



ATEX compressor

At a glance	152
Operating limits	154
Technical data	155
Dimensions and connections	157
Scope of supply and accessories	162
General information about ATEX	163

Semi-hermetic compressors in explosion-risk environments

Within the European Union, electrical and mechanical machinery operated in explosive atmospheres must comply with the **ATEX** (**AT**mospheres **EX**plosibles) conditions.

The system designer must use correspondingly marked and certified components for these applications.

Bock is the first European manufacturer who offers compressors which are conform to ATEX machine category 2.

Information about the compressors

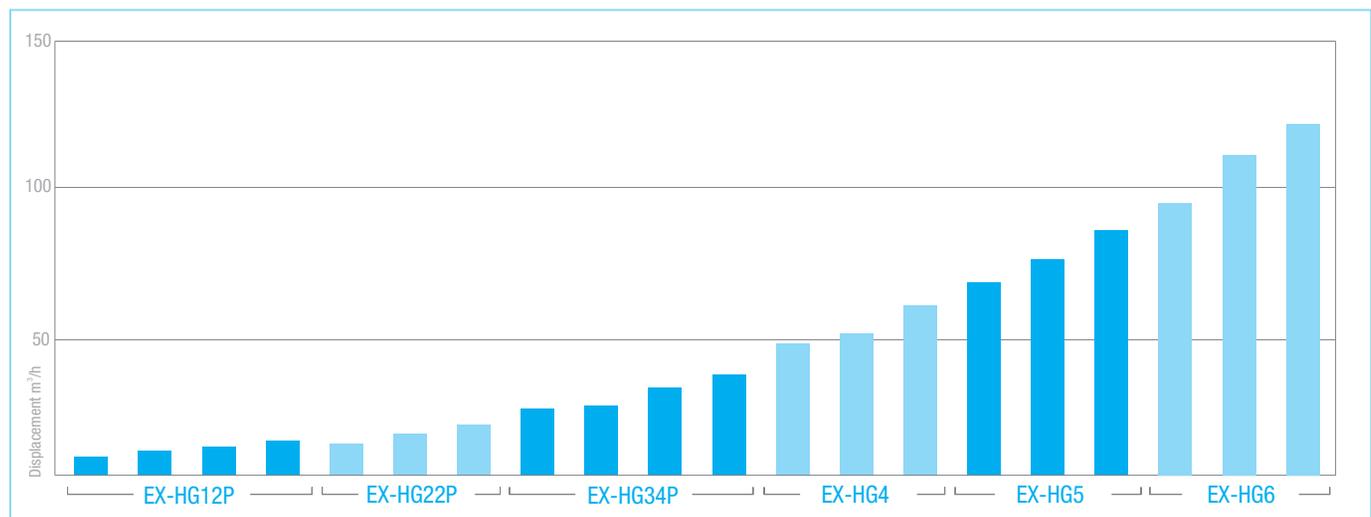
The models in the HG Series are the basic compressors for ATEX versions. Details start on page 32.



*Quality management
in accordance with
EN13980 monitored
by TÜV-SÜD*

The current program

...6 model sizes with 20 capacity stages from 5,4 to 122,4 m³/h (50 Hz)



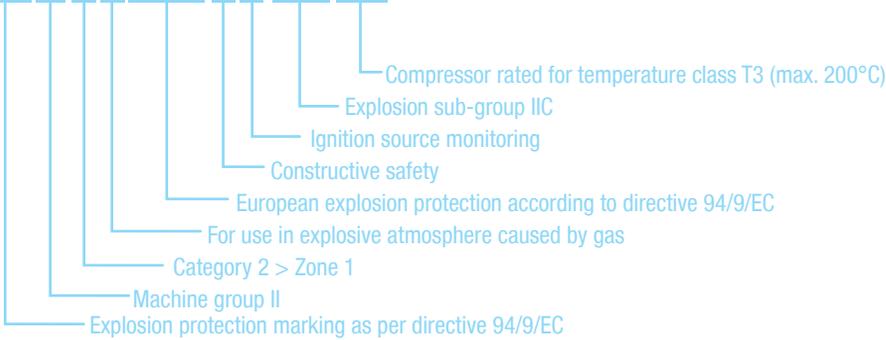
Differences to standard compressors



- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08
- 09
- 10
- 11
- 12
- 13

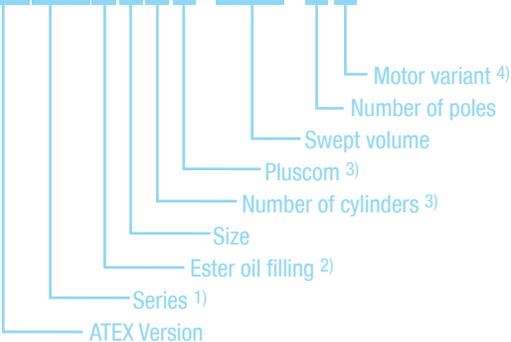
ATEX Classification

Ex II 2 GEEx cb IIC T3



Type key | ATEX Compressor

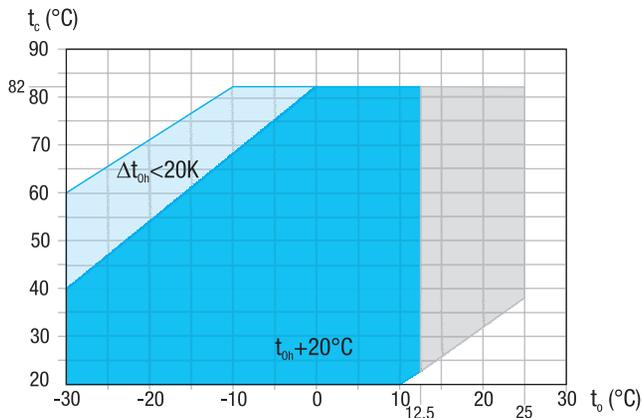
EXHGX34P/215-4S



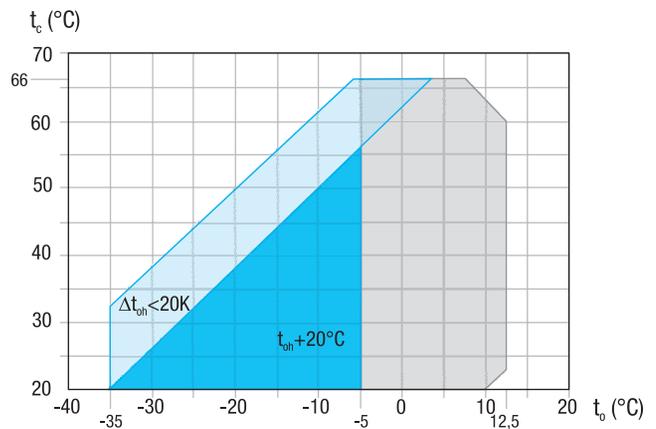
- 1) HG = Hermetic Gas-cooled (suction gas-cooled)
- 2) Ester oil filling (HFC refrigerants e.g. R134a, R404A, R507, R407C)
- 3) Additional declaration for Pluscom compressors
- 4) S = More powerful motor e.g. air conditioning applications

Operating limits

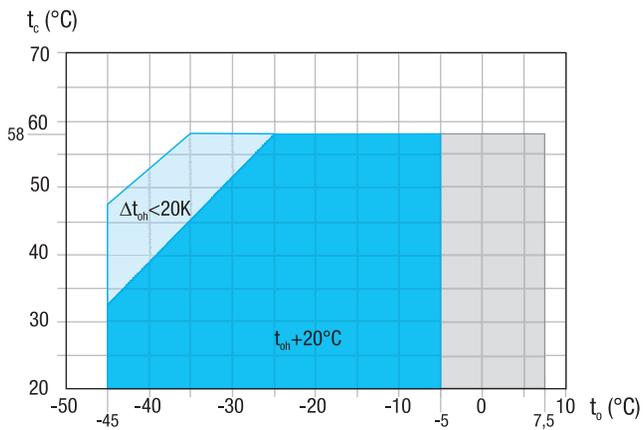
R134a / R600a



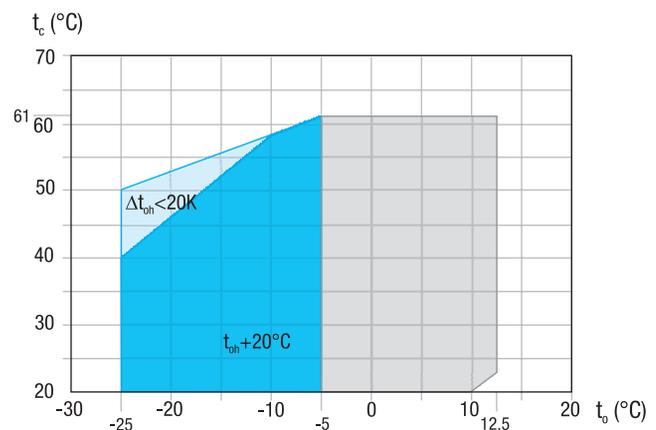
R22 / R290 / R1270



R404A / R507^①



R407C



Diagrams for other areas available on request.

Max. permissible operating pressure (LP/HP)¹⁾: 19/28 bar

¹⁾ LP = low pressure HP = high pressure

① EX-HGX6/1410-4S

max. evaporating temperature $t_o = 2\text{ °C}$

EX-HGX6/1410-4

max. evaporating temperature $t_o = -7\text{ °C}$

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

t_o Evaporating temperature (°C)

t_c Condensing temperature (°C)

Δt_{oh} Suction gas superheat (K)

t_{oh} Suction gas temperature (°C)

Notes

Operating limits

Compressor operation is possible within the limits shown on the application diagrams. Please note the coloured areas. Compressor application limits should not be chosen for design purposes or continuous operation.

Performance data:

The performance data for refrigerants can be found from page 45 onwards. In addition, performance data on hydrocarbons R290, R600a and R1270 can be found on the Internet.

Technical data

EX-HG Type	Number of cylinders	Displacement 50 / 60 Hz (1450/1740 1/min) m³/h	Electrical data ③				Weight kg	Connections		Oil charge Ltr.
			Voltage ①	Max. working current ② A Y	Max. power consumption ② kW	Starting current (rotor locked) A Y		Discharge line DV mm inch	Suction line SV mm inch	
EX-HG12P/60-4 S	2	5,40 / 6,40	④	3,9	2,2	23	48	12 / 1/2	16 / 5/8	0,9
EX-HG12P/75-4	2	6,70 / 8,10	④	4,1	2,3	23	48	12 / 1/2	16 / 5/8	0,9
EX-HG12P/75-4 S	2	6,70 / 8,10	④	4,6	2,6	25	49	12 / 1/2	16 / 5/8	0,9
EX-HG12P/90-4	2	8,00 / 9,60	④	4,9	2,8	25	49	12 / 1/2	16 / 5/8	0,9
EX-HG12P/90-4 S	2	8,00 / 9,60	④	5,1	2,9	26	49	12 / 1/2	16 / 5/8	0,9
EX-HG12P/110-4	2	9,40 / 11,30	④	5,3	3,1	25	48	12 / 1/2	16 / 5/8	0,9
EX-HG12P/110-4 S	2	9,40 / 11,30	④	6,1	3,6	26	48	12 / 1/2	16 / 5/8	0,9
EX-HG22P/125-4	2	11,10 / 13,30	④	5,6	3,2	32	73	16 / 5/8	22 / 7/8	1,1
EX-HG22P/125-4 S	2	11,10 / 13,30	④	6,3	3,7	32	74	16 / 5/8	22 / 7/8	1,1
EX-HG22P/160-4	2	13,70 / 16,40	④	6,0	3,5	32	74	16 / 5/8	22 / 7/8	1,1
EX-HG22P/160-4 S	2	13,70 / 16,40	④	7,4	4,4	40	75	16 / 5/8	22 / 7/8	1,1
EX-HG22P/190-4	2	16,50 / 19,80	④	7,7	4,6	32	74	16 / 5/8	22 / 7/8	1,1
EX-HG22P/190-4 S	2	16,50 / 19,80	④	9,3	5,7	40	75	16 / 5/8	22 / 7/8	1,1
EX-HG34P/215-4	4	18,80 / 22,60	④	8,3	5,0	40	94	16 / 5/8	22 / 7/8	1,4
EX-HG34P/215-4 S	4	18,80 / 22,60	④	10,5	6,1	70	96	16 / 5/8	22 / 7/8	1,4
EX-HG34P/255-4	4	22,10 / 26,60	④	10,0	6,1	40	94	16 / 5/8	28 / 1 1/8	1,4
EX-HG34P/255-4 S	4	22,10 / 26,60	④	12,6	7,5	70	96	16 / 5/8	28 / 1 1/8	1,4
EX-HG34P/315-4	4	27,30 / 32,80	④	12,2	7,3	70	93	22 / 7/8	28 / 1 1/8	1,4
EX-HG34P/315-4 S	4	27,30 / 32,80	④	16,3	8,9	77	96	22 / 7/8	28 / 1 1/8	1,4
EX-HG34P/380-4	4	33,10 / 39,70	④	15,1	9,1	70	91	22 / 7/8	28 / 1 1/8	1,4
EX-HG34P/380-4 S	4	33,10 / 39,70	④	18,7	11,1	77	94	22 / 7/8	28 / 1 1/8	1,4

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ATEX Compressor - Technical data

EX-HG Type	Number of cylinders	Displacement 50 / 60 Hz (1450/1740 1/min) m³/h	Electrical data ③				Weight kg	Connections		Oil charge Ltr.
			Voltage ①	Max. working current ②	Max. power consumption ②	Starting current (rotor locked) A		Discharge line DV mm inch	Suction line SV mm inch	
				A	kW	A				
				* PW 1+2			* PW1 / PW 1+2			
EX-HG4/465-4	4	40,50 / 48,60	⑤	18	11,0	57 / 75	151	28 / 1 ¹ / ₈	35 / 1 ³ / ₈	3,4
EX-HG4/465-4 S	4	40,50 / 48,60	⑤	27	13,0	82 / 107	154	28 / 1 ¹ / ₈	35 / 1 ³ / ₈	3,4
EX-HG4/555-4	4	48,20 / 57,80	⑤	27	12,9	82 / 107	153	28 / 1 ¹ / ₈	35 / 1 ³ / ₈	3,4
EX-HG4/555-4 S	4	48,20 / 57,80	⑤	34	15,2	107 / 140	156	28 / 1 ¹ / ₈	35 / 1 ³ / ₈	3,4
EX-HG4/650-4	4	56,60 / 67,90	⑤	27	15,7	82 / 107	155	28 / 1 ¹ / ₈	42 / 1 ⁵ / ₈	3,4
EX-HG4/650-4 S	4	56,60 / 67,90	⑤	34	18,4	107 / 140	158	28 / 1 ¹ / ₈	42 / 1 ⁵ / ₈	3,4
EX-HG5/725-4	4	62,90 / 75,50	⑤	33	16,5	82 / 107	201	28 / 1 ¹ / ₈	42 / 1 ⁵ / ₈	4,5
EX-HG5/725-4 S	4	62,90 / 75,50	⑤	37	19,4	107 / 140	205	28 / 1 ¹ / ₈	42 / 1 ⁵ / ₈	4,5
EX-HG5/830-4	4	72,20 / 86,70	⑤	33	18,9	82 / 107	200	28 / 1 ¹ / ₈	42 / 1 ⁵ / ₈	4,5
EX-HG5/830-4 S	4	72,20 / 86,70	⑤	49	22,3	126 / 160	207	28 / 1 ¹ / ₈	42 / 1 ⁵ / ₈	4,5
EX-HG5/945-4	4	82,20 / 98,60	⑤	37	22,6	107 / 140	204	35 / 1 ³ / ₈	54 / 2 ¹ / ₈	4,5
EX-HG5/945-4 S	4	82,20 / 98,60	⑤	49	22,8	126 / 160	208	35 / 1 ³ / ₈	54 / 2 ¹ / ₈	4,5
EX-HG6/1080-4	4	93,70 / 112,40	⑤	47	26,3	149 / 189	221	35 / 1 ³ / ₈	54 / 2 ¹ / ₈	4,5
EX-HG6/1080-4 S	4	93,70 / 112,40	⑤	57	31,0	172 / 212	227	35 / 1 ³ / ₈	54 / 2 ¹ / ₈	4,5
EX-HG6/1240-4	4	107,60 / 129,10	⑤	57	30,5	172 / 212	225	35 / 1 ³ / ₈	54 / 2 ¹ / ₈	4,5
EX-HG6/1240-4 S	4	107,60 / 129,10	⑤	71	36,0	204 / 250	228	35 / 1 ³ / ₈	54 / 2 ¹ / ₈	4,5
EX-HG6/1410-4	4	122,40 / 146,90	⑤	57	35,6	172 / 212	223	35 / 1 ³ / ₈	54 / 2 ¹ / ₈	4,5
EX-HG6/1410-4 S	4	122,40 / 146,90	⑤	71	42,6	204 / 250	226	35 / 1 ³ / ₈	54 / 2 ¹ / ₈	4,5

* PW = Part Winding, motors for part winding start

1 = 1. part winding

2 = 2. part winding

Explanations:

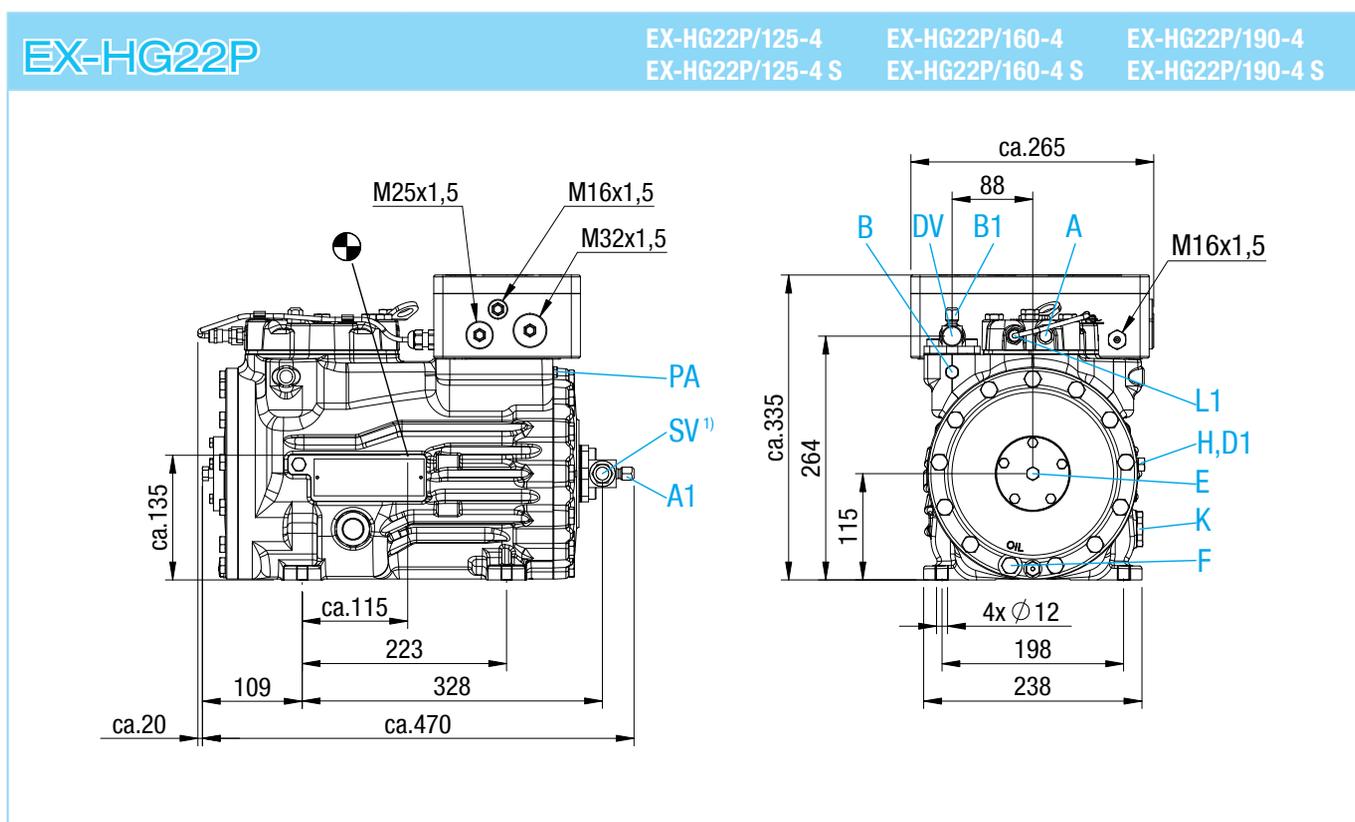
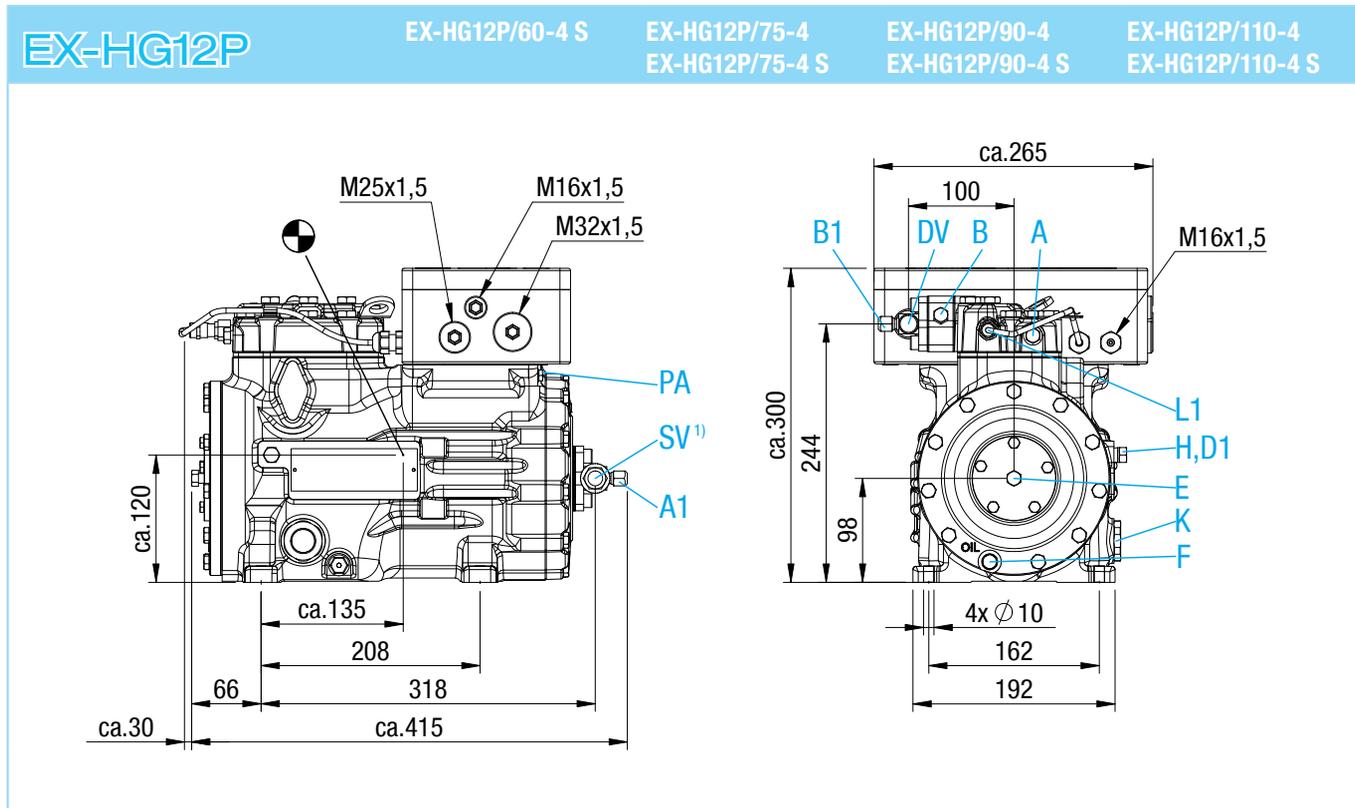
① Tolerance ($\pm 10\%$) relates to the mean value of the voltage range. Other voltages and current types on request.

② Take account of the max. operating current / max. power consumption when designing contactors, leads and fuses. Switches: Service category AC3

③ All data are based on the mean value of the voltage range.

④ 380-420 V Y - 3 - 50 Hz
440-480 V Y - 3 - 60 Hz

⑤ 380-420 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-HG4, EX-HG5, EX-HG6 = 66% / 33%

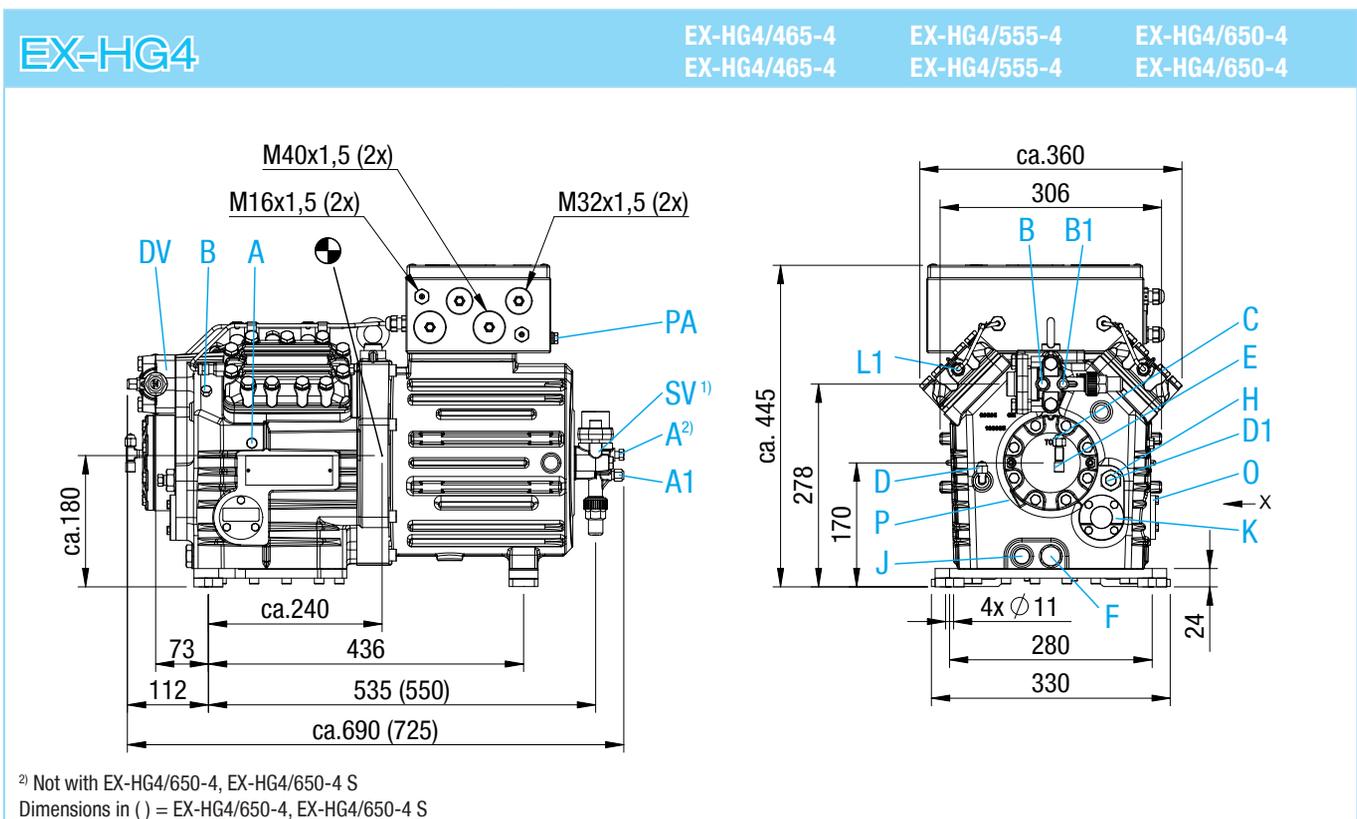
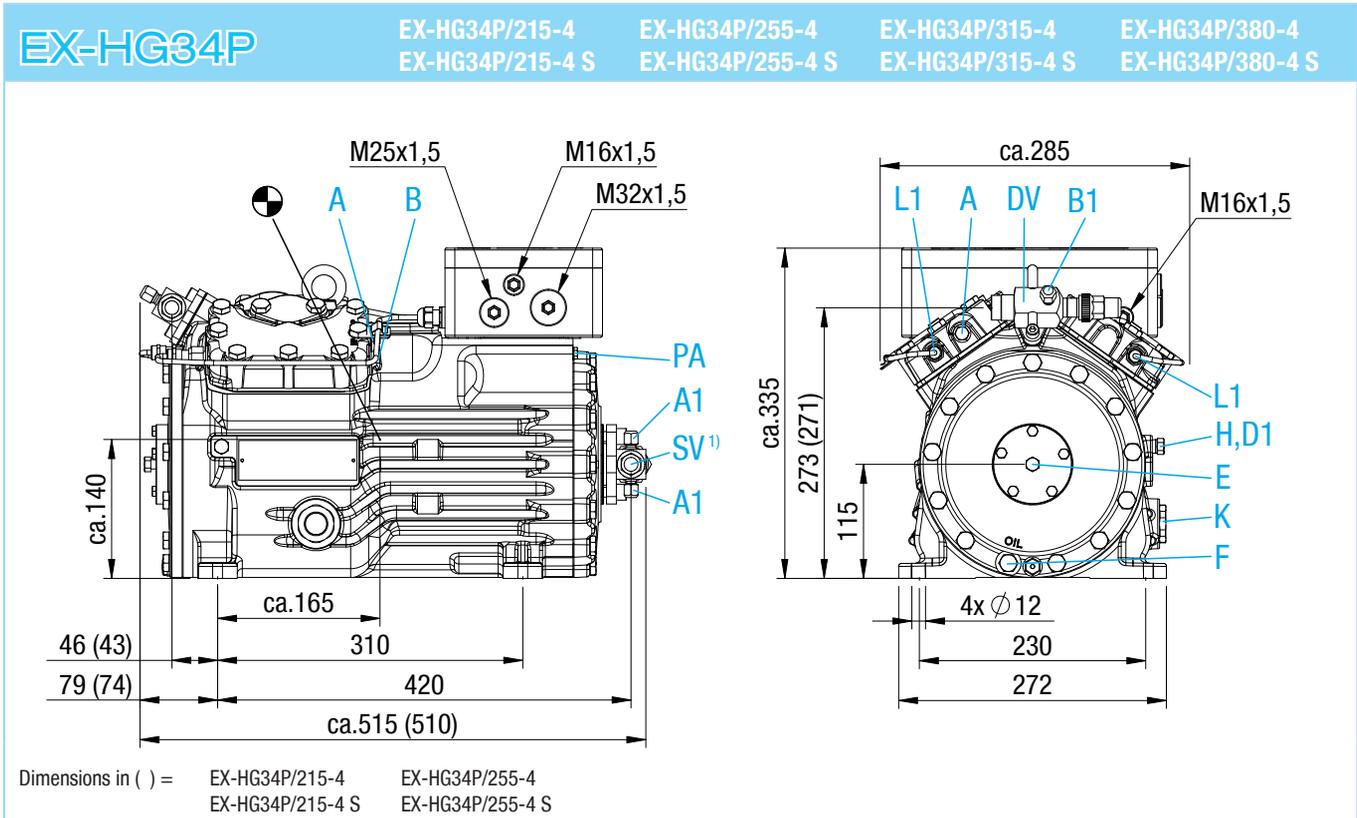


Dimensions in mm
¹⁾ SV 90° rotatable
 ● Centre of gravity

- Connections see page 160
 - Dimensions for anti-vibration pad see page 161
 - View X, see page 161

01
02
03
04
05
06
07
08
09
10
11
12
13

ATEX Compressor - Dimensions and connections



Dimensions in mm
¹⁾ SV 90° rotatable
 Centre of gravity

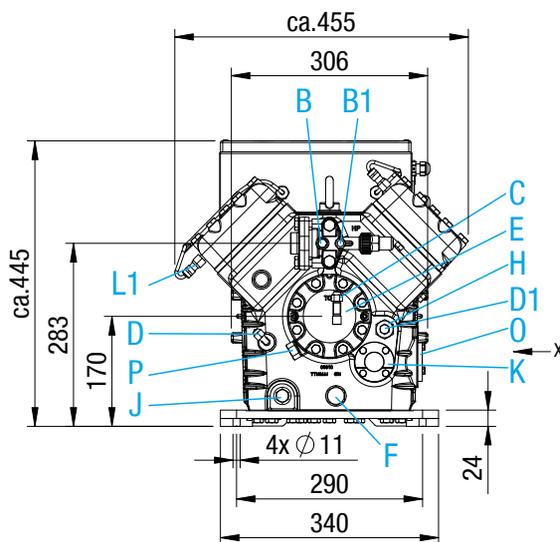
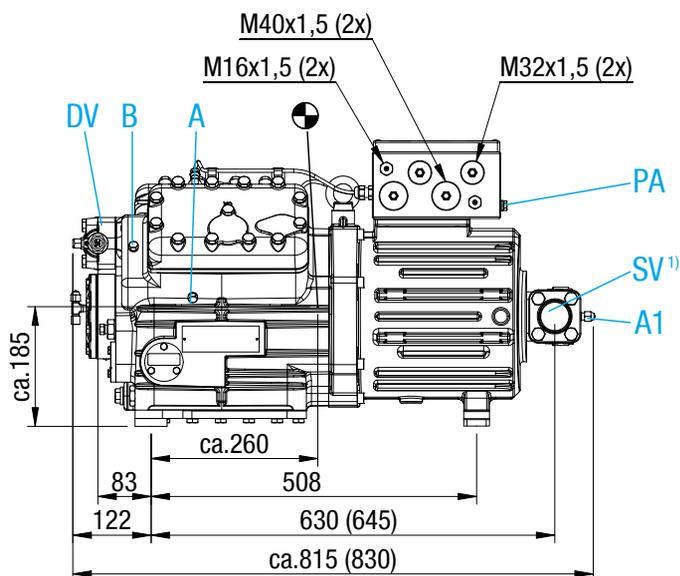
- Connections see page 160
 - Dimensions for anti-vibration pad see page 161
 - View X, see page 161

EX-HG5

EX-HG5/725-4
EX-HG5/725-4 S

EX-HG5/830-4
EX-HG5/830-4 S

EX-HG5/945-4
EX-HG5/945-4 S



Dimensions in () = EX-HG5/945-4 EX-HG5/945-4 S

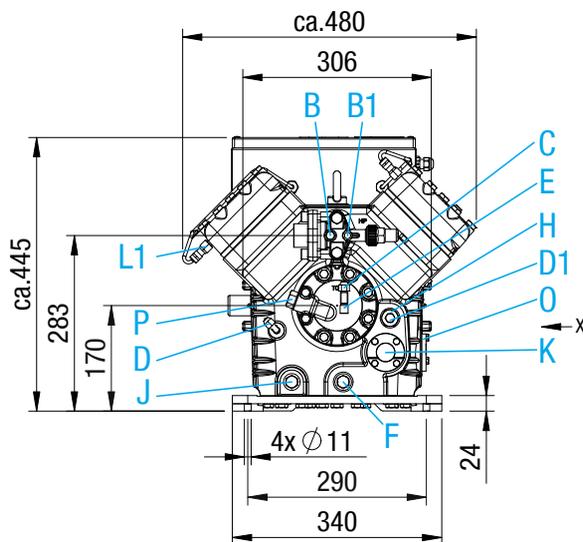
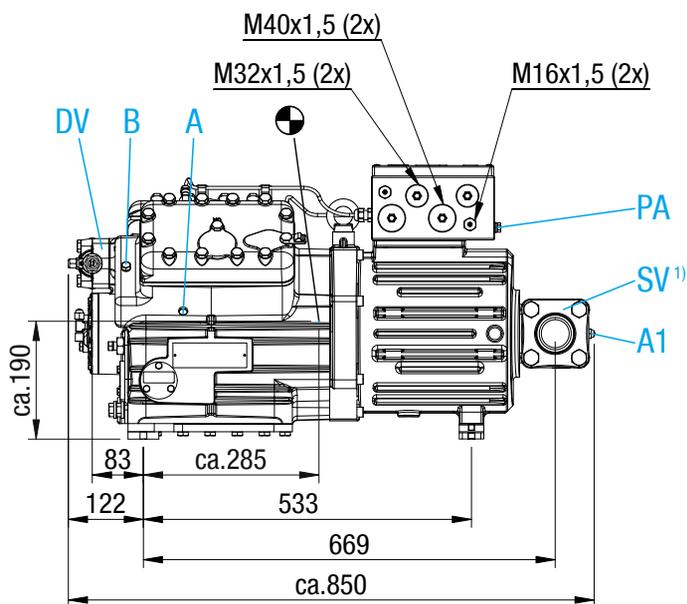
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- 07
- 08
- 09
- 10
- 11
- 12
- 13

EX-HG6

EX-HG6/1080-4
EX-HG6/1080-4 S

EX-HG6/1240-4
EX-HG6/1240-4 S

EX-HG6/1410-4
EX-HG6/1410-4 S



Dimensions in mm
¹⁾ SV 90° rotatable
 ● Centre of gravity

- Connections see page 160
 - Dimensions for anti-vibration pad see page 161
 - View X, see page 161

ATEX Compressor - Dimensions and connections

Connections	EX-HG12P	EX-HG22P	EX-HG34P	EX-HG4	EX-HG5	EX-HG6
SV Suction line DV Discharge line	Please refer to technical data! Page 155 and 156					
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 OIL ¹⁾	-	-	-	7/16 " UNF	7/16 " UNF	7/16 " UNF
D Connection oil pressure safety switch LP ¹⁾	-	-	-	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
E Connection oil pressure gauge	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	7/16 " UNF	7/16 " UNF	7/16 " UNF
F Oil drain	M 8	M 10	M 10	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5
H Oil charge plug	1/4 " NPTF	1/4 " NPTF	1/4 " NPTF	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5
K Sight glass	1 1/8 " - 18 UNEF	1 1/8 " - 18 UNEF	1 1/8 " - 18 UNEF	4 hole M 6	4 hole M 6	4 hole M 6
L1 Thermal protection thermostat	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF
O Connection oil level regulator ¹⁾	-	-	-	①	①	①
P Connection oil differential pressure sensor ¹⁾	-	-	-	M 20 x 1,5	M 20 x 1,5	M 20 x 1,5
PA Connection potential compensation	M 6	M 6	M 6	M 8	M 8	M 8

¹⁾ Operation of this component is permissible only with the appropriate type of protection

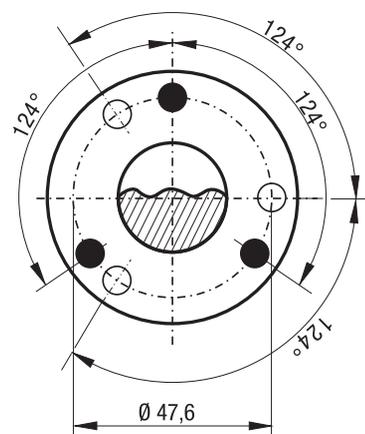
① Dimensions see view X

View X

Possibility to connect to oil level regulator

EX-HG 4, 5, 6

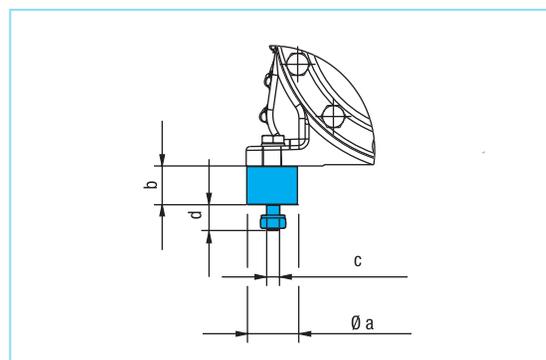
- Three-hole connection for oil level regulator make ESK, AC+R, CARLY (3x M6, 10 deep)
- Three-hole connection for oil level regulator make TRAXOIL (3 x M6 x 10 deep)



Dimensions in mm

Dimensions for anti-vibration pad

Type	Ø a mm	b mm	c mm	d mm
EX-HG12P	30	30	M8	20
EX-HG22P	40	30	M10	20
EX-HG34P	40	30	M10	20
EX-HG4	40	30	M10	20
EX-HG5	50	30	M10	25
EX-HG6	50	30	M10	25



- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08
- 09
- 10
- 11
- 12
- 13

ATEX Compressor - Scope of supply and accessories

Scope of supply	EX-HG12P	EX-HG22P	EX-HG34P	EX-HG4	EX-HG5	EX-HG6
Semi-hermetic 2 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 hermetically integrated electric motor	●	●				
Semi-hermetic 4 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 hermetically integrated electric motor			●			
Semi-hermetic 4 cylinder reciprocating compressor with drive motor for part winding start 380-420 V Y/YY - 3 - 50 Hz 440-480 V Y/YY - 3 - 60 Hz Motor unit flanged onto the compressor housing				●	●	●
Winding protection with PTC resistor sensors and electronic triggering unit Bock MP10 for installation in switch box (as accessory)	●	●	●	●	●	●
AC double barrier as energy limit in separate electrical circuit to avoid ignition. Suited for installation in switch box. (as accessory)	●	●	●	●	●	●
Oil pump cover with screwed connection for differential oil pressure sensor (Δp -switch Kriwan make)				● ¹⁾	● ¹⁾	● ¹⁾
Direct connection possibility of oil level controllers ESK, Traxoil, AC+R or CARLY				● ¹⁾	● ¹⁾	● ¹⁾
Oil charge: HG: FUCHS Reniso SP 46 HGX: FUCHS Reniso Triton SE 55	●	●	●	●	●	●
Sight glass	●	●	●	●	●	●
Decompression valve				●	●	●
Suction and discharge line valve	●	●	●	●	●	●
Thermal protection thermostat (PTC sensor) for each cylinder head	●	●	●	●	●	●
Inert gas charge	●	●	●	●	●	●
4 anti-vibration pads enclosed	●	●	●	●	●	●

¹⁾ Operation of these components only with suitable ignition protection

Accessories	EX-HG12P	EX-HG22P	EX-HG34P	EX-HG4	EX-HG5	EX-HG6
Capacity controller 230 V - 1 - 40-60 Hz, IP65 1 Capacity controller = 50% rest capacity, explosion protection, machine category 2, Directive 94/9/EG			●	●	●	●
Oil sump heater 230 V - 1 - 50/60 Hz, 80 W, explosion protection, machine category 2, Directive 94/9/EG				●		
Ölsumpfheizung 230 V - 1 - 50/60 Hz, 140 W, explosion protection, machine category 2, Directive 94/9/EG					●	●
Special voltage and/or -frequency (on request)	●	●	●	●	●	●

General information about ATEX

Explosion protection and ATEX

According to the dictionary, an explosion is a “sudden change in forces based on the expansion efforts of gases and vapours“. Explosions are accompanied by an abrupt and usually simultaneous increase in temperature and pressure. Here it is possible to reach values exceeding 2000°C and 10 bar. The Professional Association of the Chemical Industry estimates that in Germany alone, altogether three minor to medium explosions occur every day.

There is an explosion-risk in nearly all process engineering systems: in the chemical and petrochemical industry, in mining, and in crude oil and natural gas production.

In many branches of industry, flammable gases, vapours and mist are generated during manufacturing, processing, transport and storage (e.g. paint shops, refineries, chemicals companies, research establishments, hydrogen production).

An explosive atmosphere normally requires oxygen and flammable substances in a certain ratio to each other. All it then needs for an explosion to occur is a corresponding ignition source. Naked flames, hot surfaces and visible electrical or mechanical sparks immediately come to mind.

But explosions can also be triggered by static discharge (e.g. even tiny quantities of ignition energy from the clothing worn by workers), electrical equalising currents, ultrasonic sound, electromagnetic radiation, shock waves and adiabatic compression.

What is ATEX?

The so-called ATEX Directive (ATEX is derived from the French Atmosphères EXplosibles) was drawn up to create uniform minimum standards throughout Europe. In spite of the 7-year transitional phase, when the Directive became a legal requirement as of 1 July 2003, many were still surprised.

ATEX now contains aspects pertaining to dust explosion protection and **mechanical explosion protection** which were previously neglected in many national regulations.

This is why today even non-electric equipment (mechanical parts) is subject to mandatory testing or at least appraisal.

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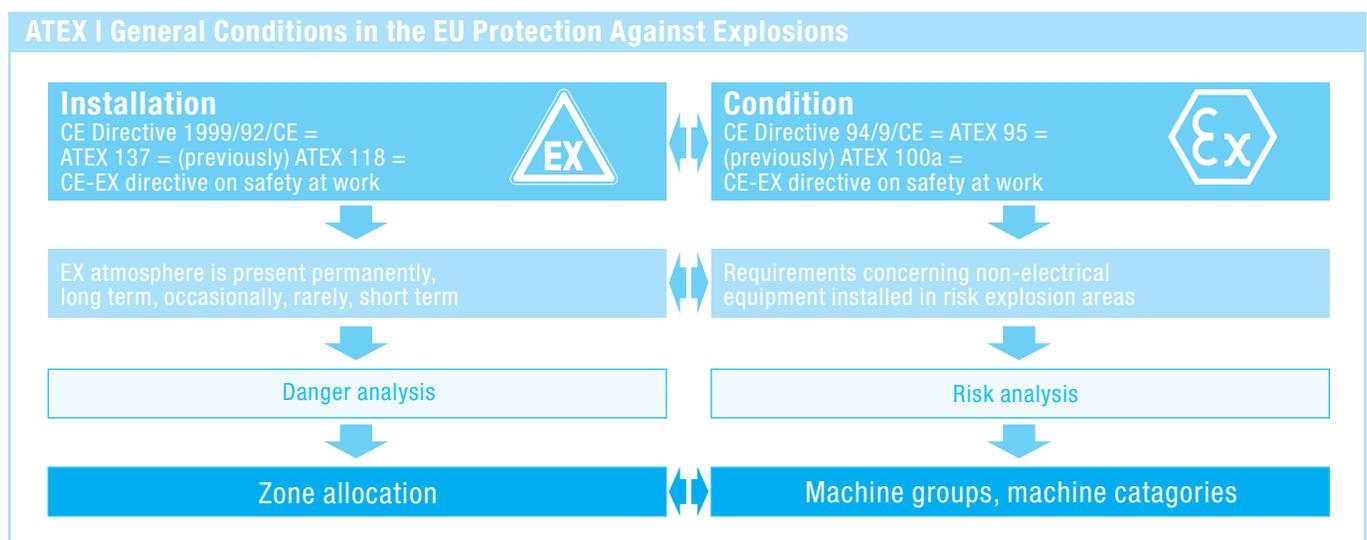
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The ATEX Directives

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

contains “minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres“. It stipulates above all the requirements made of workplaces, including:

- Compilation of explosion protection documents with a comprehensive consideration of risks
- Allocation of zones (zone 0, 1, 2, 20, 21, 22) and corresponding marking
- Safety measures
- Requirements made of the employees
- Regulations for work approval and permitting work
- Choice of working equipment

This Directive therefore primarily addresses the machine owners. This ATEX Directive came into effect on 28 January 2000. Existing workplaces must fulfil the new regulations at the latest on the expiry of the interim period on 1640 June 2006.

2. EC Directive 94/9/EC (ATEX 95)

stipulates the requirements made of the products used in explosion-risk areas. This refers to:

- Machines and protection systems for intended use in explosion-risk atmospheres
- Safety, control and regulating devices contributing to the safe operation of the machines and protection systems
- All electrical, mechanical, hydraulic and pneumatic operating equipment with inherent ignition sources

This Directive primarily addresses the manufacturers. It has been a legal requirement since 1st July 2003.

Old machines:

The ATEX Directive is not retrospectively applicable. Machinery and equipment which already exists must be reviewed and faulty systems replaced by equipment conforming to ATEX.

If any damage or other potential danger sources are discovered (e.g. wear), then the old equipment has to be replaced with ATEX-compatible equipment.

Protection principles

1.

The safest machines are machines which rule out the risk of creating an explosive atmosphere right from the very start. Primary explosion protection means for example using non-flammable substitute substances. Other possibilities include avoiding the generation of corresponding mixtures by suitable ventilation measures or by changing the concentration levels.

2.

Unfortunately, primary explosion protection is frequently not possible. For this reason, in such cases it is necessary to avoid the ignition of an explosive atmosphere as secondary explosion protection. This consists of using corresponding machines, parts and materials, as well as complying with corresponding instructions and procedures for working in such areas.

3.

Finally, the last possibility can then only consist of limiting the effects of an explosion to a harmless level. This can consist of a corresponding encapsulation, for example, or cautious selection of the erection site.

Zone allocation

The obligations of the machine operator include drawing up a so-called explosion protection document, as stipulated in ATEX 137. This also includes an appraisal of the explosion risks. Accordingly, certain zones are to be introduced.

Explosion risk areas are broken down into zones and marked accordingly, depending on the frequency and duration with which explosive atmospheres occur:

Zone 0:

The explosive atmosphere is present constantly, for long periods of time or frequently.

Zone 1:

The explosive atmosphere is occasionally present during normal operation.

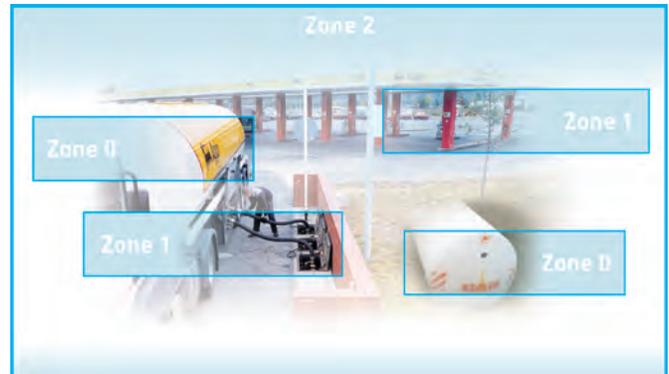
Zone 2:

The explosive atmosphere is not present during normal operation, or only briefly.

Flammable refrigerants

Refrigerating compressors used for flammable refrigerants (Group L3 - DIN EN 378) are subject to EU Directive 94/9/EU referring to the proper use of machinery and safety systems in explosion-risk areas.

Given the zone definitions stipulated above, zone allocation is also necessary when using hydrocarbons (flammable refrigerants) as refrigerants. The immediate vicinity of the machine must be presumed to be at least zone 2, because it is not possible to completely rule out the possibility of leaks. This is why machines according to the ATEX Directive are to be used for the declared zone (see machine group).



Example for zone allocations for gas, vapours and mist:

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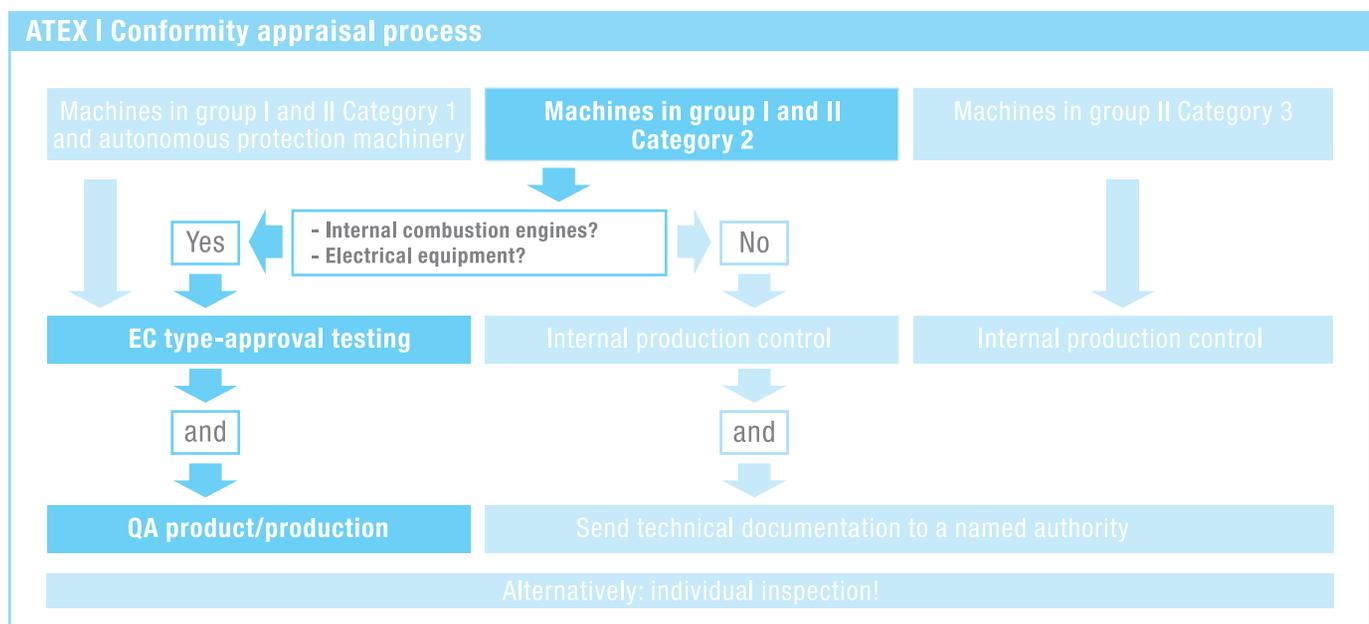
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General measures for explosion-risk areas

- The machine owner must draw up an explosion protection document (ATEX 137)
- The employer must provide employees with adequate, appropriate instructions about explosion protection
- In the case of dangerous work, written work permit must be obtained from the machine owner before commencing
- Explosion-risk areas must be marked with the warning sign at the access points
- Ignition sources (smoking, naked lights, soldering) must be prohibited
- Unauthorised access to the area must be prohibited by clear, indelible warning signs
- Working equipment must comply with the requirements for explosion protection
- The tests and inspections prescribed in the explosion protection document and in the operating instructions must be carried out punctually and corresponding records kept
- Machines with faults must not be operated

Conformity appraisal process



What does this mean for refrigerating machines?

Equipment in explosive atmospheres has to comply with ATEX requirements, when operating within the European Union.

According to ATEX requirements all electrical and mechanical equipment must be examined.

All equipment is defined according to Regulation 94/9/EG: machines, resources, stationary and moveable devices, control and plant components, as well as alarm and preventative systems which can, individually or in combination, cause the generation, transfer, accumulation, reading, control and conversion, of energy and/or are intended for processing materials and demonstrate their own potential ignition source which itself could cause an explosion.

Thus almost all components (compressor, evaporator, condenser – but also valves, pressure gauges, sensors...) of a refrigeration plant must be examined and evaluated.

The operator must produce a corresponding zone allocation. This has to be recorded in the explosion protection document.

In addition the important material properties pertinent to explosion protection must also be declared. The outcome of this provides the conditions under which the components can be used (group, category, explosion subgroup, temperature class).

Accordingly the plant operator should only use correspondingly marked and identified components with the necessary documentation (e.g. manufacturer's declaration or declaration of conformity)

The declarations issued by the component manufacturers only refer to the product itself.

It is presumed that the corresponding installation standards, installation and operating instructions (e.g. operating manual) are heeded during installation and operation.

Most manufacturers offer series products for a wide range of different applications, so that they can only consider their own product as such.

Interaction with other machinery in the system and with the environment must be taken into consideration by the system designer, particularly with regard to potential ignition sources.

When the results are positive, the system designer must draw up a corresponding declaration for the machine group or system.

The machine owner is responsible for registering the machinery with the supervisory authorities and requesting possibly necessary acceptance.



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