○ <sup>5)</sup>
Capacity regulator 230 V - 1 - 40 – 60 Hz, 1 capacity regulator = 50 % residual output, explosion-proof, conforming to the ATEX/IECEX requirement	–	–	○ <sup>4)</sup>	○ <sup>4)</sup>	–	–
<b>2</b> Capacity regulator 230 V - 1 - 40 – 60 Hz, 1–2 capacity regulator = 66/33% residual output, explosion-proof, conforming to the ATEX/IECEX requirement	–	–	–	–	○ <sup>4)</sup>	○ <sup>4)</sup>
<b>3</b> Offshore coating (multi-layer)	○	○	○	○	○	○

- Scope of supply (standard)
- Accessories
- Not available

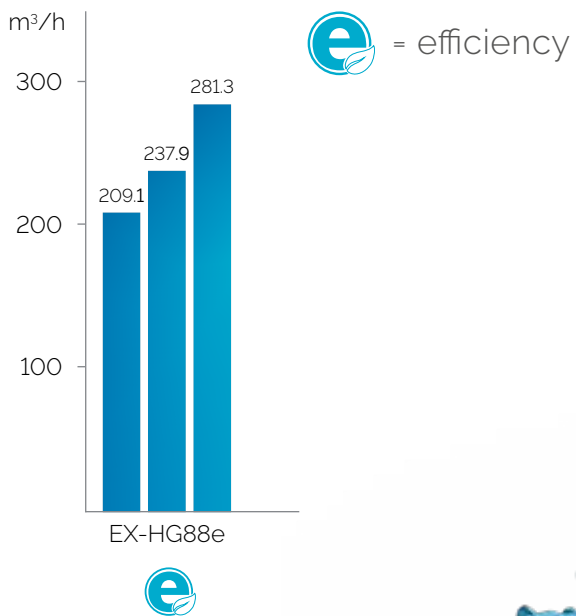
- <sup>1)</sup> Enclosed
- <sup>2)</sup> Oil sump heater required with HC compressor designs
- <sup>3)</sup> Only possible with additional adapter
- <sup>4)</sup> Mounted

<sup>5)</sup> Operation of these components only with suitable ignition protection

# BOCK HG compressors for zone 2

## The current program

3 capacity stages from 209.1 to 281.3 m<sup>3</sup>/h (50 Hz)

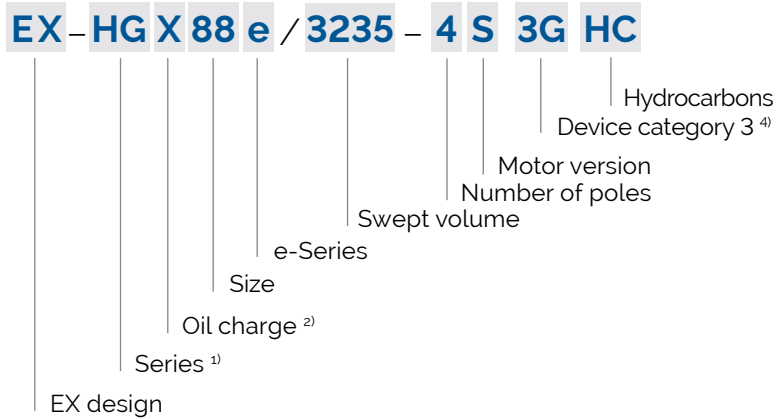




# Compressors for zone 2

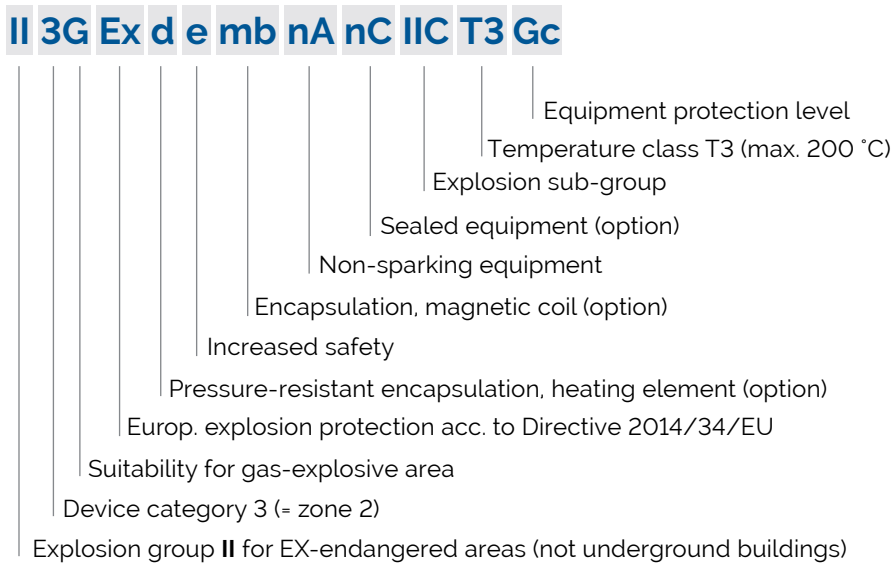
## At a glance

### Type code – EX compressor

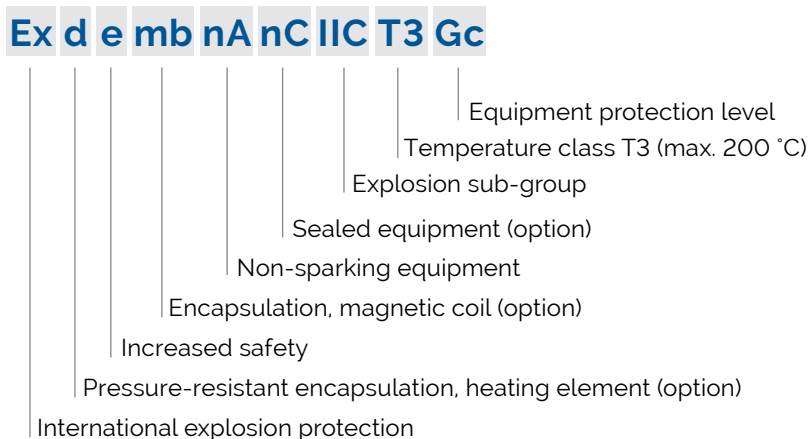


- <sup>1)</sup> HG = Compressor Hermetic Gas-cooled
- <sup>2)</sup> X = Ester oil charge (HFC refrigerant e.g. R134a, R404A, R507, R407C)
- <sup>3)</sup> S = Stronger motor, e.g. air conditioning applications
- <sup>4)</sup> For potentially explosive atmospheres caused by gases, vapors or mists

### ATEX identification



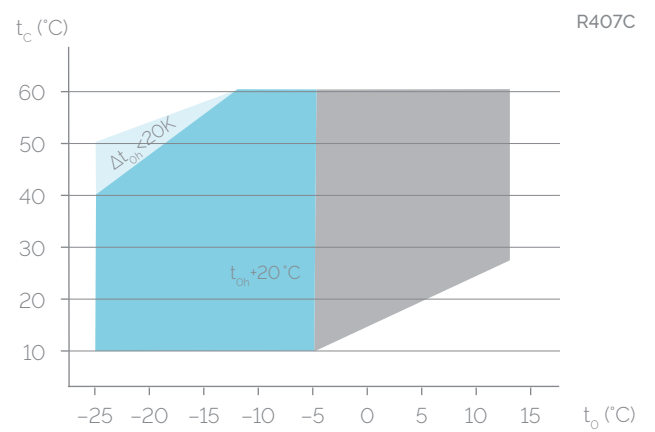
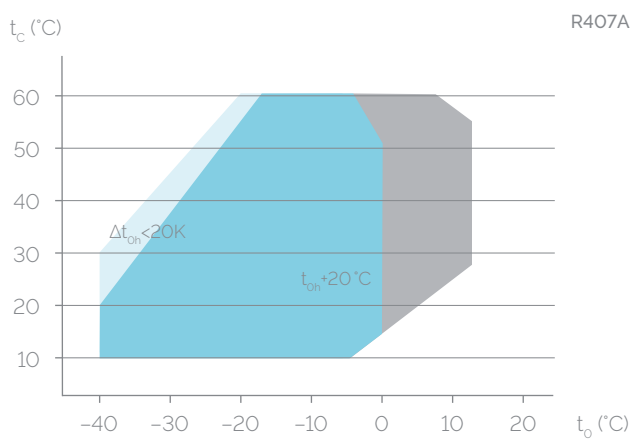
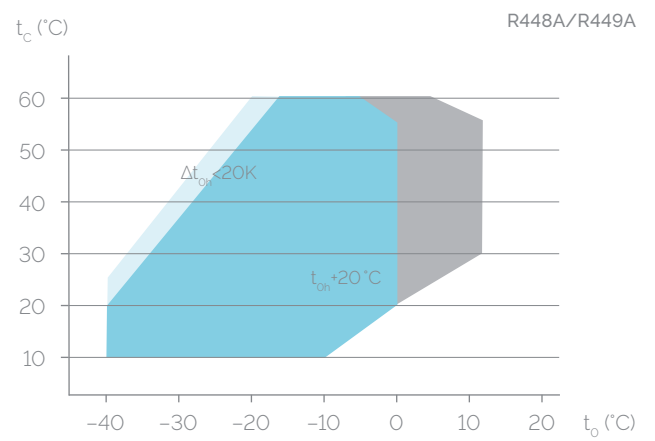
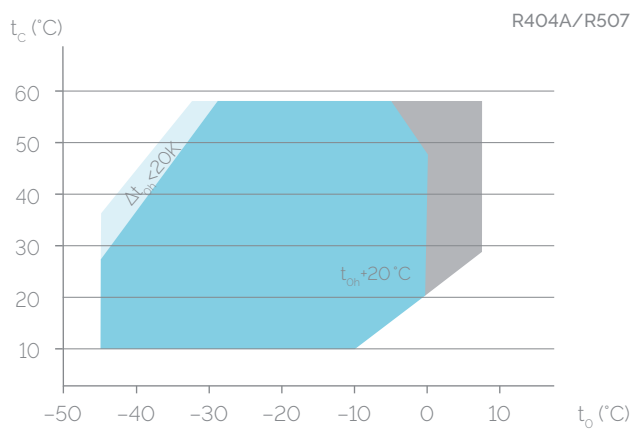
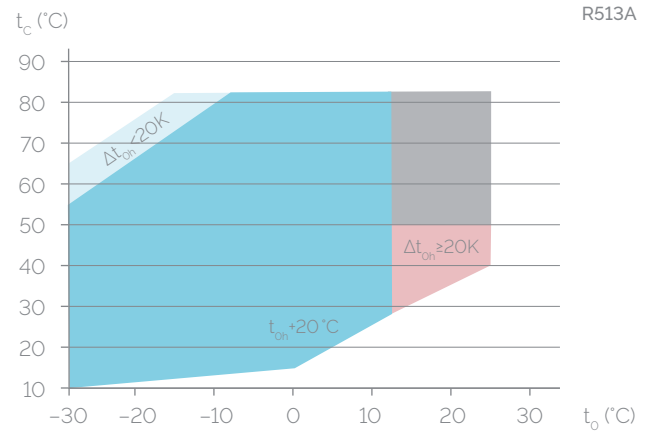
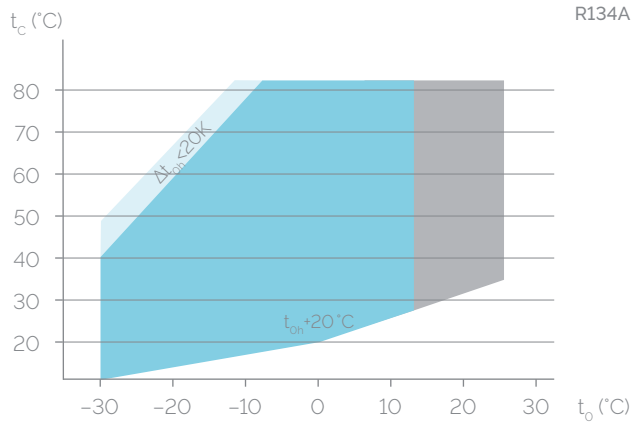
### IECEx identification



# Compressors for zone 2

## EX-HG88e operating limits

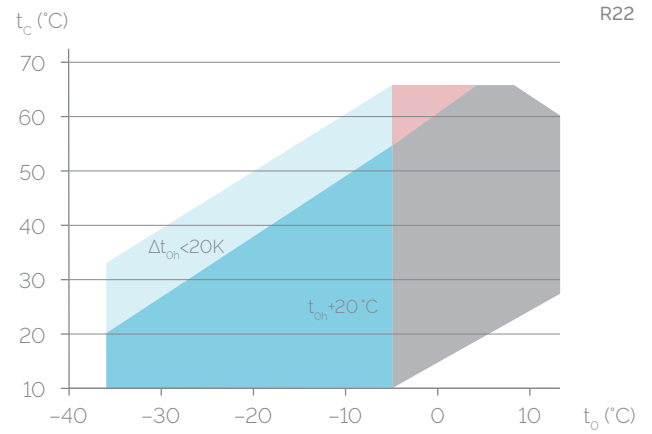
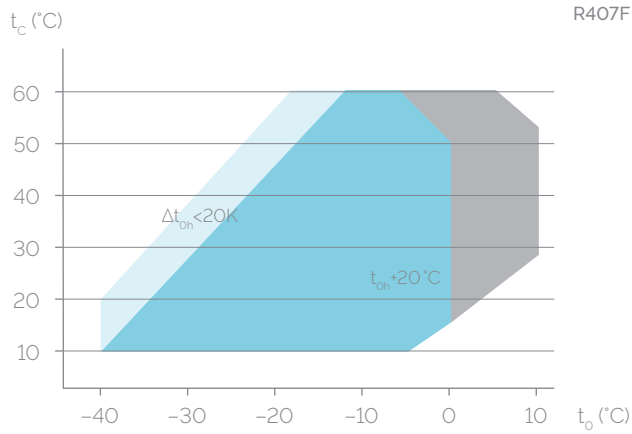
### Synthetic refrigerants operating limits



# Compressors for zone 2

## EX-HG88e operating limits

### Synthetic refrigerants operating limits



$t_o$  Evaporating temperature (°C)  
 $t_c$  Condensing temperature (°C)  
 $\Delta t_{oh}$  Suction gas superheat (K)  
 $t_{oh}$  Suction gas temperature (°C)

● Unlimited application range  
● Motor version -S- (more powerful motor)  
● Reduced suction gas temperature  
● Required minimum superheating  $\Delta t_{oh} = 20\text{K}$

Max. permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar  
<sup>1)</sup> LP = low pressure, HP = high pressure

## Notes

### Operating limits

Compressor operation is possible within the limits shown on the application diagrams. Please note the colored areas. Compressor application limits should not be chosen for

design purposes or continuous operation.

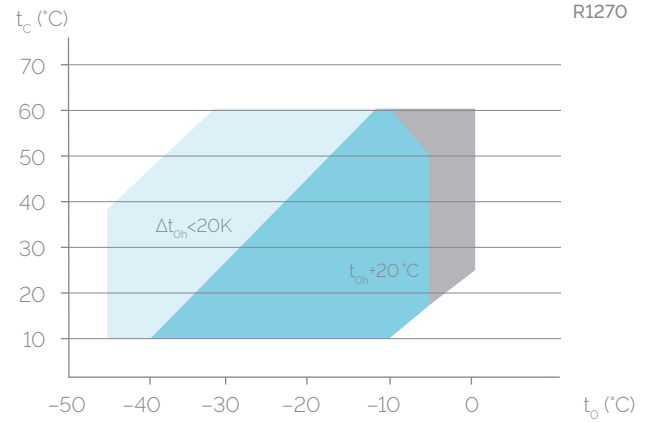
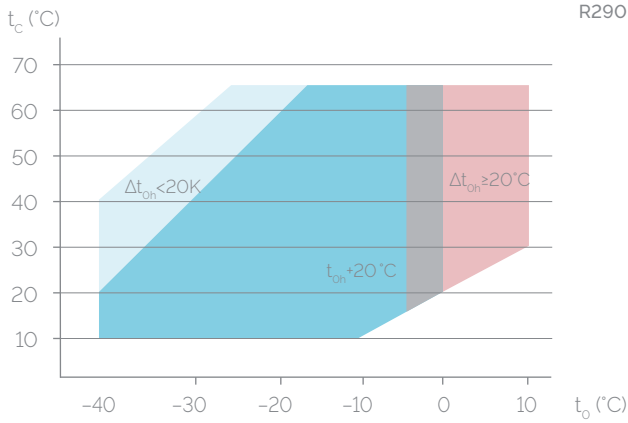
Further information can be found online at [vap.bock.de](http://vap.bock.de)



# Compressors for zone 2

## EX-HG88e operating limits

### Hydrocarbons operating limits



Design for other ranges on request

The use of other hydrocarbons is permitted only following prior written approval from Bock

- $t_o$  Evaporating temperature (°C)
- $t_c$  Condensing temperature (°C)
- $\Delta t_{on}$  Suction gas superheat (K)
- $t_{on}$  Suction gas temperature (°C)

Max. permissible operating pressure<sup>a</sup> (LP/HP): 19/28 bar

<sup>a</sup> LP = low pressure, HP = high pressure

- Required minimum superheating  $\Delta t_{on} \geq 20$  K
- Motor version -S- (more powerful motor)  
Required minimum superheating  $\Delta t_{on} \geq 20$  K
- Required minimum superheating  $\Delta t_{on} \geq 20$  K, the suction gas temperature must be adapted accordingly
- Reduced suction gas temperature ( $\Delta t_{on} < 20$  K)

## Notes

### Operating limits

The compressor can be operated within the operating limits shown in the diagram. The meaning of the color-shaded areas should be observed. A minimum superheating of  $\Delta t_{on} = 20$  K

must be maintained for the dark-blue and gray application range. An internal IHX heat exchanger must be provided for this, if necessary. Thresholds should not be selected as the design point or the continuous operating point.

Further information can be found online at [vap.bock.de](http://vap.bock.de)



# Compressors for zone 2

## Technical Data

### EX-HG88e, EX-HG88e...HC

Type	Number of cylinders	Displacement 50 / 60 Hz (1.450 / 1.740 rpm)  m <sup>3</sup> /h	Voltage <sup>1)</sup>	Electrical data			Weight  kg	Connections <sup>5)</sup>		Oil charge  Ltr.
				Max. working current <sup>2)</sup>  A	Max. power consumption <sup>2)</sup>  kW	Starting current (rotor locked)  A		Discharge line DV  mm   inch	Suction line SV  mm   inch	
				PW 1+2*		PW1 / PW 1+2*				
EX-HG88e/2400-4 3G (HC)	8	209.10 / 250.90	4)	101.0	59.5	298 / 438	450.0	28   1 <sup>1</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	9.6
EX-HG88e/2400-4 S 3G (HC)	8	209.10 / 250.90	4)	120.0	69.8	447 / 657	470.0	28   1 <sup>1</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	9.6
EX-HG88e/2735-4 3G (HC)	8	237.90 / 285.50	4)	116.0	67.1	386 / 567	457.0	28   1 <sup>1</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	9.6
EX-HG88e/2735-4 S 3G (HC)	8	237.90 / 285.50	4)	136.0	80.0	447 / 657	466.0	28   1 <sup>1</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	9.6
EX-HG88e/3235-4 3G (HC)	8	281.30 / 337.60	4)	135.0	79.2	447 / 657	480.0	28   1 <sup>1</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	9.6
EX-HG88e/3235-4 S 3G (HC)	8	281.30 / 337.60	4)	162.0	93.9	538 / 791	468.0	42   1 <sup>5</sup> / <sub>8</sub>	54   2 <sup>1</sup> / <sub>8</sub>	9.6

\* PW - Part Winding, motors for part winding start 1 - 1st part winding 2 - 2nd part winding

### Explanations

- 1) Tolerance ( $\pm 10\%$ ) relates to the mean value of the voltage range. Other voltages and current types on request.
- 2) The specifications for max. power consumption apply for 50 Hz operation. For 60 Hz operation, the specifications have to be multiplied by the factor 1.2. The max. working current remains unchanged.  
Take account of the max. operating current / max. power consumption when designing contactors, leads and fuses.  
Switches: Service category AC3
- 3) 380-420 V Y/YY - 3 - 50 Hz PW  
440-480 V Y/YY - 3 - 60 Hz PW  
PW = Part Winding, motors for part winding start (no start unloaders required)  
Winding ratios:  
EX-HG88e = 50% / 50%
- 4) 380-420 V Y/YY - 3 - 50 Hz PW  
440-480 V Y/YY - 3 - 60 Hz PW  
PW = Part Winding, motors for part winding start (no start unloaders required)  
Winding ratios:  
EX-HG88e = 50% / 50%
- 5) For soldering connections

# Compressors for zone 2

## Dimensions and connections

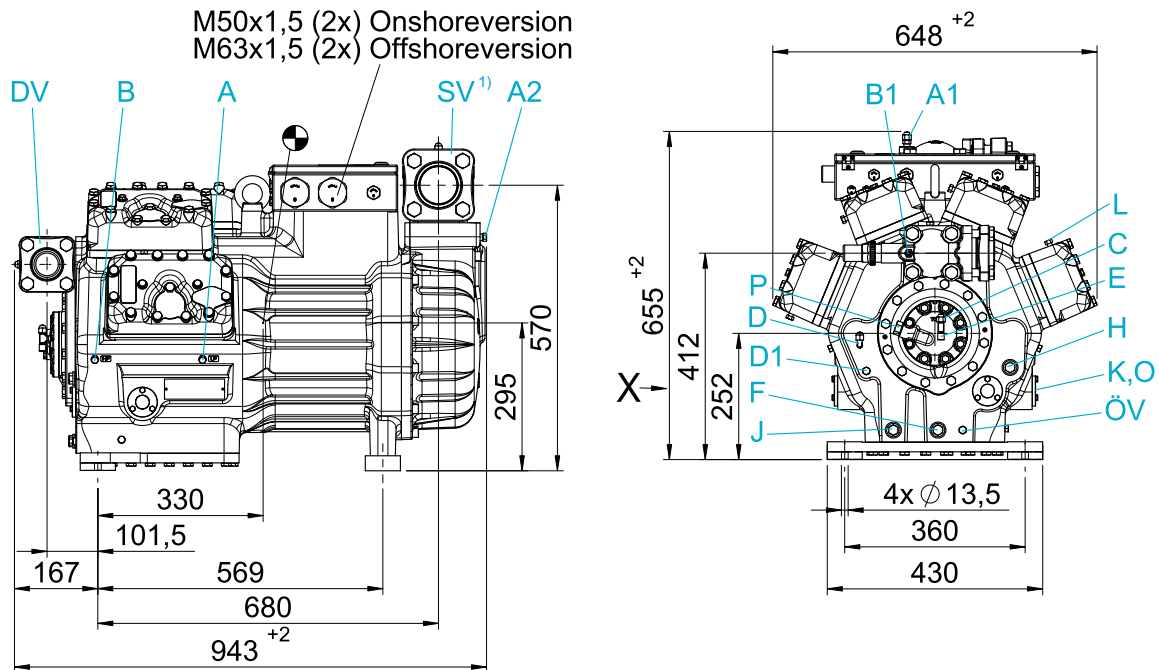
EX-HG88e

» EX-HG88e/2400-4 » EX-HG88e/2400-4 S » EX-HG88e/2735-4 3G » EX-HG88e/2735-4 S 3G

EX-HG88e...HC

» EX-HG88e/2735-4 » EX-HG88e/2735-4 S » EX-HG88e/3235-4 » EX-HG88e/3235-4 S

» EX-HG88e/3235-4 3G » EX-HG88e/3235-4 S 3G



Dimensions in mm

1) Position SV see table on page 41

☉ Center of gravity

For connections see page 42

Dimensions for anti-vibration pad, see page 41

Dimensions for view X, see page 41

# Compressors for zone 2

## Dimensions and connections

### View X

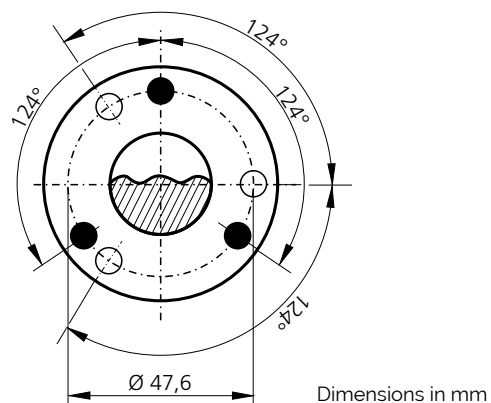
#### Possibility to connect to oil level regulator

##### EX-HG88e

● Three-hole connection for oil level regulator  
Products ESK, AC+R, CARLY (3 × M6 × 10 deep)<sup>1)</sup>

○ Three-hole connection for oil level regulator  
Product TRAXOIL (3 × M6 × 10 deep)<sup>1)</sup>

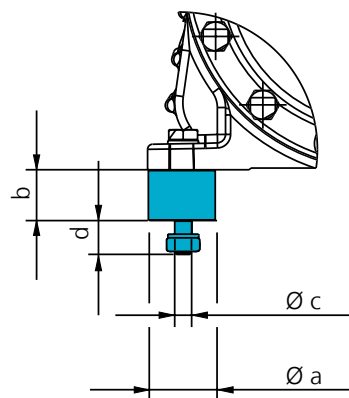
<sup>1)</sup> Operation of this component is permissible only with the appropriate type of protection.



#### Dimensions for anti-vibration pad

Type	Ø a	b	c	d
EX-HG88e	70	45	M12	37

Dimensions in mm



#### Variable suction line valve position

1 2



1 Shut-off valve can be rotated 90°

2 The suction cover can be rotated 90°

1+2 Flexible connection positioning of the suction line

	Suction line valve position	Suction cover position
EX-HG88e	180°	90°

# Compressors for zone 2

## Dimensions and connections

### Connections

EX-HG88e

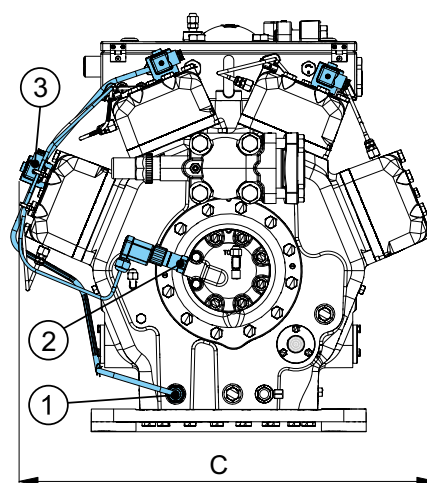
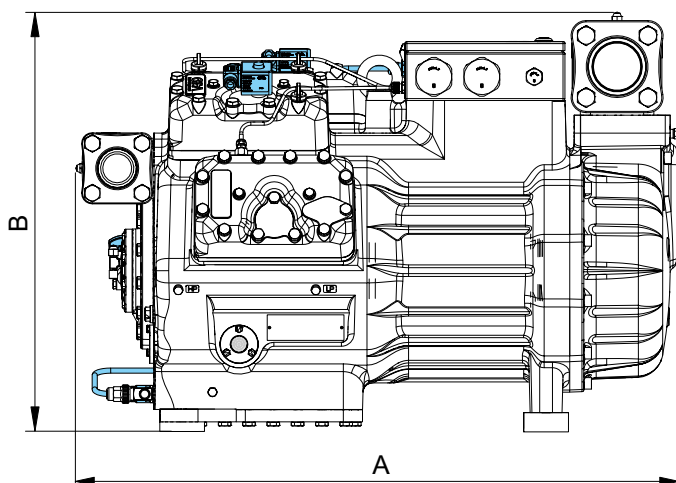
SV	Suction line	See technical data page 40
DV	Discharge line	
A	Connection suction side, not lockable	1/8" NPTF
A1	Connection suction side, lockable	7/16" UNF
A2	Connection suction side, not lockable	1/4" NPTF
B	Connection discharge side, not lockable	1/8" NPTF
B1	Connection discharge side, lockable	7/16" UNF
C	Oil pressure gauge connection <sup>1)</sup>	7/16" UNF
D	Connection oil pressure safety switch LP <sup>1)</sup>	7/16" UNF
D1	Connection oil return from oil separator	1/4" NPTF
F	Oil drain	M 22 x 1,5
H	Oil charge plug	M 22 x 1,5
J	Connection oil sump heater <sup>1)</sup>	M 22 x 1,5
K	Sight glass	3 Loch M6
L	Connection Thermal protection thermostat	1/8" NPTF
O	Connection oil level regulator <sup>1)</sup>	3 x M 6
ÖV	Connection oil service valve	1/4" NPTF
P	Connection oil differential pressure sensor <sup>1)</sup>	M 20 x 1,5

<sup>1)</sup> Operation of this component is permissible only with the appropriate type of protection

<sup>2)</sup> Dimensions for view X, see page 41

### Dimensions with accessories

EX-HG88e



① Oil sump heater    ② Oil differential pressure sensor    ③ Capacity regulator

### Dimensions

Type	A (mm)	B (mm)	C (mm)
EX-HG88e	ca. 943	ca. 655	ca. 648



# Compressors for zone 2

## Scope of supply and accessories

Scope of supply and accessories		EX-HG88e
	Semi-hermetic eight-cylinder reciprocating compressor with drive motor for partial winding start 380-420 V Y/YY - 3 - 50 Hz 440-480 V Y/YY - 3 - 60 Hz Single-section compressor housing with integrated electric motor	●
	Special voltage and/or special frequency (on request)	○
	Winding protection with PTC sensors and electronic trigger device INT69 EX2 for control cabinet installation	●
	Thermal protection thermostat (PTC Sensor)	○ <sup>4)</sup>
	Oil pump	●
	Oil charge: HG: FUCHS Reniso SP 46 HGX: FUCHS Reniso Triton SE 55 HG...HC: FUCHS Reniso SYNTH 68	●
	Service charge	●
	Four anti-vibration pads enclosed	●
	Pressure relief valve	●
	Suction and pressure shutoff valve	●
	Sight glass (3 pcs.)	●
1	Oil sump heater 230 V - 1 - 50/60 Hz, 240 W, explosion-proof, conforming to the ATEX/IECEX requirement	○ <sup>2) 4)</sup>
	Oil pump cover with screw-in option for oil differential pressure sensor	● <sup>4)</sup>
	Possibility to connect to oil level regulator of makes ESK, AC+R, CARLY	● <sup>5)</sup>
	Possibility to connect to oil level regulator Product TRAXOIL	● <sup>3) 5)</sup>
2	Oil differential pressure (INT 250 EX, product Kriwan), explosion-proof, conforming to the ATEX/IECEX requirement	○ <sup>1)</sup>
3	Capacity regulator 230 V - 1 - 40 - 60 Hz 1-3 capacity regulator = 75/50/25% residual output, explosion-proof, conforming to the ATEX/IECEX requirement	○ <sup>4)</sup>
	Offshore coating (multi-layer)	○

- Scope of supply (standard)
- Accessories
- Not available

<sup>1)</sup> Enclosed

<sup>2)</sup> Oil sump heater required with HC compressor designs

<sup>3)</sup> Only possible with additional adapter

<sup>4)</sup> Mounted

<sup>5)</sup> Operation of these components only with suitable ignition protection



**BOCK is one of the world's technology and innovation leaders in the development of environmentally friendly, economical solutions in the field of refrigeration and air-conditioning technology, including heat pumps and heat recovery – with one of the world's largest portfolios of compressors for natural refrigerants such as CO<sub>2</sub> (R744), hydrocarbons and other low-GWP refrigerants.**

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