



THE HEART OF FRESHNESS

OPERATING INSTRUCTIONS

BETRIEBSANLEITUNG
INSTRUCTION DE SERVICE

SB-170-9

Semi-hermetic compact screw compressors Translation of the original Operating Instructions English.....	2
Halbhermetische Kompaktschraubenverdichter Originalbetriebsanleitung Deutsch	35
Compresseurs à vis compacts hermétiques accessibles Traduction des instructions de service d'origine Français.....	68

CSH6553-35Y .. CSH6593-60Y
CSH7553-50Y .. CSH7593-110(Y)
CSH8553-80Y .. CSH8593-180(Y)
CSH9553-180(Y) .. CSH95113-320Y

CSW6583-40Y .. CSW6593-60(Y)
CSW7571-60Y .. CSW7593-90(Y)
CSW8573-90Y .. CSW8593-140(Y)
CSW9563-140Y .. CSW95113-320(Y)
CSW10593-400Y

CSH7673-70Y .. CSH7693-90Y
CSH8673-110Y .. CSH8693-140Y
CSH9663-160Y .. CSH96113-320Y

CSK6151-50 .. CSK6161-60

Document for installers
Dokument für Monteure
Document pour des monteurs



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1 Introduction

These refrigeration compressors are intended for incorporation into refrigeration systems in accordance with the 2006/42/EC Machinery Directive. They may only be put into operation if they have been installed in the refrigeration systems according to these Mounting/Operating Instructions and if the overall system complies with the applicable legal provisions (applied standards: see declaration of incorporation).

The compressors have been built in accordance with state-of-the-art methods and current regulations. Particular importance was placed on user safety.

These Operating Instructions must be kept available near the refrigeration system during the whole lifetime of the compressor.

1.1 Also observe the following technical documents

SW-170: Checking and replacing intervals in compact screw compressors.

2 Safety

2.1 Authorized staff

All work done on compressors and refrigeration systems may only be performed by qualified and authorized staff who have been trained and instructed accordingly. The qualification and expert knowledge of the personnel must correspond to the local regulations and guidelines.

2.2 Residual risks

The compressor may present unavoidable residual risks. That is why any person working on this device must carefully read these Operating Instructions!

The following regulations shall apply:

- relevant safety regulations and standards (e.g. EN 378, EN 60204 and EN 60335),
- generally accepted safety rules,
- EU directives,
- national regulations.

2.3 Safety references

are instructions intended to prevent hazards. Safety references must be stringently observed!



NOTICE

Safety reference to avoid situations which may result in damage to a device or its equipment.



CAUTION

Safety reference to avoid a potentially hazardous situation which may result in minor or moderate injury.



WARNING

Safety reference to avoid a potentially hazardous situation which could result in death or serious injury.



DANGER

Safety reference to avoid an imminently hazardous situation which may result in death or serious injury.

2.3.1 General safety references



NOTICE

Risk of compressor failure!
Operate the compressor only in the intended rotation direction!

State of delivery



CAUTION

The compressor is filled with a holding charge:
Excess pressure 0.2 .. 0.5 bar.



Risk of injury to skin and eyes.
Depressurize the compressor!
Wear safety goggles!

For work on the compressor once it has been commissioned



WARNING

The compressor is under pressure!
 Serious injuries are possible.
 Depressurize the compressor!
 Wear safety goggles!



CAUTION

Surface temperatures of more than 60°C or below 0°C.
 Risk of burns or frostbite.
 Close off accessible areas and mark them.
 Before performing any work on the compressor: switch it off and let it cool down.



For work on the electrical and/or electronic system



WARNING

Risk of electric shock!
 Before working on the terminal box, module housing and electrical lines: Switch off the main switch and secure it against being switched on again!
 Close the terminal box and the module housing before switching on again!



NOTICE

The compressor module may be damaged or fail!
 Never apply any voltage to the terminals of CN7 to CN12 – not even for test purposes!
 The voltage applied to the terminals of CN13 must not exceed 10 V!
 The voltage applied to terminal 3 of CN14 must not exceed 24 V! Do not apply voltage to the other terminals!

3 Application ranges

Permitted refrigerants (other refrigerants on request)	CSH65 .. CSH95, CSW65 .. CSW95: R134a, R407C, R450A, R513A, R1234yf, R1234ze(E) CSW105: R134a, R450A, R513A, R1234yf	CSH76 .. CSH96: R134a, R450A, R513A, R1234yf, R1234ze(E)	CSH65 .. CSH95, CSW65 .. CSW95, CSK61: R22
Oil charge	CSH: BSE170 CSW: BSE170L	BSE170L	B320SH
Application limits	CSH: see brochure SP-171 and BITZER SOFTWARE CSW: see brochure SP-172 and BITZER SOFTWARE		

Tab. 1: Application ranges of CS. compressors

The use of R404A and R507A and other refrigerant blends requires individual consultation with BITZER.

Application limit for CSK61

CSK61 compressors are only approved for use with R22 refrigerant, without ECO and LI. The application limit goes down to -10°C. Above this value, the application limit corresponds to that for CSH65 compressors with R22 refrigerant.



WARNING

Risk of bursting due to counterfeit refrigerants!
 Serious injuries are possible!
 Purchase refrigerants only from reputable manufacturers and reliable distributors!

Risk of air penetration during operation in the vacuum range



NOTICE

Potential chemical reactions as well as increased condensing pressure and rise in discharge gas temperature.
 Avoid air penetration!



WARNING

A critical shift of the refrigerant ignition limit is possible.
 Avoid air penetration!

3.1 Economiser and additional cooling

Compressors of the series CSH65 to CSH95 are provided with an ECO economiser connection that is active in the entire capacity control range. They also have connections for external oil cooling and LI liquid injection.

The economiser of the compressor models CSW65 to CSW105 and CSH76 to CSH96 is only active at full load. These compressors have no connections for additional cooling.

For production reasons, the CSK6151 and CSK6161 compressors are equipped with connections for ECO and LI, which are not approved for use.

These connections will no longer be available in the near future.

3.2 Use of flammable refrigerants of the A2L safety group (e.g. R1234yf)



Information

The information in this chapter about the use of refrigerants of the A2L safety group refer to European regulations and directives. In regions outside the EU, observe the local regulations.



Information

For refrigerants of the A3 safety group, e.g. R290 propane or R1270 propylene, specific compressor designs can be delivered upon request. In this case, also observe the additional Operating Instructions.

This chapter describes and gives explanations of additional residual risks originating from the compressor when using refrigerants of the A2L safety group. This information helps the manufacturer of the system carry out a risk assessment. This information may in no way replace the risk assessment for the system.

Design, maintenance and operation of refrigeration systems using refrigerants of the A2L safety group are subject to particular safety regulations.

When installed according to these Operating Instructions and in normal operation conditions without malfunctions, the compressors are free from ignition sources that could ignite the flammable refrigerants

R1234yf and R1234ze(E). They are considered as technically tight. No ignition source assessment is available for other refrigerants of the A2L safety group. That is why the protection device has to be installed outside the terminal box, for example in the switch cabinet, until specific approval has been obtained.



Information

When using a flammable refrigerant:

Affix the warning sign "Warning: flammable materials" (W021 according to ISO7010) well visibly to the compressor. An adhesive label showing this warning sign is enclosed with the Operating Instructions.



Refrigerant burning in the terminal box may only happen if several very rare errors occur at the same time. The probability of this event occurring is extremely low. When suspecting burnt refrigerant in the terminal box, wait at least 30 minutes before opening it. According to the present knowledge, this is the time needed for the toxic combustion products to be degraded. It is necessary to use appropriate, acid-resistant gloves. Do not touch moist residues, but allow them to dry, because they may contain dissolved toxic substances. Never inhale evaporation products. Have trained staff clean the parts concerned or, if the parts are corroded, dispose of them properly.

4 Mounting

4.1 Transporting the compressor

Transport the compressor screwed onto the pallet or lift it using the lifting eyes. Lift CS.95, CSH96 and CSW105 with a lifting beam only, see figure 1, page 7.

Weight 1200 .. 1900 kg (depending on the model)



DANGER

Suspended load!

Do not step under the machine!



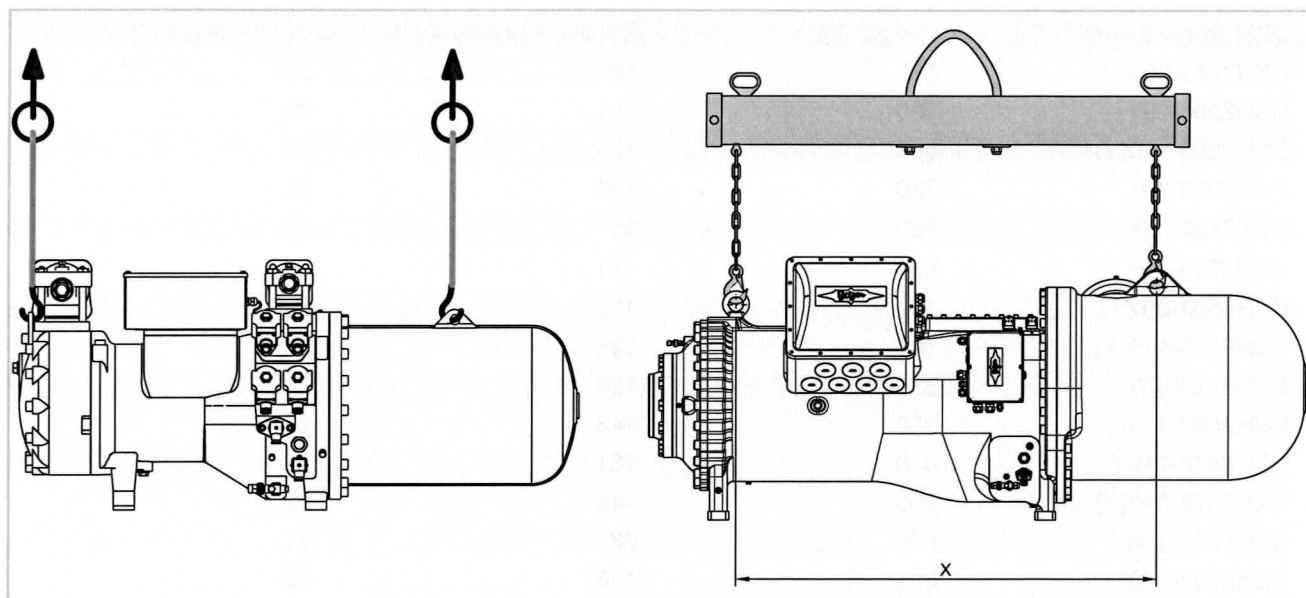


Fig. 1: Lifting the compressor. Left CS.65 .. CS.85, CSH76 and CSH86, right CS.95, CSH96 and CSW105

	X (mm)
CS.95, CSH96	1150
CSW105	1448

4.1.1 Centres of gravity and weights

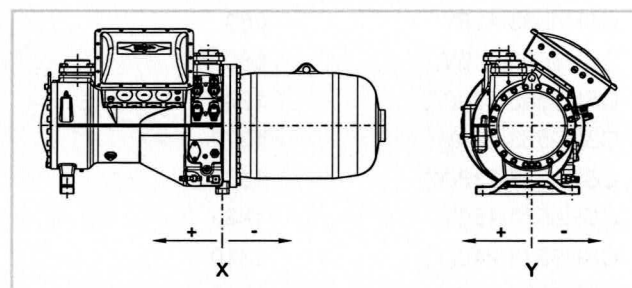


Fig. 2: Centres of gravity using the example of the CSH85

CSH compressors	Weight (kg)	Centre of gravity X (mm)	Centre of gravity Y (mm)
CSH6553-35Y	314	89	22
CSH6553-50(Y)	322	100	22
CSH6563-40Y	314	107	22
CSH6563-60(Y)	322	120	22
CSH6583-50Y	365	39	22
CSH6593-60(Y)	365	46	22
CSK6151-50	322	100	22
CSK6161-60	322	120	22
CSH7553-50Y	500	95	25
CSH7553-70(Y)	515	126	25
CSH7563-60Y	510	113	25
CSH7563-80(Y)	520	129	25
CSH7573-70(Y)	515	120	25
CSH7573-90(Y)	530	132	25
CSH7583-80Y	525	90	25

CSH compressors	Weight (kg)	Centre of gravity X (mm)	Centre of gravity Y (mm)
CSH7583-100(Y)	550	102	25
CSH7593-90Y	530	111	25
CSH7593-110(Y)	560	123	25
CSH7673-70Y	520	120	25
CSH7683-80Y	530	90	25
CSH7693-90Y	535	111	25
CSH8553-80Y	830	103	22
CSH8553-110(Y)	840	115	22
CSH8563-90Y	830	129	22
CSH8563-125(Y)	850	143	22
CSH8573-110Y	840	131	22
CSH8573-140(Y)	860	145	22
CSH8583-125Y	850	98	22
CSH8583-160(Y)	880	108	22
CSH8593-140Y	860	105	22
CSH8593-180(Y)	900	115	22
CSH8673-110Y	850	131	22
CSH8683-125Y	860	98	22
CSH8693-140Y	880	105	22
CSH9553-180(Y)	1280	128	10
CSH9563-160Y	1270	120	10
CSH9563-210(Y)	1300	129	10
CSH9573-180Y	1280	127	10
CSH9573-240(Y)	1310	137	10
CSH9583-210Y	1330	100	10
CSH9583-280(Y)	1360	109	10
CSH9593-240Y	1350	105	10
CSH9593-300(Y)	1380	109	10
CSH95103-280Y	1450	108	10
CSH95103-320(Y)	1480	120	10
CSH95113-320Y	1480	125	10
CSH9663-160Y	1280	120	10
CSH9673-180Y	1290	127	10
CSH9683-210Y	1350	100	10
CSH9693-240Y	1370	105	10
CSH96103-280Y	1450	108	10
CSH96113-320Y	1480	125	10

CSW compressors	Weight (kg)	Centre of gravity X (mm)	Centre of gravity Y (mm)
CSW6583-40Y	360	34	22
CSW6583-50(Y)	365	39	22
CSW6593-50Y	360	42	22
CSW6593-60(Y)	365	46	22
CSW7573-60Y	515	112	25
CSW7573-70(Y)	520	120	25
CSW7583-70Y	525	84	25
CSW7583-80(Y)	530	90	25
CSW7593-80Y	530	92	25
CSW7593-90(Y)	535	111	25
CSW8573-90Y	840	93	22
CSW8573-110(Y)	850	131	22
CSW8583-110Y	850	90	22
CSW8583-125(Y)	860	98	22
CSW8593-125Y	870	103	22
CSW8593-140(Y)	880	105	22
CSW9563-140Y	1270	115	10
CSW9563-160(Y)	1280	120	10
CSW9573-160Y	1260	123	10
CSW9573-180(Y)	1290	127	10
CSW9583-180Y	1320	96	10
CSW9583-210(Y)	1350	100	10
CSW9593-210Y	1360	103	10
CSW9593-240(Y)	1370	105	10
CSW95103-240Y	1430	105	10
CSW95103-280(Y)	1450	108	10
CSW95113-280Y	1450	109	10
CSW95113-320(Y)	1480	125	10
CSW10593-400Y	1900	300	-44

Tab. 2: Weights and centres of gravity of CSH and CSW compressors (without shut-off valves)

4.2 Installing the compressor

Every compact semi-hermetic screw compressor is a motor-compressor unit. Therefore, it is only necessary to install the whole unit correctly and to connect the electrical system and the pipelines.

Install/mount the compressor horizontally. Take suitable measures if the compressor is operated under extreme conditions (e.g. aggressive atmosphere, low outside temperatures, etc.). Consultation with BITZER is recommended.

4.2.1 Arranging for removal clearances

When installing the compressor in the system, arrange for removal and maintenance clearances of sufficient size.

- CSW105: provide at least 450 mm for the removal of the oil filter!

4.2.2 Marine application

With regard to marine applications, defined diagonal mounting on the longitudinal axis of the ship can be necessary, see figure 3, page 10.



Mount the compressor in parallel to the longitudinal axis of the ship and

- either horizontally to the water level
- or inclined by 10° in the longitudinal direction of the compressor, with the motor downwards
Requirement: During operation, the oil level must remain in the range of the upper sight glass. This is indicated in the following figure as a large grey line.

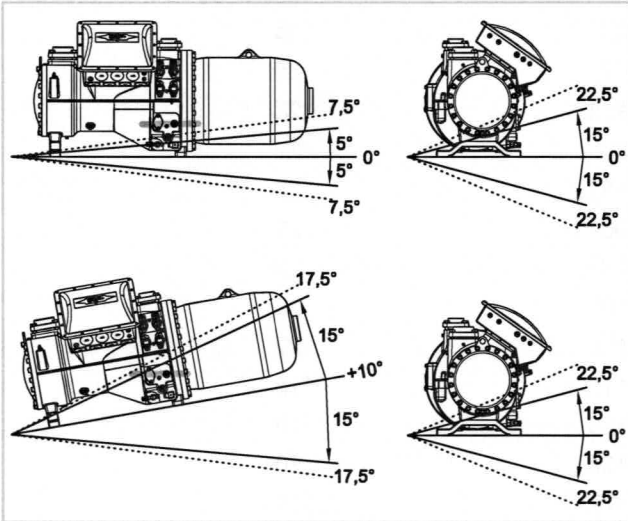


Fig. 3: Permitted inclination angles of the ship using the example of the CSH85

Installation	Inclination in the longitudinal direction		Inclination in the transversal direction	
	static	dynamic	static	dynamic
horizontal	±5°	±7.5°	±15°	±22.5°
inclined by +10°	±15°	±17.5°	±15°	±22.5°

Tab. 3: Maximum inclination angles of the ship

4.2.3 Vibration dampers

The compressors may be mounted solidly. To reduce structure-borne noise however, it is recommended using specially tuned vibration dampers.

NOTICE
Do not mount the compressor solidly on the heat exchanger!
Risk of damage to the heat exchanger (fatigue fractures).

Mounting vibration dampers

Tighten the screws until first deformations signs of the upper rubber disc are visible.

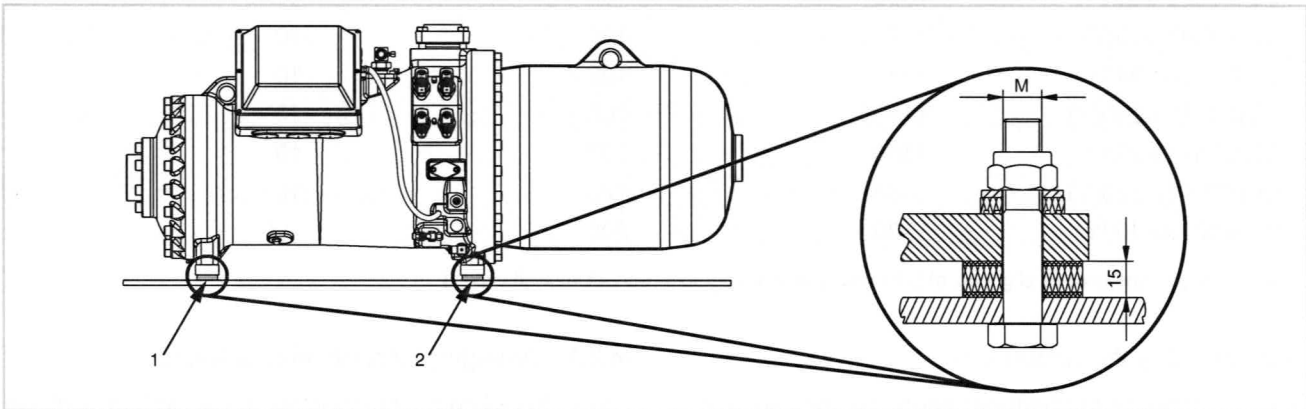


Fig. 4: Vibration dampers

Vibration dampers	
1 CS.9553 .. CS.9573, CSH96: blue CSW10593: yellow	2 CS.9553 .. CS.9573, CSH96: yellow CSW10593: yellow

Compressor	M
CSK61, CS.65	M10
CS.75, CSH76	M16
CS.85, CSH86	M16
CS.95, CSH96	M20
CS.105	M20

4.3 Connecting the pipelines



WARNING

The compressor is under pressure!
 Serious injuries are possible.
 Depressurize the compressor!
 Wear safety goggles!



NOTICE

Potential chemical reactions due to air penetration!
 Proceed swiftly and keep shut-off valves closed until evacuation.

4.3.1 Pipe connections

The pipe connections are suitable for pipes in all common dimensions in millimetres and inches. Brazed connections have stepped diameters. The pipe will immerse more or less depending on its dimensions. If necessary, the bushing may even be cut at the end with the largest diameter.

4.3.2 Shut-off valves



CAUTION

Depending on the operation mode, the shut-off valves may become very cold or very hot.



Risk of burning or frostbite!

Wear suitable protective equipment!



NOTICE

Do not overheat the shut-off valves!
 Cool the valve body and the brazing adapter during and after the brazing operation.
 Maximum brazing temperature 700°C!
 For welding, dismount the pipe connections and the bushes.

When turning or mounting shut-off valves:



NOTICE

Risk of damage to the compressor.
 Tighten screws crosswise in at least 2 steps to the prescribed tightening torque.
 Test tightness before commissioning!

When retrofitting the ECO shut-off valve:



Information

To increase the corrosion protection, it is recommended to coat the surface of the ECO shut-off valve.

4.3.3 Pipelines

Use only pipelines and system components which are

- clean and dry inside (free from slag, swarf, rust and phosphate coatings) and
- which are delivered with an air-tight seal.

Depending on the compressor versions, they are supplied with blanking plates on the pipe connections or shut-off valves. These must be removed before performing the strength pressure and tightness tests and commissioning the system.



Information

The blanking plates are only designed to serve as a transport protection. They are not suitable as a separation between different system sections during the strength pressure test.



NOTICE

For systems with rather long pipelines or for brazing operations without protective gas:
 Install the suction-side cleaning filter (mesh size < 25 µm).



NOTICE

Risk of compressor damage!
 Generously sized filter dryers should be used to ensure a high degree of dehydration and to maintain the chemical stability of the circuit.
 Make sure to choose a suitable quality (molecular sieves with specially adapted pore sizes).



Information

Notice for mounting the suction-side cleaning filter, see manual SH-170.

Mount pipelines in such a way that the compressor is protected from flooding with oil or liquid refrigerant during standstill. Follow the notes given in SH-170.

Optional pipes for economiser (ECO) (not for CSH95), see figure 5, page 12 and/or liquid injection (LI), see figure 6, page 12 must first be routed upward from the connection. This avoids oil migration and damage to the components through hydraulic pressure peaks (see manual SH-170).

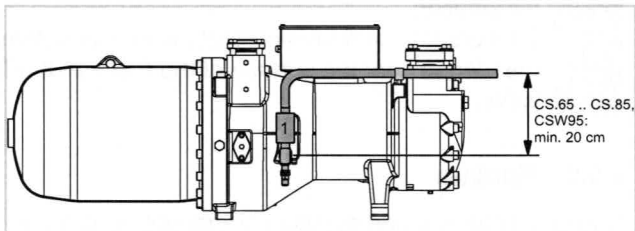


Fig. 5: Pipe layout of the ECO suction gas line at the compressor

1 Pulsation muffler

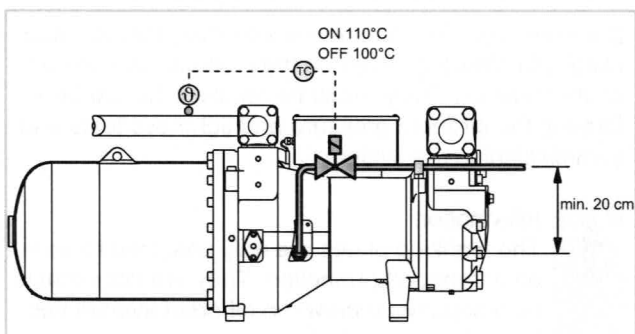


Fig. 6: Pipe layout for liquid injection (LI) with liquid injection valve



Information

The connections for economiser (ECO) and/or liquid injection (LI) are not provided on all compressor models, see dimensional drawings. The connections for ECO and LI on the CSK61 compressor are not approved for use. These connections will no longer be available in the near future.



Information

Notice for connecting an external oil cooler, see manual SH-170.



Information

For other examples about pipe layout, see manual SH-170.

Additional connections for evacuation

For an optimal evacuation capacity, it is recommended to install generously-sized, lockable additional connections on the discharge and suction sides. Sections locked by check valves must have separate connections.

Observe the following for all connections retrofitted on the compressor



NOTICE

Risk of refrigerant loss!
Check the thread.
Carefully screw the adapter in and tighten it to the prescribed tightening torque.
Test tightness before commissioning!

4.4 Oil connection

Pressure gauge connection on the oil valve for maintenance

The pressure gauge connection on the oil valve for maintenance is delivered with a screwing cap (7/16-20 UNF, tightening torque max. 10 Nm). In case of any modification, proceed very carefully.



NOTICE

Risk of refrigerant loss!
Check the thread.
Carefully screw the adapter in and tighten it to the prescribed tightening torque.
Test tightness before commissioning!

4.5 Capacity control (CR) and start unloading (SU)

The standard CS. versions are equipped with a "Dual capacity control" (control with a slider). This allows infinite as well as 4-stage regulation without any rebuilding of the compressor. The only difference in the operating mode is the activation of the solenoid valves.

The capacity control of CSW105 compressors is automatically controlled via the CM-SW-01 compressor module.



Information

For detailed descriptions on capacity control and start unloading as well as their control, see manual SH-170.

4.5.1 Solenoid valves and control sequences

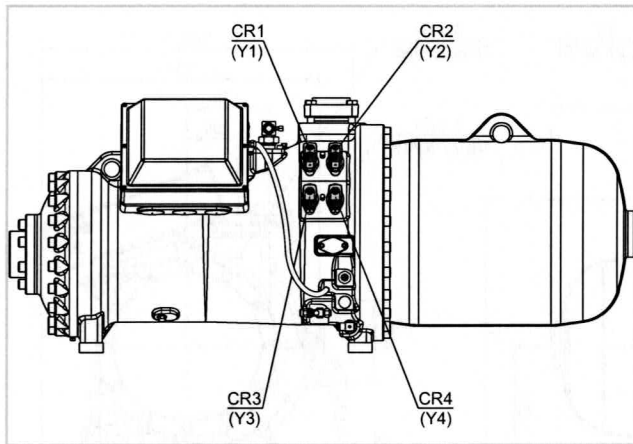


Fig. 7: Arrangement of the solenoid valves

CR	Y1	Y2	Y3	Y4
Start / Stop	○	○	●	○
CAP ↑	○	○	○	⊙
CAP ↓	○	○	⊙	○
CAP ⇔	○	○	○	○

Tab. 4: Infinite capacity control (CR) in the range 100% .. 25%

CR	Y1	Y2	Y3	Y4
Start / Stop	○	○	●	○
CAP ↑	○	○	○	⊙
CAP min. 50% ↓	○	⊙	○	○
CAP ⇔	○	○	○	○

Tab. 5: Infinite capacity control (CR) in the range 100% .. 50%

CR	Y1	Y2	Y3	Y4
Start / Stop	○	○	●	○
CAP 25%	○	○	●	⊙
CAP 50%	○	●	○	⊙
CAP 75%	●	○	○	⊙
CAP 100%	○	○	○	⊙

Tab. 6: 4-stage capacity control (CR)

CAP	Cooling capacity
CAP ↑	Increase cooling capacity
CAP ↓	Decrease cooling capacity
CAP ⇔	Constant cooling capacity
○	Solenoid valve de-energized
●	Solenoid valve energized
⊙	Solenoid valve pulsing
⊕	Solenoid valve intermittent (10 s on / 10 s off)

Tab. 7: Legends

Capacity steps 75%/50%/25% are nominal values. The real residual capacities depend on the operating conditions and on the compressor design. The data can be determined with the BITZER SOFTWARE.

i Information
In part-load operation, the application ranges are limited! See manual SH-170 or BITZER SOFTWARE.

4.6 Connections and dimensional drawings

CSH6553 .. CSH95113, CSK6151 .. CSK6161

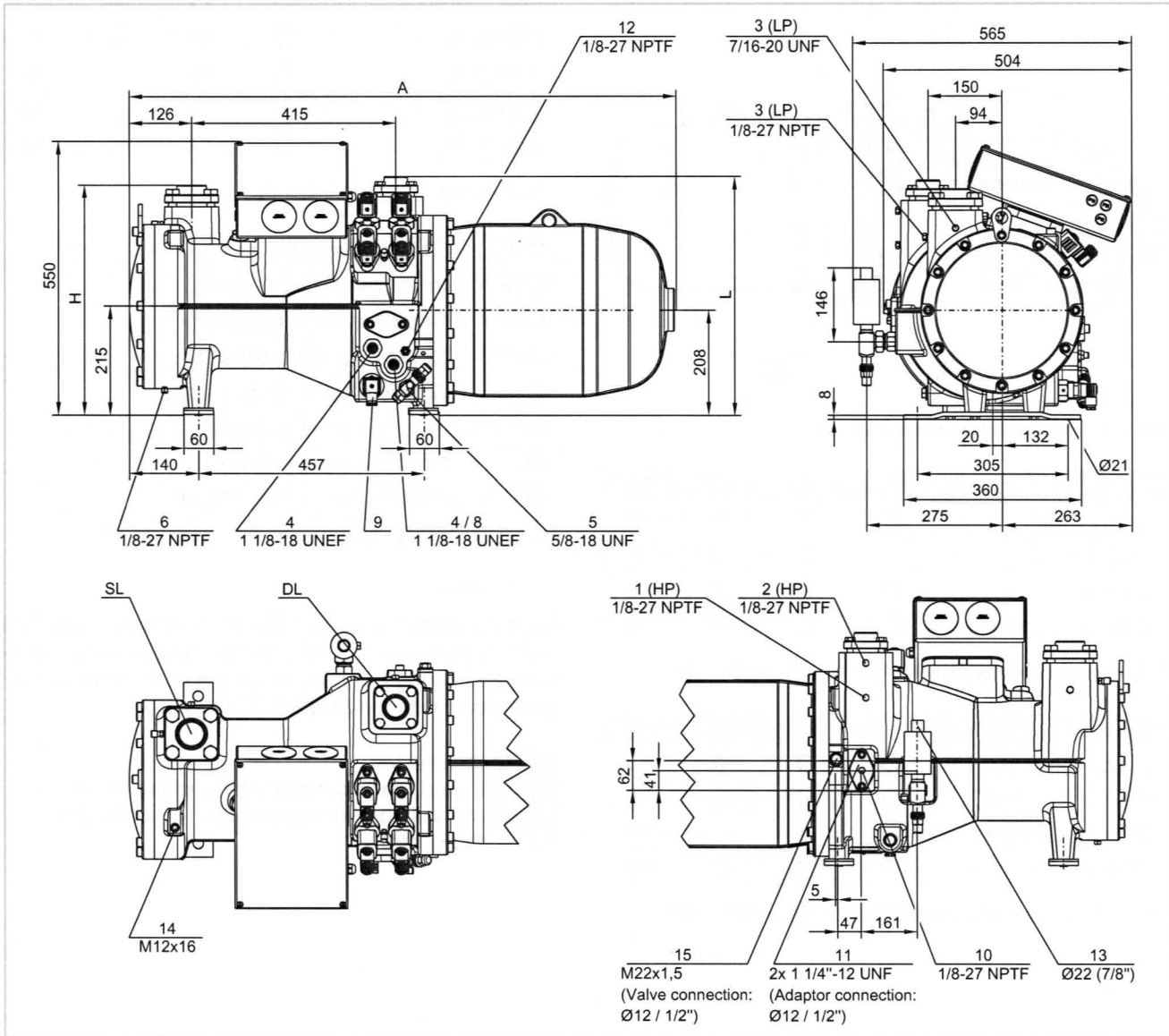


Fig. 8: Dimensional drawing CSH6553-35Y .. CSH6593-60Y, CSK6151 .. CSK6161

	A	H	L
	mm	mm	mm
CSH6553, CSH6563, CSK6151, CSK6161	1107	460	478
CSH6583, CSH6593	1207	469	481

Representation with optional ECO valve (position 13).

Legend for connections, see table 8, page 23.

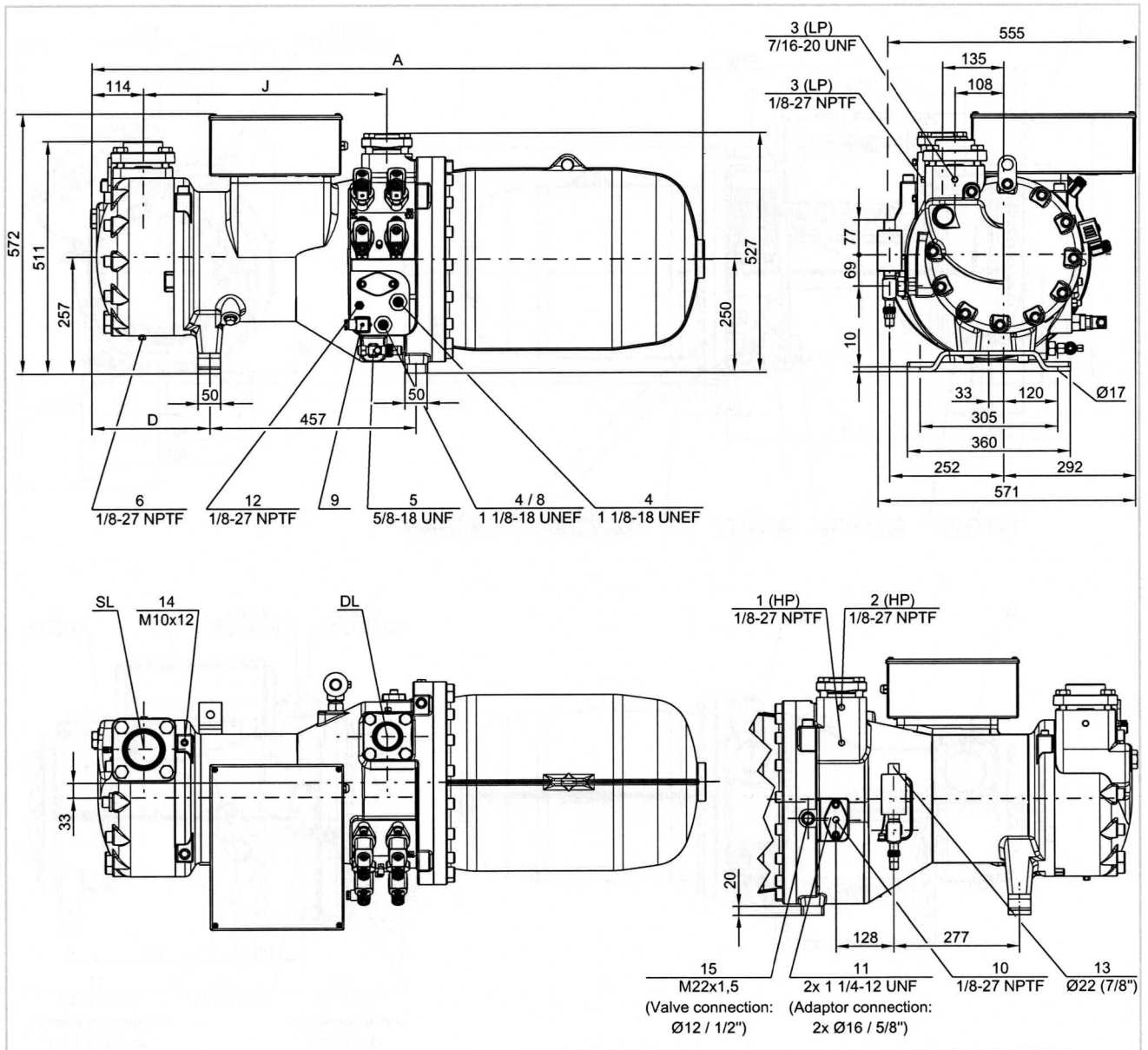


Fig. 9: Dimensional drawing CSH7553-50Y .. CSH7593-110(Y)

	A	D	J
	mm	mm	mm
CSH7553, CSH7563, CSH7573, CSH7583-80Y, CSH7593-90Y	1354	262	540
CSH7583-100(Y), CSH-7593-110(Y)	1385	293	570

Representation with optional ECO valve (position 13).

Legend for connections, see table 8, page 23.

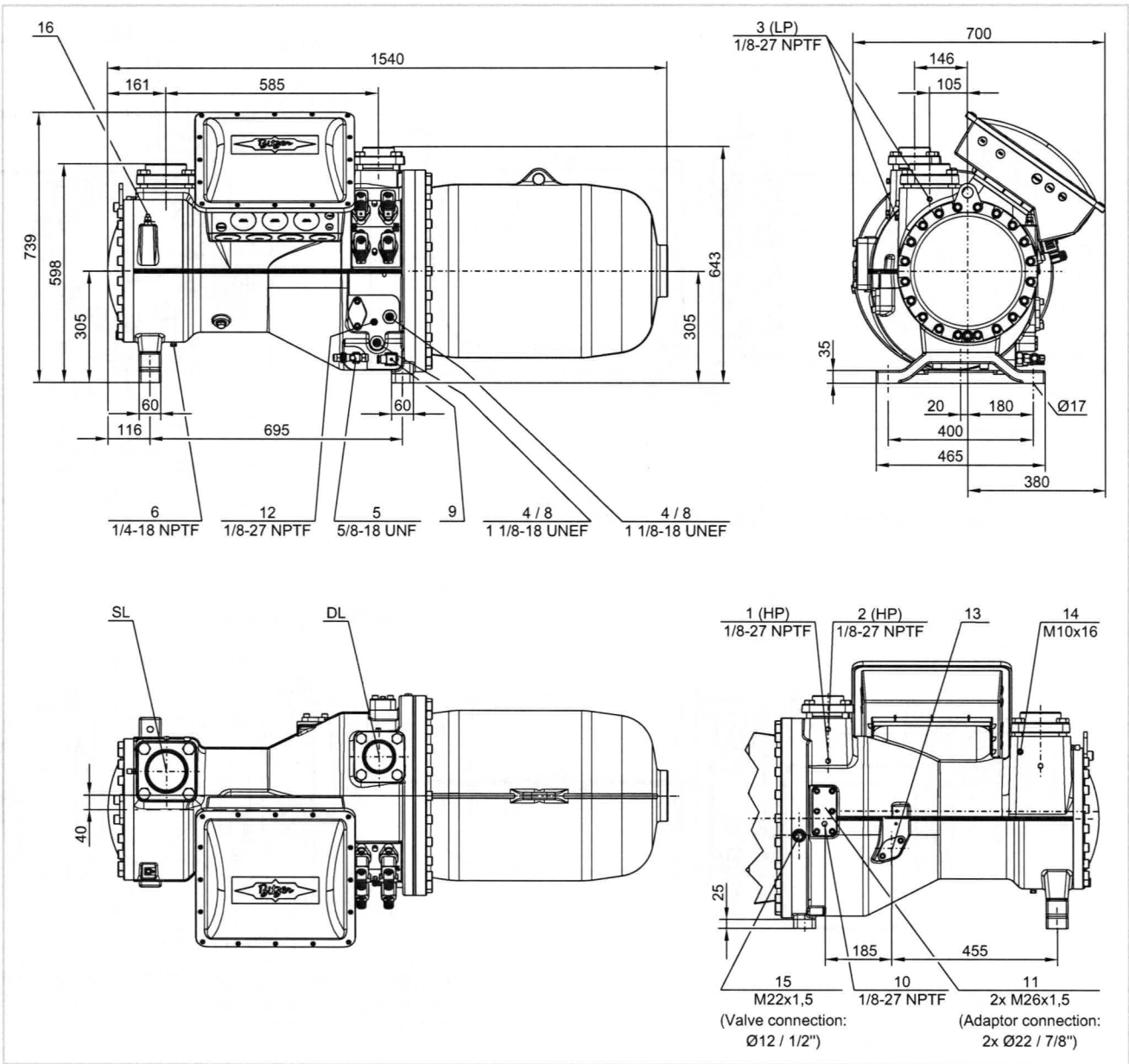


Fig. 10: Dimensional drawing CSH8553-80Y .. CSH8593-180(Y)

Legend for connections, see table 8, page 23.

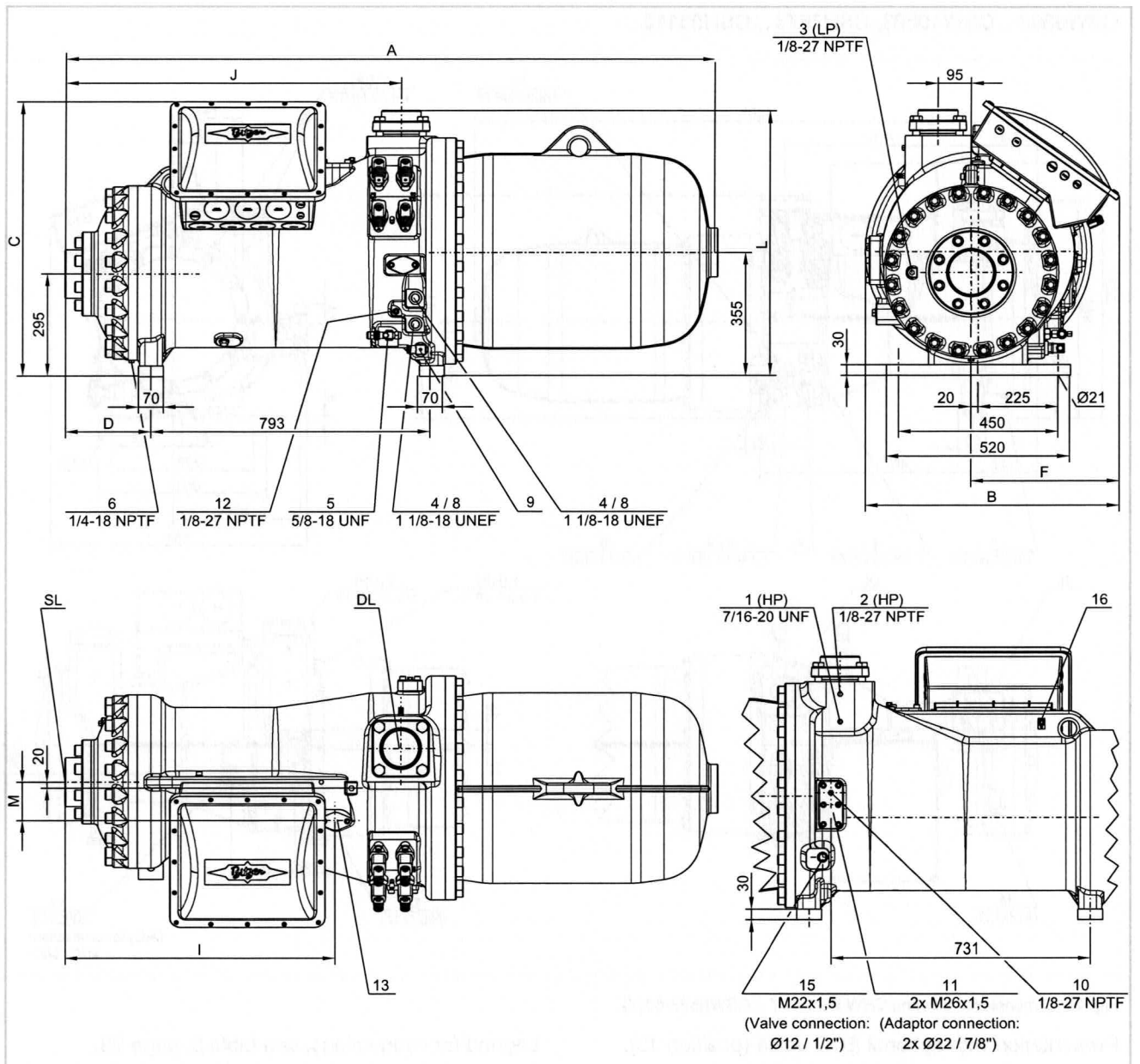


Fig. 11: Dimensional drawing CSH9553-180(Y) .. CSH95113-320Y

	A	B	C	D	F	I	J	L	M
	mm	mm	mm	mm	mm	mm	mm	mm	mm
CSH9553 .. CSH9573	1824	717	776	224	417	746	930	744	106
CSH9583-210Y, CHS9593-240Y	1842	717	776	242	417	764	948	751	113
CSH9583-280(Y), CSH9593-300(Y)	1869	717	776	269	417	791	975	751	113
CSH95103-280Y	1955	731	796	269	431	791	975	758	113
CSH95103-320(Y), CSH95113-320Y	1975	731	796	289	431	810	995	758	113

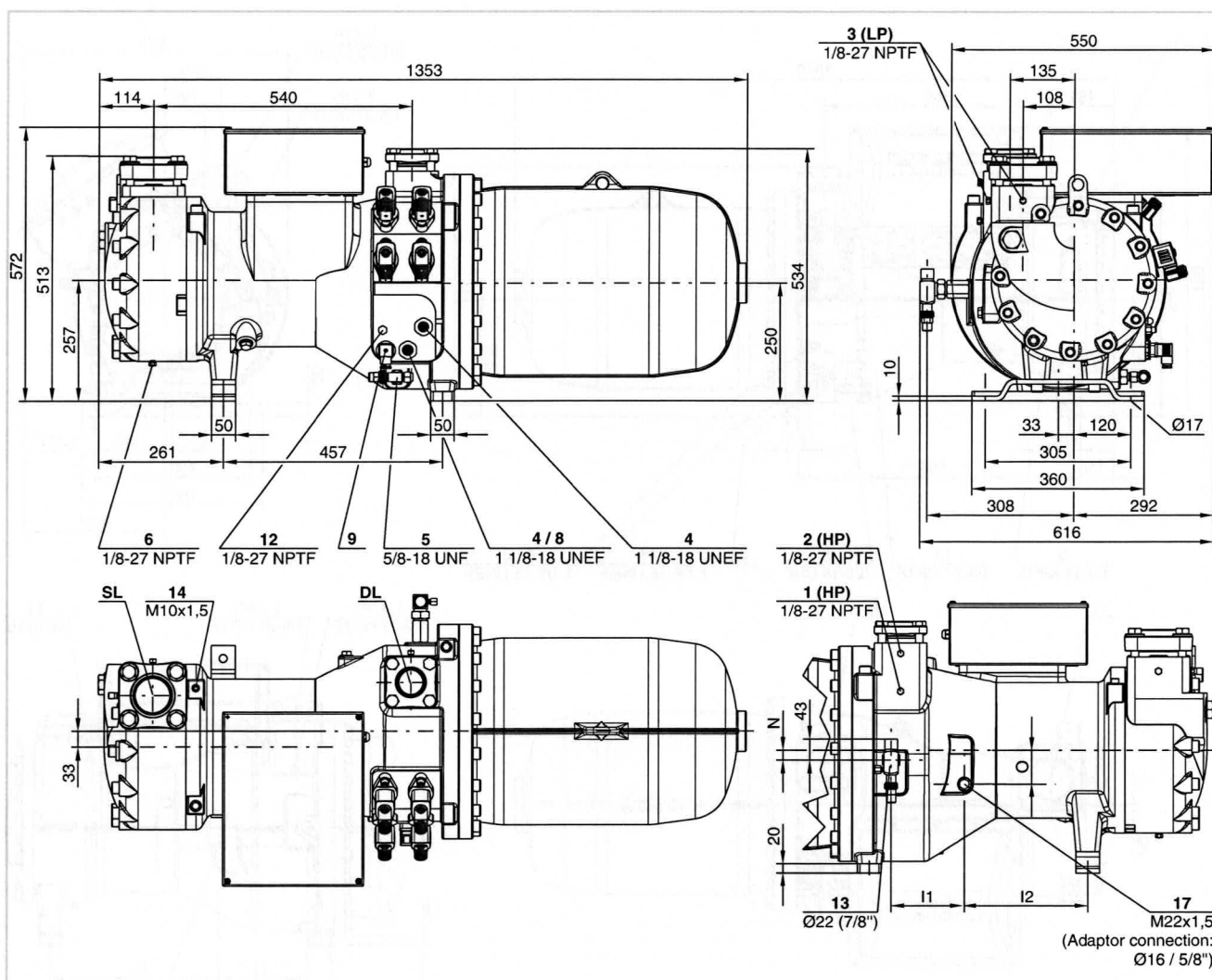


Fig. 13: Dimensional drawing CSW7573-60Y .. CSW7593-90(Y), CSH7673-70Y .. CSH7693-90Y

	I1	I2	N	O
	mm	mm	mm	mm
CSW7573, CSH7673	153	258	20	70
CSW7583, CSW7593, CSH7683, CSH7693	157	261	23	70

Representation with optional ECO valve (position 13).

Legend for connections, see table 8, page 23.

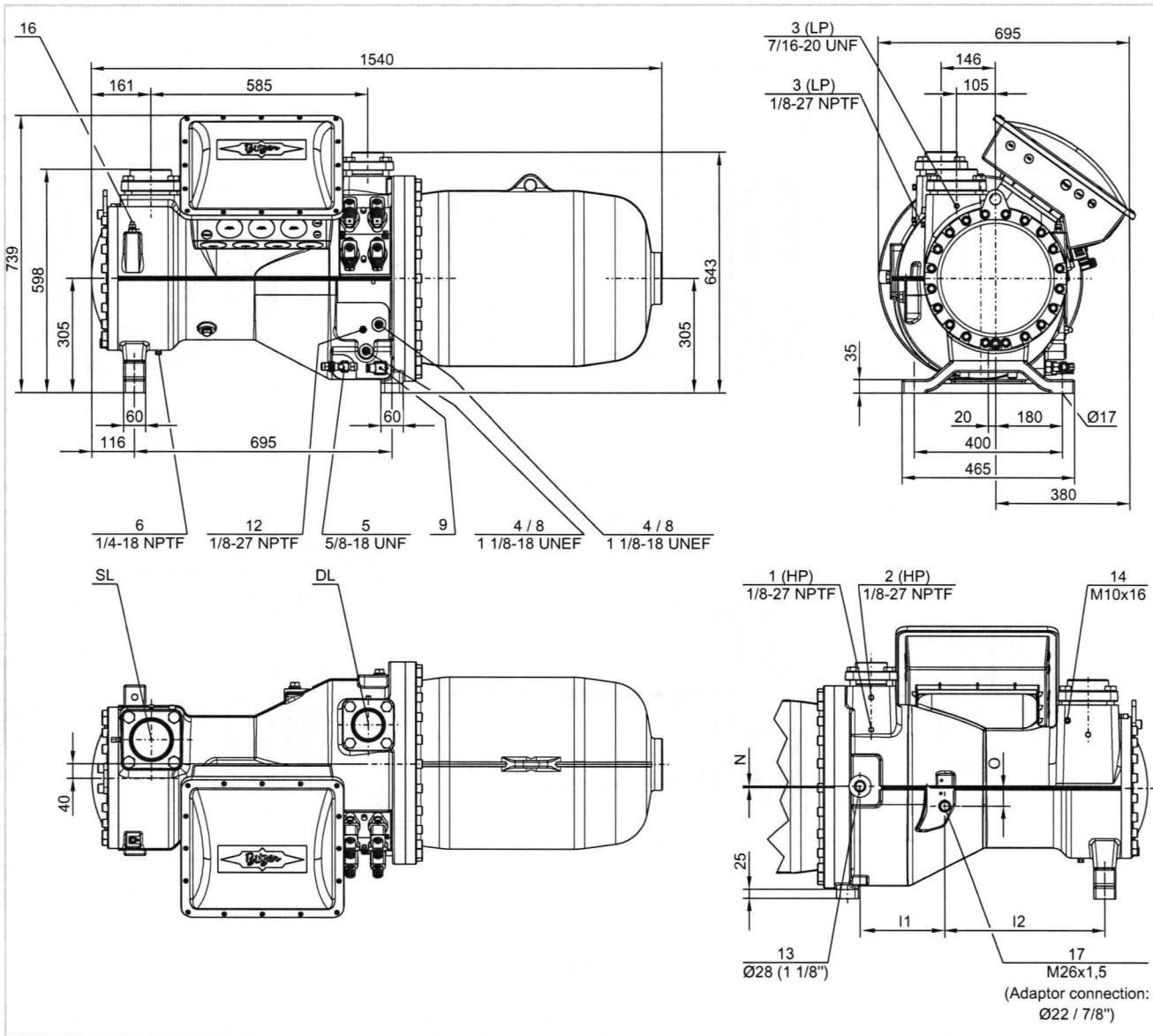


Fig. 14: Dimensional drawing CSW8573-90Y .. CSW8593-140(Y), CSH8673-110Y .. CSH8693-140Y

	I1	I2	N	O
	mm	mm	mm	mm
CSW8573, CSH8673	221	434	0	56
CSW8583, CSW8593, CSH8683, CSH8693	228	432	4	50

Legend for connections, see table 8, page 23.

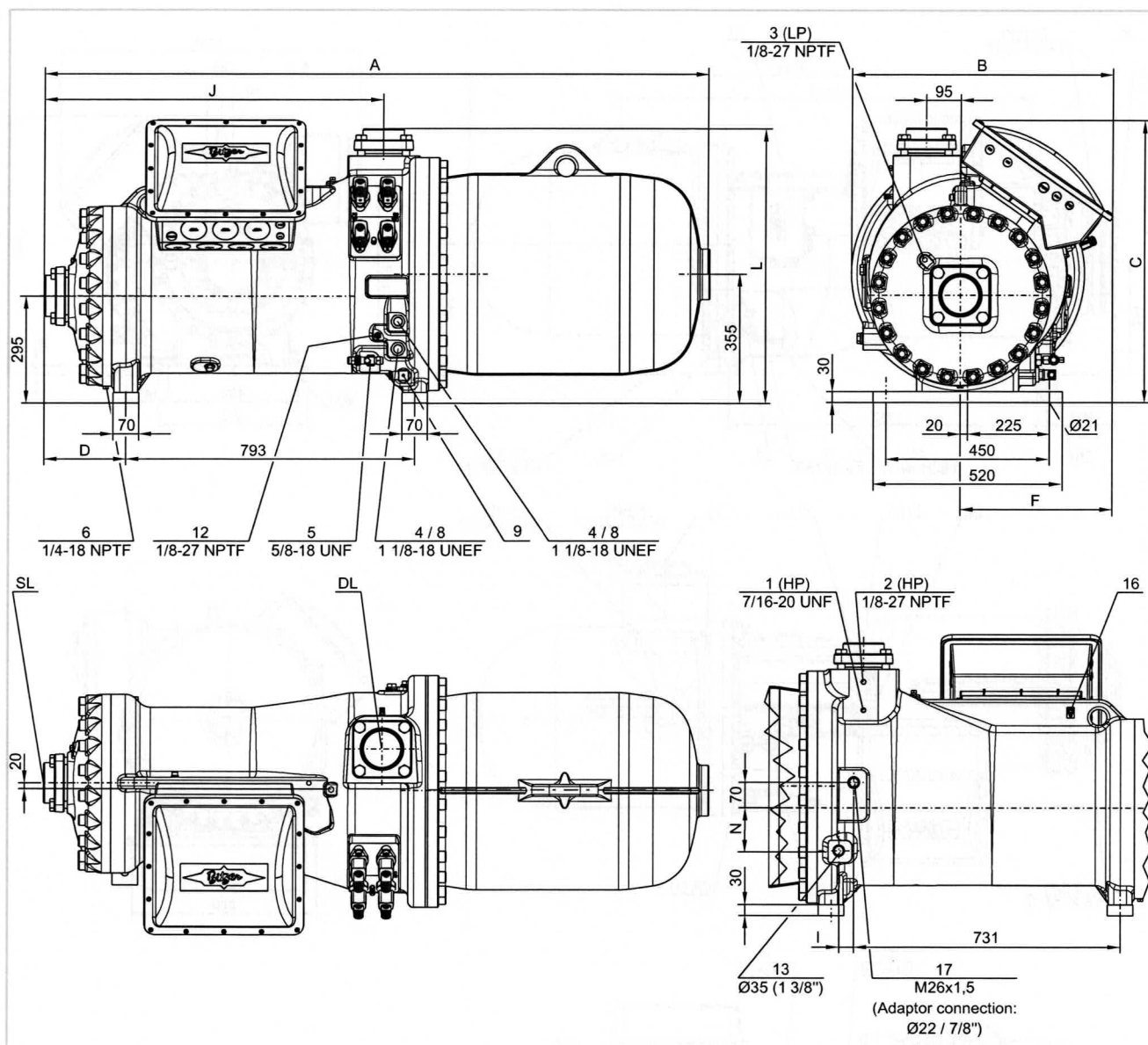


Fig. 15: Dimensional drawing CSW9563-140Y .. CSW95113-320(Y), CSH9663-160Y .. CSH96113-320Y

	A	B	C	D	F	I	J	L	N
	mm	mm	mm	mm	mm	mm	mm	mm	mm
CSW9563, CSW9573, CSH9663, CSH9673	1824	717	776	224	417	41	930	751	118
CSW9583, CSW9593, CSH9683, CSH9693	1842	717	776	242	417	34	948	751	122
CSW95103-240Y	1927	731	796	242	431	26	948	751	120
CSW95103-280(Y), CSW95113-280Y, CSH96103-280Y	1955	731	796	269	431	26	975	751	120
CSW95113-320(Y), CSH96113-320Y	1974	731	796	289	431	26	994	751	120

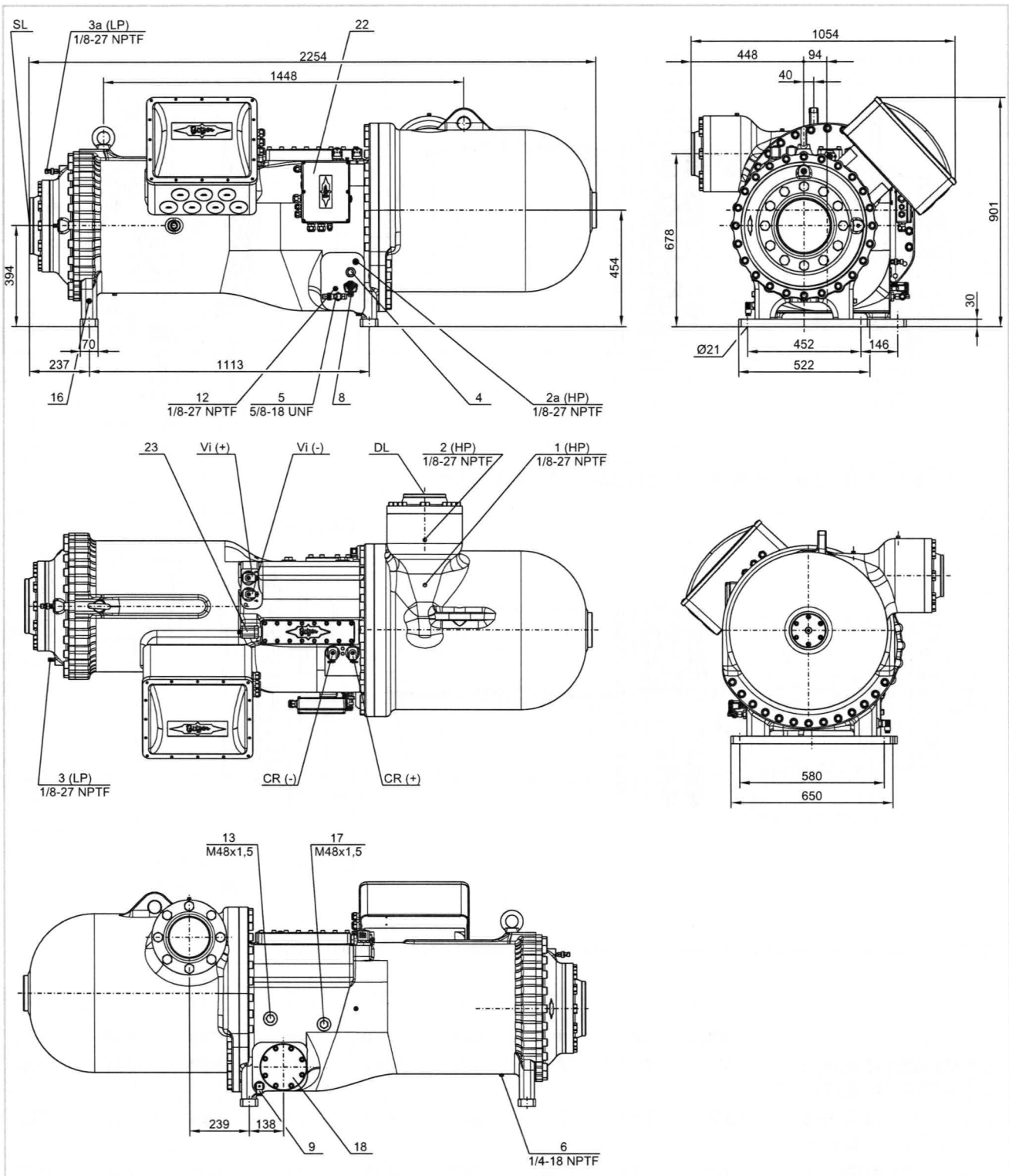


Fig. 16: Dimensional drawing CSW10593-400Y

Legend for connections, see table 8, page 23.

Connection positions	
1	High pressure connection (HP)
2	Additional high pressure connection (HP)
2a	Connection for high pressure transmitter (HP) CS.105: connected to the compressor module
3	Low pressure connection (LP)
3a	Connection for low pressure transmitter (LP) CS.105: connected to the compressor module
4	Oil sight glass
5	Oil valve for maintenance (standard) / connection for oil equalisation (parallel operation)
6	Oil drain plug (motor body)
7	Connection for electro-mechanical oil level switch for the replacement of CSH.1 with CSH.3
8	Connection for opto-electronic oil level switch (OLC-D1-S) CS.105: connected to the compressor module
9	Oil heater with heater sleeve (standard) CS.105: connected to the compressor module
10	Oil pressure connection
11	Connections for external oil cooler (optional adapter)
11a	Outlet to the oil cooler
11b	Inlet/return from the oil cooler
12	Oil temperature sensor CS.105: connected to the compressor module
13	Connection for economiser (ECO, optional shut-off valve, CSH65 and CSH75 with pulsation muffler)
14	Threaded bore for pipe fixture for ECO or LI line
15	Connection for liquid injection (LI, optional shut-off valve)
16	Earth screw for housing
17	Connection for oil and gas return (for systems with flooded evaporator, optional adapter)
18	Oil filter (maintenance connection)
21	Oil injection valve (internal)
22	Compressor module

Connection positions	
23	Slider position indicator
SL	Suction gas line
DL	Discharge gas line

Tab. 8: Connection positions

Dimensions (if specified) may have tolerances according to EN ISO 13920-B.

The legend applies to all CS. compressors and contains connection positions that do not exist in every compressor series.

5 Electrical connection

Compressors and electrical equipment comply with the EU Low Voltage Directive 2014/35/EU.

Connect mains cables, protective earth conductors and bridges (if needed) as specified on the labels in the terminal box. Observe EN60204-1, the safety standard series IEC60364 and national safety regulations.



NOTICE

Risk of short-circuit due to condensation water in the terminal box!

Use only standardised cable bushings.

When mounting, pay attention to proper sealing.

Additionally earthing the compressor housing



DANGER

High electrostatic discharge voltage possible. Risk of electric shock!

Also earth the compressor housing!



Connection, see position 16 in the dimensional drawings.

5.1 Mains connections

When dimensioning motor contactors, feed lines and fuses:

- Use the maximum operating current or maximum power consumption of the motor as a basis.
- Select the contacts according to the operational category AC3.
- Set the thermal overload relays to the maximum operating current of the compressor.

5.2 Motor versions



NOTICE

Risk of compressor failure!
Operate the compressor only in the intended rotation direction!

The compressor series CS.65, CS.75, CS.85, CSH76 and CSH86 and are equipped by default with part-winding motors ("PW") in Δ/Δ -wiring. Star-delta motors (Y/ Δ) are also available as an option. For detailed information, see manual SH-170.

The CS.95, CSH96 and CSW105 models are generally equipped with star-delta motors (Y/ Δ).

Part-winding motors (PW)

Starting modes:

- Part-winding start to reduce the starting current.
- Direct start.

Time delay until switch-on of the 2nd part winding: max. 0.5 s!

Make the connections correctly! Wrong electrical connections will lead to opposite fields of rotation or to fields of rotation out of phase and therefore to a motor lock!

Connect motor terminals on the cover of the terminal box according to the instructions.

Strictly observe the order of the part windings!

- 1st part winding (contactor K1): connections 1 / 2 / 3.
- 2nd part winding (contactor K2): connections 7 / 8 / 9.
- Winding partition 50%/50%.
- Motor contactor selection:
 - 1st contactor (PW 1): 60% of the max. operating current.
 - 2nd contactor (PW 2): 60% of the max. operating current.

Star-delta motor

The time delay between switch-on of the compressor and switch-over from star to delta operation shall not exceed 2 s.

Make the connections correctly!

Wrong electrical connections will lead to short-circuit!



Information

Rate the mains contactor and the delta contactor at min. 60% and the star contactor at min. 33% of the max. operating current.

5.3 High potential test (insulation strength test)

The compressors were already submitted to a high potential test in the factory according to EN12693 or according to UL984 or UL60335-2-34 for the UL model.



NOTICE

Risk of defect on the insulation and motor failure!
Never repeat the high potential test in the same way!

A repeated high potential test may only be carried out with max. 1000 V AC.

5.4 Protection devices



WARNING

Risk of electric shock!

Before performing any work in the terminal box of the compressor: Switch off the main switch and secure it against being switched on again! Close the terminal box of the compressor before switching on again!



NOTICE

Potential failure of the protection device and the motor due to improper connection and/or faulty operation!

Connect properly according to the schematic wiring diagrams and check the connections for tight seat.

The cables and terminals of the PTC control circuit must not come into contact with the control voltage or operating voltage!

5.4.1 SE-E1

This protection device is incorporated as standard in the terminal box of all HS.53 .. HS.85 compressors and CSH, CSW compressors. In the state of delivery, the cables for the monitoring of motor and oil temperature, rotation direction and phase failure are connected to the terminal plate. Other connections according to the wiring diagram in the terminal box, see manual SH-170 and Technical Information ST-120.

Monitoring functions:

- Temperature monitoring.
- Rotation direction monitoring.
- Phase failure monitoring.

5.4.2 CM-SW-01

Standard for all CSW105 compressors

The compressor module integrates the entire electronic periphery of the compressor: It allows monitoring the essential operating parameters of the compressor: motor and discharge gas temperature, phase and rotation direction monitoring, oil supply and application limits and thus protects the compressor from operation under critical conditions. For further information, see Technical Information ST-150.



NOTICE

The compressor module may be damaged or fail!

Never apply any voltage to the terminals of CN7 to CN12 – not even for test purposes!

The voltage applied to the terminals of CN13 must not exceed 10 V!

The voltage applied to terminal 3 of CN14 must not exceed 24 V! Do not apply voltage to the other terminals!

The following components are completely installed and wired in the state of delivery:

- Slider position indicator.
- Oil monitoring (OLC-D1).
- Solenoid valves for capacity control and V_r .
- Discharge gas temperature sensor.
- Low pressure and high pressure transmitter.

Modification to these components or their wiring is not required and should not be done without consulting BITZER.

The following components are not installed and wired in the state of delivery and need to be connected:

- Motor temperature monitoring (PTC sensor in motor winding).
- Phase monitoring (in case of a phase failure or inadmissibly high phase asymmetry).

The compressor module internally supplies voltage to the peripheral devices (solenoid valves, oil monitoring device and slider position indicator) and to the terminal strips CN7 to CN12.

Please refer to the Technical Information ST-150 for information on all connections.

5.4.3 SE-i1

This protection device with extended monitoring functions can be used as an option for all HS.53 .. HS.85 compressors and CSH and CSW compressors.

Monitoring functions:

- Temperature monitoring.
- Monitoring of the PTC control circuit to detect any short-circuit or line break/sensor failure.
- Rotation direction monitoring.
- Monitoring of phase failure and asymmetry.
- Monitoring of the maximum cycling rate.

For further information, see Technical Information CT-110.

5.4.4 SE-E2

Optional protection device for operation with frequency inverter and soft starter (for a ramp time shorter than 1 s).

- Dimensions and integration in the control identical to SE-E1.
- Suitable for all CS. compressors.
- Monitoring functions are basically identical to those of SE-E1. However, the SE-E2 monitors phase failure during the entire running time of the compressor.

For further information, see Technical Information ST-122.

5.4.5 Monitoring of the oil circuit

- For short circuits without liquid injection (LI) for additional cooling and for small system volume and small refrigerant charge: Indirect monitoring with oil temperature sensor (standard)



NOTICE

Lack of oil leads to a too high increase in temperature.

Risk of damage to the compressor!

- For circuits with liquid injection (LI) for additional cooling and / or for great system volume as well as parallel compounding: Monitor oil level directly with opto-electronic oil level monitoring (option), see chapter Opto-electronic oil level monitoring OLC-D1-S, page 26. The connection is on the compressor housing, see chapter Connections and dimensional drawings, page 14, position 8.

Opto-electronic oil level monitoring OLC-D1-S

The OLC-D1-S is an opto-electronic proximity sensor that monitors the oil level with infrared light. Depending on the mounting position and electrical connection, the same unit can be used for monitoring the minimum and maximum oil levels.

The monitoring device comprises two parts: a prism unit and an opto-electronic unit.

- The prism unit – a glass cone is mounted directly into the compressor housing.
- The opto-electronic unit is designated as OLC-D1. It is not directly connected to the refrigerating circuit. It is screwed into the prism unit and integrated in the system's control logic. No external control device is required.

Delivery in a pre-setup state

If the prism unit of the OLC-D1-S has been ordered pre-assembled, the compressor will have already been tested as a whole in the factory for strength pressure and tightness. In this case, it will only be necessary to screw in the opto-electronic unit and to connect it electrically (see Technical Information ST-130). Subsequent tightness testing will not be required in this case.

When retrofitting, both prism and electronic unit must be mounted. For a detailed mounting description, please see Technical Information ST-130.

5.4.6 Safety devices for pressure limiting (HP and LP)

- These safety devices are required for securing the compressor's application range in order to avoid unacceptable operating conditions.
- Do not connect any safety devices to the maintenance connection of the shut-off valve!
- Set cut-in and cut-out pressures according to the application limits and perform a test to exactly check them.

5.4.7 Oil heater

The oil heater ensures the lubricity of the oil even after long standstill periods. It prevents increased refrigerant concentration in the oil and therefore reduction of viscosity.

The oil heater must be operated while the compressor is at standstill in case of

- outdoor installation of the compressor,
- long shut-off periods,
- high refrigerant charge,
- possible refrigerant condensation in the compressor.

Connection according to Technical Information KT-150.

Isolating the oil separator

Operating at low ambient temperatures or with high temperatures on the high-pressure side during standstill (e.g. for heat pumps) requires additional isolation of the oil separator.

6 Commissioning

The compressor has been carefully dried, checked for tightness and filled with a holding charge (N₂) before leaving the factory.



DANGER

Risk of explosion!
Never pressurize the compressor with oxygen (O₂) or other industrial gases!



WARNING

Risk of bursting!
A critical shift of the refrigerant ignition limit is possible in case of excess pressure.
Do not add a refrigerant (e.g. as a leak indicator) to the test gas (N₂ or air).
Environmental pollution in case of leakage and when deflating!



NOTICE

Risk of oil oxidation!
Check the entire system for strength pressure and tightness, preferably using dried nitrogen (N₂).
When using dried air: Remove the compressor from the circuit – make sure to keep the shut-off valves closed.

6.1 Checking pressure strength

Check the refrigerant circuit (assembly) according to EN378-2 (or other applicable equivalent safety standards). The compressor had been already tested in the factory for strength pressure. A tightness test is therefore sufficient, see chapter Checking tightness, page 27. If you still wish to perform a strength pressure test for the entire assembly:



DANGER

Risk of bursting due to excessive pressure!
The pressure applied during the test must never exceed the maximum permitted values!
Test pressure: 1.1-fold of the maximum allowable pressure (see name plate). Make a distinction between the high-pressure and low-pressure sides!

6.2 Checking tightness

Check the refrigerant circuit (assembly) for tightness, as a whole or in parts, according to EN378-2 (or other applicable equivalent safety standards). For this, create an excess pressure, preferably using dried nitrogen.

Observe test pressures and safety reference, see chapter Checking pressure strength, page 27.

6.3 Evacuation

- Switch on the oil heater.
- Open all shut-off valves and solenoid valves.
- Use a vacuum pump to evacuate the entire system, including the compressor, on the suction side and the high-pressure side.

With the vacuum pump shut off, a "standing vacuum" lower than 1.5 mbar must be achieved.

- Repeat the operation several times if necessary.



NOTICE

Risk of damage to the motor and compressor!
Do not start the compressor while it is in a vacuum!
Do not apply any voltage, not even for testing!

6.4 Charging refrigerant

Use only permitted refrigerants, see see chapter Application ranges, page 5.



DANGER

Risk of bursting of components and pipelines due to hydraulic excess pressure while feeding liquid.
Serious injuries are possible.
Avoid overcharging the system with refrigerant under all circumstances!



WARNING

Risk of bursting due to counterfeit refrigerants!
Serious injuries are possible!
Purchase refrigerants only from reputable manufacturers and reliable distributors!



NOTICE

Risk of wet operation during liquid feeding!
Measure out extremely precise quantities!
Maintain the discharge gas temperature at least 20 K above the condensing temperature.

- Before charging with refrigerant:
- Do not switch on the compressor!
- Switch on the oil heater.
- Check the oil level in the compressor.
- Fill liquid refrigerant directly into the condenser or receiver; on systems with flooded evaporator, maybe directly into the evaporator.
- Blends must be taken out of the charging cylinder as a solid liquid.
- After commissioning, it may be necessary to add refrigerant: While the compressor is running, charge with refrigerant on the suction side, preferably at the evaporator inlet. Blends must be taken out of the charging cylinder as a solid liquid.

6.5 Checks prior to compressor start

- Oil level (between the middle of the lower sight glass and the upper area of the upper sight glass).
- During compressor start, oil temperature must be at least 20°C and 20 K above ambient temperature – that means approximately (at least) 15 K at the measuring point directly under the oil sight glass.
- Setting and functions of safety and protection devices.
- Setpoints of the time relays.
- Cut-out pressures of the high-pressure and low-pressure switches.
- Check if the shut-off valves are opened.

In case of compressor replacement

Oil is already in the circuit. It may therefore be necessary to drain off some oil.



NOTICE

In case of larger oil quantities in the refrigerant circuit: Risk of liquid slugging when the compressor starts!
Maintain the oil level within the marked sight glass area!

When a reciprocating compressor is replaced:

- Completely remove the oil from the system. The new oil is not only more viscous. It is an ester oil with different chemical and physical properties.



NOTICE

Risk of damage to the compressor!
The new oil has a great cleaning effect in the refrigerant circuit.
On the suction side, mount a cleaning filter suitable for bidirectional operation!
Mesh size: 25 µm

- Mount a filter for bidirectional operation with perforated metal tubes around the inside and outside diameter of the filter element.
- After several operating hours: Change the oil filters and cleaning filters.
- If needed, repeat the operation, see chapter Oil change, page 31.

6.6 Compressor start

6.6.1 Checking the rotation direction



NOTICE

Risk of compressor failure!
Operate the compressor only in the intended rotation direction!

Even if the protection device SE-E1 or the optional protection device SE-i1 monitors the rotating field, a test is recommended:

Rotation direction test with integrated suction shut-off valve:

- Connect the pressure gauge to the suction shut-off valve. Close the valve spindle and open again by one turn.
- Let the compressor start shortly (approximately 0.5 .. 1 s).
- Correct rotation direction: Suction pressure drops immediately.
- Incorrect rotation direction: Suction pressure increases or protection device shuts off.
- Incorrect rotation direction: Change the poles of the terminals on the common feed line.

Direction rotation test without suction shut-off valve:

- Close the solenoid valves on the evaporator and the economiser. The pressure changes measured in such a case are much lower than with throttled suction shut-off valve!
- Let the compressor start shortly (approximately 0.5 .. 1 s).
- Correct rotation direction: Suction pressure drops a bit.
- Incorrect rotation direction: Suction pressure stays the same or increases a bit, or protection device shuts off.
- Incorrect rotation direction: Change the poles of the terminals on the common feed line.

After the rotation direction test:

- Let the compressor start while opening slowly the suction shut-off valve.

6.6.2 Lubrication/oil level monitoring

- Check the lubrication of the compressor directly after the compressor start.

The oil level must be visible in the zone of both sight glasses.

- Check the oil level repeatedly within the first hours of operation!

During the start phase, oil foam may arise but its level should decrease at stable operating conditions. Otherwise high proportions of liquid in the suction gas are suspected.



NOTICE

Risk of wet operation!
Maintain the discharge gas temperature well above the condensing temperature: at least 20 K.
At least 30 K for R407A, R407F and R22.



NOTICE

Risk of compressor failure due to liquid slugging!
Before adding larger quantities of oil: check the oil return!

6.6.3 Set high pressure and low pressure switches (HP + LP)

Check exactly the cut-in and cut-out pressure values according to the operating limits by testing them.

6.6.4 Set the condenser pressure

- Set the condenser pressure so that the minimum pressure difference is reached within 20 s after the compressor start.
- Avoid quick pressure reduction with finely stepped pressure control.

Application limits, see BITZER SOFTWARE, manual SH-170 and brochure SP-171 (CSH) / SP-172 (CSW).

6.6.5 Vibrations and frequencies

Check the system carefully to detect any abnormal vibration, check particularly pipelines and capillary tubes. In case of strong vibrations, take mechanical measures: e.g. use pipe clamps or install vibration dampers.



NOTICE

Risk of burst pipes and leakages on the compressor and system components!
Avoid strong vibrations!

6.6.6 Checking the operating data

- Evaporation temperature
- Suction gas temperature
- Condensing temperature
- Discharge gas temperature
 - min. 20 K above condensing temperature
 - min. 30 K above condensing temperature for R407C, R407F and R22
 - max. 120°C on the outside of the discharge gas line
- Oil temperature directly under the oil sight glass
- Cycling rate
- Current values
- Voltage
- Prepare data protocol.

Application limits, see BITZER SOFTWARE, manual SH-170 and brochure SP-171 (CSH) / SP-172 (CSW).

6.6.7 Control logic requirements



NOTICE

Risk of motor failure!

The specified requirements must be ensured by the control logic!

- Desirable minimum running time: 5 minutes!
- Switching the compressor off:
When using a star-delta motor, shut it off from the 25%-CR stage!
- Minimum standstill time:
 - 5 minutes (CSW105: 10 minutes).
This is the time the control slider needs to reach the optimal start position.
 - 1 minute.
Only if the compressor has been shut off from the 25%-CR stage!
 - Also observe minimum standstill times during maintenance work!
- Maximum cycling rate:
 - CS.65 and CS.75: max. 6 starts per hour.
 - CS.85, CS.95 and CSW105: max. 4 starts per hour.
- Switching time of the motor contactors:
 - Part winding: 0.5 s.
 - Star-delta: 1 to 2 s for CS.65, CS.75 and CS.85.
 - Star-delta: 1.5 to 2 s for CS.95 and CSW105.

6.6.8 Particular notes on safe compressor and system operation

Analysis show that compressor failures are most often due to an inadmissible operating mode. This applies especially to damage resulting from lack of lubrication:

- Function of the expansion valve – observe the manufacturer's notes!
 - Position the temperature sensor correctly at the suction gas line and fasten it.
 - When using a liquid suction line heat exchanger: Position the sensor as usual after the evaporator and not after the heat exchanger.

- Ensure sufficiently high suction gas superheat, while also taking into account the minimum discharge gas temperatures.
- Stable operating mode under all operating and load conditions (also part-load, summer/winter operation).
- Solid liquid at the expansion valve inlet, during ECO operation already before entering the liquid subcooler.
- Avoid refrigerant migration from the high-pressure side to the low-pressure side or into the compressor during long shut-off periods!
 - Always maintain oil heater operation when the system is at standstill. This is valid for all applications.
When installing the system in zones where the temperatures are low, it may be necessary to insulate the oil separator. At compressor start, the oil temperature, that is measured under the oil sight glass, should be 15 .. 20 K above the ambient temperature.
 - Automatic sequence change for systems with several refrigerating circuits (approximately every 2 hours).
 - Mount an additional check valve in the discharge gas line if no temperature and pressure compensation is reached even after long standstill times.
 - If needed, mount a time and pressure-dependant controlled pump down system or liquid separators on the suction side – particularly for high refrigerant charges and/or when the evaporator may become hotter than the suction gas line or the compressor.
- For further information about pipe layout, see manual SH-170.



Information

In the case of refrigerants with low isentropic exponent (e.g. R134a), a heat exchanger between the suction gas line and the liquid line may have a positive effect on the system's operating mode and coefficient of performance. Arrange the temperature sensor of the expansion valve as described above.

7 Operation

7.1 Regular tests

Check the system at regular intervals according to national regulations. Check the following points:

- Operating data, see chapter Compressor start, page 28.
- Oil supply, see chapter Compressor start, page 28.
- Safety and protection devices and all components for compressor monitoring (check valves, discharge gas temperature sensors, differential oil pressure switches, pressure limiters, etc.).
- Tight seat of electrical cable connections and screwed joints.
- Screw tightening torques (see SW-100).
- Refrigerant charge.
- Tightness.
- Prepare data protocol.

7.2 Locking the protection and monitoring devices

The compressors are equipped with electronic protection and monitoring devices, triggering a lock-out in case of overload or inadmissible operating conditions.

Determine and remove the cause before performing a reset!

8 Maintenance

Observe the manufacturer's documentation of the components used!

8.1 Oil change



NOTICE

Damage to the compressor caused by degraded ester oil.

Moisture is chemically bound to the ester oil and cannot be removed by evacuation.

Proceed with extreme care:

Any penetration of air into the system and oil drum must be avoided under all circumstances.

Use only oil drums in their original unopened state!

The listed oils, (see chapter Application ranges, page 5), are characterised by their high degree of stability. An oil change is generally not required when appropriate suction-side fine filters are mounted or used. In case of compressor or motor damage, it is recommended performing an acid test. If necessary, carry out cleaning measures: Mount a bidirectional acid retaining suction line gas filter and change oil. Purge the system on the highest point of the discharge side and collect the refrigerant in a recycling cylinder. If necessary, change filter and oil again after several operating hours and purge the system.

Changing the oil



WARNING

The compressor is under pressure!

Serious injuries are possible.

Depressurize the compressor!

Wear safety goggles!



- Drain the oil from the compressor and motor housing. Oil draining positions on the compressor are the connection positions 5 and 6, see chapter Connections and dimensional drawings, page 14.
- Fill in new oil.
- Dispose of waste oil properly.

8.2 Replace oil filter (CSW105)

→ Prepare a new oil filter.

- Place a flat pan under the oil valve for maintenance (5) and the oil filter flange (18).
- Drain oil and dispose of it properly.
- Open the flange of the oil filter and remove it by pulling it forward.

The integrated oil filter is mounted on the rear side of the flange.

- Unscrew the oil filter from the flange.
- Mount a new oil filter on the flange.
- Replace the O-ring at the flange.
- Insert the flange with the new oil filter, the new flat gasket and the new O-ring.



NOTICE

Risk of damage to the compressor.
Tighten screws and nuts only to the prescribed tightening torque and, if possible, crosswise in at least 2 steps.

- Charge with new oil.
- Test tightness before commissioning.

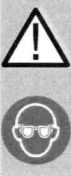
8.3 Integrated pressure relief valve

The valve is maintenance-free. Its response pressure difference is 28 bar.

However, after repeated venting, it may leak permanently because of abnormal operating conditions. The consequences are reduced performance and a higher discharge gas temperature.

8.4 Integrated check valve

After being shut off, the compressor runs reverse for a short time (approx. 5 s, until pressure compensation in the oil separator takes place). When the check valve is damaged or clogged, this time extends. The valve must then be changed.



WARNING

The compressor is under pressure!
Serious injuries are possible.
Depressurize the compressor!
Wear safety goggles!

Mounting position: in discharge gas outlet flange below the discharge shut-off valve or pipe connection. Replacement see maintenance instructions SW-170.

9 Decommissioning

9.1 Standstill

Leave the oil heater switched on until disassembly. This prevents increased refrigerant concentration in the oil.



WARNING

Risk of refrigerant evaporation from the oil. Increased risk of flammability, depending on the refrigerant!
Shut-down compressors or used oil may still contain rather high amounts of dissolved refrigerant.
Close the shut-off valves on the compressor and extract the refrigerant!

9.2 Dismantling the compressor



WARNING

The compressor is under pressure!
Serious injuries are possible.
Depressurize the compressor!
Wear safety goggles!

Close the shut-off valves on the compressor. Extract the refrigerant. Do not deflate the refrigerant, but dispose of it properly!

Loosen screwed joints or flanges on the compressor valves. Remove the compressor from the system; use hoisting equipment if necessary.

9.3 Disposing of the compressor

Drain the oil from the compressor. Dispose of waste oil properly! Have the compressor repaired or dispose of it properly!

When returning compressors that have been operated with flammable refrigerant, mark the compressor with the symbol "Caution flammable gas", as the oil may still contain refrigerant.

10 Tightening torques for screwed connections

Mind when mounting or replacing parts:

- Clean threads carefully.
- Gaskets:
 - Use new gaskets only!
 - Do not oil gaskets with metallic support.
 - Flat gaskets may be moistened slightly with oil.
- Wrap plugs with sealing tape or coat them with liquid sealing agent.
- Admissible screwing methods:
 - Tighten with calibrated torque spanner to indicated torque.
 - Tighten with pneumatic impact wrench and retighten with calibrated torque spanner to indicated torque.
 - Tighten with electronically controlled angled wrench to indicated torque.
- Tolerance range of tightening torques: $\pm 6\%$ of nominal value
- Tighten flange connections crosswise and in at least 2 steps (50/100%). Alternatively, they may be tightened in one step with a multi spindle tool.

10.1 Normal screwed connections

Size	Case A	Case B
M5	7 Nm	
M6	9 Nm	16 Nm
M8	23 Nm	40 Nm
M10	42 Nm	80 Nm
M12	80 Nm	125 Nm
M16	150 Nm	220 Nm
M20	220 Nm	220 Nm
M20 with CS.105		400 Nm

Case A: Screws without flat gasket, property class 8.8 or 10.9

Case B: Screws with flat gasket or gasket with metallic support, property class 10.9

10.2 Special screwed connections

Sealing plugs without gasket

Size	Brass	Steel
1/8-27 NPTF	35 .. 40 Nm	15 .. 20 Nm
1/4-18 NPTF	50 .. 55 Nm	30 .. 35 Nm
3/8-18 NPTF	85 .. 90 Nm	50 .. 55 Nm
1/2-14 NPTF	95 .. 100 Nm	60 .. 65 Nm
3/4-14 NPTF	120 .. 125 Nm	80 .. 85 Nm

Sealing screws or plugs with aluminium gasket

Size	
M10	30 Nm
M18 x 1,5	60 Nm
M20 x 1,5	70 Nm
M22 x 1,5	80 Nm
M26 x 1,5	110 Nm
M30 x 1,5	120 Nm
M48 x 1,5	300 Nm
G1/4	40 Nm
G1 1/4	180 Nm

Sealing screws or plugs with O-ring

Size	
1 1/8-18 UNEF	50 Nm
M22 x 1,5	40 Nm
M52 x 1,5	100 Nm

Sealing nuts with O-ring

Thread	AF	
3/4-16 UNF	22	50 Nm
1-14 UNS	30	85 Nm
1 1/4-12 UNF	36	105 Nm
1 3/4-12 UN	50	150 Nm
2 1/4-12 UN	65	180 Nm

These sealing nuts are normally used for Rotalock screwed joints.

AF: width across flats in mm

Screws for shut-off valves and counter flanges

Size	Case C	Case D
M10		50 Nm
M12	36 Nm	100 Nm
M16	98 Nm	150 Nm
M18	136 Nm	200 Nm
M20	175 Nm	200 Nm
M24		320 Nm

Case C: Screws of property class 5.6

Case D: Screws of property class 8.8

They can be used for welding flanges as well.

10.3 Sight glasses

Also mind when mounting or replacing:

- Tighten sight glasses only with calibrated torque spanner to indicated torque. Do not use a pneumatic impact wrench.
- Tighten flanges of sight glasses in several steps to indicated torque.
- Check sight glass visually in detail before and after mounting.
- Test changed component for tightness.

Sight glasses with sealing flange

Screw size	
M8	14 Nm
M10	18 Nm

Sight glasses with union nut

Size	AF	
1 3/4-12 UN	50	150 Nm
2 1/4-12 UN	65	180 Nm

AF: width across flats in mm

Screwed sight glass

Size	
1 1/8-18 UNEF	50 Nm

10.4 Screwed joints of electrical contacts in the terminal box

Size	
M4	2 Nm
M5	5 Nm
M6	6 Nm
M8	10 Nm
M10	20 Nm
M12	40 Nm ①
M16	40 Nm ①

①: with thrust washer

10.5 Screws inside the compressor

Set screws at shaft seals

Size	
M5	3 .. 5 Nm
M6	5 .. 9 Nm
M8	10 Nm

Pressure relief valve

Size	
3/4-14 NPTF	15 .. 20 Nm

This valve vents from the pressure side (HP) to the suction side (LP) inside the compressor if the HP pressure exceeds the maximum allowable pressure.



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Subject to change
Änderungen vorbehalten
Toutes modifications réservées

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THE HEART OF FRESHNESS

TECHNICAL INFORMATION

TECHNISCHE INFORMATION
INFORMATION TECHNIQUE

ST-120-3

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SE-E1
SE-E3
SE-B2
OFC

Electrically skilled installer
Elektrisch unterwiesener Monteur
Monteur habilité



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1 Introduction

Electronic protection devices monitor the principal operating parameters and protect the compressor and the system against abnormal operating conditions. The protection devices SE-E* monitor the motor and discharge gas temperature, rotation direction and phase failure.

In addition to these functions, the SE-i1 monitors also the cycling rate and the oil supply (oil level and oil flow).

During operation, numerous operating data of the compressor can be tracked and evaluated via the integrated interface using the BEST Software, for example, the position in the application limits diagram. The data are recorded and allow a specific diagnosis and optimization of the compressor and system operation. For further details, see Technical Information CT-110.

The protection devices OFC and SE-B2 are intended for integration in the switch cabinet. They are used to monitor the oil supply.

Only the protection devices SE-E2 and SE-i1 are authorized for use with frequency inverters (FI).

This Technical Information provides an overview of all BITZER protection devices for HS.-, CS.-, OS.- and VSK screw compressors and a detailed description of the following protection devices:

- SE-E1
- SE-E3
- SE-B2
- OFC

SE-B2 and OFC are used to monitor the oil circuit for HS.- and OS.- screw compressors in connection with the protection devices SE-E* (see chapter SE-B2, page 8 and see chapter OFC, page 8).

For the following protection devices, a separate Technical Information is available:

- SE-E2: Technical Information ST-122
- SE-i1: Technical Information CT-110

2 Safety

2.1 Authorized staff

All work done on the protection devices, compressors and refrigeration systems may only be performed by qualified and authorized staff who have been trained and instructed accordingly. The local regulations and guidelines will apply with respect to the qualification and expertise of the specialists.

The protection devices have been built in accordance with state-of-the-art methods and current regulations. Particular importance was placed on user safety.

This Technical Information must be kept available near the refrigeration system during the whole lifetime of the protection device.

2.2 Residual risks

Compressors and electronic accessories may present unavoidable residual risks. This is why any person working on this device must carefully read this document!

The following regulations shall apply:

- the relevant safety regulations and standards (e.g. EN 378, EN 60204 and EN 60335),
- generally accepted safety rules,
- EU directives,
- national regulations.

2.3 Safety references

are instructions intended to prevent hazards. Safety references must be stringently observed!



NOTICE

Instructions on preventing possible damage to equipment.



CAUTION

Instructions on preventing a possible minor hazard to persons.



WARNING

Instructions on preventing a possible severe hazard to persons.



DANGER

Instructions on preventing an immediate risk of severe hazard to persons.

2.3.1 General safety references



WARNING

Risk of electric shock!



Before performing any work in the terminal box of the compressor: Switch off the main switch and secure it against being switched on again! Close the terminal box of the compressor before switching on again!



NOTICE

Potential failure of the protection device and the motor due to improper connection and/or faulty operation!

Connect properly according to the schematic wiring diagrams and check the connections for tight seat.

The cables and terminals of the PTC control circuit must not come into contact with the control voltage or operating voltage!

For work on the compressor once it has been put into operation



CAUTION

Surface temperatures of more than 60°C or below 0°C.



Risk of burns or frostbite.

Close off accessible areas and mark them.

Before performing any work on the compressor: switch it off and let it cool down.

3 Overview and technical data

The following table shows the product range of the standard protection devices for BITZER screw com-

pressors and provides a short summary of the monitoring functions. Each protection device is assigned to a compressor series in which it can be used.

Protection device	for compressors	PTC control circuit	Monitoring of					Fixation	
			Rotation direction	Phase failure	Phase symmetry	Oil management	Cycling rate		
SE-E1	HS. CSH, CSW	①	① 5 s / start	①: 3x within 18 min ①: 10x within 24 h	---	---	---	③ / ④	
SE-E2	VSK	①: 3x within 2 h ②	① 6 s / start	①: 4x within 2 h ①: 11x within 24 h ②	①: 4x within 2 h ①: 11x within 24 h ②	---	---	③ / ④	
SE-E3	HS. CSH, CSW	①	① 5 s / start	①: 3x within 18 min ①: 10x within 24 h	---	---	---	③ / ④	
SE-B2	HS. OS.	---	---	---	---	① +K1T and C1	---	③ / ④	
OFC	HS. OS.	---	---	---	---	①	---	③	
SE-i1	HS.53 .. HS.85 CS.65 .. CS.95	✓ ⑥	✓ ⑥	✓ ⑥	---	✓ ⑥	✓ ⑥	③	

Tab. 1: Overview of protection devices for screw compressors

K1T Time relay for oil flow monitoring

C1: Electrolytic capacitor

Tab. 2: Legend

① The protection device locks immediately when the respective limit value is exceeded.

② The protection device switches the compressor immediately off when the respective limit value is exceeded and switches the compressor automatically on when the nominal temperature is reached or, in the case of phase monitoring, after 10 min.

③ Can be fixed with screws.

④ Can be fitted on a top hat rail.

⑤ The protection device limits the time period between two compressor starts to at least 12 minutes (sum of running time and shut-off period) or to a shut-off period of at least 3 minutes after a longer operation time.

⑥ Further information on the complete functional range of the SE-i1 and on data communication using BEST, see Technical Information CT-110.

3.1 Technical data

	Protection devices					
	SE-E1	SE-E2	SE-E3	SE-i1	SE-B2	OFC
Operating voltage	115 / 230 V +10/-15%	24 .. 240 V +10/-25%	115 / 230 V +10/-15%	115 .. 230 +10/-15%	230 V +10/-15%	230 V ±10%
Operating frequency	50/60 Hz AC	50/60 Hz AC/DC	50/60 Hz AC	50/60 Hz AC	50/60 Hz AC	50/60 Hz AC
Motor voltage	200 .. 600 V ±10%	80 .. 575 V ±10%	600 .. 690 V ±10%	200 .. 690 V ±10%	---	---
Motor frequency range	50/60 Hz AC	20..100 Hz AC	50/60 Hz AC	20..135 Hz AC	---	---
Relay:						
• Switching voltage U_{switch}	240 V AC	240 V AC min. 100 mV ①	240 V AC	250 V AC	240 V AC	250 V AC
• Continuous current $I_{\text{continuous}}$	max. 2.5 A	max. 2.5 A min. 0.5 mA ①	max. 2.5 A	max. 2.5 A	max. 2.5 A	max. 5 A
• Switching capacity I_{switch}	300 VA	300 VA	300 VA	300 VA	300 VA	300 VA
Allowable ambient temperature	-30°C.. +60°C	-30°C.. +70°C	-30°C.. +60°C	-30°C.. +60°C	-30°C.. +70°C	-20°C.. +60°C
Required fuse	4 A quick acting	4 A quick acting	4 A quick acting	4 A quick acting	4 A quick acting	4 A quick acting
Enclosure class terminals	IP00	IP00	IP00	IP20	IP00	IP00
Suitable for operation with frequency inverter	---	80 .. 575 V ±10% 20 .. 100 Hz AC ②	---	83 .. 690 V +10% 50/60 Hz AC ③	---	---
UL homologation	Yes	---	---	is being prepared	---	---

Tab. 3: Overview of the technical data of the protection devices for screw compressors (in the case of differing requirements/operating conditions, consultation with BITZER is recommended)

①: The SE-E2 has a relay with gold contacts. After a first operation at AC/DC > 36 V or > 50 mA, the minimum switching voltage is AC/DC > 24 V and the minimum continuous current is > 20 mA.

②: Suitable for operation with soft starter at a ramp time shorter than 1 s.

③: For operation with soft starter: 200 .. 690 V AC, ±10%, 50/60 Hz AC

EMC: All protection devices comply with the EU EMC directives 2014/30/EU and 2004/108/EC.

Interference immunity:

EN 61000-6-1:2007, Immunity for residential, commercial and light-industrial environments.

EN 61000-6-2:2005, Immunity for industrial environments.

Emitted interference:

EN 61000-6-3:2007 +A1:2011, Emission standard for residential, commercial and light-industrial environments.

4 SE-E1 and SE-E3

SE-E1 and SE-E3 are protection devices for extended voltage and frequency ranges as well as for additional monitoring functions (Signal Evaluation - Enhanced).

The protection device SE-E3 has been developed for the motor voltage range of 600 V .. 690 V / 3 / 50 and 60 Hz.

- Are used for:
 - CSH and CSW series. Connection, see chapter Schematic wiring diagrams, page 9.
 - HS.53 series. Connection, see chapter Schematic wiring diagrams, page 9.
 - HS.85 series. Connection, see chapter Schematic wiring diagrams, page 9.
- Fixation options:
 - Can be fitted on a top hat rail.
 - Can be fixed with screws.
- PTC control circuit:

Sensor type:

 - Thermistors according to DIN 44081/82

Thermistor type:

1 .. 9 in series R_{25} total < 1.8 k Ω

Break point:

Relay off > 11.4 k Ω \pm 20%

Relay on > 2.95 k Ω \pm 20%

Electrical and technical data, see table 3, page 6.

4.1 Monitoring functions SE-E1 and SE-E3

Connect the SE-E1 and SE-E3 in accordance with the schematic wiring diagrams, see chapter Schematic wiring diagrams, page 9.



NOTICE

Potential failure of the compressor protection device and the motor due to improper connection and/or faulty operation!

The terminals M1-M2 or T1-T2 on the compressor and 1-2 on the protection device must not come into contact with the control voltage or operating voltage!

Temperature monitoring

SE-E1 and SE-E3 lock immediately when the preset motor, discharge gas or oil temperatures are exceeded. The respective PTC temperature sensors must be connected in series.

Rotation direction monitoring

SE-E1 and SE-E3 monitor the rotation direction within the first 5 seconds after the compressor start (operation recognition). If the compressor starts with the wrong rotation direction, SE-E1 and SE-E3 lock immediately.

Phase failure monitoring

In the event of a phase failure within the first 5 seconds after the compressor start, SE-E1 and SE-E3 interrupt immediately the relay contact in the safety chain and close it again after 6 minutes. Moreover, SE-E1 and SE-E3 lock after:

- 3 phase failures within 18 minutes and
- 10 phase failures within 24 hours.

Locked / reset

SE-E1 and SE-E3 locked: The safety chain (11/14) is interrupted, the lamp H1 is lit (signal contact 12) and indicates the fault.

To reset: Interrupt the voltage supply for at least 5 seconds. Let the compressor cool down and reset it manually.

5 SE-B2

5.1 Monitoring functions SE-B2

The SE-B2 is used for semi-hermetic and open drive screw compressors in combination with a time relay and an electrolytic capacitor for oil flow monitoring (Signal Evaluation – Basic). It is intended for installation in a switch cabinet.

- Fixation:
 - can be fitted on a top hat rail.

Connecting the oil flow monitoring

Connect the SE-B2 in accordance with the schematic wiring diagram, see chapter Schematic wiring diagrams, page 9.



NOTICE

Potential failure of the compressor protection device and the motor due to improper connection and/or faulty operation!

The terminals M1-M2 or T1-T2 on the compressor and B1-B2 on the protection device as well as its two orange cables must not come into contact with the control voltage or operating voltage!

Determine the polarity (+ / -) of the orange instrument leads of the SE-B2 using a voltmeter and connect the electrolytic capacitor with correct polarity.

Technical data, see table 3, page 6.

Locked / reset

SE-B2 locked: The safety chain (11/14) is interrupted, the lamp H1 is lit (signal contact 12) and indicates the fault.

To reset, interrupt the voltage supply for at least 5 seconds. Let the compressor cool down and reset it manually.

6 OFC

As an alternative to the SE-B2, the OFC can also monitor the oil flow (Oil Flow Control). The time relay (K1T) and electrolytic capacitor (C1) are not required for this. The OFC is intended for installation in the switch cabinet.

The OFC locks after the interruption of the oil flow switch (F7) and the end of the bridging time.

- Fixation:
 - can be fixed with screws.
- Control delay:
 - 15 .. 20 s during start procedure
 - 2 .. 3 s during operation

Connecting the oil flow monitoring

Connect the OFC in accordance with the schematic wiring diagrams, see chapter Schematic wiring diagrams, page 9.



NOTICE

Potential failure of the OFC due to improper connection and/or faulty operation!
Never apply any external voltage to the sensor inputs T11 and T12 – not even for test purposes!

Technical data, see table 3, page 6.

Locked / reset

OFC locked: The safety chain (M1/M2) is interrupted. Display via signaling contacts A1/A2, lamp H1 is lit and indicates the fault.

To reset, interrupt the voltage supply for at least 5 seconds. Let the compressor cool down and reset it manually.

Dimensional drawing OFC

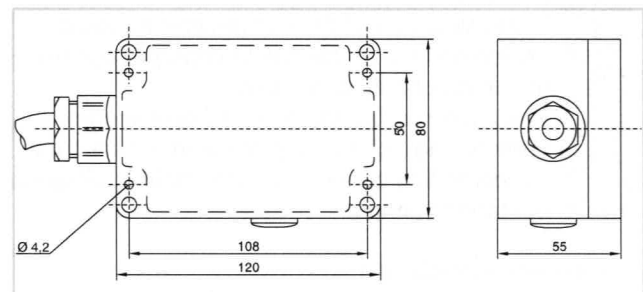


Fig. 1: Dimensional drawing OFC

7 Electrical connection

7.1 Schematic wiring diagrams

The schematic wiring diagrams show the electrical connection of the protection devices in the terminal box of the compressor or in the switch cabinet of the system. Detailed schematic wiring diagrams can be found in the corresponding applications manual:

- SH-100: HS.53 .. HS.74
- SH-110: HS.85
- SH-500: OS.53 and OS.74
- SH-500: OS.85

Legend for schematic wiring diagram

C1	Electrolytic capacitor
F7	Oil flow switch
F9	Monitoring oil stop valve
F10	Oil filter monitoring
K1T	Time relay "Oil supply monitoring" 20 s
R1	Oil heater
R2	Discharge gas and oil temperature sensor
—	Permanently wired
—	Wired on site

Open drive screw compressors

For OS.53 to OS.85, the following protection devices must be monitored in the same way as the respective semi-hermetic compressor:

- The oil flow switch (F7) for OS.53 and OS.74.
- The oil flow switch (F7) and the oil stop valve (F9) and the oil filter (F10) for OS.85.

7.1.1 CS series: Connection of the protection devices SE-E1 / SE-E3

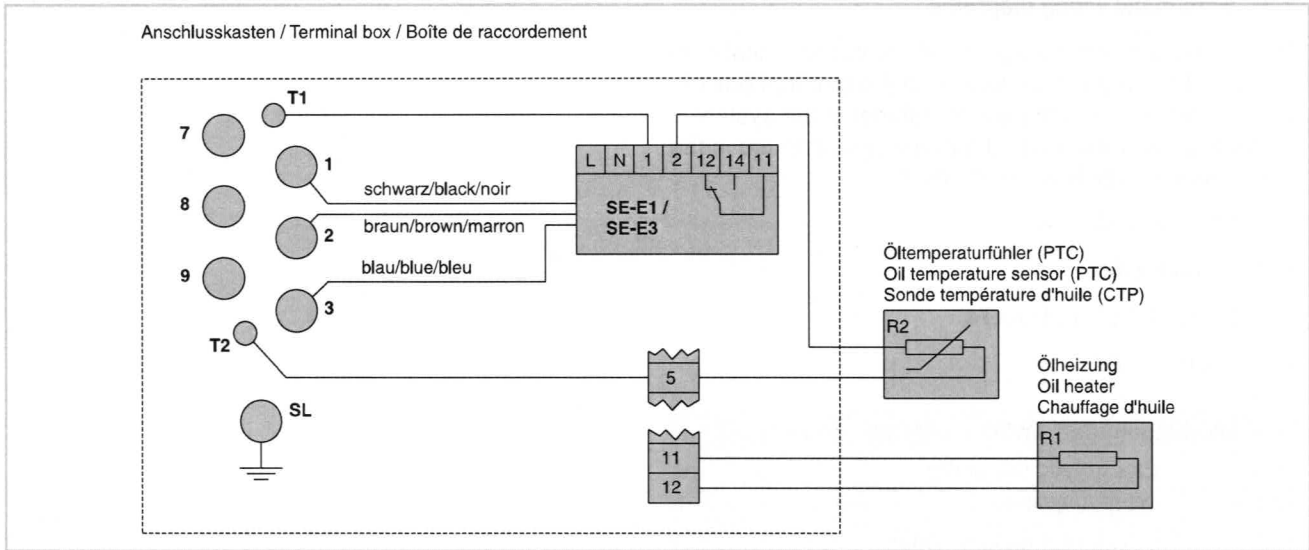


Fig. 2: CSH and CSW screw compressors: Example showing the connection of the protection devices SE-E1 / SE-E3

Legend see chapter Schematic wiring diagrams, page 9.

7.1.2 HS.53 .. HS.74: Connection of the protection devices SE-E1 / SE-E3 with SE-B2

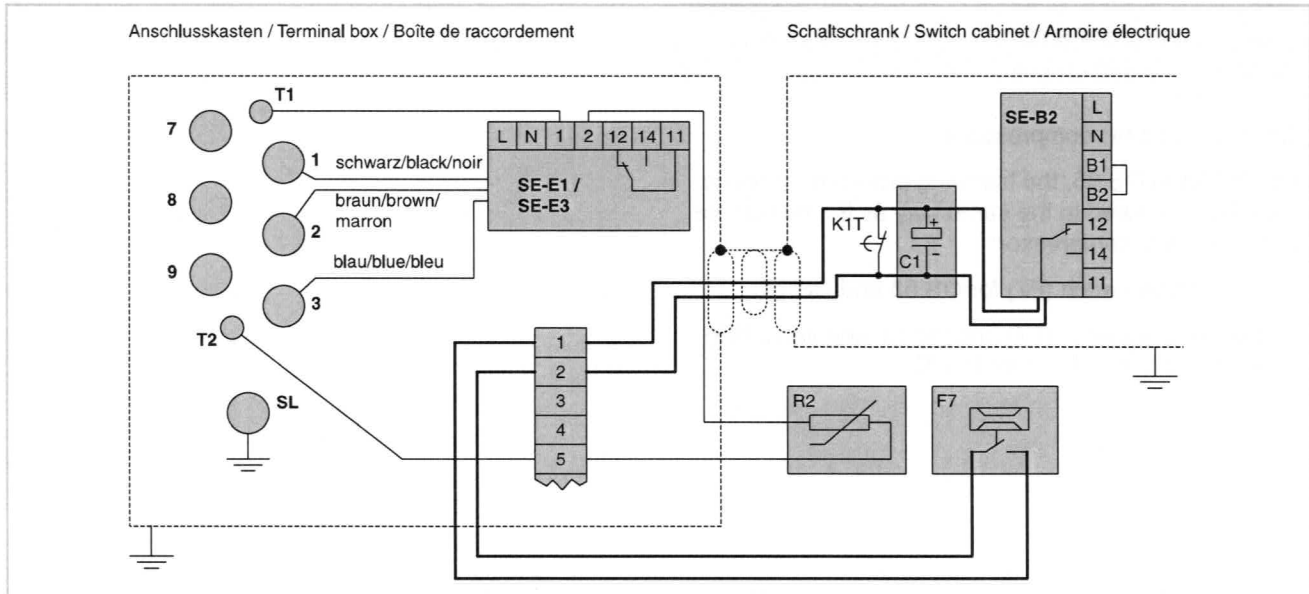


Fig. 3: HS.53 .. HS.74 screw compressors: Example showing the connection of SE-E1 / SE-E3 in the terminal box and SE-B2 in the switch cabinet

Legend see chapter Schematic wiring diagrams, page 9.

7.1.3 HS.53 .. HS.74: Connection of the protection devices SE-E1 / SE-E3 with OFC

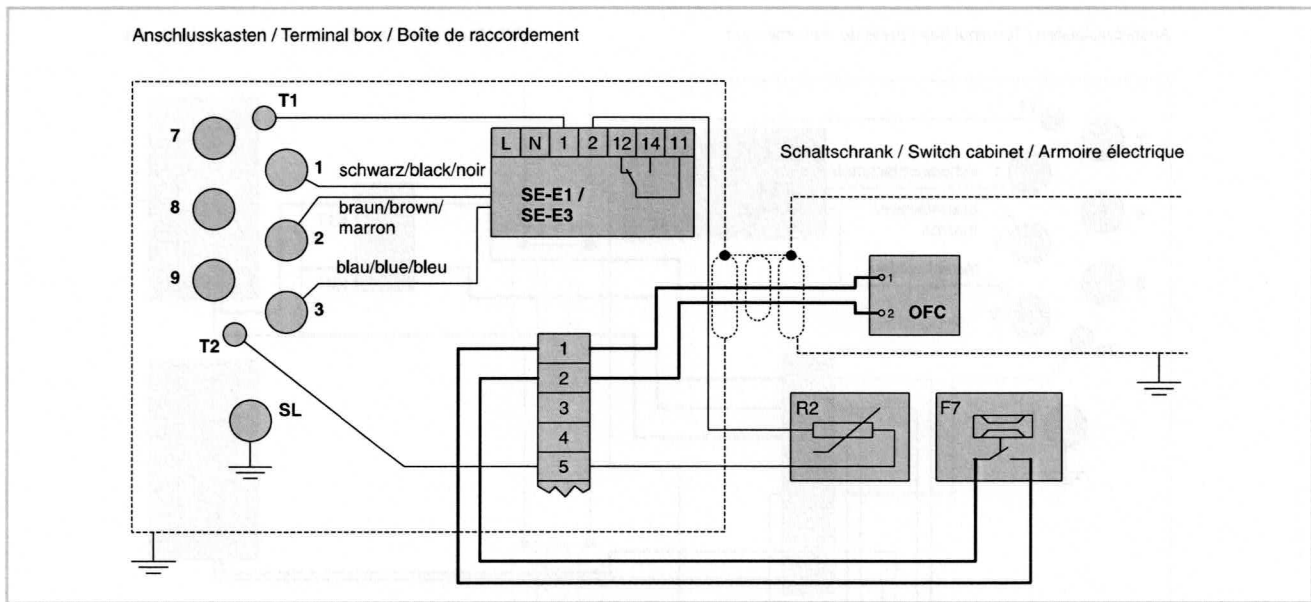


Fig. 4: HS.53 .. HS.74 screw compressors: Example showing the connection of SE-E1 / SE-E3 in the terminal box and OFC in the switch cabinet

Legend see chapter Schematic wiring diagrams, page 9.

7.1.4 HS.85: Connection of the protection devices
SE-E1 / SE-E3 with two SE-B2

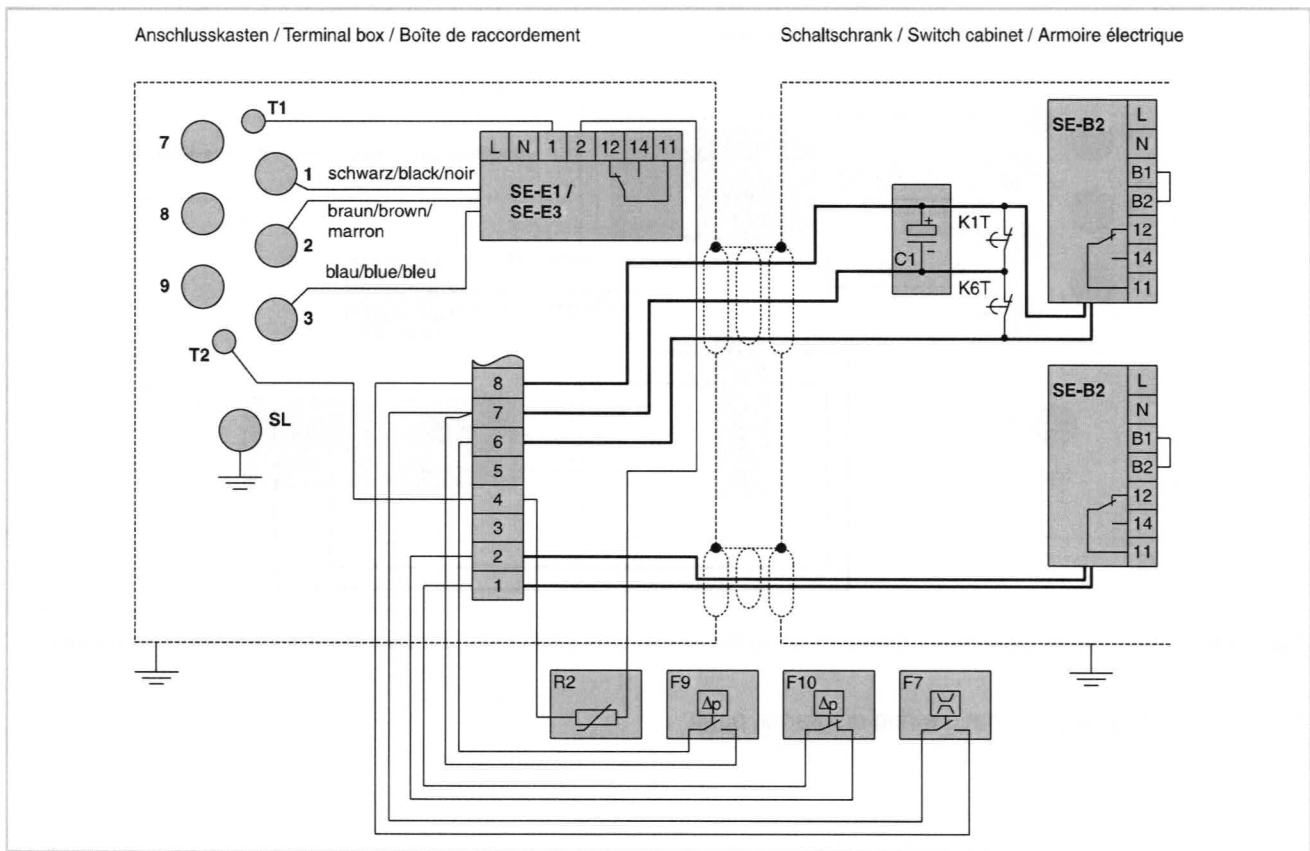


Fig. 5: HS.85 screw compressor: Example showing the connection of SE-E1 / SE-E3 in the terminal box and two SE-B2 in the switch cabinet

Legend see chapter Schematic wiring diagrams, page 9.

7.1.5 HS.85: Connection of the protection devices SE-E1 / SE-E3 with two SE-B2 and one OFC

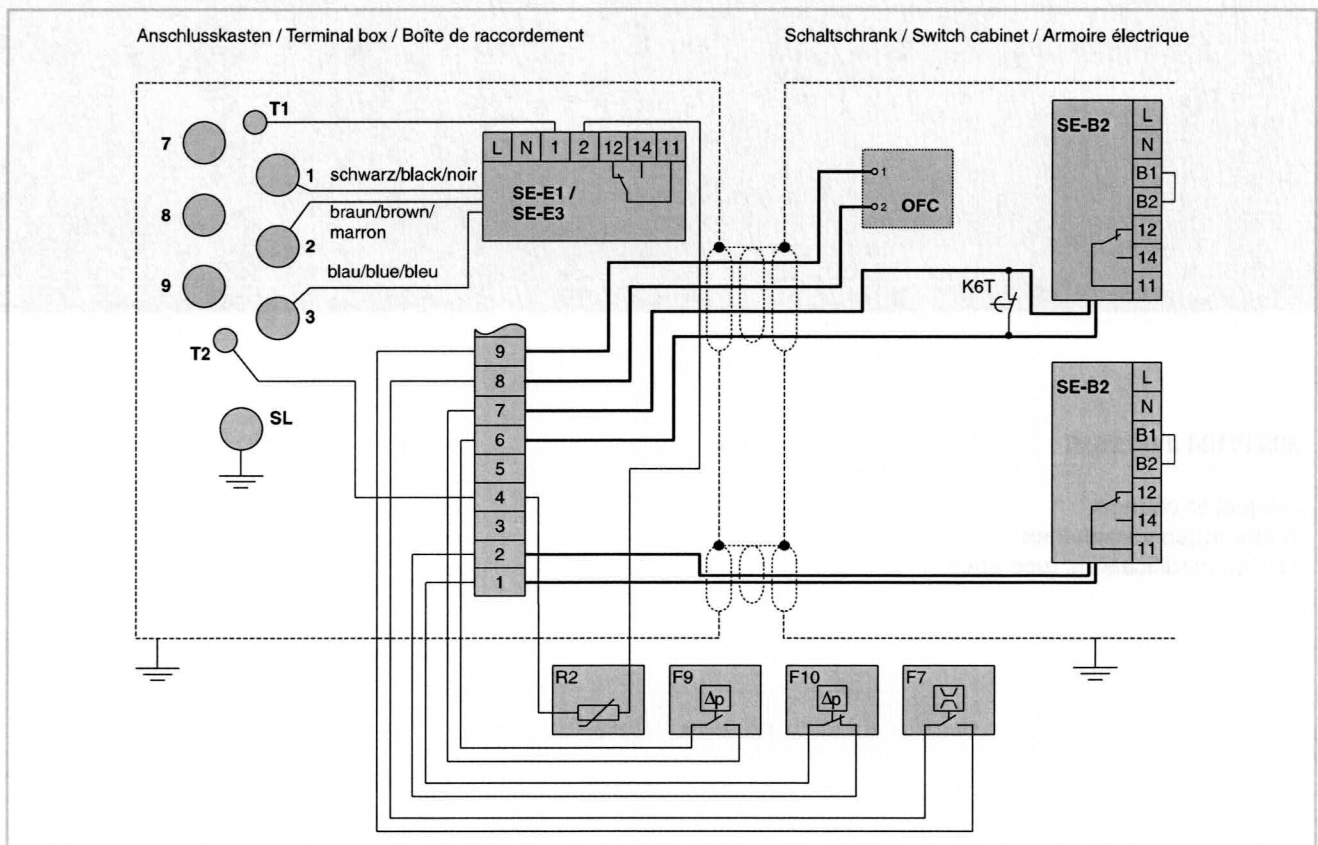
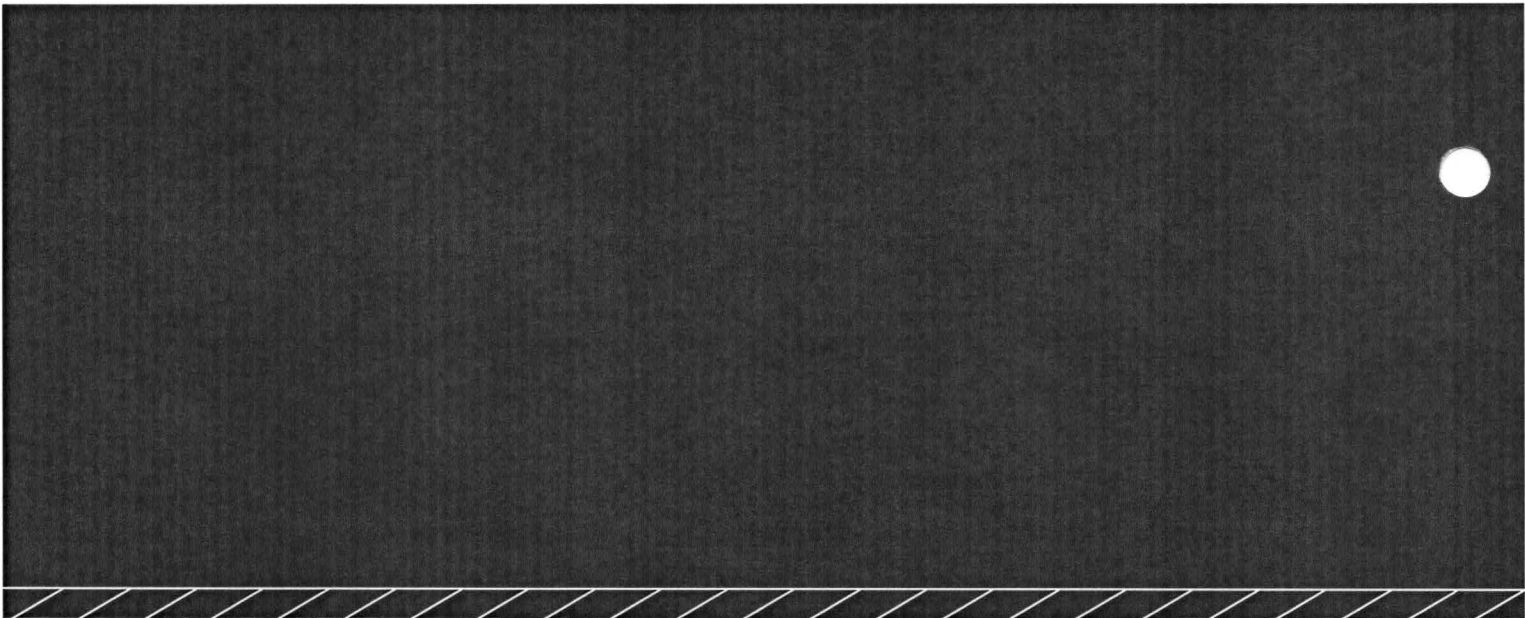


Fig. 6: HS.85 screw compressor: Example showing the connection of SE-E1 / SE-E3 in the terminal box and two SE-B2 and one OFC in the switch cabinet

Legend see chapter Schematic wiring diagrams, page 9.



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Toutes modifications réservées

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THE HEART OF FRESHNESS

MAINTENANCE INSTRUCTIONS

WARTUNGSANLEITUNG
INSTRUCTION DE MAINTENANCE

SW-100-7

Anzugsmomente für Schraubverbindungen bei Schraubenverdichtern

Tightening Torques for Screw Fixings of Screw Compressors

Couples de serrage pour assemblages vissés des compresseurs à vis

1 Normale Schraubverbindungen

1 Normal screw fixings

1 Assemblages vissés normaux

	M5	M6	M8	M10	M12	M16	M20
Ohne Flachdichtung und Schraubenqualität 8.8 oder 10.9 Without flat gasket and screw quality 8.8 or 10.9 Sans joint plat et qualité à vis 8.8 ou 10.9	7 Nm	9 Nm	23 Nm	42 Nm	80 Nm	150 Nm	220 Nm
Mit Dichtungen und Schraubenqualität 10.9 With gasket and screw quality 10.9 Avec joints plats et qualité à vis 10.9	—	16 Nm	40 Nm	80 Nm	125 Nm	220 Nm	220 Nm

- Ausschließlich neue Dichtungen verwenden!
- Metallträgerdichtungen keinesfalls einölen! Flachdichtungen dürfen leicht mit Öl benetzt werden.
- Schrauben über Kreuz und in mindestens zwei Schritten (50 / 100%) anziehen.

- Use new gaskets only!
- Do not oil gaskets with metallic support! Flat gaskets may be moistened slightly with oil.
- Tighten screws crosswise and at least in two steps (50 / 100%).

- Utiliser seulement des joints nouveaux!
- Ne pas enduire d'huile les joints comportant un support métallique! Les joints plats doivent être mouillés légèrement avec de l'huile.
- Serrer les vis à croix et au minimum en deux étapes (50 / 100%).

2 Spezielle Schraubverbindungen

2 Special screw fixings

2 Assemblages vissés spéciaux

Verschlussstopfen	Sealing plug			Bouchon de fermeture	
	1/8-27 NPTF	1/4-18 NPTF	3/8-18 NPTF	1/2-14 NPTF	3/4-14 NPTF
Stahl / Steel / Acier	15 .. 20 Nm	30 .. 35 Nm	50 .. 55 Nm	60 .. 65 Nm	80 .. 85 Nm
Messing / Brass / Laiton	35 .. 40 Nm	50 .. 55 Nm	85 .. 90 Nm	95 .. 100 Nm	120 .. 125 Nm

Gewinde sorgfältig reinigen und Stopfen mit Teflonband umwickeln.

Clean thread carefully and wrap plug with Teflon tape.

Purifier le filetage soigneusement et entourer le bouchon de bande téflon.



Verschlusschraube ① und Einschraubnippel ①	Sealing screw ① and Screwed nipple ①	Vis de fermeture ① et Nipple à vis ①	
M10		30 Nm	
M20 x 1,5		70 Nm	
M22 x 1,5		80 Nm	
M26 x 1,5		110 Nm	
M30 x 1,5		120 Nm	
G 1 1/4		180 Nm	
Verschlusschraube ② und Schraubschauglas ②	Sealing screw ② and Screwed sight glass ②	Vis de fermeture ② et Voyant à vis ②	
1 1/8-18 UNEF		50 Nm	
M22 x 1,5		40 Nm	
M52 x 1,5		100 Nm	
Rotalock-Verschraubung ③	Threaded Rotalock joint ③	Vissage Rotalock ③	
3/4-16 UNF	(SW / AF / clé 22)	50 Nm	
1-14 UNS	(SW / AF / clé 30)	85 Nm	
1 1/4-12 UNF	(SW / AF / clé 36)	105 Nm	
1 3/4-12 UN	(SW / AF / clé 50)	150 Nm	
2 1/4-12 UN	(SW / AF / clé 65)	180 Nm	
Überwurfmutter für Schauglas ③ ④	Union nut for sight glass ③ ④	Ecrou-raccord pour voyant ③ ④	
1 3/4-12 UN	(SW / AF / clé 50)	150 Nm	
2 1/4-12 UN	(SW / AF / clé 65)	180 Nm	
Gegenflansch und Absperrventil	Companion flange and shut-off valve	Contre-bride et vanne d'arrêt	
M10		50 Nm ⑥	
M12	36 Nm ⑤	100 Nm ⑥	
M16	98 Nm ⑤	150 Nm ⑥	
M18	136 Nm ⑤	200 Nm ⑥	
M20	175 Nm ⑤	200 Nm ⑥	
Kontaktschrauben der Strom- durchführungsplatte bei 20°C	Contact screws for terminal plate at 20°C	Vis contacts de plaque à bornes à 20°C	
M4	2 Nm	M8	10 Nm
M5	5 Nm	M10	20 Nm
M6	6 Nm	M12	40 Nm
Rotor (Motor) ⑦	Rotor (motor) ⑦	Rotor (moteur) ⑦	
M10		20 Nm	
M12		40 Nm	
M16		60 Nm	
Integriertes Druckentlastungsventil	Internal pressure relief valve	Soupape de décharge incorporée	
3/4-14 NPTF		15 .. 20 Nm	

- ① mit Aluminiumdichtring
- ② mit O-Ring
- ③ mit Teflonring
- ④ Überwurfmutter nur mit kalibriertem Werkzeug montieren!
- ⑤ Schraubenqualität 5.6
- ⑥ Schraubenqualität 8.8
- ⑦ Schraubenqualität 10.9

- ① with aluminium gasket ring
- ② with O-ring
- ③ with teflon ring
- ④ Mount union nut with calibrated tool only!
- ⑤ screw quality 5.6
- ⑥ screw quality 8.8
- ⑦ screw quality 10.9

- ① avec joint annulaire d'aluminium
- ② avec joint annulaire
- ③ avec joint téflon
- ④ Monter l'écrou-raccord seulement avec un outil étalonné !
- ⑤ qualité à vis 5.6
- ⑥ qualité à vis 8.8
- ⑦ qualité à vis 10.9



THE HEART OF FRESHNESS

MAINTENANCE INSTRUCTIONS

WARTUNGSANLEITUNG
INSTRUCTION DE MAINTENANCE

SW-110-2

Prüf- und Austausch- Intervalle bei halbhermeti- schen und offenen Schraubenverdichtern

Verdichtertypen

- HS.53 / HS.64 / HS.74 / HS.85
- OS.53 / OS.70 / OS.74 / OS.85

Inhalt

- 1 Allgemeine Erläuterungen
- 2 Prüf- und Austausch-Intervalle
- 3 Weitere regelmäßige Kontrollen

1 Allgemeine Erläuterungen

Verlässliche Angabe zu Prüf- und Austausch-Intervallen sind nur eingeschränkt möglich, da die Standzeiten der Verschleißteile von vielen Einflüssen abhängig sind.

Haupteinflüsse

- Betriebsbedingungen:
 - Betriebsdrücke,
 - Saug- und Druckgastemperatur,
 - Öltemperatur
- Ölart und Ölviskosität in Betrieb
- Kältemittel
- Intensität und Häufigkeit von Flüssigkeitsschüben aus dem Verdampfer
- Schalzhäufigkeit
- Zeitspanne nach dem Start bis zur Stabilisierung der Betriebsbedingungen

Inspection and Replace- ment Intervals with Semi- hermetic and Open Type Screw Compressors

Compressor types

- HS.53 / HS.64 / HS.74 / HS.85
- OS.53 / OS.70 / OS.74 / OS.85

Content

- 1 General Explanations
- 2 Inspection and replacement intervals
- 3 Further regular checks

1 General Explanations

Serious statements on inspection and replacement intervals are only possible with restrictions since the lifetimes of the working parts are determined by several influences.

Main influences

- Operating conditions:
 - operating pressures,
 - suction and discharge gas temperatures,
 - oil temperature
- Oil type and operational viscosity
- Refrigerant
- Liquid thrust rates and intensities from the evaporator
- Cycling rate
- Time after start until stable conditions are achieved

Intervalles de contrôle et de remplacement pour les com- presseurs à vis hermétiques- accessibles et ouverts

Types de compresseur

- HS.53 / HS.64 / HS.74 / HS.85
- OS.53 / OS.70 / OS.74 / OS.85

Sommaire

- 1 Généralités
- 2 Intervalles de contrôle et de remplacement
- 3 Contrôles réguliers supplémentaires

1 Généralités

Fixer des intervalles de contrôle et de remplacement est assez aléatoire car les durées de vie des pièces d'usure dépendent de nombreux facteurs.

Facteurs principaux

- Conditions de fonctionnement
 - Pressions de fonctionnement
 - Températures des gaz à l'aspiration et au refoulement
 - Température de l'huile
- Types d'huile et viscosité de l'huile durant le service
- Fluide frigorigène
- Intensité et fréquence des poussées de liquide hors de l'évaporateur
- Fréquence d'enclenchements
- Laps de temps entre démarrage et conditions de fonctionnement stables

- Ölmenge im Verdichter beim Start
 - Gefahr von hydraulischen Drucksitzen
 - Nach Sicherheitsabschaltungen besteht die Gefahr hoher Schalthäufigkeit bei geringem Öldruck
- Art und Steuerung der Ölkühlung
- Verschmutzungsgrad des Systems und des Öls

Alle nachfolgend angegebenen Prüf- und Austausch-Intervalle sind nur als Richtwerte zu verstehen. Die Zusage einer bestimmten Lebensdauer oder Eigenschaft im Sinne einer Gewährleistung ist damit nicht verbunden.

Standzeiten und Austausch-Intervalle von Verschleißteilen können nur näherungsweise angegeben werden

- bei fabrikmäßig gefertigten Systemen oder
- bei Systemen, die mit mehreren Verdichtern ausgerüstet sind (Parallelbetrieb)

und wenn gleichzeitig

- ein oder mehrere Verdichter aus der Serie oder einem Parallelsystem nach 10 000 Betriebsstunden vorsorglich überprüft werden.

Aus einem so ermittelten Verschleißbild der einzelnen Komponenten lassen sich Voraussagen treffen, die auf die spezifische Betriebsweise bezogen sind.

- Compressor oil level at start
 - risk of hydraulic pressure peaks with high level
 - risk of compressor trips and resulting high switching frequencies with low levels
- Type and control of oil cooling
- System and oil contamination levels

All given inspection and replacement intervals can only be guidelines. Any kind of assurance for a certain lifetime or characteristic feature – as defined by warranty – cannot be obliged to.

Lifetime of moving parts and replacement intervals can only be predicted approximately

- for factory produced systems or
- for systems, that are equipped with several compressors (parallel operation)

and if at the same time

- one or more compressors of the series or a parallel system are thoroughly inspected after 10 000 running hours.

The signs of wear of single components gained by this method make it possible to give predictions – always based on the specific operating conditions.

- Niveau d'huile dans le compresseur au démarrage:
 - Risque de pics de pression hydraulique
 - Risque de fréquence d'enclenchements élevée avec faible pression d'huile après des arrêts par sécurité
- Type et commande du refroidissement d'huile
- Niveau d'encrassement du système et de l'huile

Tous les intervalles de contrôle et du remplacement nommés suivant, se comptent comme valeur approximative. Ces références ne sont pas à interpréter comme étant une garantie sur la durée de vie ou sur certaines propriétés de ces pièces.

La durée de vie et les intervalles de remplacement des pièces d'usure ne peuvent être déterminés approximatif

- pour des systèmes assemblés en usine, ou
- pour des systèmes équipés de plusieurs compresseurs (fonctionnement en parallèle)

et si, simultanément

- un ou plusieurs compresseurs de la série ou d'un système fonctionnant en parallèle sont contrôlés de manière préventive après 10 000 heures de service.

Avec l'aide d'un profil d'usure des différents composants ainsi établi, il est possible de faire des prévisions pour des conditions de fonctionnement bien spécifiques.

2 Prüf- und Austausch-Intervalle

2.1 Wellenabdichtung

Leckölmengen bis zu 0,05 cm³ pro Betriebsstunde liegen im zulässigen Toleranzbereich. Gasdichtheit kann mittels eines Leckdetektors geprüft werden. Er muss für das jeweilige Kältemittel geeignet sein.

2.2 Druckentlastungs-Ventil

Das Druckentlastungs-Ventil hat eine Ansprech-Druckdifferenz von 28 bar.

Das Ventil ist wartungsfrei. Allerdings kann es nach wiederholtem Abblasen auf Grund abnormaler Betriebsbedingungen zu stetiger Leckage kommen. Folgen sind Minderleistung und erhöhte Druckgastemperatur. Ventil prüfen und ggf. austauschen.

2 Inspection and replacement intervals

2.1 Shaft seal

Leakage oil quantities up to 0.05 cm³ per operating hour are within the permitted tolerance range. Gas tightness of the shaft seal can be detected by a leak detector. It must be suitable for the respective refrigerant.

2.2 Pressure relief valve

The relieve valve has a response pressure difference of 28 bar.

The valve is maintenance free. Repeated opening of valve due to abnormal operating conditions, however, may result in steady leakage. Consequences are losses in capacity and increased discharge temperature. Check and replace valve in this case.

2 Intervalles de contrôle et de remplacement

2.1 Garniture d'étanchéité

Un débit de fuite d'huile jusqu'à 0,05 cm³ par heure de fonctionnement est encore admissible. L'étanchéité au gaz peut être contrôlée avec un détecteur de fuites. A vérifier que celui-ci est adapté au fluide frigorigène concerné.

2.2 Soupape de décharge

La soupape de décharge réagit quand la différence de pression atteint 28 bar.

Cette soupape n'exige aucun entretien. Cependant des fuites permanentes peuvent se produire après l'avoir crachée à plusieurs reprises en raison des conditions de service anormales. Capacité réduite et température du gaz de refoulement élevée sont des conséquences. Contrôler la soupape et la remplacer en cas utile.

Bauteil Part Composant	Prüfintervall Inspection interval Intervalle contrôle	Austausch-Intervall Replacement interval Intervalle de remplacement
Wellenabdichtung Shaft seal Garniture d'étanchéité	M, L ^① 10 000 h H ^② 5 000 h	20 000 h .. 40 000 h
Druckentlastungs-Ventil Pressure relief valve Soupape de décharge	siehe Kapitel 2.2 see chapter 2.2 voir chapitre 2.2	100 000 h
Rückschlagventil Check valve Clapet de retenue	5 000 h ^③	20 000 h .. 40 000 h
Öl-Magnetventil Oil solenoid valve Vanne magnétique	5 000 h ^③	100 000 h
Ölstoppventil Oil stop valve Vanne de retenue d'huile	5 000 h ^③	nur bei Leckage only in case of leakage seulement en cas de vidage
Öldurchfluss-Wächter Oil flow switch Contrôleur de débit d'huile	5 000 h ^③	100 000 h
Ölfilter Oil filter Filtre à huile	5 000 h ^④	nach den ersten / after first / après les premières 50 h .. 100 h ^④

- ① L Tiefkühl-Bereich
M Normalkühl-Bereich
- ② H Klimabereich
- ③ oder mindestens jährliche Kontrolle
anlässlich Routine-Service
- ④ nur bei Feldinstallationen

- ① L Low temperature range
M Medium temperature range
- ② H Air conditioning range
- ③ or at least annual inspection in combination with routine service check
- ④ only with field installations

- ① L Domaine de congélation
M Réfrigération à moyenne température
- ② H Domaine de climatisation
- ③ ou au minimum un contrôle annuel à l'occasion d'un entretien de routine
- ④ seulement avec installations sur le site

2.3 Integriertes Rückschlagventil

Zum Schutz des Verdichters gegen Rückwärtslauf (Expansionsbetrieb) im Stillstand ist in die Druckkammer ein Rückschlagventil eingebaut.

Wenn der Verdichter nach dem Abschalten länger als ca. 2 bis 3 Sekunden rückwärts dreht, ist dieses Ventil möglicherweise schadhaft und muss gegebenenfalls ausgetauscht werden.

i Starke Leckage des Öl-Magnetventils oder des Ölstopppventils kann zu Rückwärtslauf führen. Ventil bei Bedarf prüfen.

2.3 Integrated check valve

To protect against reverse rotation (expansion operation) during standstill a check valve is incorporated in the discharge chamber.

If the compressor runs in reverse direction for more than approx. 2 to 3 seconds after switch-off, the valve may be damaged and should be replaced if necessary.

i Strong leakage of the oil solenoid valve or of the oil stop valve can lead to reverse rotation. Check the valve if necessary.

2.3 Clapet de retenue intégré

Un clapet de retenue est monté dans la chambre haute pression afin de protéger le compresseur à l'arrêt de toute rotation inverse (fonctionnement d'expansion).

Si après le déclenchement, le compresseur tourne plus de 2 à 3 secondes environ en sens inverse, ce clapet peut être défectueux et doit être remplacé en cas utile.

i Une fuite importante de la vanne magnétique d'huile ou de la vanne de retenue d'huile peut provoquer une rotation inverse. Contrôler la vanne en cas utile.

2.4 Öl-Magnetventil und Ölstopppventil

Im Stillstand der Anlage darf bei geschlossenem Öl-Magnetventil oder Ölstopppventil kein Ölfluss im Ölschauglas sichtbar sein.

HS.53 .. HS.74 / OS.53 & OS.74: Öl-Magnetventil

Bei Leckage Membran und Stützring auf Verformungen hin überprüfen. Höhe des Stützrings max. 2,0 mm.

2.4 Oil solenoid valve and oil stop valve

During standstill of the plant and with closed oil solenoid valve or oil stop valve an oil flow must not be visible in the oil sight glass.

HS.53 .. HS.74 / OS.53 & OS.74: oil solenoid valve

In case of a leaking valve check the diaphragm and the retaining ring regarding deformations. Max. height of retaining ring is 2.0 mm.

2.4 Vanne magnétique d'huile et vanne de retenue d'huile

À l'arrêt, quand la vanne magnétique d'huile ou la vanne de retenue d'huile est fermée, aucun débit d'huile ne doit être visible dans le voyant d'huile.

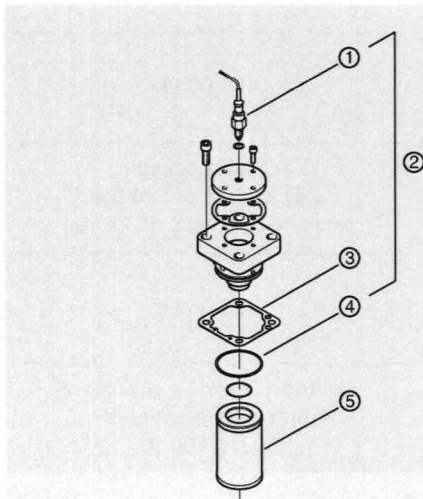
HS.53 .. HS.74 / OS.53 & OS.74: vanne magnétique d'huile

En cas de fuite, vérifier que la membrane et la bague d'appui ne sont pas déformées. Hauteur de la bague d'appui: 2,0 mm max.

HS.85 & OS.85: Ölstopppventil

HS.85 & OS.85: oil stop valve

HS.85 & OS.85: vanne de retenue d'huile



① Stößelschalter	Tappet switch	Interrupteur de coulisseu
② Ölstopppventil	Oil stop valve	Vanne de retenue d'huile
③ Flachdichtung	Flat gasket	Joint plat
④ O-Ring	O-ring	Joint annulaire
⑤ Ölfiter	Oil filter	Filtre à huile

Abb. 1 Ölstopppventil HS.85 und OS.85

Fig. 1 Oil stop valve HS.85 and OS.85

Fig. 1 Vanne de retenue d'huile HS.85 et OS.85

Bei Leckage Ölstopppventil ausbauen.

Dismount oil stop valve in case of leakage.

En cas de fuite démonter la vanne de retenue d'huile.

⚠️ Warnung!
 Ölfilter ist im Verdichter integriert und steht somit unter Druck! Schwere Verletzungen möglich. Verdichter und Ölfilter-Kammer auf drucklosen Zustand bringen! Schutzbrille tragen!

⚠️ Warning!
 Oil filter is integrated into compressor and therefore under pressure! Serious injuries possible. Release the pressure in the compressor and oil filter chamber! Wear safety goggles!

⚠️ Avertissement !
 Le filtre à huile est intégré dans le compresseur et se trouve donc sous pression ! Des blessures graves sont possibles. Evacuer la pression du compresseur et de la chambre de filtre à huile ! Porter des lunettes de protection !

Detaillierte Beschreibung von Aus- und Einbau des Ölstopppventils siehe SB-110 (HS.85) und SB-510 (OS.85) jeweils in Kapitel 6.1 "Wartung / Ölfilter".

Detailed description of dismounting and mounting of oil stop valve see SB-110 (HS.85) and SB-510 (OS.85) chapter 6.1 "maintenance / oil filter".

Description détaillée du démontage et du montage de la vanne de retenue d'huile voir SB-110 (HS.85) et SB-510 (OS.85) "maintenance / filtre à huile".

Kolben und Ventilstößel des Ölstopppventils auf Leichtgängigkeit prüfen. Ggf. Ventil ersetzen (Abb. 1). Ölfilter ebenfalls prüfen (Kapitel 2.6).

Check piston and tappet of oil stop valve for free movement. Replace valve if necessary (fig. 1). Check oil filter as well (chapter 2.6)

Vérifier le piston et le poussoir de la vanne de retenue d'huile sur souplesse. Le cas échéant remplacer la vanne (fig.1). Vérifier ainsi le filtre à huile (chapitre 2.6).

Beim Einbau neue Flachdichtung ③ und neuen O-Ring ④ verwenden.

Ensure fitted flat gasket ③ and O-ring ④ are new.

Pendant le montage utiliser un joint plat nouveau ③ et un joint annulaire nouveau ④.

Mögliche Ursache

Die Beschädigungen deuten auf hydraulische Überlastung hin. Die Ursache kann z. B. Öl- oder Kältemittel-Überflutung des Verdichters während Stillstands-Zeiten sein.

Possible reason

The damages indicate hydraulic overload. The reason could be e. g. oil or refrigerant flooding to the compressor during standstill periods.

Cause possible

Les endommagements laissent supposer une surcharge hydraulique. Le compresseur noyé durant les arrêts (huile / fluide frigorigène) peut en être la cause.

Ursache feststellen und beseitigen.

Reason must be found and eliminated.

A vérifier et faire le nécessaire pour y remédier.

2.5 Öldurchfluss-Wächter

2.5 Oil flow switch

2.5 Contrôleur de débit d'huile

Funktion prüfen

- Verdichter sollte bereits mehr als eine Minute in Betrieb sein.
- Ölzufuhr unterbrechen:
 - HS.53 .. HS.74 / OS.53 & OS.74: Stromzufuhr zum Ölmagnetventil unterbrechen.
 - HS.85 & OS.85: Serviceventil in der Ölleitung schließen.
- Nach max. 5 Sekunden muss der Öldurchfluss-Wächter den Verdichter abschalten.

Function test

- The compressor should already be in operation for more than one minute.
- Interrupt oil supply:
 - HS.53 .. HS.74 / OS.53 & OS.74: Disconnect power to the oil solenoid valve.
 - HS.85 & OS.85: Shut service valve in oil line.
- After max. 5 seconds the oil flow control must switch off the compressor.

Contrôler le fonctionnement

- Le compresseur doit déjà être en marche plus qu'une minute.
- Couper l'alimentation d'huile:
 - HS.53 .. HS.74 / OS.53 & OS.74: Couper l'alimentation électrique de la vanne magnétique.
 - HS.85 & OS.85: Fermer la vanne de service dans la conduite.
- Après 5 secondes en maximum, le contrôleur de débit d'huile doit déclencher le compresseur.

Steuerung ebenfalls prüfen

Ursache für Fehlfunktion können auch schadhafte elektrische Steuerungskomponenten sein.

Entsprechende Prüfung durchführen.

Check also electrical control

Reason for the malfunction could be damaged electrical control components as well.

Carry out an adequate examination.

Contrôler aussi la commande

Des composants défectueux de la commande électrique peuvent également être à l'origine d'un mauvais fonctionnement.

Effectuer les contrôles en conséquence.

2.6 Filterelemente

Die Prüf- und Austausch-Intervalle von Filtern sind stark abhängig vom Verschmutzungsgrad des Systems.

Bei Ölfiltern empfiehlt sich ein erster Filterwechsel nach 50 bis 100 Betriebsstunden.

HS.53 .. HS.74 / OS.53 & OS.74

Bei Druckabfall am Filter > 0,5 bar (unter stabilisierten Betriebsbedingungen) sollte die Filterpatrone ausgetauscht werden.

HS.85 & OS.85

Der Verschmutzungsgrad des Ölfilters wird im Betrieb permanent überwacht. Wenn die Signallampe der Ölfilter-Überwachung (F10) leuchtet: Ölfilter auf Verschmutzung prüfen und ggf. austauschen. Siehe dazu SB-110 (HS.85) und SB-510 (OS.85) jeweils in Kapitel 6.1 "Wartung / Ölfilter".

2.7 Wälzlager

BITZER Schraubenverdichter sind mit dauerfesten Wälzlagern ausgerüstet. Deshalb ist ein Austausch grundsätzlich nicht erforderlich unter der Voraussetzung, dass der Verdichter immer im sicheren Betriebsbereich und innerhalb der von BITZER dokumentierten Anwendungsgrenzen betrieben wird.

2.6 Filter elements

The inspection and replacement intervals of all filters depend upon the contamination level of the whole system.

For oil filters an initial filter change is recommended after 50 to 100 operating hours.

HS.53 .. HS.74 / OS.53 & OS.74

If the pressure drop increases above 0.5 bar at the filter (with stabilized operating conditions) the filter cartridge has to be changed.

HS.85 & OS.85

The oil filter's pollution degree is monitored permanently during operation. If the signal lampe of oil filter monitoring (F10) lights up, check oil filter for pollution and replace if necessary. See SB-110 (HS.85) and SB-510 (OS.85) chapter 6.1 "maintenance / oil filter".

2.7 Roller bearing

BITZER screw compressors are equipped with fatigue resistant bearings. Therefore a replacement is generally not necessary provided that the application is kept at safe conditions and within the operating limits released by BITZER.

2.6 Eléments de filtre

Les intervalles de contrôle et de remplacement des filtres dépendent avant tout du taux d'encrassement du système.

Un remplacement des filtres à huile est recommandé après 50 à 100 heures de fonctionnement.

HS.53 .. HS.74 / OS.53 & OS.74

Si la chute de pression dans le filtre > 0,5 bar (dans des conditions de fonctionnement stables), il faut procéder au remplacement de la cartouche filtrante.

HS.85 & OS.85

Le degré de pollution du filtre à l'huile est surveillé toujours pendant qu'il est en marche. Si la lampe du contrôle du filtre à l'huile (F10) s'allume: Vérifier le filtre à l'huile au point de vue de la pollution et l'échanger éventuellement. Voir SB-110 (HS.85) et SB-510 (OS.85) "maintenance / filtre à huile".

2.7 Paliers à roulements

Les compresseurs à vis BITZER sont équipés de paliers à roulements résistants à la fatigue. Ainsi, un remplacement n'est en principe pas nécessaire, sous réserve que le compresseur fonctionne en permanence dans la plage de fonctionnement préconisée et dans les limites d'application indiquées par BITZER.

Wälzlager Roller bearing Palier à roulement	Prüfintervall / Austausch-Intervall Inspection interval / Replacement interval Intervalle de contrôle / Intervalle de remplacement			
	Kältemittel Refrigerant Fluide frigorigène	Klimabereich Air conditioning Climatisation	Normalkühlung Medium temperature Réfrigération normale	Tiefkühlung Low temperature Congélation
bei normalem Betrieb		with normal operation	en fonctionnement normal	
R134a		10 000 h / 50 000 h	10 000 h / 50 000 h	—
R404A / R507A / R407C / R22 / NH ₃		10 000 h / 40 000 h	10 000 h / 40 000 h	10 000 h / 50 000 h
Betrieb vorwiegend oberhalb 50°C Verflüssigungstemperatur		predominant operation above 50°C condensing temperature	fonctionnement principalement au-dessous de 50°C température de condensation	
R134a		10 000 h / 40 000 h	10 000 h / 50 000 h	—
R404A / R507A / R407C / R22 / NH ₃		10 000 h / 30 000 h	10 000 h / 40 000 h	10 000 h / 40 000 h

Wälzlager prüfen

Die Wälzlager werden anhand einer Geräuschanalyse geprüft. Empfohlene Prüfintervalle siehe Tabelle.

Für eine vorbeugende Wartung sind ebenfalls Austausch-Intervalle der Wälzlager angegeben. Im Falle eines störungsfreien Betriebs ist dann aber das volle Lebensdauer-Potenzial der Lager nicht ausgeschöpft.

i Bei Austausch der Wälzlager sollten auch die Rotoren, das Gehäuse sowie der Druckflansch optisch überprüft werden. Bei starken Riefen oder abnormalem Verschleiß empfiehlt sich eine Generalüberholung des Verdichters oder dessen Austausch.

Prüf- und Austausch-Intervalle

Austausch-Intervalle bei regelmäßiger Wartung siehe Tabelle. In diesem Fall wird die gesamte Lebensdauer der Wälzlager nicht ausgeschöpft.

Ein Austausch der Lager kann erforderlich werden durch gelegentliche Abweichungen vom normalen Betrieb wie Ölangel, Ölverdünnung durch Nassbetrieb, zu geringe Sauggas-Überhitzung oder thermische Überlastung.

Checking the roller bearing

Bearing wear detection is to be carried out by a sound analysis. For recommended inspection intervals see table.

For a preventive maintenance the replacement intervals of the bearings are also listed in the table. In case of normal operation, however, the total life span potential of the bearings is not reached.

i At bearing change the rotors, the housing and the discharge flange should also be checked visually. With severe scores or distinct signs of wear a general overhaul or the replacement of the entire compressor should be considered.

Inspection and replacement intervals

Replacement intervals see table if preventive maintenance is intended. In this case, however, the total life span potential for normal operation of the bearings is not reached.

A bearing change might become necessary due to occasional deviations from normal operating conditions like lack of oil, wet operation, insufficient suction superheat or thermal overload.

Contrôle des paliers à roulements

Le contrôle des paliers à roulements repose sur une analyse acoustique. Voir tableau pour les intervalles de contrôle recommandés.

Des intervalles de remplacement des paliers à roulements dans le cadre d'un entretien préventif sont également indiqués. Dans le cas d'un fonctionnement sans problèmes, le potentiel de durée de vie des roulements n'est pas totalement épuisé alors.

i Lors du remplacement des paliers à roulements, un contrôle visuel des rotors, du carter, ainsi que de la bride au refoulement est à envisager. Une révision générale du compresseur ou son remplacement s'impose en cas de stries prononcées ou d'usure anormale.

Intervalles de contrôle et de remplacement

Pour les intervalles de remplacement dans le cadre d'un entretien régulier, voir tableau. Dans ce cas, la durée de vie totale des paliers à roulements n'est pas épuisée.

Un remplacement des paliers peut s'avérer nécessaire en cas d'écarts occasionnels des conditions de fonctionnement normales engendrés par un manque d'huile, une huile diluée lors d'un fonctionnement en noyé, une surchauffe à l'aspiration trop faible ou une surcharge thermique.

2.8 Kupplung (OS.-Modelle)

Elastomer-Elemente

- nach der Einlaufzeit prüfen
- danach jährlich prüfen

Elastomer-Elemente auf Verschleiß prüfen

- Beide Kupplungshälften ohne Drehmoment gegeneinander bis zum Anschlag drehen.
- Markierung auf beiden Hälften anbringen (siehe Abb. 2).
- Kupplungshälften ebenfalls ohne Drehmoment bis zum Anschlag in die andere Richtung drehen.
- Radialen Abstand zwischen beiden Markierungen messen.
- Alle Elastomer-Elemente tauschen, wenn der Abstand 4 mm überschreitet.

2.8 Coupling (OS. models)

Elastomer elements

- check after running-in period
- thereafter check annually

Check elastomer elements for wear

- Turn both clutch halves against each other (without torque) until stop position.
- Mark both halves (see fig. 2).
- Turn clutch halves (also without torque) in other direction until stop position.
- Measure radial distance between the two marks.
- Replace all elastomer elements if the distance exceeds 4 mm.

2.8 Accouplement (modèles OS.)

Éléments d'élastomère

- contrôler après la période de rodage
- contrôler en suite anuellement

Vérifier l'abrasion des éléments d'élastomère

- Tourner les deux demi-manchons d'accouplement (sans moment de torsion) l'un vers l'autre jusqu'à l'arrêt.
- Marquer les deux demi-manchons (voir fig. 2).
- Tourner les deux demi-manchons d'accouplement (pareillement sans moment de torsion) jusqu'à l'arrêt dans l'autre sens.
- Mesurer la distance radiale des deux marquages.
- Changer tous les éléments d'élastomère quand la distance dépasse 4 mm.

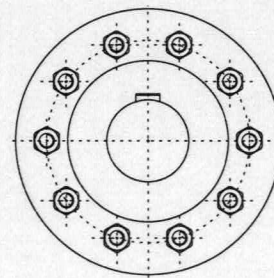
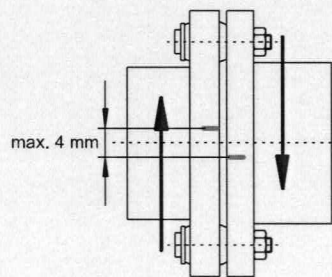
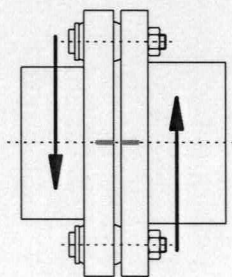


Abb. 2 Elastomer-Elemente der Kupplung prüfen

Fig. 2 Checking the elastomer elements of the clutch

Fig. 2 Vérifier les éléments d'élastomère d'accouplement

3 Weitere regelmäßige Kontrollen

Anlage entsprechend den nationalen Vorschriften regelmäßig prüfen. Dabei folgende Punkte ebenfalls kontrollieren:

- Betriebsdaten (Kapitel 3.1)
- Schutz-Einrichtungen und alle Teile zur Überwachung des Verdichters
Siehe Betriebsanleitung:
- SB-100: HS.53 .. HS.74
- SB-110: HS.85
- SB-500: OS.53 & OS.74
- SB-510: OS.85
- Verschraubungen und elektrische Kabel-Verbindungen auf festen Sitz prüfen.
Schrauben-Anzugsmomente siehe SW-100.
- Kältemittelfüllung und Dichtheitsprüfung
- Datenprotokoll pflegen.

3.1 Betriebsdaten überprüfen

- Verdampfungstemperatur
- Sauggasttemperatur
- Verflüssigungstemperatur
- Druckgastemperatur
- mind. 30 K (R407C, R22, NH₃)
mind. 20 K (R134a, R404A, R507A)
über Verflüssigungstemperatur
- max. 100°C
- Öltemperatur:
- HS.-Modelle:
maximal 100°C
mit Öl B100 maximal 80°C
- OS.-Modelle:
B150SH / BSE170: max. 90°C
B100 max. 80°C
MO* mit 32 / 46 cSt max. 50°C
MO* mit 68 cSt max. 60°C
PAO*: SHC226E max. 60°C
- Schalthäufigkeit siehe unten
- Strom
- Spannung
- Bei Betrieb mit ECO:
- ECO-Druck
- Temperatur am ECO-Anschluss

* MO: Mineralöl
PAO: Polyalpha-Olefin

3 Further regular checks

Examine regularly the plant according to national regulations. The following points should also be checked:

- Operating data (chapter 3.1)
- Protection devices and all compressor monitoring parts see Operating Instructions:
- SB-100: HS.53 .. HS.74
- SB-110: HS.85
- SB-500: OS.53 & OS.74
- SB-510: OS.85
- Check screwed joints and electrical cable connections on tight fitting. Tightening torques see SW-100.
- Refrigerant charge and tightness test
- Update data protocol.

3.1 Checking operating data

- Evaporation temperature
- Suction gas temperature
- Condensing temperature
- Discharge gas temperature
- at least 30 K (R407C, R22, NH₃)
at least 20 K (R134a, R404A, R507A)
above condensing temperature
- max. 100°C
- Oil temperature
- HS. models:
100°C maximum
with oil B100 80°C maximum
- OS. models:
B150SH / BSE170: max. 90°C
B100 max. 80°C
MO* with 32 / 46 cSt max. 50°C
MO* with 68 cSt max. 60°C
PAO*: SHC226E max. 60°C
- Cycling rate see below
- Current
- Voltage
- Operation with ECO:
- ECO pressure
- Temperature at ECO connection

* MO: Mineral oil
PAO: Poly-alfa-olefin

3 Contrôles régulières supplémentaires

Vérifier l'installation régulièrement conformément aux réglementations nationales. Les points suivants devraient être contrôlés:

- Caractéristiques de service (chap. 3.1)
- Dispositifs de protection et toutes pièces, qui surveillent le compresseur
Voir instruction de service:
- SB-100: HS.53 .. HS.74
SB-110: HS.85
- SB-500: OS.53 & OS.74
- SB-510: OS.85
- Vérifier les vissages et les raccords des câbles électriques sur ajustement solide.
Couples de serrage voir SW-100.
- Remplissage de fluide frigorigène, essai d'étanchéité
- Soigner le procès-verbal.

3.1 Contrôle des conditions de fonctionnement

- Température d'évaporation
- Température du gaz aspiré
- Température de condensation
- Température du gaz au refoulement
- au moins de 30 K (R407C, R22, NH₃)
au moins de 20 K (R134a, R404A, R507A)
plus élevée que la température de condensation
- max. 100°C
- Température de l'huile:
- Modèles HS.:
100°C en maximum
avec l'huile B100 80°C en maximum
- Modèles OS.:
B150SH / BSE170: max. 90°C
B100 max. 80°C
MO* avec 32 / 46 cSt max. 50°C
MO* avec 68 cSt max. 60°C
PAO*: SHC226E max. 60°C
- Fréquence d'enclenchements
voir en dessous
- Courant
- Tension
- Fonctionnement avec ECO:
- Pression ECO
- Température au raccord ECO

* MO: Huile minérale
PAO: Poly-alpha-oléfine

Einsatzgrenzen

Siehe BITZER Software oder jeweiliger Prospekt / Projektierungs-Handbuch:

- SP-100 / SH-100: HS.53 .. HS.74
- SP-110 / SH-110: HS.85
- SP-500 / SH-500: OS.53 & OS.74
- SP-510 / SH-510: OS.85

Schalzhäufigkeit



Achtung!

Gefahr von Verdichterausfall!
Unbedingt folgende Anforderungen durch entsprechende Steuerungslogik einhalten:

- Maximale Schalzhäufigkeit
6 bis 8 Starts pro Stunde!
- Anzustrebende Mindestlaufzeit
5 Minuten!

Application limits

See BITZER Software or respective brochure / Applications Manual:

- SP-100 / SH-100: HS.53 .. HS.74
- SP-110 / SH-110: HS.85
- SP-500 / SH-500: OS.53 & OS.74
- SP-510 / SH-510: OS.85

Cycling rate



Attention!

Danger of severe compressor damage!
The following requirements must be ensured by the control logic:

- Maximum cycling rate
6 to 8 starts per hour!
- 5 minutes minimum operating time desired!

Limites d'application

Voir BITZER Software ou spécifique prospectus / manuel de mise en œuvre:

- SP-100 / SH-100: HS.53 .. HS.74
- SP-110 / SH-110: HS.85
- SP-500 / SH-500: OS.53 & OS.74
- SP-510 / SH-510: OS.85

Fréquence d'enclenchements



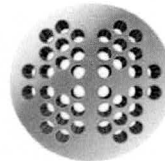
Attention !

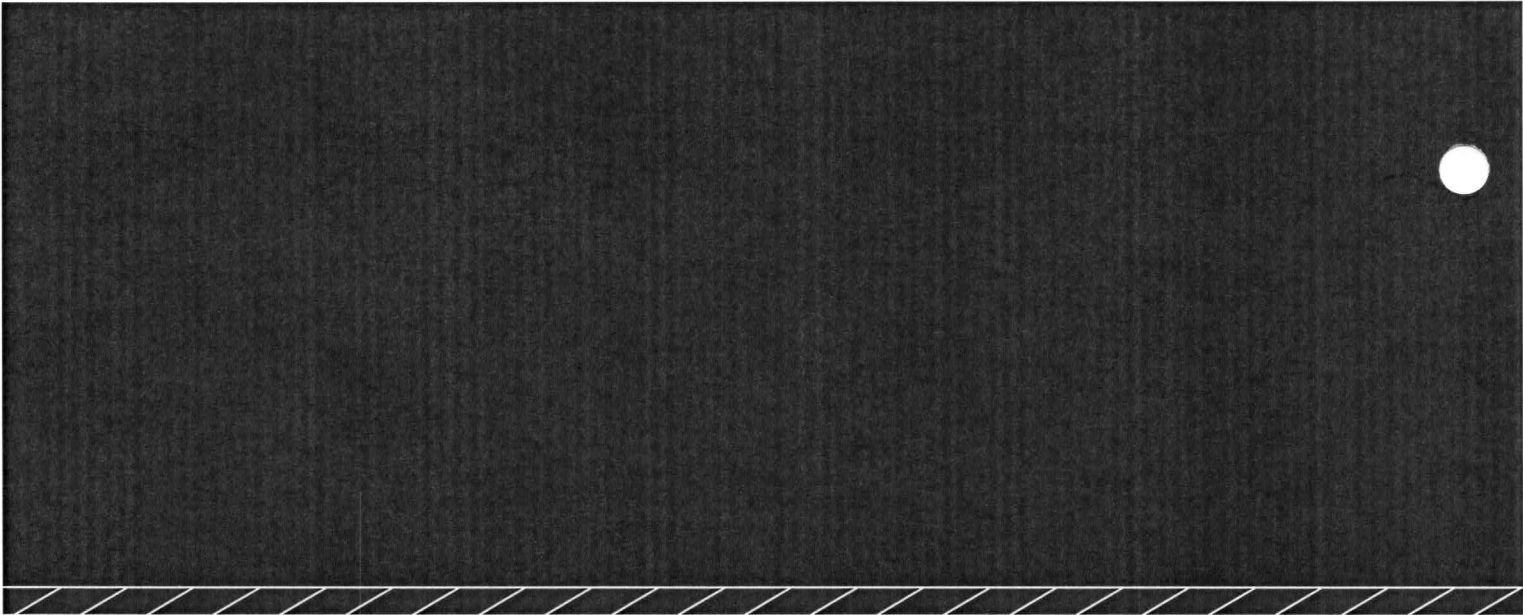
Risque de défaillance du compresseur !
Les conditions suivantes doivent absolument assurées par la logique de commande:

- Fréquence maximale d'enclenchements
6 à 8 démarrages par heure !
- Durée de marche à atteindre au minimum: 5 minutes !

Notes

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