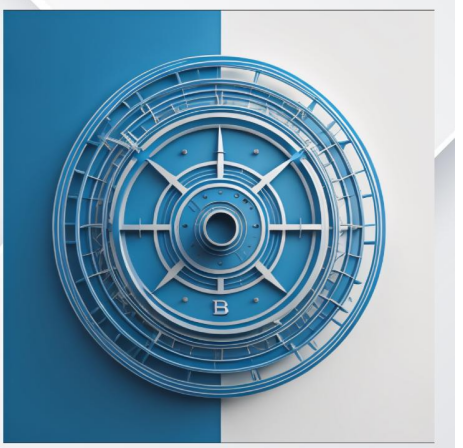
Service Manual

Screw Compressor

FSD SIGMA CONTROL 2

9_5894 22 E



Manufacturer:

KAESER KOMPRESSOREN

96410 Coburg • PO Box 2143 • GERMANY • Tel. +49-(0)9561-6400 • Fax +49-(0)9561-640130

http://www.kaeser.com

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KAESER KOMPRESSOREN

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1 Regarding this document

1.1 Using this document

The operating manual is a component of the product. It describes the machine as it was at the time of first delivery after manufacture.

- ➢ Keep the operating manual in a safe place throughout the life of the machine.
- ➢ Supply any successive owner or user with this operating manual.
- ➢ Please insert any amendment or revision of the operating manual sent to you.
- ➢ Enter details from the machine nameplate and individual items of equipment in the table in chapter 2.

1.2 Further documents

Further documents included with this operating manual are:

- Certificate of acceptance / operating instructions for the pressure vessel
- Declaration of Conformity in accordance with the applicable directive
- Operating manual for SIGMA CONTROL 2

Missing documents can be requested from KAESER.

- ➢ Make sure all documents are complete and observe the instructions contained in them.
- ➢ Make sure you provide the data from the nameplate when ordering documents.

1.3 Copyright

This service manual is copyright protected. Queries regarding use or duplication of the documentation should be referred to KAESER. Correct use of information will be fully supported.

1.4 Symbols and labels

- ➢ Please note the symbols and labels used in this document.

1.4.1 Warnings

Warning notices indicate dangers that may result in injury when disregarded.

Warning notices indicate three levels of danger identified by the corresponding signal word:

Signal term	Meaning	Consequences of disregard
DANGER	Warns of an imminent danger	Will result in death or severe injury
WARNING	Warns of a potentially imminent danger	May result in death or severe injury
CAUTION	Warns of a potentially dangerous situation	May result in a moderate physical injury

Tab. 1 Danger levels and their definition (personal injury)

Warning notices preceding a chapter apply to the entire chapter, including all sub-sections.
Example:

DANGER
The type and source of the imminent danger is shown here!
The possible consequences of ignoring a warning are shown here.
If you ignore the warning notice, the "DANGER" signal word indicates a lethal or severe injury will occur.

➢ The measures required to protect yourself from danger are shown here.

Warning notes referring to a sub-section or the subsequent action are integrated into the procedure and numbered as an action.

Example:

1. WARNING!
   The type and source of the imminent danger is shown here!
   The possible consequences of ignoring a warning are shown here.
   If you ignore the warning notice, the "WARNING" signal word indicates that a lethal or severe injury may occur.
   ➢ The measures required to protect yourself from danger are shown here.
2. Always read and comply with warning instructions.

1.4.2 Potential damage warnings

Contrary to the warnings shown above, damage warnings do not indicate a potential personal injury.

Warning notices for damages are identified by their signal term.

Signal term	Meaning	Consequences of disregard
NOTICE	Warns of a potentially dangerous situation	Damage to property is possible

Tab. 2 Danger levels and their definition (damage to property)

Example:

NOTICE
The type and source of the imminent danger is shown here!
Potential effects when ignoring the warning are indicated here.

➢ The protective measures against the damages are shown here.

➢ Carefully read and fully comply with warnings against damages.

1.4.3 Other alerts and their symbols

This symbol identifies particularly important information.

Material — Here you will find details on special tools, operating materials or spare parts.

Precondition — Here you will find conditional requirements necessary to carry out the task.
The conditions relevant to safety shown here will help you to avoid dangerous situations.

Option H1 — ➢ This symbol denotes lists of actions comprising one stage of a task.
Operating instructions with several steps are numbered in the sequence of the operating steps.
Information relating to one option only are marked with an option code (e.g., H1 indicates that this section applies only to machines with screw-in machine feet). Option codes used in this service manual are explained in chapter 2.2.

Information referring to potential problems are identified by a question mark.
The cause is named in the help text ...
➢ ... as is a solution.

This symbol identifies important information or measures regarding the protection of the environment.

Further information — Further subjects are introduced here.

2 Technical Specifications

2.1 Nameplate

The machine's nameplate provides the model designation and important technical information.

The nameplate is located on the outside of the machine:

- above the cooler,
  or
- on the rear of the machine.

➢ Enter here the nameplate data as a reference:

Feature	Value
Rotary Screw Compressor	
Part No.	
Serial No.	
Year of manufacture	
Rated power	
Rated motor speed	
Maximum working pressure	
Ambient temperature	

Tab. 3 Nameplate

2.2 Optional accessories

The table contains a list of possible options.

➢ Enter options here as a reference.

Option	Option code	Available?
Modulating control	C1	
SIGMA CONTROL 2	C3	
Adjustable machine mountings	H1	
Air-cooling	K1	
Water cooling	K2	
Cooling-air filter mat	K3	
Prepared for heat recovery	W1	

Tab. 4 Optional accessories

2.3 Weight

The weight given is the maximum. The actual weights of the machine are dependent on the individually mounted equipment.

	FSD 471	FSD 501	FSD 571
Weight [kg]	6825	6550	7100

Tab. 5 Machine weight

2.4 Select Temperature

	FSD 471	FSD 501	FSD 571
Minimum cut-in temperature [°C]	3	3	3
Typical compressor block discharge temperature during operation [°C]	65–100	65–100	65–100
Maximum compressor block discharge temperature (automatic safety shut-down) [°C]	110	110	110

Tab. 6 Select Temperature

2.5 Ambient conditions

	FSD 471	FSD 501	FSD 571
Maximum elevation amsl* [m]	1000	1000	1000
Permissible ambient temperature [°C]	3–45	3–45	3–45
Cooling air temperature [°C]	3–45	3–45	3–45
Intake air temperature [°C]	3–45	3–45	3–45

* Higher altitudes are permissible only after consultation with the manufacturer.

Tab. 7 Ambient conditions

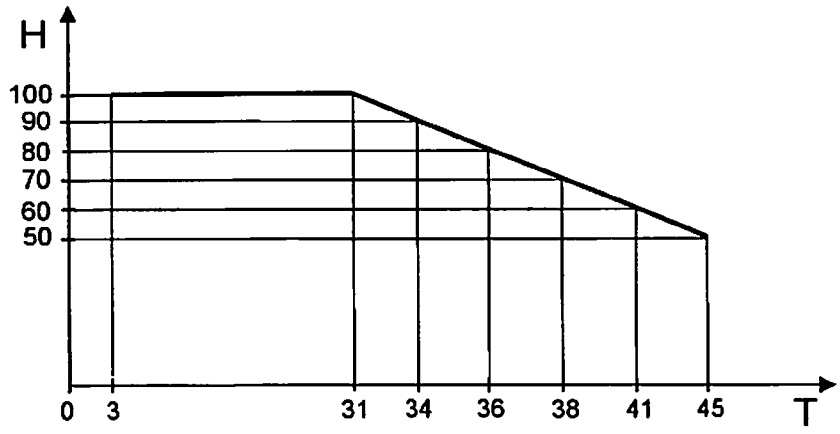

Fig. 1 Maximum relative humidity of intake air

(T) Intake air temperature [°C]
(H) Maximum relative humidity of intake air [%]

2.6 Ventilation

The values given are minimum guide values.

Mains frequency 50 Hz

	FSD 471	FSD 571
Inlet aperture (Z) [m²] see illustration 11.	6.0/0.9*	7.0/1.1*
Extractor for forced ventilation: Flow rate [m³/h] at 100 Pa	13000*	16000*
Exhaust duct: Dimensions [mm]	1900 x 1000	1900 x 1000

* Option K2

Tab. 8 Overview Ventilation (50 Hz)

Mains frequency 60 Hz

	FSD 471	FSD 501	FSD 571
Inlet aperture (Z) [m²] see illustration 11.	6.0/0.9*	7.0/1.1*	7.0/1.1*
Extractor for forced ventilation: Flow rate [m³/h] at 100 Pa	13000*	16000*	16000*

* Option K2

	FSD 471	FSD 501	FSD 571
Exhaust duct: Dimensions [mm]	1900 x 1000	1900 x 1000	1900 x 1000

* Option K2

Tab. 9 Overview Ventilation (60 Hz)

2.7 Pressure

Maximum working pressure: (see nameplate)

Pressure relief valve activating pressure at 50 Hz [bar]:

Maximum working over-pressure [bar]	FSD 471	FSD 571
8.0	10.0	10.0
10.0	11.5	—
12.0	14.0	14.0
13.5	—	16.0
15.0	—	16.0

* China: 15.9

Tab. 10 Pressure relief valve activating pressure (50Hz)

Pressure relief valve activating pressure at 60 Hz [bar]:

Maximum working over-pressure [bar]	FSD 471	FSD 501	FSD 571
8.5	10.0	10.0	10.0
10.0	11.5	11.5	—
12.0	14.0	—	14.0
15.0	—	—	16.0

Tab. 11 Pressure relief valve activating pressure (60Hz)

2.8 Delivery

FAD [m^3/min] at 50 Hz mains frequency

Maximum working pressure [bar]	FSD 471	FSD 571
8.0	47.0	57.0
10.0	40.5	—
12.0	35.5	46.0
13.5	—	39.3

Maximum working pressure [bar]	FSD 471	FSD 571
15.0	—	34.4

Tab. 12 FAD (50 Hz)

FAD [m³/min] at 60 Hz mains frequency

Maximum working pressure [bar]	FSD 471	FSD 501	FSD 571
8.5	43.1	49.4	56.3
10.0	—	49.0	—
12.0	36.0	—	42.4
15.0	—	—	35.4

Tab. 13 FAD (60 Hz)

2.9 Cooling oil recommendation

A sticker showing the type of oil filled is to be found near the oil separator filling port.
Information on ordering cooling oil is found in chapter 11.

Cooling oils for general applications

	SIGMA FLUID		
	MOL	S-460	S-570
Description	Mineral oil	Silicone-free synthetic oil	Synthetic oil
Application:	Standard oil for all applications except in connection with foodstuffs. Particularly suitable for machines with a low duty cycle.	Standard oil for all applications except in connection with foodstuffs. Particularly suitable for machines with a high duty cycle. Not suitable for East- / South-East-Asian countries.	Standard oil for East- / South-East-Asian countries, suitable for all applications except food processing. Particularly suitable for machines with a high duty cycle.
Approval	—	—	—
Viscosity at 40°°C	44 mm²/s (DIN 51562-1)	45 mm²/s (D 445; ASTM test)	52.8 mm²/s (D 445; ASTM test)
Viscosity at 100 °C	6.8 mm²/s (DIN 51562-1)	7.2 mm²/s (D 445; ASTM test)	8.0 mm²/s (D 445; ASTM test)
Flash point	220 °C (ISO 2592)	238 °C (D 92; ASTM test)	258 °C (D 92; ASTM test)
Density at 15 °C	—	864 kg/m³ (ISO 12185)	0.869 kg/l (D 1298; ASTM test)
Pour point	-33 °C (ISO 3016)	-46 °C (D 97; ASTM test)	-54 °C (D 97; ASTM test)

	SIGMA FLUID		
	MOL	S-460	S-570
Demulsibility at 54 °C	—	40/40/0/10 min (D 1401; ASTM test)	15 min (D 1401; ASTM test)

Tab. 14 Cooling oil recommendation

Cooling oils for applications in food processing

	SIGMA FLUID	
	FG-460	FG-680
Description	Synthetic oil	Synthetic oil
Application	Specifically for applications where the compressed air comes into contact with foodstuffs.	Specifically for applications where the compressed air comes into contact with foodstuffs.
Approval	USDA H-1, NSF Approved for the manufacture of food packaging, meat and poultry processing and other food processing applications.	USDA H-1, NSF Approved for the manufacture of food packaging, meat and poultry processing and other food processing applications.
Viscosity at 40°°C	50.7 mm^2/s (D 445; ASTM test)	70.0 mm^2/s (D 445; ASTM test)
Viscosity at 100 °C	8.2 mm^2/s (D 445; ASTM test)	10.4 mm^2/s (D 445; ASTM test)
Flash point	245 °C (D 92; ASTM test)	245 °C (D 92; ASTM test)
Density at 15 °C	—	—
Pour point	—	—
Demulsibility at 54 °C	—	—

Tab. 15 Cooling oil recommendation (food processing)

Cooling oils for the operation with snow cannons

	SIGMA FLUID
	PANOLIN HLP SYNTH 46
Description	Saturated synthetic ester with additives (mineral oil free). Easily biologically degradable as per OECD criteria.
Application	Specifically designed for machines intended for the operation with snow cannons.
Approval	—
Viscosity at 40°°C	47 mm^2/s
Viscosity at 100 °C	8.1 mm^2/s
Flash point	> 210 °C

	SIGMA FLUID
	PANOLIN HLP SYNTH 46
Density at 15 °C	0.92 g/ml
Pour point	–35 °C
Demulsibility at 54 °C	—

Tab. 16 Cooling oil recommendation (machines for snow cannons)

2.10 Cooling oil charge

For machines with the Option W1, the volume required additionally for the heat recovery must be added to the charge.

Option K1 **Air cooling**

	FSD 4[illegible]	FSD 501	FSD 571
Fluid volume* [litre]	180	180	180
Topping up volume [litres] (minimum–maximum)	20	20	20

* Plus the oil volume of the heat recovery system.

Tab. 17 Cooling oil charge (Option K1)

Option K2 **Water-cooled**

	FSD 471	FSD 501	FSD 571
Fluid volume* [litre]	180	180	180
Topping up volume [litres]	20	20	20

(minimum–maximum)

* Plus the oil volume of the heat recovery system.

Tab. 18 Cooling oil charge (Option K2)

Option W1 **Heat recovery**

Option W1 The additional volume corresponds to the oil volume of the heat exchanger and the connecting lines:

	FSD 471	FSD 501	FSD 571
Additional charge volume [litres]*			

* Enter the volume required by your heat recovery system.

Tab. 19 Cooling oil charge (option W1)

2.11 Motors and Power

2.11.1 Compressor drive motor

Mains frequency: 50 Hz

	FSD 471	FSD 571
Rated power [kW]	250	315
Rated speed [min^{-1}]	1490	1490
Protection rating	IP 55	IP 55
Motor bearing re-greasing interval [h]	1500	1500
Grease requirement, each bearing [g]*		

h = operating hours

* Copy the data from the motor nameplate into the table.

Tab. 20 Compressor drive motor

Mains frequency: 60 Hz

	FSD 471	FSD 501	FSD 571
Rated power [kW]	250	315	315
Rated speed [min^{-1}]	1790	1790	1790
Protection rating	IP 55	IP 55	IP 55
Motor bearing re-greasing interval [h]	1500	1500	1500
Grease requirement, each bearing [g]*			

h = operating hours

* Copy the data from the motor nameplate into the table.

Tab. 21 Compressor motor (60Hz)

2.11.2 Option K1 Fan motor

Mains frequency: 50 Hz

	FSD 471	FSD 571
Rated power [kW]	11	11
Rated speed [min^{-1}]	970	970
Protection rating	IP 54	IP 54

h = operating hours

* 60Hz

* Copy the data from the motor nameplate into the table.

	FSD 471	FSD 571
Motor bearing re-greasing interval [h]	1500	1500
Grease requirement, each bearing [g]**		

h = operating hours

* 60Hz

* Copy the data from the motor nameplate into the table.

Tab. 22 Fan motor (option K1)

Mains frequency: 60 Hz

	FSD 471	FSD 501	FSD 571
Rated power [kW]	11	11	11
Rated speed [min^{-1}]	1175	1175	1175
Protection rating	IP 54	IP 54	IP 54
Motor bearing re-greasing interval [h]	1500	1500	1500
Grease requirement, each bearing [g]**			

Tab. 23 Fan motor (Option K1, 60Hz)

2.11.3 Option K2 Fan motor

Mains frequency: 50 Hz

	FSD 471	FSD 571
Rated power [kW]	0.3	0.3
Rated speed [min^{-1}]	1400	1400
Protection rating	IP 54	IP 54

Tab. 24 Fan motor (Option K2, 50Hz)

Mains frequency: 60 Hz

	FSD 471	FSD 501	FSD 571
Rated power [kW]	0.3	0.3	0.3
Rated speed [min^{-1}]	1460	1460	1460
Protection rating	IP 54	IP 54	IP 54

Tab. 25 Fan motor (Option K2, 60Hz)

2.12 Noise emission [dB(A)]

Mains frequency: 50 Hz

Mains frequency	FSD 471	FSD 571
50 Hz	79/76*	79/76*

Noise pressure level as per ISO 2151 and the basic standard ISO 9614-2, tolerance: ±3 dB(A) at maximum machine working pressure

* Option K2

Tab. 26 Noise emission [dB(A)]50Hz

Mains frequency: 60 Hz

Mains frequency	FSD 471	FSD 501	FSD 571
60 Hz	83/77*	83/77*	83/77*

Noise pressure level as per ISO 2151 and the basic standard ISO 9614-2, tolerance: ±3 dB(A) at maximum machine working pressure

* Option K2

Tab. 27 Noise emission [dB(A)]60Hz

2.13 Power Supply

Basic requirements

The machine is designed for a power supply conforming to EN 60204-1 (IEC 60204-1), section 4.3. In the absence of other user-specified conditions, the limits laid down in this standard must be adhered to.
It is recommended that the user and the supplier reach an agreement on the basis of the EN 60204-1, Annex B.

The machine requires a symmetrical three-phase power supply.
In a symmetrical three-phase supply the phase displacement and voltages are equal for all phases.

The machine may only be operated from an earthed TN or TT three-phase supply.

Connection to an IT supply is not permitted without taking further measures (earth leak detection, etc.).

This machine is designed for the operation in an industrial environment with proprietary supply network separated from the public supply by a transformer or generator.
Incoming line within the switching cabinet to be as short as possible.

If external sensors or communications lines are to be connected to the machine, use shielded cables and insert the same through EMC connections into the switching cabinet.

2.14 Power supply specifications

The following supply cable conductor cross sections (copper multi-core) and fusing (slow-blow class gG) are selected according to German DIN VDE 0100-430 (IEC 60364-4-43 and IEC 60364-4-473) and DIN VDE 0298-4 (HD 384.5.523 S2) standards for 30 °C ambient temperature and wiring type C.

➢ The conductor cross-sections should be changed accordingly if other conditions prevail.
➢ Cables laid side-by-side must be separated by a distance equal to one cable diameter.

Other conditions would include, for example:

- higher temperature
- other cable laying method
- Cable lengths >50 m
- Bundled cables

2.14.1 Mains frequency: 50 Hz

Rated power supply: 400V±10%/3/50Hz

	FSD 471	FSD 571
Backup fuse [A]	500	630
Power supply line [mm²]	2x 4x150	3x 4x150/3x 4x120*
Current input [A]	482/463*	618/600*

* Option K2

Tab. 28 Supply details 400V/3/50Hz

2.14.2 Mains frequency: 60 Hz

Rated power supply: 380V±10%/3/60Hz

	FSD 471	FSD 501	FSD 571
Backup fuse [A]	630	800	800
Power supply line [mm²]	2x 4x185/2x 4x150*	3x 4x150	3x 4x150
Current input [A]	507/487*	655/636*	675/655*

* Option K2

Tab. 29 Supply details 380V/3/60Hz

Rated power supply: 440V±10%/3/60Hz

	FSD 471	FSD 501	FSD 571
Backup fuse [A]	500	630	630
Power supply line [mm²]	2x 4x150	3x 4x120/2x 4x185*	3x 4x120/2x 4x185*
Current input [A]	445/428*	564/547*	581/563*

* Option K2

Tab. 30 Supply details 440V/3/60Hz

Rated power supply: 460V±10%/3/60Hz

	FSD 471	FSD 501	FSD 571
Backup fuse [A]	500	630	630

* Option K2

	FSD 471	FSD 501	FSD 571
Power supply line [mm²]	2x 4x120	2x 4x185	2x 4x185
Current input [A]	423/406*	537/521*	553/537*

* Option K2

Tab. 31 Supply details 460V/3/60Hz

2.15 Option K2 Water cooling

Cooling oil may contaminate the cooling water if a leak occurs.

➢ A special heat exchanger must be used for heating drinking water.

The specific heat capacity and required volume flow rate of the cooling water changes if anti-freeze is added.

➢ Consult KAESER Service to ensure optimum cooling-system performance.

➢ Comply with the specified minimum requirements for the cooling water in order to avoid downtimes due to corrosion, calcification and contamination.

It is imperative that measures for cooling water treatment and filtration are implemented and performed.
KAESER can provide the names of companies specialising in cooling water analysis and the supply of suitable treatment devices.

Open cooling system

An open cooling system may be a cooling circuit with open cooling towers for cooling via evaporation. As a portion of the cooling water evaporates, it must be replenished regularly. During evaporation, the material content of the cooling water concentrates and the contact with ambient air can contaminate the cooling water. When replenishing cooling water, you must ensure the minimum requirements for the cooling water.

Closed cooling system

In a closed cooling system, the cooling water has not contact with the atmosphere. Thus, it cannot be contaminated by the atmosphere or enriched with oxygen, for example.

Continuous-flow cooling system

A continuous-flow cooling system is an open cooling system. Ground, surface or drinking water circulate once through the cooling system.

Further information The dimensional drawing in chapter 13.3 gives the flow direction, size and location of the connection ports.

2.15.1 Design data

Cooling water temperature rise 10 K

	FSD 471	FSD 501	FSD 571
Maximum permissible inlet temperature [°C]	40	40	40

	FSD 471	FSD 501	FSD 571
Water flow rate [m^3/h]	23.0	28.8	28.5
Cooling water pressure drop [bar]	0.9	1.3	1.3

Tab. 32 Cooling water temperature (ΔT=10K)

Cooling water temperature rise 30 K

	FSD 471	FSD 501	FSD 571
Maximum permissible inlet temperature [°C]	20	20	20
Water flow rate [m^3/h]	7.8	9.6	9.8
Cooling water pressure drop [bar]	0.5	0.5	0.5

Tab. 33 Cooling water temperature (ΔT=30K)

Cooler specification

	FSD 471	FSD 501	FSD 571
Material	1.4401	1.4401	1.4401
Braze	Copper (Cu)	Copper (Cu)	Copper (Cu)
Maximum working pressure [bar] (cooling water)	10	10	10
Maximum permissible outlet temperature [°C]	70	70	70
Maximum flow rate [m^3/h]	23	23	23
Unsuitable cooling medium	Seawater Consult KAESER on the suitability of water.		

Tab. 34 Cooler specification (option K2)

2.15.2 Cooling water quality

Characteristics/content	Closed cooling system	Open cooling system
pH value	7,5–9,0	7,5–9,0
Total hardness [°dH]	0–20	0–20
Carbonate hardness [°dH]	<20	<4
Chlorides (Cl) [mg/l]	<100	<100
Dissolved iron (Fe) [mg/l]	<0,5	<0,2
Sulphate (SO_4) [mg/l]	<300	<300
HCO_3/SO_4 ratio	>1	>1

* CFU: colony-forming units

Characteristics/content	Closed cooling system	Open cooling system
Electrical conductivity [µS/cm]	10–800	10–1500
Ammonia (NH_4 *) [mg/l]	<1	<1
Manganese (Mn), dissolved [mg/l]	<0,1	<0,1
Glycol [%]	20–40	—
Solids (particle size) [mm]	<0,1	<0,1
Bacterial count [CFU*/ml]	10 000	10 000
Suspended solids [ppm] (portion of undissolved matter)	<20	<20

* CFU: colony-forming units

Tab. 35 Cooling water quality

2.16 Option W1 Available heat capacity

The quality of the heat transfer medium and its required flow rate depend on the type of heat exchanger used.

Maximum permissible pressure loss in the cooling air circuit: 0.6 bar

Maximum available heat capacity	FSD 471	FSD 501	FSD 571
[kW]	218	266	266
[MJ/h]	786	959	959
[kcal/h]	187790	229063	229063

* With the combination valve set to open at 80 °C.

Tab. 36 Heat capacity (Option W1)

3 Safety and Responsibility

3.1 Basic instructions

The machine is manufactured to the latest engineering standards and acknowledged safety regulations. Nevertheless, dangers can arise through its operation:

- danger to life and limb of the operator or third parties,
- damages to the machine and other material assets.

Disregard of warning or safety instructions can cause serious injuries!

- ➢ Use this machine only if it is in a technically perfect condition and only for the purpose for which it is intended; observe all safety measures and the instructions in the service manual.
- ➢ Immediately rectify (have rectified) any faults that could be detrimental to safety!

3.2 Specified use

The machine is intended solely for generating compressed air for industrial use. Any other use is considered incorrect. The manufacturer is not liable for any damages that may result from incorrect use. The user alone is liable for any risks incurred.

- ➢ Keep to the specifications listed in this service manual.
- ➢ Operate the machine only within its performance limits and under the permitted ambient conditions.
- ➢ Do not use compressed air for breathing purposes unless it is specifically treated.
- ➢ Do not use compressed for any application that will bring it into direct contact with foodstuffs unless it is specifically treated.

3.3 Improper use

Improper usage can cause damage to property and/or (severe) injuries.

- ➢ Only use the machine as intended.
- ➢ Never direct compressed air at persons or animals.
- ➢ Use hot cooling air for heating purposes only if there is no risk to the health of humans or animals. If necessary, hot cooling air should be treated by suitable means.
- ➢ Do not allow the machine to take in toxic, acidic, flammable of explosive gases or vapours.
- ➢ Do not operate the machine in areas in which specific requirements with regard to explosion protection are in force.

3.4 User's Responsibilities

3.4.1 Observe statutory and universally accepted regulations

These are, for example, nationally applied European directives and/or valid national laws and safety and accident prevention regulations.

➢ Observe relevant statutory and accepted regulations during installation, operation and maintenance of the machine.

3.4.2 Determining personnel

Suitable personnel are experts who, by virtue of their training, knowledge and experience as well as their knowledge of relevant regulations can assess the work to be done and recognize the possible dangers involved.

Authorised operators possess the following qualifications:

- are of legal age,
- are conversant with and adhere to the safety instructions and sections of the service manual relevant to operation,
- have received adequate training and authorization to operate electrical and compressed air devices.

Authorised installation and maintenance personnel have the following qualifications:

- are of legal age,
- have read, are conversant with and adhere to the safety instructions and sections of the service manual applicable to installation and maintenance,
- are fully conversant with the safety concepts and regulations of electrical and compressed air engineering,
- are able to recognize the possible dangers of electrical and compressed air devices and take appropriate measures to safeguard persons and property,
- they have received adequate training in and authorization for the safe installation and maintenance of this machine.

➢ Ensure that personnel entrusted with operation, installation and maintenance are qualified and authorised to carry out their tasks.

3.4.3 Adherence to inspection schedules and accident prevention regulations

The machine is subject to local inspection schedules.

Examples of German inspection schedules

➢ Recurring inspections according to BGR 500, chapter 2.11:
The user must ensure that the machine's safety devices are checked for function as required or at least annually.

➢ Oil changing according to BGR 500, chapter 2.11:
The user must ensure that the cooling oil is changed as required or at least annually and the oil change must be documented. This requirement may be waived if an oil analysis proves that the oil is still usable.

➢ Keep to inspection intervals in accordance with the Ordinance on Industrial Safety and Health with maximum intervals as laid down in §15.

Inspection	Inspection interval	Inspecting authority
Installation and equipment inspection	Before commissioning	Approved supervisory body
Internal inspection	Every 5 years after installation or the last inspection	Approved supervisory body

Inspection	Inspection interval	Inspecting authority
Strength test	Every 10 years after installation or the last inspection	Approved supervisory body

Tab. 37 Inspection intervals according to Ordinance on Industrial Safety and Health

3.5 Dangers

Basic instructions

The following describes the various forms of danger that can occur during machine operation.

Basic safety instructions are found in this service manual at the beginning of each chapter in the section entitled 'Safety'.

Warning instructions are found before a potentially dangerous task.

3.5.1 Safely dealing with sources of danger

The following describes the various forms of danger that can occur during machine operation.

Electricity

Touching voltage carrying components can result in electric shocks, burns or death.

- ➢ Allow only qualified and authorised electricians or trained personnel under the supervision of a qualified and authorised electrician to carry out work on electrical equipment according to electrical engineering regulations.
- ➢ Before commissioning or re-commissioning the machine, the user must ensure adequate protection against electric shock from direct or indirect contact.
- ➢ Before starting any work on electrical equipment:
  Switch off and lock out the power supply isolator and verify the absence of any voltage.
- ➢ Switch off any external power sources.
  These could be connections to floating relay contacts or the electrical machine heating, for example.
- ➢ Use fuses corresponding to machine power.
- ➢ Check regularly that all electrical connections are tight and in proper condition.

Forces of compression

Compressed air is contained energy. Uncontrolled release of this energy can cause serious injury or death. The following information concerns work on components that could be under *pressure*.

- ➢ Close shut-off valves or otherwise isolate the machine from the distribution network to ensure that no compressed air can flow back into the machine.
- ➢ De-pressurise all pressurised components and enclosures.
- ➢ Do not carry out welding, heat treatment or mechanical modifications on pressurised components (e.g. pipes and vessels) as this influences the component's resistance to pressure. The safety of the machine is then no longer ensured.

Compressed air quality

The composition of the compressed air must be suitable for the actual application in order to preclude health and life-threatening dangers.

- ➢ Use appropriate systems for air treatment before using the compressed air from this machine as breathing air and/or for the processing of foodstuffs.
- ➢ Use foodstuff-compatible cooling oil whenever compressed air is to come into contact with foodstuffs.

Spring forces

Springs under tension or compression store energy. Uncontrolled release of this energy can cause serious injury or death.
Minimum pressure / check valves, pressure relief valves and inlet valves are powerfully spring-loaded.

- ➢ Do not open or dismantle any valves.

Rotating components

Touching the fan wheel, the coupling or the belt drive while the machine is switched on can result in serious injury.

- ➢ Do not open the enclosure while the machine is activated.
- ➢ Switch off and lock out the power supply disconnecting device and verify the absence of any voltage.
- ➢ Wear close-fitting clothes and a hair net if necessary.
- ➢ Make sure all covers and safety guards are in place and secured before re-starting.

Temperature

High temperatures are generated during compression. Touching hot components may cause injuries.

- ➢ Avoid contact with hot components.
  These include, for example, compressor airends or blocks, oil and compressed air lines, coolers, oil separator tanks, motors and machine heaters.
- ➢ Wear protective clothing.
- ➢ If welding is carried out on or near the machine, take adequate measures to prevent sparks or heat from igniting oil vapours or parts of the machine.

Noise

The enclosure absorbs the machine noise to a tolerable level. This function will be effective only if the enclosure is closed.

- ➢ Operate the machine only with intact sound insulation.
- ➢ Wear hearing protection if necessary.
  The blowing-off of the pressure relief valve can be particularly loud.

Operating fluids/materials

The used operating fluids and materials can cause adverse health effects. Suitable safety measures must be taken in order to prevent injuries.

- ➢ Strictly forbid fire, open flame and smoking.
- ➢ Follow safety regulations when dealing with oils, lubricants and chemical substances.
- ➢ Avoid contact with skin and eyes.
- ➢ Do not inhale oil mist or vapour.

- ➢ Do not eat or drink while handling cooling and lubricating fluids.
- ➢ Keep suitable fire extinguishing agents ready for use.
- ➢ Use only KAESER approved operating materials.

Unsuitable spare parts

Unsuitable spare parts compromise the safety of the machine.

- ➢ Use only spare parts approved by the manufacturer for use in this machine.
- ➢ Use only genuine KAESER replacement parts on pressure bearing parts.

Conversion or modification of the machine

Modifications, additions to and conversions of the machine or the controller can result in unpredictable dangers.

- ➢ Do not convert or modify the machine!
- ➢ Obtain written approval by the manufacturer prior to any technical modification or expansion of the machine, the controller, or the control programs.

Extending or modifying the compressor station

If dimensioned appropriately, pressure relief valves reliably prevent an impermissible rise in pressure. New dangers may arise if you modify or extend the compressed air station.

- ➢ When extending or modifying the compressed air system:
  Check the blow-off capacity of pressure relief valves on air receivers and compressed air lines before installing a new machine.
- ➢ If the blow-off capacity is insufficient:
  Install pressure relief valves with larger blow-off capacity.

3.5.2 Safe machine operation

The following is information supporting you in the safe handling of the machine during individual product life phases.

Personal protective equipment

When working on the machine you may be exposed to dangers that can result in accidents with severe adverse health effects.

- ➢ Wear protective clothing as necessary.

Suitable protective clothing (examples):

- Safety workwear
- Protective gloves
- Safety boots
- Eye protection
- Ear protection

Transporting

The weight and size of the machine require safety measures during its transport to prevent accidents.

- ➢ Use suitable lifting gear that conforms to local safety regulations.

- ➢ Allow transportation only by personnel trained in the safe movement of loads.
- ➢ Attach lifting gear only to suitable lifting points.
- ➢ Be aware of the centre of gravity to avoid tipping.
- ➢ Make sure the danger zone is clear of personnel.
- ➢ Do not step onto machine components to climb up the machine.

Assembly

- ➢ Only use only electrical cables that are suitable and approved for the surroundings and electrical loads applied.
- ➢ Never dismantle compressed air pipes until they are fully vented.
- ➢ Only use pressure lines that are suitable and approved for the maximum working pressure and the intended medium.
- ➢ Do not allow connection pipes to be placed under mechanical stress.
- ➢ Do not induce any forces into the machine via the connections, so that the compressive forces must be balanced by bracing.

Positioning

A suitable installation location for the machine prevents accidents and faults.

- ➢ Install the machine in a suitable compressor room.
- ➢ Ensure sufficient and suitable lighting such that the display can be read and work carried out comfortably and safely.
- ➢ Ensure accessibility so that all work on the machine can be carried out without danger or hindrance.
- ➢ If installed outdoors, the machine must be protected from frost, direct sunlight, dust, rain and splashing water.
- ➢ Do not operate in areas in which specific requirements regarding explosion protection are in force.
  For instance, the requirements of ATEX directive 94/9/EC "Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres".
- ➢ Ensure adequate ventilation.
- ➢ Place the machine in such a manner that the working conditions in its environment are not impaired.
- ➢ Comply with limit values for ambient temperature and humidity.
- ➢ The intake air must not contain any damaging contaminants,
  Damaging contaminants are for instance: explosive or chemically instable gases and vapours, acid or base forming substances such as ammonia, chlorine or hydrogen sulfide.
- ➢ Do not position the machine in warm cooling outlet air from other machines.
- ➢ Keep suitable fire extinguishing agents ready for use.

Commissioning, operation and maintenance

During commissioning, operation and maintenance you may be exposed to dangers resulting from, e.g., electricity, pressure and temperature. Careless actions can cause accidents with severe adverse effects for your health.

- ➢ Allow maintenance work to be carried out only by authorised personnel.
- ➢ Wear close-fitting, flame-resistant clothing. Wear protective clothing as necessary.
- ➢ Switch off and lock out the power supply isolating device and verify the absence of voltage.

- ➢ Check that there is no voltage on floating relay contacts.
- ➢ Close shut-off valves or otherwise isolate the machine from the compressed air network to ensure that no compressed air can flow back into the machine.
- ➢ De-pressurise all pressurised components and enclosures.
- ➢ Allow the machine to cool down.
- ➢ Do not open the cabinet while the machine is switched on.
- ➢ Do not open or dismantle any valves.
- ➢ Use only spare parts approved by KAESER for use in this machine.
- ➢ Carry out regular inspections:
  for visible damages,
  of safety installations,
  of the EMERGENCY STOP command device,
  of any components requiring monitoring.
- ➢ Pay particular attention to cleanliness during all maintenance and repair work. Cover components and openings with clean cloths, paper or tape to keep them clean.
- ➢ Do not leave any loose components, tools or cleaning rags on or in the machine.
- ➢ Components removed from the machine can still be dangerous.
  Do not attempt to open or destroy any components taken from the machine.

De-commissioning, storage and disposal

Improper handling of old operating fluids and components represent a danger for the environment.

- ➢ Drain off fluids and dispose of them according to environmental regulations.
  These include, for example, compressor oil and cooling water.
- ➢ Have refrigerant disposed of by authorised bodies only.
- ➢ Dispose of the machine in accordance with local environmental regulations.

3.5.3 Organisational Measures

- ➢ Designate personnel and their responsibilities.
- ➢ Give clear instructions on reporting faults and damage to the machine.
- ➢ Give instructions on fire reporting and fire-fighting measures.

3.5.4 Danger Areas

The table gives information on the areas dangerous to personnel.
Only authorised personnel may enter these areas.

Activity	Danger area	Authorised personnel
Transport	Within a 3 m radius of the machine.	Installation personnel for transport preparation.
		No personnel during transport.
	Beneath the lifted machine.	No personnel!
Installation	Within the machine.	Installation personnel
	Within 1 m radius of the machine and its supply cables.	
Operation	Within a 1 m radius of the machine.	Operating personnel

Activity	Danger area	Authorised personnel
Maintenance	Within the machine.	Maintenance personnel
	Within a 1 m radius of the machine.	

Tab. 38 Danger Areas

3.6 Safety devices

Various safety devices ensure safe working with the machine.

- ➢ Do not change, bypass or disable safety devices.
- ➢ Regularly check safety devices for their correct function.
- ➢ Do not remove or obliterate labels and notices.
- ➢ Ensure that labels and notices are clearly legible.

Further information More information on safety devices is contained in chapter 4, section 4.6.

3.7 Safety signs

The diagram shows the positions of safety signs on the machine. The table lists the various safety signs used and their meanings.

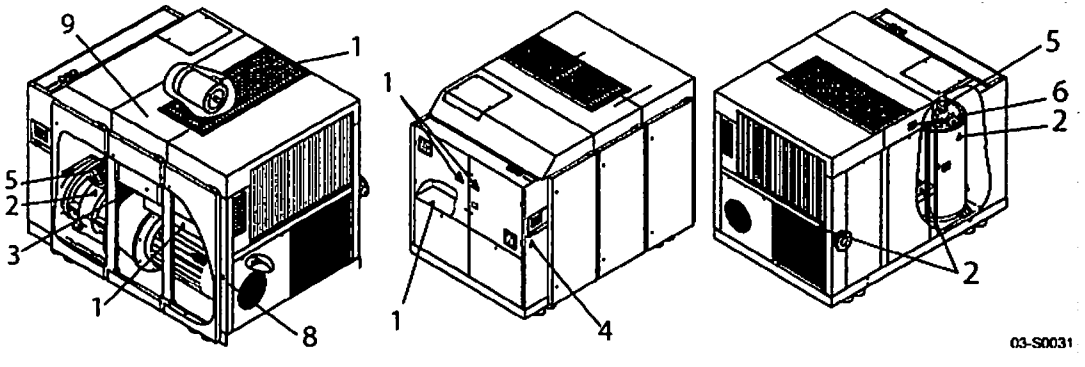

Fig. 2 Location of safety signs

Item	Symbol	Meaning
1		Danger of fatal injury from electric shock! ➢ Before starting any work on electrical equipment: Switch off and lock out the power supply disconnecting device and check that no voltage is present.
2		Hot surface! Risk of burns caused by contact with hot components. ➢ Do not touch the surface. ➢ Wear long-sleeved garments (no synthetics such as polyester) and protective gloves.

Item	Symbol	Meaning
3		Risk of serious lacerations or even severing of extremities (fingers) from rotating components! ➢ Operate the machine only with closed safety guards, access doors and panels. ➢ Switch off and lock out the mains isolating devices and verify the absence of any voltage before opening any machine enclosure or guard.
4		Risk of injury caused by an automatic machine start! ➢ Switch off and lock out the mains isolating devices and verify the absence of any voltage before opening any machine enclosure or guard.
5		Risk of fatal injury caused by dismantling valves (spring-loaded or under pressure)! ➢ Do not open or dismantle valves. ➢ Call an authorised Service Technician in the event of a fault.
6		Serious injury, particularly to the eyes, can result from foreign objects being thrown out from rotating components. ➢ Do not allow anything to fall through the ventilation grille ➢ Do not work above the machine if it is switched on.
8		Bearing damage due to re-greasing in standstill! ➢ Re-grease the bearings only with the motor running. ➢ Use only ESSO UNIREX N3 bearing grease. ➢ Adhere to the prescribed maintenance interval and grease quantity.
9		Danger of falling or damage to the machine! ➢ Do not sit or walk on the enclosure. ➢ Do not place or store any load on the enclosure.

Tab. 39 Safety signs

3.8 Emergency situations

3.8.1 Correct fire fighting

Suitable measures

Calm and prudent action can safe lives in the event of a fire.

- ➢ Keep calm.
- ➢ Give the alarm.
- ➢ Shut off supply lines if possible.
  Mains disconnecting device (all poles)
  Cooling water (if present)
  Heat recovery (if present)
- ➢ Warn and move endangered personnel to safety.
- ➢ Help incapacitated persons.
- ➢ Close the doors.
- ➢ When trained accordingly: Attempt to extinguish the fire.

Extinguishing substances

- ➢ Suitable extinguishing media:
  Foam
  Carbon dioxide
  Sand or soil
- ➢ Unsuitable extinguishing media:
  Strong jet of water

3.8.2 Treating injuries from handling cooling oil

Eye contact:

Cooling oil can cause irritation.

- ➢ Rinse open eyes thoroughly for a few minutes under running water.
- ➢ Seek medical help if irritation persists.

Skin contact:

Cooling oil may irritate after prolonged contact.

- ➢ Wash thoroughly with skin cleaner, then with soap and water.
- ➢ Contaminated clothing should be dry-cleaned before reuse.

Inhalation:

Cooling oil mist may make breathing difficult.

- ➢ Clear air passages of oil mist.
- ➢ Seek medical help if difficulty with respiration continues.

Ingestion

- ➢ Wash out the mouth immediately.
- ➢ Do not induce vomiting.
- ➢ Seek medical aid.

3.9 Warranty

This service manual contains no independent warranty commitment. Our general terms and conditions apply with regard to warranty.

A condition of our warranty is that the machine is used solely for the purpose for which it is intended and under the conditions specified.
Due to the multitude applications for which the machine is suitable the obligation lies with the user to determine its suitability for his specific application.

Furthermore, we accept no warranty obligation for:

- the use of unsuitable parts or operating materials,
- un-authorised modifications,
- incorrect maintenance,
- incorrect repair.

Correct maintenance and repair includes the use of genuine KAESER spare parts and operating materials.

➢ Obtain confirmation from KAESER that your specific operating conditions are suitable.

3.10 Environment protection

The operation of this machine may cause dangers for the environment.

➢ Do not allow cooling oil to escape to the environment or into the sewage system.

➢ Store and dispose of operating materials and replaced parts in accordance with local environment protection regulations.

➢ Observe national regulations.
This applies particularly to parts contaminated with compressor cooling oil.

4 Design and Function

4.1 Enclosure

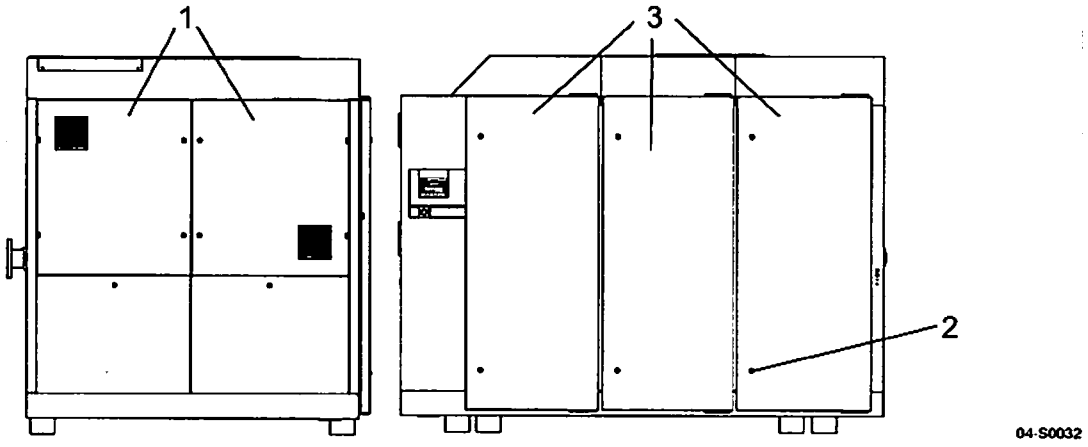

Fig. 3 Enclosure overview

[1] Control cabinet door
[2] Latch
[3] Access door

When closed, the enclosure serves various functions:

- Sound insulation
- Protection against contact with components
- Cooling air flow

The enclosure is not suitable for the following uses:

- Walking on, standing or sitting on.
- As resting place or storage of any kind of load.

Safe and reliable operation is only assured with the enclosure closed.

Access doors are hinged to swing open and removable panels can be lifted off. Latches are released by a key supplied with the machine.

4.2 Machine function

The description uses an air-cooled machine as an example.

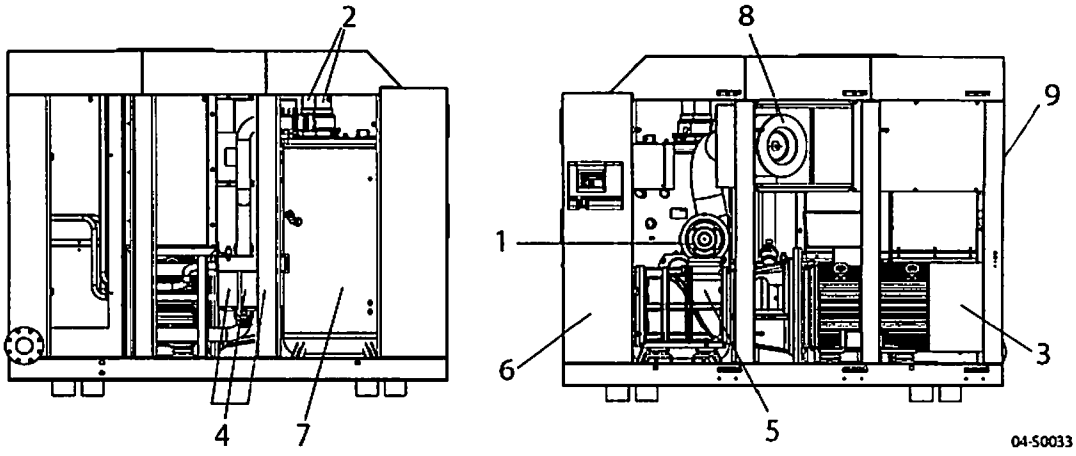

Fig. 4 Machine layout

[1]	Inlet valve	[6]	Control cabinet
[2]	Minimum pressure/check valve	[7]	Oil separator tank
[3]	Compressor drive motor	[8]	Air filter
[4]	Oil filter	[9]	Oil/air cooler
[5]	Airend		

Ambient air is cleaned as it is drawn in through the filter [8].

The air then flows through the inlet valve [1] and is compressed in the airend [5].

The airend is driven by an electric motor [3].

Cooling oil is injected into the airend. It lubricates moving parts and forms a seal between the rotors themselves and between them and the airend casing. This direct cooling in the compression chamber ensures a very low airend discharge temperature.

Cooling oil recovered from the compressed air in the oil separator tank [7] gives up its heat in the oil cooler [9]. The oil then flows through the oil filter [4] and back to the point of injection. Pressure within the machine keeps the oil circulating. A separate pump is not necessary. A thermostatic valve maintains optimum cooling oil temperature.

Compressed air, freed of cooling oil in the oil separator tank [7], flows through the minimum pressure / check valve [2] into the air cooler [9]. The minimum pressure check valve ensures that there is always a minimum internal pressure sufficient to maintain cooling oil circulation in the machine.

The cooler brings down the compressed air temperature to only 5 K to 10 K above ambient. A major portion of the existing humidity is removed from the compressed air and drained via the condensate drain.

4.3 Floating relay contacts

Floating relay contacts are provided for the transfer of signals, messages.
Information on location, loading capacity and type of message or signal is found in the electrical diagram.

If the floating relay contacts are connected to an external voltage source, voltage may be present even when the machine is isolated from the power supply.

4.4 Options

The options available for your machine are described below.

4.4.1 Option H1
Machine mountings

These mountings allow the machine to be anchored firmly to the floor.

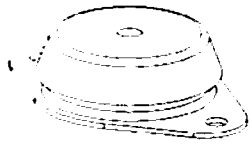

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Fig. 5 Machine mountings

4.4.2 Option K2
Water-cooling

Plate heat exchangers in stainless steel are used for water-cooled machines.

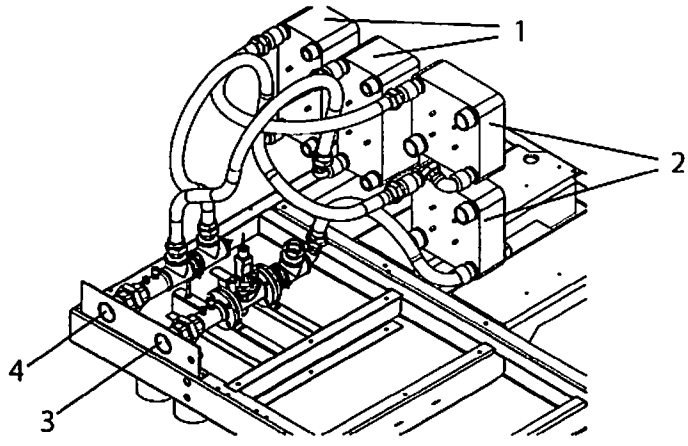

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Fig. 6 Water-cooling (option K2)

[1] Oil cooler
[2] Compressed air cooler
[3] Cooling water connection
[4] Cooling water connection

4.4.3 Option K3
Cooling air filter mat

The mat filters the cooling air and keeps the cooler surface clean.

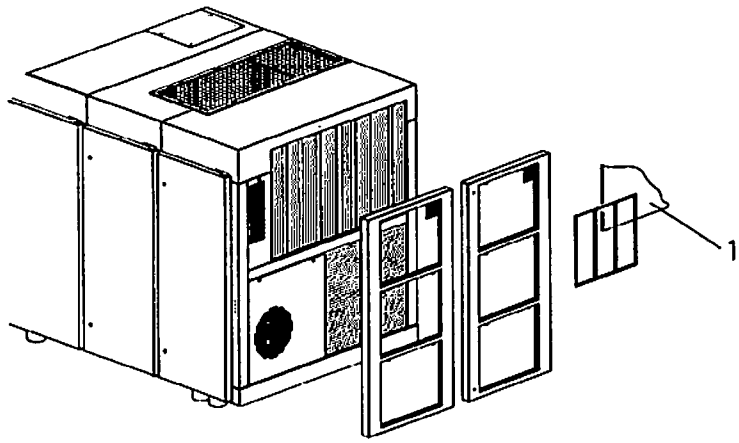

Fig. 7 Cooling air filter mat (option K3)
[1] Cooling air filter mat

4.4.4 Option W1 Prepared for external heat recovery

The cooling oil circuit includes 2 valves regulating the cooling oil temperature.

- Combination valve: Oil cooler temperature regulator
- Thermostatic valve: Heat recovery system oil temperature regulator

The oil temperature regulators ensure that the cooling oil is kept at the ideal temperature for machine operation.
The thermostatic valve opens first so that surplus heat is released into the heat recovery system. If the heat recovery system cannot remove sufficient heat, the combination valve opens to additionally release the cooling circuit via the oil cooler.

Condition:
Combination valve opening temperature = thermostatic valve opening temperature

The heat available for recovery depends on the individual operating conditions of the machine.

Connections are provided for an external system to recover surplus heat.

The thermostatic valve is deactivated when the machine is delivered. The necessary operating element must be installed when installing the heat recovery system.

If necessary, the operating element in the combination valve can be exchanged for one with higher opening temperature. The opening temperature depends on operating and ambient conditions. Operating elements are marked with their opening temperature [°C].

If the cooling oil temperature is too low, condensate can form and damage the machine.

➢ Consult KAESER Service on components and layout to ensure proper functioning of the cooling and heat recovery systems.

4.4.5 Control air connection for modulating control

4.4.5.1 Internal control air connection

The control air flows from the oil separator tank via the solenoid valve [24.7] switched to passage and the changeover valve [24.8] mechanically switched to open in direction of the inlet valve [2]; see also P&I diagram in chapter 13.2.

4.4.5.2 External control air connection

In a vented start-up of the compressor system, the SIGMA CONTROL 2 switches the solenoid valve [24.7] to passage. The control pressure from the oil separator tank pressurises the change-over valve [24.8]. At a pressure of 5.5 bar, the SIGMA CONTROL 2 switches voltage-free the solenoid valve [24.7] to passage through zero. The control pressure now flows from outside (external) to the inlet valve [2] (see P&I diagram in chapter 13.2).

4.5 Operating modes and control modes

4.5.1 Operating modes

The machine operates in the following modes:

- LOAD:
  The inlet valve is open. The airend delivers compressed air to the system.
  The drive motor runs under full load.
- IDLE:
  The inlet valve is closed. The minimum pressure/check valve shuts off the oil separator from the distribution network. The venting valve is open.
  A small volume of air circulates through the bleed hole in the inlet valve, through the airend and back to the inlet valve via the venting valve.
  The compressor motor runs without load and draws little current.
- STANDSTILL:
  The inlet valve is closed. The minimum pressure/check valve shuts off the oil separator from the distribution network. The venting valve is open.
  The drive motor is stopped.

Option C1
- MODULATING CONTROL:
  With the help of a control valve (the proportional controller) the degree of opening of the inlet valve is steplessly varied in response to the air demand. The airend delivers compressed air to the system.
  The load and power consumption of the drive motor rises and falls with the air demand.
  The control valve is factory set. The setting should not be changed without consultation with KAESER Service.

4.5.2 Control modes

Using the selected control mode, the controller switches the compressor between the three operational modes to maintain system pressure between the set cut-in and cut-out pressure values independent of actual air consumption. The control mode also rules the degree of energy efficiency of the machine.

The machine-dependant venting phase between the LOAD and STANDSTILL operating modes ensures load changes at minimum material stresses.

The controller SIGMA CONTROL 2 can operate in the following modes:

- DUAL
- QUADRO
- VARIO
- DYNAMIC

Option C1
- MODULATING control

Energy-efficient control modes for various applications:

Application	Recommended control mode
Compressed air station with one machine or several machines with comparable delivery	DYNAMIC*
Machine for peak load in a compressed air station	VARIO
Machine for intermediate load in a compressed air station	DYNAMIC*
Machine for basic load in a compressed air station	DYNAMIC*

* At exceedingly high pressure fluctuations and/or motor starts (current peaks), switch from DYNAMIC to VARIO.

Tab. 40 Energy-efficient control modes

The SIGMA CONTROL 2 controller is factory set to DYNAMIC control mode unless specifically ordered otherwise.

DUAL

In the DUAL control mode, the machine is switched back and forth between LOAD and IDLEto maintain the machine working pressure between the preset minimum and maximum values. When maximum pressure is reached, the machine switches to IDLE. When the preset *idling time* has elapsed the machine is STOPPED.

The *idling time* is factory preset according to the maximum starting frequency of the compressor motor. The shorter the *idle period* setting, the sooner (and more frequently) the motor is stopped.

QUADRO

In contrast to the the DUAL regulating mode, the machine will switch from LOAD to STANDSTILLin QUADRO mode after periods with low compressed air consumption.

After periods with a high compressed air consumption, the machine will switch from LOAD to STANDSTILL after passing through IDLE.

In this control mode, the controller requires two specified times: The *running time* and the *idle/ standstill time*.

The shorter these times are set, the sooner (and more frequently) the motor is stopped.

VARIO

The VARIO mode is based on the DUAL control mode. The difference to DUAL is that the *idle time* is automatically lengthened or shortened to compensate for higher or lower machine starting frequencies.

DYNAMIC

In contrast to the the DUAL regulating mode, the machine will switch from LOAD to STANDSTILL in DYNAMIC mode at low drive motor temperature.

And from LOAD via IDLE to STANDSTILL at a high drive motor temperature.

The lower the drive motor temperature, the sooner (and, therefore, more often and longer) it is stopped.

Option C1 **MODULATING control**

The MODULATING control completes the aforementioned control types. It continuously changes the delivery volume within the machine's control range.

Compressed air demand	Operating modes
rises	MODULATING
	LOAD
falls	MODULATING
	IDLE
	STANDSTILL

Tab. 41 Operating modes under MODULATING control

4.6 Safety Devices

The following safety devices are provided and may not be changed:

- EMERGENCY STOP control device:
  Stops the machine immediately in an emergency situation. The motor remains stopped. The pressure system is vented.
- Pressure relief valve:
  The pressure relief valve protects the system against excessive pressure. This is factory set.
- Enclosures and guards for moving parts and electrical connections
  Protect against accidental contact.

4.7 Operating panel SIGMA CONTROL 2

Buttons

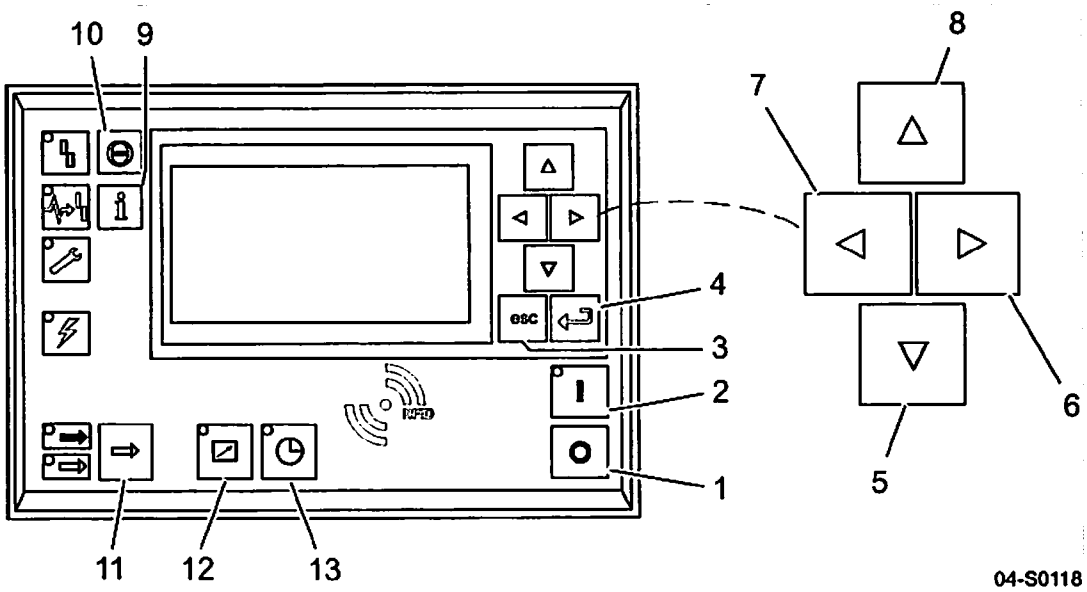

Fig. 8 Keys

Item	Name	Function
1	«OFF»	Switch off the machine.
2	«ON»	Switch on the machine.
3	«Escape»	Returns to the next higher menu level. Exits the edit mode without saving.
4	«Enter»	Returns to the selected submenu. Saves and leaves the edit mode.
5	«DOWN»	Scrolls down menu. Reduces a parameter value.
6	«Right»	Jumps to the right.
7	«Left»	Jumps to the left.
8	«UP»	Scrolls menu up. Increases a parameter value.
9	«Events and information key»	Operating mode: Displays the event memory.
10	«Reset»	Acknowledges alarms and warning messages. If permissible: Resets the fault counter (RESET).
11	«LOAD/IDLE»	Toggles the compressor between LOAD and IDLE operating modes.
12	«Remote control»	Switches remote control on and off.
13	«Shift clock»	Switching clock-control on and off.

Tab. 42 Buttons

Displays

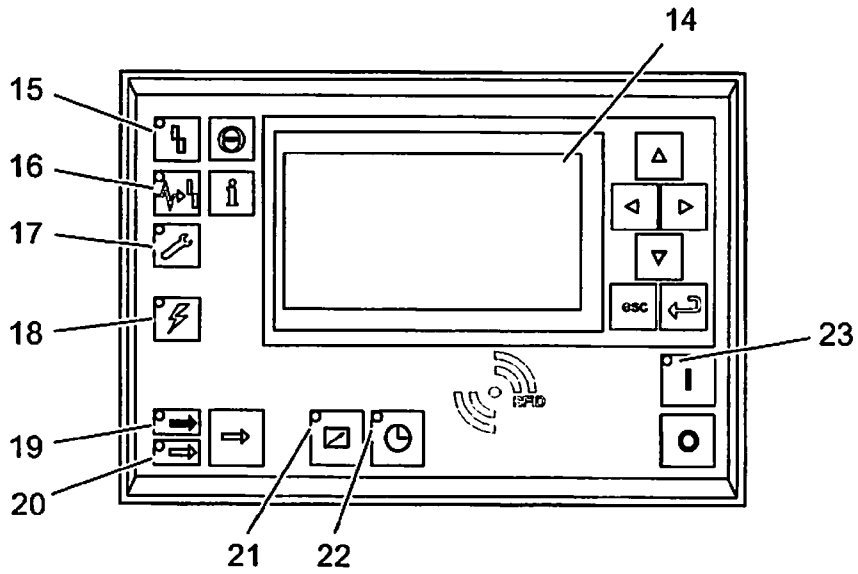

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Fig. 9 Indicators

Item	Name	Function
14	Display field	Graphic display with 8 lines and 30 characters.
15	*Fault*	Flashes red when an alarm occurs. Lights continuously when acknowledged.
16	*communication*	Continuous red illumination if a communication connection (Ethernet, USS, COM modules) has a fault.
17	*Warning*	Flashes in yellow in the following events: ■ maintenance work due, ■ Warning message Lights continuously when acknowledged.
18	*Control voltage*	Lights green when the power supply is switched on.
19	*LOAD*	Lights green when the compressor is running under LOAD.
20	*IDLE*	Lights green when the compressor is running in IDLE. Flashes when the «LOAD/IDLE» toggle key is pressed.
21	*Remote control*	The LED lights when the machine is in remote control.
22	*Shift clock*	The LED lights when the machine is in clock control.
23	*Machine ON*	Lights green when the machine switched on.

Tab. 43 Displays

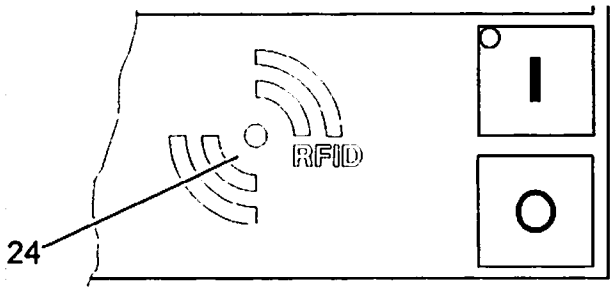
RFID sensor field

RFID is the abbreviation for "Radio Frequency Indentification" and enables the identification of persons or objects.
Placing a suitable transponder in front of the RFID sensor field of the controller will automatically activate the communication between transponder and SIGMA CONTROL 2 .

A suitable transponder is the KAESER RFID equipment card. Two of them have been provided with the machine.

Typical application:

- Users log on to the machine.
  (no manual input of the password required.)



04-S1102

Fig. 10 RFID sensor field

Item	Name	Function
24	RFID	RFID sensor field for the communication with a suitable RFID transponder.

Tab. 44 RFID sensor field

Further information More information about the use of RFID technology is provided in the SIGMA CONTROL 2 operating manual.

5 Installation and Operating Conditions

5.1 Ensuring safety

The conditions in which the machine is installed and operated have a decisive effect on safety.
Warning instructions are located before a potentially dangerous task.

Disregard of warning instructions can cause serious injuries!

Complying with safety notes

Disregard of safety notes can cause unforeseeable dangers!

- ➢ Strictly forbid fire, open flame and smoking.
- ➢ If welding is carried out on or near the machine, take adequate measures to prevent sparks or heat from igniting oil vapours or parts of the machine.
- ➢ Do not store inflammable material in the vicinity of the machine.
- ➢ The machine is not explosion-proof!
  Do not operate in areas in which specific requirements with regard to explosion protection are in force.
  For instance, the requirements of ATEX directive 94/9/EC "Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres".
- ➢ Ensure sufficient and suitable lighting such that the display can be read and work carried out comfortably and safely.
- ➢ Keep suitable fire extinguishing agents ready for use.
- ➢ Ensure that required ambient conditions are maintained.

Required ambient conditions may be:

- Maintain ambient temperature and humidity
- Ensure the appropriate composition of the air within the machine room:
  - clean with no damaging contaminants (e.g., dust, fibres, fine sand)
  - free of explosive or chemically unstable gases or vapours
  - free of acid/alkaline forming substances, particularly ammonia, chlorine or hydrogen sulfide.

5.2 Installation conditions

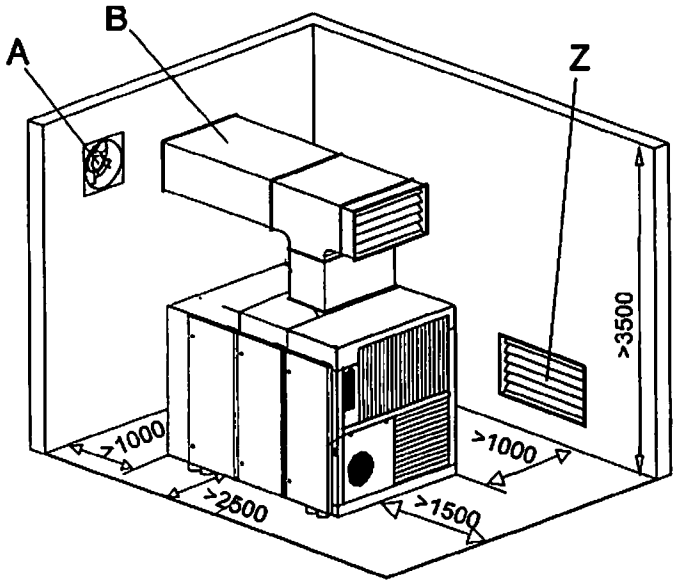
5.2.1 Determining location and clearances

The machine is intended for installation in an appropriate machine room. Information on distances from walls and ventilation is given below.

The distances quoted are recommended distances and ensure unhindered access to all machine parts.

➢ Please consult KAESER if you cannot comply with these recommendations.

Precondition The floor must be level, firm and capable of bearing the weight of the machine.



05-S0037

Fig. 11 Recommended machine placement and dimensions [mm]

(A) Exhaust fan
(B) Exhaust air duct
(Z) Inlet air opening

1. *NOTICE!*
   Ambient temperature too low.
   Frozen condensate and highly viscous cooling oil can cause damage when starting the machine.
   - ➢ Make sure that the temperature of the machine is at least +3 °C before starting.
   - ➢ Heat the machine room adequately or install an auxiliary heater.
2. Ensure adequate lighting so that all work on the machine can be carried out without danger or hindrance.
3. Ensure that the indicators can be read without glare and that the controller display cannot be damaged by direct sunlight (UV radiation).
4. Ensure that all intake and exhaust apertures of the enclosure remain opened.
5. If installed outdoors, the equipment must be protected from frost, direct sunlight, dust and rain.

5.2.2 Ensuring the machine room ventilation

Adequate ventilation of the machine room has several tasks:

- It prevents subatmospheric pressure in the machine room.
- It evacuates the exhaust heat of the machine and thus ensures the required operating conditions.

- ➢ Consult with KAESER if you cannot ensure the conditions for an adequate ventilation of the machine room.

1. Ensure that the volume of air flowing into the machine room is at least equivalent to that being removed from it by the machine and exhaust fan.
2. Make sure that the machine and exhaust fan can only operate when the inlet aperture is actually open.

3. Keep the inlet and exhaust apertures free of obstructions so that the cooling air can flow freely through the room.
4. Ensure clean air in order to support the proper functioning of the machine.

5.2.3 Exhaust duct design

At the cooling air inlet and exhaust, the machine can only overcome the air resistance resulting from the duct design. Any additional air resistance will reduce airflow and deteriorate machine cooling.

➢ Consult the KAESER service representative before deciding on:

- Design of the exhaust air ducting
- Transition between the machine and the exhaust air duct
- Length of the ducting
- Number of duct bends
- Design of flaps or shutters

Further information

Further information on the design of exhaust air ducts can be found in chapter 13.3.

5.3 Operating the machine in a compressed air network

When the machine is connected to an air network, the network operating pressure must not exceed 16 bar (China: 15.9 bar).

When charging a fully vented air system there is generally a very high rate of airflow through the air treatment devices. These conditions are detrimental to correct air treatment. Air quality suffers.
To ensure the desired air quality when charging a vented air network, we recommend the installation of an air main charging system.

➢ Consult KAESER for advice on this subject.

6 Installation

6.1 Ensuring safety

Follow the instructions below for safe installation.
Warning instructions are located before a potentially dangerous task.

Disregard of warning instructions can cause serious injuries!

Complying with safety notes

Disregard of safety notes can cause unforeseeable dangers!

- ➢ Follow the instructions in chapter 3 'Safety and Responsibility'.
- ➢ Installation work may only be carried out by authorised personnel.
- ➢ Make sure that no one is working on the machine.
- ➢ Ensure that all service doors and panels are locked.

When working on live components

Touching voltage carrying components can result in electric shocks, burns or death.

- ➢ Work on electrical equipment may only be carried out by authorised electricians.
- ➢ Switch off and lock out the power supply isolating device and verify the absence of voltage.
- ➢ Check that there is no voltage on floating relay contacts.

When working on the compressed air system

Compressed air is contained energy. Uncontrolled release of this energy can cause serious injury or death. The following safety concerns relate to any work on components that could be under pressure.

- ➢ Close shut-off valves or otherwise isolate the machine from the compressed air network to ensure that no compressed air can flow back into the machine.
- ➢ De-pressurise all pressurised components and enclosures.
- ➢ Check all hose couplings in the compressed air system with a hand-held pressure gauge to ensure that they all read 0 bar.
- ➢ Do not open or dismantle any valves.

When working on the drive system

Touching voltage carrying components can result in electric shocks, burns or death.
Touching the fan wheel, the coupling or the belt drive while the machine is switched on can result in serious injury.

- ➢ Switch off and lock out the power supply isolating device and verify the absence of voltage.
- ➢ Do not open the cabinet while the machine is switched on.

Further information

Details of authorised personnel are found in chapter 3.4.2.
Details of dangers and their avoidance are found in chapter 3.5.

6.2 Reporting Transport Damage

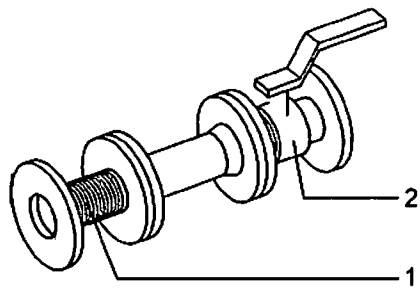
1. Check the machine for visible and hidden transport damage.
2. Inform the carrier and the manufacturer in writing of any damage without delay.

6.3 Connecting the machine with the compressed air network

Condensate in the compressed air network can damage the pipework:

- ➢ Install only corrosion-resistant pipes.
- ➢ Use fluoroelastomers as sealing material for seals.
- ➢ Note the electro-chemical voltage sequence.
- ➢ Consult with KAESER for suitable materials for the compressed air network.

Precondition The compressed air system is vented completely to atmospheric pressure.



06-S0047

Fig. 12 Compressed air pipework
[1] Axial compensator or flexible hose
[2] Shut-off valve

- ➢ Do not induce any forces into the machine for which the compressive forces must be balanced by bracing.

1. **WARNING!**
   Serious injury or death can result from loosening or opening components under pressure.
   - ➢ Depressurise all components and enclosures that are subjected to pressure.
2. A shut-off valve must be installed by the user in the connection line.
3. Connect the axial compensator or flexible hose.

Further information The dimensional drawing in chapter 13.3 provides the size and position of the connection ports.

6.4 Connecting the power supply

Precondition The supply isolating device is switched off,
the device is locked off,
the absence of any voltage has been verified.

1. The power supply must only be connected by authorised installation personnel or an authorised electrician.

2. Carry out safety measures as stipulated in relevant regulations (IEC 364, for example or DIN VDE 0100) and in national accident prevention regulations (BGV A3 in Germany). In addition, observe the regulations of the local electricity supplier.
3. Test the overcurrent protection cut-out to ensure that the time it takes to disconnect in response to a fault is within the permitted limit.
4. Select supply cable conductor diameters and fusing in accordance with local regulations.
5. The user must provide the machine with a lockable power supply disconnecting device. This could be, for example, a load disconnect switch with fused input. If a circuit breaker is used it must be suitable for the motor starting characteristics.
6. Check that the tappings on the control voltage transformer are connected according to the supply voltage.
   If not, change the tappings to suit the power supply voltage.

7. DANGER!
   Danger of fatal injury from electric shock!
   ➢ Switch off and lock out the power supply disconnecting device and verify the absence of voltage.
8. Connect the machine to the power supply.
9. Ensure that the cabinet again complies with the requirements of degree of protection IP54.

Further information — The electrical diagram in chapter 13.4 contains further details of the power supply connection.

6.5 Connecting the Condensate Drain

A threaded hose connection is provided to connect a condensate drain hose to the condensate drain outlet.

Condensate must be able to drain freely.

The illustration shows typical installations.
Condensate flows downward in the collecting line. This prevents condensate flowing back to the compressor.

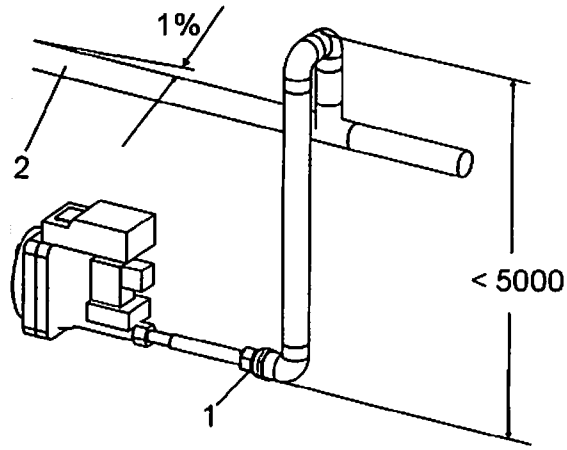


Fig. 13 Condensate drain dimensions [mm]
[1] Threaded connection
[2] Condensate collecting line

➢ Connect the condensate hose.

➢ Collect the condensate in a suitable container and dispose of in accordance with environmental regulations.

Further information The dimensional drawing in chapter 13.3 gives the size and position of the condensate drainage connection ports.

6.6 Options

6.6.1 Option H1 Anchoring the machine

➢ Use appropriate fixing bolts to anchor the machine.

Further information Details of the fixing holes are contained in the dimensional drawing in chapter 13.3.

6.6.2 Option K2 Connecting the cooling water

➢ Take the electrochemical series into consideration and choose suitable materials for water connections.

➢ Keep the effect of pressure surges on the coolers as low as possible.

➢ Install an expansion tank to act as a pulsation damper if pressure surges cannot be avoided.

➢ Avoid a low inlet temperature for the cooling water as it can cause condensation. If required, contactKAESER for suitable insulation measures.

Temperature-controlled cooling water supply systems, to which numerous machines are connected, regulate the water flow rate according to the difference in temperature between the supply and the return water. Individual machines may not receive an adequate flow under this system. Breakdowns are the result.

➢ KAESER can advise on how to ensure the cooling water supply via suitable control valves.

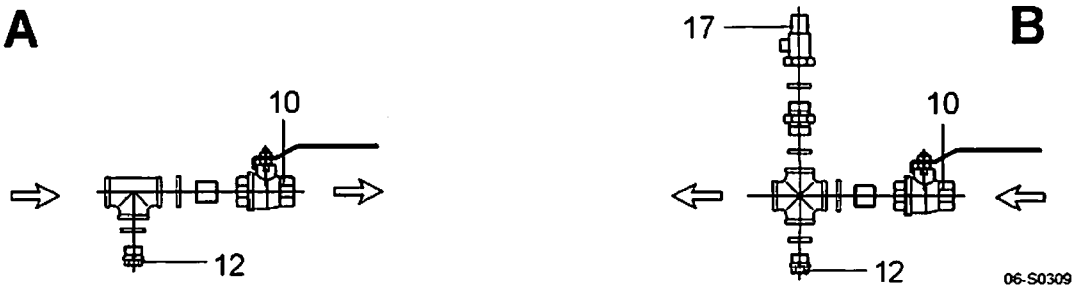


Fig. 14 Connecting the cooling water

- (A) Cooling water outlet
- (B) Cooling water inlet
- (10) Shut-off valve
- (12) Connection port with plug
- (17) Pressure relief valve

1. The user is to provide the following fittings:
   - Dirt trap with max. 0.1 mm strainer mesh
   - Shut-off valves (10) and connection ports (12) for maintenance and venting
   - Pressure relief valve (17) to prevent build-up of excessive pressure.
     Blow-off pressure and capacity are governed by the user's installation design. The technical specification of the cooler must be taken into account.
2. Connect the cooling water lines to the fittings.
3. Open the shut-off valve on the cooling water outlet (A).
4. Slowly open the cooling water inlet shut-off valve (B) to gradually fill the cooler with water.
5. Bleed air from the water lines.

Further information The dimensional drawing in chapter 13.3 gives the flow direction, size and location of the connection ports.

6.6.3 Option W1
Connecting the external heat recovery system

An unsuitable heat exchanger or incorrect installation may adversely impact the cooling oil circuit within the compressor. Damage to the machine will follow.

➢ Consult with KAESER on a suitable heat exchanger and have an authorised KAESER Service do the installation.

6.6.4 Option C1
Connecting external control air

A connection is provided for external control air to influence the MODULATING control.

The standard arrangement is for the MODULATING control to be influenced by internal machine pressure.

Material

Control air line:
up to 6 m length: Inner diameter >8 mm
from 6 m length: Inner diameter >12 mm

Suitable materials for the control air line:
Copper pipe with brass fittings or
Plastic pipe.

Precondition

The supply disconnecting device is switched off.
The disconnecting device is locked off.
A check has been made that no voltage is present.

The compressed air network is vented completely to atmospheric pressure.

The connection of an external compressed air source allows the possibility of dirt or condensate entering the machine to cause damage. Fit a KAESER FV compressed air filter to reliably prevent this possibility.

The connection point of the control line to the air network must be down stream of all air treatment devices.

1. WARNING!
   Compressed air!
   Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly.
   ➢ De-pressurise all pressurised components and enclosures.
2. Fit a suitable filter in the control air line and then connect the line to a suitable point in the air network.
3. Connect the control air line to the machine.

Result

The external control air is connected. As soon as the machine is switched to external control, the pressure in the air network modulates the compressor's air delivery rate.

Further information

The location of the connection point is provided in chapters 13.2 and 13.3.

Instructions on switching the machine to external control are given in chapter 7.8.

7 Initial Start-up

7.1 Ensuring safety

Here you will find instructions for a safe commissioning of the machine.
Warning instructions are located before a potentially dangerous task.

Disregard of warning instructions can cause serious injuries!

Complying with safety notes

Disregard of safety notes can cause unforeseeable dangers!

- ➢ Follow the instructions in chapter 3 'Safety and Responsibility'.
- ➢ Commissioning tasks may only be carried out by authorised personnel!
- ➢ Make sure that no one is working on the machine.
- ➢ Ensure that all service doors and panels are locked.

When working on live components

Touching voltage carrying components can result in electric shocks, burns or death.

- ➢ Work on electrical equipment may only be carried out by authorised electricians.
- ➢ Switch off and lock out the power supply isolating device and verify the absence of voltage.
- ➢ Check that there is no voltage on floating relay contacts.

When working on the compressed air system

Compressed air is contained energy. Uncontrolled release of this energy can cause serious injury or death. The following safety concerns relate to any work on components that could be under pressure.

- ➢ Close shut-off valves or otherwise isolate the machine from the compressed air network to ensure that no compressed air can flow back into the machine.
- ➢ De-pressurise all pressurised components and enclosures.
- ➢ Check all hose couplings in the compressed air system with a hand-held pressure gauge to ensure that they all read 0 bar.
- ➢ Do not open or dismantle any valves.

When working on the drive system

Touching voltage carrying components can result in electric shocks, burns or death.
Touching the fan wheel, the coupling or the belt drive while the machine is switched on can result in serious injury.

- ➢ Switch off and lock out the power supply isolating device and verify the absence of voltage.
- ➢ Do not open the cabinet while the machine is switched on.

Further information

Details of authorised personnel are found in chapter 3.4.2.
Details of dangers and their avoidance are found in chapter 3.5.

7.2 Instructions to be observed before commissioning or re-commissioning

Incorrect or improper commissioning can cause injury to persons and damage to the machine.

➢ Commissioning may only be carried out by authorised installation and service personnel who have been trained on this machine.

Special measures for re-commissioning after storage

Storage period longer than:	Remedy
3 months	➢ Manually fill the airend with cooling oil.
12 months	➢ Change the oil filter. ➢ Change the oil separator cartridge. ➢ Change the cooling oil. ➢ Have the motor bearings checked by an authorised KAESER Service Technician.
36 months	➢ Have the overall technical condition checked by an authorised KAESER Service Technician.

Tab. 45 Re-commissioning after storage

7.3 Checking installation and operating conditions

➢ Check and confirm all the items in the checklist before initially starting the machine.

Check	See chapter	Confirmed?
➢ Are the operators fully conversant with safety regulations?	–	
➢ Have all the positioning conditions been complied with?	5	
➢ Is a user-supplied lockable power supply disconnection device installed?	6.4	
➢ Is the power supply as specified on the nameplate?	2.1	
➢ Are the power supply cable conductor diameters and fuse ratings adequate?	2.14	
➢ Drive motor overload protection switch is set according to the mains voltage?	7.4	
➢ Fan motor overload protection switch set according to the mains voltage?	7.5	
➢ Have all electrical connections been checked for tightness?	–	
➢ (Repeat check after 50 operating hours)		
➢ Is a shut-off valve fitted to the compressed air outlet?	6.3	
➢ Connection made to air main with hose or axial compensator?	6.3	
➢ Is the condensate drain connected?	6.5	
➢ Sufficient cooling oil in the separator tank? (oil level indicator outside the red zone)	10.13	

Check	See chapter	Confirmed?
➢ Is there sufficient cooling oil in the airend?	7.6	
➢ Is the machine firmly anchored to the floor? (Option H1)	6.6.1	
➢ Supply of cooling water ensured? (Option K2)	6.6.2	
➢ Are all access doors closed and latched and all removable panels in place and secured?	–	

Tab. 46 Installation conditions checklist

7.4 Setting the overload protection cut-out

Electrical diagram 13.4 gives the location of the overload protection cut-out.

With star-delta starting, the phase current is fed via the overload protection cut-out. This phase current is 0.58-times the rated motor current.

To prevent the overload protection cut-out from being triggered by voltage fluctuations, temperature influences or component tolerances, the setting can be higher than the arithmetical phase current.

➢ Check the overload protection cut-out setting.

The overload protection cut-out shuts the machine down despite being correctly set?

➢ Contact KAESER Service.

7.5 Setting the motor overload protection switch

Electrical diagram in chapter 13.4 gives the setting values for the motor overload protection switch.

In direct on-line starting, the current for the fan motor is fed via the motor overload protection switch.

To prevent the motor overload protection switch from being triggered by voltage fluctuations, temperature influences or component tolerances, the setting can be higher than the rated motor current.

➢ Check the motor overload protection switch setting.

The overload protection switch shuts the machine down despite being correctly set?

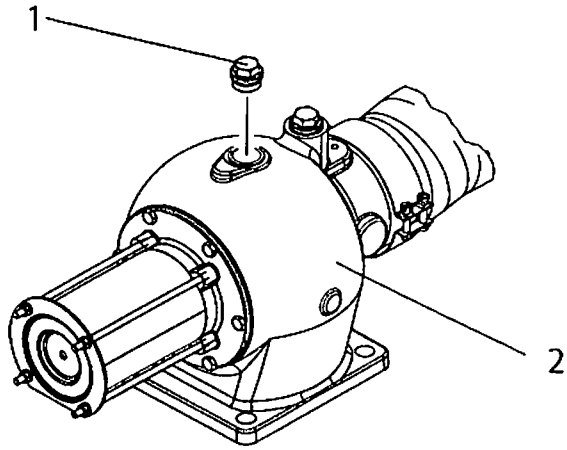
➢ Contact KAESER Service.

7.6 Filling cooling oil into the airend

Before starting the compressor for the very first time and before re-starting after a shutdown period of more than 3 months it is necessary to manually add a quantity of cooling oil into the airend. In order to avoid that the cooling oil exceeds the permissible level, drain the required quantity from the de-pressurised oil separator tank.
Chapter 10.16 provides detailed information on how to drain cooling oil from the oil separator tank.

Material 5 litre cooling oil from separator tank

Precondition The supply disconnecting device is switched off,
the device is locked off,
the absence of voltage has been verified.
The machine is fully vented, the pressure gauge on the oil separator tank reads 0 bar.

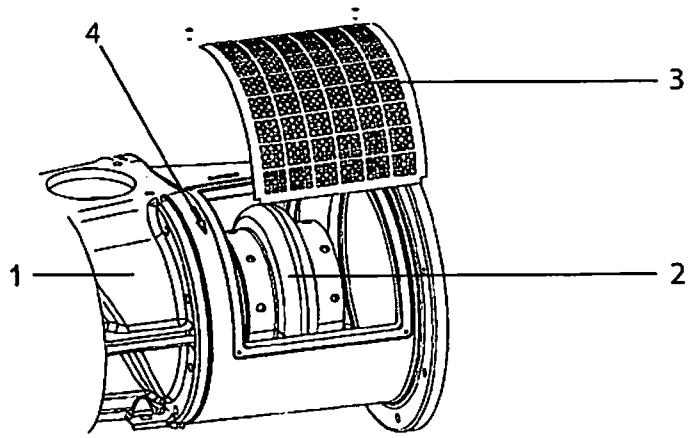


07-S0048

Fig. 15 Inlet valve filling port

[1] Screw plug
[2] Inlet valve

1. Unscrew the filler plug from the inlet valve.
2. Pour the stipulated amount of cooling oil into the airend and replace the filler plug.



07-S0311

Fig. 16 Coupling

[1] Airend
[2] Coupling
[3] Safety screen
[4] Arrow showing direction of rotation

1. Remove the safety screen [3].
2. Turn the airend [4] by turning the coupling [1] by hand in the direction indicated by the arrow [2].
3. Replace the safety screen [3].

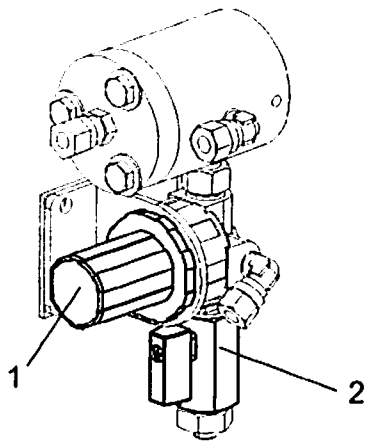
7.7 Option C1
Activating and deactivating the MODULATING control

Use a shut-off valve to activate and deactivate the MODULATING control. If the MODULATING control is deactivated, the machine always delivers the maximum possible compressed air quantity in LOAD mode.

MODULATING control	Shut-off valve
switch on	open.
switch off	close

Tab. 47 MODULATING control: Setting the shut-off valve

Precondition The supply disconnecting device is switched off,
the device is locked off,
the absence of voltage has been verified.



07-S1293

Fig. 17 MODULATING control: Setting the shut-off valve
(1) Control valve (proportional control)
(2) Shut-off valve

➢ Open or close the control valve, depending on the required control mode.

The control valve is factory set. The setting should not be changed without consultation with KAESER Service.

7.8 Option C1
Switching MODULATING control to external control air

1. Set the pressure switching point 5.5 bar in the menu *<configurarion → control mode → modulating>*.

Result Pressure in the network controls the machine's delivery rate.

7.9 Starting the machine for the first time

Precondition
No personnel are working on the machine.
All access doors are closed.
All removable panels are in place and secured.

1. Open the shut-off valve to the air network.
2. Switch on the power supply isolating device.
   After the controller has carried out a self-test, the green *Control voltage* LED is lit continuously.
3. If required:
   Change the display language as described in chapter 7.11.
4. Press the «ON »key.
   The drive motor runs up and after a short time the machine switches to LOAD and delivers compressed air.

- ➢ Watch for any faults occurring in the first hour of operation.
- ➢ After the first 50 operating hours, check all electrical connections and tighten where necessary.

Does the machine stop when the compressor motor rotates in the wrong direction?

- ➢ Switch off and lock out the power supply isolating device and verify the absence of voltage.
- ➢ Changeover phase lines L1 and L2.

7.10 Setting the set point pressure

The system pressure pA is factory set to the highest possible value.
Adjustment is necessary for individual operating conditions.

Do not set the set point pressure of the machine higher than the maximum working pressure of the compressed air system.

The machine may not toggle more than twice per minute between LOAD and IDLE.

To reduce the cycling (toggling) frequency:

- ➢ Increase the difference between cut-in and cut-out pressure.
- ➢ Add a larger air receiver downstream to increase buffer capacity.

➢ Set the set point pressure as described in the SIGMA CONTROL 2 operating manual.

7.11 Setting the display language

The controller can display text messages in several languages.
You can set the language for texts on the display. This setting will be retained even when the machine is switched off.

1. In operating mode, switch to the main menu with the «Return» key.

2. Press the «UP» or «DOWN» keys until the current language is shown as active line (inverse):

Current language (active line)

▸1 xxxxxxxxxx	Submenu
▸2 xxxxxxxxxx	Submenu
▸3 xxxxxxxxxx	Submenu
▸4 xxxxxxxxxx	Submenu
▸5 xxxxxxxxxx	Submenu
▸6 xxxxxxxxxx	Submenu

3. Use the «Return» key to switch to setting mode.
   The language display flashes.
4. Move to the required language with «UP »or «DOWN».
5. Confirm the setting with the «Enter» key.

Result — The display texts are now in the selected language.

Further information — Detailed information can be found in the SIGMA CONTROL 2 operating manual.

8 Operation

8.1 Switching on and off

Always switch the machine on with the «ON» key and off with the «OFF» key.
A power supply disconnecting device has been installed by the user.

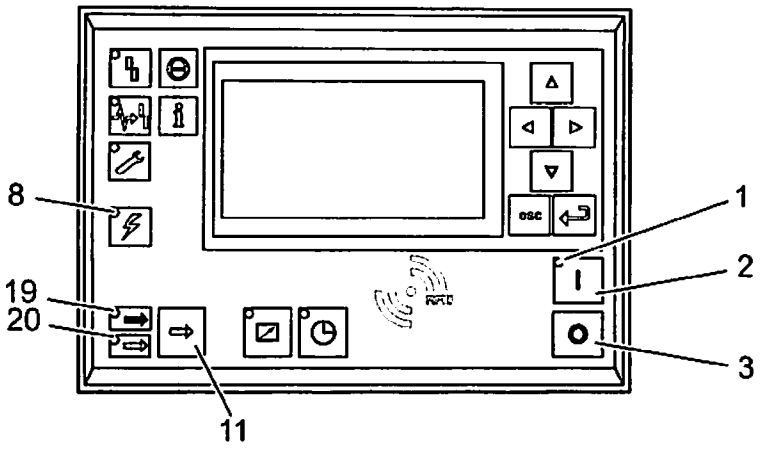


Fig. 18 Switching on and off

[1] *Machine ON* LED (green)
[2] «ON» key
[3] «OFF» key
[8] *Control voltage* LED (green)
[11] «LOAD/IDLE» toggle key
[19] *LOAD* LED
[20] *IDLE* LED

8.1.1 Switching on

Precondition No personnel are working on the machine.
All access doors and panels are closed and secure.

1. Switch on the power supply isolating device.
   After the controller has carried out a self-test, the green *Control voltage* LED is lit continuously.
2. Press the «ON »key.
   The green *Machine ON* LED is lit continuously.

If a power failure occurs, the machine is not prevented from re-starting automatically when power is resumed.
It can re-start automatically as soon as power is restored.

Result The compressor motor starts as soon as system pressure is lower than the set point pressure (cut-off pressure).

8.1.2 Switching off

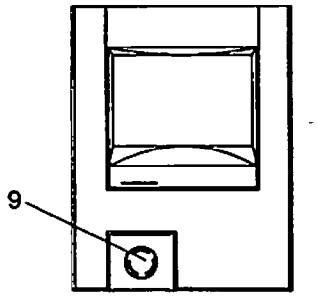
1. Press the «LOAD/IDLE »key.
   The machine switches to IDLE and the *IDLE* LED flashes.
2. After allowing the machine to IDLE for 20 seconds, Press the «OFF» key.
   The *Machine ON* LED extinguishes.

3. Press the «LOAD/IDLE »key.
   The *warning* LED extinguishes.
   The machine is ready for further operation. The machine can be re-started.
4. Switch off and lock out the power supply disconnecting device.

Result The *Control voltage* LED extinguishes. The machine is switched off and disconnected from the mains supply.

8.2 Switching off in an emergency and switching on again

The EMERGENCY STOP push-button is located below the control panel.



08-S0061

Fig. 19 Switching off in an emergency
[9] EMERGENCY STOP control device:

Switching off

➢ Press the EMERGENCY STOP control device.

Result The EMERGENCY STOP button remains latched after actuation.
The compressor's pressure system is vented and the machine is prevented from automatically re-starting.

Switching on

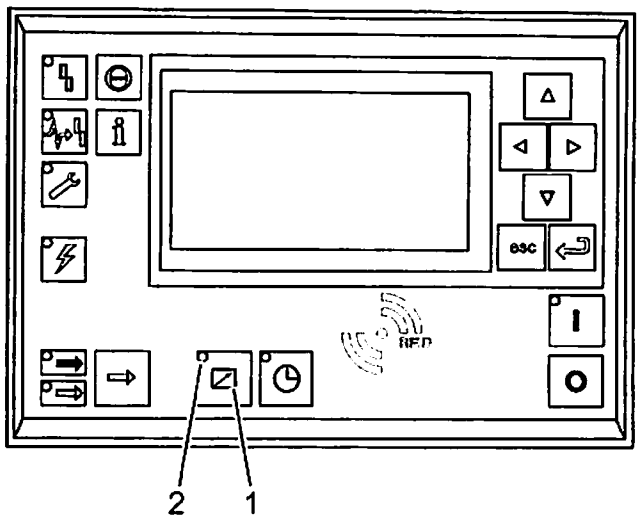
Precondition The fault has been rectified

1. Turn the EMERGENCY STOP device in the direction of the arrow to unlatch it.
2. Acknowledge any existing alarm messages.

Result The machine can now be started again.

8.3 Switching on and off from a remote control centre

Precondition A link to the remote control centre exists.



08-S0120

Fig. 20 Switching on and off from a remote control centre

[1] «Remote control» key
[2] *Remote control* LED

1. Attach an easily seen notice to the machine that warns of remote operation.

⚠ WARNING

Remote control: danger of unexpected starting!

➢ Make sure the power supply disconnecting device is switched off before commencing any work on the machine.

Tab. 48 Machine identification

2. Label the starting device in the remote control centre as follows:

⚠ WARNING

Remote control: danger of unexpected starting!

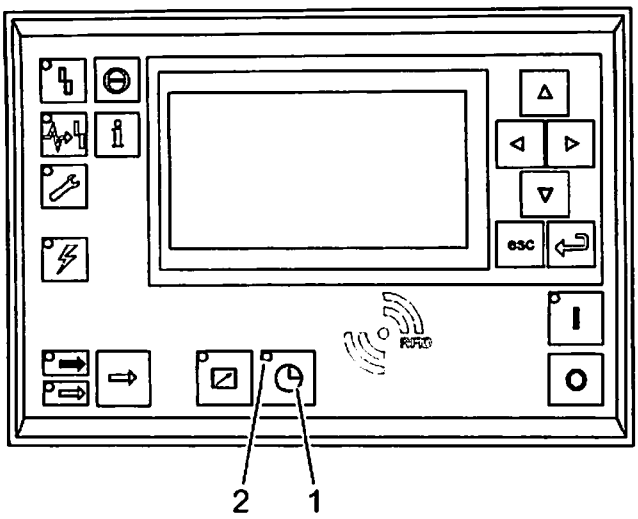
➢ Before starting, make sure that no one is working on the machine and that it can be safely started.

Tab. 49 Remote control identification

3. Press the «remote control» key.
   The *remote control* LED lights. The machine can be remotely controlled.

8.4 Switching on and off with the clock

Precondition The clock is programmed.



08-S0121

Fig. 21 Switching on and off with the clock

[1] «Clock» key
[2] *Clock* LED

1. Attach an easily seen notice warning of time-controlled operation:

⚠ WARNING

Clock control: danger of unexpected starting!

➢ Make sure the power supply disconnecting device is switched off before commencing any work on the machine.

Tab. 50 Machine identification

2. Press the «clock» key.
   The *clock* LED lights. The machine is switched on and off by the clock.

8.5 Interpreting operation messages

The controller will automatically display operation messages informing you about the current operational state of the machine.

Operating messages are identified with the letter O.

Further information Detailed information can be found in the SIGMA CONTROL 2 operating manual.

8.6 Acknowledging alarm and warning messages

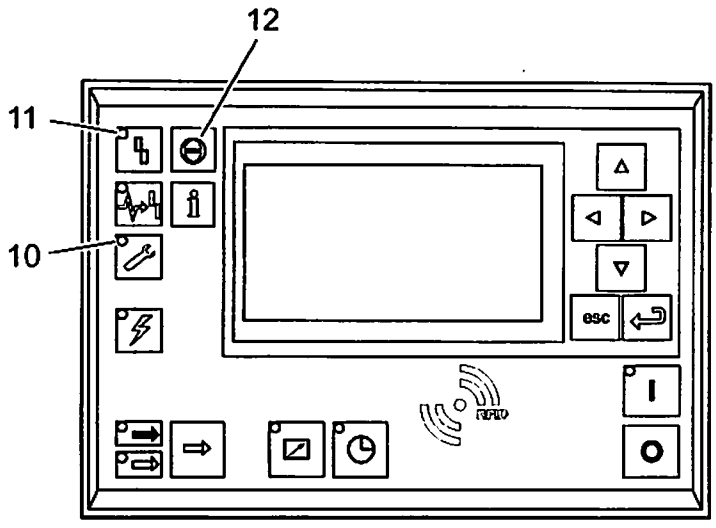
Messages are displayed on the "new value" principle:

- Message coming: LED flashes
- Message acknowledged: LED illuminates
- Message going: LED off

or

- Message coming: LED flashes

- Message going: LED flashes
- Message acknowledged: LED off



08-S0122

Fig. 22 Acknowledging messages
(10) LED *Warning* (yellow)
(11) LED *Alarm* (red)
(12) Key«Acknowledge»

Alarm message

An alarm shuts the machine down automatically. The red *alarm* LED flashes.
The system displays the appropriate message.

Precondition The fault has been rectified

➢ Acknowledge the message with the «acknowledge» key.
Alarm LED extinguishes.
The machine is again ready for operation.

If the machine was switched off with the EMERGENCY Stop button:
➢ Unlatch the EMERGENCY STOP button (turn in direction of the arrow) before acknowledging the alarm message.

Further information A list of possible alarm messages occurring during operation can be found in the service manual SIGMA CONTROL 2.

Warning message

If maintenance work is to be carried out or if the warning is displayed before an alarm, the yellow *warning* LED flashes.
The system displays the appropriate message.

Precondition The danger of an alarm is passed,
maintenance has been carried out.

➢ Acknowledge the message with the «Acknowledge» key.
The *warning* LED extinguishes.

Further information A list of possible alarm messages occurring during operation can be found in the service manual SIGMA CONTROL 2.

9 Fault Recognition and Rectification

9.1 Basic instructions

There are 3 types of fault:

- Warning:
  - Warning messages *W*
- Fault (with indication):
  - Alarm messages *A*
  - System messages *Y*
  - Diagnostic messages *D*
- Other faults (without indication): See chapter 9.2

The messages valid for your machine are dependent on how the individual machine is equipped.

1. Do not attempt fault rectification measures other than those given in this manual!
2. In all other cases:
   Have the fault rectified by an authorized KAESER service representative.

Further information: Detailed information for the various messages can be found in the service manual SIGMA CONTROL 2.

9.2 Other Faults

Fault	Possible cause	Remedy
Machine runs but produces no compressed air.	Inlet valve not opening or only opening partially.	Call KAESER service representative.
	Venting valve not closing.	Call KAESER service representative.
	Leaks in the pressure system.	Check pipework and connections for leaks and tighten any loose fittings.
	Air consumption is greater than the capacity of the compressor.	Check the air system for leaks. Shut down the consumer(s).
	Hose coupling or maintenance hose still plugged into the quick-release coupling on the oil separator tank.	Remove coupling or maintenance hose.
Cooling oil runs out of the air filter.	Oil level in the oil separator tank too high.	Drain off oil until the correct level is reached.
	Inlet valve defective.	Call KAESER service representative.

Fault	Possible cause	Remedy
Compressor switches between LOAD and IDLE more than twice per minute.	Air receiver too small.	Increase size of air receiver.
	Airflow into the compressed air network restricted.	Increase air pipe diameters.
		Check filter elements.
	The differential between cut-in and cut-out pressure too is small.	Check switching differential.
Cooling oil leaking into the floor pan.	Hose coupling or maintenance hose still plugged into the quick-release coupling on the oil separator tank.	Remove coupling or maintenance hose.
	Oil cooler leaking.	Call KAESER service representative.
	Leaking joints.	Tighten joints.
		Replace seals.
Cooling oil consumption too high.	Unsuitable oil is being used.	Use SIGMA FLUID cooling oil.
	Oil separator cartridge split.	Change the oil separator cartridge.
	Oil level in the oil separator tank too high.	Drain off oil until the correct level is reached.
	Oil return line clogged.	Check dirt trap in the return line.

Tab. 51 Other faults and actions

10 Maintenance

10.1 Ensuring safety

Follow the instructions below for safe installation.
Warning instructions are located before a potentially dangerous task.

Disregard of warning instructions can cause serious injuries!

Complying with safety notes

Disregard of safety notes can cause unforeseeable dangers!

- ➢ Follow the instructions in chapter 3 'Safety and Responsibility'.
- ➢ Allow maintenance work to be performed by authorised personnel only.
- ➢ Make sure that no one is working on the machine.
- ➢ Ensure that all service doors and panels are locked.

When working on live components

Touching voltage carrying components can result in electric shocks, burns or death.

- ➢ Work on electrical equipment may only be carried out by authorised electricians.
- ➢ Switch off and lock out the power supply isolating device and verify the absence of voltage.
- ➢ Check that there is no voltage on floating relay contacts.

When working on the compressed air system

Compressed air is contained energy. Uncontrolled release of this energy can cause serious injury or death. The following safety concerns relate to any work on components that could be under pressure.

- ➢ Close shut-off valves or otherwise isolate the machine from the compressed air network to ensure that no compressed air can flow back into the machine.
- ➢ De-pressurise all pressurised components and enclosures.
- ➢ Check all hose couplings in the compressed air system with a hand-held pressure gauge to ensure that they all read 0 bar.
- ➢ Do not open or dismantle any valves.

When working on the drive system

Touching voltage carrying components can result in electric shocks, burns or death.
Touching the fan wheel, the coupling or the belt drive while the machine is switched on can result in serious injury.

- ➢ Switch off and lock out the power supply isolating device and verify the absence of voltage.
- ➢ Do not open the cabinet while the machine is switched on.

Further information

Details of authorised personnel are found in chapter 3.4.2.
Details of dangers and their avoidance are found in chapter 3.5.

10.2 Following the maintenance plan

10.2.1 Logging maintenance work

The maintenance intervals given are those recommended for KAESER original components with average operating conditions.

➢ In adverse conditions, perform maintenance work at shorter intervals.

Adverse conditions are, e.g.:

- high temperatures
- much dust
- high number of load changes
- low load

➢ Adjust the maintenance intervals with regard to local installation and operating conditions.

➢ Document all maintenance and service work.

This enables the frequency of individual maintenance tasks and deviations from our recommendations to be determined.

Further information A prepared list is provided in chapter 10.21.

10.2.2 Resetting maintenance interval counters

According to the way a machine is equipped, sensors and/or maintenance interval counters monitor the operational state of important functional devices. Required maintenance work is shown on SIGMA CONTROL 2 .

Precondition Maintenance performed and
maintenance message acknowledged.

➢ Reset the maintenance interval counter as described in the SIGMA CONTROL 2 operating manual.

10.2.3 Regular maintenance tasks

The table below lists maintenance tasks required.

➢ Take note of the controller's service messages and carry out tasks punctually, taking ambient and operating conditions into account.

Interval	Maintenance task	See chapter
weekly	Check the cooling oil level.	10.13
	Control cabinet: Check the filter mat	10.3
Monthly	Condensate drainage maintenance	10.19
Up to 1,000 h	Clean the cooler.	10.4
	Check the cooling air filter mat	10.6

h = operating hours

Interval	Maintenance task	See chapter
Up to 3,000 h	Change the cooling air filter mat	10.6
	Control cabinet: Change the filter mat.	10.3
Display: SIGMA CONTROL 2	Change the air filter element.	10.8
	Maintain the motor bearings.	10.9
	Check the coupling.	10.10
Display: SIGMA CONTROL 2	Change the oil filter.	10.17
At least annually		
Display: SIGMA CONTROL 2	Change the oil separator cartridge.	10.18
Every 3 years at least		
Variable, see table 53	Change the cooling oil.	10.16
Annually	Check the pressure relief valve.	10.11
	Check the overheating safety shutdown function.	10.12
	Check the cooler for leaks.	10.4
	Maintain the water-cooling system.	10.5
	Maintain the heat recovery system.	10.7
	Check that all electrical connections are tight.	–

h = operating hours

Tab. 52 Regular maintenance tasks

10.2.4 Cooling oil: Change interval

Duty cycles and ambient conditions are important factors influencing the number and length of the oil change intervals.

KAESER Service will support you in determining suitable intervals and provide information on the possibilities of oil analysis.

- ➢ Observe national regulations regarding the use of cooling oil in oil-injected rotary screw compressors.
- ➢ Check operating conditions and adjust intervals as necessary; log the results in table 53 for future reference.

	Maximum permissible oil change interval [operating hours/years]		
SIGMA FLUID	Favourable operating conditions*	Unfavourable operating conditions	My operating conditions
S-460	6 000**/2	4 000/1	
S-570	6 000**/2	4 000/1	
MOL	3 000/1	2 000/1	

* Cool to moderate ambient temperatures, low humidity, high duty cycle

** Changing intervals of > 6000 operating hours are not permissible without an oil analysis.

	Maximum permissible oil change interval [operating hours/years]		
SIGMA FLUID	Favourable operating conditions*	Unfavourable operating conditions	My operating conditions
FG-460	3 000/1	2 000/1	
FG-680	3 000/1	2 000/1	
PANOLIN HLP SYNTH 46	3 000/1	2 000/1	

* Cool to moderate ambient temperatures, low humidity, high duty cycle

** Changing intervals of > 6000 operating hours are not permissible without an oil analysis.

Tab. 53 Cooling oil: Change intervals

10.2.5 Regular service tasks

The table below lists necessary service tasks.

➢ Only an authorized KAESER Service Technician should carry out service work.

➢ Have service tasks carried out punctually taking ambient and operating conditions into account.

Interval	Service task
Display: SIGMA CONTROL 2	Valve Maintenance
Display: SIGMA CONTROL 2	Compressor drive motor: Replace the motor bearings.
	Fan motor: Replace the motor bearings.
Up to 36,000 h	Replace the hose lines:
Every 6 years at least	■ Pressure pipes ■ Control air lines ■ Intake line at intake valve

h = operating hours

Tab. 54 Regular service tasks

10.3 Control cabinet: Clean or renew the filter mat

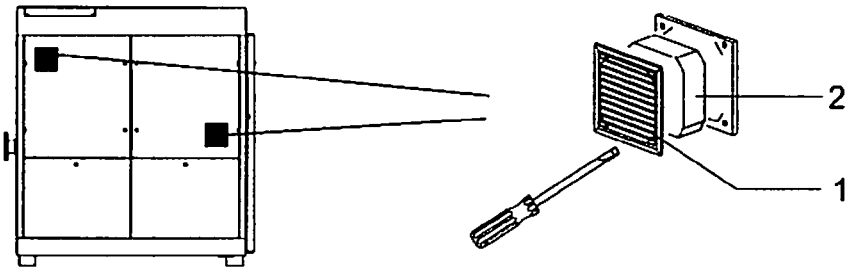
A filter mat is placed behind every ventilation grille. Filter mats protect the control cabinet from ingress of dirt. If the filter mats are clogged, adequate cooling of the components is no longer ensured. In such a case, clean or replace the filter mats.

Material Warm water and household detergent

Spare parts (as required)

Precondition The power supply isolating device is switched off,
the device is locked off,
the absence of any voltage has been verified.

The machine has cooled down.



10-S0057

Fig. 23 Switching cabinet ventilation
[1] Ventilation grille
[2] Filter mat

1. Carefully remove the ventilation grille and take out the filter mat.
2. Beat the mat or use a vacuum cleaner to remove loose dirt. If necessary, wash with lukewarm water and household detergent.
3. Change the filter mat if cleaning is not possible or if the change interval has expired.
4. Insert the filter mat in the frame and latch in the ventilation grille.

10.4 Option K1 Cooler maintenance

Regularly clean the cooler. This ensures reliable cooling of the machine and the compressed air. The frequency is mainly dependent on local operating conditions.

A leaking cooler results in loss of cooling oil and compressed air.

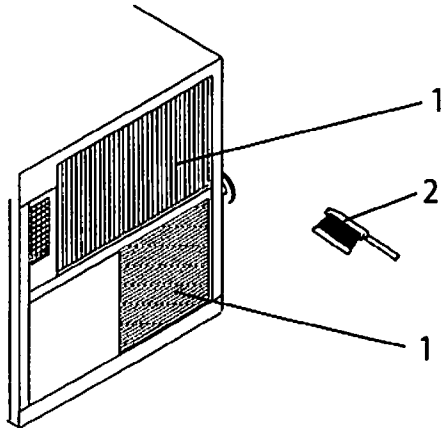
Clogged coolers are indicative of unfavourable ambient conditions. Such ambient conditions clog the cooling air ducts in the machine's interior and the engines resulting in increased wear and tear.

➢ Have the authorised KAESER Service clean the cooling air ducts.

Material Brush and vacuum cleaner
Face mask (as required)

Precondition The supply disconnecting device is switched off,
the device is locked off,
the absence of voltage has been verified.

The machine has cooled down.



10-S0313

Fig. 24 Clean cooler/radiator

[1] Radiator
[2] Brush

Clean cooler/radiator

Do not use sharp objects to clean the cooler. It could be damaged.

Avoid creating clouds of dust.

➢ Dry brush the oil and air coolers and use a vacuum cleaner to suck up the dirt.

The air and oil coolers can no longer be properly cleaned?

➢ Have severe clogging removed by an authorised KAESER Service Technician.

Check the cooler for leaks

➢ Visual inspection: Did cooling oil escape?

Is a cooler leaking?

➢ Have the defective cooler repaired immediately by KAESER Service.

10.5 Option K2 Water-cooling Maintenance

Cooler clogging causes overheating and machine damage.

➢ Observe the airend discharge temperature to detect any tendency to rise.

Check the cooler regularly for leaks and contamination. Frequency of checking is dependant on the characteristics of the cooling water.

Precondition The power supply disconnecting device is switched off.
The disconnecting device is locked in the off position.
A check has been made that no voltage is present.

Check for leaks

Pressure in the cooling oil circuit is generally higher than that in the cooling water system. If a leak occurs, oil will run into the cooling water.

1. Check the cooler visually for leaks.
2. Have an authorised KAESER Service Technician check the heat exchanger for internal leaks at least once a year.

Cleaning

➢ An authorised KAESER Service Technician should clean the cooler when the airend discharge temperature is 10 °C above the annual average.

10.6 Option K3
Cleaning or Renewing the Cooling Air Filter Mat

The filter mat help to keep the cooler clean. If the filter mat is clogged, adequate cooling of the components is no longer ensured.

Material: Warm water and household detergent
Spare parts (as required)

Precondition: The machine is switched off.

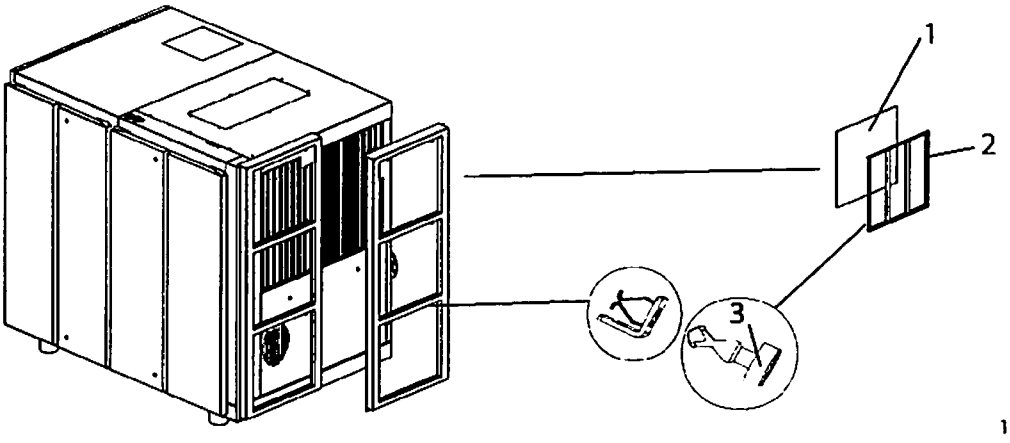


Fig. 25 Cooling air filter mat
[1] Cooling air filter mat
[2] Retaining frame
[3] Fixing

Removal

1. Open the fixing [3] by turning 90° anti-clockwise with a screwdriver.
2. Remove the frame [2].

Cleaning

➢ Renew the mat if cleaning is not possible or has already been carried out five times.

➢ Beat the mat [1] or use a vacuum cleaner to remove loose dirt.
If necessary, wash the mat in lukewarm water (about 40 °C) and household detergent then rinse thoroughly.

Refitting

➢ Replace the frame and close the fixings.
Use a screwdriver to turn the fixings 90° clockwise until they latch.

10.7 Option W1 Maintaining the heat recovery system.

Deposits in the heat exchanger can significantly reduce its capacity to transfer heat.

Check the heat exchanger regularly for leaks and contamination. Frequency of checking is dependant on the characteristics of the heat transfer medium.

➢ Have the external heat recovery system checked annually by KAESER Service.

10.7.1 Option W1 External heat recovery system

➢ Have the external heat recovery system checked annually by an authorised KAESER Service technician.

10.8 Changing the air filter

Check that all sealing surfaces match each other. The use of an unsuitable air filter element can permit dirt to ingress into the pressure system and cause damage to the machine.

Do not clean the air filter element. A damaged air filter element can permit dirt to ingress the pressure system and cause damage to the machine.

Material Spares

Precondition The supply disconnecting device is switched off,
the device is locked off,
the absence of voltage has been verified.

The machine has cooled down.

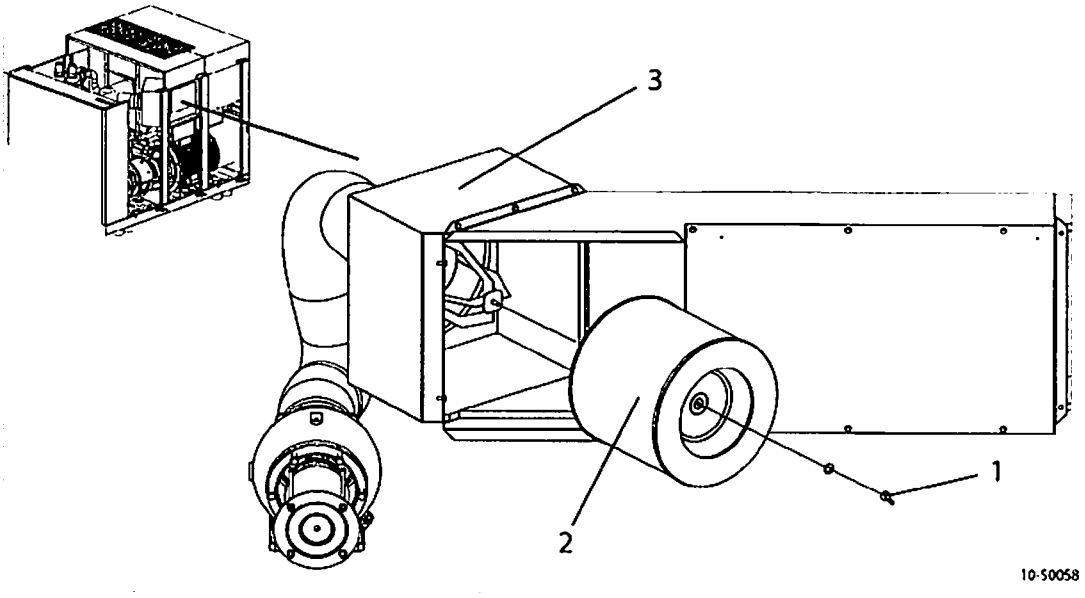


Fig. 26 Air filter maintenance

[2] Air filter cartridge
[4] Clamping nut
[5] Cover plate
[6] Access panel

1. Remove the access panel [6].
2. Remove the cover plate [5].
3. Unscrew the nut [4] and remove the filter element.
4. Clean all parts and sealing surfaces.
5. Insert the new element and secure with the nut [4].
6. Screw the cover plate [5] onto the machine.
7. Close all access doors and replace all enclosure panels.
8. Switch on the power supply and reset the maintenance interval counter.

10.9 Motor maintenance

Use only the high temperature grease ESSO UNIREX N3 for the motor bearings. Bearing damages caused by the use of other brands of grease are excluded from the warranty.

Material Bearing grease ESSO UNIREX N3
Cleaning cloths

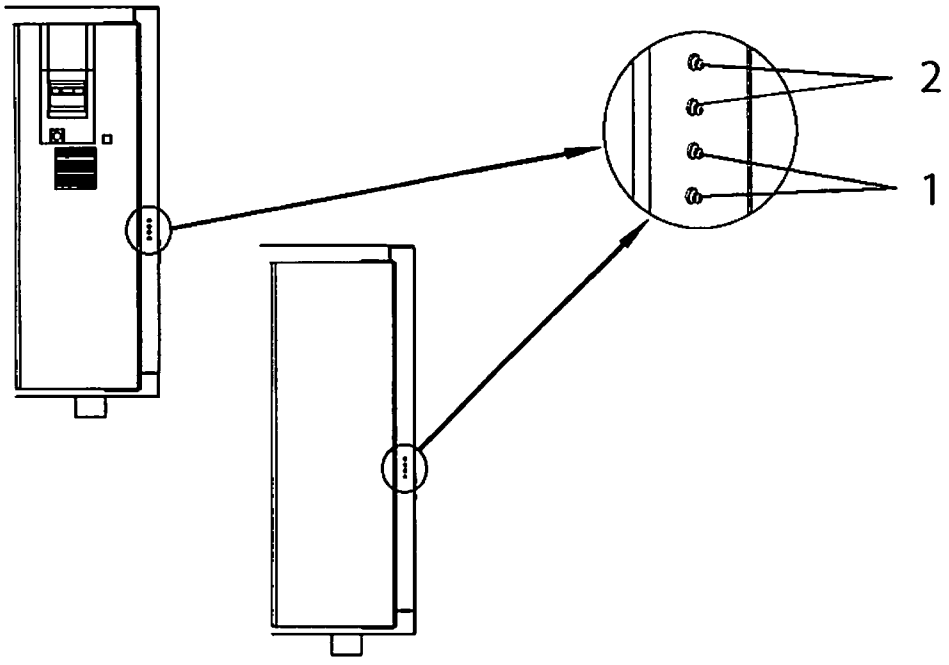


Fig. 27 Drive motor maintenance
[1] Grease nipple (drive motor)
[2] Grease nipple (fan motor K1)

Drive motor

Nipples for re-greasing the motor bearings are located on the outside of the machine.
The lines to the bearings are factory-filled with grease.

Apply the quantity of grease as stated on the motor nameplate.

Precondition Motor running

1. Clean the nipple [1] with a cloth before greasing.
2. Grease both bearings with a grease gun.
3. Reset the maintenance interval counter.

Option K1 **Fan motor**

Nipples for re-greasing the motor bearings are located on the outside of the machine.
The lines to the bearings are factory-filled with grease.

Apply the quantity of grease as stated on the motor nameplate.

Precondition Motor running

1. Clean the nipple [2] with a cloth before greasing.
2. Grease both bearings with a grease gun.
3. Reset the maintenance interval counter.

Option K2 Fan motor

➢ Have the fan motor bearings checked by a KAESER Service Technician during the course of a visit.

10.10 Checking the Coupling

A defective coupling is recognisable by:

- noisy running,
- surface cracks,
- colour change.

WARNING
Danger of injury from rotating coupling!

➢ Never switch the machine on without the safety screen in place over the coupling.

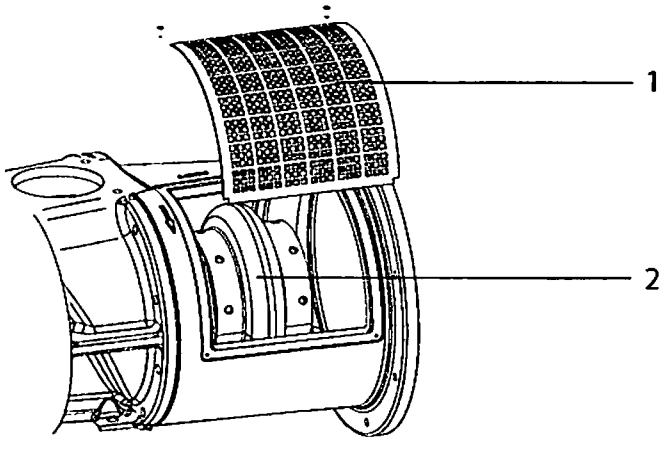


Fig. 28 Checking the coupling
[1] Safety screen
[2] Coupling

Check for uneven or noisy running

Precondition The machine is running

➢ Check the coupling for noisy or uneven running

Make a visual check for damage

Precondition The power supply disconnecting device is switched off.
The disconnecting device is locked in the off position.
A check has been made that no voltage is present.
The machine has cooled down.

1. Remove the securing screws and take off the safety screen.
2. Turn the coupling my hand and look for damage or colour change.

3. Refit the safety screen.
4. Close all access doors and replace all enclosure panels.

Has the coupling cracks or colour changes?

➢ Have a damaged coupling changed by an authorised KAESER Service Technician.

10.11 Testing the pressure relief valve

In order to check the pressure relief valve, the machine's working pressure is raised above the activating pressure of the valve.

Blow off protection and air system pressure monitoring are switched off during the test. In normal operation, the blow-off protection will switch off the machine before the pressure relief valve responds. During the inspection, the blow-off protection will switch off the machine only when the activating pressure of the pressure relief valve has been exceeded by 1 bar.

➢ Follow the detailed description of this procedure in the SIGMA CONTROL 2 operating manual

➢ Never operate the machine without a correctly functioning pressure relief valve.

➢ Have a defect pressure relief valve replaced immediately.

WARNING
Excessive noise is caused when the pressure relief valve blows off!

➢ Close all access doors, replace and secure all removable panels.

➢ Wear hearing protection.

Precondition The machine is switched off.

1. Close the user's shut-off valve between the machine and the air distribution network.
2. Read off the activating pressure on the valve.
   (the activating pressure is usually to be found at the end of the part identification)
3. Log on to SIGMA CONTROL 2 with access level 2.
4. Observe the display of pressure on SIGMA CONTROL 2 and call up the test function.
5. WARNING!
   Risk of burns due to released cooling oil and compressed air when blowing off the pressure relief valve!
   ➢ Close all access doors, replace and secure all removable panels.
   ➢ Wear eye protection.
6. End the test as soon as the pressure relief valve blows off or working pressure exceeds the activating pressure of the pressure relief valve by nearly 1 bar.
7. If necessary, vent the machine and replace the defective pressure relief valve.
8. Deactivate the test function
9. Open the user's shut-off valve between the machine and the air distribution network.

10.12 Checking the overheating safety shutdown function

The machine should shut down if the airend discharge temperature reaches a maximum of 110 °C.

➢ Check the safety shutdown function as described in the SIGMA CONTROL 2 operating manual.

The machine does not shut down?

➢ Have the safety shutdown function checked by an authorised KAESER Service Technician.

10.13 Checking the cooling oil level

In frequency-controlled compressors (SFC) the oil level indicator is only accurate when the machine is running at or near maximum speed.
The lower the pressure at the compressed air outlet, the higher the speed.
SIGMA CONTROL 2 displays this value.

Precondition The machine has been running at least 5 minutes under LOAD.

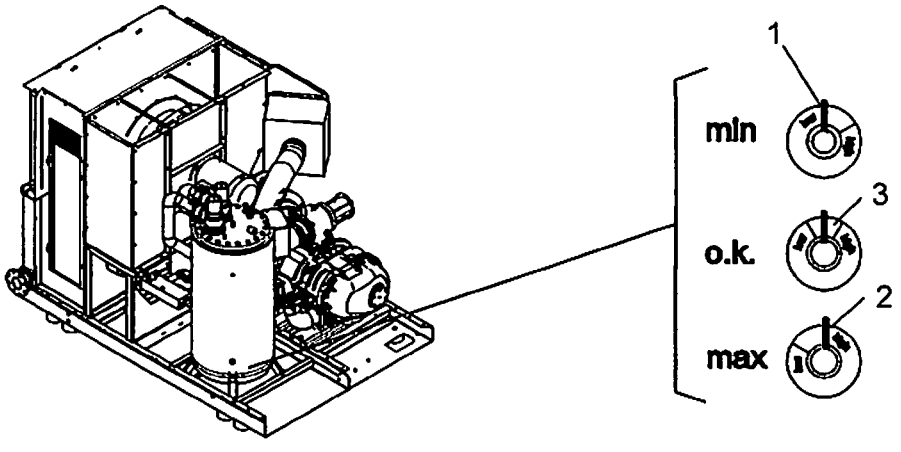


Fig. 29 Checking the cooling oil level

[1] Minimum oil level
[2] Maximum oil level
[3] Optimum oil level

1. CAUTION!
   Danger of burning - hot surfaces!
   ➢ Wear long-sleeved clothing and protective gloves.
2. Check the oil level with machine running under LOAD.

Result As soon as the minimum level is reached: Replenish the cooling oil.

10.14 Venting the machine (de-pressurising)

Venting takes place in three stages:

- Isolate the compressor from the air system.
- Vent the oil separator tank.
- Manually vent the air cooler.

The machine must be isolated from the compressed air network and completely vented before undertaking any work on the pressure system.

Material — The maintenance hose with hose coupling and shut-off valve needed for venting is stowed beneath the oil separator tank.

Precondition — The power supply isolating device is switched off,
the device is locked off,
the absence of any voltage has been verified.

CAUTION
Escaping oil mist is damaging to health.
- ➢ Do not direct the maintenance hose at persons while venting.
- ➢ Do not inhale the oil mist.

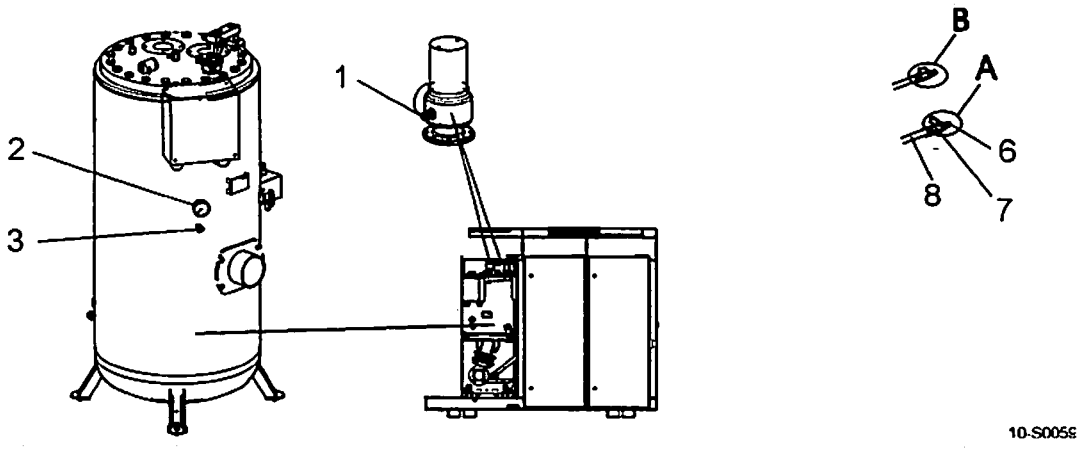


Fig. 30 Venting the machine

[1]	Hose coupling (air cooler venting)	[7]	Shut-off valve
[2]	Pressure gauge	[A]	Shut-off valve open
[3]	Hose coupling (oil separator tank venting)	[B]	Shut-off valve closed
[6]	Plug-in nozzle	[8]	Maintenance hose

Isolating the machine from the air system

- ➢ Close the user's shut-off valve between the machine and the air distribution network.

If no shut-off valve is provided by the user, the complete air network must be vented.

Venting the oil separator tank

The oil circulation vents automatically as soon as the machine is stopped.

- ➢ Check that the oil separator tank pressure gauge reads 0 bar.

The pressure gauge does not read 0 bar after automatic venting?
- ➢ Make sure that the shut-off valve is closed or that the complete air system is vented.
- ➢ With the shut-off valve closed, insert the male hose fitting [6] into the hose coupling [3].
- ➢ Slowly open the shut-off valve [7] to release pressure.
- ➢ Disconnect the male hose fitting [6] and close the shut-off valve [7].
- ➢ If manual venting does not bring the oil separator tank pressure gauge to zero: Contact the KAESER Service.

Manually venting the air cooler

After shutting down the compressor and venting the oil separator tank, the machine is still under pressure from the air system or the section from the shut-off valve to the minimum pressure/check valve.

1. With the shut-off valve closed, insert the male hose fitting [6] into the hose coupling [1].
2. Slowly open the shut-off valve [7] to release pressure.
3. Disconnect the male hose fitting [6] and close the shut-off valve [7].

10.15 Replenishing the cooling oil

The machine must be isolated from the compressed air network and completely vented before undertaking any work on the pressure system.

Material The maintenance hose with hose coupling and shut-off valve needed for venting is stowed beneath the oil separator tank.

Precondition The power supply isolating device is switched off,
the device is locked off,
the absence of any voltage has been verified.

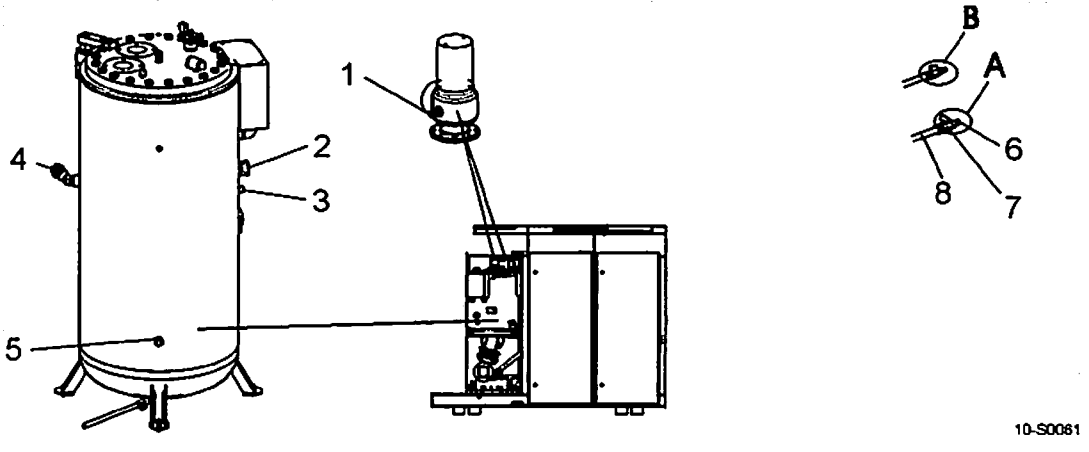


Fig. 31 Replenishing the cooling oil

[1]	Hose coupling (air cooler venting)	[6]	Plug-in nozzle
[2]	Pressure gauge	[7]	Shut-off valve
[3]	Hose coupling (oil separator tank venting)	[A]	Shut-off valve open
[4]	Oil filler port with plug	[B]	Shut-off valve closed
[5]	Cooling oil level indicator	[8]	Maintenance hose

1. Vent the machine as described in section 10.15.1.
2. Fill with cooling oil and test run as described in section 10.15.2.

10.15.1 Venting the machine (de-pressurising)

Venting takes place in three stages:

- Isolate the compressor from the air system.

- Vent the oil separator tank.
- Manually vent the air cooler.

CAUTION
Escaping oil mist is damaging to health.
➢ Do not direct the maintenance hose at persons while venting.
➢ Do not inhale the oil mist.

Isolating the machine from the air system

➢ Close the user's shut-off valve between the machine and the air distribution network.

If no shut-off valve is provided by the user, the complete air network must be vented.

Venting the oil separator tank

The oil circulation vents automatically as soon as the machine is stopped.

➢ Check that the oil separator tank pressure gauge reads 0 bar.

The pressure gauge does not read 0 bar after automatic venting?
➢ Make sure that the shut-off valve is closed or that the complete air system is vented.
➢ With the shut-off valve closed, insert the male hose fitting [6] into the hose coupling [3].
➢ Slowly open the shut-off valve [7] to release pressure.
➢ Disconnect the male hose fitting [6] and close the shut-off valve [7].
➢ If manual venting does not bring the oil separator tank pressure gauge to zero: Contact the KAESER Service.

Manually venting the air cooler

After shutting down the compressor and venting the oil separator tank, the machine is still under pressure from the air system or the section from the shut-off valve to the minimum pressure/check valve.

1. With the shut-off valve closed, insert the male hose fitting [6] into the hose coupling [1].
2. Slowly open the shut-off valve [7] to release pressure.
3. Disconnect the male hose fitting [6] and close the shut-off valve [7].

10.15.2 Topping up with cooling oil and trial run

Replenishing the cooling oil

A sticker on the oil separator tank specifies the type of oil used.

1. WARNING!
   Compressed air!
   Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly.
   ➢ De-pressurise all pressurised components and enclosures.

2. *NOTICE!*
   The machine could be damaged by unsuitable oil!
   - ➢ Never mix different types of oil.
   - ➢ Never top up with a different type of oil to that already used in the machine.
3. Slowly unscrew the filler plug [4].
4. Top up to bring the oil to the correct level.
5. Renew the filler plug's gasket if necessary and screw the plug into the filler port.

Starting the machine and carrying out a trial run

1. Close all access doors, replace and secure all removable panels.
2. Open the user's shut-off valve between the machine and the air distribution network.
3. After approx. 10 minutes of operation: Check the cooling oil level and top up if necessary.
4. Switch off the machine and check visually for leaks.

10.16 Changing the Cooling Oil

Drain the oil completely from the following components:
- Oil separator tank
- Oil cooler
- Airend
- Heat recovery system (Option W1)

- ➢ Always change the oil filter and oil separator cartridge when changing the oil.
- ➢ Contact KAESER Service if condensate is detected in the cooling oil. It is necessary to adjust the airend discharge temperature to suit operating conditions.

Compressed air helps to expel the oil. This compressed air can be taken either from the compressor itself or from an external source.

An external source of compressed air is necessary in the following cases:
- The machine is not operational.
- The machine is to be restarted after a long period of standstill.

The machine must be isolated from the compressed air network and completely vented before undertaking any work on the pressure system.

Material Cooling oil
Cooling oil receptacle

The maintenance hose with hose coupling and shut-off valve is stowed beneath the oil separator tank.

CAUTION
There is risk of burns from hot components and oil!
- ➢ Wear long-sleeved clothing and gloves.

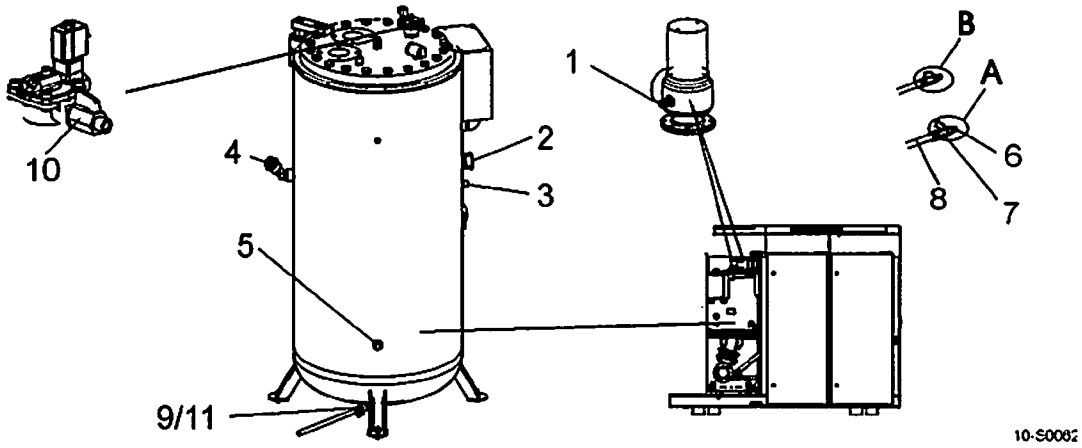


Fig. 32 Changing the cooling oil, oil separator tank

[1] Hose coupling (air cooler venting)
[2] Pressure gauge
[3] Hose coupling (oil separator tank venting)
[4] Oil filler port with plug
[5] Cooling oil level indicator
[6] Male hose fitting
[7] Shut-off valve
[A] Shut-off valve open
[B] Shut-off valve closed
[8] Maintenance hose
[9] Hose coupling (oil drain)
[10] Shut-off valve (venting line)
[11] Shut-off valve (oil drain)

Changing the oil with internal pressure

Machine has been running at least 5 minutes under LOAD.

The machine is fully vented,
the pressure gauge on the oil separator tank reads 0 bar.

1. Close the shut-off valve [10] in the venting line.
2. Select IDLE running.
3. Start the machine and watch the oil separator tank pressure gauge [2] until it reads 3–5 bar.
4. Switch off and lock out the power supply disconnecting device and verify the absence of any voltage.
5. Wait at least 2 minutes to allow the oil to flow back to the separator tank.

Oil change with an external compressed air source

The power supply isolating device is switched off,
the device is locked off,
the absence of any voltage has been verified.

The machine is fully vented,
the pressure gauge on the oil separator tank reads 0 bar.

An external source of compressed air is available.

1. Close the shut-off valve [10] in the venting line.
2. With the shut-off valve closed, insert the male hose fitting [6] into the hose coupling [3].
3. Connect the maintenance hose to the external air supply.
4. Open the shut-off valve [7] until the pressure gauge on the oil separator tank reads 3–5 bar.
5. Close the shut-off valve [7] and remove the male hose fitting from the coupling.

Draining the oil from the separator tank

1. Have an oil receptacle ready.
2. With the shut-off valve closed, insert the male hose fitting [6] into the hose coupling [9].

3. Place the other end of the maintenance hose in the oil receptacle and secure it in place.
4. Open the shut-off valve [11].
5. Slowly open the shut off valve [7] in the maintenance hose to release oil and close immediately when air escapes.
6. Close the shut-off valve [11] and unplug the male hose fitting.

Draining the oil from the cooler

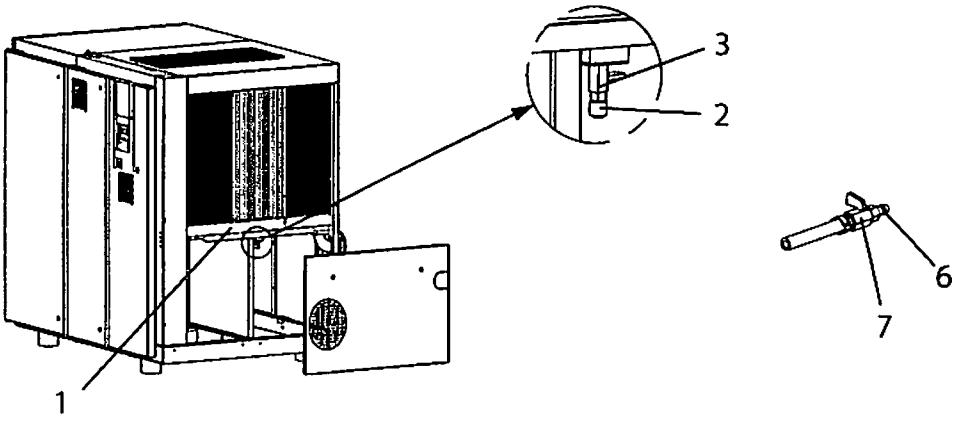


Fig. 33 Changing the cooling oil, oil cooler

[1] Oil cooler
[2] Hose coupling (oil drainage)
[3] Shut-off valve
[6] Male hose fitting
[7] Shut-off valve

1. Have an oil receptacle ready.
2. With the shut-off valve closed, insert the male hose fitting [6] into the hose coupling [2].
3. Place the other end of the maintenance hose in the oil receptacle and secure it in place.
4. Open the shut-off valve [3].
5. Slowly open the shut-off valve [7] and allow cooling oil and air to escape completely until the pressure gauge reads 0 bar.
6. Close the shut-off valve [2] and unplug the male hose fitting.

Draining the oil from the airend

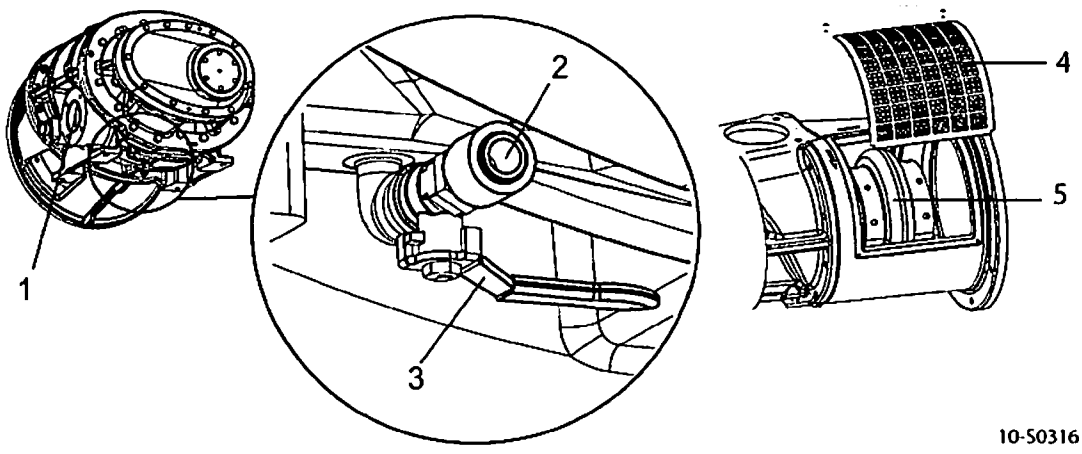


Fig. 34 Changing the cooling oil, airend

[1]	Compressed air outlet on airend	[4]	Safety screen
[2]	Hose coupling (oil drainage)	[5]	Coupling
[3]	Shut-off valve		

1. Have an oil receptacle ready.
2. With the shut-off valve closed, insert the male hose fitting [6] (Fig. 32) into the hose coupling [2].
3. Place the other end of the maintenance hose in the oil receptacle and secure it in place.
4. Open shut-off valves [3] and [7] (Fig. 32)
5. Remove the coupling safety screen [4] and turn the coupling [5] by hand at least five revolutions until all the oil has run out.
6. Fit the safety screen again.
7. Close the shut-off valve [3] and unplug the male hose fitting.

Result The cooling oil is drained from the airend.

Turning the coupling lets a small quantity of cooling oil return to the oil separator container. Thus, please repeat the step "Draining cooling oil from the oil separator container", in order to also drain this cooling oil.

Option W1 **Draining the oil from the external heat recovery system**

If the machine is connected to an external heat recovery system, drain the oil from the heat exchanger at a suitable point.

Precondition The external heat recover system is de-pressurised.

1. Have an oil receptacle ready.
2. Open the external heat recovery system and allow the oil to drain completely.
3. Close the external heat recovery system.

Filling with cooling oil

1. WARNING!
   Compressed air!
   Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly.
   ➢ De-pressurise all pressurised components and enclosures.
2. Open the filler plug [4] (Fig. 32) slowly.
3. Fill with cooling oil.
4. Check the filler plug and ring seal for damage and screw the plug back in again.

Starting the machine and carrying out a trial run

1. Close all access doors; replace and secure all removable panels.
2. Open the user's shut-off valve between the machine and the air distribution network.
3. Switch on the power supply and reset the maintenance interval counter.
4. Start the machine and check the oil level again after about 10 minutes, topping up if necessary.
5. Switch off the machine and check visually for leaks.

➢ Dispose of used oil in accordance with environment protection regulations.

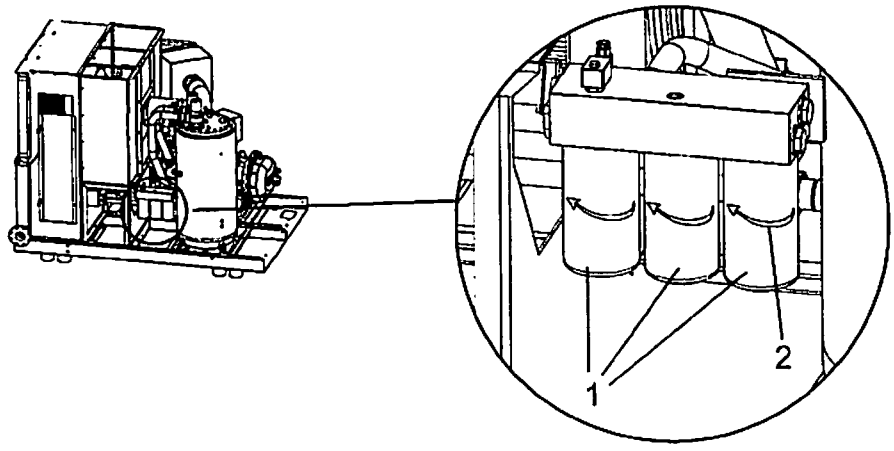
10.17 Changing the oil filter

The machine must be isolated from the compressed air network and completely vented before undertaking any work on the pressure system.

Material: Spares
Cooling oil receptacle

Precondition: The supply disconnecting device is switched off.
The disconnecting device is locked in the off position.
A check has been made that no voltage is present.
The machine is fully vented,
the pressure gauge on the oil separator tank reads 0 bar.

CAUTION
There is risk of burns from hot components and oil!
➢ Wear long-sleeved clothing and gloves.



10-S0064

Fig. 35 Changing the oil filter
[1] Oil filter
[2] Direction to unscrew

Changing the oil filter

1. WARNING!
   Compressed air!
   Compressed air and devices under pressure can injure or cause death if the contained energy of the air is released suddenly or uncontrolled.
   ➢ Vent all pressurized components and chambers completely.
2. Unscrew the oil filter anti-clockwise, catch oil spillage and dispose of in accordance with environmental protection regulations.
3. Lightly oil the new filter's O-ring.
4. Turn the oil filter clockwise by hand to tighten.

➢ Dispose of parts and materials contaminated with oil in accordance with environmental protection regulations.

Start the machine and carry out a trial run

1. Close all access doors, replace and secure all removable panels.
2. Open the user's shut-off valve between the machine and the air distribution network.
3. Switch on the power supply and reset the maintenance interval counter.
4. After approx. 10 minutes of operation: Check the cooling oil level and top up if necessary.
5. Switch off the machine and check visually for leaks.

10.18 Changing the oil separator cartridge

The oil separator cartridge cannot be cleaned.

The life of the oil separator cartridge is influenced by:

- contamination in the air drawn into the compressor,
- and adherence to the changing intervals for:
  - Cooling oil
  - Oil filter
  - Air filter

The machine must be isolated from the compressed air network and completely vented before undertaking any work on the pressure system.

Material Spares
Cleaning cloth

Precondition The supply disconnecting device is switched off.
The disconnecting device is locked off.
A check has been made that no voltage is present.
The machine is fully vented,
the pressure gauge on the oil separator tank reads 0 bar.

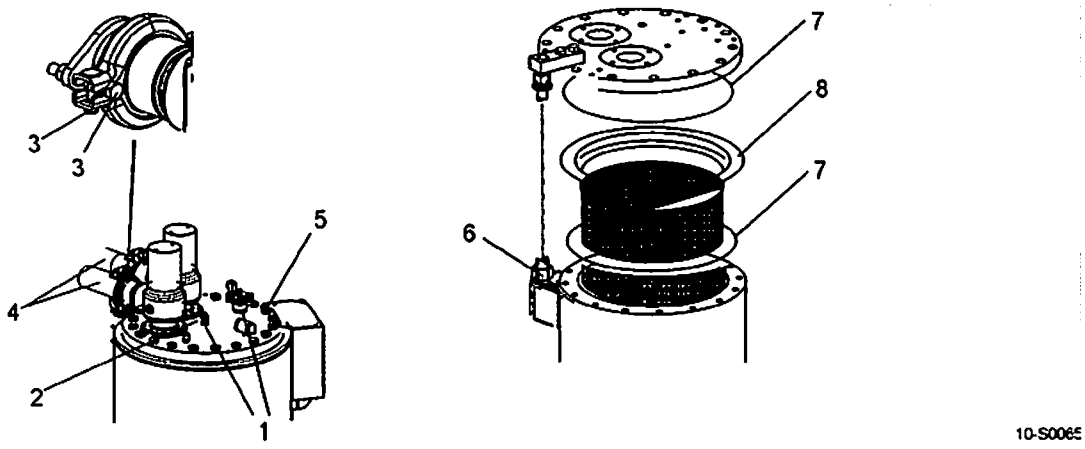


Fig. 36 Changing the oil separator cartridge

[1]	Screw fitting	[5]	Screw
[2]	dirt trap	[6]	Clamping nut
[3]	Screw fitting	[7]	Gasket
[4]	Air pipe	[8]	Oil separator cartridge

Changing the oil separator cartridge

1. WARNING!
   Compressed air!
   Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly.
   ➢ De-pressurise all pressurised components and enclosures.
2. Unscrew the fitting [1] and carefully put the parts to one side, then pull out the copper pipe from the dirt trap [2].
3. Loosen the fitting [3] and disconnect the air pipe [4] completely if necessary.
4. Remove the tank cover securing screws [5].

5. Use the nut [6] to lift the cover and swing it to the side.
6. Take out the old oil separator cartridge [8] together with the gaskets [7] and dispose of according to environmental protection regulations.
7. Clean all sealing faces.
8. Insert the new cartridge and gaskets.
9. Swing the cover over the tank and lower with the nut [6] until it rests on the tank rim.
   The nut [6] becomes free and can be turned by hand when the cover is resting on the tank.
10. Renew the O-ring and strainer in the dirt trap [2].
11. Secure the air pipe [4] with a new self-locking nut.

➢ Follow the instructions in chapter 10.20 concerning flexible pipe connections.

12. Replace and tighten all fittings.

➢ Dispose of parts and materials contaminated with oil in accordance with environmental protection regulations.

Starting the machine and carrying out a trial run

1. Close all access doors; replace and secure all removable panels.
2. Open the user's shut-off valve between the machine and the air distribution network.
3. Switch on the power supply and reset the maintenance interval counter.
4. After approx. 10 minutes of operation: Switch off the machine and check visually for leaks.

10.19 Condensate drainage maintenance

Condensate drainage maintenance is done in 2 steps:

1. Check the condensate drain. (chapter 10.19.1)
2. Maintain the condensate drain unit if necessary (chapter 10.19.2)

10.19.1 Checking condensate drainage

The check is made with the machine running. The *Valve* LED lights as soon as condensate begins to drain. It can be seen on lifting the cover plate.

Precondition
The machine has run for a sufficient period under LOAD.
The *Power* LED lights.
The *Alarm* LED does not light.

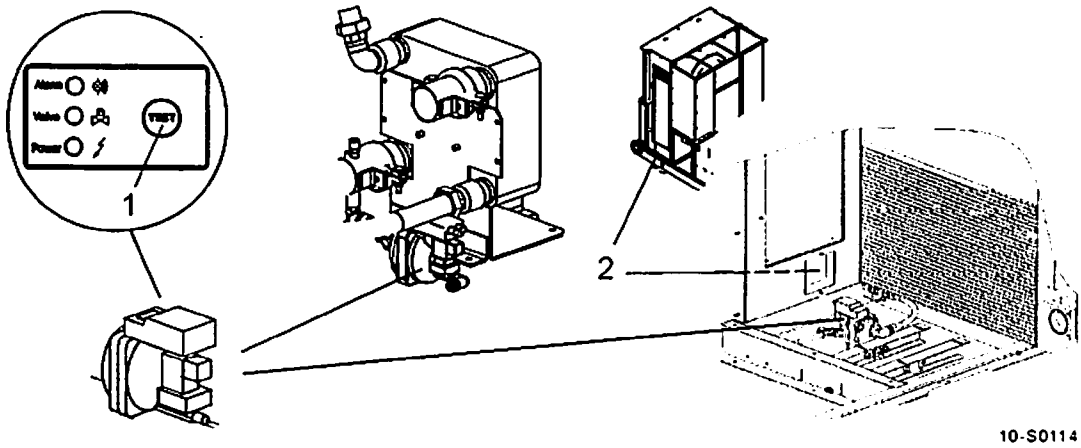


Fig. 37 Checking condensate drainage
[1] «TEST» button
[2] Plate

➢ Carry out visual inspection: Visual check: Does condensate flow as soon as the drain automatically opens?

Condensate does not flow?

The condensate drain hose or the drain itself is blocked.

➢ Switch off the machine and clean the drain pipe.

➢ Manually check condensate drainage: Remove the plate [2] and press and hold the «TEST» button for at least 2 seconds.

➢ Clean the condensate drain if condensate still does not flow.

➢ Collect condensate in a suitable container and dispose of in accordance with environmental regulations.

10.19.2 Cleaning the condensate drain

Precondition The supply disconnecting device is switched off,
the device is locked off,
a check has been made that no voltage is present.
Machine fully vented (no pressure).

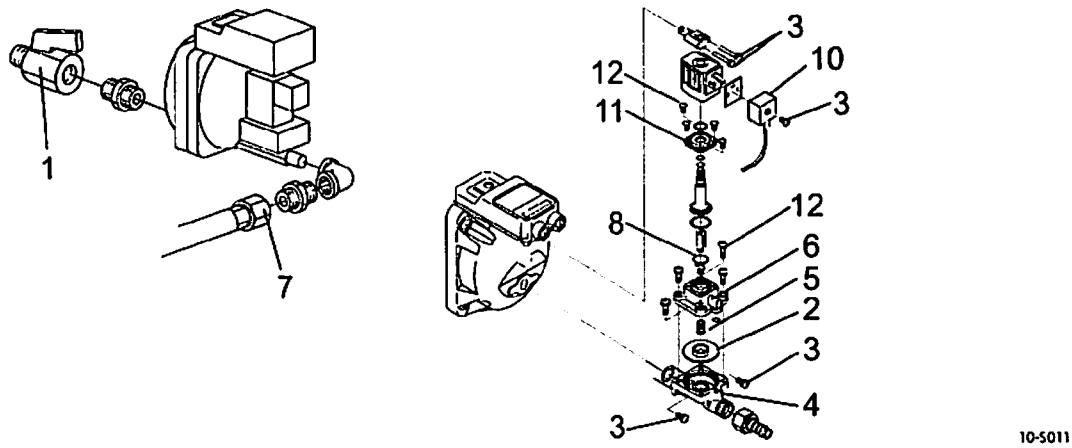


Fig. 38 Cleaning the condensate drain

[1]	Shut-off valve	[7]	Screw fitting
[2]	Diaphragm	[8]	Compression spring (valve core)
[3]	Screw	[9]	Valve core
[4]	Diaphragm seat	[10]	Plug
[5]	Compression spring (diaphragm)	[11]	Flange
[6]	Cover (diaphragm)	[12]	Screws

Dismantling the condensate drain

1. Close the shut-off valve [1] upstream of the condensate drain.
2. Unscrew the drain hose fitting [7].
3. Undo the screw [3] and withdraw the plug [10].

Cleaning the condensate drain

1. Undo the screws [12].
2. Remove and clean the following parts:
   - compression spring [5]
   - diaphragm [2]
   - valve core [9] with compression spring [8]
3. Blow out the housing with compressed air (<5 bar!).

Installing the condensate drain

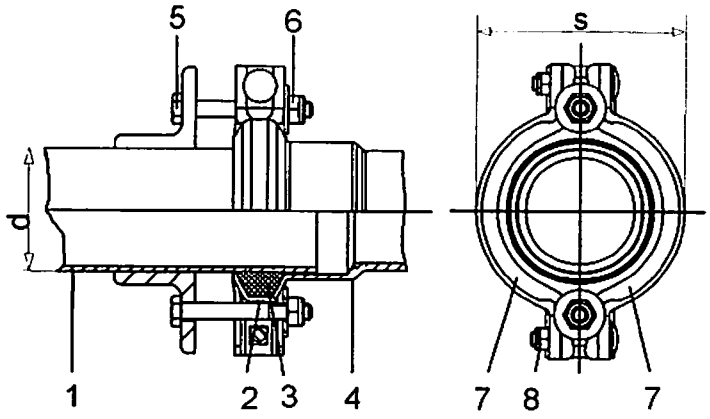
1. Assemble the parts as illustrated, making sure the spring and diaphragm seat properly, and secure with screws [3].
2. Fit the drain hose and open the shut-off valve [9] upstream of the condensate drain.
3. Close all access doors; replace and secure all removable panels.

10.20 Assembling flexible pipe connections

With the machine depressurized, the clamping bolts must be freely movable by hand and parallel with the pipe.

All clamping bolts must be equally loaded.

➢ Replace the self-locking nuts.



10-S0417

Fig. 39 Assembling flexible pipe connections

[1] Pipe
[2] Seal holder
[3] Gasket
[4] Sleeve
[5] Tensioning bolt
[6] Self-locking nut
[7] Pipe clamp halves
[8] Self-locking nut
[d] Pipe diameter (outside)
[s] Dimension of the flexible pipe joint under tension.

Precondition The pipe [1] must be deburred and the sealing face clean and undamaged.

1. Slide the seal holder [2] and gasket [3] over the pipe [1].
2. Slide the pipe end [1] into the bush [4] without pretension.
3. Slide the gasket [3] with seal holder [2] up the sealing face of the bush [4] taking care of pipe alignment.
4. Tighten up the clamping bolts [5] with the self-locking nuts [6].
5. Lay the pipe clamp halves [7] over the seal holder [2] and bush [4] and tighten the self-locking nuts [8] until the dimension [s] is reached.

Pipe diameter: d [mm]	Clamp diameter: s [mm]
88.9	146.0 ±2 %
48.0	80.0 ±2 %

Tab. 55 Dimensions of the flexible pipe connection

10.21 Documenting maintenance and service work

Machine number:

➢ Enter maintenance and service work carried out in the list.

Date	Maintenance task carried out	Operating hours	Signature

Tab. 56 Logged maintenance tasks

11 Spares, Operating Materials, Service

11.1 Note the Nameplate

The nameplate contains all information to identify your machine. This information is essential to us in order to provide you with optimal service.

➢ Please give the information from the nameplate with every enquiry and order for spares.

11.2 Ordering consumable parts and operating fluids/materials

KAESER consumable parts and operating materials are original Kaeser products. These are correct for use in our machines.

Unsuitable or poor quality maintenance parts and operating materials may damage the machine or impair its proper function.

Damage to the machine can also result in personal injury.

WARNING

There is risk of personal injury or damage to the machine resulting from the use of unsuitable spare parts or operating materials.

➢ Use only original KAESER parts and operating fluids/materials.

➢ Have an authorized KAESER Service Technician carry out regular maintenance.

Machine

Name	Quantity	Number
Air filter cartridge	1	1250
Filter mat (control cabinet)	2	1100
Filter mat (Option K3)	4	1050
Oil filter	3	1200
Oil separator cartridge	1	1450
Cooling oil	1	1600
Bearing grease [g]	100	9.0915.0
	400	6.3234.0

Tab. 57 Machine maintenance parts

11.3 KAESER AIR SERVICE

KAESER AIR SERVICE offers:

- authorised service technicians with KAESER factory training,
- increased operational reliability ensured by preventive maintenance,
- energy savings achieved by avoidance of pressure losses,
- optimum conditions for operation of the compressed air system,

- the security of genuine KAESER spare parts,
- increased legal certainty as all regulations are kept to.

➢ Why not sign a KAESER AIR SERVICE maintenance agreement!

Result Your advantage:
lower costs and higher compressed air availability.

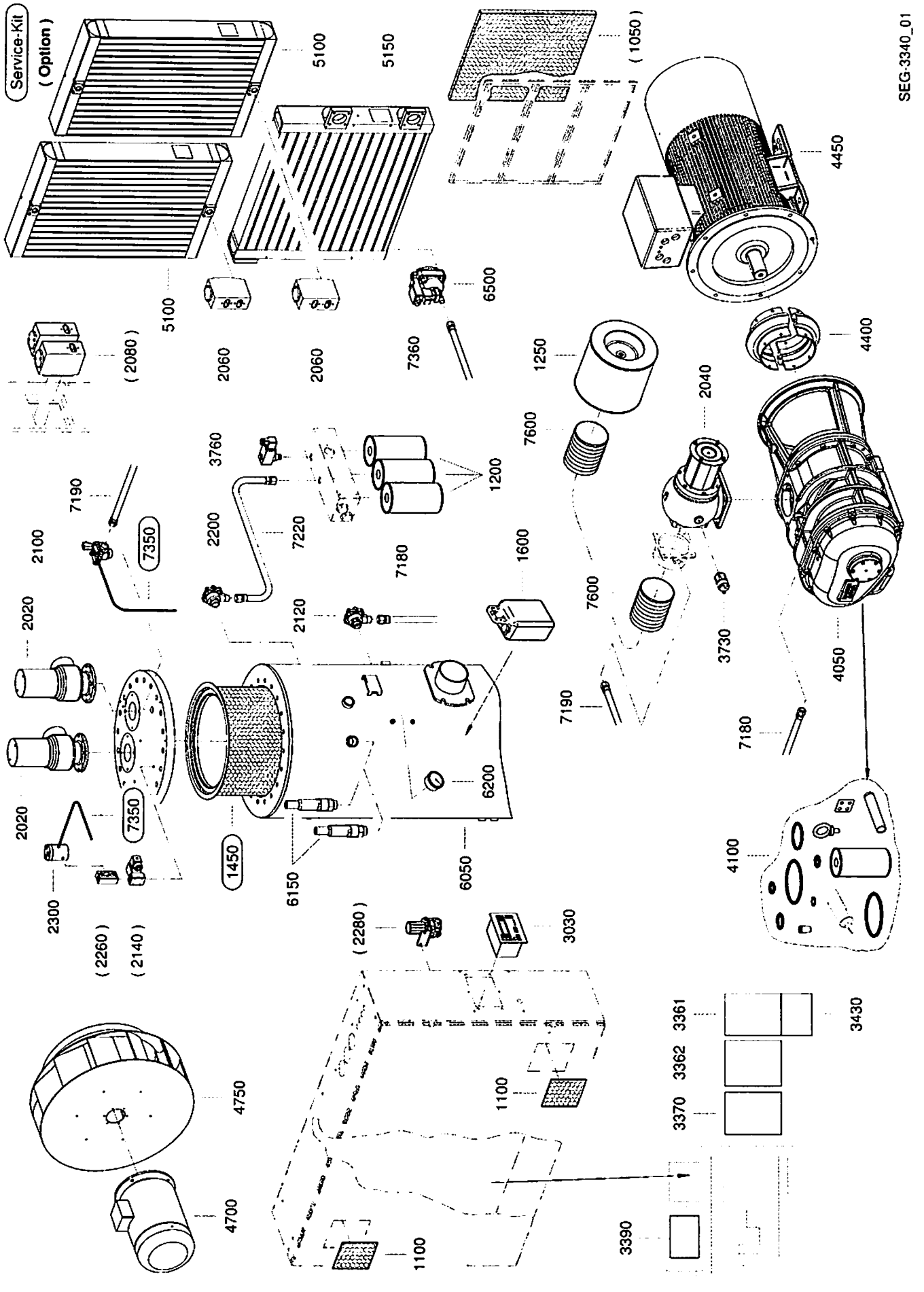
11.4 Service Addresses

Addresses of KAESER agents are given at the end of this manual.

11.5 Spare Parts for Service and Repair

With the help of this parts list you can plan your material requirement according to operating conditions and order the spare parts you need.

➢ Make sure that any service or repair tasks not described in this manual are carried out by an authorized KAESER service representative.


Service-Kit
(Option)
SEG-3340_01
5100
5150
(1050)
4450
6500
(2080)
2060
2060
7360
1250
4400
2040
7600
3760
1200
7190
7350
2200
7220
7180
1600
2100
2020
2120
7600
3730
4050
7190
7180
6200
7350
1450
6150
6050
4100
2300
(2260)
(2140)
(2280)
3030
3361
3430
3362
3370
4750
1100
4700
1100
3390

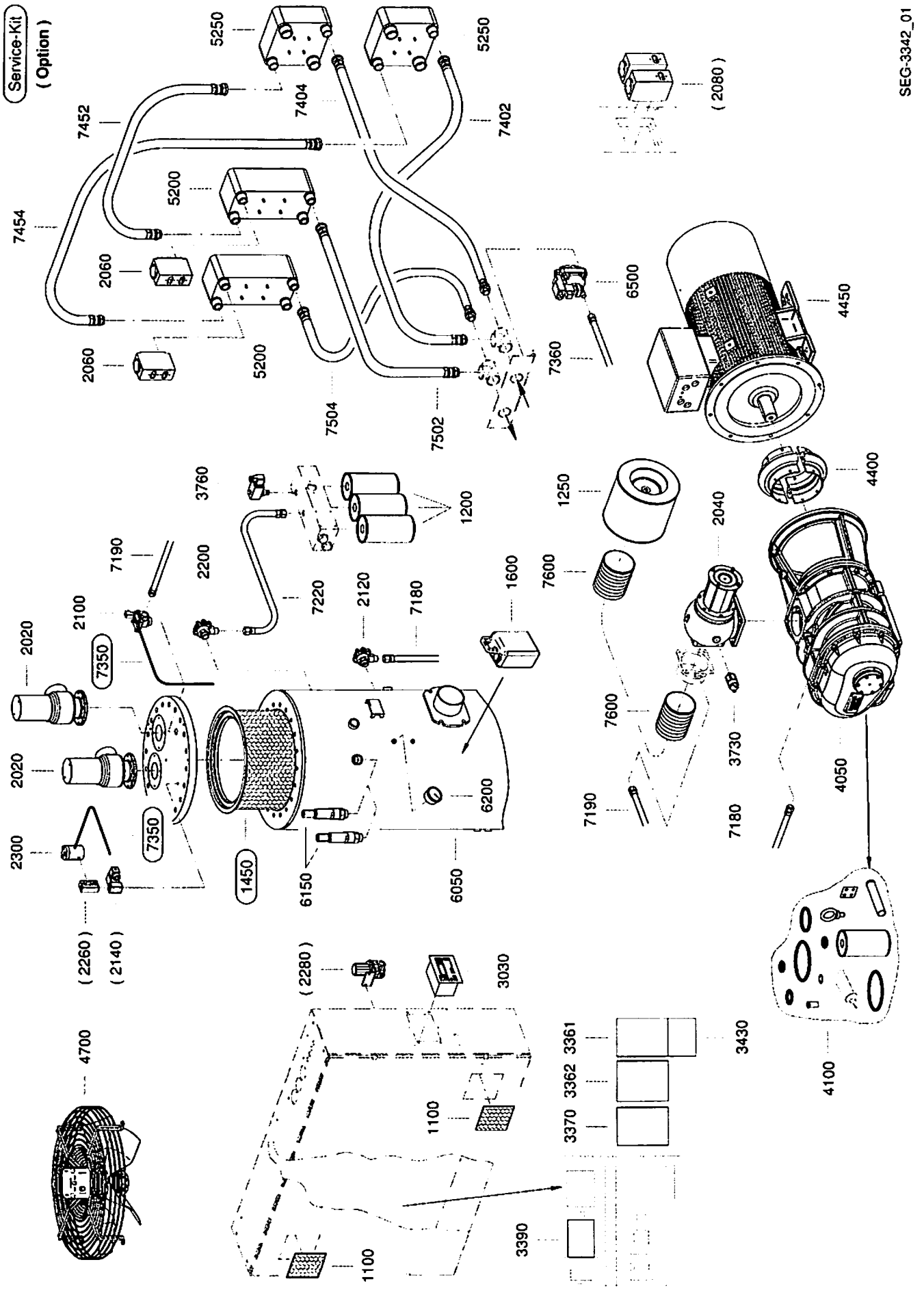
Legend	KAESER
FSD.2 - (K1)	SEL-2517_01E

Item	Description	Option
1050	Filter mat, cooling air	X
1100	Filter mat, control cabinet	
1200	Oil filter	
1250	Air filter element	
1450	Oil separator cartridge	
1600	Sigma Fluid *)	
2020	Minimum pressure/check valve	
2022	Maintenance kit, MP/CV	
2024	Overhaul kit, MP/CV	
2040	Inlet valve	
2042	Maintenance kit, in et valve	
2044	Overhaul kit, inlet valve	
2060	Combination valve	
2062	Maintenance kit, combi. valve	
2064	Overhaul kit, comb nation valve	
2080	Thermostatic valve (heat rec.)	X
2082	Maintenance kit, thermostatic valve	
2084	Overhaul kit, thermostatic valve	
2100	Venting/control valve	
2102	Maintenance kit, VC valve	
2104	Overhaul kit, VC valve	
2120	Venting valve	
2122	Maintenance kit, venting valve	
2140	Control valve	X
2144	Control valve solenoid coil	
2200	Pressure compensation valve	
2202	Maintenance kit, PC valve	
2260	Changeover valve	X
2280	Proportional controller	X
2300	Pneumatic valve	
2302	Maintenance kit, pneumatic valve	
3030	SIGMA CONTROLLER	
3361	Mains contactor	
3362	Delta contactor	
3370	Star contactor	
3390	Fan motor contactor	
3430	Overload protection cutout	
3730	Rotating direction breaker	
3732	Protective cap	
3760	Pressure differential switch	
4050	SIGMA exchange airend	
4100	Airend installation kit	
4400	Drive coupling	
4450	Drive motor	
4451	Bearing set, drive motor	
4700	Fan motor	
4701	Bearing set, fan motor	
4750	Fan motor blower wheel	
5100	Oil cooler	
5150	Compressed air aftercooler	
6050	Oil separator tank	
6150	OST pressure relief valve	
6200	Oil sep. tank pressure gauge	
6500	Condensate drain	
9601	Maintenance kit, condens.drain	
9603	Gasket kit, condensate drain	
9607	Repair kit, control valve	
9611	Repair kit, condens. drain	
9625	Protective hood	
9629	Control board	
9631	Condensate drain power unit	
9659	Heater 230V 50/60 Hz	
7180	Hose line	
7190	Hose line	
7220	Hose line	
7350	Control line kit	
7360	Condensate drain line set	
7600	Inlet hose	

Please quote the part number and serial number of the machine together with the item number and the description of the part when ordering.

Before and during all work, be sure to read and follow the safety and service instructions in the machine's service manual.

*) See cooling fluid recommendations


Service-Kit
(Option)
SEG-3342_01
5250
5250
7404
7452
7402
(2080)
5200
7454
2060
2060
5200
6500
7360
4450
7504
7502
3760
1200
1250
4400
2040
7190
2200
7600
1600
2100
7220
2120
7180
2020
7350
7600
3730
2020
6200
7190
7180
4050
7350
2300
1450
6150
6050
(2260)
(2140)
(2280)
3030
4700
3361
3430
3362
4100
1100
3370
3390
1100

Legend	KAESER
FSD.2 - (K2)	SEL-2519_01E

Item	Description	Option
1100	Filter mat, control cabinet	
1200	Oil filter	
1250	Air filter element	
1450	Oil separator cartridge	
1600	Sigma Fluid *)	
2020	Minimum pressure/check valve	
2022	Maintenance kit, MP/CV	
2024	Overhaul kit, MP/CV	
2040	Inlet valve	
2042	Maintenance kit, inlet valve	
2044	Overhaul kit, inlet valve	
2060	Combination valve	
2062	Maintenance kit, combi. valve	
2064	Overhaul kit, combination valve	
2080	Thermostatic valve (heat rec.)	X
2082	Maintenance kit, thermostatic valve	
2084	Overhaul kit, thermostatic valve	
2100	Venting/control valve	
2102	Maintenance kit, VC valve	
2104	Overhaul kit, VC valve	
2120	Venting valve	
2122	Maintenance kit, venting valve	
2140	Control valve	X
2144	Control valve solenoid coil	
2200	Pressure compensation valve	
2202	Maintenance kit, PC valve	
2260	Changeover valve	X
2280	Proportional controller	X
2300	Pneumatic valve	
2302	Maintenance kit, pneumatic valve	
3030	SIGMA CONTROLLER	
3361	Mains contactor	
3362	Delta contactor	
3370	Star contactor	
3390	Fan motor contactor	
3430	Overload protection cutout	
3730	Rotating direction breaker	
3732	Protective cap	
3760	Pressure differential switch	
4050	SIGMA exchange airend	
4100	Airend installation kit	
4400	Drive coupling	
4450	Drive motor	
4451	Bearing set, drive motor	
4700	Fan motor	
5200	Oil cooler	
5250	Compressed air aftercooler	
6050	Oil separator tank	
6150	OST pressure relief valve	
6200	Oil sep. tank pressure gauge	
6500	Condensate drain	
9601	Maintenance kit, condens.drain	
9603	Gasket kit, condensate drain	
9607	Repair kit, control valve	
9611	Repair kit, condens. drain	
9625	Protective hood	
9629	Control board	
9631	Condensate drain power unit	
9659	Heater 230V 50/60 Hz	
7180	Hose line	
7190	Hose line	
7220	Hose line	
7350	Control line kit	
7360	Condensate drain line set	
7402	Hose line	
7404	Hose line	
7452	Hose line	
7454	Hose line	
7502	Hose line	
7504	Hose line	
7600	Inlet hose	

Please quote the part number and serial number of the machine together with the item number and the description of the part when ordering.

Before and during all work, be sure to read and follow the safety and service instructions in the machine's service manual.

*) See cooling fluid recommendations

12 Decommissioning, Storage and Transport

12.1 Putting Out of Operation

This is necessary under the following circumstances:

- The machine is temporarily not needed.
- The machine is to be moved to another location.
- The machine is to be scrapped.

Temporarily putting out of operation

Precondition The machine can be started at regular intervals.

➢ Run the machine once a week for at least 30 minutes under LOAD to ensure sufficient protection against corrosion.

Putting out of operation for a longer period

Precondition Before putting out of operation, the machine should be run under LOAD for at least 30 minutes.
Switch off the mains disconnecting device,
the disconnect device is locked in the off position,
check that no voltage is present.
Machine fully vented (no pressure).

1. Allow the machine to cool down completely.
2. Disconnect all air and electrical connections.

12.2 Packing

A wooden crate is required for overland transport to protect the machine from mechanical damage.
Other measures must be taken for the transport of machines by sea or air. Please contact KAESER SERVICE for more information.

Material Desiccant
Plastic sheeting
Wooden crate

Precondition The machine is decommissioned.
The machine is dry and cooled down.

1. Place sufficient desiccant silica gel or desiccant clay) in the machine.
2. Wrap the machine fully in plastic sheeting.
3. Protect the machine in a wooden crate against mechanical damages.

12.3 Storage

Moisture can lead to corrosion, particularly on the surfaces of the airend and in the oil separator tank.
Frozen moisture can damage components, valve diaphragms and gaskets.

The following measures also apply to machines not yet commissioned.

Please consult with KAESER if you have questions to the appropriate storage and commissioning.

1. *NOTICE!*
   Moisture and frost can damage the machine!
   - ➢ Prevent ingress of moisture and formation of condensation.
   - ➢ Maintain a storage temperature of >0 °C.
2. Store the machine in a dry, frost-proof room.

12.4 Transport

12.4.1 Safety

Weight and centre of gravity determine the most suitable method of transportation. The centre of gravity is shown in the drawing in chapter 13.3.

- ➢ Please consult with KAESER if you intend to transport the machine in freezing temperatures.

Precondition Transport only using a forklift truck or lifting gear and only by personnel trained in the safe transportation of loads.

- ➢ Make sure the danger area is clear of personnel.

12.4.2 Transport with a forklift truck

Precondition The forks are fully under the machine.

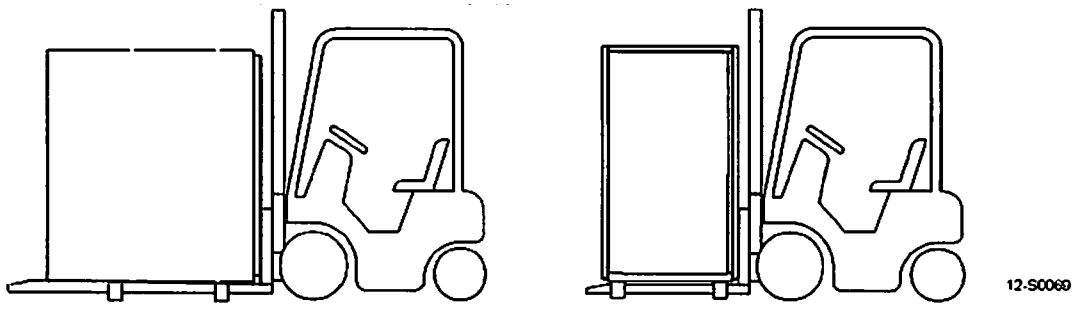


Fig. 40 Transport with a forklift truck

- ➢ Drive the forks completely under the machine or pallet and lift carefully.

12.4.3 Transport with a crane

Suitable lifting gear ensures correct transportation.
The lifting slings must be fed under the machine.
The slings may not bear on the side of the machine enclosure.

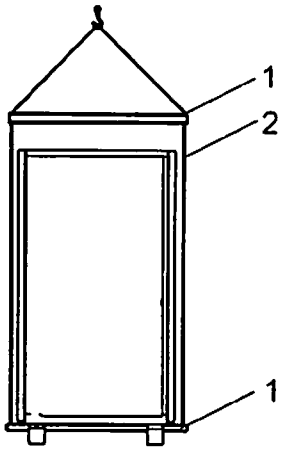
Examples of unsuitable fixing points:

- Pipe sockets

- Flanges
- Attached components such as cyclone separators, condensate drains or filters
- Rain protection covers

➢ Please consult with KAESER if you have questions to the appropriate lifting gear.

Precondition The lifting gear complies with local safety regulations.
No pressure should bear on the sides of the machine cabinet.



12-S0070

Fig. 41 Transport with a crane
[1] Lifting gear
[2] Slings

1. *NOTICE!*
   The machine can be damaged by incorrect attachment of the lifting gear!
   ➢ Do not attach the lifting gear to any of the machine components.
2. Use the lifting gear correctly and lift the machine carefully.

12.5 Disposal

When disposing of a machine, drain out all liquids and remove old filters.

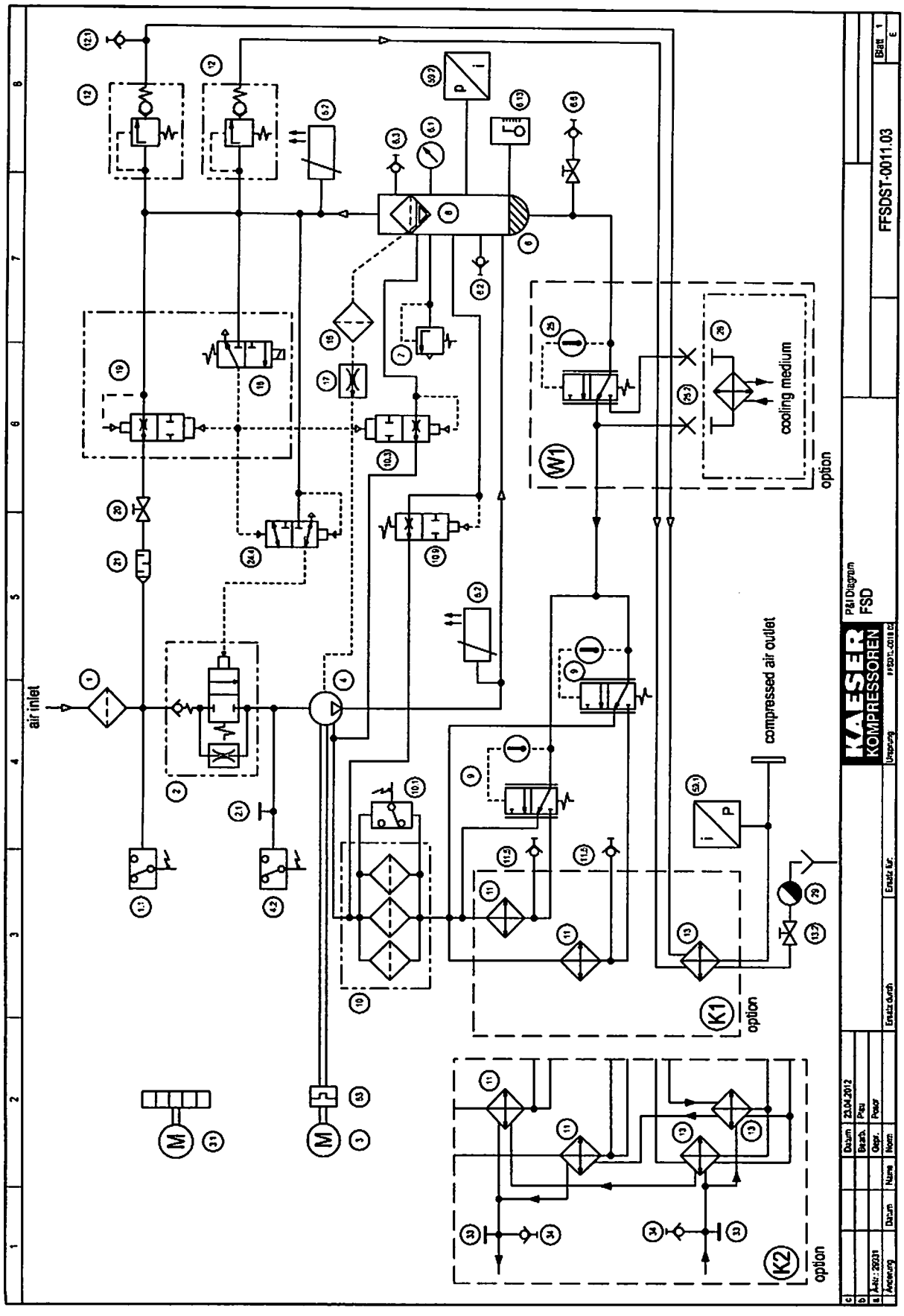
Precondition The machine is decommissioned.

1. Completely drain the cooling oil from the machine.
2. Remove used oil filter and separator cartridge.
3. Hand the machine over to an authorised disposal expert.

➢ Components contaminated with cooling oil must be disposed of in accordance with local environment protection regulations.

13 Annex

13.1 Pipeline and instrument flow diagram (P+I diagram)


air inlet
compressed air outlet
cooling medium
option
option
option
FFSDST-0011.03
P&I Diagram
FSD

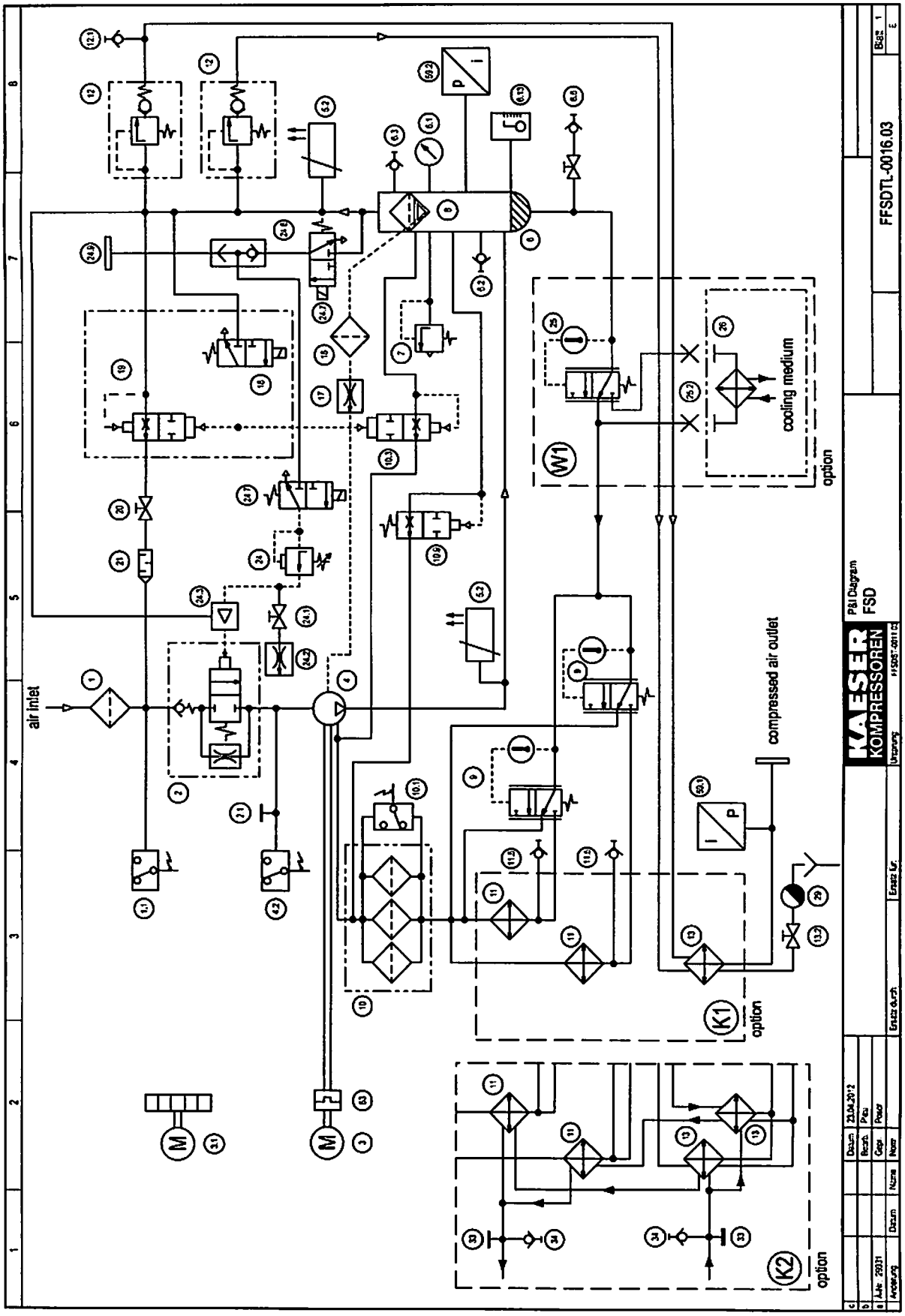
1	air filter
1.1	vacuum switch - air filter
2	inlet valve
2.1	oil filler with screw plug
3	drive motor
3.1	fan motor
4	airend
4.2	pressure switch - wrong direction of rotation
5.2	PT100-sensor
6	oil separator tank
6.1	pressure gauge
6.2	hose coupling (oil end)
6.3	hose coupling (air end)
6.6	shut-off valve with hose coupling - oil drain
6.13	oil level indicator
7	pressure relief valve
8	oil separator cartridge
9	oil temperature controller
10	oil filter
10.1	differential pressure switch - oil filter
10.3	oil flow reduction valve
10.9	ventilating valve
11	oil cooler
11.5	hose coupling - oil drain
12	minimum pressure check valve
12.1	hose coupling
13	air cooler
13.2	shut-off valve - condensate drainage
16	dirt trap
17	nozzle
18/19	combined control/venting valve
18	control valve
19	venting valve
20	shut-off valve - venting line
21	silencer
24.4	3/2-directional control valve (amplifies volume of control air for the inlet valve)
25	oil temperature thermostat for heat recovery system
25.2	screw plug
26	heat recovery system
29	electronically controlled condensate drain
33	measuring point connection
34	hose coupling
53	coupling
59.1	pressure transducer - system pressure
59.2	pressure transducer - internal pressure

option

K1	air-cooled
K2	water-cooled
W1	heat recovery system, external

c				Datum	23.04.2012		KAESER KOMPRESSOREN	P&I Diagram egend FSD	
b				Bearb.	Pau				
a				Gepr.	Posor				
	Änderung	Datum	Name	Norm		Ersetzt durch:	Ersetzt für:	Ursprung: FFSDTL-0016.02	FFSDST-0011.03 Blatt 2 E

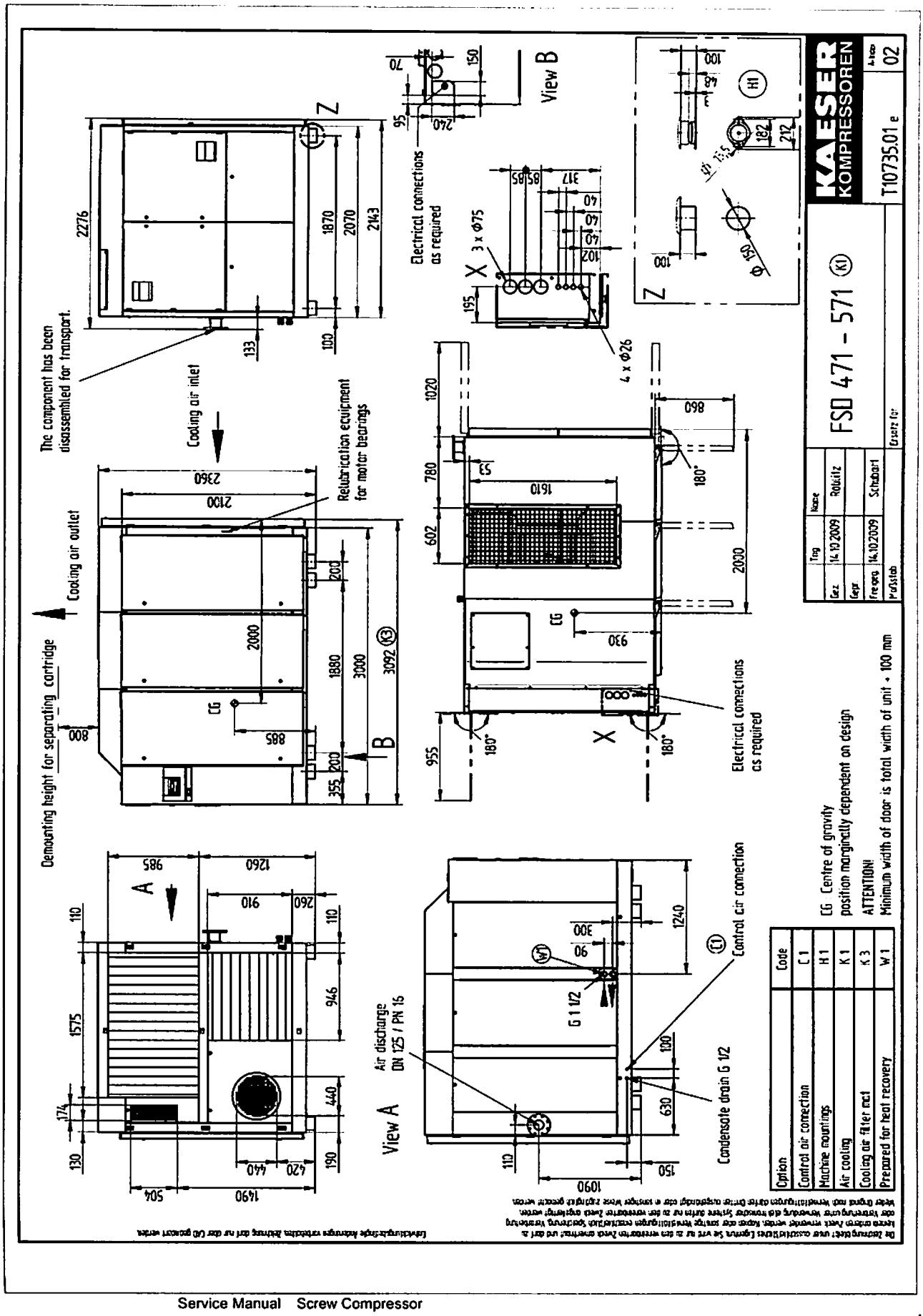
13.2 Option C1
Pipeline and instrument flow diagram (P&I diagram) MODULATING control

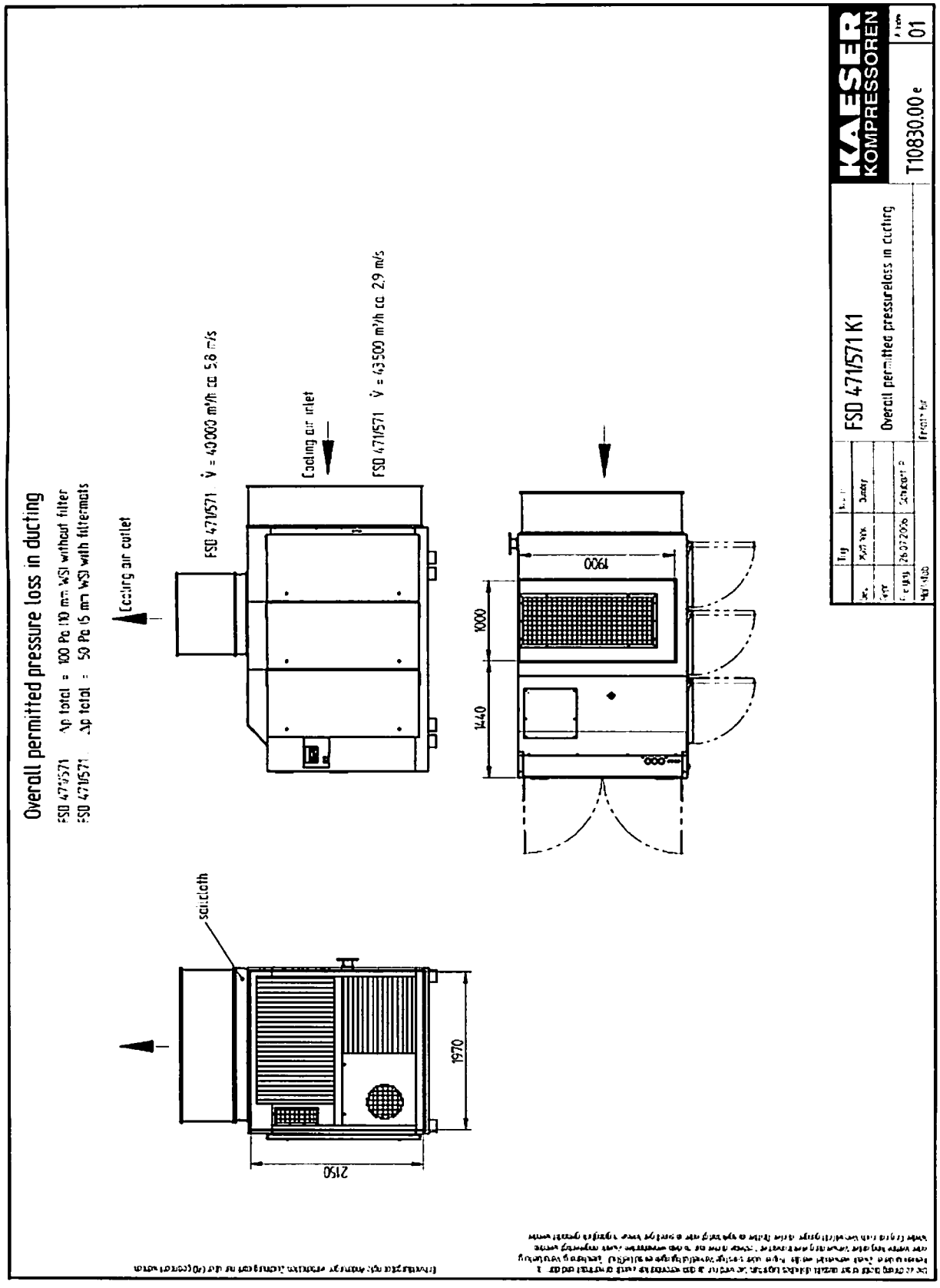

air inlet
compressed air outlet
cooling medium
option
option
option
W1
K1
K2
M
M
P&I Diagram
FSD
FFSDTL-0016.03
KAESER KOMPRESSOREN

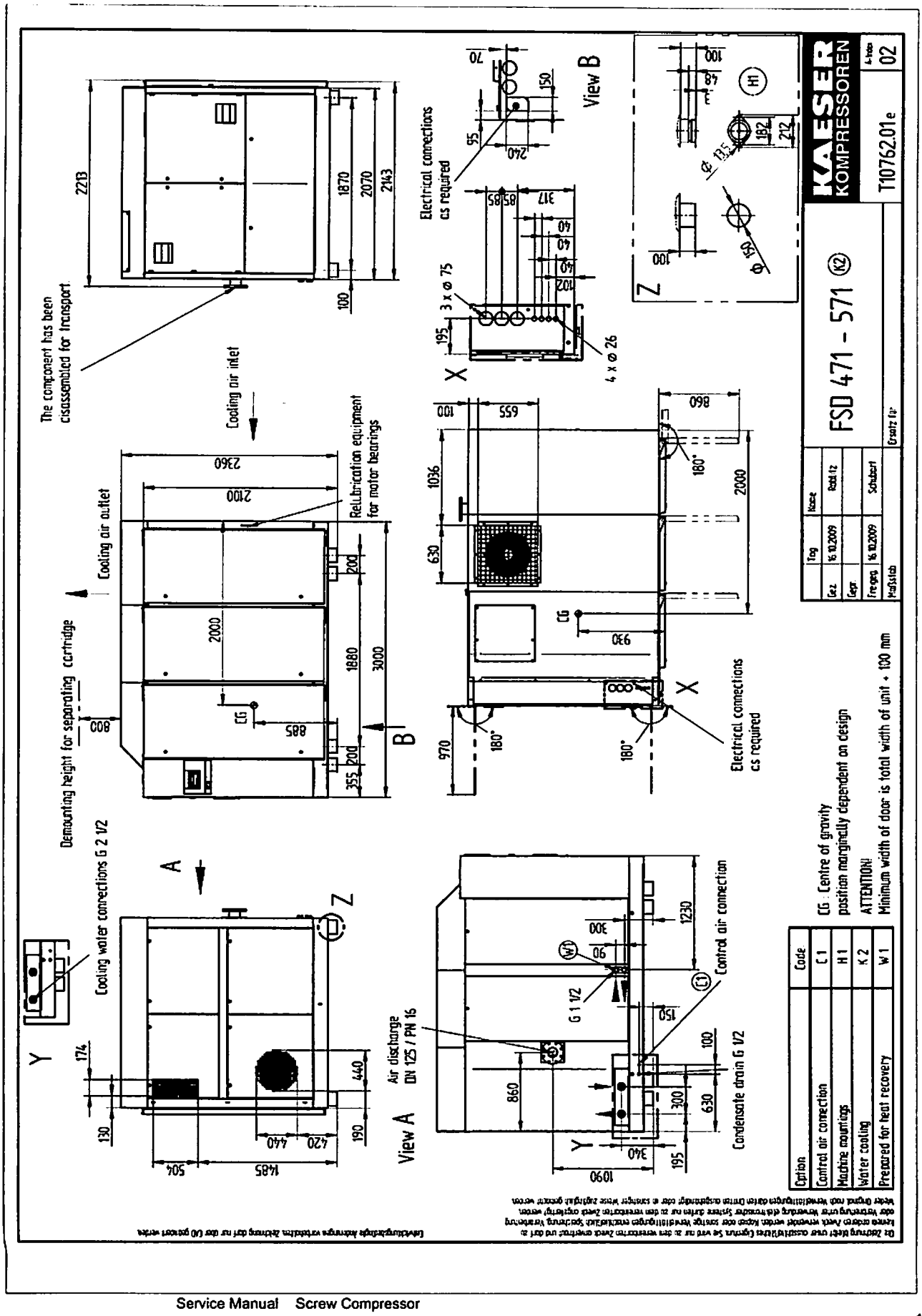
1	air filter
1.1	vacuum switch - air filter
2	inlet valve
2.1	oil filler with screw plug
3	drive motor
3.1	fan motor
4	airend
4.2	pressure switch - wrong direction of rotation
5.2	PT100-sensor
6	oil separator tank
6.1	pressure gauge
6.2	hose coupling (oil end)
6.3	hose coupling (air end)
6.6	shut-off valve with hose coupling - oil drain
6.13	oil level indicator
7	pressure relief valve
8	oil separator cartridge
9	oil temperature controller
10	oil filter
10.1	differential pressure switch - oil filter
10.3	oil flow reduction valve
10.9	ventilating valve
11	oil cooler
11.5	hose coupling - oil drain
12	minimum pressure check valve
12.1	hose coupling
13	air cooler
13.2	shut-off valve - condensate drainage
16	dirt trap
17	nozzle
18/19	combined control/venting valve
18	control valve
19	venting valve
20	shut-off valve - venting line
21	silencer
24	proportional controller
24.1	shut-off valve
24.2	nozzle
24.3	signal amplifier (amplifies volume of control air for the inlet valve)
24.7	solenoid valve
24.8	changeover valve (for optional connection of working pressure either via internal or external compressed air connection)
24.9	version for control air: external control air connection (e.g. from downstream air receiver)
25	oil temperature thermostat for heat recovery system
25.2	screw plug
26	heat recovery system
29	electronically controlled condensate drain
33	measuring point connection
34	hose coupling
53	coupling
59.1	pressure transducer - system pressure
59.2	pressure transducer - internal pressure
option	
K1	air-cooled
K2	water-cooled
W1	heat recovery system, external

c				Datum	23.04.2012		KAESER KOMPRESSOREN	P&I Diagram legend FSD	
d				Bearb.	Pscu				
e				Gepr.	Pscor				
	Änderung	Datum	Name	Norm		Ersatz durch	Ersatz für:	Ursprung	Blatt 1	FFSDTL-0016.03	Blatt 2
											E

13.3 Dimensional drawing


KAESER KOMPRESSOREN
FSD 471 - 571
T10735.01 e
02
View A
View B
Cooling air inlet
Cooling air outlet
Demounting height for separating cartridge
The component has been disassembled for transport.
Relubrication equipment for motor bearings
Electrical connections as required
Air discharge DN 125 / PN 16
Control air connection
Condensate drain G 1/2
CG Centre of gravity position marginally dependent on design
ATTENTION! Minimum width of door is total width of unit + 100 mm
Option
Code
Control air connection C1
Machine mountings H1
Air cooling K1
Cooling air filter mat K3
Prepared for heat recovery W1


Overall permitted pressure loss in ducting
FSD 471/571 Δp total = 100 Pa (10 mm WS) without filter
FSD 471/571 Δp total = 50 Pa (5 mm WS) with filtermats
Cooling air outlet
FSD 471/571 V̇ = 40000 m³/h ca. 5.8 m/s
Cooling air inlet
FSD 471/571 V̇ = 43500 m³/h ca. 2.9 m/s
1900
1000
1440
sailcloth
1970
2150
KAESER KOMPRESSOREN
FSD 471/571 K1
Overall permitted pressureloss in ducting
T10830.00 e
01


KAESER KOMPRESSOREN
FSD 471 - 571 (K2)
T10762.01e
02
The component has been disassembled for transport
Cooling air inlet
Cooling air outlet
Demounting height for separating cartridge
Cooling water connections G 2 1/2
Re-Lubrication equipment for motor bearings
Electrical connections as required
View A
View B
Air discharge DN 125 / PN 16
Control air connection
Condensate drain G 1/2
CG: Centre of gravity position marginally dependent on design
ATTENTION!
Minimum width of door is total width of unit + 100 mm
Option
Code
Control air connection
C 1
Machine mountings
H 1
Water cooling
K 2
Prepared for heat recovery
W 1

13.4 Electrical Diagram

Electrical diagrams

Compressor series FSD

Air cooled and Water cooled

380V±10% 60Hz
440V±10% 60Hz
400V±10% 50Hz
460V±10% 60Hz

TT/TN power supply with common point grounding

ATTENTION !!!
The document gives collective information on power supply voltages and frequencies for all machines. The voltage and frequency and local conditions under which any particular machine may be used are given on the nameplate of the machine and in the accompanying service manual.

Manufacturer: KAESER KOMPRESSOREN AG
96450 Coburg
GERMANY

c				Datum	27.04.2012 E		KAESER KOMPRESSOREN	Cover page Compressor series FSD	
b				Bearbeiter	Sitter				
a				Geprüft	Gegner				
A	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2 / DFSD-03000.02 / page 1 / 1 Bl.

Lfd. Nr. No.	Benennung Name		Zeichnungsnummer (Kunde) Drawing No. (customer)	Zeichnungsnummer (Hersteller) Drawing No. (manufacturer)	Blatt Page	Anlagenkennzeichen Unit designation
1	Cover page			DFSD-03000.02	1	
2	List of contents			ZFSD-03000.02	1	
3	general instructions			UFSD-03000.02	1	
4	electrical equipment identification			UFSD-03000.02	2	
5	Equipment parts list	performance-related components		UFSD-03000.02	3	
6	Equipment parts list	performance-related components		UFSD-03000.02	4	
7	Equipment parts list	Common parts		UFSD-03000.02	5	
8	Circuit diagram	Power supply/Compressor motor		SFSD-03000.02	1	
9	Circuit diagram	Compressor motor		SFSD-03000.02	2	
10	Circuit diagram	Fan motor		SFSD-03000.02	3	
11	Circuit diagram	Control voltage tapping		SFSD-03000.02	4	
12	Circuit diagram	Power supply unit		SFSD-03000.02	5	
13	Circuit diagram	IO module/Configuration		SFSD-03000.02	6	
14	Circuit diagram	sensors/actuators		SFSD-03000.02	7	
15	Circuit diagram	Volt-free contacts		SFSD-03000.02	8	
16	Circuit diagram	Digital/analogue outputs		SFSD-03000.02	9	
17	Circuit diagram	Digital/analogue outputs		SFSD-03000.02	10	
18	Circuit diagram	Digital/analogue outputs		SFSD-03000.02	11	
19	Terminal schedule	Terminal strip -X11		KFSD-03000.02	1	
20	Component layout	Mounting plate		AFSD-03000.02	1	

C				Datum	27.04.2012		KAESER KOMPRESSOREN	List of contents Compressor series FSD	
B				Bearbeiter	Sitter				
A				Geprüft	Gegner				
B	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2 / ZFSD-03000.02 / page 1 / 1 Bl.

general instructions

ATTENTION !!!
Install supplies, grounding and shock protection
to local safety regulations.
Control circuits are single-end-earthed, if they are floating
they may only be used together with insulation monitoring.
Do not make or break
live plug-in connectors.

control cabinet wiring for non-designated conductors
with multi-standard stranded conductors

primary circuits:	black
Control voltage AC:	red 1mm² H05V-K, 18AWG UL-Style 1015, CSA-TEW
Control voltage DC:	blue 1mm² H05V-K, 18AWG UL-Style 1015, CSA-TEW
external voltage:	orange 1,5mm² H07V-K, 16AWG UL-Style 1015, CSA-TEW
measuring circuits:	violet 1mm² H05V-K, 18AWG UL-Style 1015, CSA-TEW
earth conductor:	green/yellow H07V-K, UL-Style 1015, CSA-TEW

option C1 = Modulating control

option K1 = Air cooling

option K2 = Water cooling

c				Datum	27.04.2012		KAESER KOMPRESSOREN	general instructions Compressor series FSD	
b				Bearbeiter	Sitter				
a				Geprüft	Gegner				
C	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2	UFSD-03000.02	page 1 5 Bl.

electrical equipment identification

general components

-B25	Overload relay, Compressor motor
-F4	Overload protection switch, Fan motor
-F11	Overload protection switch, Control transformer
-M1	Compressor motor
-M4	Fan motor
-M7	Control cabinet ventilator
-Q1	Mains contactor
-Q2	Delta contactor
-Q3	Star contactor
-Q4	Motor contactor Fan motor
-S1	EMERGENCY STOP pushbutton
-T11	Control transformer
-T21,-T22	Power unit

terminal strips

-X0	Terminal strip, Power supply
-X11	Terminal strip, Control

Control

-K20	*Main Control System SC2MCS*
-X1	Ethernet
-X2	IO-Bus
-X3	RS485-FC (USS)
-X4	Communication module (Bus)
-X5	SD card slot
-X6	Earth connection
-K21	*IO-module SC2IOM-1*
	internal
-X1	IO-Bus, Input
-X2	IO-Bus, Output
-X3,-X8	digital inputs
-X4	Power supply unit, digital outputs
-X5,-X9	Relay outputs
-X6	Analog input, 4-20mA
-X7	Analog input, PT100
	external
-X11...-X13	analog inputs, 4-20mA
-X14...-X17	analog inputs, PT100
-X18...-X29	digital inputs
-X30...-X32	digital outputs
-K22	*IO-module SC2IOM-2*
	internal
-X1	IO-Bus, Input
-X2	IO-Bus, Output
-X3	analog inputs, PT100
-X4	Power supply unit, digital outputs
-X5,-X9	Relay outputs
-X6	Analog input, Analog output 4-20mA
-X8	digital inputs
	external
-X11...-X13	analog inputs, 4-20mA
-X15	Analog output 4-20mA
-X18,-X19	digital inputs
-X22...-X24	analog inputs, PT100
-X29...-X32	digital outputs

sensors/actuators

-B1	Pressure transducer, Air main pressure
-B2	Direction of rotation pressure switch
-B3	Oil filter differential pressure switch
-B4	Pressure transducer, package internal pressure
-B5	Air filter vacuum switch
-B40	Temperature probe Airend discharge temperature
-B41	Temperature probe Oil separator tank air discharge
-B60,-B61,-B62	Temperature probe, Compressor motor
-K1	Control valve
-K5	Valve Modulating control, external control pressure - option C1
-K7	Valve Modulating control, Venting - option C1
-K10	condensate drain, Centrifugal separator

c				Datum	27.04.2012		KAESER KOMPRESSOREN	electrical equipment identification	
b				Bearbeiter	Sitter			Compressor series FSD	
a				Geprüft	Gegner				
C	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2	UFSD-03000.02	page 7 5 Bl.

	performance-related components			
model	FSD471	FSD471	FSD471	
machine power supply	380 V±10 %, 60 Hz	400 V±10 %, 50 Hz	440 V±10 %, 60 Hz 460 V±10 %, 60 Hz	
Motor -M1	250 kW	250 kW	250 kW	
Motor -M2 (option K1)	11 kW	11 kW	11 kW	
-M2 (option K2)	0,3 kW 380 V Δ	0,3 kW 400 V Δ	0,3 kW	
supply terminals -X0	3x 7.3146.01860 SV9342.310 Rittal 95-300 mm²	3x 7.3146.01860 SV9342.310 95-300 mm²	3x 7.3146.01860 SV9342.310 95-300 mm²	
Contactor -Q1/-Q2	7.6884.0 3RT1075-6AP36	7.6876.0 3RT1066-6AP36	7.3140.01720 3RT1065-6AP36	
Interference suppressor Siemens	7.3140.01490 3RT1956-1CD00	7.3140.01490 3RT1956-1CD00	7.3140.01490 3RT1956-1CD00	
Contactor -Q3	7.3140.01730 3RT1056-6AP36	7.3140.01480 3RT1055-6AP36	7.3140.01480 3RT1055-6AP36	
Interference suppressor Siemens	7.3140.01490 3RT1956-1CD00	7.3140.01490 3RT1956-1CD00	7.3140.01490 3RT1956-1CD00	
Overload protection -B25	7.6873.00260 3RB2066-1MC2 160-630 A	7.6873.00260 3RB2066-1MC2 160-630 A	7.6873.00260 3RB2066-1MC2 160-630 A setting: 273 A (440 V)	
Low pressure			setting: 260 A (440 V)	
Low pressure Siemens	setting: 310 A setting: 296 A	setting: 295 A setting: 249 A	setting: 259 A (460 V) setting: 247 A (460 V)	
Contactor -Q4 (option K1)	7.6867.0 3RT1034-1AL20	7.6867.0 3RT1034-1AL20	7.6867.0 3RT1034-1AL20	
Interference suppressor Siemens	7.3140.00920 3RT1936-1CD00	7.3140.00920 3RT1936-1CD00	7.3140.00920 3RT1936-1CD00	
Contactor -Q4 (option K2)	7.6863.0 3RT1023-1AL20	7.6863.0 3RT1023-1AL20	7.6863.0 3RT1023-1AL20	
Interference suppressor Siemens	7.3140.01400 3RT1926-1CD00	7.3140.01400 3RT1926-1CD00	7.3140.01400 3RT1926-1CD00	
Overload protection switch -F4 (option K1)	7.6886.00020 3RV1031-4DB10 18-25 A setting: 23 A	7.6886.00020 3RV1031-4DB10 18-25 A setting: 22 A	7.6886.00020 3RV1031-4DB10 18-25 A setting: 20,3 A (440 V) setting: 19,4 A (460 V)	
-F4 (option K2)	7.6860.00110 3RV1011-1AA10 1,1-1,6 A setting: 1,3 A	7.6860.00100 3RV1011-0KA10 0,9-1,25 A setting: 1,1 A	7.6860.00080 3RV1011-0HA10 0,55-0,8 A setting: 0,7 A	
Auxiliary switch Siemens	7.3140.01890 3RV1901-1E	7.3140.01890 3RV1901-1E	7.3140.01890 3RV1901-1E	
connection -W11/-W13	Cu-rail 24x(10x1)mm	Cu-rail 24x(5x1)mm	Cu-rail 24x(5x1)mm	
connection -W14	1x70 mm² black 500 V, 180°C	1x70 mm² black 500 V, 180°C	1x70 mm² black 500 V, 180°C	
motor cable -W19	1x150 mm² 500 V, 90°C	1x150 mm² 500 V, 90°C	1x120 mm² 500 V, 90°C	
motor cable -W29	4G4 mm² 500 V, 70°C	4G4 mm² 500 V, 70°C	4G4 mm² 500 V, 70°C	
(option K1) -W29	4G1,5 mm² 500 V, 70°C	4G1,5 mm² 500 V, 70°C	4G1,5 mm² 500 V, 70°C	
(option K2)				

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UFSD-03000.02
SIGMA CONTROL 2
Equipment parts list
Compressor series FSD
performance-related components
KAESER KOMPRESSOREN
Ursprung
Ersatz für:
Ersatz durch:
Datum 27.04.2012
Bearbeiter Sitter
Gepr-dift
Gegner
Norm
Name
Datum
Änderung

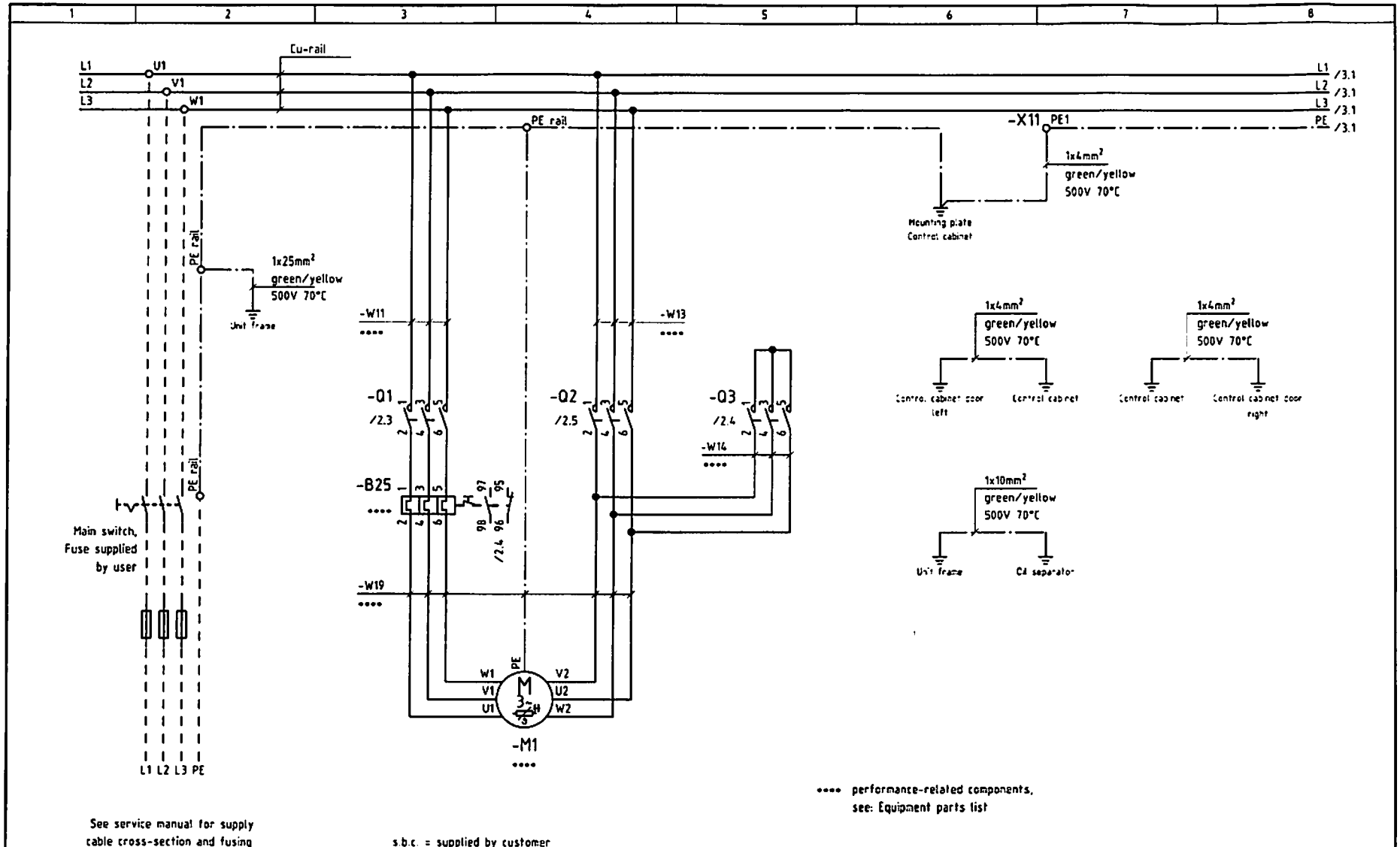
model	performance-related components FSD501 FSD571	FSD571	FSD501 FSD571	
machine power supply	380 V±10 %, 60 Hz	400 V±10 %, 50 Hz	440 V±10 %, 60 Hz 460 V±10 %, 60 Hz	
Motor -M1	315 kW	315 kW	315 kW	
Motor -M2 (option K1)	11 kW	11 kW	11 kW	
-M2 (option K2)	0,3 kW 380 V Δ	0,3 kW 400 V Δ	0,3 kW	
supply terminals -X0	3x 7.3146.01860 SV9342.310	3x 7.3146.01860 SV9342.310	3x 7.3146.01860 SV9342.310	
Rittal	95-300 mm²	95-300 mm²	95-300 mm²	
Contactor -Q1/-Q2	7.6885.0 3RT1076-6AP36	7.6884.0 3RT1075-6AP36	7.6884.0 3RT1075-6AP36	
Interference suppressor	7.3140.01490	7.3140.01490	7.3140.01490	
Siemens	3RT1956-1CD00	3RT1956-1CD00	3RT1956-1CD00	
Contactor -Q3	7.3140.01720 3RT1065-6AP36	7.3140.01850 3RT1064-6AP36	7.3140.01730 3RT1056-6AP36	
Interference suppressor	7.3140.01490	7.3140.01490	7.3140.01490	
Siemens	3RT1956-1CD00	3RT1956-1CD00	3RT1956-1CD00	
Overload protection -B25	7.6873.00260 3RB2066-1MC2 160-630 A	7.6873.00260 3RB2066-1MC2 160-630 A	7.6873.00260 3RB2066-1MC2 160-630 A setting: 348 A FSD501(440 V) setting: 359 A FSD571(440 V)	
Low pressure			setting: 305 A FSD571(440 V) setting: 332 A FSD501(460 V)	
	setting: 405 A FSD501 setting: 417 A FSD571	setting: 382 A	setting: 342 A FSD571(460 V)	
Low pressure Siemens	setting: 354 A FSD571	setting: 331 A	setting: 290 A FSD571(460 V)	
Contactor -Q4	7.6867.0	7.6867.0	7.6867.0	
(option K1)	3RT1034-1AL20	3RT1034-1AL20	3RT1034-1AL20	
Interference suppressor	7.3140.00920	7.3140.00920	7.3140.00920	
Siemens	3RT1936-1CD00	3RT1936-1CD00	3RT1936-1CD00	
Contactor -Q4	7.6863.0	7.6863.0	7.6863.0	
(option K2)	3RT1023-1AL20	3RT1023-1AL20	3RT1023-1AL20	
Interference suppressor	7.3140.01400	7.3140.01400	7.3140.01400	
Siemens	3RT1926-1CD00	3RT1926-1CD00	3RT1926-1CD00	
Overload protection switch -F4	7.6886.00020	7.6886.00020	7.6886.00020	
(option K1)	3RV1031-4DB10 18-25 A	3RV1031-4DB10 18-25 A	3RV1031-4DB10 18-25 A setting: 20,3 A (440 V)	
	setting: 23 A	setting: 22 A	setting: 19,4 A (460 V)	
-F4	7.6860.00110	7.6860.00100	7.6860.00080	
(option K2)	3RV1011-1AA10 1,1-1,6 A	3RV1011-0KA10 0,9-1,25 A	3RV1011-0HA10 0,55-0,8 A	
	setting: 1,3 A	setting: 1,1 A	setting: 0,7 A	
Auxiliary switch	7.3140.01890	7.3140.01890	7.3140.01890	
Siemens	3RV1901-1E	3RV1901-1E	3RV1901-1E	
connection -W11/-W13	Cu-rail 24x(10x1)mm	Cu-rail 24x(10x1)mm	Cu-rail 24x(10x1)mm	
connection -W14	1x120 mm² black 500 V, 180°C	1x95 mm² black 500 V, 180°C	1x70 mm² black 500 V, 180°C	
motor cable -W19	1x240 mm² 500 V, 90°C	1x240 mm² 500 V, 90°C	1x185 mm² 500 V, 90°C	
motor cable -W29	4G4 mm² 500 V, 70°C	4G4 mm² 500 V, 70°C	4G4 mm² 500 V, 70°C	
(option K1)				
-W29	4G1,5 mm² 500 V, 70°C	4G1,5 mm² 500 V, 70°C	4G1,5 mm² 500 V, 70°C	
(option K2)				

page 5 BI
UFSD-03000.02
SIGMA CONTROL 2
Equipment parts list
Compressor series FSD
performance-related components
KAESER KOMPRESSOREN
Ursprung
Ersatz für:
Ersatz durch:
Datum 27.04.2012
Bearbeiter Sattler
Geprüft Geppert
Name
Datum
Änderung

model	Common parts FSD
machine power supply	380 V±10 %, 60 Hz 400 V±10 %, 50 Hz 440 V±10 %, 60 Hz 460 V±10 %, 60 Hz
Power supply -T21,-T22 Siemens	7.7030.1 230 VAC/24 VDC 2,5 A
Terminal strip -X11 Wieland	7.7114.00100
Overload protection switch -F11 Siemens	7.6860.00140 3RV1011-1DA10 2,2-3,2 A setting: 2,7 A
Transformer -T11 Block	7.2238.10060 USTE 630/2X115 630 VA
Compressor control -K20 Prodrive	7.7601.0 SIGMA CONTROL 2 MCS
IO-module -K21 Prodrive	7.7602.0 SIGMA CONTROL 2 IOM-1
IO-module -K22 Prodrive	7.7603.0 SIGMA CONTROL 2 IOM-2
EMERGENCY STOP pushbutton -S1	7.3217.0 QRUV
Switching element Schlegel	7.3218.0 MHT00
Control cabinet ventilator -M7	7.2751.00010 LV300 / grey
Outlet filter Rübsamen&Herr	7.2752.00010 GV300 / grey

Equipment parts list
Compressor series FSD
Common parts
KAESER KOMPRESSOREN
SIGMA CONTROL 2
UFSD-03000.02
page 5 Bl.

	Datum	Name	Ersatz für:	Ersatz durch:	Ursprung
c Änderung					
b	27.04.2012	Sitter			
a	Bearbeiter				
	Gepruft	Geyer			
	Norm				

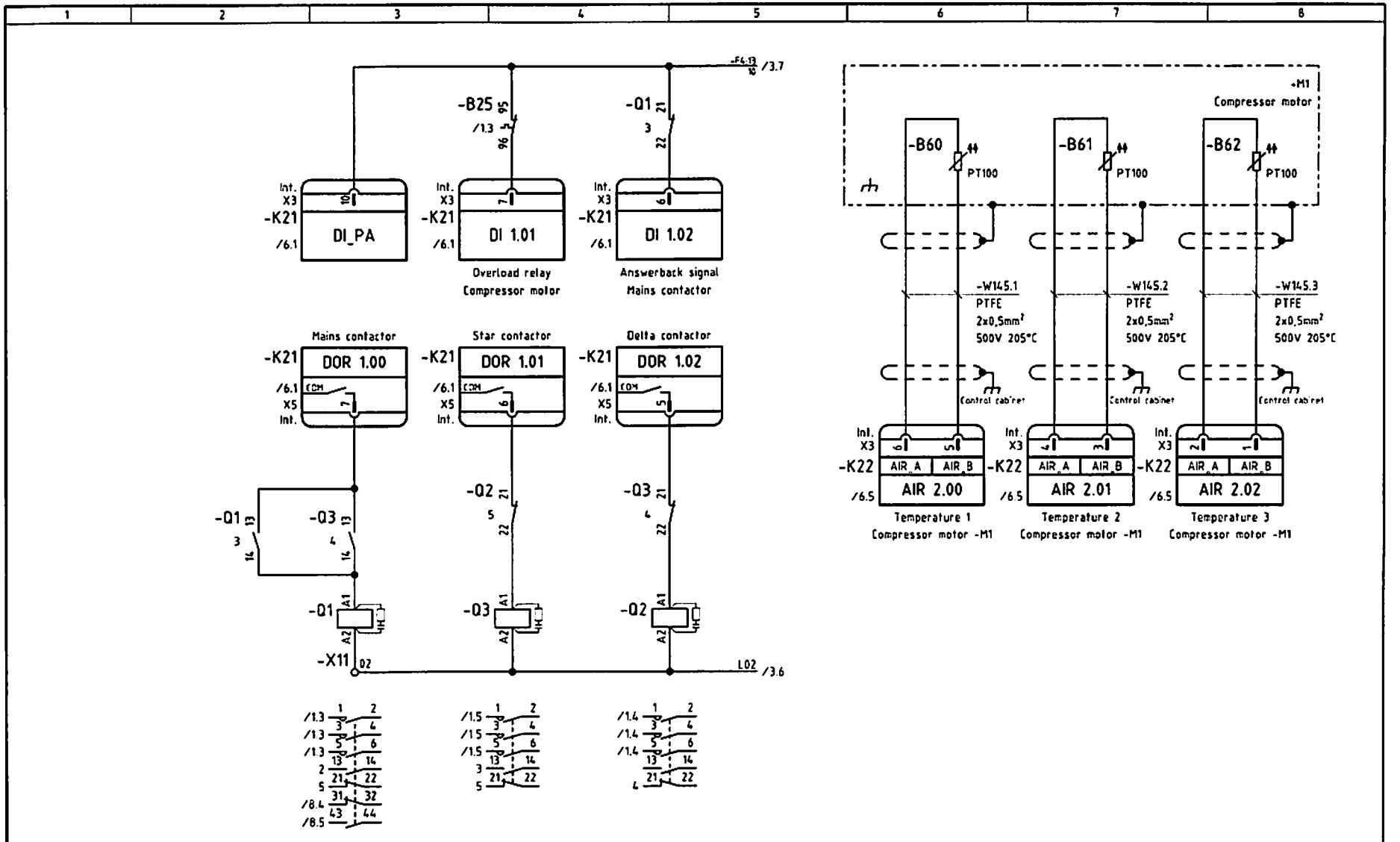


Function:					Compressor motor			
Group of functions:	Main power supply				Power switching			
c				Datum	27.04.2012			
b				Bearbeiter	Sitter			
a				Geprüft	Gegner			
D	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung

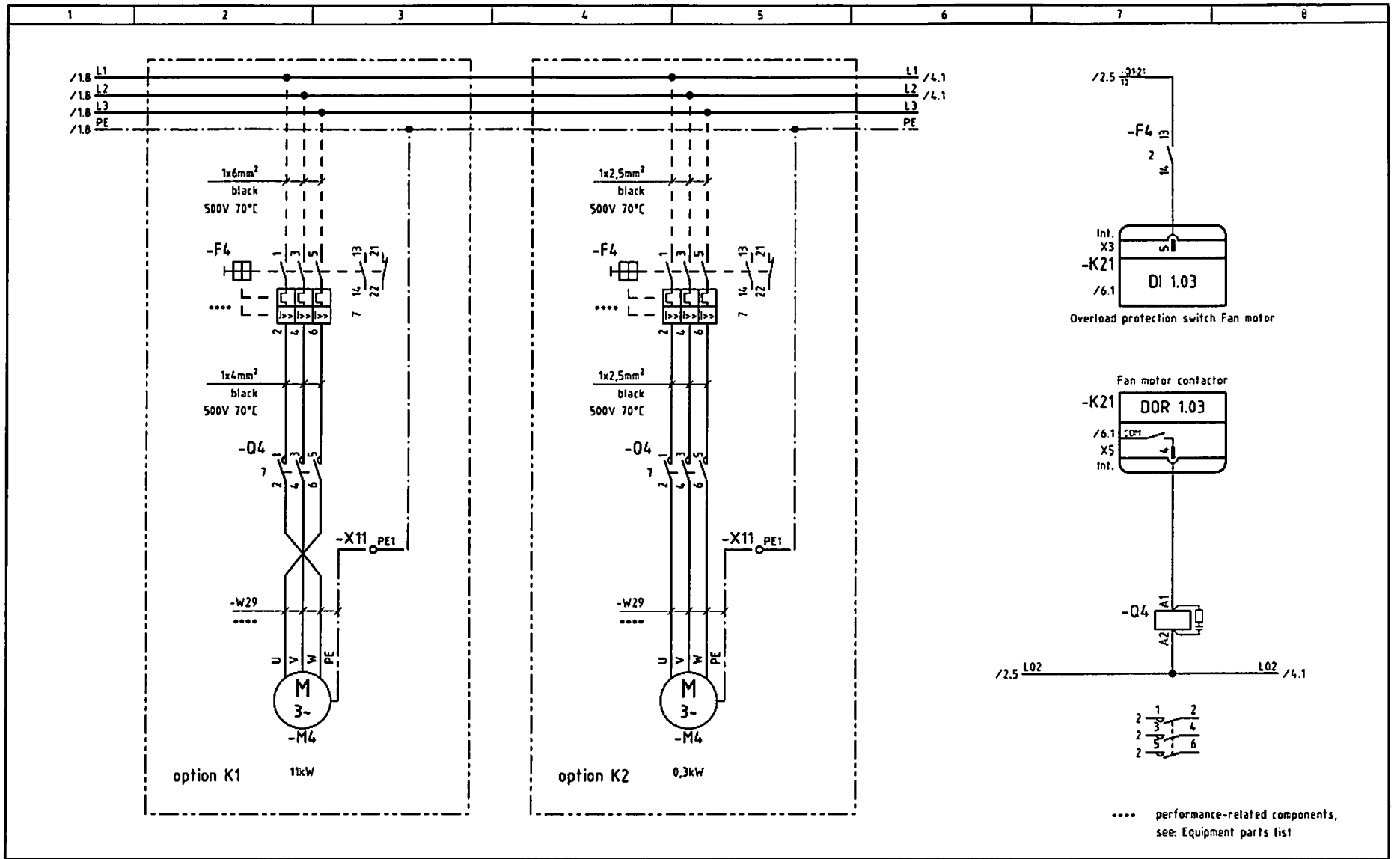
KAESER KOMPRESSOREN

Circuit diagram
Compressor series FSD
Power supply/Compressor motor

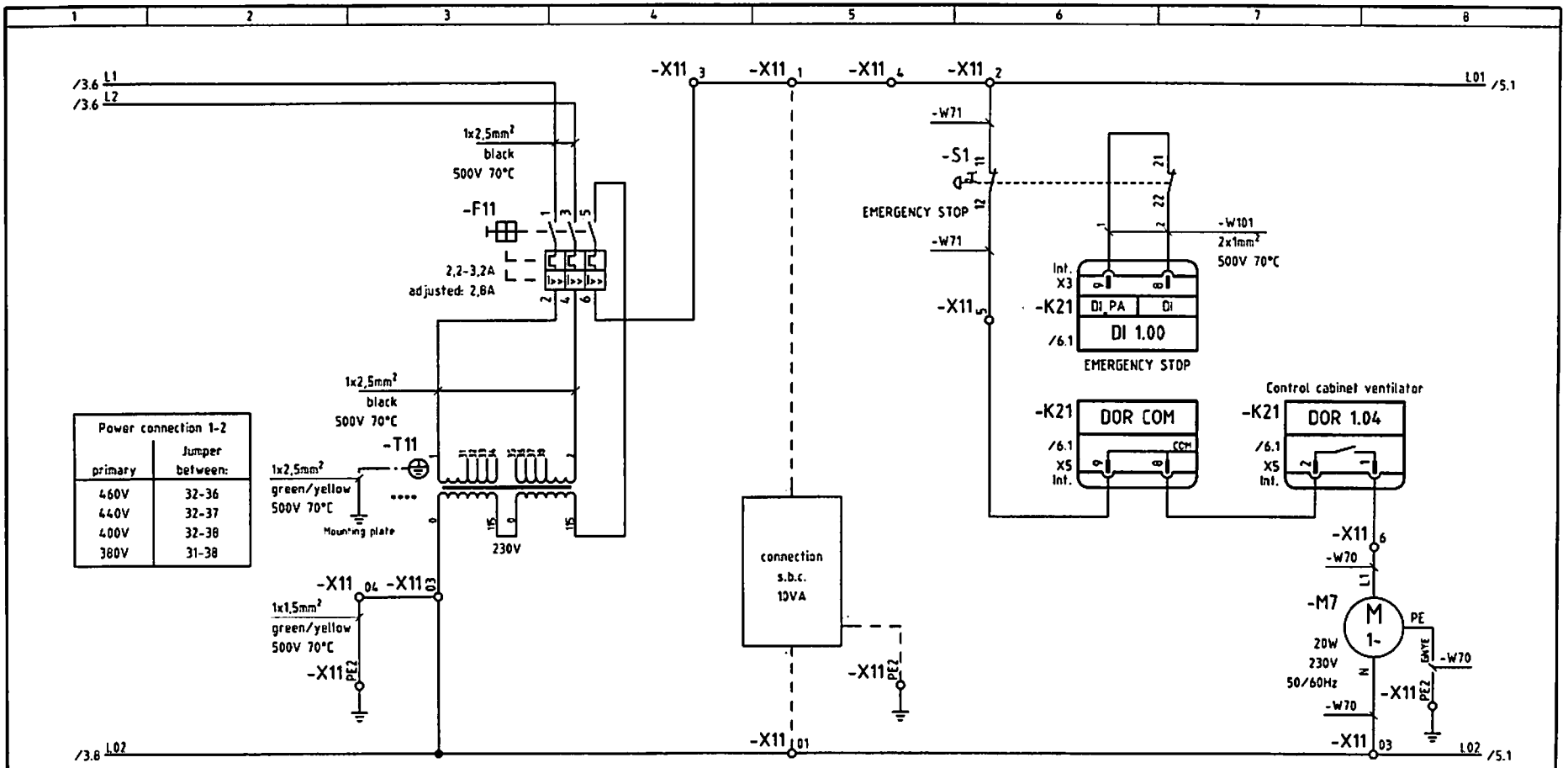
SIGMA CONTROL 2 | SFSD-03000.02 | page 1 / 11 Bl.



Function:								Temperature measurement	
Group of functions:					Star-delta changeover				
c				Datum	27.04.2012	KAESER KOMPRESSOREN	Circuit diagram Compressor series FSD Compressor motor		
b				Bearbeiter	Sitter				
a				Gepr.Dft	Gegner				
D	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2	SFSD-03000.02	page 2 11 Bl.

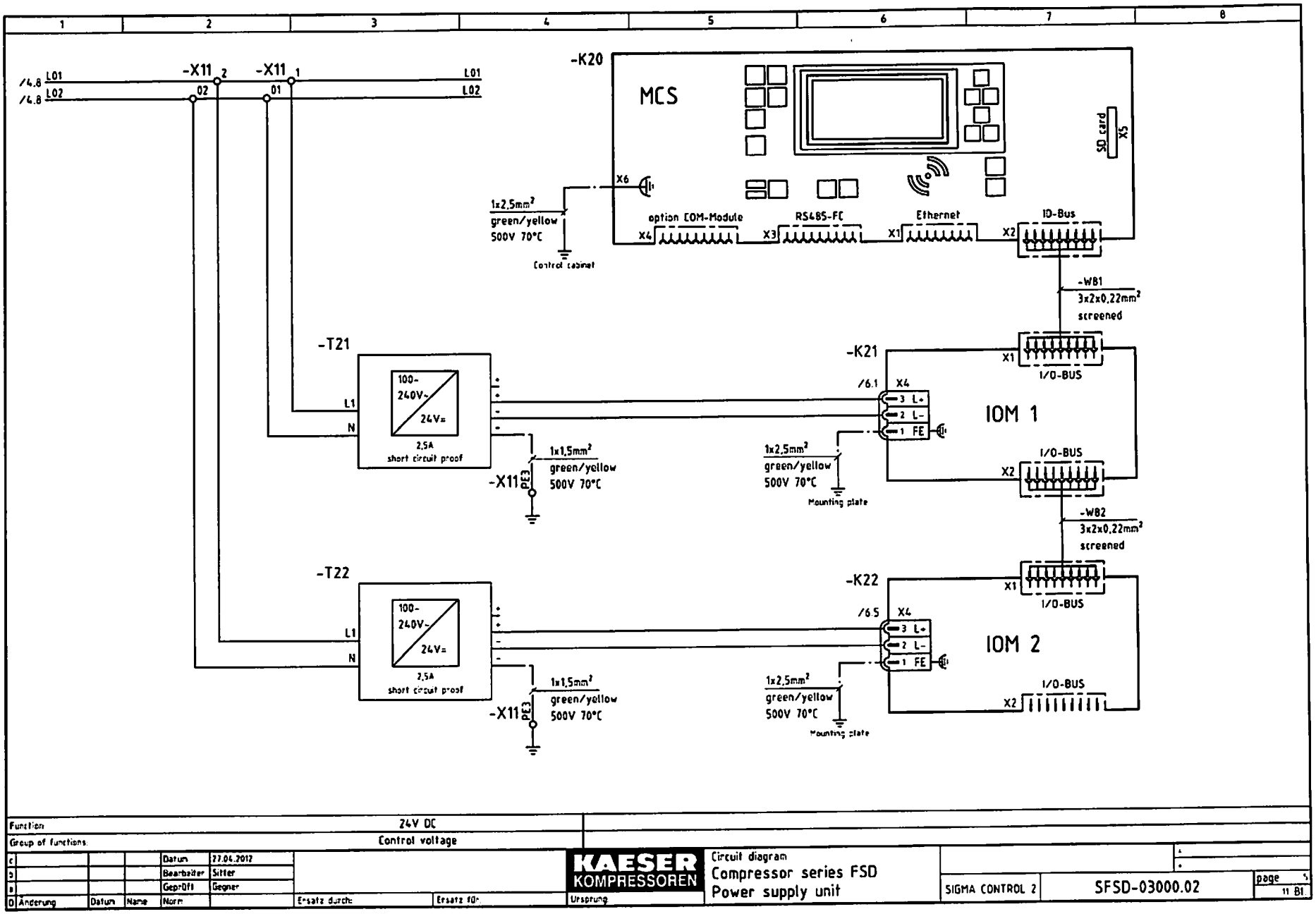


Function	Fan motor Air cooled				Fan motor Water cooled				
Group of functions	Power switching							Control	
c			Datum	27.04.2012	KAESER KOMPRESSOREN	Circuit diagram			
b			Bearbeiter	Sitter		Compressor series FSD			
a			Gepr'dtl	Gegner		Fan motor			
D	Änderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2	SFSD-03000.02	page 1 11 Bl.

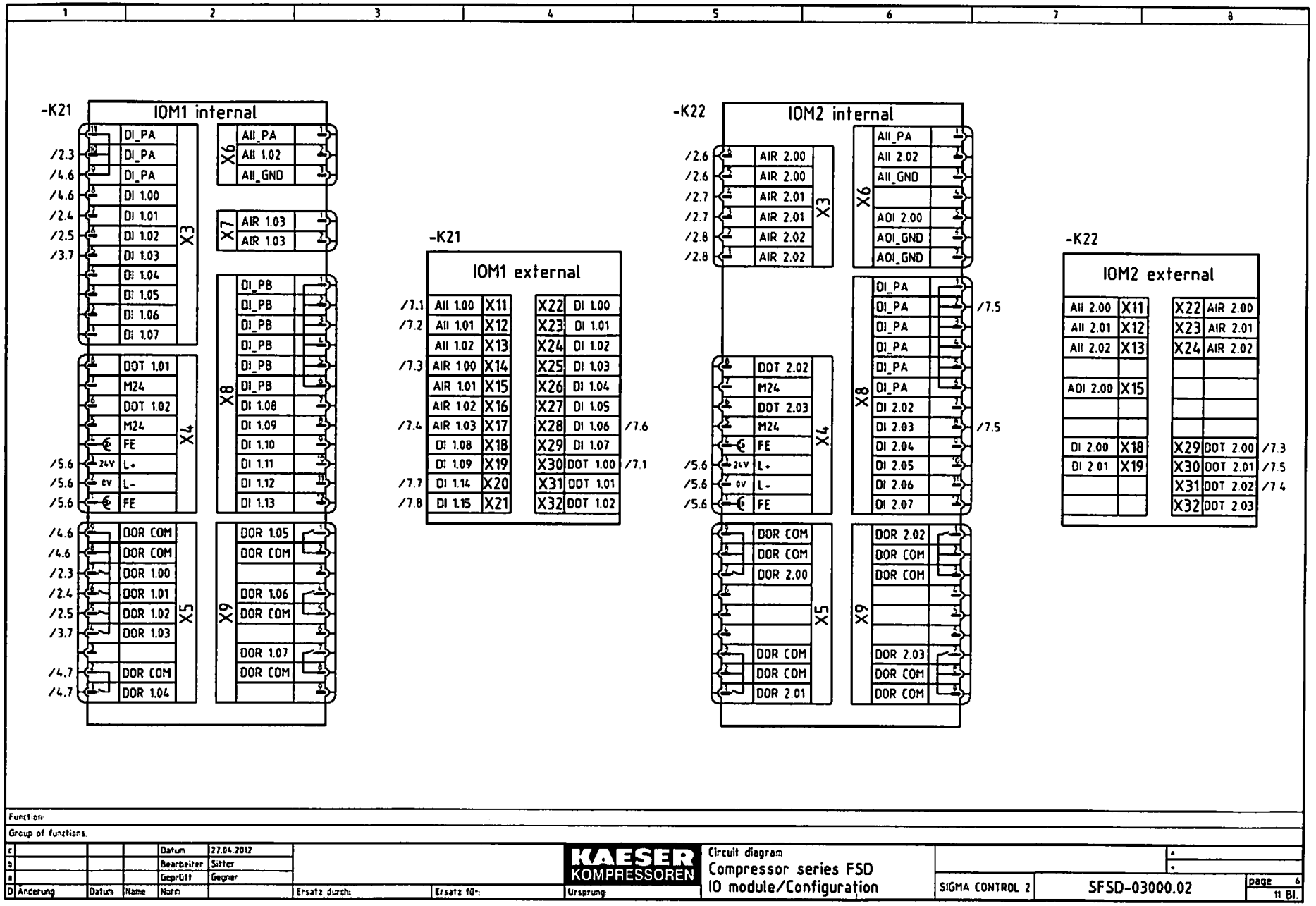


**** performance-related components,
see: Equipment parts list

Function				230V/1-/50/60Hz			EMERGENCY STOP	Control cabinet ventilator
Group of functions				Control voltage tapping		Consumer external	Safety chain	
c			Datum	27.04.2012		KAESER KOMPRESSOREN	Circuit diagram	
b			Bearbeiter	Sitter			Compressor series FSD	
a			Geprüft	Gegner			Control voltage tapping	
0	Änderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2 / SFSD-03000.02 / page 4 / 11 Bl.



Function					24V DC			
Group of functions					Control voltage			
c				Datum	27.04.2012	KAESER KOMPRESSOREN	Circuit diagram Compressor series FSD Power supply unit	
b				Bearbeiter	Sitter			
a				Geprüft	Gegner			
0	Änderung	Datum	Name	Norm		Ersatz durch: / Ersatz für: / Ursprung	SIGMA CONTROL 2	SFSD-03000.02 page 11 B1



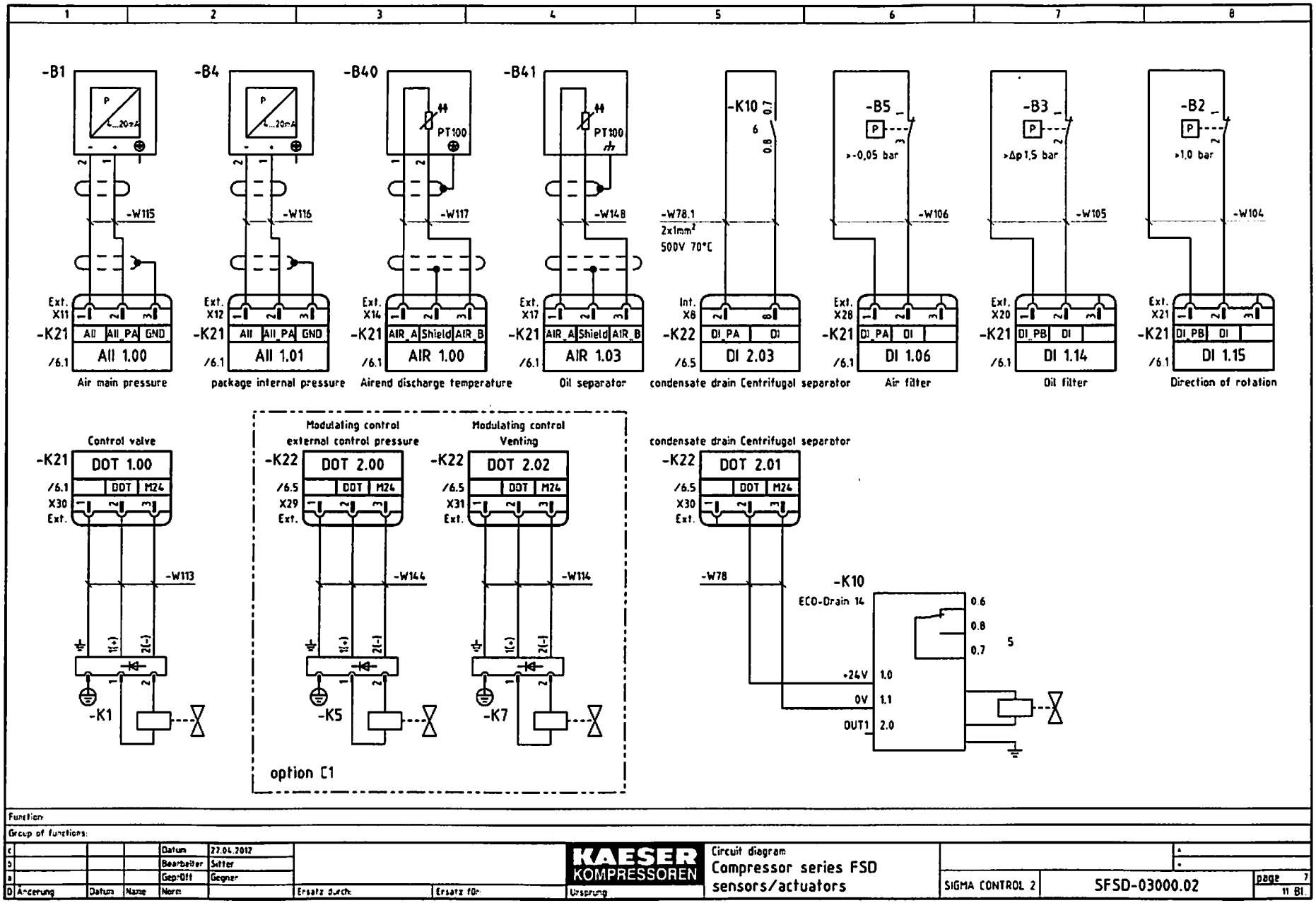
Function
Group of functions

c				Datum	27.04.2012			
b				Bearbeiter	Sitter			
a				Geprüft	Gegner			
D	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung:

KAESER KOMPRESSOREN

Circuit diagram
Compressor series FSD
IO module/Configuration

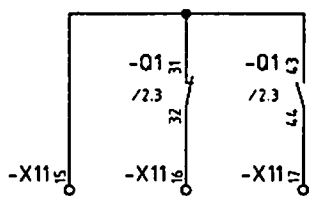
SIGMA CONTROL 2 | SFSD-03000.02 | page 6 / 11 Bl.



Function:									
Group of functions:									
c				Datum	27.04.2012		KAESER KOMPRESSOREN	Circuit diagram	
b				Bearbeiter	Sutter			Compressor series FSD	
a				Gep/Off	Gegner			sensors/actuators	
D	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2	SFSD-03000.02	page 7 / 11 B1.

1	2	3	4	5	6	7	8

Volt-free contacts
User's connection



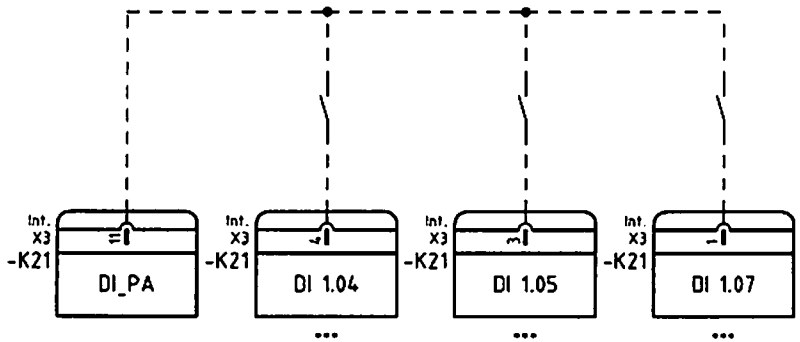
max. 250V AC/24V DC, 3A

All non-designated conductors
1,5mm² orange 500V 70°C

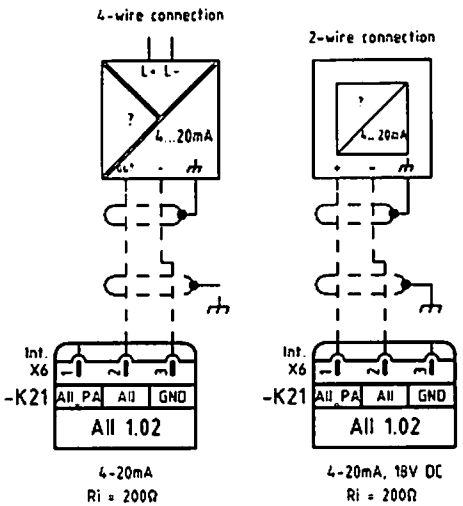
Function:					Compressor motor running				
Group of functions:					Volt-free contacts				
c				Datum	27.04.2012		KAESER KOMPRESSOREN	Circuit diagram	
b				Bearbeiter	Sitter			Compressor series FSD	
a				Gepr.Dfl	Gegner			Volt-free contacts	
D	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2	SFSD-03000.02	page 8 / 11 Bl.

•• Pre-allocated
••• Available for use

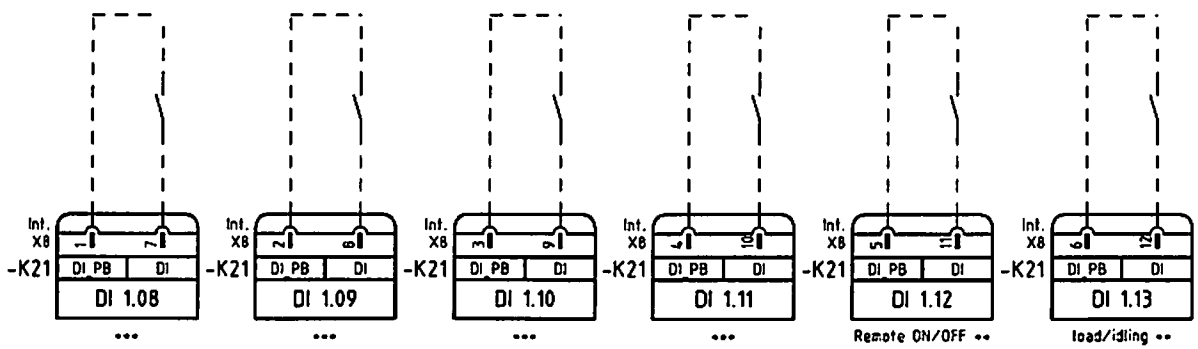
Inputs/outputs for use by others
Example connections



Possible connections for AII 1.02



analog inputs, User's connection
max. cable length 30m



digital inputs, User's connection
18V DC/7mA
max. cable length 100m

Function										
Group of functions					digital inputs				analog inputs	
c				Datum	27.04.2012		KAESER KOMPRESSOREN	Circuit diagram		
b				Bearbeiter	Sutter			Compressor series FSD		
a				Geprüft	Gegner			Digital/analogue outputs		
D	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	SIGMA CONTROL 2	SFSD-03000.02

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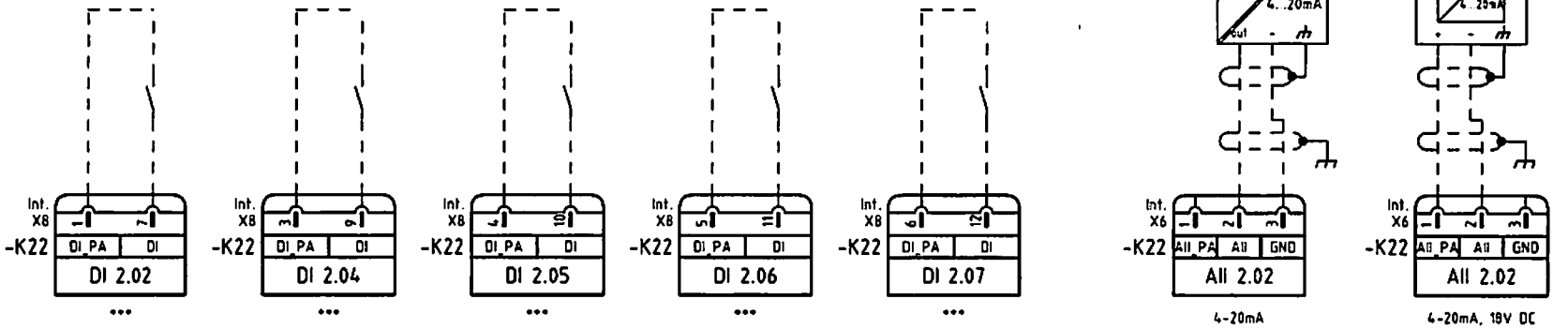
Inputs/outputs for use by others
Example connections

•• Pre-allocated
••• Available for use



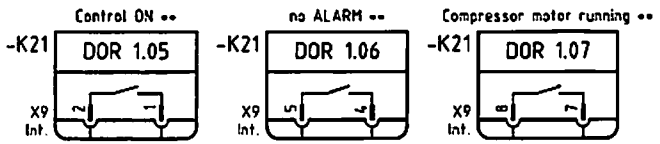
digital inputs, User's connection
18V DC/7mA
max. cable length 100m

analog inputs, User's connection
max. cable length 30m

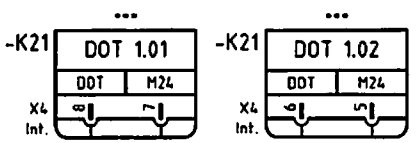
Function:									
Group of functions				digital inputs				analog inputs	
c				Datum	27.04.2012	KAESER KOMPRESSOREN	Circuit diagram		
b				Bearbeiter	Sitter		Compressor series FSD		
a				Geprüft	Gegner		Digital/analogue outputs		
D	Änderung	Datum	Name	Norm		Ersatz durch: / Ersatz für: / Ursprung		SIGMA CONTROL 2	SFSD-03000.02	page 10 / 11 Bl.

Inputs/outputs for use by others
Example connections

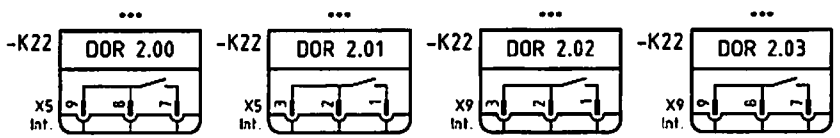
Relay outputs, User's connection
max. 250V AC/24V DC, 1A
max. cable length 100m



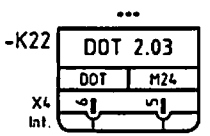
Digital output, User's connection
24V DC/0,5A
max. cable length 30m



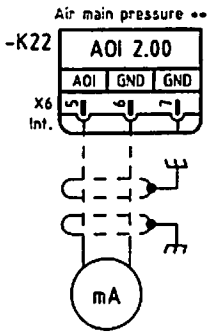
Relay outputs, User's connection
max. 250V AC/24V DC, 1A
max. cable length 100m



Digital output, User's connection
24V DC/0,5A
max. cable length 30m



Analog output, User's connection
4-20mA, max. 450Ω
max. cable length 30m



•• Pre-allocated
••• Available for use

Function:									
Group of functions				digital outputs					Analog output
c				Datum	27.04.2012				
b				Bearbeiter	Sitter				
a				Gep-Dfl	Gegner				
D	Änderung	Datum	Name	Norm		Ersatz durch:	Ersatz für:	Ursprung	

KAESER KOMPRESSOREN
Circuit diagram
Compressor series FSD
Digital/analogue outputs

SIGMA CONTROL 2 | SFSD-03000.02 | page 11 Bl.

Volt-free contacts
1) Compressor motor running

**** performance-related components,
see: Equipment parts list

GNYE = green/yellow

Terminal strip: -X11
total 20 Terminals

Terminal number	Location	Destination external: Component identification	Destination external: Connection number	Destination internal: Component identification	Destination internal: Connection number	Cable identification
PE1	/1.7	-M6	PE	Mounting plate		-W29 **** (GNYE)
1	/4.5	-T21	L1		.	
01	/4.5	-T21	N		.	
2	/4.6	-T22	L1	-S1	11	-W71 2x1mm² 500V 70°C (X)
02	/2.3	-T22	N	-01	A2	
3	/4.4	-F11	6			
03	/4.8	-T11	0	-M7	N	-W70 3G1mm² 500V 70°C (X)
4	/4.5					
04	/4.3					
5	/4.6	-K21-X5	9	-S1	12	-W71 2x1mm² 500V 70°C (X)
6	/4.8	-K21-X5	1	-M7	L1	-W70 3G1mm² 500V 70°C (X)
7						
8						
PE2	/4.3		.	-M7	PE	-W70 3G1mm² 500V 70°C (GNYE)
PE2	/4.5				.	
PE3	/5.4	-T21	-			
PE3	/5.4	-T22	-			
15	/8.4	-01	43			1)
16	/8.4	-01	32			1)
17	/8.5	-01	44			1)

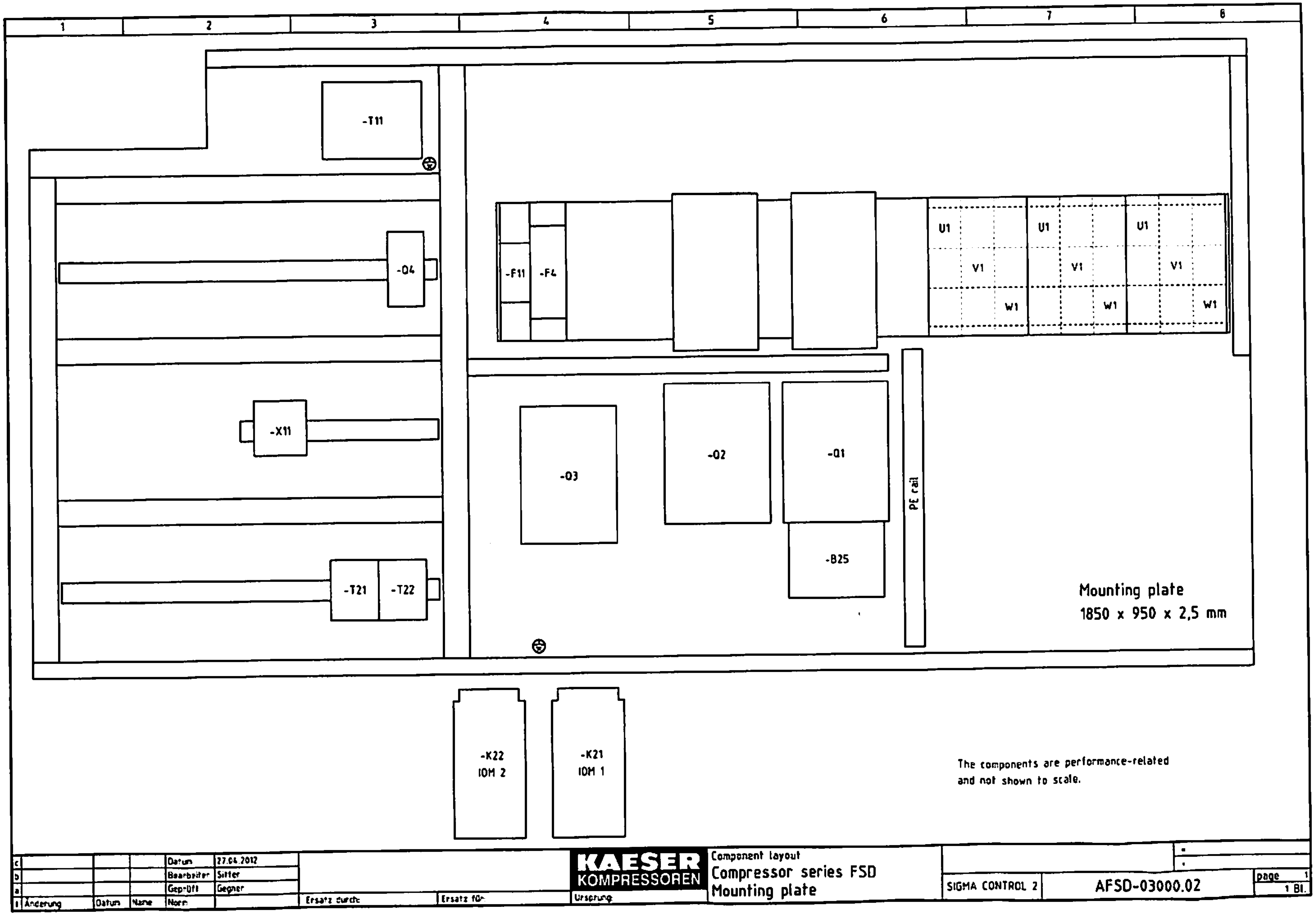
c				Datum	27.04.2012
b				Bearbeiter	Sitter
a				Geprüft	Gegner
M	Änderung	Datum	Name	Norm	

Ersatz durch: Ersatz für: Ursprung:

KAESER KOMPRESSOREN

Terminal schedule
Compressor series FSD
Terminal strip -X11

SIGMA CONTROL 2 | KFSD-03000.02 | page 1, 1 Bl.


1
2
3
4
5
6
7
8
-T11
-04
-X11
-T21
-T22
-F11
-F4
U1
V1
W1
U1
V1
W1
U1
V1
W1
-03
-02
-01
-B25
PE rail
Mounting plate
1850 x 950 x 2,5 mm
-K22
IOM 2
-K21
IOM 1
The components are performance-related
and not shown to scale.
Datum 27.04.2012
Bearbeiter Sitter
Gepr.üft Gegner
Norm
Änderung
Datum
Name
Ersatz durch:
Ersatz für:
KAESER KOMPRESSOREN
Ursprung
Component layout
Compressor series FSD
Mounting plate
SIGMA CONTROL 2
AFSD-03000.02
page 1
1 Bl.

Europe

Austria
KAESER Kompressoren Ges.m.b.H.
Niederlassung Österreich
Dallingerstr. 8
PO Box 70 - 4031 Linz
Tel.: +43/70-38 60 51-0
Fax: +43/70-38 67 80
E-mail: info.austria@kaeser.com

Belgium
KAESER Kompressoren B.V.B.A.
Heiveldekens 7A
2550 Kontich
Tel.: +32/3-326 39 62+63
Fax: +32/3-326 39 73
E-mail: info.belgium@kaeser.com

Bulgaria
MAVA Industrial S.A.
BUSINESS PARK SOFIA
255, Okolovrasten pat blvd.
Sofia 1715
Tel.: +359/2 975 6100
Fax: +359/2 975 6111
E-mail: info@mavaindustrial.com

Croatia
KAESER Kompressoren d.o.o.
Rimski put 11/d
10360 Sesvete/Zagreb
Tel.: +385/1-2405-551
Fax: +385/1-2405-566
E-mail: info.croatia@kaeser.com

Czech Republic
KAESER Kompressoren, s.r.o.
Obchodní 126
251 01 Cestlice
Tel.: +00420/272 706 821
Fax: +00420/272 690 707
E-mail: info.czech@kaeser.com

Denmark
KAESER Kompressorer A/S
Skruegangen 7
2690 Karlslunde
Tel.: +45/46 15 43 34
Fax: +45/46 15 43 35
E-mail: info.denmark@kaeser.com

England
HPC Engineering PLC
Victoria Gardens
Burgess Hill
West Sussex RH15 9RQ
Tel.: +44/1444-24 16 71
Fax: +44/1444-24 73 04
E-mail: info@hpcplc.co.uk

Estonia
KAESER Kompressorid
Viljandi mnt. 25 D
11218 Tallinn
Tel.: +372/651 4000
Fax: +372/651 4007
E-mail: info@kaeser.ee

Finland
KAESER Kompressorit Oy
Tiilitie 18
01720 Vantaa
Tel.: +358/9-41 32 04 00
Fax: +358/9-41 32 04 50
E-mail: info.finland@kaeser.com

France
KAESER Compresseurs S.A.
3, av.du Bataillon-Carmagnole Liberté
69518 Vaulx-en-Velin Cedex
Tel.: +33/4 72 37 44 10
Fax: +33/4 78 26 49 15
E-mail: info.france@kaeser.com

Germany
KAESER KOMPRESSOREN AG
PO Box 2143
96410 Coburg
Tel.: +49/9561-640-0
Fax: +49/9561-640-130
Service: 08000-KAESER (08000-523737)
E-mail: produktinfo@kaeser.com

Greece
Vamvacas Industrial Equipment S.A.
DIM. Moutsopoulou 103
185 41 Kaminia - Piraeus
Tel.: +30/2-10 08 700
Fax: +30/2-10 09 517
E-mail: info@vamvacas.gr

Hungary
KAESER Kompressoren Kft.
Gyár u. 2.
2040 Budaörs
Tel.: +36/23 445 300
Fax: +36/23 445 301
E-mail: info.hungary@kaeser.com

Ireland
KAESER Compressors Ltd.
Unit 43/44 Western Parkway
Business Park
Ballymount Road
Dublin 12
Tel.: +353/1-456 54 33
Tel.: 1850/369400 (National)
Fax: +353/1-456 73 28
E-mail: info.ireland@kaeser.com

Italy
KAESER Compressori s.r.l.
Via del Fresatore, 5
Zona Ind. Roveri
40138 Bologna
Tel.: +39/051-60 09 011
Fax: +39/051-53 86 11
E-mail: info.italy@kaeser.com

Latvia
SIA IST-Riga
Ziepniekkalna iela 21a
1004 Riga
Tel.: +371/7620485
Fax: +371/7627923
E-mail: gunars@ist-riga.lv

Lithuania
UAB RYTVITA
Žemdirbių g.5
70171 Vilkaviškis
Tel.: +370/69988995
Fax: +370/34260043
E-mail: kaeser@kaeser.lt

Luxembourg
Kaeser Luxembourg
Luxembourg
Tel.: +32-3 326 3962
Fax: + 0032-3 326 3973
E-mail: info.luxemburg@kaeser.com

The Netherlands
Kaeser Compressoren B.V.
Generatorstraat 34
7556 RC Hengelo
Tel.: +31/74-245 2900
Fax: +31/74-245 2905
E-mail: info@kaeser.nl

Norway
KAESER Kompressorer AS
Verpetveien 38
1540 Vestby
Tel.: +47/64-98 34 00
Fax: +47/64-98 34 01
E-mail: info.norway@kaeser.com

Poland
KAESER Kompressoren Sp z.o.o.
Ul. Taneczna 82
02-829 Warszawa
Tel.: +48/22-322 86 65
Fax: +48/22-322 86 66
E-mail: info.poland@kaeser.com

Portugal
KAESER COMPRESSORES, Lda.
Zona Industrial da Poupa, Lote J
4780-793 Santo Tirso
Tel.: +351/252 080 441/2/3
Fax: +351/252 080 438
E-mail: info.portugal@kaeser.com

Romania
KAESER Kompressoren S.r.l.
B-dul Ion Mihalache, Nr. 179
011181 Bucharest, Sector 1
Tel.: +40/21-2245681+ 2245688
Fax: +40/21-2245602
E-mail: info.romania@kaeser.com

Россия
ООО "КЕЗЕР КОМПРЕССОРЕН ГмбХ"
ул. Искры 17"А", стр. 2, 1-й этаж
129344 Москва
тел.: +7/495 797 3037
факс: +7/495 797 6846
E-mail: info.russia@kaeser.com

Slovakia
AIR CONSULTING spo. s r. o.
Janotova 15
841 05 Bratislava
Tel.: +421/2-4524 3565
Fax: +421/2-4552 4380
E-mail: info@airconsulting.sk

Slovenia
Kaeser Kompresorji, d.o.o.
Betokranjska ul 12
2000 Maribor
Tel.: +386/2-3333 242
Fax: +386/2-3333 245
E-mail: Info.slovenia@kaeser.com

Spain
KAESER Compresores S.L.
P.I. Malpica Sta. Isabel C/E, parcela 70
50016 Zaragoza
Tel.: +34/976-46 51 45
Fax: +34/976-46 51 51
E-mail: info.spain@kaeser.com

Sweden
KAESER Kompressorer AB
Linjalvägen 6
Box 7329
18714 Täby
Tel.: +46/8-544 44 330
Fax: +46/8-630 10 65
E-mail: info.sweden@kaeser.com

Swiss
KAESER Kompressoren AG
Großäckerstr. 15
PO Box Watt
8105 Regensdorf
Tel.: +41/1-87163-63
Fax: +41/1-87163-90
E-mail: info.swiss@kaeser.com

Turkey
Topkapi Endüstri
Mallari Ticaret A.S.
Millet Cad No. 180-184
34270 Topkapi-Istanbul
Tel.: +90/212-534 04 10
Fax: +90/212-524 58 46
E-mail: info@topkapigroup.com.tr

Україна
ТОВ "Кезер Компрессорен"
Вул. Пост-Волинська, 5
03061 Київ
Tel.: +380/44 4084757
Fax: +380/44 4084787
E-mail: info.ukraine@kaeser.com

Middle East

Bahrain
Abdulla Ahmed Nass & Sons
PO Box 669
Manama, Bahrain
Tel.: +973/703 123
Fax: +973/703 090
E-mail: mkapoor@aanass.com

Israel
Kaeser Compressors ltd
7 hasadan st.
45304 Hod hashron
Tel.: +972/9788 5888
Fax: +972/9788 5889
E-mail: info.israel@kaeser.com

Oman
Pipeline Supply Company LLC.
PO Box 1896
Postal Code 112
Ruwi, Muscat
Tel.: +968/244 925 17-19
Fax: +968/244 925 16
E-mail: mohan joseph@psc-llc.com

Saudi Arabia
ARCOMA
Arabia Commercial Agency Co. Ltd.
Technical Division
PO Box 811
Jeddah 21421
Tel.: +966/2-644 42 12
Fax: +966/2-642 09 75
E-mail: mobajammal@yahoo.com

U.A.E.
KAESER Kompressoren FZE
Warehouse CC02
Roundabout 08, Blue Shed Area
P.O. Box 17485, Jebel Ali Free Zone
Dubai
Tel.: +971/4-8838 363
Fax: +971/4-8838 324
E-mail: info.dubai@kaeser.com

Bhatia Brothers
PO Box 1275
Dubai
Tel.: +971/4-333 05 65
Fax: +971/4-333 79 66
E-mail: bbisddxb@emirates.net.ae

America

Argentina
KAESER Compresoros de Argentina S.R.L.
Ruta Panamericana, ramal Campana
KM 37,500, Centro Industrial Garín
Calle Haendel Lote 33 – (1619)
Garín, Buenos Aires
Tel.: +54/0 3327 41 4800
Fax: + 0054/0 3327 41 4836
E-mail: info.argentina@kaeser.com

Brazil
KAESER Compressores do Brasil
Rua Agostino Tognen, 505
CEP 04690-090 - São Paulo - SP
Tel.: +55/11 5633-3030
Fax: +55/11 5633-3033
E-mail: info.brasil@kaeser.com

Canada
KAESER Compressors, Inc.
3760 La Vérendrye
Boisbriand, QC J7H 1R5
Tel.: +1/450-971 14 14
Fax: +1/450-971 14 15
E-mail: info.canada@kaeser.com

Chile
KAESER Compresoros Chile Ltda.
Cerro Portezuelo 9817-A
749-0460 Quilicura
Santiago de Chile
Tel.: +56/2-747-14-1446
Fax: +56/2-747-14 25
E-mail: info.chile@kaesor.com

Colombia
KAESER Compresores de Colombia Ltda.
Transversal 95 bis A No. 25D-55
Fontibón, Centro Industrial la Rábida
Bogotá D.C.
Tel.: +57/1-742 9393
Fax: +57/1-263 8701
E-mail: info.colombia@kaeser.com

Costa Rica
EQUIPOS NEUMÁTICOS S.A.
Del Colegio Marista 100 este
200 Sur y 25 Este, Urbanización Ciruelas
Alajuela
Tel.: +506/2442-1638
Fax: +506/2440-2393
E-mail: kaesor@cnesa.net

Ecuador
Indutorres S.A.
KM 7 Vía Durán-Tambo
Guayaquil
Tel.: + 00593/4-281 0212
Fax: + 00593/4-280 5212
E-mail: ernesto.torres@indutorres.com

El Salvador
Kaeser Compresores de
El Salvador Ltda. de C.V.
1ª. Calle Poniente y 61 Av. Norte #3150
San Salvador
Tel.: + 00503/2260-5168
Fax: + 00503/2260-5147
E-mail: info.elsalvador@kaesor.com

Guatemala
Kaeser Compresores
de Guatemala y Cía Ltda.
Calzada Atanasio Tzul 21-00, zona 12
Empresarial El Cortijo II Bodega 501
01012 Guatemala City
Tel.: +502/2412-6000
Fax: +502/2412-6060
E-mail: info.guatemala@kaeser.com

Honduras
Kaeser Compresores de Honduras
S. de R.L. de C.V.
AV. Circunvalación entre 6 y 7, Av. NO
Edificio La Rotonda, Locales 5, 6 y 12
San Pedro Sula
Tel.: +504/553-5233
Fax:
E-mail: info.honduras@kaeser.com

Mexico
KAESER COMPRESORES de México
S. de R.L. de C. V.
Calle 2 No. 123 Parque Industrial Jurica
76100 Querétaro, Qro
Tel.: +52/442-218 6448
Fax: +52/442-218 6449
E-mail: sales.mexico@kaesor.com

Panama
Neumática y Control S.A.
Via Ricardo J. Alfaro
E- Centro Comercial Multimax, Local 19-20
Local 17-18, Apartado 6-797, El Dorado
Ciudad de Panamá
Tel.: +507/236-2419/7093
Fax: +507/236-3259
E-mail: afreeman@cableonda.net

USA
KAESER Compressors, Inc
511 Sigma Drive
Fredericksburg, VA 22408
P.O. Box 946/Fredericksburg VA 22404
Tel.: +1/540-898.5500
Fax: +1/540-898.5520
E-mail: info.usa@kaeser.com

Africa

Algeria
ENTEC Engineering Technics
59, Cité Boussouf Lot. HADDAD
25027 Constantine
Tel.: +213/31 66 25 12
Fax: +213/31 66 23 56
E-mail: m.aimeur@entec-dz.com

Egypt
El Haggar Compressors Co.
Engineering Agents
83-87 El Sabteya St.
PO Box 2 Sabteya
Cairo
Tel.: +20/2-5766 266
Fax: +20/2-5773 020
E-mail: elhaggar@intouch.com

Kenya
Energy Pak (K) Ltd
49, Alpha Centre, Mombasa Road
00504 Nairobi
Tel.: +254/202020112
Fax.: +254/202020115
E-mail: info@energypak-kenya.com

Mauritania
Erco.
Ilot V, No. 491
40106 Nouakchott
Tel.: +222/529 2284
Fax: +222/529 3686
E-mail: erco@mauritel.mr

Mauritius
HAREL MALLAC ENGINEERING LTD.
Pailles Road, Les Pailles
Tel.: +230/2073000
Fax: +230/2073030
E-mail: info@hmengineering.mu

Morocco
Techni Dispo
Commercial Department
140, Bd el Fouarat
Bd Ibnou Tachefine, Casablanca
Tel.: +212/22602586
Fax: +212/22602584
E-mail: info@ technidispo.com

South Africa
KAESER Compressors (SA) (PTY) Ltd.
P.O.Box 5031 - 79 Watt Street
Meadowdale, 1614
Tel.: +27/119745002
Fax: +27/119746696
E-mail: info.southafrica@kaeser.com

Tunisia
HP automatisme
68, Rue du18 Janvier 1952
1001 Tunis
Tel.: +216/71-334 238
Fax: +216/71-335 303
E-mail: hp.automatisme@planet.tn

Asia

Bangladesh
M/s NEW ASIA Ltd.
117/A Tejgaon I/A
50 New Eskaton Road
G.P.O.Box 931Dhaka – 1000
Tel.: +880/2-8816128
Fax: +880/2-8828953
E-mail: allabj@nowasiabd.com

China
Kaeser Kompressoren System
(Shanghai) Co.Ltd.
No. 3500 JinDu Road, XinZhuang
Industry Zone, MinHang District
Shanghai 201108
Tel.: +86/21-544 22 666
Fax: +86/21-544 25 566
E-mail: info.china@kaoser.com

India
KAESER Compressors (India) Pvt. Ltd.
Plot No. 1&2, Survey No. 297, 298 & 299
Indo-German Technology Park,
Village Urawade, Taluka Mulshi
Dist. Pune – 412 108
Tel.: +91/20-667 69 240
Fax: +91/20-667 69 238
E-mail: info.india@kaeser.com

Indonesia
PT Indo Komprosigma
Gedung Kawan Lama, 2nd Floor
Jl. Puri Kencana No. 1
Meruya Kembangan
Jakarta 11610
Tel.: +62/21-582 33 33
Fax: +62/21-582 39 33
E-mail: info_jkt@kaoserindo.com

Japan
KAESER Kompressoren Co. Ltd.
Kaigan 3-31-1
Minato-ku
Tokyo 108-0022
Tel.: +81/3-345 275 71
Fax: +81/3-345 275 88
E-mail: info.japan@kaeser.com

Korea
KAESER Kompressoren Co Ltd.
Hyeongok Industrial Complex,
22, Hyeongoksandan-ro, Cheongbukmyeon,
Pyeongtaek-si, Gyeonggi-do
Seoul
Tel.: +82/2-597-6296
Fax: +82/2-598-6385
E-mail: info.korea@kaeser.com

Malaysia
KAESER Kompressoren SDN BHD
No. 18 Jalan Astaka U8/82
Bukit Jelutong
40150 Shah Alam, Selangor
Tel.: +60/3-78452791
Fax: +60/3-78457790
E-mail: info.malaysia@kaesor.com

Philippines
KAESER Kompressoren Philippines
Unit 103/104 Ground Floor
Cedar Executive Building II
No. 26 Timog Avenue
Corner Scout Tobias Street
Quezon City, 1103 Philippines
Tel.: +63/2-372 6642
Fax: +63/2-372 6643
E-mail: info.philippines@kaeser.com

Singapore
KAESER Kompressoren Pte Ltd
81 Tech Park Crescent
Tuas Tech Park
Singapore 638067
Tel: +65/6885-7733
Fax: +65/6885-7700
E-mail: info.singapore@kaeser.com

Sri Lanka
Nikini Automation Systems(Pvt.) Ltd.
249 High Level Road, Colombo 5
Sri Lanka
Tel.: +94/1 826 894
Fax: +94/1 826 252
E-mail: sales@nikiniautomation.com

Thailand
Kaeser Kompressoren (Thailand) Ltd.
700/680 Moo 1, Amata Nakorn
Industrial Estate, Tambon Panthong
Amphur Panthong, Chonburi 20160
Tel.: + 6638-447401-03
Fax: + 6638-447404
E-mail: info.thailand@kaeser.com

Australia

Australia
KAESER Compressors Australia Pty. Ltd.
Locked Bag 1406
Dandenong South, Vic. 3164
45 Zenith Road
Dandenong, Vic. 3175
Tel.: +61/3-9791-5999
Fax: +61/3-9791-5733
E-mail: info.australia@kaeser.com