

## **GEA Bock Open Type Compressors F**

The full range of open type compressors and units

In touch with our customers

## GEA Refrigeration Technologies: Your partner for low temperatures

GEA Refrigeration Technologies, part of the internationally active GEA Group, is a synonym for industrial refrigeration technology. Since the end of the 19th century, it has been our business to cool processes and products, and to control the temperature of goods in transport.

You will find our solutions in the food and beverage sector; in the petrochemical, chemical, and pharmaceutical industries; on fishing ships; in natural gas liquefaction; in infrastructure facilities; and in ice factories. We are also at the top with know-how when it comes to refrigeration at leisure facilities. After all, we have been excited about refrigeration for decades now. As a result, our staff enthusiastically goes about its development and production projects – to include preventive and remedial maintenance of your refrigeration systems.

This enthusiasm is highly apparent in the daily work of all companies in our Segment. Whether it's complete systems or individual valves: we have the experience in every section of our company to optimally design, manufacture, and install refrigeration systems. And to take full advantage of this experience, we not only carry out development in our own company: we also manufacture, assemble, and test the core components. A chain is, after all, only as strong as its weakest link: and this also applies equally well to refrigeration technology, cooling processes, and cooling chains.

This makes it all the more important that you have a partner – in GEA Refrigeration Technologies – that has learned to master refrigeration from A to Z. And all of this since 1896, when Willem Grasso founded his refrigeration division. From this history of GEA Refrigeration Technologies, you will profit in the form of technical expertise and top sector know-how.

But we all live in the present and think about the future. We ponder a future in which more and more processes need energy around the world, and fewer natural resources are available. As a result, we have taken it as our goal to create solutions that are not only long-life and cost-effective, but also energy-saving and environment-protecting. We feel obligated to sustainability in many respects. Our objective is to produce longlife and material-saving products over the long run – as well as products that use environmentally benign refrigerants. And we aim to produce efficiently. But our responsibility does not end at the factory gate. As a result, we take great pains to ensure that our systems are energy-efficient and that they protect the climate. With GEA Refrigeration Technologies, you can also count on optimal economy: saving energy indeed means reducing money spent for energy. At the same time, you protect the environment. Thanks to our refrigeration technology, your processes will run more economically and more ecologically. To maintain our standard of living and to assure quality of life for future generations as well.

Our claim of combining economy with saving natural resources is reflected in all components of our company, such as the following: compressors, chillers, heat pumps, ice machines, fittings and valves, control systems, and many, many more. You can find proof of the above throughout the world. Our international corporate network – and above all our reference projects – are spread all over the globe.



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## Disclaimer

This brochure has been produced for you with the greatest of care. Nevertheless it is not possible to rule out mistakes completely. In such cases we cannot assume any liability. The contents correspond to the status on going to print. Illustrations may include optional equipment. Deviations cannot be ruled out because of the ongoing development process of our products.

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## GEA Bock - More than a compressor

Over 80 years ago, when the refrigeration and air-conditioning industry was still in its infancy, our company's founder, Wilhelm Bock, had a vision: He wanted to build first-class and reliable refrigeration machines. In the following decades Bock developed into one of the world's leading manufacturers of refrigeration and air-conditioning compressors.

As part of the GEA Group AG, GEA Bock offers the right compressor for refrigeration and air conditioning in all commercial, industrial, rail, bus and transport sectors.

The F model series provides modern open type compressors for separate drive systems (using V belts or direct couplings) in 7 model sizes and 10 capacity stages from 10,5 to 282 m<sup>3</sup>/h. Load transfer through a V pair.

GEA Bock F compressors are compact, robust and due to their open type construction they are easy to handle in almost all application fields of refrigeration technology.

As an alternative to the established F compressor series, a specially modified compressor series F NH<sub>3</sub> is available for use with the refrigerant R 717. The F NH<sub>3</sub> series is especially suitable for small to medium capacities.

No matter what your application is – we offer you the ideal compressor for your individual demand.

Be inspired. By our new products, our established product series and the entire passion that goes into each of our products.



## Semi-hermetic compressors HG (HA)

The GEA Bock HG (Hermetic Gas-cooled) range of semi-hermetic compressors offers traditional suction gas-cooled compressor state of the art technology. These compressors of the highest quality standard excel in their running comfort, easy maintenance, efficiency and reliability. Suitable as standard for conventional or chlorine-free HFC refrigerants.

The HA (Hermetic Air-cooled) range, specially engineered by GEA Bock, is available for deep-freezing applications, in particular for use with the refrigerants R22 and R404A.

- Single-stage
- CO<sub>2</sub> compressors subcritical
- CO<sub>2</sub> compressors transcritical
- R134a compressors
- R407C compressors
- ATEX compressors
- HC compressors
- Aluminium compressors
- 2-pole compressors
- Two-stage compressors
- Duplex compressors
- Compressor units with receiver
- Condenser units air-cooled



## Vehicle compressors FK

GEA Bock vehicle compressors of the FK range are the result of many years of experience in the domain of mobile cooling systems.

The unsurpassed light, compact, robust design and wide r.p.m. range are only some of the outstanding features of this unique product range of two, four and six cylinder compressors.

A wide variety of designs can be tailored to suit individual requirements.

The so-called K version is a special innovation with a unique valve plate system for maximum requirements in bus and coach air-conditioning systems.

- Compressors for bus and train air-conditioning
- Compressors for transport refrigeration and other applications



## Open type compressors F

The F model series provides modern open type compressors for separate drive systems (using V belts or direct couplings). Load transfer through a V pair.

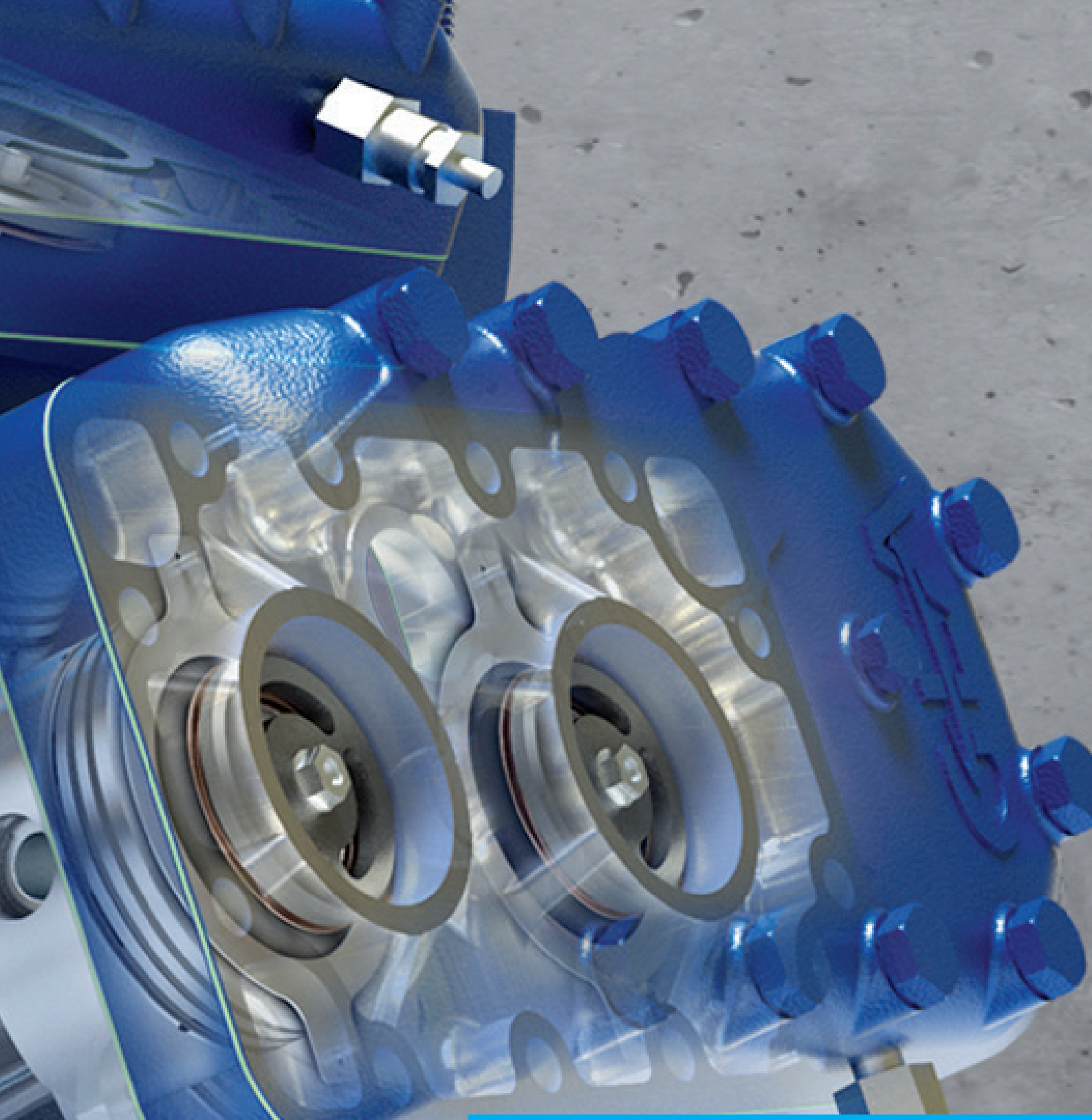
Virtually all drive capacity requirements can be met.

Very compact compressor design, robust and easy to handle. Oil pump lubrication as standard.

- F compressors
- F NH<sub>3</sub> compressors
- Compressor units for direct drive
- NH<sub>3</sub> compressor units for direct drive







The difference is in the detail -  
Characteristics  
GEA Bock open type compressors F

Special features

Open type 2-, 4-, 6- and 8-cylinder compressors

- Compact construction
- Robust and easy to handle
- Suitable for v-belt or coupling drive
- Large number of applications with a wide r.p.m. range
- Naturally with oil pump lubrication

Universal

- e.g. R134a, R404A, R507, R407C, R22
- One compressor design for all conventional refrigerants, for air-conditioning applications, normal or deep-freezing.  
Maximum permissible operating pressure: 28 bar
- Compressor designs for NH<sub>3</sub>
- Compressor designs for CO<sub>2</sub> on request

Quiet with low vibrations

- Large-dimensioned crankshaft area
- Dynamic mass balance
- High volume pressure area to dampen pulsations

Reliable and safe oil supply



- Classic lubricating oil circuit with oil pump independent of rotating direction
- High-volume oil sump
- F14, F16 option of expanding the oil volume by 2.5 litres by raising the base plate (accessories)
- F14, F16, F18 with connection facility for oil pressure monitoring via  $\Delta p$  oil differential pressure sensor
- F14, F16 and F18 with practical oil service valve for clean oil changes without intervening in the refrigeration cycle (accessories).
- Maximum slant of 30° short-term possible in both axes (e.g. marine applications)

Low-wearing long-lived mechanism

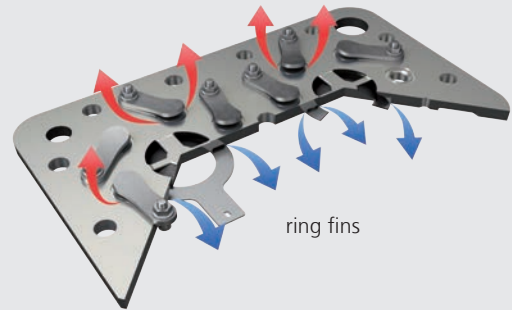
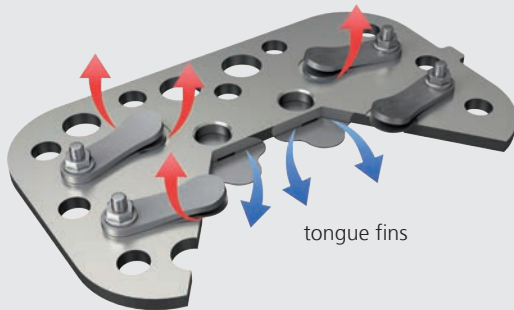


8-cylinder drive

- Solid construction and design
- Classic crankshaft construction with hardened surface
- Classic crankshaft construction with carbonated plasma-nitrite surface (F18)
- Low-friction, wear-resistant plain bearings
- Aluminium pistons with two-ring assembly, F14, F16, F18 three-ring assembly, compression ring chromehardened
- Aluminium con-rod in divided, screwed design, F14, F16, F18 with high-strength small end bearings



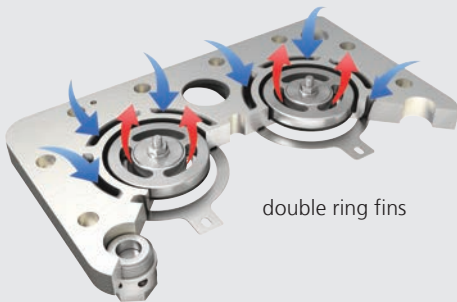
Valve plate construction for safe operation



- Universally proven valve design with intake and discharge finger reed valves clamped on one side (F14, F16 intake side formed as ring fins)
- Valves made out of high-quality, impact-resistant spring steel

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mexxFlow valve system - F18



# mexxFlow

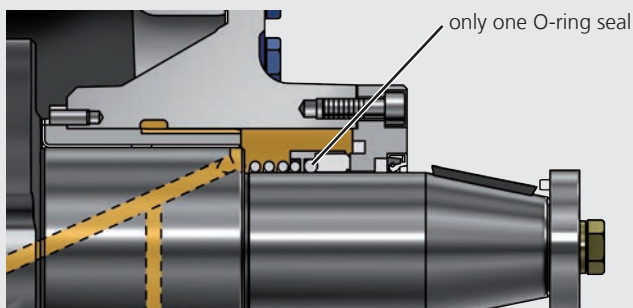
mexxFlow by GEA – the new benchmark for efficiency

With mexxFlow GEA Bock presents in the F18 compressor its new generation of highly efficient and reliable valve systems for higher refrigerating capacity at a lower power consumption!

Further information is available on [www.mexxFlow.com](http://www.mexxFlow.com)

- Valve plate with highly efficient double ring fins
- Fins made out of high-quality, impact-resistant spring steel
- Flow optimized system of valve plate and cylinder head

Simply constructed floating ring seals

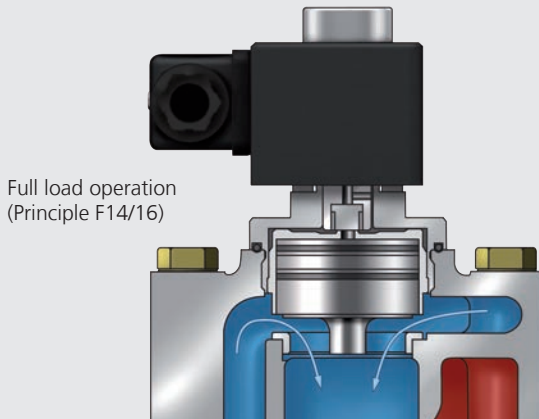


Example: assembly shaft seal F16

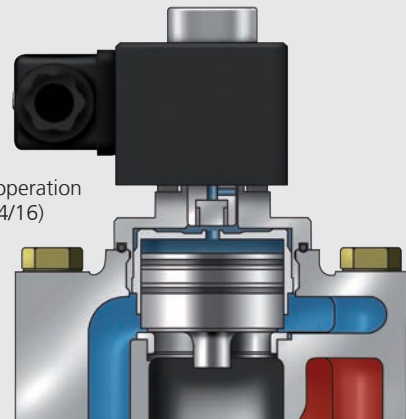
- Tried and tested construction for decades
- Only one o-ring seal, counter ring designed as the screw-on cover
- With oil washing for cooling and lubricating the whole unit
- Easy to change the shaft seal for maintenance purposes
- F14, F16 and F18 design with piece of tube for controlled oil drain option

practical drain-option via freely accessible piece of tube

Economic performance regulation (accessories)



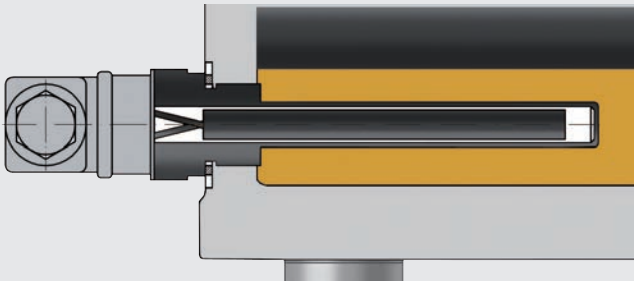
Full load operation  
(Principle F14/16)



Partial load operation  
(Principle F14/16)

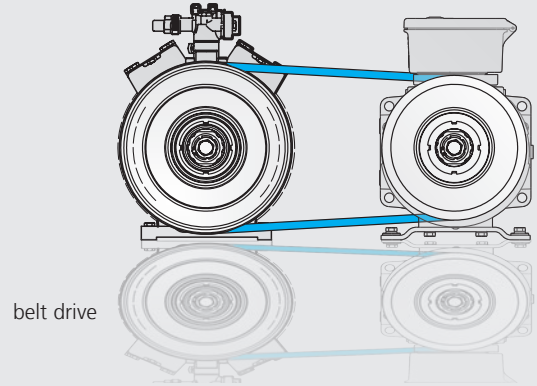
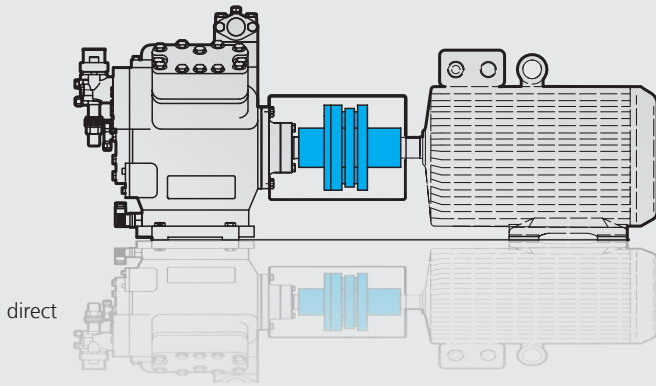
- Blocking of the intake of a cylinder bank with an electromagnetic pilot valve
- Possible regulating steps:  
 4-cylinder compressor: 50 %      6-cylinder compressor: 33 % / 66 %      8-cylinder compressor: 25 % / 50 % / 75 %
- Continuously variable speed control (up to 60 Hz) via external frequency converter possible

Oil sump heater (accessories)



- Design with immersion sleeve
- Changes possible without intervening in the refrigeration cycle

Various drive options



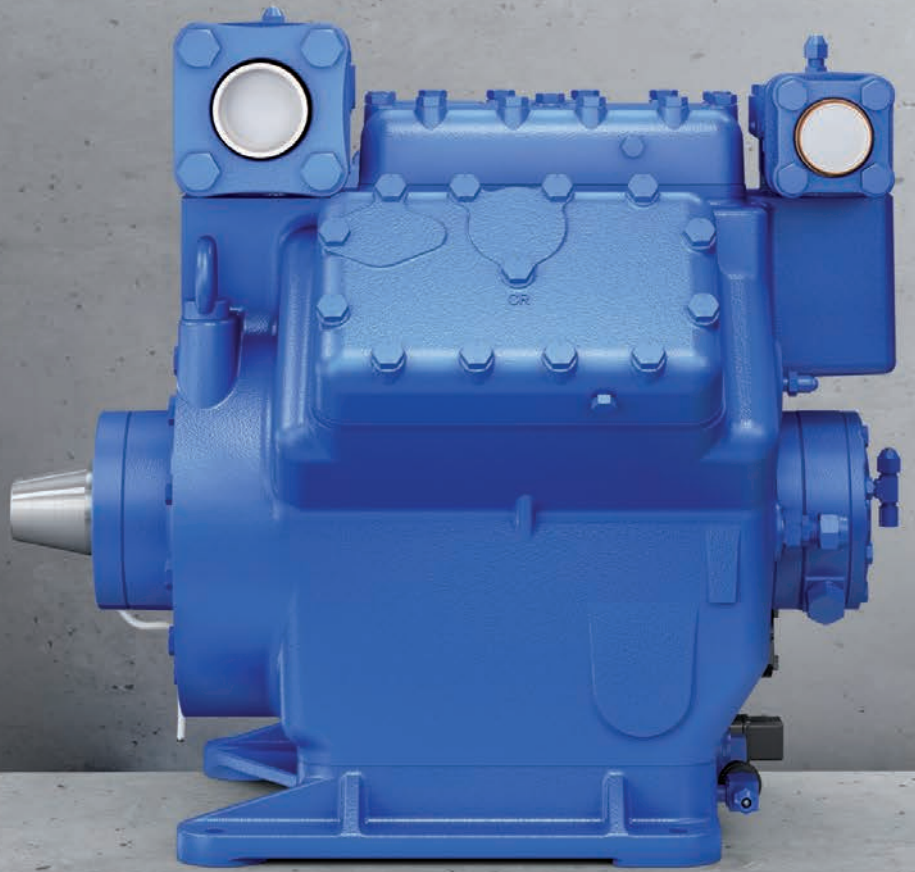
- Conical (F18 = cylindrical) shaft end for safe force transmission and exact installation of the drive elements
- Drive via v-belt or coupling, with all the conventional drive sources (electric motors, combustible motors, hydraulic motors, etc.)
- Coupling bell for quick and easy installation

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4

Acceptance by classification societies (accessories)



Further classification societies on request.



## F Compressors

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Scope of supply and accessories	34



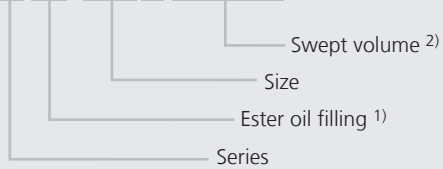
The F model series provides modern open type compressors for separate drive systems using V belts or direct couplings. Load transfer through a V pair. Virtually all drive capacity requirements can be met.

The compressor design is very compact, robust and due to its open type construction it can be used reliably and without problems in almost all areas of refrigeration technology.

All our F compressors are equipped with oil pump lubrication.

Type key

**FX 14 / 1166**

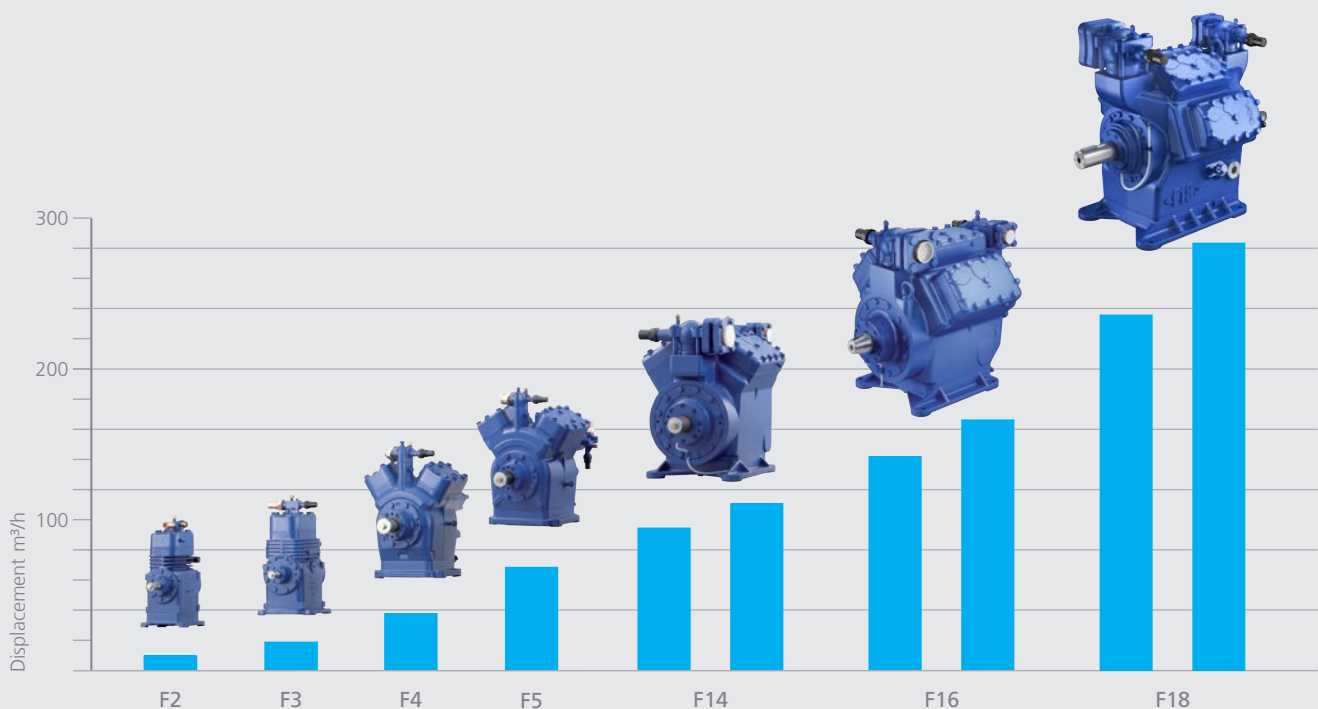


1) X - Ester oil filling (HFC refrigerant, e.g. R134a, R407C)

2) Indication only at F14, F16, F18

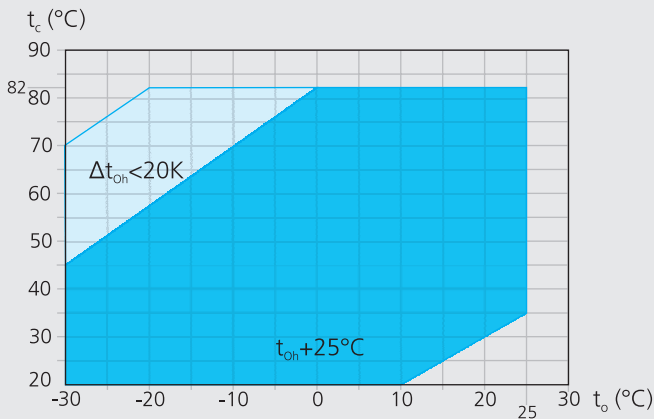
The current program

...7 model sizes with 10 capacity stages from 10.5 to 281 m<sup>3</sup>/h (1.450 rpm)



R134a Operating limits

FX2, FX3, FX4, FX5, FX14, FX16, FX18



Unlimited application range

Supplementary cooling or reduced suction gas temperature

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

Maximum permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar

<sup>1)</sup> LP = low pressure HP = high pressure

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R134a Notes

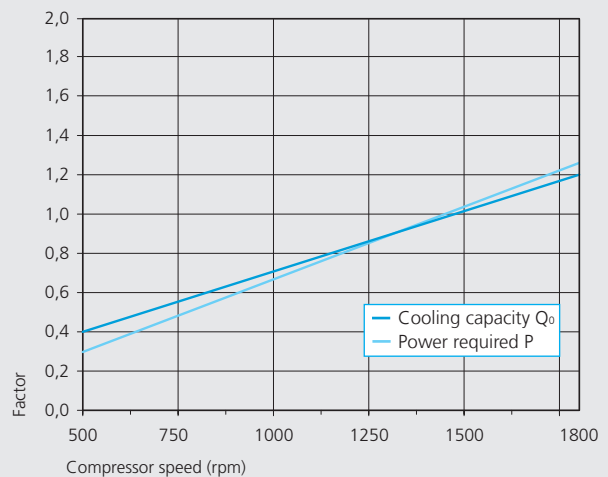
Operating limits

Compressor operation is possible within the examples in the diagram showing the limitations of use. The meaning of the surfaces marked in colour are to be observed. Limiting areas should not be selected for layout or continuous operating points.

Performance data

Performance specifications for the R134a are based on 25 °C suction gas temperatures without liquid subcooling. (Exception: FX18 = 20 °C suction gas temperature). Compressor speed 1450 rpm. The values can be stated to judge the overall performance at other speed with the help of the calculation factors below.

For additional technical data for other operating points see GEA Bock software.



R134a		Performance data											1.450 rpm	
Type	Cond. temp. °C		Cooling capacity $\dot{Q}_o$ [W]										Power consumption P [kW]	
			Evaporating temperature °C											
			15	12,5	10	5	0	-5	-10	-15	-20	-25	-30	
FX2	30	Q	10018	9158	8354	6903	5648	4570	3653	2878	2228	1684	1229	
		P	0,92	0,97	1,01	1,05	1,04	1,01	0,95	0,87	0,78	0,69	0,60	
	40	Q	8960	8176	7444	6126	4990	4017	3190	2490	1901	1404	981	
		P	1,33	1,34	1,34	1,32	1,26	1,18	1,08	0,97	0,86	0,76	0,66	
	50	Q	7870	7163	6504	5323	4308	3442	2707	2085	1559	1111	723	
		P	1,68	1,66	1,63	1,55	1,45	1,33	1,20	1,07	0,94	0,83	0,74	
60	Q	6757	6128	5544	4500	3609	2852	2212	1671	1211	815	464		
	P	1,99	1,94	1,88	1,75	1,61	1,45	1,30	1,15	1,01	0,90	0,81		
70	Q	5629	5079	4570	3667	2902	2257	1715	1256	865	522	211		
	P	2,24	2,17	2,08	1,91	1,73	1,55	1,37	1,21	1,08	0,97	0,89		
FX3	30	Q	19421	17754	16195	13383	10949	8861	7083	5580	4319	3265	2383	
		P	1,79	1,89	1,96	2,03	2,02	1,95	1,84	1,68	1,51	1,33	1,16	
	40	Q	17370	15850	14431	11877	9674	7787	6183	4827	3685	2721	1902	
		P	2,57	2,60	2,60	2,56	2,45	2,29	2,10	1,89	1,68	1,47	1,29	
	50	Q	15258	13887	12610	10319	8351	6672	5247	4042	3023	2154	1402	
		P	3,26	3,22	3,17	3,01	2,81	2,58	2,33	2,07	1,83	1,61	1,43	
60	Q	13100	11881	10748	8725	6997	5530	4289	3240	2348	1580	900		
	P	3,86	3,76	3,65	3,40	3,12	2,82	2,52	2,23	1,97	1,75	1,58		
70	Q	10912	9847	8861	7110	5627	4376	3324	2436	1677	1013	410		
	P	4,35	4,20	4,04	3,71	3,36	3,00	2,67	2,35	2,09	1,87	1,73		
FX4	30	Q	38841	35508	32390	26765	21899	17722	14165	11160	8638	6530	4767	
		P	3,58	3,77	3,91	4,05	4,04	3,91	3,67	3,37	3,02	2,66	2,32	
	40	Q	34740	31700	28861	23753	19347	15575	12367	9655	7369	5442	3804	
		P	5,15	5,20	5,20	5,11	4,89	4,58	4,20	3,78	3,35	2,94	2,58	
	50	Q	30516	27774	25219	20638	16702	13344	10494	8084	6045	4308	2805	
		P	6,52	6,45	6,34	6,03	5,63	5,16	4,66	4,15	3,66	3,22	2,86	
60	Q	26201	23762	21496	17450	13994	11060	8578	6479	4696	3159	1800		
	P	7,71	7,52	7,30	6,80	6,23	5,64	5,04	4,46	3,94	3,49	3,16		
70	Q	21825	19693	17721	14220	11254	8753	6648	4871	3353	2026	819		
	P	8,70	8,40	8,08	7,41	6,71	6,01	5,33	4,71	4,17	3,74	3,46		
FX5	30	Q	70611	64551	58883	48658	39811	32217	25751	20288	15703	11871	8666	
		P	6,51	6,86	7,11	7,37	7,35	7,10	6,67	6,12	5,49	4,84	4,21	
	40	Q	63155	57629	52468	43182	35173	28315	22483	17552	13397	9894	6916	
		P	9,36	9,45	9,46	9,29	8,89	8,32	7,63	6,87	6,09	5,35	4,69	
	50	Q	55477	50492	45848	37518	30364	24259	19078	14697	10990	7832	5099	
		P	11,86	11,72	11,52	10,96	10,23	9,38	8,47	7,54	6,65	5,86	5,20	
60	Q	47632	43198	39078	31723	25440	20106	15594	11779	8537	5743	3271		
	P	14,02	13,67	13,27	12,36	11,33	10,25	9,16	8,11	7,15	6,35	5,74		
70	Q	39677	35802	32216	25852	20459	15912	12086	8856	6096	3683	1490		
	P	15,81	15,27	14,70	13,48	12,20	10,92	9,69	8,56	7,58	6,81	6,29		
FX14/1166	30	Q	97150	88813	81014	66946	54774	44326	35430	27914	21605	16333	11923	
		P	8,96	9,43	9,78	10,14	10,11	9,77	9,18	8,42	7,55	6,65	5,80	
	40	Q	86892	79288	72188	59412	48392	38956	30932	24148	18432	13612	9515	
		P	12,87	13,00	13,02	12,78	12,24	11,45	10,50	9,45	8,38	7,36	6,45	
	50	Q	76328	69469	63079	51620	41776	33376	26248	20220	15120	10776	7015	
		P	16,32	16,13	15,85	15,08	14,07	12,90	11,65	10,37	9,15	8,06	7,16	
60	Q	65534	59433	53766	43646	35002	27662	21454	16206	11746	7902	4501		
	P	19,29	18,80	18,26	17,00	15,59	14,10	12,60	11,16	9,84	8,73	7,90		
70	Q	54590	49258	4325	35568	28148	21892	16628	12184	8387	5067	2050		
	P	21,75	21,01	20,22	18,54	16,79	15,03	13,33	11,78	10,43	9,37	8,65		
FX14/1366	30	Q	114013	104228	95076	78566	64282	52020	41580	32759	25356	19168	13993	
		P	10,52	11,07	11,48	11,90	11,87	11,47	10,77	9,88	8,86	7,81	6,80	
	40	Q	101973	93049	84717	69724	56792	45718	36302	28340	21632	15975	11167	
		P	15,11	15,25	15,28	15,00	14,36	13,44	12,32	11,09	9,84	8,63	7,57	
	50	Q	89575	81526	74027	60579	49027	39169	30804	23730	17745	12646	8233	
		P	19,15	18,93	18,60	17,69	16,51	15,14	13,67	12,17	10,74	9,46	8,40	
60	Q	76908	69749	63098	51221	41077	32463	25178	19019	13785	9273	5282		
	P	22,63	22,07	21,43	19,95	18,30	16,55	14,79	13,09	11,55	10,25	9,27		
70	Q	64065	57808	52019	41743	33034	25692	19514	14298	9843	5946	2405		
	P	25,52	24,65	23,73	21,76	19,70	17,63	15,65	13,82	12,24	10,99	10,15		


Based on 25 °C suction gas temperature without liquid subcooling

Supplementary cooling or reduced suction gas temp.



R134a		Performance data										1.450 rpm			
Type	Cond. temp. °C	Cooling capacity $\dot{Q}_0$ [W]										Power consumption P [kW]			
		Evaporating temperature °C													
		15	12,5	10	5	0	-5	-10	-15	-20	-25	-30			
FX16/1751	30	Q	145822	133308	121602	100486	82215	66533	53180	41898	32429	24515	17897		
		P	13,45	14,16	14,68	15,22	15,18	14,67	13,78	12,63	11,33	9,99	8,70		
	40	Q	130423	119010	108353	89177	72636	58473	46429	36247	27667	20431	14282		
		P	19,32	19,51	19,54	19,18	18,37	17,19	15,76	14,19	12,58	11,04	9,68		
	50	Q	114566	104272	94681	77480	62705	50097	39399	30351	22696	16175	10530		
		P	24,50	24,21	23,79	22,63	21,12	19,37	17,48	15,57	13,74	12,09	10,74		
60	Q	98365	89208	80702	65512	52538	41521	32203	24326	17631	11861	6756			
	P	28,95	28,23	27,40	25,52	23,41	21,17	18,91	16,74	14,78	13,11	11,86			
70	Q	81937	73935	66531	53388	42250	32860	24959	18288	12589	7605	3076			
	P	32,65	31,53	30,35	27,83	25,19	22,55	20,01	17,68	15,66	14,06	12,99			
FX16/2051	30	Q	170924	156256	142534	117783	96368	77986	62334	49110	38011	28735	20977		
		P	15,77	16,60	17,21	17,84	17,80	17,19	16,15	14,81	13,29	11,71	10,20		
	40	Q	152875	139497	127005	104528	85140	68539	54422	42486	32429	23948	16740		
		P	22,65	22,87	22,90	22,49	21,53	20,15	18,47	16,63	14,75	12,94	11,35		
	50	Q	134288	122222	110980	90818	73499	58721	46181	35575	26602	18959	12342		
		P	28,71	28,37	27,89	26,52	24,75	22,70	20,49	18,25	16,10	14,17	12,59		
60	Q	115298	104565	94594	76789	61582	48668	37746	28513	20666	13902	7919			
	P	33,93	33,08	32,12	29,91	27,43	24,81	22,17	19,63	17,32	15,37	13,90			
70	Q	96042	86662	77983	62578	49523	38517	29255	21436	14757	8914	3606			
	P	38,27	36,96	35,57	32,62	29,53	26,44	23,46	20,72	18,35	16,48	15,22			

Based on 25 °C suction gas temperature without liquid subcooling

 Supplementary cooling or reduced suction gas temp.

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R134a		Performance data										1.450 rpm			
Type	Cond. temp. °C	Cooling capacity $\dot{Q}_0$ [W]										Power consumption P [kW]			
		Evaporating temperature °C													
		15	12,5	10	5	0	-5	-10	-15	-20	-25	-30			
FX18/2735	30	Q	242000	222000	203000	169000	139000	112000	89500	70500	54500	41300	30600		
		P	19,90	20,90	21,70	22,50	22,50	21,80	20,60	18,90	16,90	14,70	12,60		
	40	Q	218000	200000	182000	151000	123000	99100	78700	61300	46700	34400	24300		
		P	29,20	29,50	29,60	29,10	27,90	26,10	23,80	21,30	18,60	15,90	13,30		
	50	Q	193000	176000	161000	132000	107000	85700	67400	51800	38600	27400	18000		
		P	37,50	37,10	36,40	34,70	32,30	29,60	26,50	23,20	19,90	16,80	13,80		
60	Q	167000	152000	138000	113000	90800	72000	55900	42200	30500	20500	12000			
	P	44,70	43,60	42,40	39,40	36,10	32,40	28,60	24,70	20,90	17,30	14,20			
70	Q	140000	127000	115000	93000	74300	58200	44400	32700	22600	14000	6290			
	P	50,90	49,20	47,40	43,40	39,10	34,70	30,20	25,70	21,60	17,70	14,40			
FX18/3235	30	Q	290000	265000	243000	201000	165000	134000	107000	84200	65100	49300	36500		
		P	23,70	25,00	25,90	26,90	26,90	26,10	24,60	22,60	20,20	17,60	15,00		
	40	Q	261000	238000	218000	180000	147000	119000	94000	73200	55700	41100	29000		
		P	34,90	35,30	35,30	34,70	33,30	31,10	28,50	25,50	22,30	19,00	15,90		
	50	Q	230000	210000	192000	158000	128000	103000	80500	61900	46100	32800	21500		
		P	44,80	44,30	43,50	41,40	38,60	35,30	31,60	27,80	23,80	20,00	16,50		
60	Q	199000	182000	165000	135000	109000	86000	66800	50400	36400	24500	14300			
	P	53,40	52,10	50,60	47,10	43,10	38,70	34,10	29,50	25,00	20,70	16,90			
70	Q	168000	152000	138000	112000	88700	69500	53000	39000	27000	16700	7520			
	P	60,80	58,80	56,60	51,90	46,80	41,40	36,00	30,80	25,80	21,20	17,20			

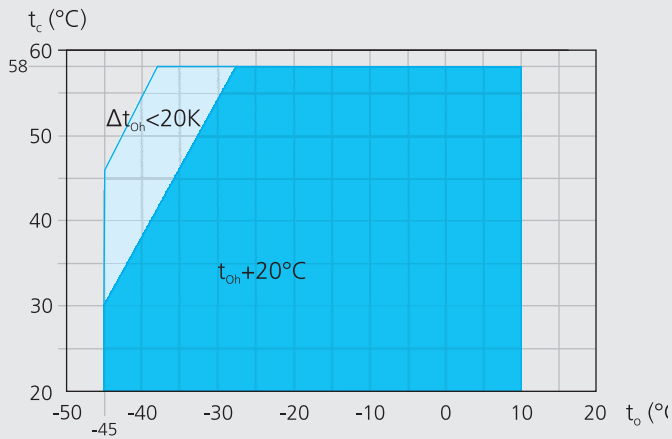
Based on 20 °C suction gas temperature without liquid subcooling

 Supplementary cooling or reduced suction gas temp.

The performance data for the FX18 is preliminary data!

R404A/R507 Operating limits

FX2, FX3, FX4, FX5, FX14, FX16, FX18



- Unlimited application range
- Supplementary cooling or reduced suction gas temperature

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

Maximum permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar

<sup>1)</sup> LP = low pressure HP = high pressure

R404A/R507 Notes

Operating limits

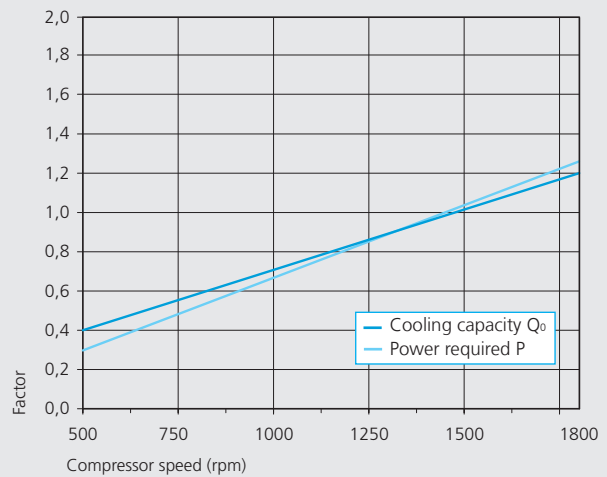
Compressor operation is possible within the examples in the diagram showing the limitations of use. The meaning of the surfaces marked in colour are to be observed. Limiting areas should not be selected for layout or continuous operating points.

Performance data

Performance specifications for R404A/R507 are based on 20°C suction gas temperatures without liquid subcooling. Compressor speed 1450 rpm.

The values can be stated to judge the overall performance at other speed with the help of the calculation factors below.

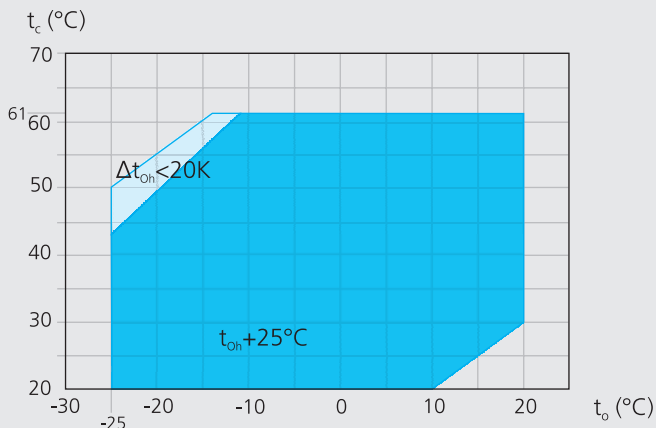
For additional technical data for other operating points see GEA Bock software.





R407C Operating limits

FX2, FX3, FX4, FX5, FX14, FX16, FX18



- Unlimited application range
- Supplementary cooling or reduced suction gas temperature

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

Maximum permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar

<sup>1)</sup> LP = low pressure HP = high pressure

R407C Notes

Operating limits

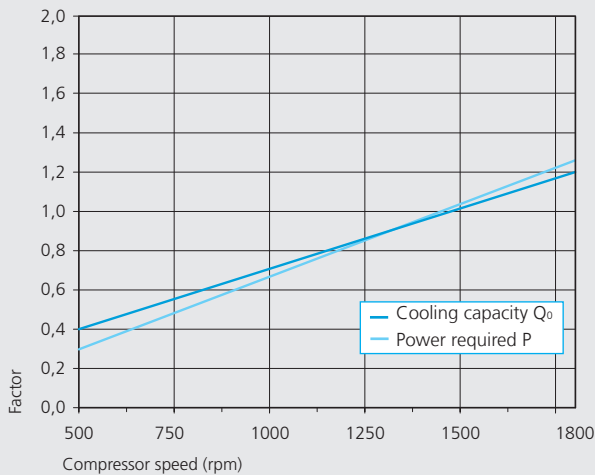
Compressor operation is possible within the examples in the diagram showing the limitations of use. The meaning of the surfaces marked in colour are to be observed. Limiting areas should not be selected for layout or continuous operating points.

Performance data

Performance specifications for R407C are based on 25°C suction gas temperatures without liquid subcooling. (Exception: FX18 = 20 °C suction gas temperature). Compressor speed 1450 rpm.

The values can be stated to judge the overall performance at other speed with the help of the calculation factors below.

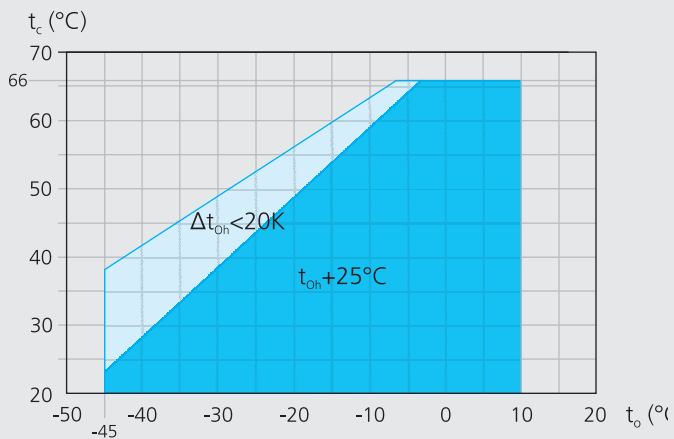
For additional technical data for other operating points see GEA Bock software.





R22 Operating limits

F2, F3, F4, F5, F14, F16, F18



- Unlimited application range
- Supplementary cooling or reduced suction gas temperature

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

Maximum permissible operating pressure (LP/HP)<sup>1)</sup>: 19/28 bar

<sup>1)</sup> LP = low pressure HP = high pressure

R22 Notes

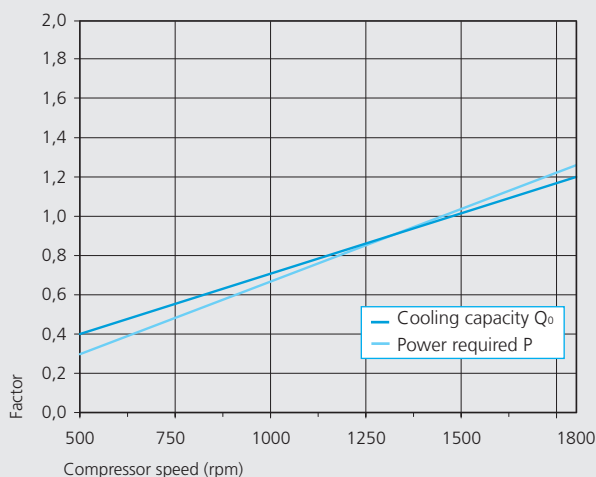
Operating limits

Compressor operation is possible within the examples in the diagram showing the limitations of use. The meaning of the surfaces marked in colour are to be observed. Limiting areas should not be selected for layout or continuous operating points.

Performance data

Performance specifications for R22 are based on 25°C suction gas temperatures without liquid subcooling. (Exception: F18 = 20 °C suction gas temperature). Compressor speed 1450 rpm. The values can be stated to judge the overall performance at other speed with the help of the calculation factors below.

For additional technical data for other operating points see GEA Bock software.





F Type	Number of cylinders	Displacement (1.450/1.740 rpm)  m <sup>3</sup> /h	Weight  kg ②	Connections ①		Oil charge  Ltr.	Speed range  rpm
				Discharge line DV  mm   inch	Suction line SV  mm   inch		
F2	2	10,5 / 12,6	18	16   5/8	16   5/8	0,8	960 - 1800
F3	2	20,3 / 24,3	28	22   7/8	28   1 1/8	1,5	960 - 1800
F4	4	40,5 / 48,6	51	28   1 1/8	35   1 3/8	2,6	500 - 1800
F5	4	73,7 / 88,4	85	35   1 3/8	2 x 35   2 x 1 3/8	3,8	500 - 1800
F14/1166	4	101,4 / 121,7	149	42   1 5/8	54   2 1/8	3,8	700 - 1800
F14/1366	4	119,0 / 142,8	149	42   1 5/8	54   2 1/8	3,8	700 - 1800
F16/1751	6	152,2 / 182,6	175	42   1 5/8	54   2 1/8	5,0	700 - 1800
F16/2051	6	178,4 / 214,1	175	42   1 5/8	54   2 1/8	5,0	700 - 1800
F18/2735	8	238,0 / 285,5	292	54   2 1/8	76   3 1/8	10,0	500 - 1800
F18/3235	8	281,3 / 337,6	286	54   2 1/8	76   3 1/8	10,0	500 - 1800

① for soldering connections

② version with accessories

**Oil sump heater: 230 V – 1 – 50/60 Hz**

F2: 40 W (accessories)

F3: 60 W (accessories)

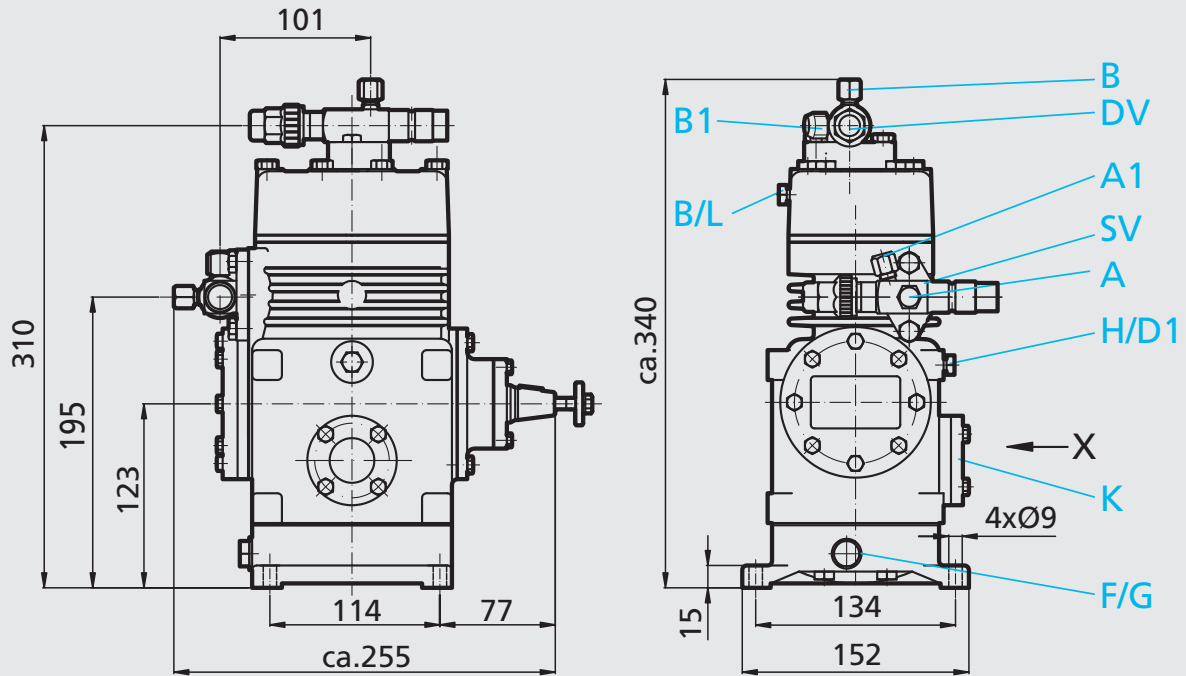
F4, F5: 80 W (accessories)

F14, F16: 140 W (accessories)

F18: 200 W (accessories)

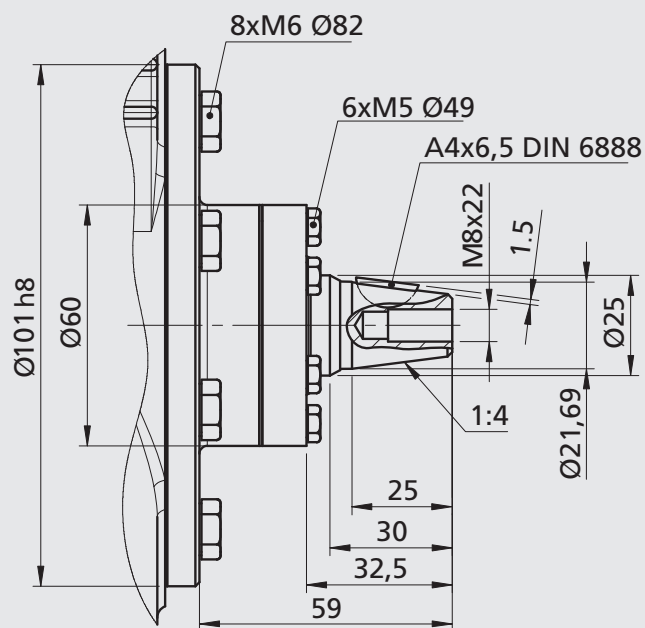


F2

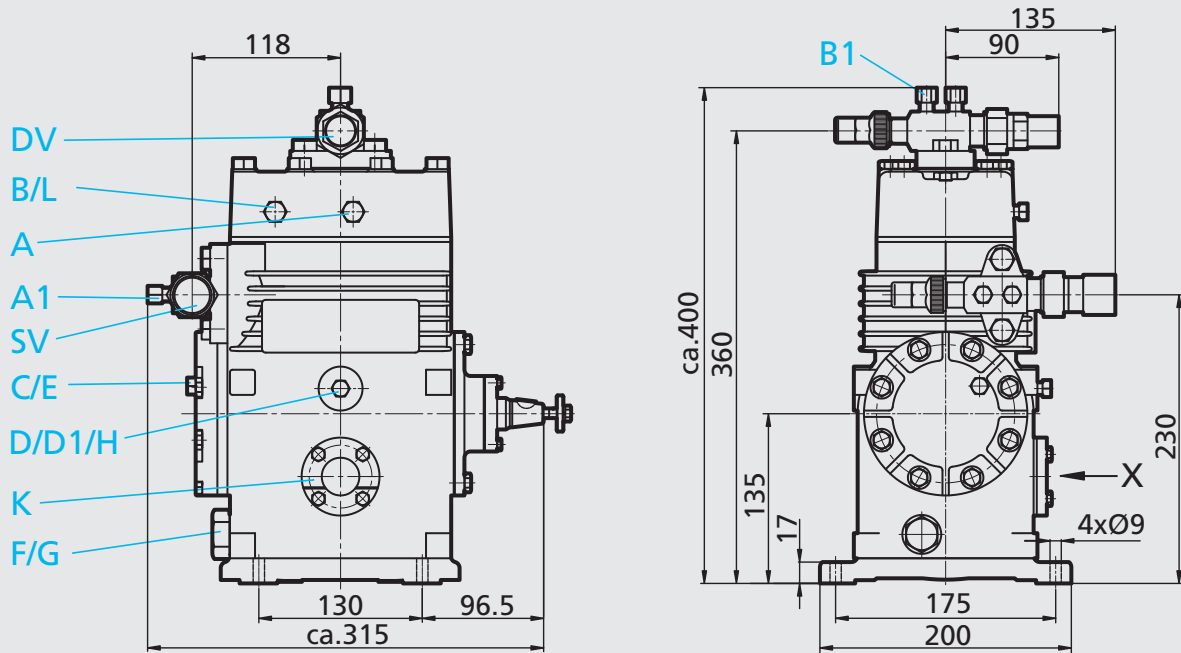


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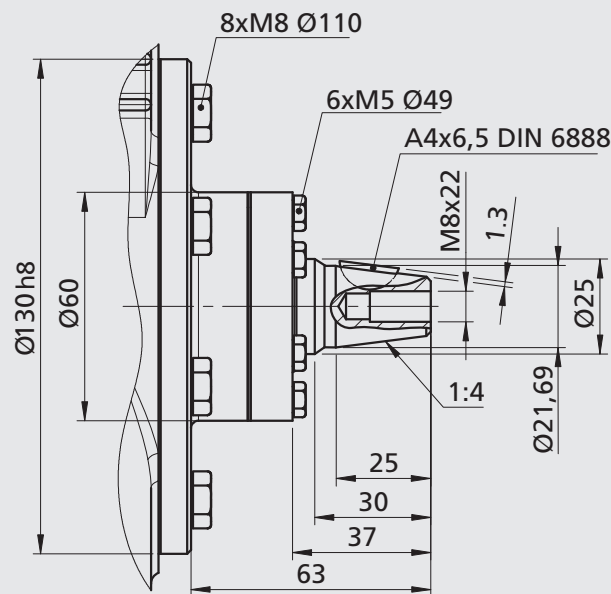
Shaft end



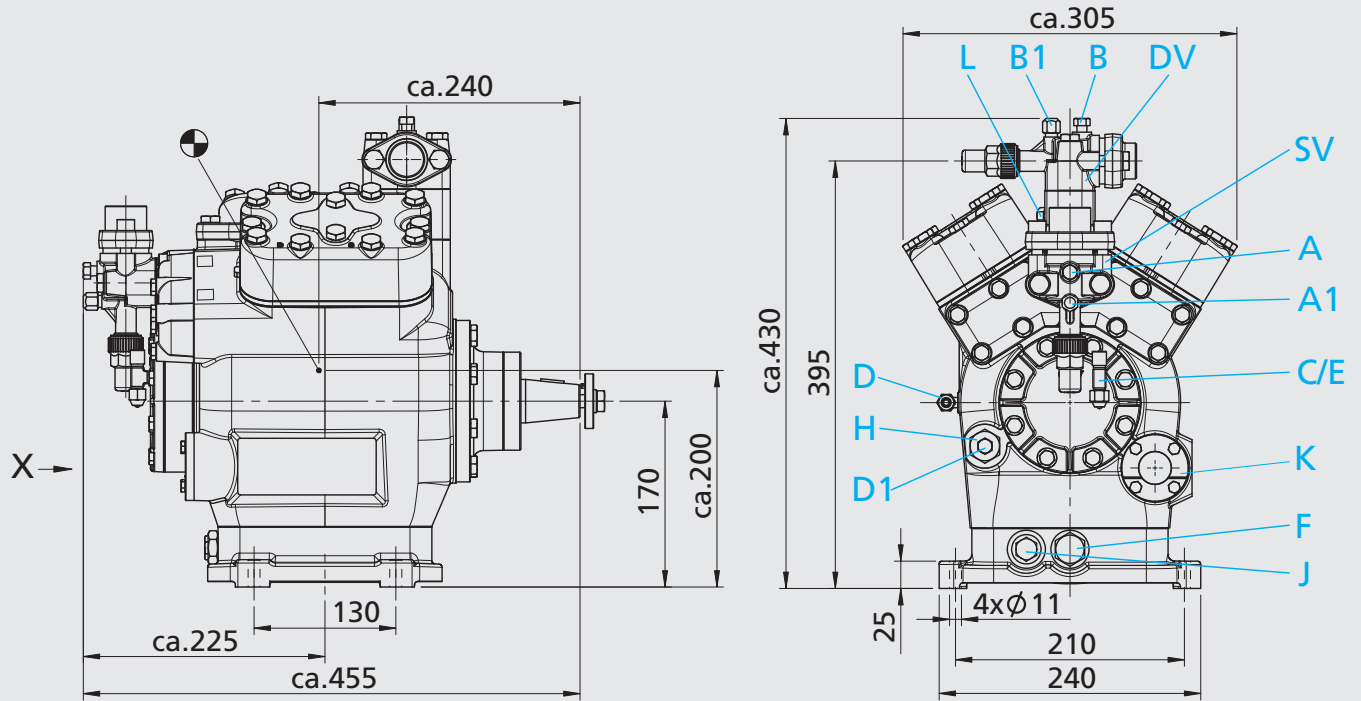
F3



Shaft end

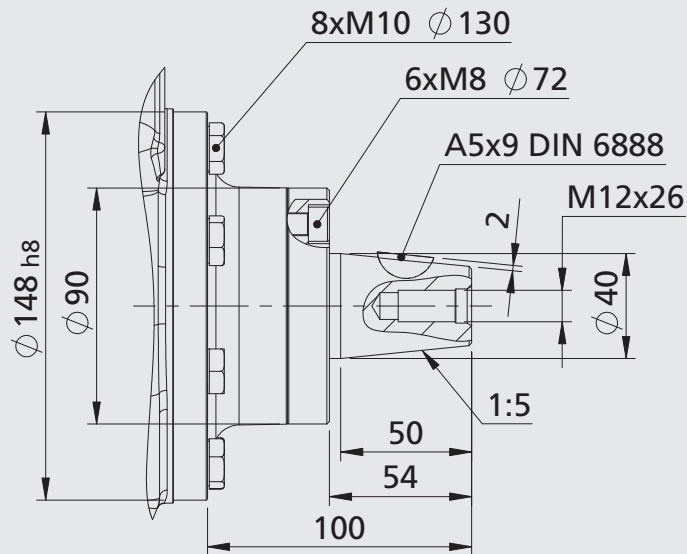


F4



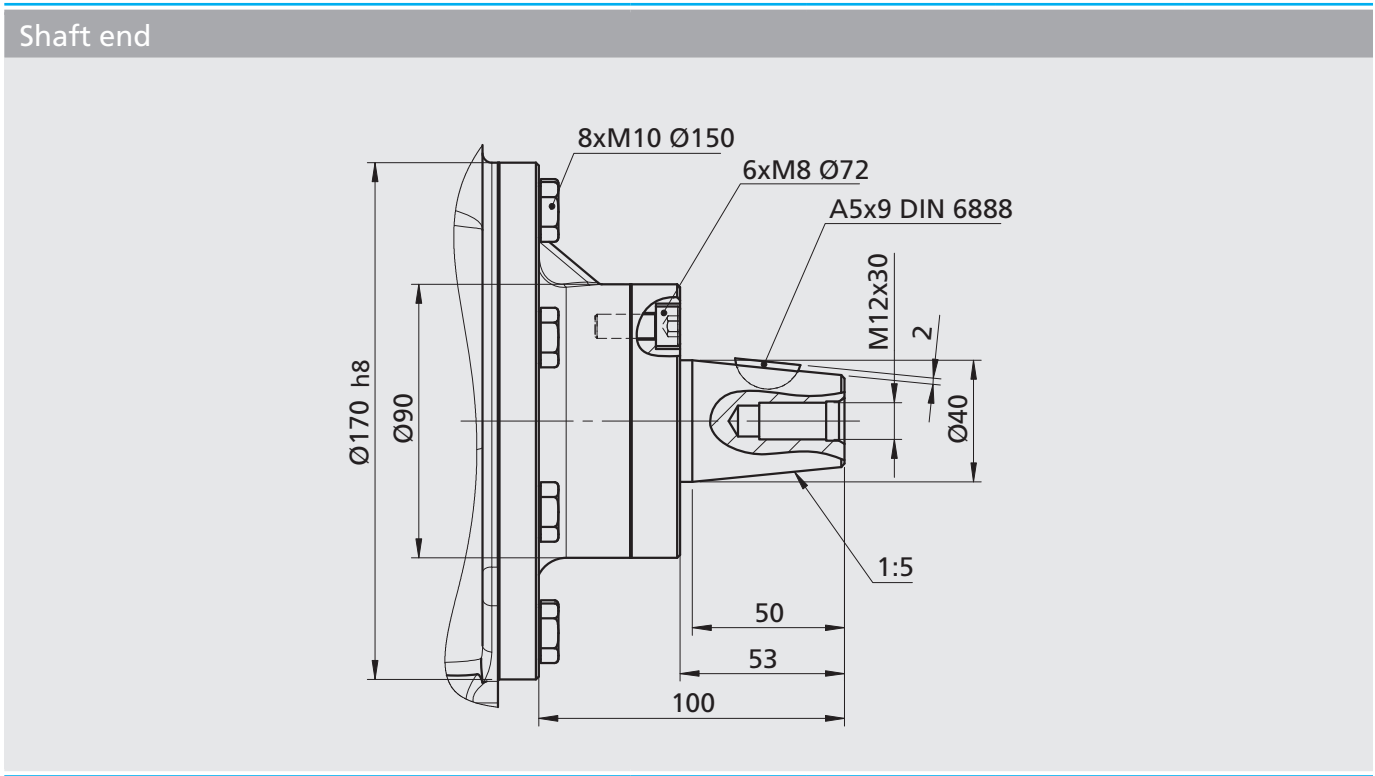
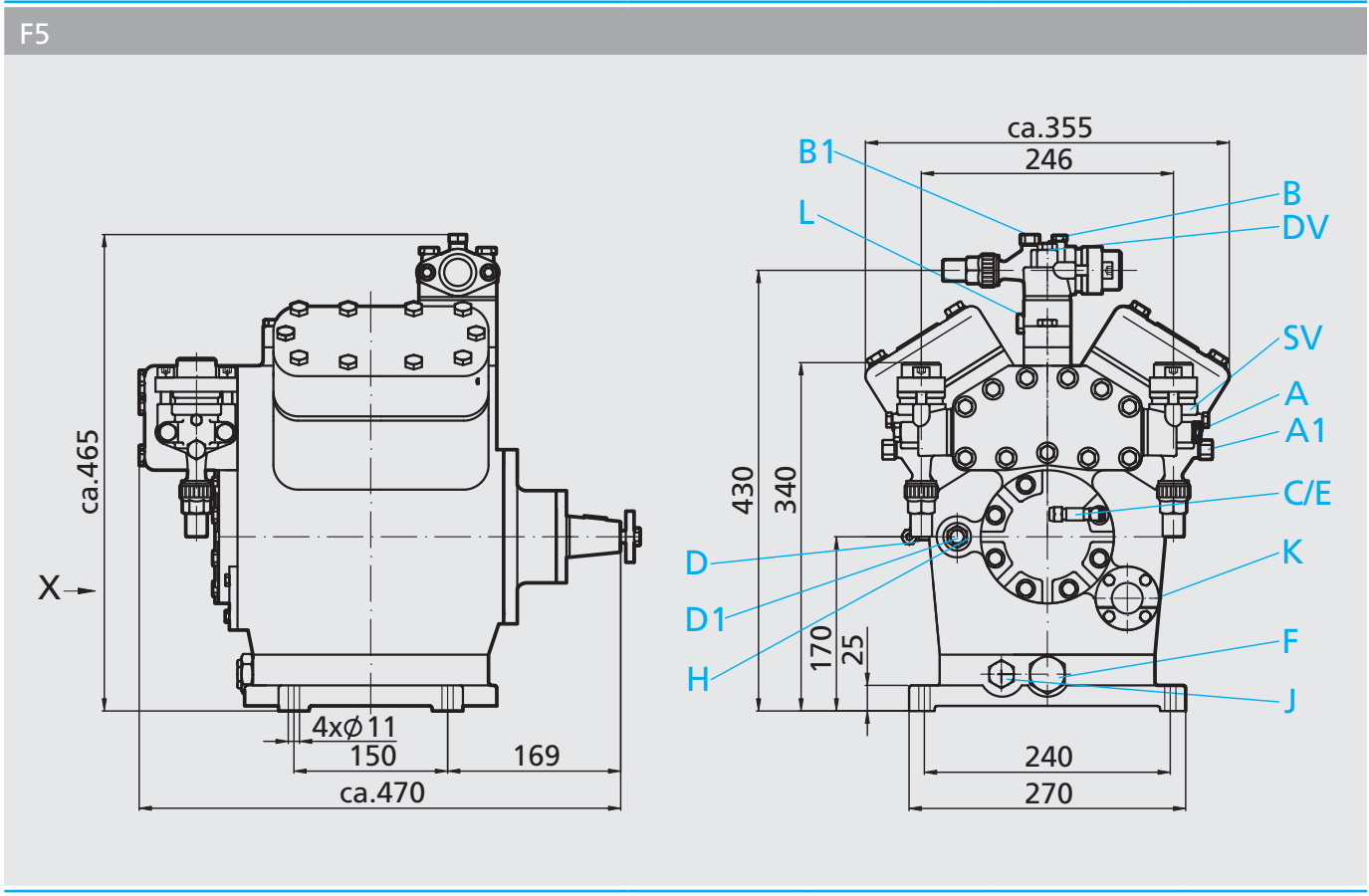
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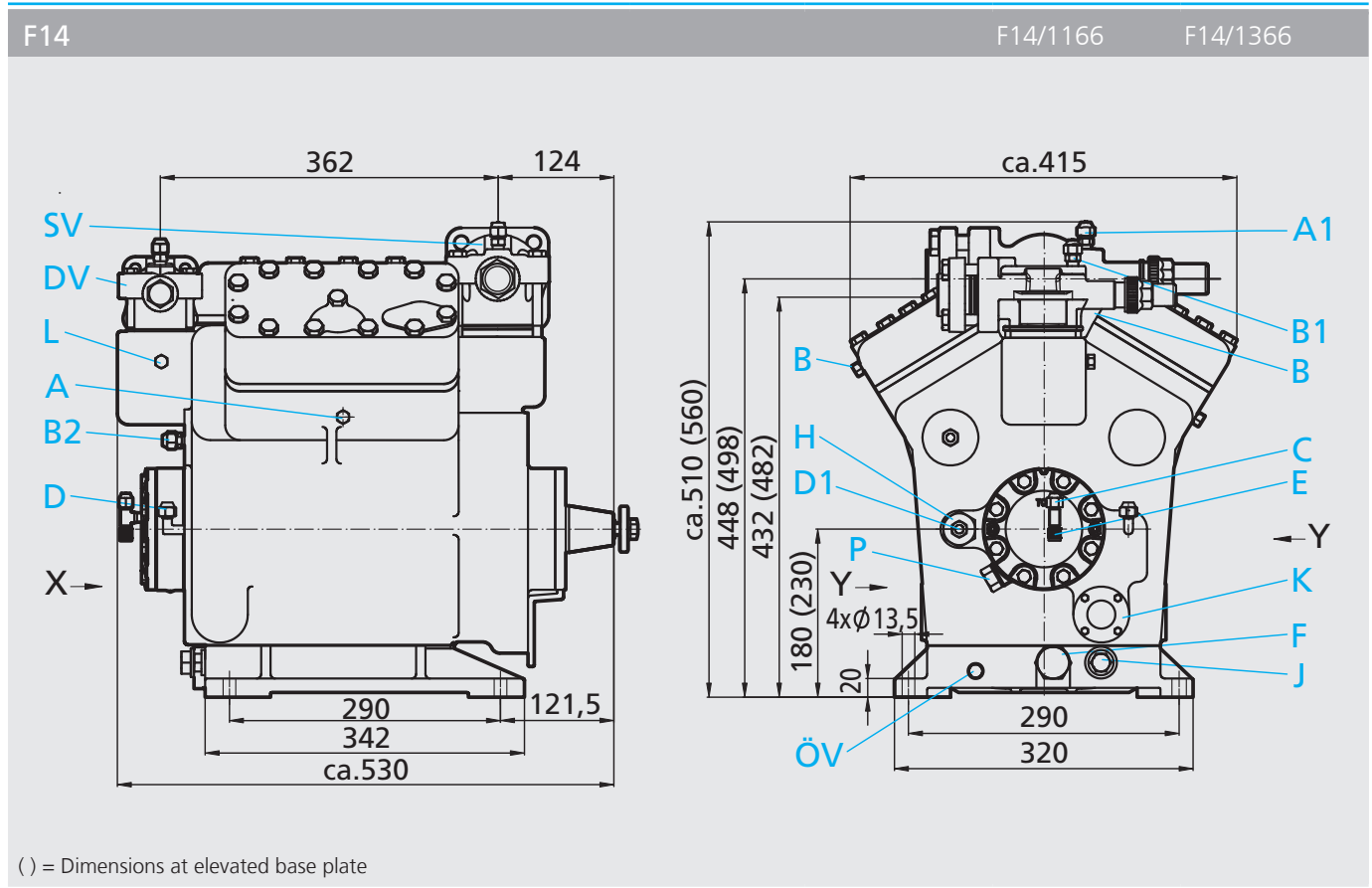
Shaft end



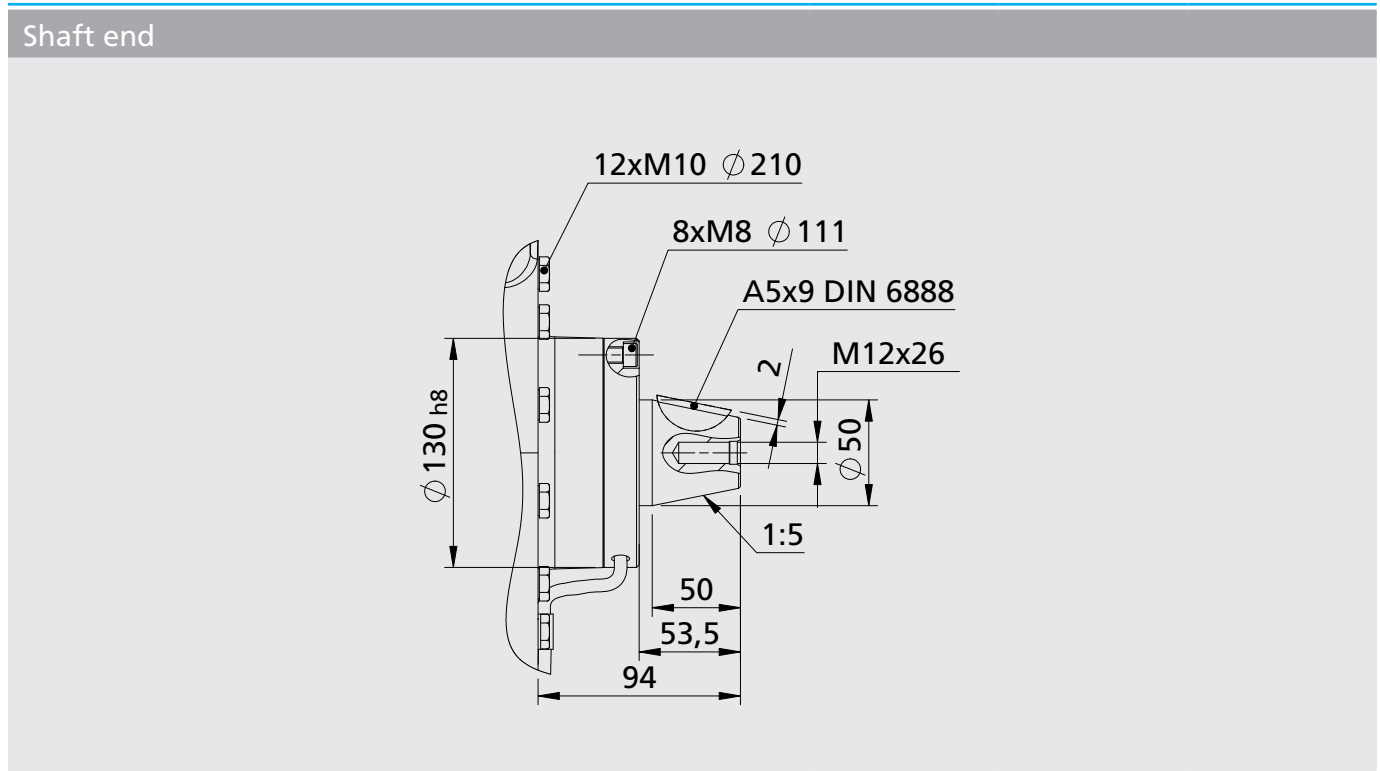
Dimensions in mm  
 ● Centre of gravity

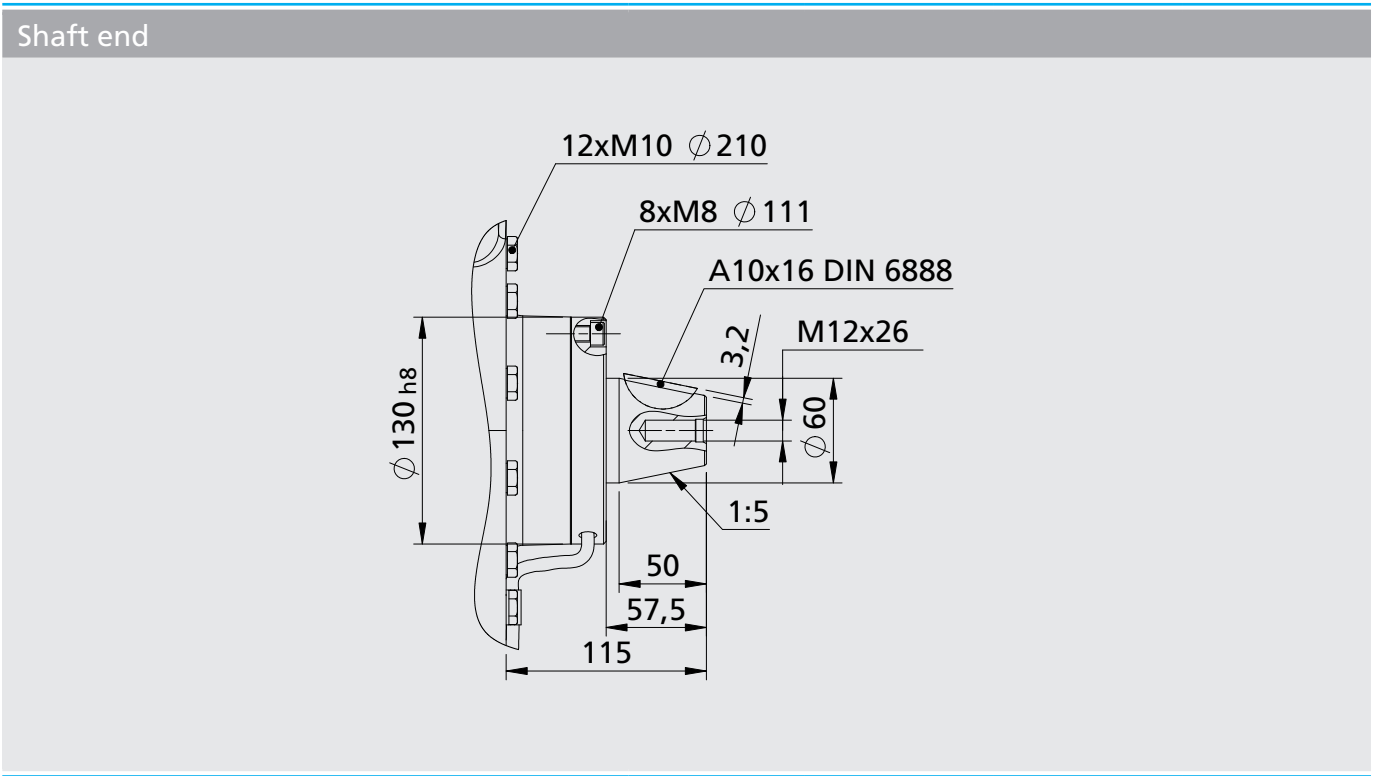
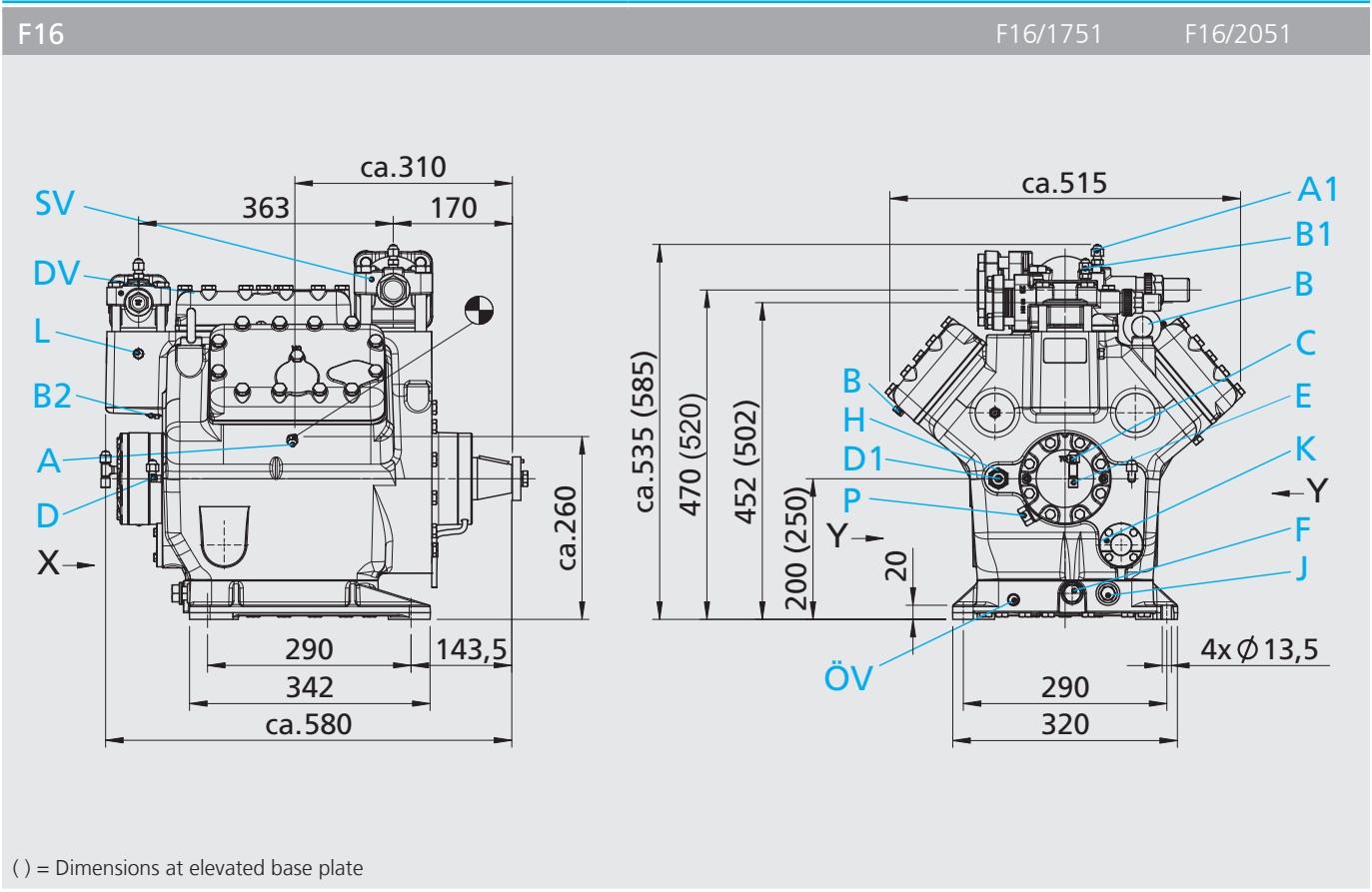
- Connections see page 33  
 - Dimensions for view X see page 32

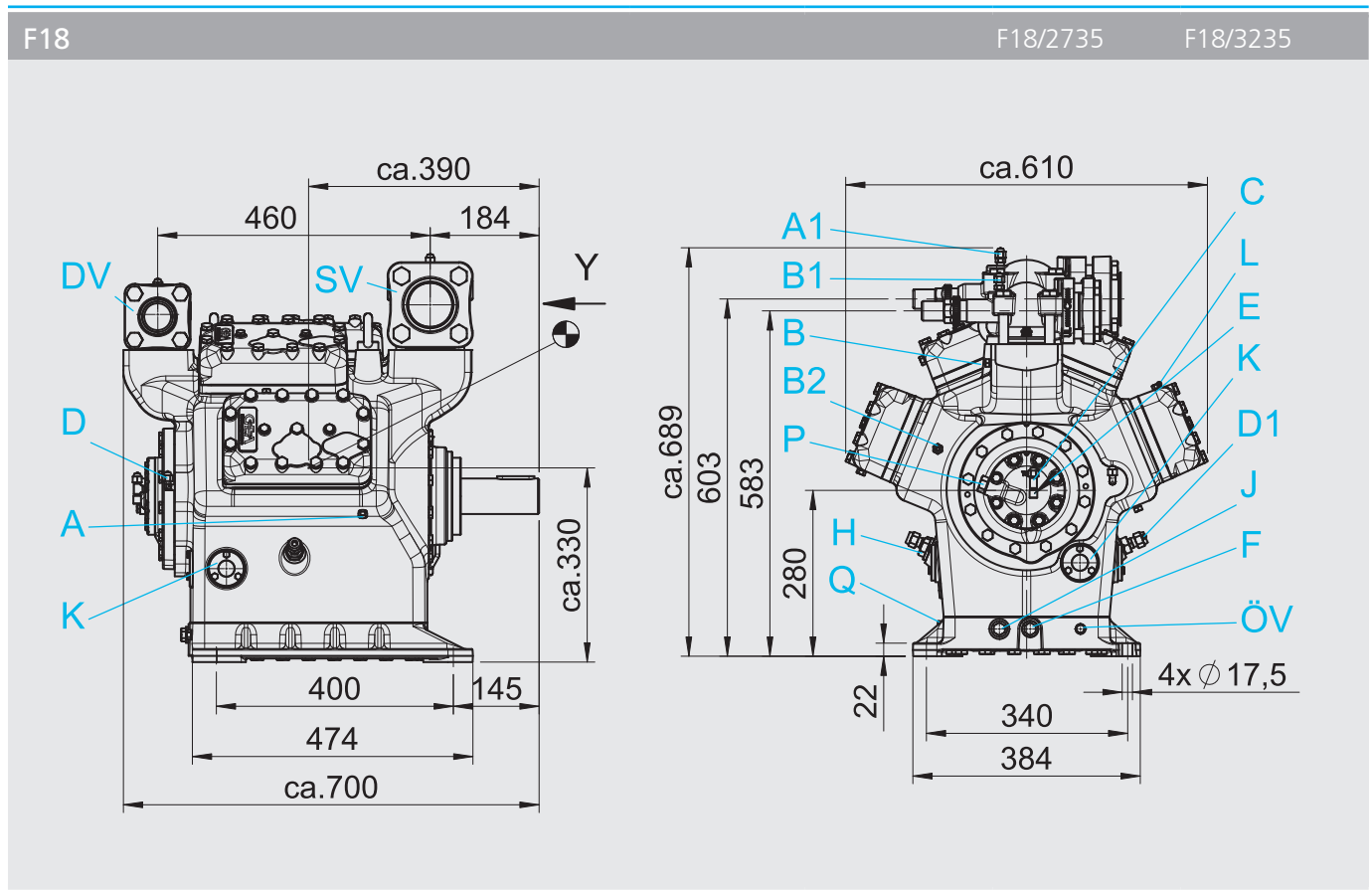




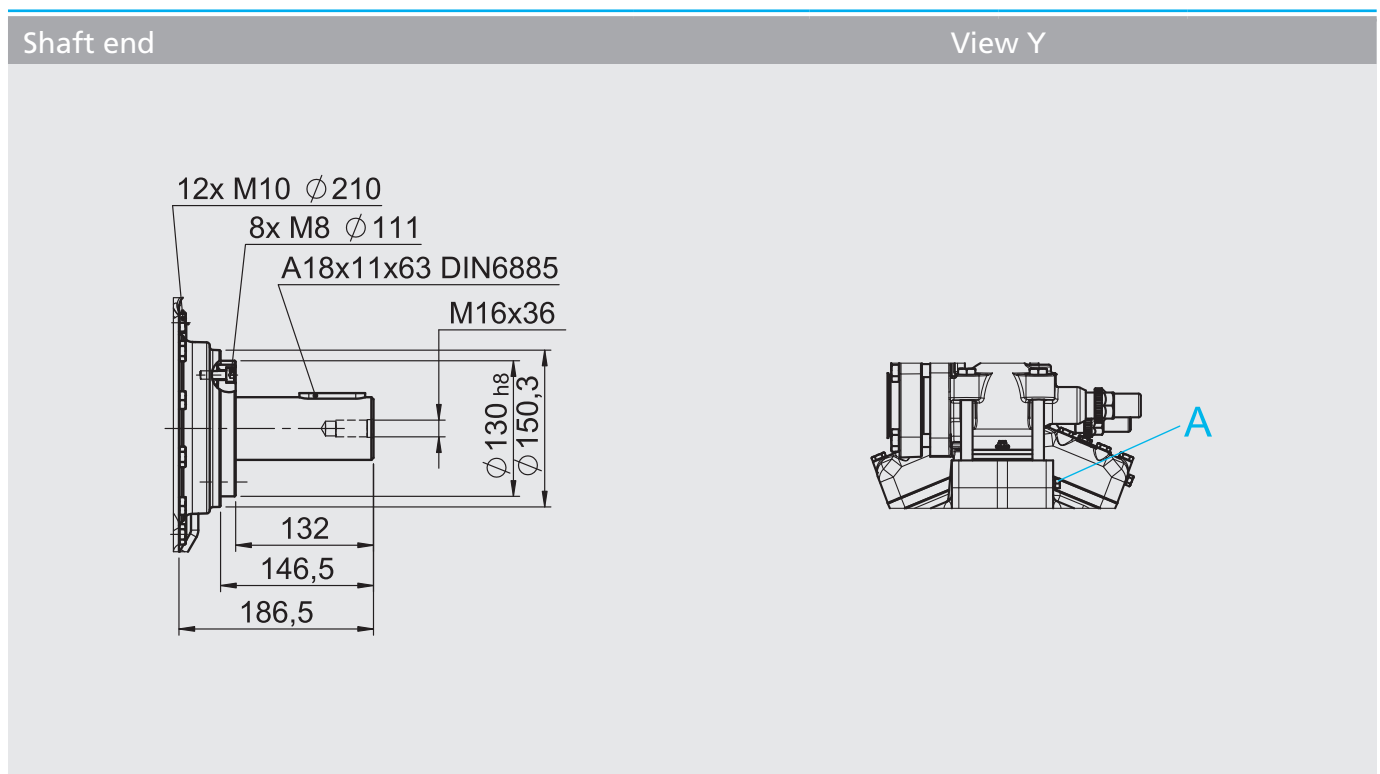
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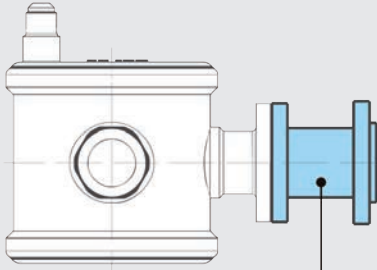


Dimensions in mm  
 ☉ Centre of gravity

- Connections see page 33  
 - Dimensions for view X see page 32

### Connection facilities

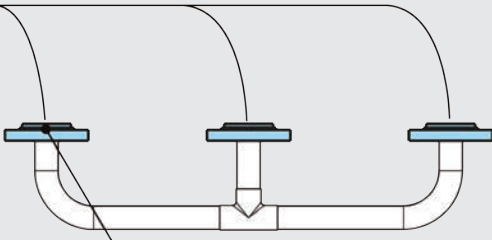
**A** Operation with oil level regulator



**Art.Nr. 80462**

GEA Bock adapter for oil level regulator, fits the makes ESK, AC+R, CARLY. Three-hole fastener on the side of the oil level regulator. Four-hole fastener on the side of the compressor. Available for F2 - F16.

**B** Operation with common oil-gas balance pipe



Example: 3 compressors in parallel

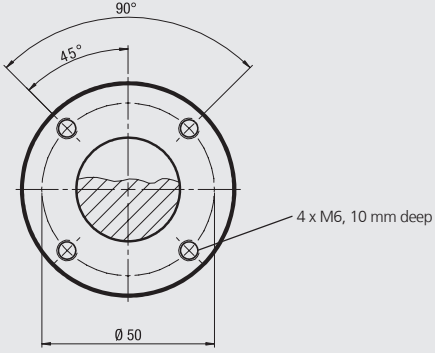
**Art.Nr. 80463**

GEA Bock adapter for oil-gas regulator, single design, four-hole steel connector for Pipe Ø 35 mm, fits all sightglass positions. 1 item per compressor required. Available for F2 - F16.

### View X,Y

- Oil sight glass
- Connection facility for parallel operation

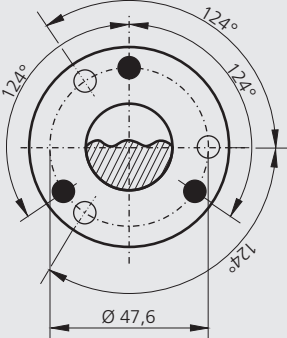
**Position view X:  
F2, F3, F4, F5, F14, F16**  
Four-hole oil sight glass



**Position view X:  
F18**  
Possibility to connect to oil level regulator

- 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 (3x M6, 10 deep)

**Position view Y:  
F14, F16**  
Second oil sight glass can be attached as accessories (available as original equipment only)



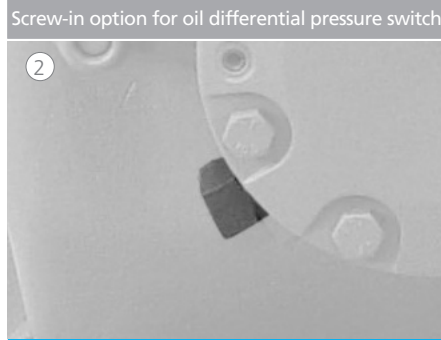


Connections	F2	F3	F4	F5	F14	F16	F18
SV Suction line DV Discharge line	please refer to technical data page 24						
A Connection suction side, not lockable	7/16 " UNF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF
A1 Connection suction side, lockable	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF	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	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	7/16 " UNF
B2 Connection discharge side, not lockable	-	-	-	-	7/16 " UNF	7/16 " UNF	7/16 " UNF
C Connection oil pressure safety switch OIL	-	1/8 " NPTF	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF
D Connection oil pressure safety switch LP	-	1/8 " NPTF	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF
D1 Connection oil return from oil separator	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	5/8 " UNF	5/8 " UNF	5/8 " UNF
E Connection oil pressure gauge	-	1/8 " NPTF	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF	7/16 " UNF
F Oil drain plug	R 3/8 "	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 26 x 1,5	M 26 x 1,5	M 22 x 1,5
G Oil sump heater plug	R 3/8 "	M 22 x 1,5	-	-	-	-	-
H Oil charge plug	1/8 " NPTF	1/8 " NPTF	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5
J Connection oil sump heater	-	-	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5
K Sight glass	4 hole M 6	4 hole M 6	4 hole M 6	4 hole M 6	4 hole M 6 <sup>1)</sup>	4 hole M 6 <sup>1)</sup>	3 hole M 6
L Connection thermal protection thermostat	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF	1/8 " NPTF
ÖV Connection oil service valve	-	-	-	-	1/4 " NPTF	1/4 " NPTF	1/4 " NPTF
P Connection oil pressure differential sensor	-	-	-	-	M 20 x 1,5	M 20 x 1,5	M 20 x 1,5
Q Connection oil temperature sensor	-	-	-	-	-	-	1/8 " NPTF

<sup>1)</sup> Second sight glass can be attached,  
Positioning view Y ( accessories, available only as original equipment)

Scope of supply	F2	F3	F4	F5	F14	F16	F18
Open type compressor with suction and discharge shut-off valves	●	●	●	●	●	●	●
Two cylinder, cylinder arrangement in row	●	●					
Four cylinder, cylinder arrangement in V			●	●	●		
Six cylinder, cylinder arrangement in W						●	
Eight cylinder, cylinder arrangement in VV							●
Seat front bearing flange	●	●	●	●	●	●	●
① Shaft seal with piece of tube for controlled oil collection					●	●	●
Oil pump	●	●	●	●	●	●	●
② Oil pump cover with screw-in option for oil pressure differential sensor ( $\Delta p$ -switch by Kriwan)					●	●	●
Connection possibility for oil level regulators make ESK, AC+R or CARLY	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	●
Connection possibility for oil level regulators make Traxoil							● <sup>1)</sup>
Oil charge: F: FUCHS Reniso SP46 FX: FUCHS Reniso Triton SE55	●	●	●	●	●	●	●
Sight glass	●	●	●	●	●	●	
Three sight glasses							●
Decompression valve			●	●	●	●	●
Inert gas charge	●	●	●	●	●	●	●

<sup>1)</sup> Only possible with additional adapter



1

2


3

4

Accessories	F2	F3	F4	F5	F14	F16	F18
① Oil sump heater 220-240 V - 1 - 50/60 Hz	●	●	●	●	●	●	● <sup>1)</sup>
② Compressor flywheel	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>
③ Shaft coupling for direct drive	● <sup>2) 3)</sup>	● <sup>2) 3)</sup>	● <sup>2) 3)</sup>	● <sup>2) 3)</sup>	● <sup>2) 3)</sup>	● <sup>2) 3)</sup>	● <sup>2) 3)</sup>
Coupling bell for motor adjustment, for B5/B35 IEC motors, flange diameter Ø 450 and Ø 550 (on request)							● <sup>2)</sup>
④ Capacity regulator 230 V - 1 - 50/60 Hz, IP65 1 capacity regulator = 50 % residual capacity			●	●	●		
Capacity regulator 230 V - 1 - 50/60 Hz, IP65 1-2 capacity regulator = 66/33 % residual capacity						●	
Capacity regulator 230 V - 1 - 50/60 Hz, IP65 1-3 capacity regulator = 75/50/25 % residual capacity							● <sup>5)</sup>
⑤ Start unloader 230 V - 1 - 50/60 Hz, IP65, without check valve, including thermal protection thermostat (bimetal sensor)		●	●	●	●	●	
Thermal protection thermostat (bimetal-sensor)	●	●	●	●	●	●	
⑥ Thermal protection thermostat (PTC)							● <sup>2)</sup>
⑦ Oil pressure safety switch MP 54 230 V - 1 - 50/60 Hz, IP20		● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>
Oil pressure differential sensor (Δp-switch by Kriwan) 220-240 V - 1 - 50/60 Hz					● <sup>2)</sup>	● <sup>2)</sup>	● <sup>2)</sup>
⑧ Oil service valve					● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
Oil temperature sensor (NTC)							● <sup>2)</sup>
Electronic motor protection unit Bock MP10 for installation in switch cabinet							●
⑨ Bock Compressor Management BCM2000 including oil pressure control (Δp-switch by Kriwan) ⑦, oil temperature control (NTC), thermal protection thermostat (PTC) per cylinder cover ⑥							●
⑩ Two additional sight glasses (both-sided), positioning view Y					● <sup>4)</sup>	● <sup>4)</sup>	
⑪ Elevated base plate (oil volume plus 2,5 litres)					●	●	
⑫ Additional fan 230 V Δ / 400 V Y - 3 - 50 Hz, 120 W, 230-265 V Δ / 400-460 V Y - 3 - 60 Hz, 190 W, IP54, Voltage range ± 10%							● <sup>1)</sup>
⑬ Water-cooled cylinder covers Sea water resistant water-cooling cylinder covers		●	●	●	●	●	

- 1) Installed
- 2) Enclosure
- 3) Please state motor Ø and feather key groove dimensions when ordering shafts
- 4) Available as original equipment only
- 5) Capacity regulator premounted, control unit enclosed


**Oil sump heater**



1

F2: 40 Watt    F14: 140 Watt  
 F3: 60 Watt    F16: 140 Watt  
 F4+5: 80 Watt    F18: 200 Watt

**Compressor flywheel**



2

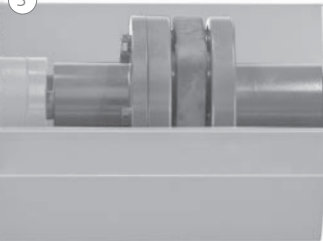
F2: Ø 165,2 x SPA  
 F3: Ø 210,2 x SPA  
 F4: Ø 210,3 x SPA  
 F5: Ø 230,4 x SPA  
 F14: Ø 322 x SPB  
 F16: Ø 322 x SPB  
 F18: Ø 406,9 x SPB

**Capacity regulator/Start unloader**



4 5

**Shaft coupling**



3

F2: WK 42.44  
 F3: WK 42.44  
 F4: WK 70.40  
 F5: WK 70.40  
 F14: WK 190.50  
 F16: WK 190.60

**Thermal protection thermostat**



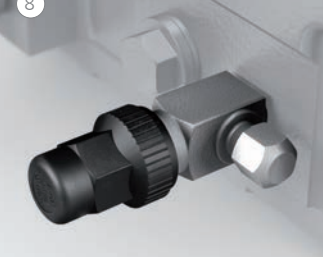
6

**Oil pressure safety switch**




7

**Oil service valve**



8

**BCM2000**



9

**Sight glass**



10

**Elevated base plate**



11

**Additional fan**



12

**Water-cooled cylinder covers**



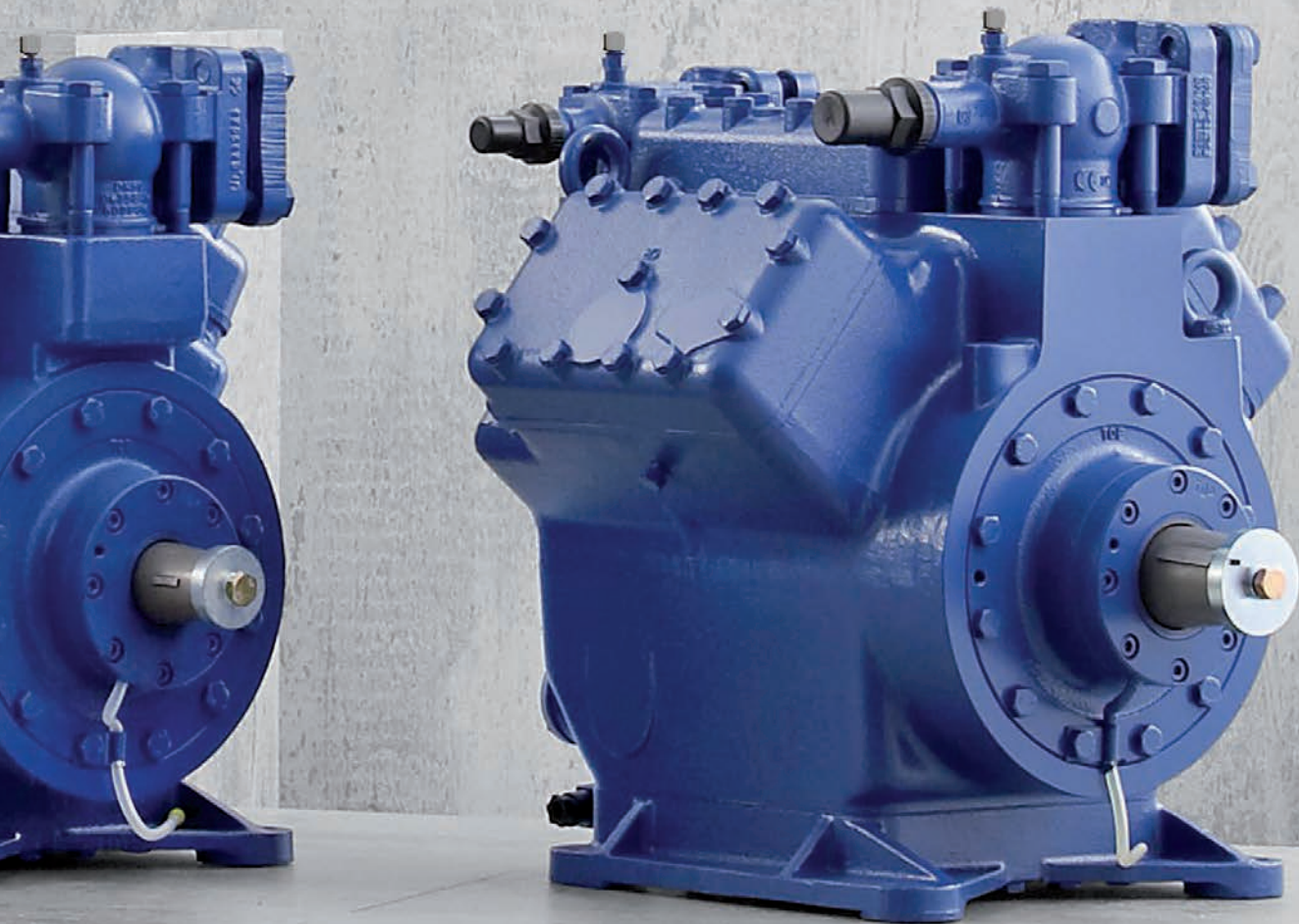
13

- 1
- 2
- 3
- 4



## F Compressors for NH<sub>3</sub>

At a glance	40
Operating limits and performance data	41
Technical data	44
Dimensions and connections	45
Scope of supply and accessories	52



Based on the F compressor series, a specially modified selection of compressors is available for use with the refrigerant R 717.

The special features:

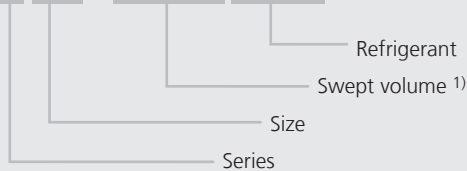
2, 4 and 6 cylinder models with displacements of 10 to 180 m<sup>3</sup>/h (1450 rpm)

Deviations from the basis compressor F:

- Pistons with three-ring assembly
- Connecting rod with additional oil supply oil to the small end
- Valve plate with optimized pressure unit
- Shut-off valve with steel connector for welded joints
- All connections are designed as compression joints for steel pipes
- F14 NH<sub>3</sub>, F16 NH<sub>3</sub> with increased oil volume by elevated base plate
- Special oil filling for NH<sub>3</sub> (Fuchs Reniso KC 68). If R723 or other oils are used, please consult our application engineering department.
- You will find further information on the F basis compressors in the chapter entitled „F series single-stage compressors“ from page 8 onwards.

### Type key

F14 / 1166 NH<sub>3</sub>



<sup>1)</sup> Indication only at F14, F16

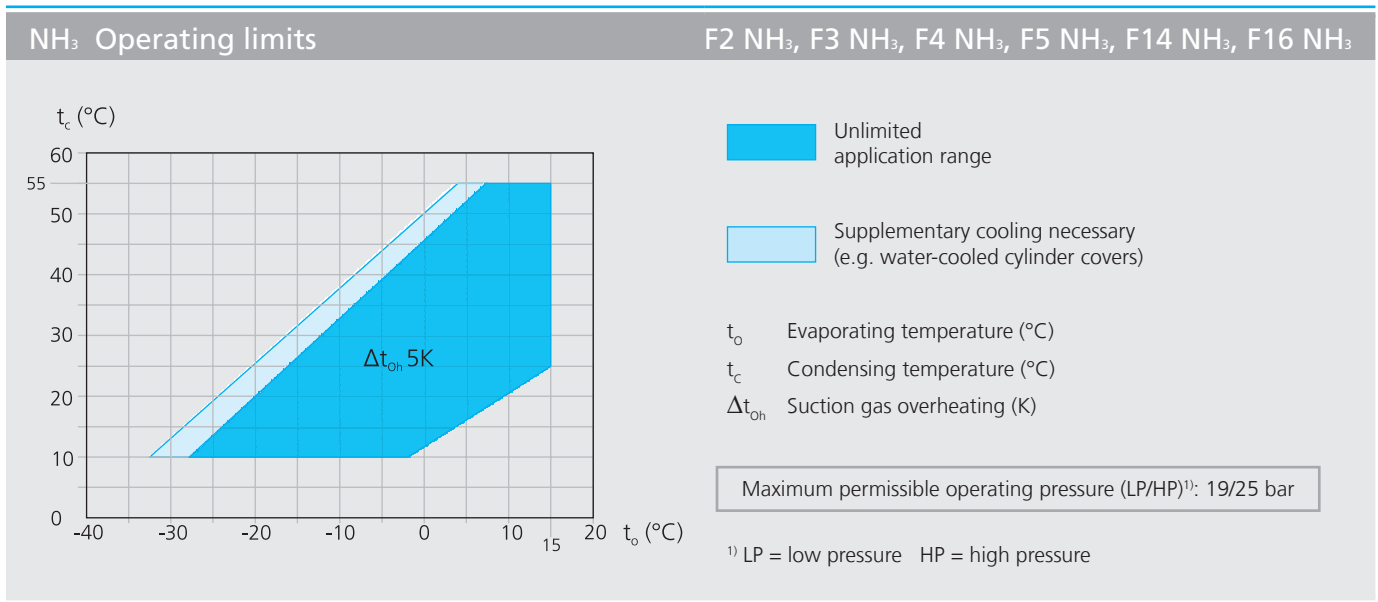
The current program

...6 model sizes with 8 capacity stages from 10,5 to 178,4 m<sup>3</sup>/h (1.450 rpm)

Models available	Displacement (1.450 rpm) [m <sup>3</sup> /h]
F2 NH <sub>3</sub>	10,5
F3 NH <sub>3</sub>	20,3
F4 NH <sub>3</sub>	40,5
F5 NH <sub>3</sub>	73,7
F14 NH <sub>3</sub>	101,5 / 118,9
F16 NH <sub>3</sub>	152,2 / 178,4
F18 NH <sub>3</sub>	in planning stage







- 1
- 2
- 3
- 4

**NH<sub>3</sub> Notes**

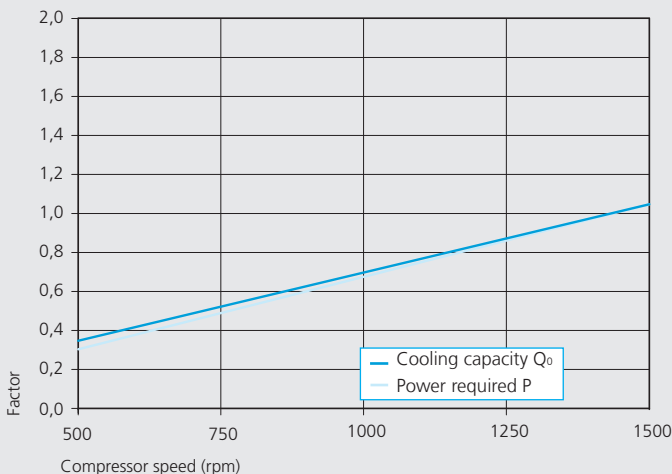
**Operating limits**

Compressor operation is possible within the examples in the diagram showing the limitations of use. The meaning of the surfaces marked in colour are to be observed. Limiting areas should not be selected for layout or continuous operating points.

**Performance data**

Performance specifications for the NH<sub>3</sub> are based on 5 K suction gas overheating without liquid subcooling. Compressor speed 1450 rpm. The values can be stated to judge the overall performance at other speed with the help of the calculation factors below.

For additional technical data for other operating points see GEA Bock software.



**Operation with NH<sub>3</sub> and R723**

NH<sub>3</sub> is a refrigerant traditionally used in industry and largescale refrigeration systems, as NH<sub>3</sub> has considerably more vapouration heat and thus a larger volumetric refrigerating capacity than most F gases. That is why operating NH<sub>3</sub> at small capacities (< 30 KW, e.g. in the commercial sector) can be problematic.

NH<sub>3</sub> has a high adiabatic index and thus significantly higher pressure gas temperatures. On one hand, this greatly limits the application range with regard to lower temperatures; on the other hand, this requires thermally highly stable refrigeration oils. Nonsoluble mineral oils with a viscosity of 68 are used as standard - Fuchs Reniso KC 68. Flooded operation is customary.

In case of dry expansion, please note that the necessary overheating in the evaporator results in higher hot gas temperatures. This is why only low compression ratios are possible and accordingly multi-stage refrigeration systems are necessary.

Compared to mineral oil, PAO (poly-alpha-olefin) oil has better thermal and chemical characteristics and higher lubricating properties. For applications with PAO oil a suitable shaft seal is used in the compressor. The PAO oil "Fuchs Reniso Synth 68" is approved for these systems. The compressors can also be operated with R723 (60 % NH<sub>3</sub> + 40 % dimethyl ether). It is recommended to use the oil „Fuchs Reniso Synth 68“. The use of the mentioned PAO oils and the use of R723 have to be explicitly when ordering a compressor.

NH <sub>3</sub>		Performance data									1.450 rpm	
Type	Cond. temp. °C	Cooling capacity $\dot{Q}_o$ [W]					Power consumption P [kW]					
		Evaporating temperature °C										
		15	10	5	0	-5	-10	-15	-20	-25	-30	
F2 NH <sub>3</sub>	10	Q					9670	7740	6080	4690	3520	2570
		P					1,30	1,26	1,19	1,11	1,02	0,94
	20	Q			13700	11200	8920	7020	5400	4050	2940	
		P			1,44	1,47	1,45	1,41	1,33	1,24	1,14	
	30	Q	18700	15500	12600	10200	7970	6140	4610			
		P	1,67	1,77	1,81	1,80	1,75	1,66	1,54			
	40	Q	17300	14200	11400	9020	7000					
		P	2,28	2,32	2,29	2,21	2,08					
	50	Q	15900	12900	10300	8070						
		P	2,99	2,92	2,79	2,61						
F3 NH <sub>3</sub>	10	Q					18700	15000	11800	9050	6800	4970
		P					2,51	2,43	2,31	2,15	1,98	1,81
	20	Q			26500	21600	17300	13600	10500	7820	5680	
		P			2,80	2,84	2,82	2,72	2,58	2,40	2,20	
	30	Q	36100	29800	24400	19600	15400	11900	8910			
		P	3,24	3,43	3,50	3,48	3,38	3,21	2,98			
	40	Q	33400	27300	22100	17500	13600					
		P	4,42	4,48	4,43	4,28	4,03					
	50	Q	30600	24900	19900	15600						
		P	5,78	5,65	5,40	5,04						
F4 NH <sub>3</sub>	10	Q					37300	29900	23500	18100	13600	9910
		P					5,02	4,86	4,61	4,30	3,96	3,61
	20	Q			52700	4300	34400	27100	20900	15600	11400	
		P			5,58	5,68	5,62	5,44	5,16	4,80	4,40	
	30	Q	71900	59500	48600	39000	30800	23700	17800			
		P	6,47	6,84	6,99	6,96	6,75	6,41	5,95			
	40	Q	66500	54500	43900	34800	27000					
		P	8,83	8,95	8,85	8,54	8,05					
	50	Q	61100	49600	69700	31200						
		P	11,50	11,20	10,70	10,00						
F5 NH <sub>3</sub>	10	Q					67900	54300	42700	32900	24700	18100
		P					9,13	8,84	8,39	7,83	7,21	6,57
	20	Q			95900	78200	62600	49300	37900	28400	20700	
		P			10,10	10,30	10,20	9,90	9,39	8,74	8,01	
	30	Q	131000	109000	88400	71000	55900	43100	32400			
		P	11,70	12,40	12,70	12,60	12,20	11,60	10,80			
	40	Q	12100	99100	79900	63300	49200					
		P	16,00	16,30	16,10	15,50	14,60					
	50	Q	112000	90200	72100	56700						
		P	21,00	20,50	19,60	18,30						

Based on 5 K suction gas overheating without liquid subcooling

 Supplementary cooling necessary

NH <sub>3</sub>		Performance data									1.450 rpm	
Type	Cond. temp. °C	Cooling capacity $\dot{Q}_o$ [W]						Power consumption P [kW]				
		Evaporating temperature °C										
		15	10	5	0	-5	-10	-15	-20	-25	-30	
F14/1166 NH <sub>3</sub>	10	Q					93500	74800	58800	45300	34000	24900
		P					12,50	12,10	11,50	10,70	9,93	9,05
	20	Q			133000	108000	86300	67900	52200	39100	28400	
		P			14,00	14,20	14,10	13,60	12,90	12,00	11,00	
	30	Q	181000	149000	12200	97700	77000	59400	44600			
		P	16,20	17,10	17,50	17,40	16,90	16,00	14,90			
F14/1366 NH <sub>3</sub>	10	Q					110000	87600	68900	53100	39900	29100
		P					14,70	14,20	13,50	12,60	11,60	10,60
	20	Q			155000	127000	101000	79500	61100	45800	33300	
		P			16,40	16,60	16,50	15,90	15,10	14,10	12,90	
	30	Q	211000	175000	143000	115000	90200	69500	52200			
		P	19,00	20,00	20,50	20,40	19,80	18,80	17,40			
F16/1751 NH <sub>3</sub>	10	Q					141000	113000	88200	67900	51000	37300
		P					18,80	18,20	17,30	16,10	14,80	13,50
	20	Q			199000	162000	130000	102000	78300	58600	42600	
		P			21,00	21,30	21,10	20,40	19,30	18,00	16,50	
	60	Q	270000	224000	183000	147000	116000	89000	66800			
		P	24,30	25,70	26,30	26,10	25,30	24,10	22,30			
F16/2051 NH <sub>3</sub>	10	Q					165000	132000	104000	79600	59800	43700
		P					22,10	21,40	20,30	18,90	17,40	15,90
	20	Q			233000	190000	152000	120000	91700	68700	49900	
		P			24,60	25,00	24,70	23,90	22,70	21,10	19,30	
	30	Q	317000	262000	214000	172000	136000	105000	78300			
		P	28,50	30,10	30,80	30,60	29,70	28,20	26,20			

Based on 5 K suction gas overheating without liquid subcooling

 Supplementary cooling necessary

- 1
- 2
- 3
- 4

F NH <sub>3</sub> Type	Number of cylinders	Displacement (1.450 rpm) m <sup>3</sup> /h	Weight kg	Connections ①		Oil charge Ltr.	Speed range rpm
				Discharge line DV mm	Suction line SV mm		
F2 NH <sub>3</sub>	2	10,5	18	18	18	0,8	960 - 1450
F3 NH <sub>3</sub>	2	20,3	28	25	30	1,5	960 - 1450
F4 NH <sub>3</sub>	4	40,5	51	30	38	2,6	700 - 1450
F5 NH <sub>3</sub>	4	73,7	85	38	2 x 38	3,8	700 - 1450
F14/1166 NH <sub>3</sub>	4	101,5	157	49	60	6,3	700 - 1450
F14/1366 NH <sub>3</sub>	4	118,9	158	49	60	6,3	700 - 1450
F16/1751 NH <sub>3</sub>	6	152,2	183	49	60	7,5	700 - 1450
F16/2051 NH <sub>3</sub>	6	178,4	183	49	60	7,5	700 - 1450

① for welded connections

Oil sump heater: 230 V – 1 – 50/60 Hz

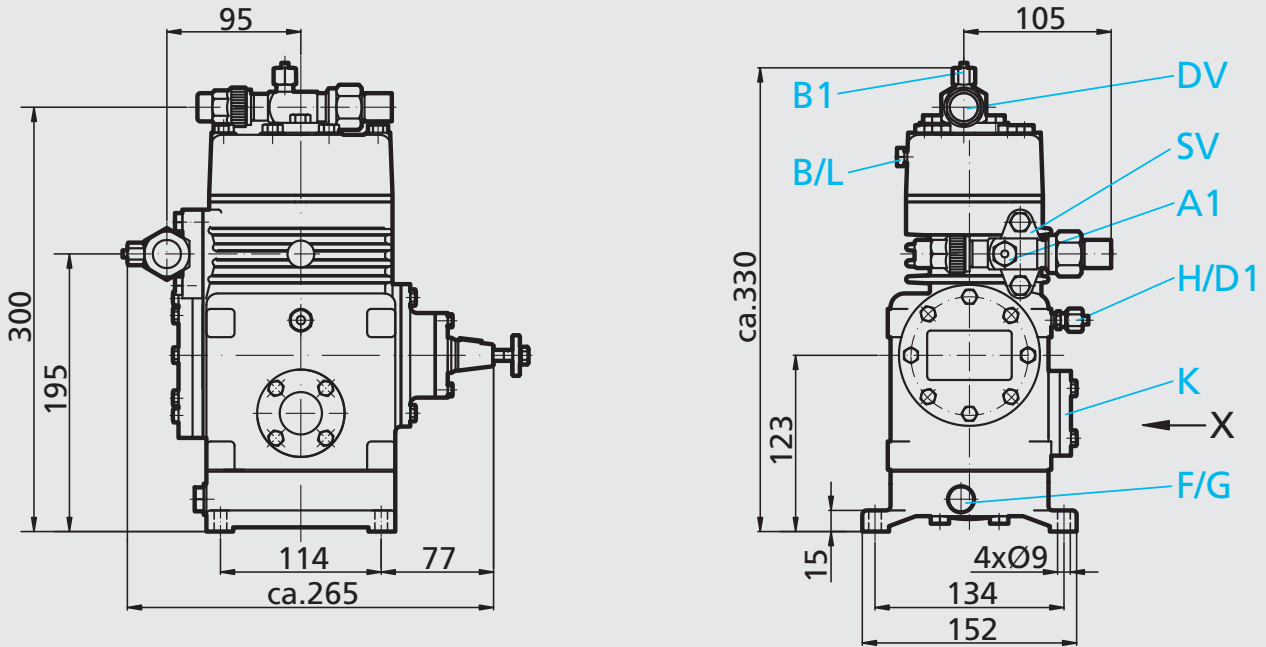
F2 NH<sub>3</sub>: 40 W (accessories)

F3 NH<sub>3</sub>: 60 W (accessories)

F4 NH<sub>3</sub>, F5 NH<sub>3</sub>: 80 W (accessories)

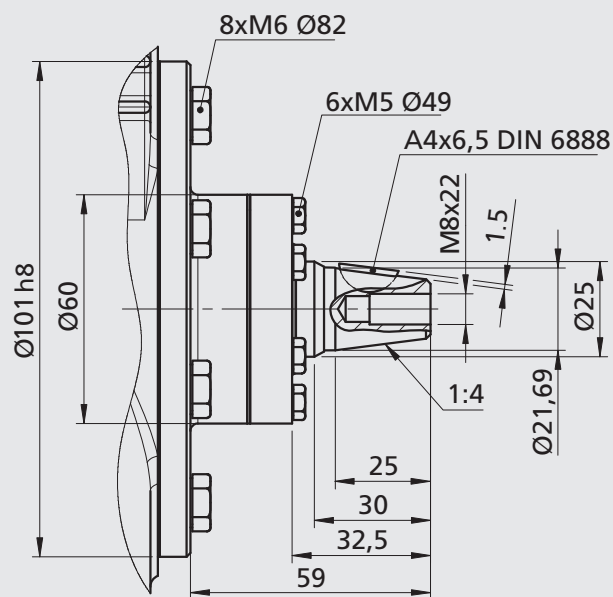
F14 NH<sub>3</sub>, F16 NH<sub>3</sub>: 140 W (accessories)

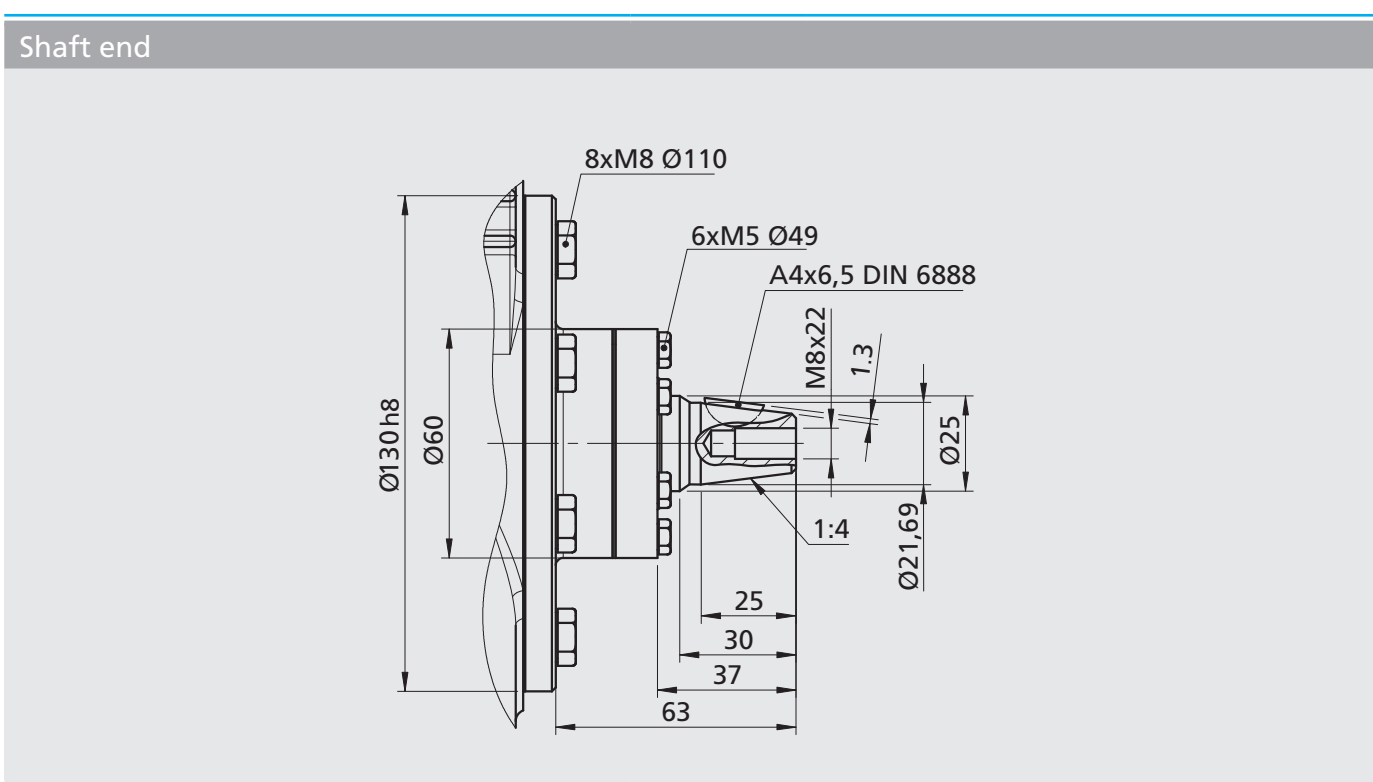
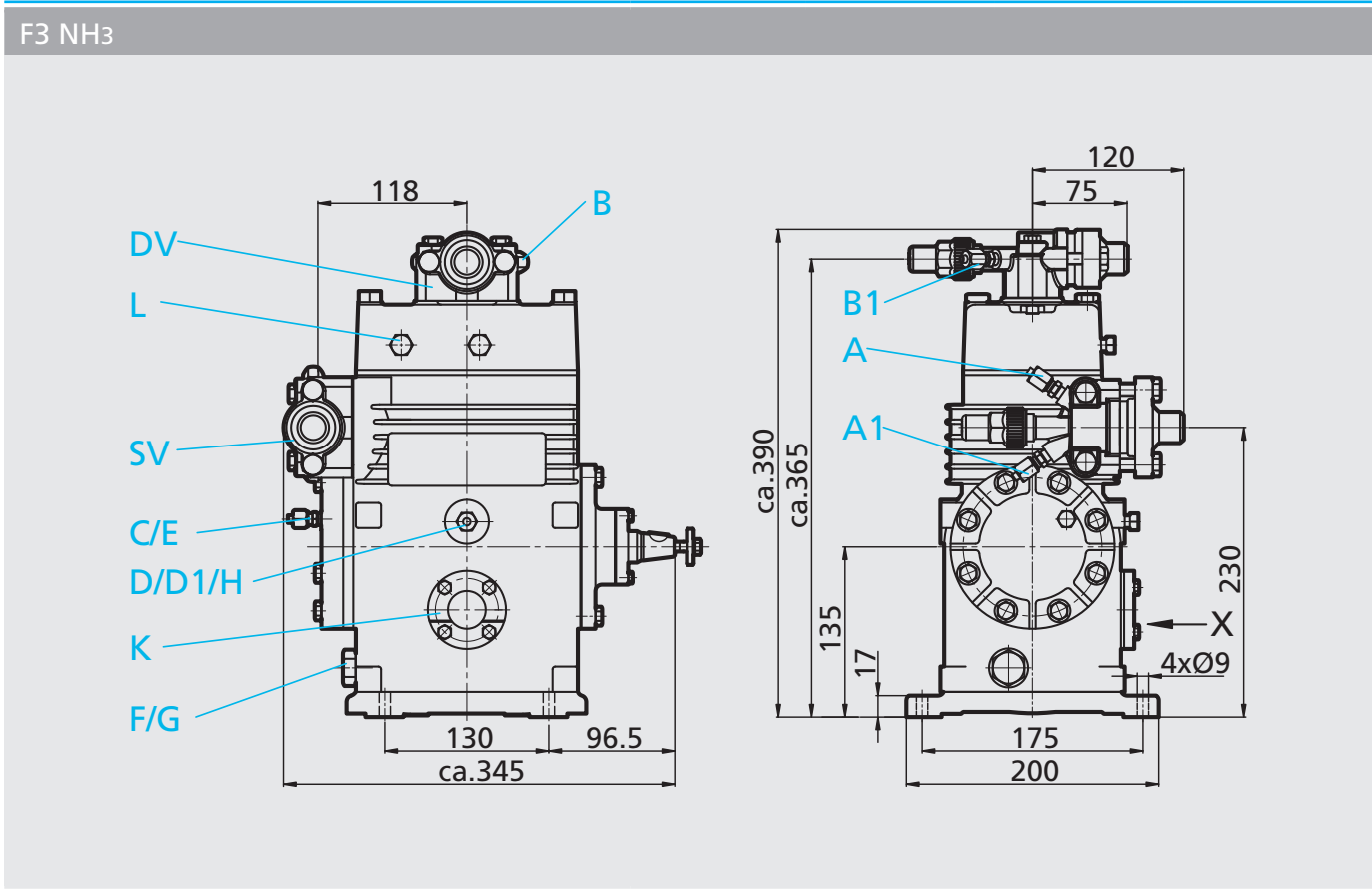
F2 NH<sub>3</sub>



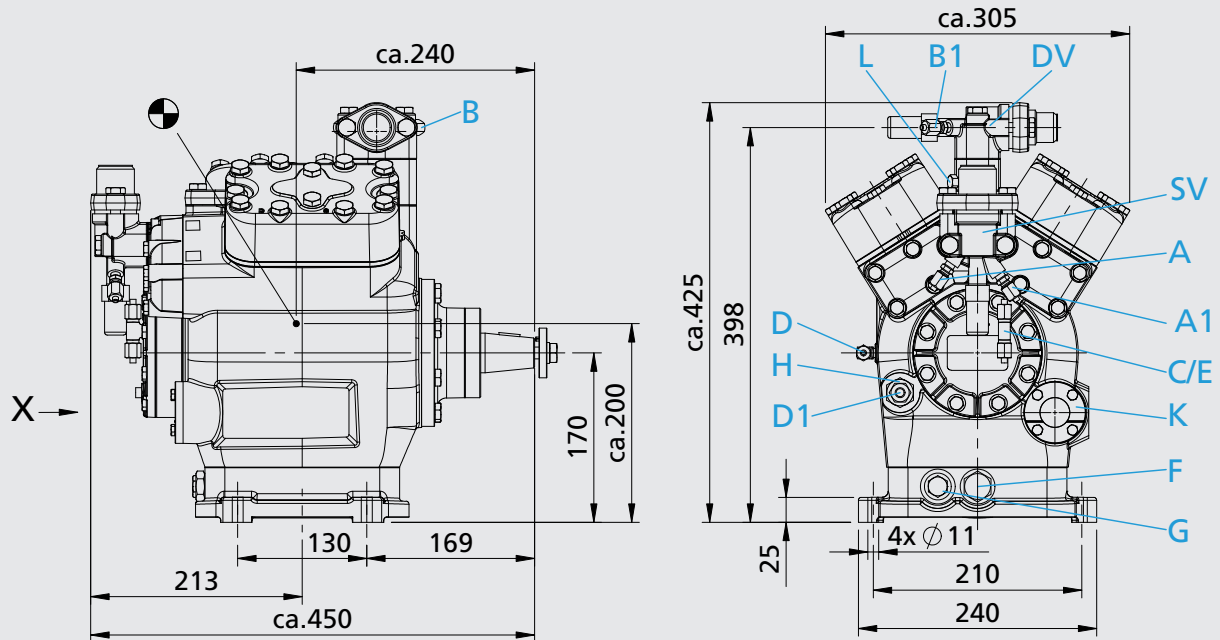
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Shaft end



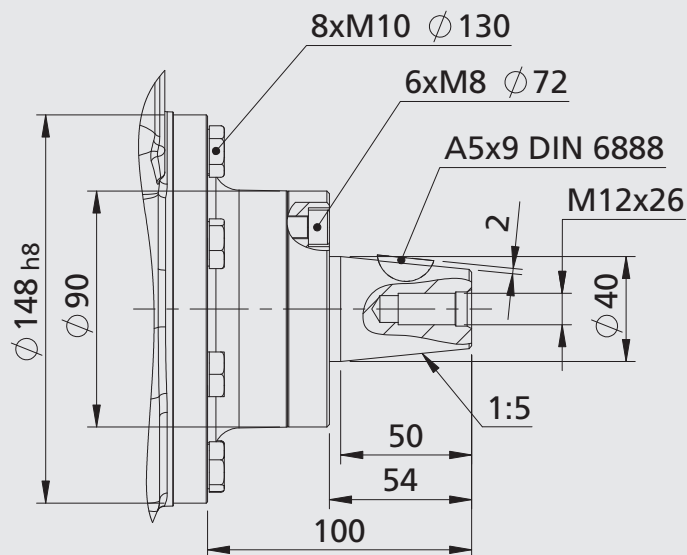


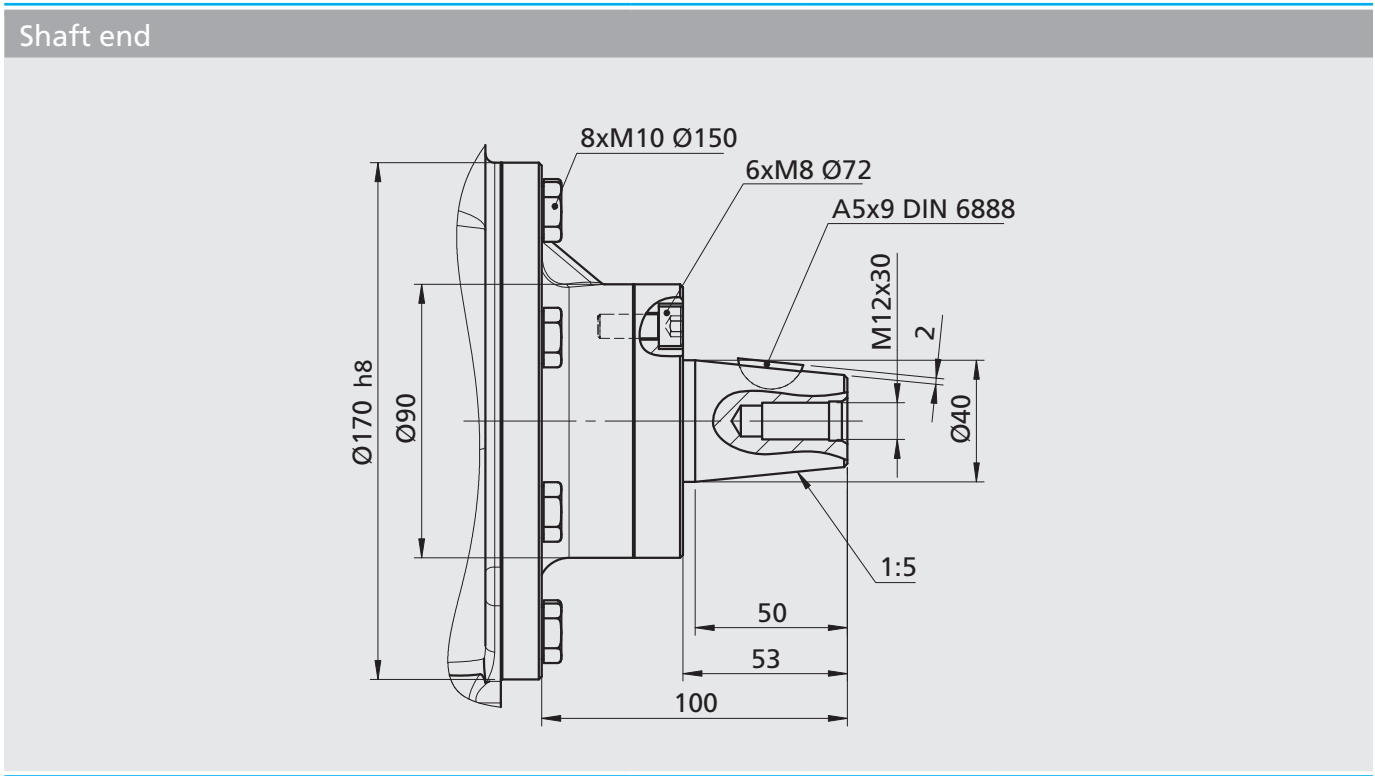
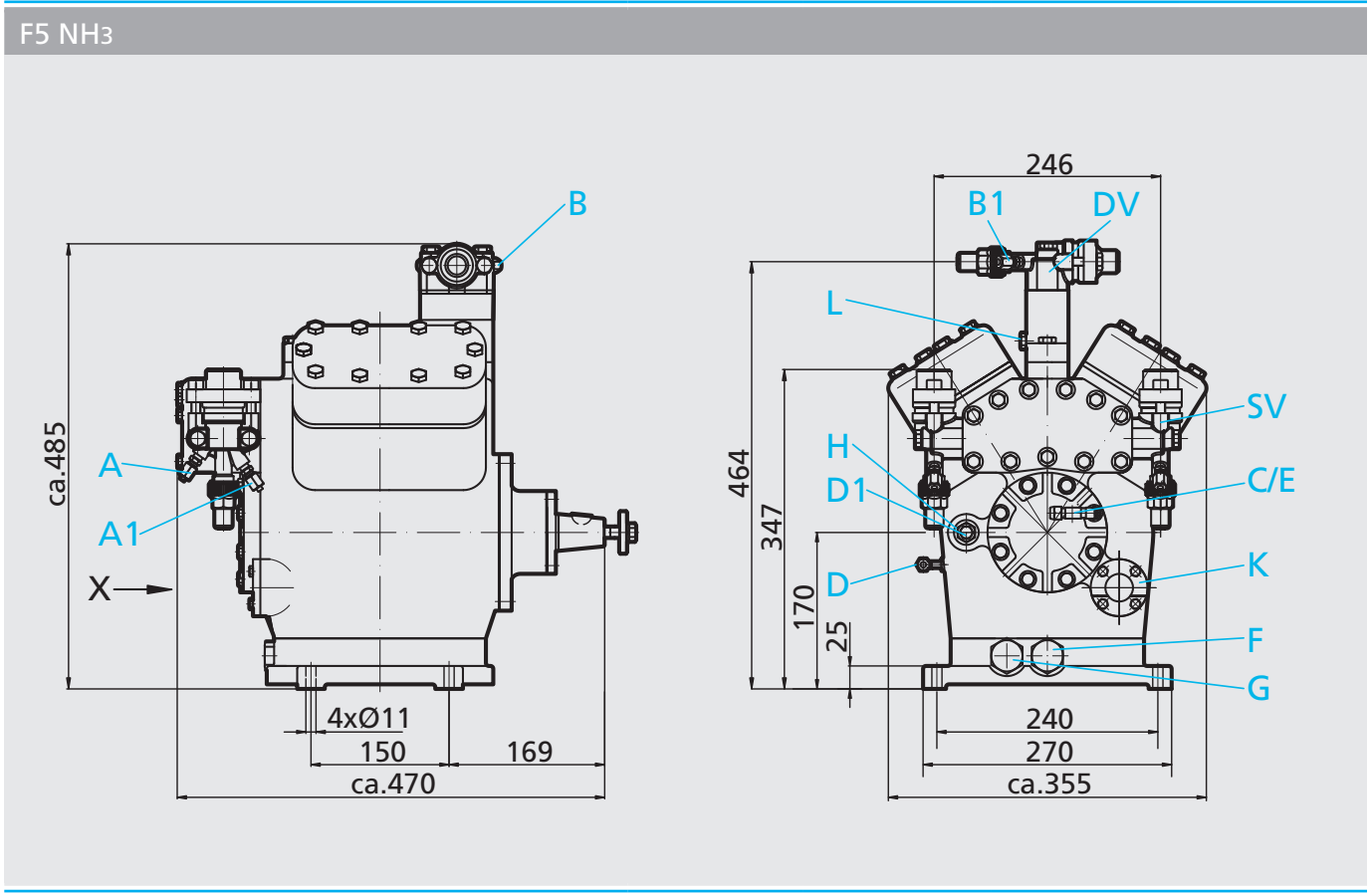
F4 NH<sub>3</sub>



- 1
- 2
- 3
- 4

Shaft end

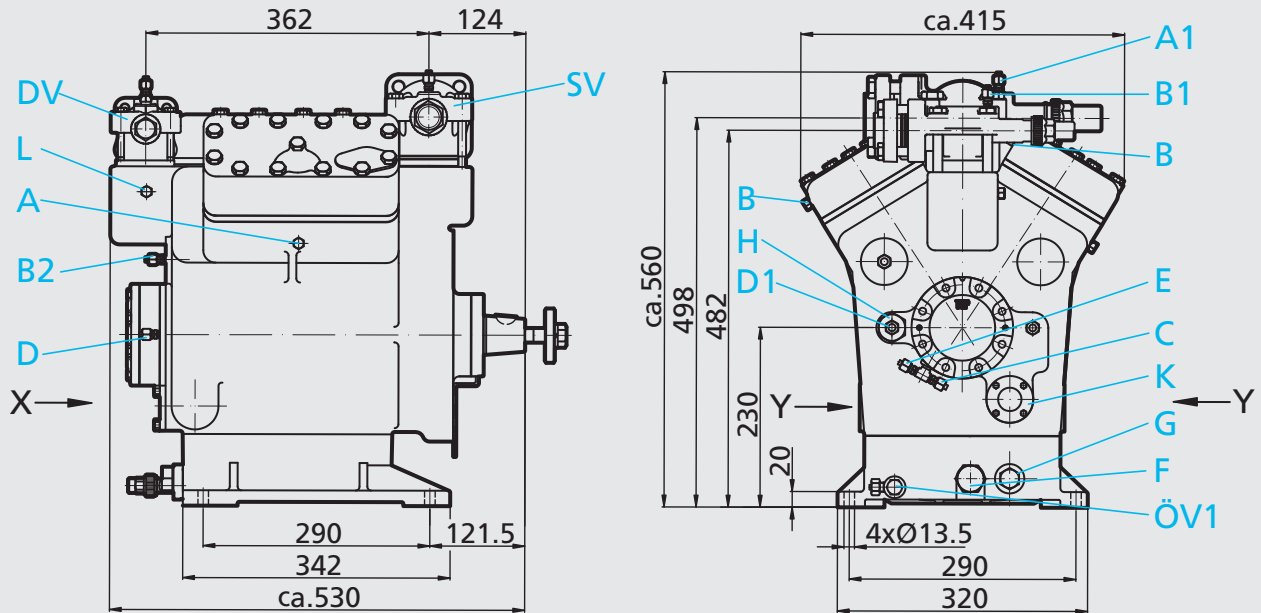






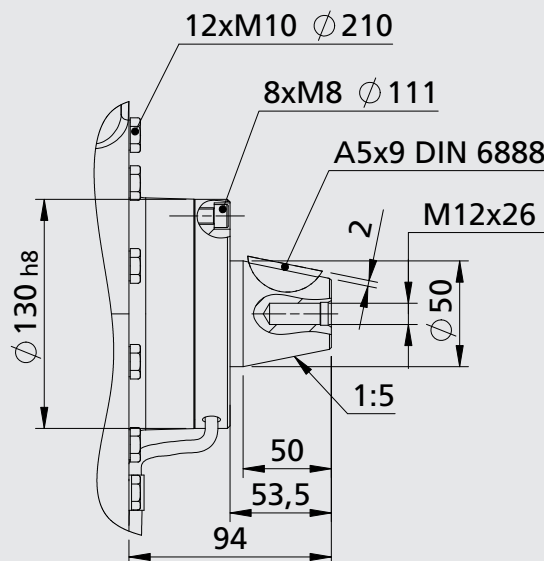
F14 NH<sub>3</sub>

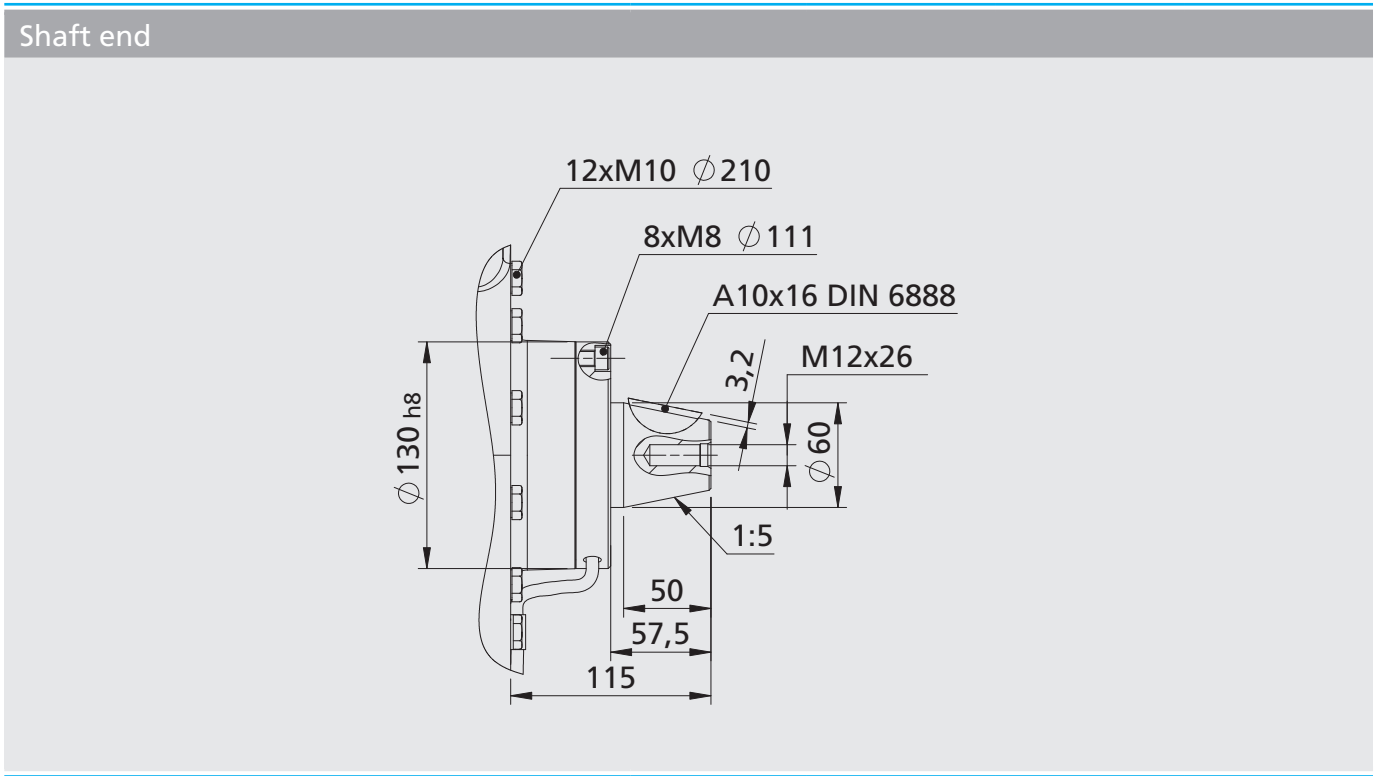
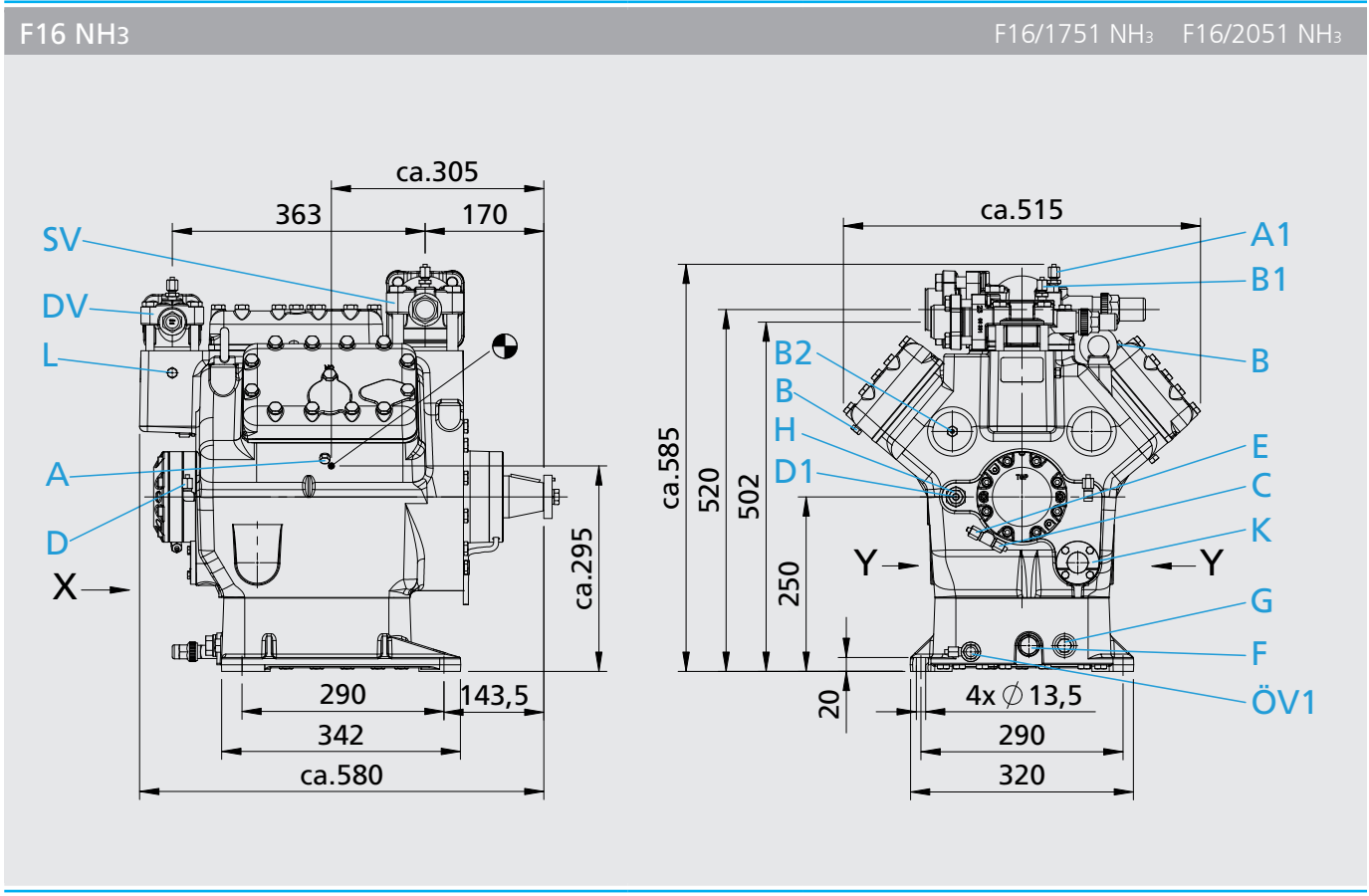
F14/1166 NH<sub>3</sub> F14/1366 NH<sub>3</sub>



- 1
- 2
- 3
- 4

Shaft end





Connections	F2 NH <sub>3</sub>	F3 NH <sub>3</sub>	F4 NH <sub>3</sub>	F5 NH <sub>3</sub>	F14 NH <sub>3</sub>	F16 NH <sub>3</sub>
SV Suction line DV Discharge line	please refer to technical data page 44					
A Connection suction side, not lockable	-	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	1/8" NPTF <sup>1)</sup>	1/8" NPTF <sup>1)</sup>
A1 Connection suction side, lockable	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>
B Connection discharge side, not lockable	1/8" NPTF	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	1/8" NPTF	1/8" NPTF
B1 Connection discharge side, lockable	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>
B2 Connection discharge side, not lockable	-	-	-	-	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>
C Connection oil pressure safety switch OIL	-	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>
D Connection oil pressure safety switch LP	-	∅ 10 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>
D1 Connection oil return from oil separator	∅ 10 mm <sup>1)</sup>	∅ 10 mm <sup>1)</sup>	∅ 10 mm <sup>1)</sup>	∅ 10 mm <sup>1)</sup>	∅ 10 mm <sup>1)</sup>	∅ 10 mm <sup>1)</sup>
E Connection oil pressure gauge	-	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>
F Oil drain plug	R <sup>3</sup> / <sub>8</sub> "	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 26 x 1,5	M 26 x 1,5
G Oil sump heater plug	R <sup>3</sup> / <sub>8</sub> "	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5
H Oil charge plug	∅ 10 mm <sup>1)</sup>	∅ 10 mm <sup>1)</sup>	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5	M 22 x 1,5
K Sight glass	4 hole M 6	4 hole M 6	4 hole M 6	4 hole M 6	4 hole M 6 <sup>2)</sup>	4 hole M 6 <sup>2)</sup>
L Connection thermal protection thermostat	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF	1/8" NPTF
ÖV1 Oil service valve (accessories)	-	-	-	-	∅ 6 mm <sup>1)</sup>	∅ 6 mm <sup>1)</sup>

1) Compression joint for steel pipes

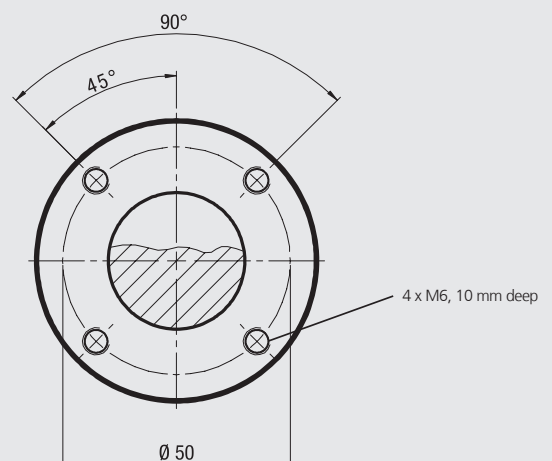
2) Second sight glass can be attached, Positioning view Y (accessories, only as original equipment)

View X,Y

- Oil sight glass
- Connection facility for parallel operation

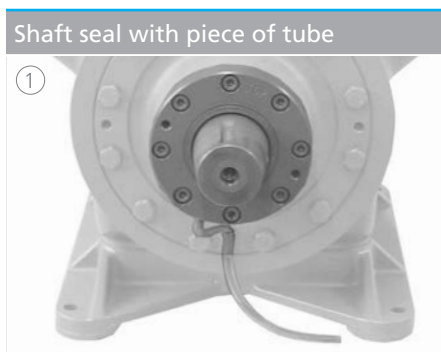
Position view X:  
F2 NH<sub>3</sub>, F3 NH<sub>3</sub>, F4 NH<sub>3</sub>, F5 NH<sub>3</sub>, F14 NH<sub>3</sub>, F16 NH<sub>3</sub>  
4 hole sight glass

Position view Y:  
F14 NH<sub>3</sub>, F16 NH<sub>3</sub>  
Second oil sight glass can be attached as accessories (available as original equipment only)



Scope of supply	F2 NH <sub>3</sub>	F3 NH <sub>3</sub>	F4 NH <sub>3</sub>	F5 NH <sub>3</sub>	F14 NH <sub>3</sub>	F16 NH <sub>3</sub>
Open type compressor for NH <sub>3</sub> with suction and discharge shut-off valve	●	●	●	●	●	●
Two cylinder, cylinder arrangement in row	●	●				
Four cylinder, cylinder arrangement in V			●	●	●	
Six cylinder, cylinder arrangement in W						●
Seat front bearing flange	●	●	●	●	●	●
① Shaft seal with piece of tube for controlled oil collection					●	●
Oil pump	●	●	●	●	●	●
Oil charge: FUCHS Reniso KC 68	● 1)	● 1)	● 1)	● 1)	● 1)	● 1)
Sight glass	●	●	●	●	●	●
Decompression valve			●	●	●	●
② Elevated base plate (oil volume plus 2,5 litres)					●	●
Inert gas charge	●	●	●	●	●	●

1) If R723 or other oils are used, please consult our application engineering department



Accessories	F2 NH <sub>3</sub>	F3 NH <sub>3</sub>	F4 NH <sub>3</sub>	F5 NH <sub>3</sub>	F14 NH <sub>3</sub>	F16 NH <sub>3</sub>
① Oil sump heater 220-240 V - 1 - 50/60 Hz	●	●	●	●	●	●
② Compressor flywheel	● 1)	● 1)	● 1)	● 1)	● 1)	● 1)
③ Shaft coupling for direct drive	● 1) 2)	● 1) 2)	● 1) 2)	● 1) 2)	● 1) 2)	● 1) 2)
④ Capacity regulator 230 V - 1 - 50/60 Hz, IP65 1 capacity regulator = 50 % residual capacity			●	●	●	
Capacity regulator 230 V - 1 - 50/60 Hz, IP65 1-2 capacity regulator = 66/33 % residual capacity						●
⑤ Start unloader 230 V - 1 - 50/60 Hz, IP65, without check valve, including thermal protection thermostat (bimetal sensor)			●	●	●	●
⑥ Thermal protection thermostat (bimetal sensor)	●	●	●	●	●	●
⑦ Oil pressure safety switch MP 55A for NH <sub>3</sub> 230 V - 1 - 50/60 Hz, IP20		● 1)	● 1)	● 1)	● 1)	● 1)
Oil service valve					●	●
⑧ Two additional sight glasses (both-sided), positioning view Y					● 3)	● 3)
⑨ Water-cooled cylinder covers Sea water resistant water-cooled cylinder covers		●	●	●	●	●


1) Enclosure

2) Please state motor Ø and feather key groove dimensions when ordering shafts

3) Available as original equipment only

1  
2  
3  
4

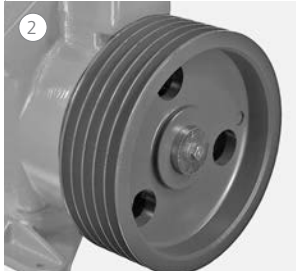
**Oil sump heater**



①

F2 NH<sub>3</sub>: 40 Watt  
 F3 NH<sub>3</sub>: 60 Watt  
 F4 NH<sub>3</sub>: 80 Watt  
 F5 NH<sub>3</sub>: 80 Watt  
 F14 NH<sub>3</sub>: 140 Watt  
 F16 NH<sub>3</sub>: 140 Watt

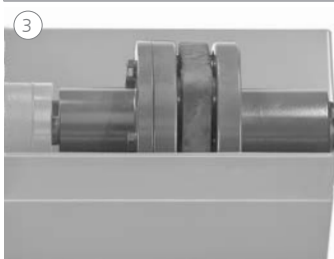
**Compressor flywheel**



②

F2 NH<sub>3</sub>: Ø 165,2 x SPA  
 F3 NH<sub>3</sub>: Ø 210,2 x SPA  
 F4 NH<sub>3</sub>: Ø 210,3 x SPA  
 F5 NH<sub>3</sub>: Ø 230,4 x SPA  
 F14 NH<sub>3</sub>: Ø 322 x SPB  
 F16 NH<sub>3</sub>: Ø 322 x SPB

**Shaft coupling**



③


F2 NH<sub>3</sub>: WK 42.44  
 F3 NH<sub>3</sub>: WK 42.44  
 F4 NH<sub>3</sub>: WK 70.40  
 F5 NH<sub>3</sub>: WK 70.40  
 F14 NH<sub>3</sub>: WK 190.50  
 F16 NH<sub>3</sub>: WK 190.60

**Capacity regulator**



④

**Start unloader**



⑤

**Thermal protection thermostat**



⑥

**Oil pressure safety switch**



⑦

**Sight glass**

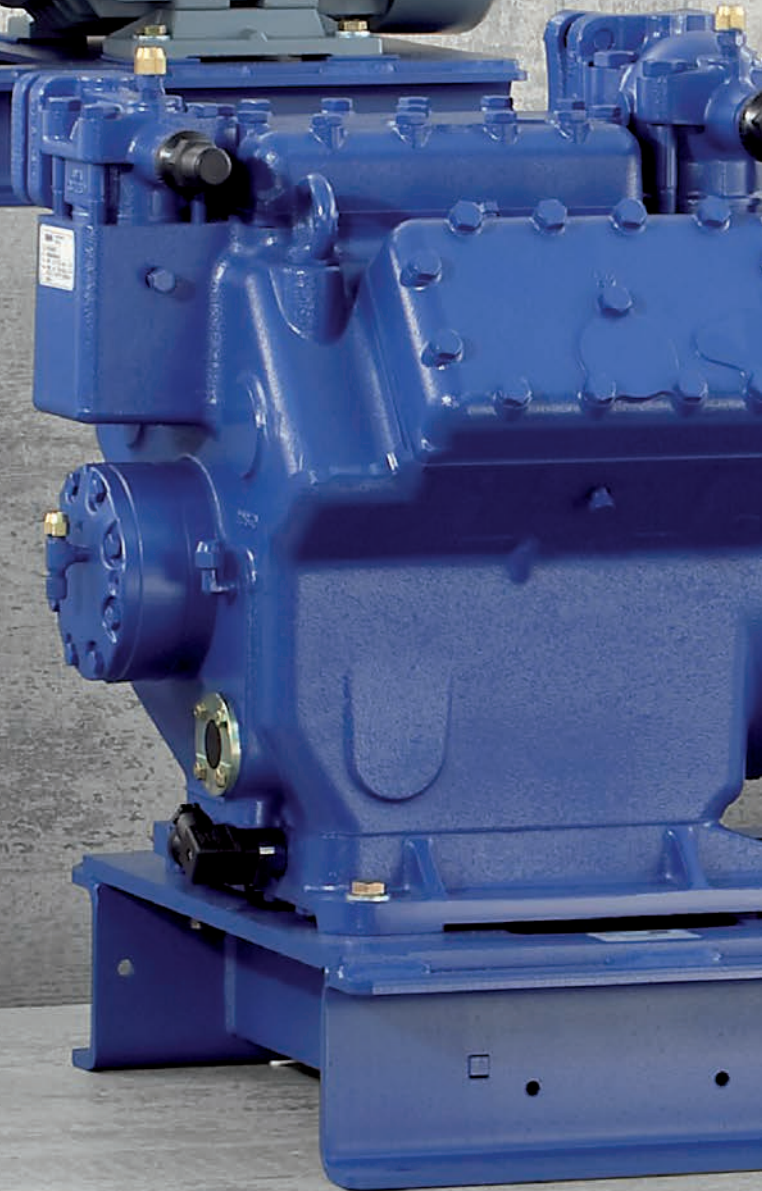
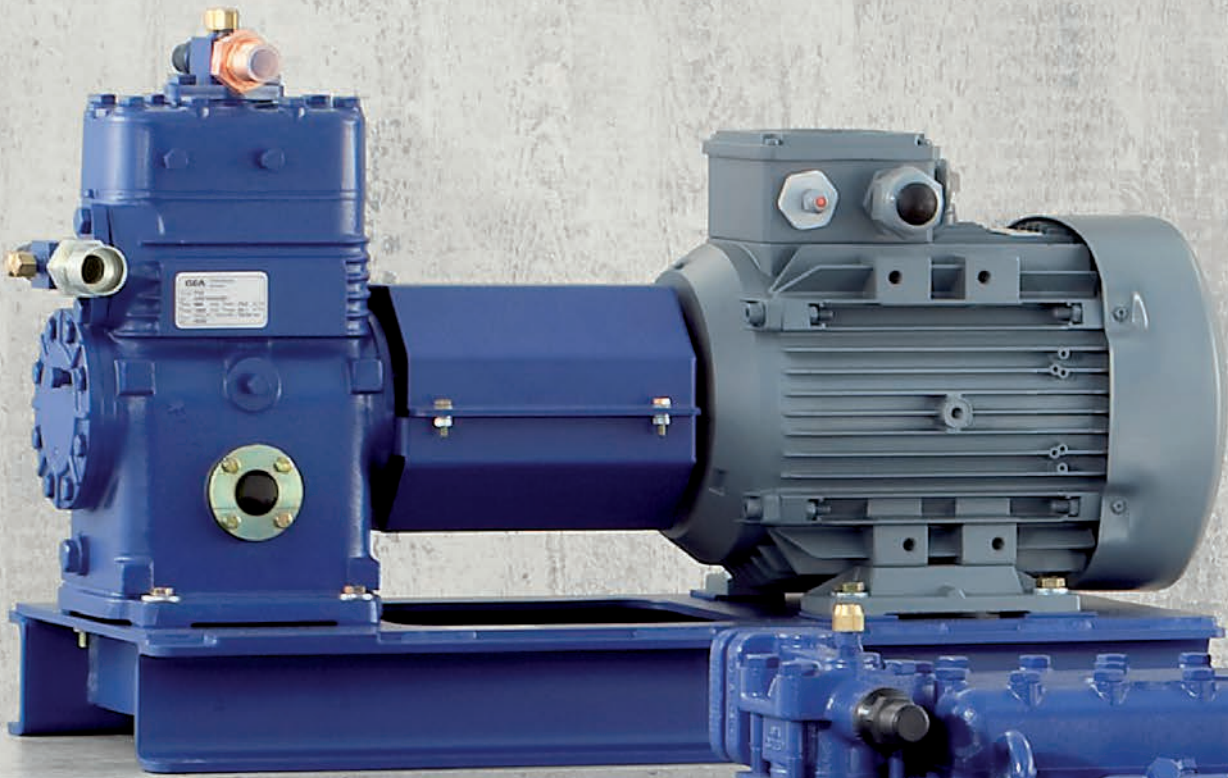


⑧

**Water-cooled cylinder covers**



⑨



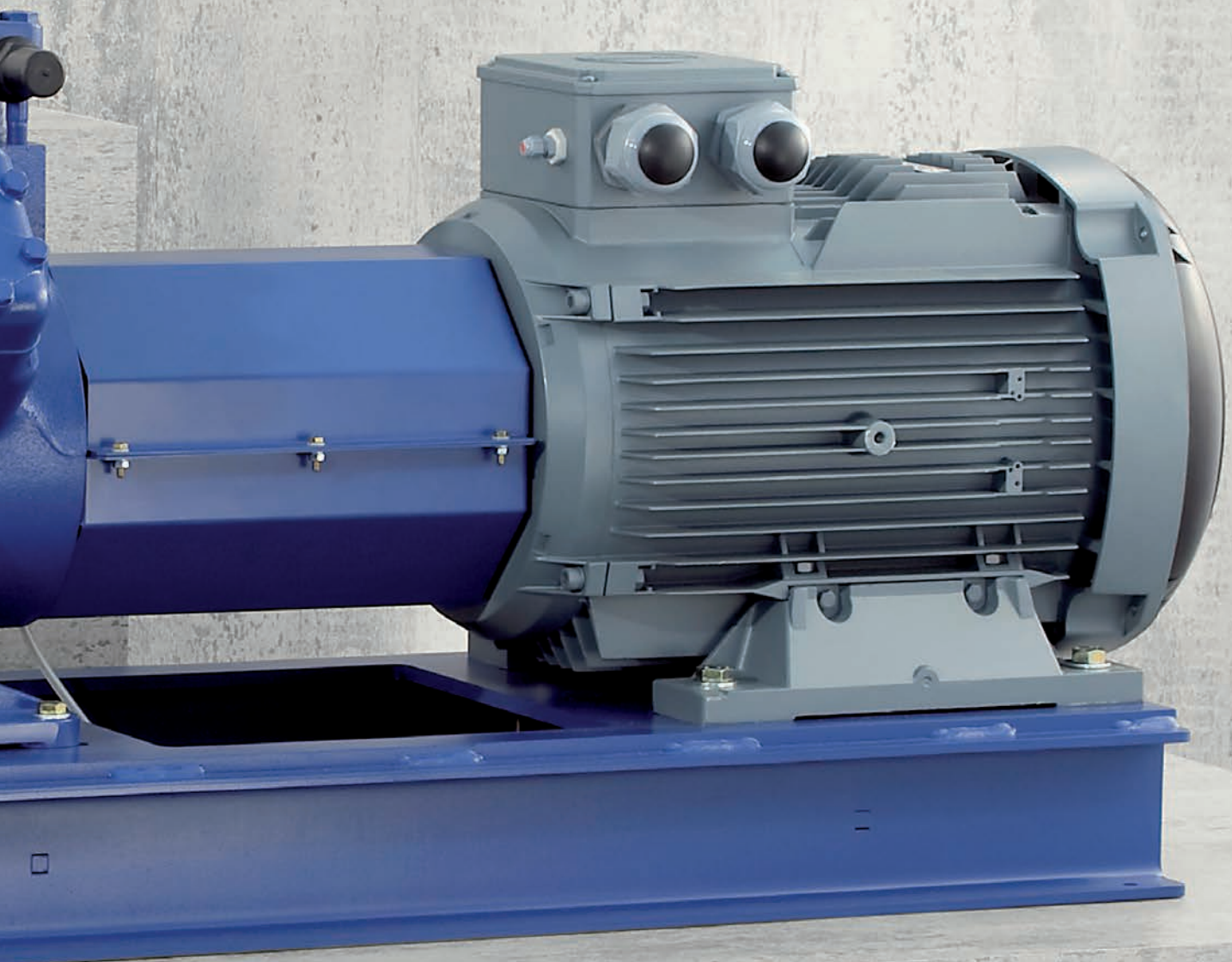
## Compressor units for directive drive

At a glance

56

Dimensions and connections

59



**FDK compressor units**

Based on the F compressor series with its many designs and application options, a selection of compressor units with compact construction is available for use with direct drive.

Compressor with flexible shaft coupling for direct drive mounted on a profile base frame. The power transmission from motor to compressor occurs via an elastic flexible shaft coupling. ICE standard motors of type IM B3 are used as drive motors (option).

The special features:

**Designed for optimum running comfort**

- simple and robust construction
- use of standard motors
- optimum power transmission via direct coupling

**Service-friendly**

- Flexible shaft coupling can be separated in its installed state, which enables maintenance work to be carried out on the compressor and motor, without having to dismantle them from the base frame.

**SFD compressor units**

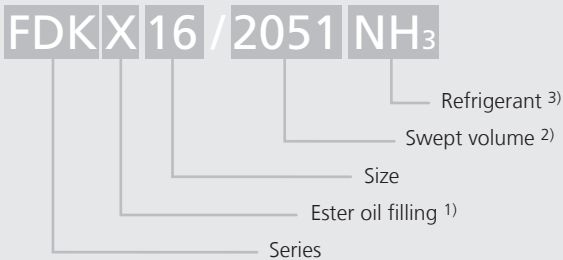
Compressor with flexible shaft coupling for direct drive mounted on a profile base frame. Power transmission from motor to compressor occurs via an elastic flexible shaft coupling. The automatic self-aligning of motor and compressor is achieved using coupling bell. ICE standard motors of type IM B5 are used as drive motors (option).

The special features:

**Designed for optimum running comfort**

- simple and robust construction
- use of standard motors
- optimum power transmission via direct coupling
- optimum alignment of motor and compressor via coupling bell

Type key

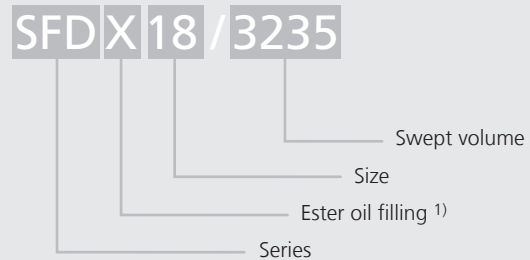


<sup>1)</sup> X - Ester oil filling (HFC refrigerant e.g. R134a, R407C)

<sup>2)</sup> Indication only at FDK14, FDK16 and FDK18

<sup>3)</sup> Indication only at NH<sub>3</sub> version

Type key



<sup>1)</sup> X - Ester oil filling (HFC refrigerant e.g. R134a, R407C)



FDK18



SFD18



The current program

...6 model sizes with 9 capacity stages from 20,3 to 281,3 m<sup>3</sup>/h (50 Hz)

Models available	Displacement (1.450 rpm) [m <sup>3</sup> /h]
FDK 3 FDK 3 NH <sub>3</sub>	20,3
FDK 4 FDK 4 NH <sub>3</sub>	40,5
FDK 5 FDK 5 NH <sub>3</sub>	73,7
FDK 14 FDK 14 NH <sub>3</sub>	101,5 / 118,9
FDK 16 FDK 16 NH <sub>3</sub>	152,2 / 178,4
FDK 18	238,0 / 281,3

Models available	Displacement (1.450 rpm) [m <sup>3</sup> /h]
SFD 18	238,0 / 281,3

### Operating limits

You will find the operating limits diagrams for the various refrigerants in the chapter entitled „F compressors“ from page 15 onwards as well as in „F compressors for NH<sub>3</sub> series“ from page 41 onwards.

### Performance data

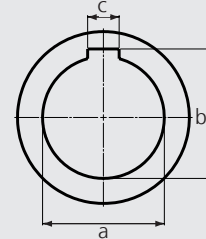
You will find the performance data for the various refrigerants in the chapter entitled „F compressors“ from page 16 onwards as well as in „F compressors for NH<sub>3</sub> series“ from page 42 onwards.

### Technical data

You will find the technical data for the various compressors in the chapter entitled „F compressors“ from page 24 onwards as well as in „F compressors for NH<sub>3</sub> series“ from page 44 onwards.

### Scope of supply FDK

- Open type F or F-NH<sub>3</sub> compressors for direct drive
- Mounted on a profile base frame
- With shaft coupling and coupling protection
- Hub on the motor side of the shaft coupling manufactured according to customer specifications.  
Required dimensions, see fig. (otherwise only one pilot hole)
- Without drive motor
- 4 rubber sheets as an extra item



You will find further information on the scope of supply for the individual basic compressors in the chapter entitled „F compressors“ from page 34 onwards as well as in „F compressors for NH<sub>3</sub> series“ from page 52 onwards.

### Scope of supply SFD

- Open type F compressors for direct drive
- Mounted on a profile base frame
- With shaft coupling and coupling bell
- Without drive motor
- 4 rubber sheets as an extra item

You will find further information on the scope of supply for the individual basic compressors in the chapter entitled „F compressors“ from page 34 onwards.

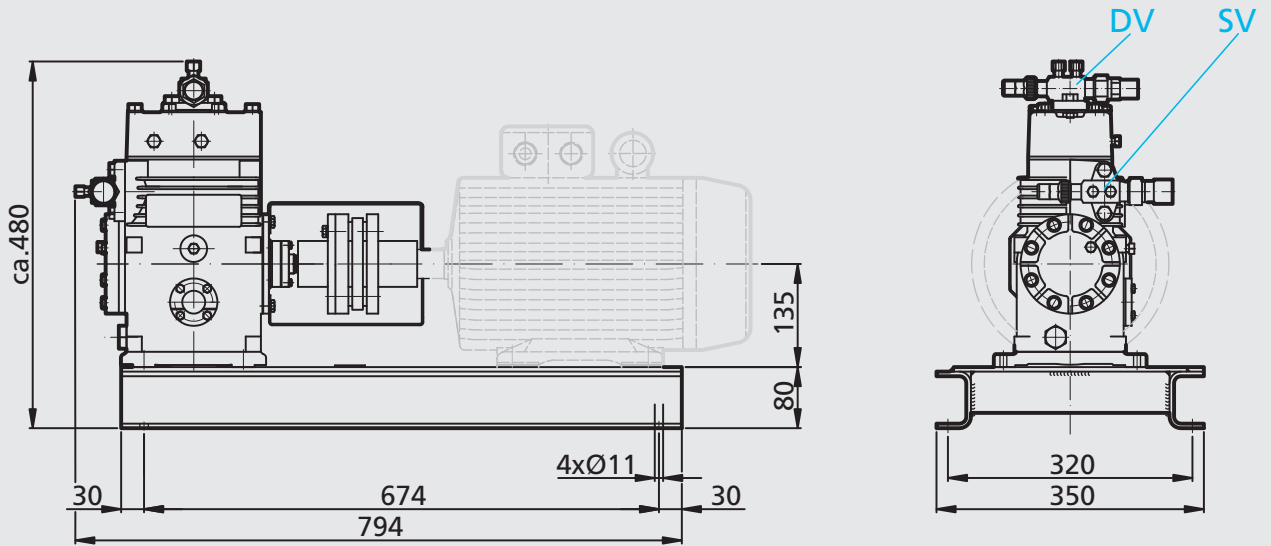
### Accessories

- Drive motors 4 to 90 KW, mounted and aligned, IP55  
FDK3 to FDK18: design IMB3  
SFD18: design IMB5
- Instrument panel can be equipped with <sup>1)</sup>:  
HP-, LP switch and pressure gauge, oil pressure gauge, oil differential pressure switch

You will find the accessories for the various compressors in the chapter entitled „F compressors“ from page 36 onwards as well as in „F compressors for NH<sub>3</sub> series“ from page 53 onwards.

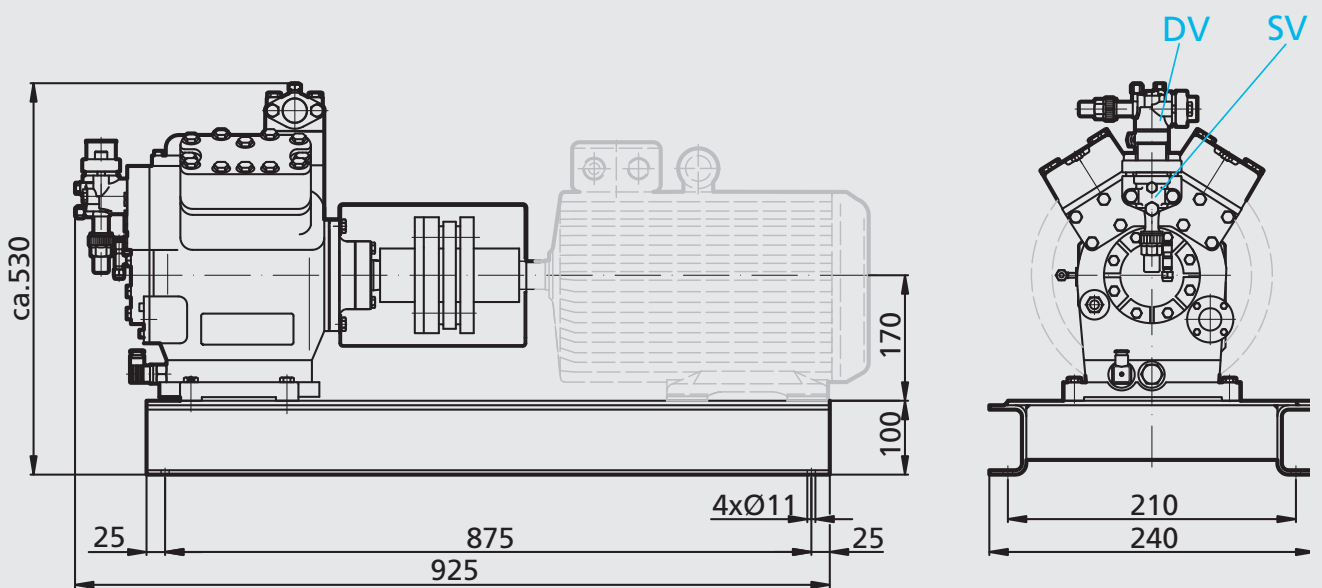
<sup>1)</sup> not available for NH<sub>3</sub> version

FDK3

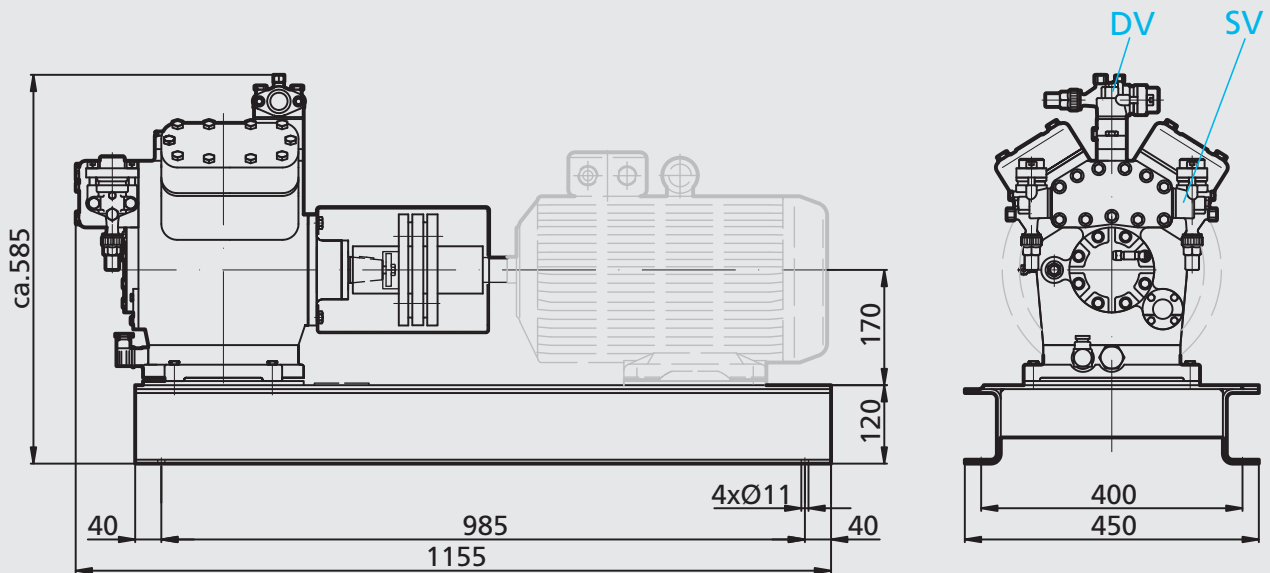


- 1
- 2
- 3
- 4

FDK4



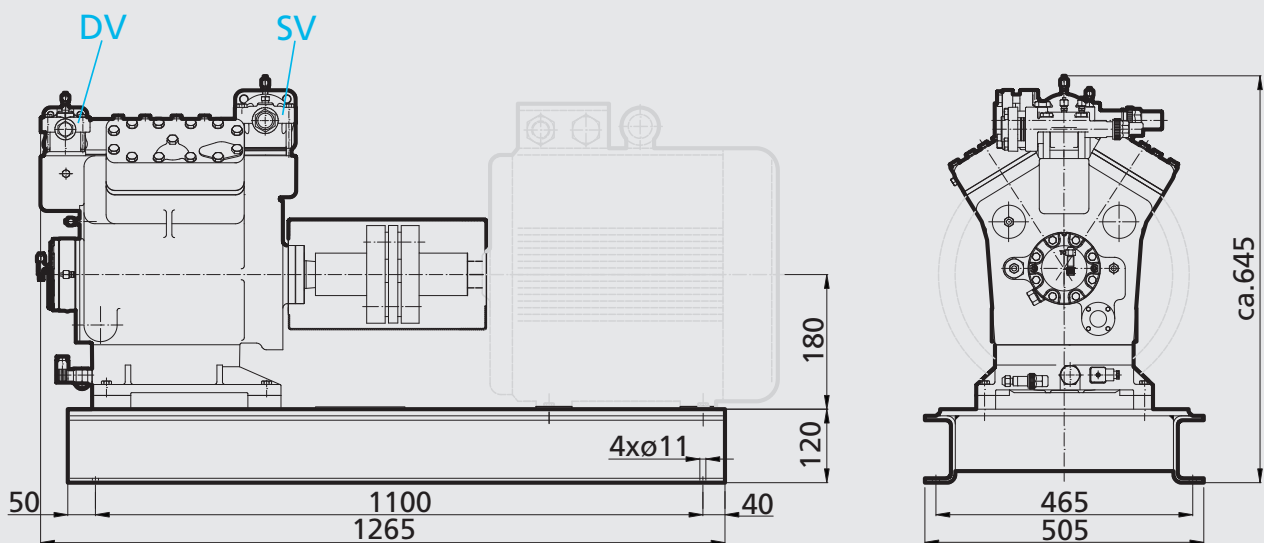
FDK5

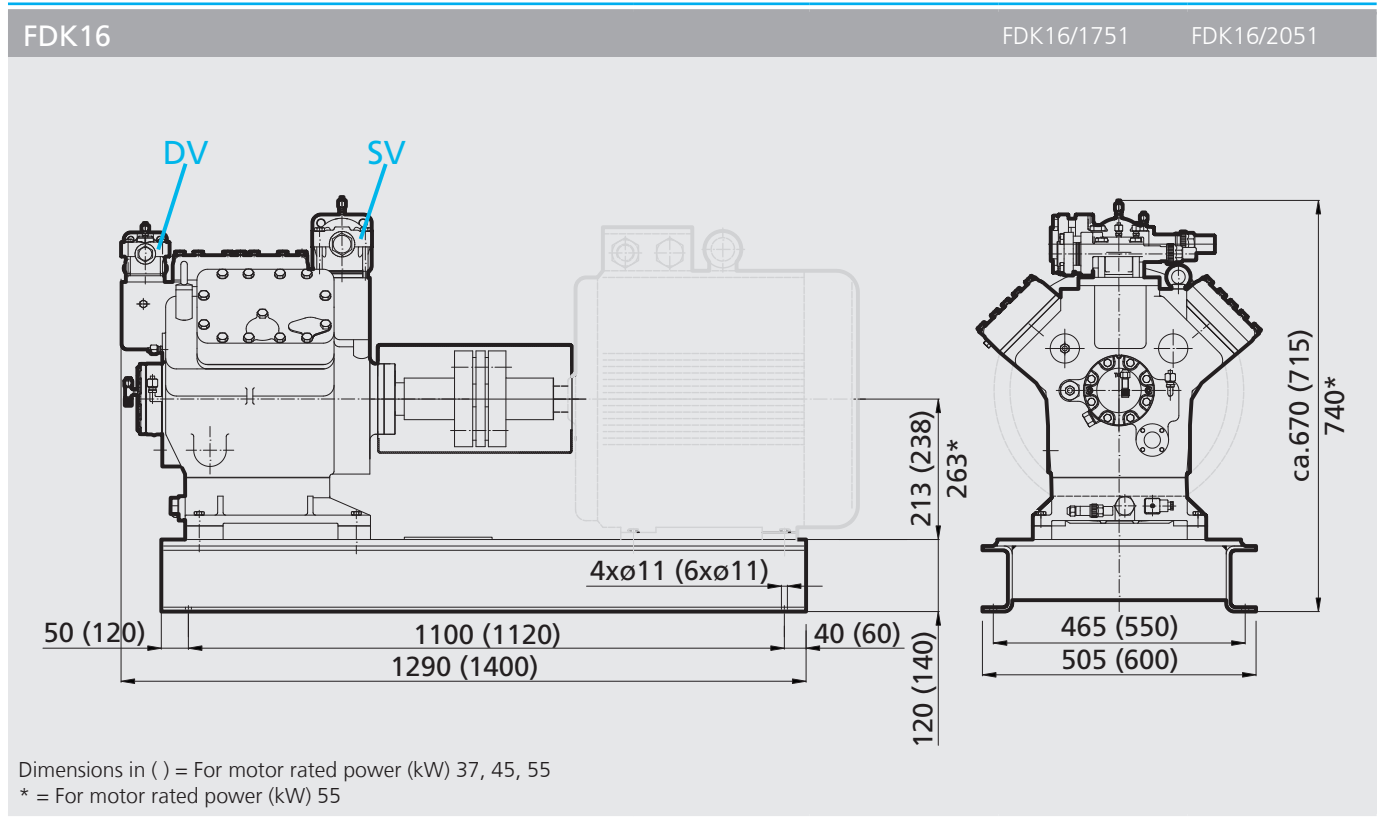


FDK14

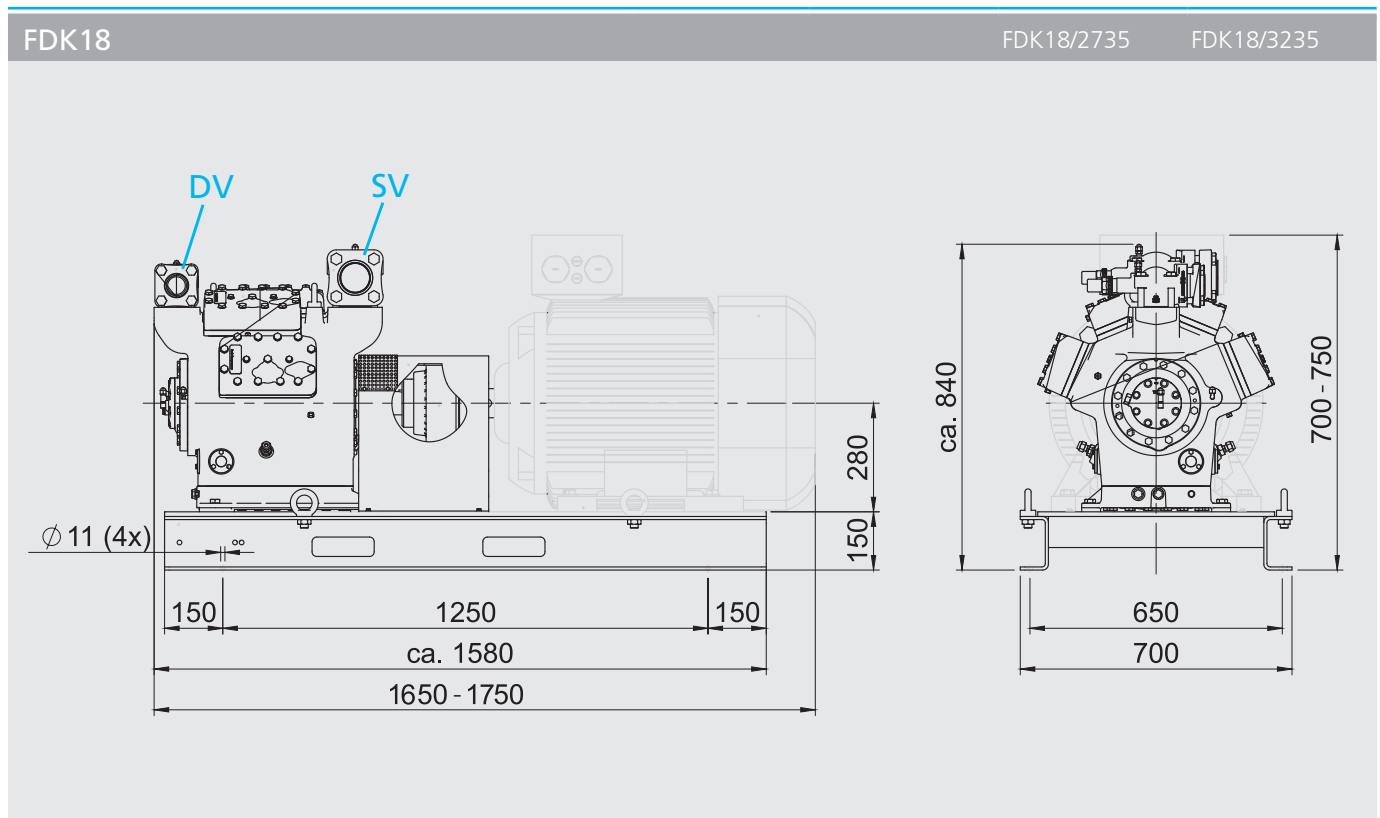
FDK14/1166

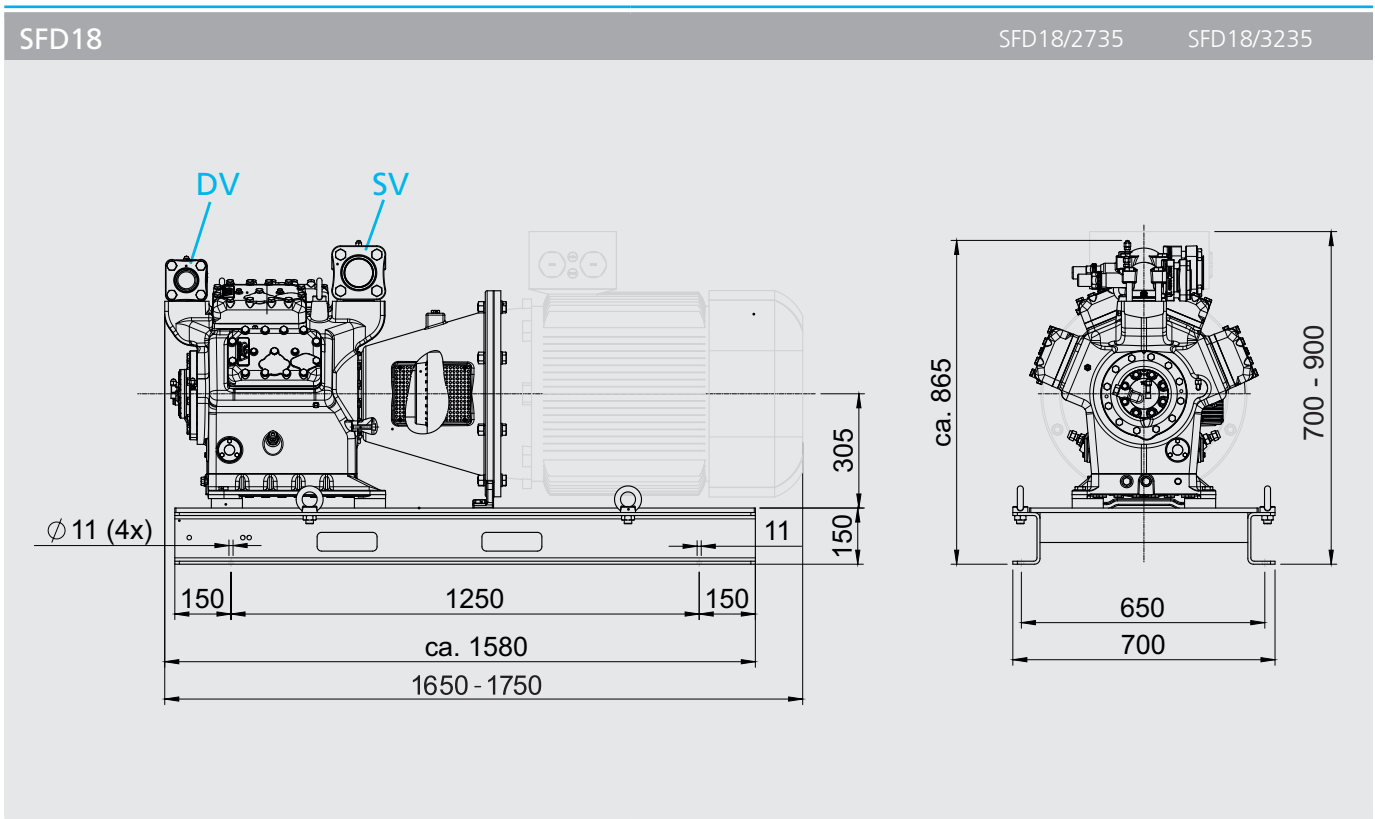
FDK14/1366





- 1
- 2
- 3
- 4





Dimensions in mm  
Motor accessories

further dimensions and connections see page 31

# GEA Bock open type compressors

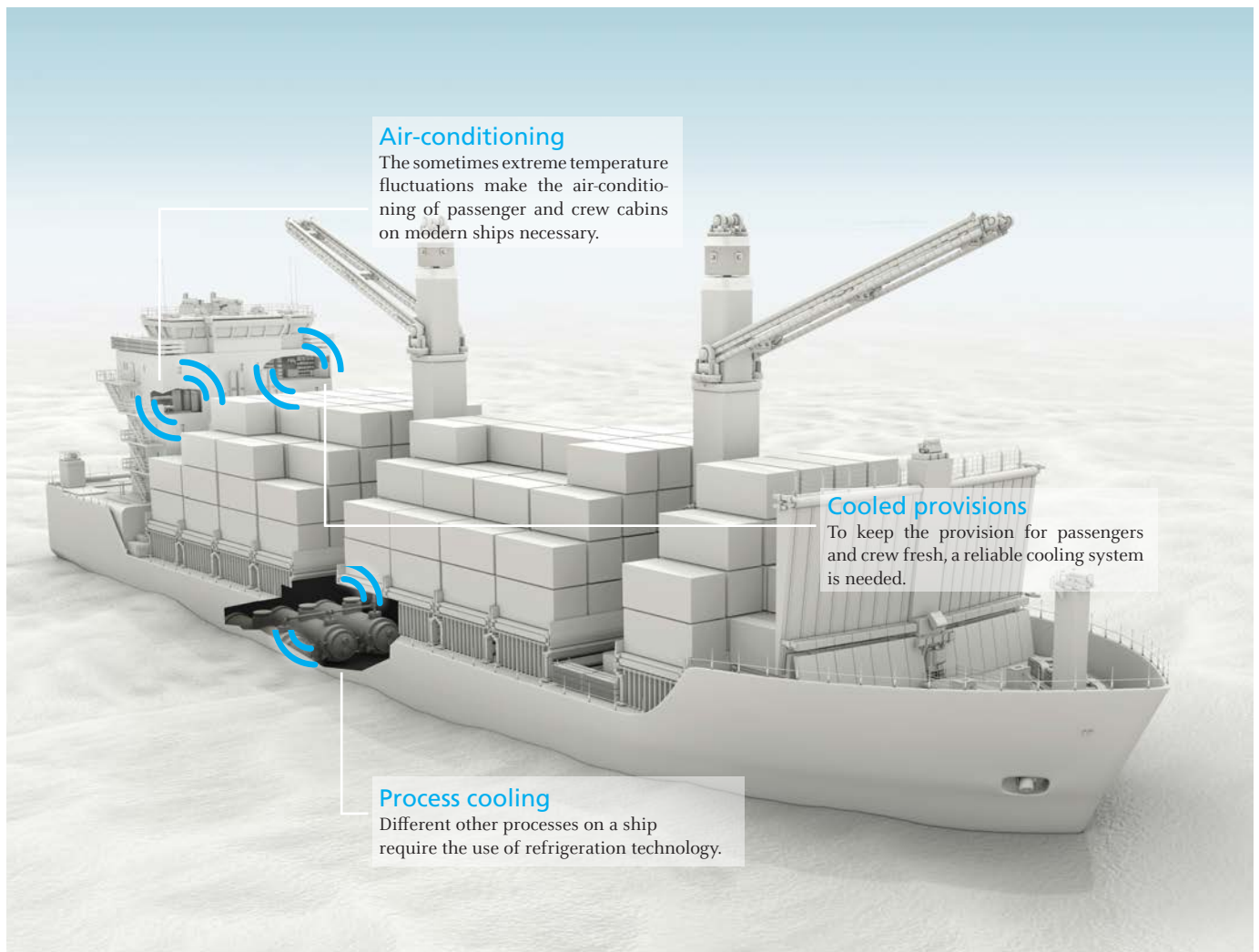
## Compressor solutions for the entire ship

GEA Bock compressors fulfill the high maritime demands already for many years. They help to provide a comfortable climate in cabins, keep provisions cooled and are additionally used in many other applications.

GEA Bock compressors also work reliably on container ships, passenger ships or fishing boats.

With a broad product range of open type and semi-hermetic compressors, the GEA Bock program has the right compressor for nearly all refrigeration and maritime applications.

Together with the program of industrial Grasso piston and screw compressors, GEA offers the broadest compressor program for maritime applications.





*We live our values.*

Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 index.

## **GEA Refrigeration Technologies**

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