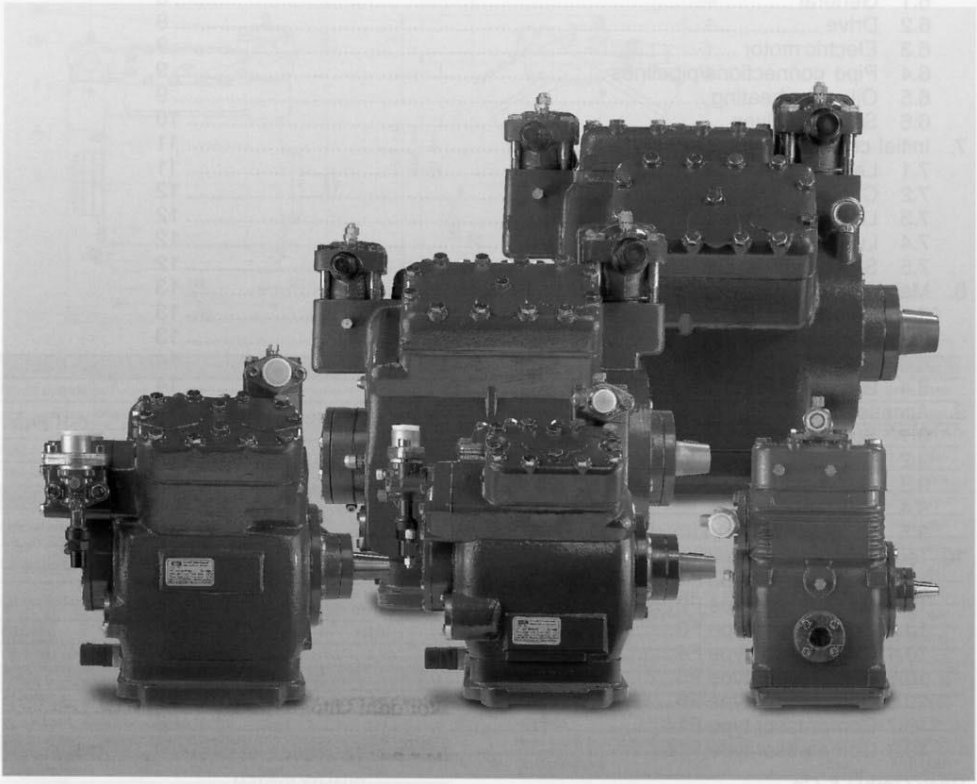
BOCK
KÄLTEMASCHINEN

E-0.59-04.99
Art. No. 09702
Page 1

Operating instructions
Open compressors F

Type: F1, F2, F3
F4, F5, F6
F14/1166, F14/1366
F16/1751, F16/2051



Contents

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1. Safety instructions

Coolant compressors are **pressurised components** and therefore require **particularly careful and meticulous handling!**

- Only qualified staff are allowed to handle refrigerating compressors.
- Local safety regulations, accident prevention regulations, technical rules and other valid specifications must be observed.
- The maximum tolerable operating overpressure may not be exceeded (not even for test purposes).
- Pressure switches are required to safeguard the machine: these must switch the compressor off before reaching the maximum tolerable operating overpressure.
- Both shut-off valves (pressure and suction side) are to be opened before starting the compressor.
- Before starting up, check that all components mounted by the user have been properly mounted and are connected pressure-tight with the compressor (e.g. pipelines, bungs, union nuts, etc.)
- The compressor may only be operated in refrigerating systems, and only with the coolants approved by Bock.
- New compressors are provided with an overpressure filling in the factory (inert gas approx. 3 bar nitrogen). Before starting any work or before connecting up to the refrigerating system, the pressure in the compressor must be relieved.
- Surface temperatures of more than 100°C are possible on the pressure side respectively under 0°C on the suction side, depending on the operating conditions.
- For queries, please contact our technical service department phone +49 70 22 / 94 54-0, or speak to our representative.

2. Open compressors F

The Bock refrigerating compressors in the F series are single-stage, fast-running reciprocating compressors for universal use in air-conditioning, normal cooling and deep-freezing operations. They offer an economical solution for every specific use.

The compressors operate according to the single-phase principle with automatic lamella inlet and outlet valves in the cylinder heads, and are supplied as series two-cylinder versions (compressor type F1 to F3), as four-cylinder versions in V-arrangement (compressor type F4, F5 and F14) and as 6-cylinder versions in W-arrangement (compressor type F6 and F16).

Note:
The following operating instructions describe the compressors in the F series in the standard version manufactured by Bock.

3. Nameplate

The following information is contained on the compressor nameplate:

1. Type designation
2. Machine number
3. Year of construction
4. Speed limits with theoretical volume flow
5. Max. permissible operating overpressure (LP = suction side / HP = pressure side) [1)]
6. Grade of oil filled in the factory

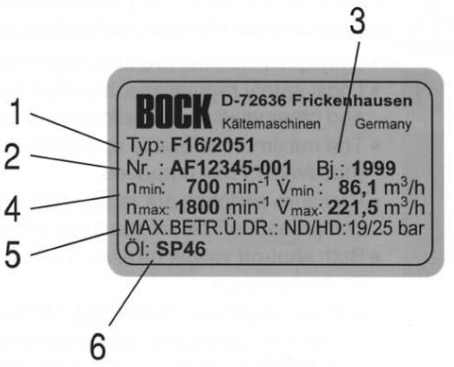
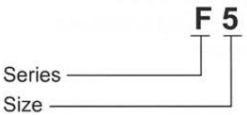


Fig. 1

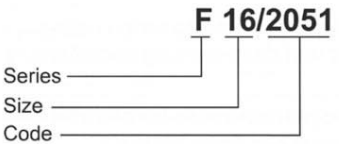
[1)] The stated low pressure and high pressure values are not maximum values **referred to the coolant** and may not be exceeded. The corresponding limits of application (page 5 – 7) apply to the various coolants.

4. Type key

4.1 Example 1



4.2 Example 2



Compressor series F14:
1166 = 101,4 m³/h theoretical volume flow rate at 1450 1/rpm
1366 = 118,8 m³/h theoretical volume flow rate at 1450 1/rpm

Compressor series F16:
1751 = 152,3 m³/h theoretical volume flow rate at 1450 1/rpm
2051 = 178,4 m³/h theoretical volume flow rate at 1450 1/rpm

Compressors which have been filled with ester oil in the factory (e.g. for R 134a) are marked in the type code with the suffix

5. Limits of application

5.1 Limits of application R 22

Absolute limits of application

- Evaporating temperature t_0 min. = -45°C
- Condensing temperature t_c max. = +60°C
- Discharge end temperature t_{v2} max. = +140°C

Designation

t_0 = evaporating temperature [°C]
t_c = condensing temperature [°C]
t_{oh} = suction gas temperature [°C]
Δ_{toh} = suction gas overheating [K]

- Speeds compressor types **F1, F2, F3:**
  $n_{min.}$ = 960 rpm
  $n_{max.}$ = 1800 rpm
- Speeds compressor types **F4, F5:**
  $n_{min.}$ = 500 rpm
  $n_{max.}$ = 1800 rpm
- Speeds compressor types **F6, F14, F16:**
  $n_{min.}$ = 700 rpm
  $n_{max.}$ = 1800 rpm

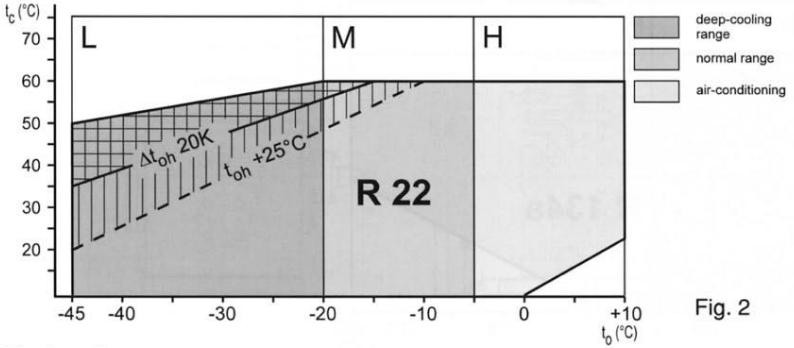


Fig. 2

Explanations:

Operation of F-compressors is possible in the area of the shown diagram.
In the unshaded area, operation without additional cooling is possible. The left limit line (t_{oh} = +25°C) moves depending on suction temperature.
Two limit curves are stated for individual stipulation (t_{oh} = + 25°C and Δ_{toh} = 20 K).
In the vertically shaded area, additional cooling is only required when the suction gas overheating exceeds 20 K.
On the cross shaded area, additional cooling is necessary.

The following applies to operation in these two areas:

- The use of a heat protection thermostat (accessory) is recommended.
- Only thermally highly stable oils should be used (see lubricant table).
  Recommendation: Bock standard oil FUCHS-DEA Reniso SP 46.
- When using capacity regulators, it may be necessary to operate with lower suction gas overheating temperatures. Individual adjustment is required (discharge end temperature may not exceed +140°C).
- Continuous operation in the limit zone is not recommended.

Rating for other areas on request.

Series F-NH_3 is available for operation with R 717 (NH_3).

5.2 Limits of application R 134a

Absolute limits of application

- Evaporation temperature t_0 min. = -30°C
- Condensing temperature t_c max. = +70°C
- Discharge end temperature t_{v2} max. = +140°C

Designations

t_0	= evaporating temperature	[°C]
t_c	= condensing temperature	[°C]
t_{oh}	= suction gas temperature	[°C]
Δ_{toh}	= suction gas overheating	[K]

- Speed compressor types **FX1, FX2, FX3:**
  $n_{min.}$ = 960 rpm
  $n_{max.}$ = 1800 rpm
- Speed compressor types **FX4, FX5:**
  $n_{min.}$ = 500 rpm
  $n_{max.}$ = 1800 rpm
- Speed compressor types **FX6, FX14, FX16:**
  $n_{min.}$ = 700 rpm
  $n_{max.}$ = 1800 rpm

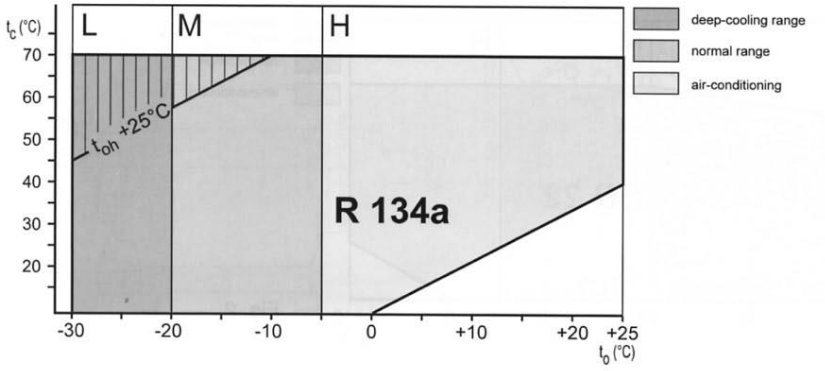


Fig. 3

Explanations:

Operation of FX-compressors is possible in the area of the shown diagram.
In the unshaded area, operation without additional cooling is possible.
In the vertically shaded area, additional cooling is only required when the suction gas overheating exceeds 20 K.

The following applies to operation in this area:

- The use of a heat protection thermostat (accessory) is recommended.
- Only thermally highly stable oils should be used (see lubricant table).
  Recommendation: Bock standard oil FUCHS-DEA Reniso SP 46.
- When using capacity regulators, it may be necessary to operate with lower suction gas overheating temperatures. Individual adjustment is required (discharge end temperature may not exceed +140°C).
- Continuous operation in the limit zone is not recommended.

Rating for other areas on request.

Series F-NH_3 is available for operation with R 717 (NH_3).

5.3 Limits of application R 404A, R 507

Absolute limits of application

- Evaporation temperature t_0 min. = -45°C
- Condensing temperature t_c max. = +52,5°C
- Discharge end temperature t_{v2} max. = +140°C

Designations

t_0 = evaporating temperature [°C]
t_c = condensing temperature [°C]
t_{oh} = suction gas temperature [°C]
Δ_{toh} = suction gas overheating [K]

- Speeds compressor types **FX1, FX2, FX3:**
  $n_{min.}$ = 960 rpm
  $n_{max.}$ = 1800 rpm
- Speeds compressor types **FX4, FX5:**
  $n_{min.}$ = 500 rpm
  $n_{max.}$ = 1800 rpm
- Speeds compressor types **FX6, FX14, FX16:**
  $n_{min.}$ = 700 rpm
  $n_{max.}$ = 1800 rpm

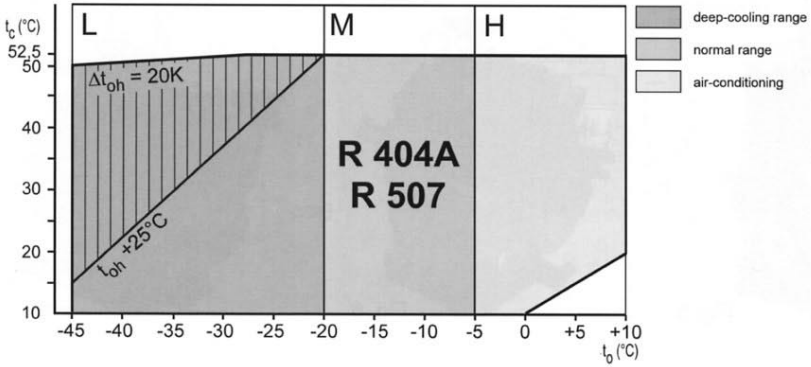


Fig. 4

Explanations:

Operation of FX-compressors is possible in the area of the shown diagram.
In the unshaded area, operation without additional cooling is possible.
The left-hand limit line (t_{oh} = +25°C) moves depending on suction temperature.
Two limit curves are stated for individual stipulation (t_{oh} = +25°C and Δ_{toh} = 20K).
In the vertically shaded area, additional cooling is only required when the suction gas overheating exceeds 20 K.

The following applies to operation in this area:

- The use of a heat protection thermostat (accessory) is recommended.
- Only thermally highly stable oils should be used (see lubricant table).
  Recommendation: Bock standard oil FUCHS-DEA Reniso SP 46.
- When using capacity regulators, it may be necessary to operate with lower suction gas overheating temperatures. Individual adjustment is required (discharge end temperature may not exceed +140°C).
- Continuous operation in the limit zone is not recommended.

Rating for other areas on request.

Series F-NH_3 is available for operation with R 717 (NH_3).

6. Installation instructions

6.1 General

- Compressor and motor mounted rigid on joint base frame. Anti-vibration pads (rubber pads) used for erection of base frame on foundation.
- Leave sufficient space for maintenance work.
- Direct assembly of water-cooled shell and tube condenser only with anti-vibration pads. Risk of vibration breakage when mounted rigidly.
- Transport and suspension possibilities:

Compressor types F1 to F3: pressure shut-off valve

Fig. 5

Compressor types F4 to F5: pressure shut-off valve

Fig. 6

Compressor types F6 to F16: transport eyelets

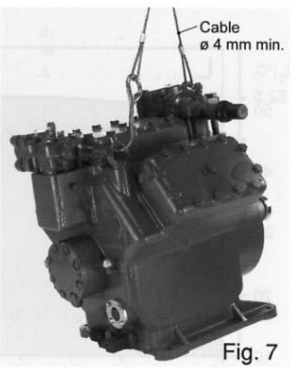


Fig. 7

6.2 Drive

The compressors of the F series can be driven by V-belts or directly by shaft couplings.

V-belt:

- Proper assembly of belt drive:
  - The pulleys of compressor and drive motor must be firmly mounted and in line.
  - Only use V-belts with calibrated lengths.
  - Select axis spacing, V-belt length and belt pre-tension according to the instructions issued by the V-belt manufacturer. Avoid belt fluttering.
  - Check belt pre-tension after running-in time.

Direct drive with shaft coupling:

- Direct drive with shaft couplings demands highly precise aligning of compressor shaft and motor shaft.
- Use the Bock shaft couplings "WK" and observe the enclosed assembly instructions.

Note:
Faulty alignment results in premature failure of the coupling and bearing damage!

Caution!

Mount suitable safeguards when driving the compressor by means of V-belts or shaft couplings!

6.3 Electric motor

Before mounting the electric motor, check:

- Electrical connection values
- Motor size
- Motor design IM B3
- Shaft diameter ød
- Shaft length l

6.4 Pipe connections / Pipelines

Caution!
Compressor is under pressure (inert gas).
Shut-off valves should remain closed until evacuated.

Pipe connections are designed so that pipes in normal millimetre and inch dimensions can be used. The soldering nipples of the shut-off valves are to be removed from the shut-off valves when soldering the pipes.

Pipelines and plant components must be thoroughly clean and dry on the inside, and free of scales, metal chips, rust and phosphate layers. The parts must also be delivered in an air-tight seal.

6.5 Oil sump heating

For description, please also refer to DEF-1.39 "Oil sump heating"

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

In order to avoid damage to the compressor, F-compressors from series F4 are equipped with an oil sump heating as standard feature. The oil sump heating should always be connected up and operated. For sizes F1 to F3, an oil sump heating is available as accessory, see page 16, item 9.4.

Operation:
The oil sump heating operates when the compressor is at a standstill. When the compressor starts, the oil sump heating is switched off again.

Note:
The oil sump heating must be connected via an auxiliary contact (or parallel wired auxiliary contact) of the compressor contactor to a separate electric circuit. It may not be connected to the electric circuit of the safety control chain.

Electric data:

Compressor types F4 and F5	230 V~ / 80 W
Compressor types F6, F14 and F16	230 V~ / 140 W

6.6 Shut-off valves

Caution!
The two-shut-off valves (suction shut-off valve and pressure shut-off valve) must be opened before starting the compressor.

Opening the shut-off valve

a) Turn spindle 1: to the left (anti-clockwise) as far as it will go.
⇒ shut-off valve fully open / service connection 2 closed (position A), fig. 8.

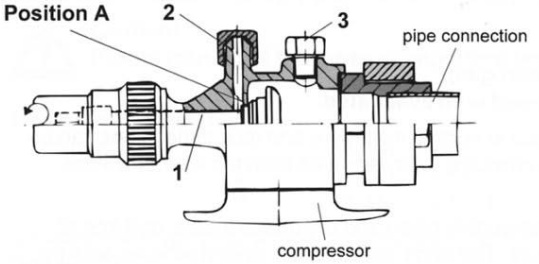


Fig. 8

Opening the service connection (2)

b) Turn the spindle 1: ½ - 1 turn to the right.
⇒ service connection 2 open / shut-off valve open (position B), fig. 9.
Service connection 3 cannot be shut-off (always open).
Position of the connection (marked B) see page 17 to 24.

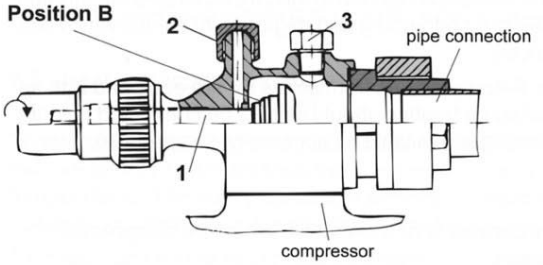
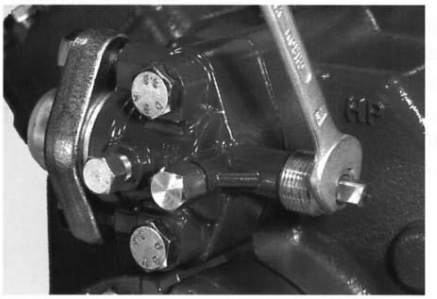


Fig. 9



Note:
Before opening or closing the shut-off valve, loosen the valve spindle seal by turning about ¼ turn.

Tighten again after activating the shut-off valve (fig. 10).

Fig. 10

7. Initial commissioning

The compressor has undergone a trial run in the factory and all functions have been checked. Special running-in instructions do not need to be observed.

Caution!

- New compressors are provided with an overpressure filling in the factory (inert gas approx. 3 bar nitrogen). Before starting any work or before connecting up to the refrigerating system, the pressure in the compressor must be relieved.
- Before starting up, check that all components mounted by the user have been properly mounted and are connected pressure-tight with the compressor (e.g. pipelines, bungs, union nuts, etc.)
- Surface temperatures of more than 100°C are possible on the pressure side respectively under 0°C on the suction side, depending on the operating conditions.

7.1 Leak test, evacuating

- Proceed with a leak test for the refrigerating plant **without including the compressor** (preferably N_2-dried).
- **Then include the compressor** in the subsequent evacuating procedure. (To do so, open the compressor suction side and pressure shut-off valve **"relieve pressure first!"**). Evacuate the suction and high-pressure side of the system using the vacuum pump.
- Vacuum < 1.5 mbar with pump shut off. Repeat procedure several times as required.
- Machine is then dry and tight when the rise in pressure in the refrigerating system is < 0.5 mbar/24 h with the vacuum pump switched off.

7.2 Coolant filling

- Check the oil level in the compressor before filling up.
  The oil level must be visible in the sight glass (from compressor type F2).
- Check once again whether the compressor suction and pressure shut-off valves are open.
- Top up the coolant (breaking the vacuum) with the machine switched off, pouring the liquid straight into the condenser respectively collector.
- Start up the compressor. If it is necessary to top up the coolant after initial commissioning, this can take place either in gaseous form on the suction side or, taking suitable precautions, in liquid form at the evaporator intake.

Caution!

- **Never top up with liquid coolant via the shut-off valve on the compressor.**
- **Additives may not be added to oil and coolant.**

7.3 Liquid hammers

Special attention must be paid to the following to avoid liquid hammers:

- The whole plant must be **properly designed.**
- All components must be rated **to be compatible with each other with regard to output** (particularly evaporator and expansion valve).
- Suction gas overheating at the evaporator outlet should be **min. 7 – 10 K** (check setting of the thermostatic expansion valve).
- Particularly in the case of critical plant (e.g. with several evaporator points), suitable measures are recommended, e.g. liquid traps, solenoid valve in the liquid pipe, etc.

Caution!
Liquid hammers can cause damage to the compressor.

7.4 Lubrication / oil check

The oil level of the compressor is to be checked immediately after the start.

- Oil level ¼ to ¾ of the sight glass (notch in sight glass = min. oil level, oil should not fall below this, fig. 11).
- Oil pressure control using a pressure gauge is possible if required via a Schrader connection at the oil pump (from compressor type F3, connection position see page 19. Oil differential pressure should be 1.5 – 4.0 bar (over the whole application range).

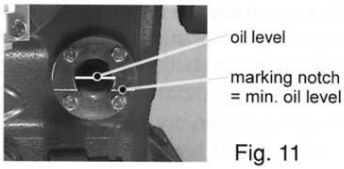


Fig. 11

- Automatic monitoring by standard oil differential pressure switch. Troubleshooting should be carried out when the machine is switched off by this device (observe instructions on the lid of the switch).

Caution!
If larger quantities of oil have to be topped up, there is a risk of liquid hammers: the oil return line must then be checked.

7.5 Shaft seal

The compressor shaft is sealed to the outside by means of a shaft seal. The sealing element turns with the shaft.

The following is **particularly important** for troublefree operation:

- The entire coolant circuit **must be properly designed and completely clean on the inside.**
- **Extreme jolts and vibrations** on the shaft are to be avoided, together with **continuous intermittent operation.**
- The sealing surfaces can stick together when the machine is at a standstill for longer periods of time. The machine should be **started up briefly every 4 weeks.**

Caution!
Failure to conform with this recommendation can cause a loss of coolant and damage to the shaft seal.

Note:

- The shaft seal seals off and lubricates with oil. A certain oil leak (few oil drops) is therefore normal, this applies in particular to the running-in phase (200 – 300 hours).
- In compressors from type F6 onwards, the shaft seal cover is equipped with an oil drain hose for controlled removal of the leaking oil. A suitable receptacle is to be provided by the customer (fig. 12).
- Replacement of a shaft seal is described in the corresponding spare parts kit.

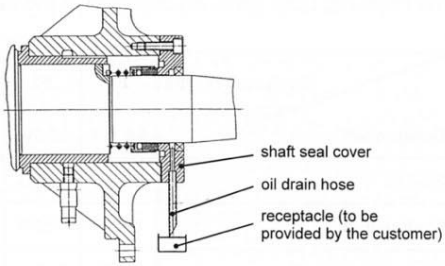


Fig. 12

8. Maintenance

8.1 Safety instructions

The same safety instructions stated in item 1, page 3 of this manual also apply here. Please also observe the following instructions:

Before any work is carried out on the compressor:

- Switch the machine off and secure it to prevent it being switched on again.
- Relieve the system pressure in the machine.
- Only use original Bock spare parts.

After maintenance work has been completed:

- Connect up the safety switch and check functions.
- Evacuate the compressor.
- Before starting up, check that all components mounted by the user have been properly mounted and are connected pressure-tight with the compressor (e.g. pipelines, bungs, union nuts, etc.)
- Open the pressure and suction shut-off valves (see page 10, item 6.6, shut-off valves).
- Remove the switching-on safeguard.

8.2 Service intervals

In order to guarantee optimum operating safety and service life of the compressor, **we recommend** carrying out the following servicing tasks at regular intervals (particularly recommended in the limit range at high temperatures and pressures):

- **Oil change:** for the first time after approx. 100 – 200 operating hours, then once every twelve months. Always clean the oil suction filter when changing the oil.
  Note:
  Used oil must be disposed of properly, in line with national regulations.
- **Function checks: once every twelve months:** oil level, compressor leaks, running noises, pressures, temperatures, functioning of the additional equipment, e.g. start unloader, capacity regulation, etc.

8.3 Recommended spare parts

The following table gives an overview of the most important spare parts:

Compressor type / Designation	F1	F2	F3	F4	F5	F6	F14/1166 F14/1366	F16/1751 F16/2051
	Art. No.	Art. No.	Art. No.	Art. No.	Art. No.	Art. No.	Art. No.	Art. No.
Seal kit	08068	08069	08070	08071	08072	08115	08492	08493
Shaft seal kit	08001	08001	08001	08008	08008	08003	08444	08012
Valve plate kit	08036	08314	08198	08198	08436	08436	08498	08498
Oil pump kit	08043	08043	08043	08044	08044	08109	08795	08795
Oil sump heating kit, 230 V ~	08423*)	08423*)	08424*)	08425	08425	08426	08426	08426
Solenoid coil kit for start unloader and capacity regulator 230 V~	-	-	-	08540	08540	08540	08540	08540
Valve body for start unloader	-	-	-	07507	07507	07848	07848	07848
Valve body for capacity regulation	-	-	-	07519	07541	07541	07848	07848

*) Oil sump heating is not contained in the scope of supply of compressor type F1 to F3 (accessory)

Tab. 1

8.4 Extract from the lubricant table

For CFC, e.g. R22	
Bock standard oil grade	**Recommended alternative**
FUCHS DEA Reniso SP46	CHEVRON Zerol 150 MOBIL SHC 425 SUNOIL Suniso 3GS SUNOIL Suniso 4GS TEXACO Capella WF 46
For FCs, e.g. R 134a	
Bock standard oil grade	**Recommended alternative**
FUCHS DEA Reniso Triton SE55	FUCHS DEA SEZ 22 FUCHS DEA SEZ 68 ICI Emkarate RL 46 H, S MOBIL Arctic EAL 46

Other suitable oil grades on request.

Tab. 2

9. Accessories

9.1 Start unloader

(retrofit kits, F3 - Art. No. 08131, F4 - Art. No. 08141
F5 - Art. No. 08141, F6 - Art. No. 08134
F14 - Art. No. 08813, F16 - Art. No. 08813
For description, please also refer to DEF-1.11 "Start unloader")

The start unloader is required for the Y/D start.
The retrofit kit is supplied with heat protection thermostat. In addition, a non-return valve is required in the pressure pipe. Non-return valve rated according to operating conditions.

Caution!

- The start unloader may only operate during the start-up phase (risk of overheating from bypass operation).
- Electrical activation of the solenoid: **switched idle.**
- Cylinder covers for start unloader are marked "SU" (start unloader) (compressor models F14 and F16).

9.2 Capacity regulation

(retrofit kits, F4 - Art. No. 08574, F5 - Art. No. 08565
F6 - Art. No. 08565, F14 / 16 Art. No. 08810
For description please also refer to DEF-1.10, "Capacity regulation")

The compressor capacity can be adjusted to the current refrigerating requirements by means of capacity regulation. The regulator affects one cylinder bank, resulting in a capacity reduction of 50% (4-cylinder compressor) or 33/66% (6-cylinder compressor).

The regulator in the retrofit kit is supplied including cylinder cover, arranged according to fig. 13.

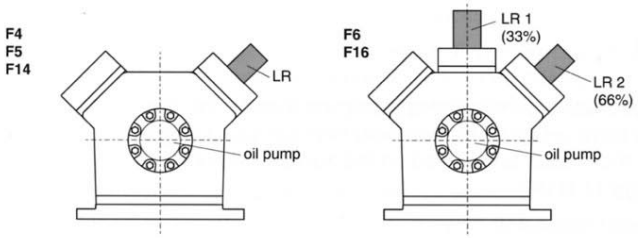


Fig.13

Caution!

- When operating with capacity regulation, the gas speeds and pressure conditions in the refrigerating plant change: suction line routing and dimensions should be adjusted accordingly, the regulation intervals should not be too short (steady operation of the refrigerating plant must be possible), continuous operation in the regulation phase is not recommended (uneconomical).
- Electrical activation of the solenoid: **switched idle.**
- Cylinder covers for capacity regulation are marked "CR" (capacity regulator).

9.3 Oil pressure safety switch

(retrofit kits, F3 - Art. No. 07294, F4 - Art. No. 07294
F5 - Art. No. 07294, F14 - Art. No. 08805
F16 - Art. No. 08805)

When installed in the factory, the switch is mounted directly on the compressor and equipped with corresponding pipes. The electrical connection should be made according to the enclosed description. When retrofitting, the switch is supplied together with the required attachment console (connection position see page 19 to 24).

Compressor model F6 is equipped with an oil pressure safety switch as standard feature.

Caution!
Proper routing of the pipes is important because of the risk of breakage.

9.4 Oil sump heating

(retrofit kits, F1 - Art. No. 08443
F2 - Art. No. 08423
F3 - Art. No. 08424)

Oil sump heatings are available as accessories and also as retrofit kits for compressor types F1 to F3.

Note:
In compressor type F1, the standard base plate has to be replaced by the base plate in the retrofit kit.

Electric data:

Compressor types F1 and F2	230 V~ / 40 W
Compressor type F3	230 V~ / 60 W

Further description see item 6.5, page 9, „oil sump heating".

9.5 Heat protection thermostat

(retrofit kit, Art. No. 07595)

The F-compressors can be equipped with a bi-metal heat protection thermostat. The thermo-contact switch protects the compressor from intolerably high compressed gas temperatures. The heat protection thermostat is mounted on the hot gas side of the compressor (connection L, see page 17 to 24).

Technical data for the heat protection thermostat:

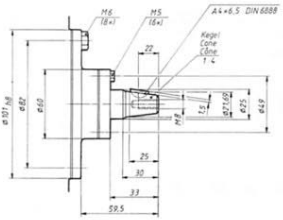
Switching voltage	max.	250 V ~
Switching current	max.	1.6 A at 250 V ~
Switching off temperature		145°C ± 5K
Switching on temperature		approx. 115°C

The thermostat is to be wired up in sequence with the control line.

10. Technical data, dimensions and connections

10.1 Compressor type F1

Wellenende des Verdichters
Shaft end of compressor
Bout de l'arbre du compresseur



Maße in mm
Dimensions in mm
Cotes en mm

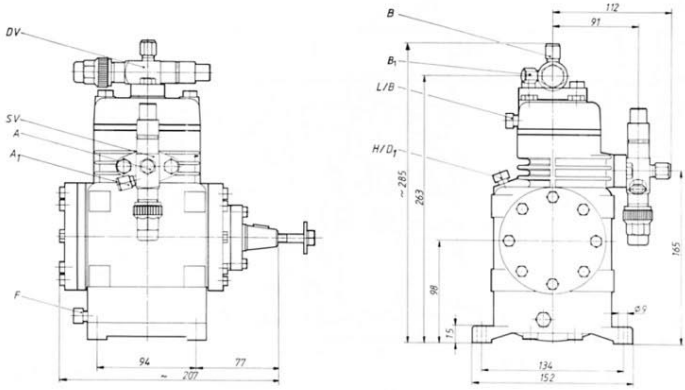


Fig. 14

Technical data	Dim.	F1
No. of cylinders		2
Cylinder bore	dia. mm	32
Piston stroke	mm	28
Theor. flow rate at 1450 rpm	m³/h	3.92
Lubrication		
Forced circulation lubrication		oil pump, independent of direction of rotation
Oil grade for R 22		FUCHS DEA RENISO SP 46
Oil grade for R 134a, R 404 A, R 507		FUCHS DEA RENISO TRITON SE 55
Oil filling	litres	0.5
Weight		
Weight incl. oil filling	kg	13
Compressor pulley		
Outer diameter	mm	165
V-belt profile		13, DIN 2215
No. of grooves		1
Weight	kg	3.1
Speed range		
Min. speed	rpm	960
Max. speed	rpm	1800
Max. tolerable operating pressure		
Pressure side HP	bar	25
Low pressure side LP	bar	19

	Connections	Dim.	F1
SV	Suction shut-off valve*, pipe dia.	mm - inch	12L - 1/2L
DV	Pressure shut-off valve*, pipe dia.	mm - inch	12L - 1/2L
A	Suction side connection, cannot be shut off	inch	7/16 UNF
A1	Suction side connection, can be shut off	inch	7/16 UNF
B	Pressure side connect., cannot be shut off	inch	1/8 NPTF
B1	Pressure side connection, can be shut off	inch	7/16 UNF
C	Oil pressure safety switch connection OIL	inch	-
D	Oil pressure safety switch connection LP	inch	-
D1	Connection for oil return from oil separator	inch	1/8 NPTF
E	Oil pressure gauge connection	inch	-
F	Oil drain bung	mm	1/8 NPTF
G	Oil sump heating bung	mm	-
H	Oil filling bung	inch	1/8 NPTF
J	Oil sump heating	mm	-
K	Connection oil/gas balance for compound operation	mm	-
L	Heat protection thermostat connection	inch	1/8 NPTF
ÖV	Oil drive valve	mm	-

L = soldered connection *) can rotate through 180°

10.2 Compressor type F2

Wellenende des Verdichters
Shaft end of compressor
Bout de l'arbre du compresseur

Maße in mm
Dimensions in mm
Cotes en mm

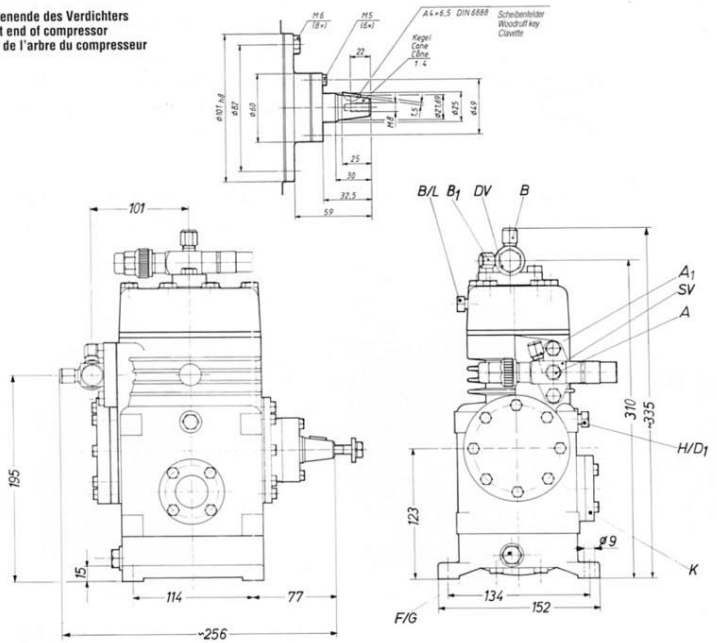


Fig. 15

Technical data	Dim.	F2
No. of cylinders		2
Cylinder bore	dia. mm	45
Piston stroke	mm	38
Theor. flow rate at 1450 rpm	m³/h	10.5
Lubrication		
Forced circulation lubrication		oil pump, independent of direction of rotation
Oil grade for R 22		FUCHS DEA RENISO SP 46
Oil grade for R 134a, R 404 A, R 507		FUCHS DEA RENISO TRITON SE 55
Oil filling	litres	0.8
Weight		
Weight incl. oil filling	kg	18
Compressor pulley		
Outer diameter	mm	165
V-belt profile		13, DIN 2215
No. of grooves		2
Weight	kg	4.7
Speed range		
Min. speed	rpm	960
Max. speed	rpm	1800
Max. tolerable operating pressure		
Pressure side HP	bar	25
Low pressure side LP	bar	19

	Connections	Dim.	F2
SV	Suction shut-off valve*, pipe dia.	mm - inch	16L - 5/8L
DV	Pressure shut-off valve*, pipe dia.	mm - inch	16L - 5/8L
A	Suction side connection, cannot be shut off	inch	7/16 UNF
A1	Suction side connection, can be shut off	inch	7/16 UNF
B	Pressure side connect., cannot be shut off	inch	1/8 NPTF
B1	Pressure side connection, can be shut off	inch	7/16 UNF
C	Oil pressure safety switch connection OIL	inch	-
D	Oil pressure safety switch connection LP	inch	-
D1	Connection for oil return from oil separator	inch	1/8 NPTF
E	Oil pressure gauge connection	inch	-
F	Oil drain bung	mm	R3/8
G	Oil sump heating bung	mm	R3/8
H	Oil filling bung	inch	1/8 NPTF
J	Oil sump heating	mm	-
K	Connection oil / gas balance for compound operation	mm	Cu pipe dia. 35
L	Heat protection thermostat connection	inch	1/8 NPTF
ÖV	Oil drain valve	mm	-

L = soldered connection *) can rotate through 180°

10.3 Compressor type F3

Wellenende des Verdichters
Shaft end of compressor
Bout de l'arbre du compresseur

Maße in mm
Dimensions in mm
Cotes en mm

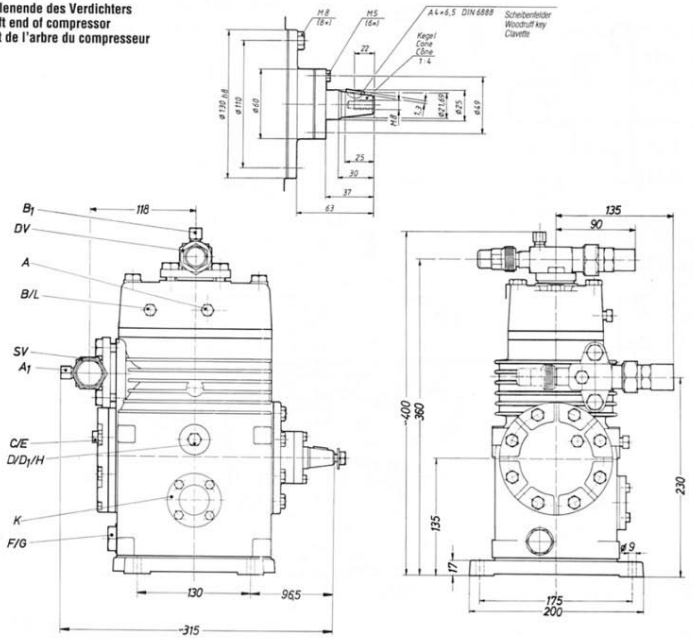


Fig. 16

Technical data	Dim.	F3
No. of cylinders		2
Cylinder bore	dia. mm	55
Piston stroke	mm	49
Theor. flow rate at 1450 rpm	m^3/h	20.3
Lubrication		
Forced circulation lubrication	oil pump, independent of direction of rotation	
Oil grade for R 22	FUCHS DEA RENISO SP 46	
Oil grade for R 134a, R 404 A, R 507	FUCHS DEA RENISO TRITON SE 55	
Oil filling	litres	1.5
Weight		
Weight incl. oil filling	kg	28
Compressor pulley		
Outer diameter	mm	210
V-belt profile		SPA, DIN 7753
No. of grooves		2
Weight	kg	8.0
Speed range		
Min. speed	rpm	960
Max. speed	rpm	1800
Max. tolerable operating pressure		
Pressure side HP	bar	25
Low pressure side LP	bar	19

	Connections	Dim.	F3
SV	Suction shut-off valve*, pipe dia.	mm - inch	28L - 1 1/8L
DV	Pressure shut-off valve*, pipe dia.	mm - inch	22L - 7/8L
A	Suction side connection, cannot be shut off	inch	1/8 NPTF
A1	Suction side connection, can be shut off	inch	7/16 UNF
B	Pressure side connect., cannot be shut off	inch	1/8 NPTF
B1	Pressure side connection, can be shut off	inch	7/16 UNF
C	Oil pressure safety switch connection OIL	inch	1/8 NPTF
D	Oil pressure safety switch connection LP	inch	1/8 NPTF
D1	Connection for oil return from oil separator	inch	1/8 NPTF
E	Oil pressure gauge connection	inch	1/8 NPTF
F	Oil drain bung	mm	M 22x1.5
G	Oil sump heating bung	mm	M 22x1.5
H	Oil filling bung	inch	1/8 NPTF
J	Oil sump heating	mm	-
K	Connection oil / gas balance for compound operation	mm	CU pipe dia. 35
L	Heat protection thermostat connection	inch	1/8 NPTF
ÖV	Oil drain valve	mm	-

L = soldered connection *) can rotate through 180°

10.4 Compressor type F4

Wellenende des Verdichters
Shaft end of compressor
Bout de l'arbre du compresseur

Maße in mm
Dimensions in mm
Cotes en mm

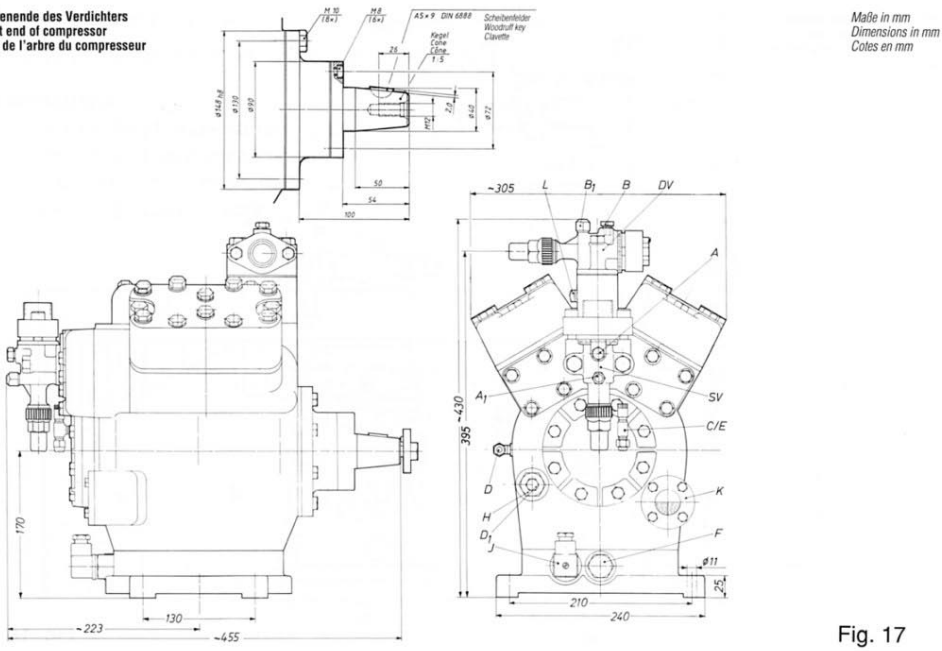


Fig. 17

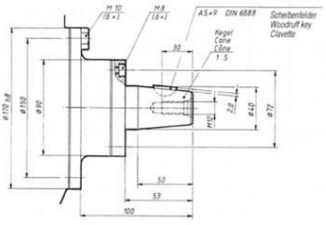
Technical data	Dim.	F4
No. of cylinders		4
Cylinder bore	dia. mm	55
Piston stroke	mm	49
Theor. flow rate at 1450 rpm	m^3/h	40.5
Lubrication		
Forced circulation lubrication	oil pump, independent of direction of rotation	
Oil grade for R 22	FUCHS DEA RENISO SP 46	
Oil grade for R 134a, R 404 A, R 507	FUCHS DEA RENISO TRITON SE 55	
Oil filling	litres	2.6
Weight		
Weight incl. oil filling	kg	51
Compressor pulley		
Outer diameter	mm	210
V-belt profile		SPA, DIN 7753
No. of grooves		3
Weight	kg	11.6
Speed range		
Min. speed	rpm	500
Max. speed	rpm	1800
Max. tolerable operating pressure		
Pressure side HP	bar	25
Low pressure side LP	bar	19

	Connections	Dim.	F4
SV	Suction shut-off valve*, pipe dia.	mm - inch	35L - 1 3/8L
DV	Pressure shut-off valve*, pipe dia.	mm - inch	28L - 1 1/8L
A	Suction side connection, cannot be shut off	inch	1/8 NPTF
A1	Suction side connection, can be shut off	inch	7/16 UNF
B	Pressure side connect., cannot be shut off	inch	1/8 NPTF
B1	Pressure side connection, can be shut off	inch	7/16 UNF
C	Oil pressure safety switch connection OIL	inch	7/16 UNF
D	Oil pressure safety switch connection LP	inch	7/16 UNF
D1	Connection for oil return from oil separator	inch	1/8 NPTF
E	Oil pressure gauge connection	inch	7/16 UNF
F	Oil drain bung	mm	M 22x1.5
G	Oil sump heating bung	mm	-
H	Oil filling bung	mm	M 22x1.5
J	Oil sump heating	mm	M 22x1.5
K	Connection oil / gas balance for compound operation	mm	Cu pipe dia. 35
L	Heat protection thermostat connection	inch	1/8 NPTF
ÖV	Oil drain valve	mm	-

L = soldered connection *) can rotate through 180°

10.5 Compressor type F5

Wellenende des Verdichters
Shaft end of compressor
Bout de l'arbre du compresseur



Maße in mm
Dimensions in mm
Cotes en mm

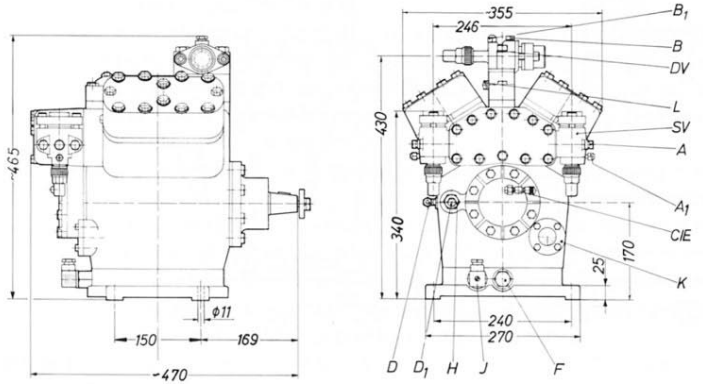


Fig. 18

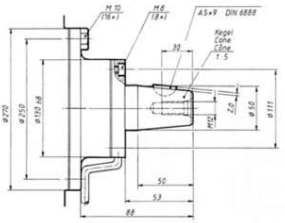
Technical data	Dim.	F5
No. of cylinders		4
Cylinder bore	dia. mm	70
Piston stroke	mm	55
Theor. flow rate at 1450 rpm	m³/h	73.6
Lubrication		
Forced circulation lubrication		oil pump, independent of direction of rotation
Oil grade for R 22		FUCHS DEA RENISO SP 46
Oil grade for R 134a, R 404 A, R 507		FUCHS DEA RENISO TRITON SE 55
Oil filling	litres	3.8
Weight		
Weight incl. oil filling	kg	85
Compressor pulley		
Outer diameter	mm	230
V-belt profile		SPA, DIN 7753
No. of grooves		4
Weight	kg	16.9
Speed range		
Min. speed	rpm	500
Max. speed	rpm	1800
Max. tolerable operating pressure		
Pressure side HP	bar	25
Low pressure side LP	bar	19

	Connections	Dim.	F5
SV	Suction shut-off valve*, pipe dia.	mm - inch	35L - 1⅜L (2x)
DV	Pressure shut-off valve*, pipe dia.	mm - inch	35L - 1⅜L
A	Suction side connection, cannot be shut off	inch	1/8 NPTF
A1	Suction side connection, can be shut off	inch	7/16 UNF
B	Pressure side connect., cannot be shut off	inch	1/8 NPTF
B1	Pressure side connection, can be shut off	inch	7/16 UNF
C	Oil pressure safety switch connection OIL	inch	7/16 UNF
D	Oil pressure safety switch connection LP	inch	7/16 UNF
D1	Connection for oil return from oil separator	inch	1/8 NPTF
E	Oil pressure gauge connection	inch	7/16 UNF
F	Oil drain bung	mm	M 22x1.5
G	Oil sump heating bung	mm	-
H	Oil filling bung	mm	M 22x1.5
J	Oil sump heating	mm	M 22x1.5
K	Connection oil / gas balance for compound operation	mm	Cu pipe dia. 35
L	Heat protection thermostat connection	inch	1/8 NPTF
ÖV	Oil drain valve	mm	-

L = soldered connection *) can rotate through 180°

10.6 Compressor type F6

Wellenende des Verdichters
Shaft end of compressor
Bout de l'arbre du compresseur



Maße in mm
Dimensions in mm
Cotes en mm

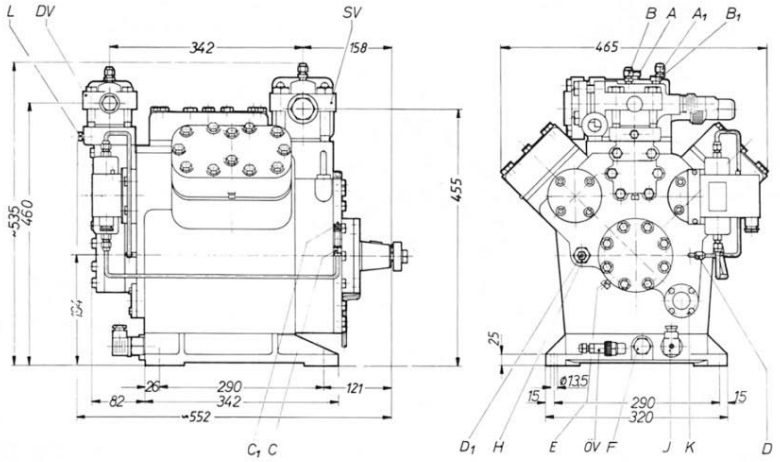


Fig. 19

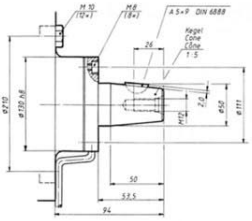
Technical data	Dim.	F6
No. of cylinders		6
Cylinder bore	dia. mm	70
Piston stroke	mm	55
Theor. flow rate at 1450 rpm	m³/h	110.4
Lubrication		
Forced circulation lubrication	oil pump, independent of direction of rotation	
Oil grade for R 22	FUCHS DEA RENISO SP 46	
Oil grade for R 134a, R 404 A, R 507	FUCHS DEA RENISO TRITON SE 55	
Oil filling	litres	5.0
Weight		
Weight incl. oil filling	kg	150
Compressor pulley		
Outer diameter	mm	260
V-belt profile		SPA, DIN 7753
No. of grooves		5
Weight	kg	19.3
Speed range		
Min. speed	rpm	700
Max. speed	rpm	1800
Max. tolerable operating pressure		
Pressure side HP	bar	25
Low pressure side LP	bar	19

	Connections	Dim.	F6
SV	Suction shut-off valve*, pipe dia.	mm - inch	54L - 2 1/8L
DV	Pressure shut-off valve*, pipe dia.	mm - inch	35L - 1 3/8L
A	Suction side connection, cannot be shut off	inch	1/4 NPTF
A1	Suction side connection, can be shut off	inch	7/16 UNF
B	Pressure side connect., cannot be shut off	inch	7/16 UNF
B1	Pressure side connection, can be shut off	inch	1/4 NPTF
C	Oil pressure safety switch connection ÖIL	inch	7/16 UNF
C1	Schraderanschluß	inch	7/16 UNF
D	Oil pressure safety switch connection LP	inch	7/16 UNF
D1	Connection for oil return from oil separator	inch	5/8 UNF
E	Oil pressure gauge connection	inch	1/8NPTF
F	Oil drain bung	mm	M 26x1.5
G	Oil sump heating bung	mm	-
H	Oil filling bung	mm	M 22x1.5
J	Oil sump heating	mm	M 22x1.5
K	Connection oil / gas balance for compound operation	mm	Cu pipe dia. 35
L	Heat protection thermostat connection	inch	1/8 NPTF
ÖV	Oil drain valve	inch	7/16 UNF

L = soldered connection *) can rotate through 180°

10.7 Compressor type F14

Wellenende des Verdichters
Shaft end of compressor
Bout de l'arbre du compresseur



Maße in mm
Dimensions in mm
Cotes en mm

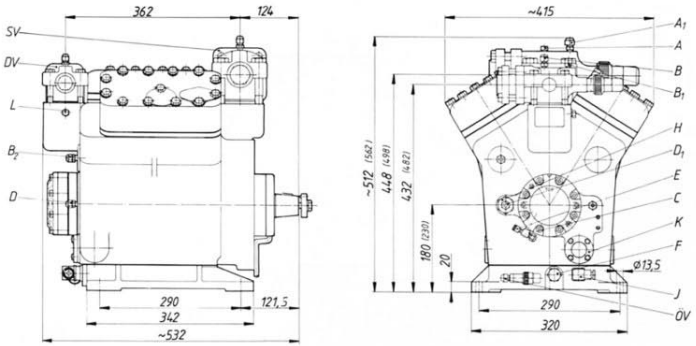


Fig. 20

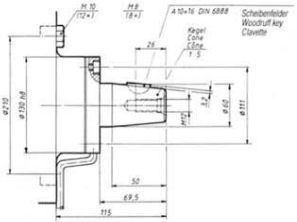
Technical data	Dim.	F14/1166	F14/1366
No. of cylinders		4	
Cylinder bore	dia. mm	80	
Piston stroke	mm	58	68
Theor. flow rate at 1450 rpm	m³/h	101.4	118.8
Lubrication			
Forced circulation lubrication		oil pump, independent of direction of rotation	
Oil grade for R 22		FUCHS DEA RENISO SP 46	
Oil grade for R 134a, R 404 A, R 507		FUCHS DEA RENISO TRITON SE 55	
Oil filling	litres	3.8	
Oil filling with raised base plate	litres	6.3	
Weight			
Weight incl. oil filling	kg	149	
Weight incl. raised base plate	kg	157	
Compressor pulley			
Outer diameter	mm	322	
V-belt profile		SPB, DIN 7753	
No. of grooves		5	
Weight	kg	17.6	
Speed range			
Min. speed	rpm	700	
max. speed	rpm	1800	
Max. tolerable operating pressure			
Pressure side HP	bar	25	
Low pressure side LP	bar	19	

	Connections	Dim.	F14/...
SV	Suction shut-off valve*, pipe dia.	mm - inch	54L - 2 1/8L
DV	Pressure shut-off valve*, pipe dia.	mm - inch	42L - 1 5/8L
A	Suction side connection, cannot be shut off	inch	1/4 NPTF
A1	Suction side connection, can be shut off	inch	7/16 UNF
B	Pressure side connect., cannot be shut off	inch	7/16 UNF
B1	Pressure side connection, can be shut off	inch	1/4 NPTF
B2	Pressure side connect., cannot be shut off	inch	7/16 UNF
C	Oil pressure safety switch connection OIL	inch	7/16 UNF
D	Oil pressure safety switch connection LP	inch	7/16 UNF
D1	Connection for oil return from oil separator	inch	5/8 UNF
E	Oil pressure gauge connection	inch	7/16 UNF
F	Oil drain bung	mm	M 26x1.5
H	Oil filling bung	mm	M 22x1.5
J	Oil sump heating	mm	M 22x1.5
K	Connection oil / gas balance for compound operation	mm	Cu pipe dia. 35
L	Heat protection thermostat connection	inch	1/8 NPTF
ÖV	Oil drain valve	inch	7/16 UNF

L = soldered connection *) can rotate through 180°

10.8 Compressor type F16

Wellenende des Verdichters
Shaft end of compressor
Bout de l'arbre du compresseur



Maße in mm
Dimensions in mm
Cotes en mm

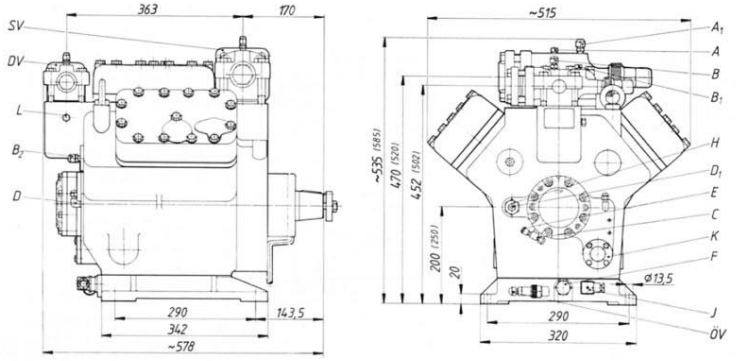


Fig. 21

Technical data	Dim.	F16/1751	F16/2051
No. of cylinders		6	
Cylinder bore	dia. mm	80	
Piston stroke	mm	58	68
Theor. flow rate at 1450 rpm	m³/h	152.3	178.4
Lubrication			
Forced circulation lubrication		oil pump, independent of direction of rotation	
Oil grade for R 22		FUCHS DEA RENISO SP 46	
Oil grade for R 134a, R 404 A, R 507		RENISO TRITON SE 55	
Oil filling	litres	5.0	
Oil filling with raised base plate	litres	7.5	
Weight			
Weight incl. oil filling	kg	175	
Weight incl. raised base plate	kg	183	
Compressor pulley			
Outer diameter	mm	322	
V-belt profile		SPB, DIN 7753	
No. of grooves		5	
Weight	kg	20.0	
Speed range			
Min. speed	rpm	700	
Max. speed	rpm	1800	
Max. tolerable operating pressure			
Pressure side HP	bar	25	
Low pressure side LP	bar	19	

	Connections	Dim.	F16/...
SV	Suction shut-off valve*, pipe dia.	mm - inch	54L - 2 1/8L
DV	Pressure shut-off valve*, pipe dia.	mm - inch	42L - 1 5/8L
A	Suction side connection, cannot be shut off	inch	1/4 NPTF
A1	Suction side connect., can be shut off	inch	7/16 UNF
B	Pressure side connect., cannot be shut off	inch	7/16 UNF
B1	Pressure side connection, can be shut off	inch	1/4 NPTF
B2	Pressure side connect., cannot be shut off	inch	7/16 UNF
C	Oil pressure safety switch connection OIL	inch	7/16 UNF
D	Oil pressure safety switch connection LP	inch	7/16 UNF
D1	Connection for oil return from oil separator	inch	5/8 UNF
E	Oil pressure gauge connection	inch	7/16 UNF
F	Oil drain bung	mm	M 26x1.5
H	Oil filling bung	mm	M 22x1.5
J	Oil sump heating	mm	M 26x1.5
K	Connection oil / gas balance for compound operation	mm	Cu pipe dia. 35
L	Heat protection thermostat connection	inch	1/8 NPTF
ÖV	Oil drain valve	inch	7/16 UNF

L = soldered connection *) can rotate through 180°