

Service Manual

Screw Compressor

FSD

9_5894 03 USE

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1 Regarding this Document

1.1 Using the Document

The service manual is part of the machine.

- Keep the service manual in a safe place throughout the life of the machine.
- Pass the manual on to the next owner/user of the machine.
- Ensure that all amendments received are entered in the manual.
- Enter details from the machine nameplate and individual items of equipment in the table in chapter 2.

1.2 Further documents

Included with this service manual are additional documents intended to assist in the safe operation of the machine:

- Certificate of acceptance/operating instructions for the pressure vessel
- Operating instructions for SIGMA CONTROL.

Missing documents can be requested from KAESER.

- Make sure all documents are complete and observe the instructions contained in them.
- Make sure you give 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 Identification

1.4.1 Warnings

Warning notices indicate three levels of danger signified by the signal word.

- DANGER
- WARNING
- CAUTION



DANGER

These show the kind of danger and its source!

The possible consequences of ignoring a warning are shown here.

The word "Danger" indicates that death or severe injury can result from ignoring the instruction.

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

- Always read and comply with warning instructions.

Signal word	Meaning	Consequences of non-observance
DANGER	Warns of an imminent threat of danger	Death or serious injury may result

1 Regarding this Document

1.4 Symbols and Identification

Signal word	Meaning	Consequences of non-observance
WARNING	Warns of possible danger	Death or serious injury are possible
CAUTION	Warns of a possibly dangerous situation	Light injuries or material damage are possible

Tab. 1 The levels of danger and their meaning

1.4.2 Other instructions and symbols



This symbol refers to 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.
Here conditions relevant to safety are named that will help you to avoid dangerous situations.

Option H1 ➤ This bullet is placed by lists of actions comprising one stage of a task.
In lists of actions with several stages the sequence of actions is numbered.
Information that refers to only one option is marked with an indicator (e.g.: H1 means that this section is only valid for machines with adjustable machine mountings). Option indicators 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 ...

➤ ... and a remedy given.



This symbol refers to important information or measures concerning environmental protection.

Further information Here, your attention is drawn to further topics.

2 Technical Data

2.1 Nameplate

The model designation and important technical information are given on the machine's nameplate.

The nameplate is located on the outside of the machine:

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

➤ Enter data from the nameplate here as reference:

Characteristic	Value
Model	
Part no.	
Year	
Serial no.	
psig	
cfm	
Voltage	
Hz/RPM	
Package FLA	
Phase	
HP	
Wiring Diagram	
FOR SERVICE, REFER TO EQUIPMENT NUMBER	

Tab. 2 Nameplate

2.2 Options

The table contains a list of possible options.

➤ Enter options here as a reference.

Option	Option code	Exists?
Modulating control	C1	
Automatic oil level monitoring	C5	
Adjustable machine feet	H1	
Air-cooling	K1	
Water-cooling	K2	
Cooling air filter mat	K3	
Prepared for heat recovery	W1	

Tab. 3 Options

2.3 Weight

The weight given is the maximum. The actual weights of individual machines are dependent on equipment fitted.

	FSD 350	FSD 400	FSD 450
Weight [lb]	11245	12410	13450

Tab. 4 Machine weight

2.4 Temperature

	FSD 350	FSD 400	FSD 450
Minimum inlet temperature [°F]	40	40	40
Typical airend discharge temperature during operation [°F]	150–200	150–200	150–200
Maximum airend discharge temperature (automatic safety shut-down) [°F]	230	230	230

Tab. 5 Temperature

2.5 Ambient conditions

	FSD 350	FSD 400	FSD 450
Maximum altitude AMSL* [ft]	3000	3000	3000
Permissible ambient temperature [°F]	40–115	40–115	40–115
Cooling air temperature [°F]	40–115	40–115	40–115
Inlet air temperature [°F]	40–115	40–115	40–115
Maximum relative humidity of inlet air	see figure 1	see figure 1	see figure 1

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

Tab. 6 Ambient conditions

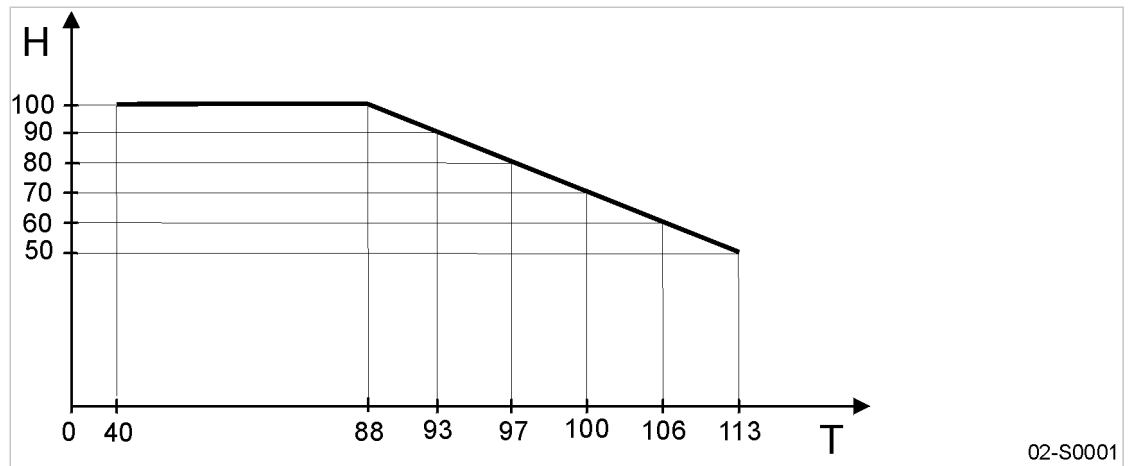


Fig. 1 Maximum relative humidity
 T Inlet air temperature [°F]
 H Maximum relative humidity of inlet air [%]

2.6 Ventilation

The values given are minimum guide values.

Mains frequency 50 Hz

	FSD 350	FSD 400	FSD 450
Inlet aperture [Z] [ft²] see illustration 12.	6.0/0.9*	7.0/1.1*	7.0/1.1*
Extractor for forced ventilation: Flow rate [cfm] at 100 Pa	— 13000*	— —*	— 16000*
Exhaust duct: Dimensions [in]	1900 x 1000	1900 x 1000	1900 x 1000

* Option K2

Tab. 7 Ventilation (50 Hz)

Mains frequency 60 Hz

	FSD 350	FSD 400	FSD 450
Inlet aperture [Z] [ft²] see illustration 12.	64.5/9.6*	75.3/12.0*	75.3/12.0*
Extractor for forced ventilation: Flow rate [cfm] at 100 Pa	— 1650*	— 9420*	— 9420*
Exhaust duct: Dimensions [in]	63 x 40	63 x 40	63 x 40

* Option K2

Tab. 8 Ventilation (60 Hz)

2.7 Pressure

Maximum working pressure: see nameplate

Pressure relief valve activating pressure [psig]

Maximum working pressure [psig]	FSD 350	FSD 400	FSD 450
125	155	—	155
145	—	175	—
175	230	—	230
217	—	—	230

Tab. 9 Pressure relief valve activating pressure

2.8 Free air delivery

FAD [cfm] mains frequency

Maximum working pressure [psig]	FSD 350	FSD 400	FSD 450
125	1520	—	1990
145	—	1730	—
175	1270	—	1497
217	—	—	1250

Tab. 10 FAD

2.9 Cooling Oil Recommendation

A sticker showing the type of oil filled is located near the oil separator filler.

Information for ordering cooling oil can be found in chapter 13.4.

2.9.1 Basic Information

Lubrication of an air compressor is essential to reliable operation. Carbon and varnish can form in compressor cooling oils. These deposits block the flow of lubricant and cause excessive wear and failure of moving parts. Contamination of the lubricant can allow the formation of acids, causing extensive internal corrosion. Water may be condensed decreasing the lubricity.

Lubricants in rotary compressors do much more than lubricate. During the compression process, it acts as a sealant in the airend which is important for maximum efficiency. The lubricant also absorbs much of the heat of compression to cool the airend and reduce the temperature of the compressed air. It's not enough that a compressor cooling oil lubricates well, it must stand up to the heat, pressure and contaminants that are present in every air compressor.

2.9.2 KAESER Lubricants

KAESER synthetic lubricants should be stored in a protected location to prevent contamination. Do not re-use drums; flush and send to reconditioner.

Although the KAESER synthetic is not highly flammable, it will burn. While KAESER synthetic compressor cooling oil is less flammable than equal viscosity mineral oils, it cannot be classified as a fire-resistant fluid. It has a flash point above 460 °F. Since the user has total control over the conditions of the compressor lubricant, he assumes total responsibility for its safe usage.

Material Safety Data Sheets are available for each lubricant from your authorized KAESER Service representative.

Regardless of the lubricant selected, the KAESER SIGMA lubricants will separate readily from water. If condensate occurs it can easily be removed. Let the compressor sit so that any water can drain back to the separator tank and separate to the bottom. See chapter 10.17 proper draining procedure.

KAESER has several lubricants available that are specially formulated to match these demands. They feature excellent lubricity, outstanding demulsibility (ability to separate from water), and long life.

M-SERIES:

- M-Series SIGMA compressor cooling oils are **semi-synthetic** lubricants.
- M-Series SIGMA compressor cooling oils are the highest quality petroleum lubricants. M-460 is specially blended to provide reliable performance in KAESER screw compressors.

S-SERIES:

- S-Series SIGMA compressor cooling oils are **synthetic** lubricants.
- S-Series SIGMA compressor cooling oils are formulated from the most advanced synthetic lubricants. These "synthetic" lubricants begin as high quality petroleum feed stock. They are then refined, processed and purified into fluids with very consistent molecular structure. These oils are carefully blended to produce extremely consistent lubricants with superior properties. SIGMA synthetic lubricants feature all the advantages of both PAO and diester fluids.
- S-460 lubricant is recommended for compressors operating in ambient temperatures between 40 °F and 105 °F.

Specialty KAESER LUBRICANTS:

- S-680 lubricant may be used when ambient temperatures are always between 70 °F and 105 °F.
- FG-460 synthetic hydrocarbon based food grade lubricant is designed for use in rotary screw compressors in the application where incidental food contact may occur with the discharge air. This lubricant meets the requirements of the FDA Regulation 21 CFR §178.3570 and is USDA H-1 approved and NSF certified. FG-460 is approved for canning, food packing, meat and poultry processing and other applications where incidental food contact may occur.

2.10 Cooling oil charge

Option K1 Air-cooling

	FSD 350	FSD 400	FSD 450
Total charge [gal]	47.5	47.5	47.5
Topping up volume [qt]	5.3	5.3	5.3
(minimum–maximum)			

Tab. 11 Cooling oil charge (option K1)

Option K2 Water-cooled

	FSD 350	FSD 400	FSD 450
Total charge [gal]	47.5	47.5	47.5
Topping up volume [qt]	5.3	5.3	5.3
(minimum–maximum)			

Tab. 12 Cooling oil charge (option K2)

Option W1 Heat recovery system



The charge of cooling oil for machines with heat recovery is increased by the volume of oil in the heat exchanger and connecting lines.

Option W1	FSD 350	FSD 400	FSD 450
Additional charge volume [qt]*			

* Enter the volume required by your heat recovery system.

Tab. 13 Cooling oil charge (option W1)

2.11 Motors and power

2.11.1 Compressor drive motor

	FSD 350	FSD 400	FSD 450
Rated power [hp]	350	400	450
Rated speed [rpm]	1490 1792*	— 1790*	1490 1790*
Enclosure protection	TEFC	TEFC	TEFC
Motor bearing re-greasing interval [h]	2000	3000	3000
Grease requirement, each bearing [g]**			

h = operating hours

* 60Hz

** Transfer data from the motor nameplate to the table for reference purposes.

Tab. 14 Compressor drive motor

2.11.2 Fan motor

Option K1	FSD 350	FSD 400	FSD 450
Rated power [hp]	11/12*	—/12*	11/12*
Rated speed [rpm]	970 1160*	— 1160*	970 1160*
Enclosure protection	TEFC	TEFC	TEFC
Motor bearing re-greasing interval [h]	2000	3000	3000
Grease requirement, each bearing [g]**			

h = operating hours

* 60Hz

** Transfer data from the motor nameplate to the table for reference purposes.

Tab. 15 Fan motor (option K1)

Option K2	FSD 350	FSD 400	FSD 450
Rated power [hp]	0.12/0.5*	—/0.5*	0.12/0.5*
Rated speed [rpm]	1380 1460*	— 1460*	1380 1460*
Enclosure protection	TEFC	TEFC	TEFC

* 60Hz

Tab. 16 Fan motor (option K2)

2.12 Sound pressure level

Operational state:

- Nominal flow rate
- Nominal pressure

Measurement conditions:

- Free-field measurement to CAGI/PNEUROP PN 8 NTC 2.3
- Measurement distance: 1 m

	FSD 350	FSD 400	FSD 450
Sound pressure level [dB(A)]	83/77*	83/77*	83/77*

* Option K2

Tab. 17 Sound pressure level

2.13 Power Supply

Basic requirements

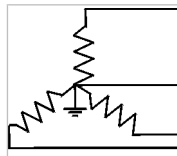
The machine is designed for an electrical supply according to National Electric Code (NEC) NEC–670, particularly NFPA 79, edition 2007, section 4.3. In the absence of any user-specified alternatives, the limits given in these standards must be adhered to. Consult manufacturer for any other specific power supply.

Three-phase

Do **NOT** operate package on any unsymmetrical power supply. Also do **NOT** operate package on power supplies like, for example, a three-phase (open) delta or three-phase star with non-grounded neutral.

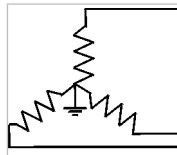
The machine requires a symmetrical three-phase power supply transformer with a WYE configuration output as shown in Figure 2 and Figure 3. In a symmetrical three phase supply the phase angles and voltages are all the same.

Other power supplies are not suitable.



03-S0235

Fig. 2 Three-phase star (wye); 4 wire; grounded neutral



03-S0236

Fig. 3 Three-phase star (wye); 3 wire; grounded neutral

Further information Please contact authorized KAESER Service representative for options.
The electrical diagram 13.4 contains further specifications for electrical connection.

2.14 Power supply specifications

The following multi-strand copper core wires are given according to 2008 NEC 310.15, Table 310.16 for 40 °C ambient temperature.

If other local conditions prevail, like for example high temperature, the cross section should be checked and adjusted according to 2008 NEC 110.14©, 220.3, 310.15, Table 310.16, 430.6, 430.22, 430.24 and other local codes.

Dual element time delay fuses are selected according to 2008 NEC 240.6, 430.52 and tables 430.52, 430.248 and 430–250.

We strongly suggest using a separate copper conductor for the equipment GROUNDING. NEC Table 250.122 will point out the "minimum size", however, we recommend a ground conductor the same size as the power leads, if local codes allow.

380V±10%/3/60Hz

	FSD 350	FSD 400	FSD 450
Mains fusing [A]	700	800	800
Supply cable	3x 4xMCM250	3x 4xMCM350	3x 4xMCM400
Current drawn [A]	520/499*	647/625*	666/644*
* Option K2			

Tab. 18 Connection details 380V/3/60Hz

460V±10%/3/60Hz:

	FSD 350	FSD 400	FSD 450
Mains fusing [A]	600	800	800
Supply cable	3x 4xAWG4/0	3x 4xMCM250	3x 4xMCM300
Current drawn [A]	430/412*	534/515*	550/531*
* Option K2			

Tab. 19 Connection details 460V/3/60Hz

575V±10%/3/60Hz:

	FSD 350	FSD 400	FSD 400
Mains fusing [A]	500	601	601
Supply cable	3x 4xAWG2/0	3x 4xAWG4/0	3x 4xAWG4/0
Current drawn [A]	344/329*	427/412*	440/425*
* Option K2			

Tab. 20 Connection details 575V/3/60Hz

2.15 Option K2 Water-cooling

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 20 °F

	FSD 350	FSD 400	FSD 450
Max. permissible inlet temperature [°F]	104	104	104
Water flow rate [gpm]	93	118	118
Water pressure drop [psi]	11	17	17

Tab. 21 Cooling water temperature (ΔT=20°F)

Cooling water temperature rise 50 °F

	FSD 350	FSD 400	FSD 450
Max. permissible inlet temperature [°F]	68	68	68
Water flow rate [gpm]	37	47	47
Water pressure drop [psi]	3	4	4

Tab. 22 Cooling water temperature ($\Delta T=50^{\circ}\text{F}$)

Cooler specification

	FSD 350	FSD 400	FSD 450
Material	1.4401	1.4401	1.4401
Braze	Copper (Cu)	Copper (Cu)	Copper (Cu)
Maximum working pressure [psig] (cooling water)	145	145	145
Maximum permissible outlet temperature [°F]	158	158	158
Unsuitable cooling medium	Seawater Consult KAESER on the suitability of water.		

Tab. 23 Cooler specification (option K2)

2.15.2 Cooling water quality



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 flow rate of the cooling water changes if antifreeze is added.

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

It is imperative that measures for cooling water treatment and filtration are implemented.

KAESER can provide the names of companies specializing in cooling water analysis and the supply of suitable treatment plant.

Characteristics/content	Value
pH value	7.5–9
Hardness [°dH]	4.0–8.5
Chloride (Cl) [mg/l]	<150
Free chlorine gas (Cl ₂) [mg/l]	<1
Sulfide (SO ₃) [mg/l]	<1
Dissolved iron (Fe) [mg/l]	<0.2
Hydrogen carbonate (HCO ₃) [mg/l]	70–300
Sulphate (SO ₄) [mg/l]	<70
HCO ₃ /SO ₄	>1

Characteristics/content	Value
Electrical conductivity [$\mu\text{S}/\text{cm}$]	10–500
Ammonia (NH_3) [mg/l]	<2
Dissolved manganese (Mn) [mg/l]	<0.1
Dissolved aluminium (Al) [mg/l]	<0.2
Dissolved nitrate (NO_3) [mg/l]	<100
Hydrogen sulfide (H_2S) [mg/l]	<0.05
Free aggressive carbon dioxide (CO_2) [mg/l]	<5
Glycol [%]	<50
Solids (particle size) [mm]	<0.1
Algae	Not permitted

Tab. 24 Cooling water quality

2.16 Option W1 Heat capacity

A connection is provided for an external heat exchanger.



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

Maximum heat capacity available	FSD 350	FSD 400	FSD 450
[kW]	217	274	274
[MJ/h]	770	990	990
[kcal/h]	184900	236500	236500

Tab. 25 Heat capacity (option W1)

3 Safety and Responsibility

3.1 Basic Information

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.
- Impairments to the machine and other material assets.



DANGER

Disregarding these instructions can result in serious injury.

- Read the service manual carefully and take notice of the contents for safe machine operation.
- 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 industrial use in generating compressed air. Any other use is incorrect and does not comply with requirements. The manufacturer is not liable for any resulting damages. The risk involved in such incorrect use is taken solely by the user.

- 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 for such.
- Do not use compressed for any application that will bring it into direct contact with food products unless it is specifically treated for this.

3.3 Improper Use

- Never direct compressed air at persons or animals.
- Cooling air, warmed after passing through the machine, may be used for heating purposes but only when it poses no health risk to 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 or explosive gases or vapors.
- Do not operate the machine in areas in which specific requirements with regard to explosion protection are applied.

3.4 User's responsibilities

3.4.1 Observe statutory and universally accepted regulations

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

3.4.2 Defining 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.

Authorized 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.

Authorized 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 authorized to carry out their tasks.

3.4.3 Adhere to Inspection Schedules and Accident Prevention Regulations.

The machine is subject to local inspection schedules.

- Ensure that local inspection schedules are adhered to.

3.5 Dangers

Basic Information

Information concerning the various forms of danger that can arise during machine operation are found here.

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

Information concerning the various forms of danger that can arise during machine operation are found here.

Electricity

- Allow only qualified and authorized electricians or trained personnel under the supervision of a qualified and authorized electrician to carry out work on electrical equipment according to electrical engineering regulations .
- Before every start-up, the user must make sure there is 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 disconnecting device and check that no voltage is present.
- Switch off any external power sources.
These could be connections to floating contacts or electrical machine heating, for example.
- Use fuses corresponding to machine power.
- Check regularly that all electrical connections are tight and in order.

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 compressed air system to ensure that no compressed air can flow back into the machine.
- Vent all pressurized components and chambers completely.
- Do not carry out welding, heat treatment or mechanical modifications to pressurized 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

- Never directly inhale compressed air.
- Use appropriate systems for air treatment before using the compressed air from this machine as breathing air and/or for the processing of food products.
- Use food-grade cooling oil whenever compressed air is to come into contact with food products.

Spring tension

Springs under tension or compression represent contained energy. Uncontrolled release of this energy can cause serious injury or death.

Minimum pressure/check valves, safety 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 switched on.
- Switch off and lock out the power supply disconnecting device and check that no voltage is present.
- Wear close-fitting clothes and a hair net if necessary.
- Make sure all covers and safety guards are in place and secured before starting.

Temperature

- Avoid contact with hot components.
These include, for example, compressor air ends 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 vapors or parts of the machine.

Noise

- Operate the machine only with full soundproofing.
- Wear hearing protection if necessary.
The safety relief valve blowing off can be particularly loud.

Operating materials

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

- Use only spare parts approved by the manufacturer for use in this machine.
Unsuitable spare parts compromise the safety of the device.
- Use only genuine KAESER pressure components.

Conversion or modification of the machine

- Do not permit conversion or modification of the machine as this can compromise function and safe working.

Extension or modification of the compressed air system

- Extension or modification of the compressor station:
Check the blow-off capacity of safety relief valves on air receivers and compressed air lines before installing any new machines.
- If the blow-off capacity is insufficient:
Install safety relief valves with larger blow-off capacity.

3.5.2 Safe Machine Operation

Information on safe conduct when handling the machine is found here.

Transport

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

- Allow transport only by personnel trained in the safe movement of goods.
- Attach lifting gear only to suitable lifting points.
- Be aware of the center of gravity to avoid tipping.
- Make sure the danger zone is clear of personnel.

Installation

- Install the machine in a suitable compressor room.
- 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 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 adequate ventilation.
- Ensure that required ambient conditions are maintained with regard to:
 - ambient temperature and humidity,
 - clean inlet air with no damaging contaminants,
 - inlet air free of explosive or chemically unstable gases or vapors,
 - inlet air free of acid/alkaline forming substances, particularly ammonia, chlorine or hydrogen sulfide.
- Do not position the machine in warm exhaust air from other machines.
- Ensure accessibility so that all work on the machine can be carried out without danger or hindrance.

Decommissioning, storage, disposal

- Drain out fluids and dispose of according to environmental regulations.
These include, for example, compressor oil and cooling water.
- Give refrigerant only to authorized groups for disposal.
- Dispose of the machine in accordance with local environmental regulations.

3.5.3 Organizational 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 authorized personnel may enter these areas.

Activity	Danger area	Authorized personnel
Transport	Within a 10 ft radius of the machine.	Installation personnel for transport preparation. No personnel during transport.
	Beneath the lifted machine.	No personnel!

Activity	Danger area	Authorized personnel
Installation	Within the machine. Within 3 ft radius of the machine and its supply cables.	Installation personnel
Operation	Within a 3 ft radius of the machine.	Operating personnel
Maintenance	Within the machine. Within a 3 ft radius of the machine.	Maintenance personnel

Tab. 26 Danger Areas

3.6 Safety Devices

Various safety devices ensure safe working with the machine.

- Do not change, bypass or disable safety devices.
- Check safety devices for correct function regularly.
- 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 4.7.

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.

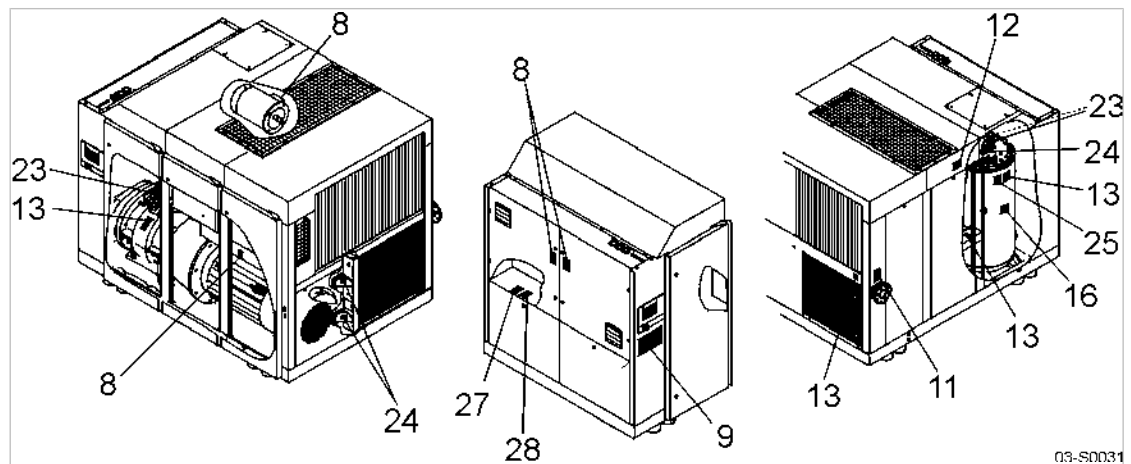












Fig. 4 Location of safety signs

Item	Symbol	Meaning
8		Danger of fatal injury from touching electrically live components! <ul style="list-style-type: none"> ➤ Switch off and lock out the supply disconnecting device and check that no voltage is present.

3 Safety and Responsibility

3.7 Safety Signs

Item	Symbol	Meaning
9		Machine starts automatically! Severe injury could result from rotating components, electrical voltage and air pressure. ➤ Isolate from the power supply and lock out before opening any machine enclosure or guard.
11		Injury and/or contamination can result from breathing compressed air! Contamination of food can result from using untreated compressed air for food processing! ➤ Never breathe untreated compressed air. ➤ Air from this compressor must meet OSHA 29CFR1910.134 and FDA 21CFR178.3570 standards, if used for breathing or food processing. Use proper compressed air treatment.
12		Rotating parts! Severe injury, especially of the eyes, could result while the fan is rotating. ➤ Prevent all materials from falling into the fan guard. ➤ Never work over the running machine.
13		Hot surface can cause burns! ➤ Let the machine cool down. ➤ Wear long-sleeved garments (not synthetics such as polyester) and protective gloves.
16		Wrong cooling oil level can cause machine defects or rising oil consumption (oil content for pure air)! ➤ Check the oil level regularly and top up as necessary.
23		Serious injury or death can result from loosening or opening component that is under pressure and heavily spring loaded! ➤ Do not open or dismantle the valve. ➤ Call for authorized KAESER Service representative if a fault occurs.
24		Serious injury or death can result from loosening or opening component under pressure! ➤ De-pressurize all pressurized components and enclosures. ➤ Secure that machine keeps de-pressurized. ➤ Check that machine is de-pressurized.
25		Ear damage and burns can result from loud noise and/or oil mist when the safety relief valve opens! ➤ Wear ear protection and protective clothing. ➤ Close all access doors and cover panels.
27		Risk of electric shock! If the interrupter has tripped current-carrying components of the controller should be examined and replaced if damaged to reduce the risk of fire or electric shock.
28		Risk of electric shock! To maintain overcurrent short-circuit, and ground-fault protection, the manufacturer's instructions for setting the interrupter must be followed to reduce the risk of fire or electric shock.

Tab. 27 Safety Signs

3.8 Emergencies

3.8.1 Correct fire fighting

Suitable extinguishing agents

- Foam
- Carbon dioxide
- Sand or dirt

1. Keep calm.
2. Give the alarm.
3. Shut off supply lines if possible.

For example:

Option K2

- Power supply disconnecting device (all phases)

Option W1

- Cooling water
- Heat recovery system

4. Move to safety.

For example:

- Warn persons in danger
- Help incapacitated persons.
- Close the doors.

5. Try to extinguish the fire if you have the skill to do so.

3.8.2 Remove any cooling oil from your person

- Eye contact:
Rinse eyes thoroughly with lukewarm water and seek medical assistance.
- Skin contact:
Wash off immediately.

3.9 Warranty

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

A condition of our warranty is that the machine is used for the purpose for which it is intended 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.

In addition, we accept no warranty obligation for:

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

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

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

3.10 Environmental Protection

- Store and dispose of operating materials and replaced parts in accordance with local environmental protection regulations.
- Observe relevant national regulations.
This applies particularly to parts contaminated with cooling oil.



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

4 Design and Function

4.1 Enclosure

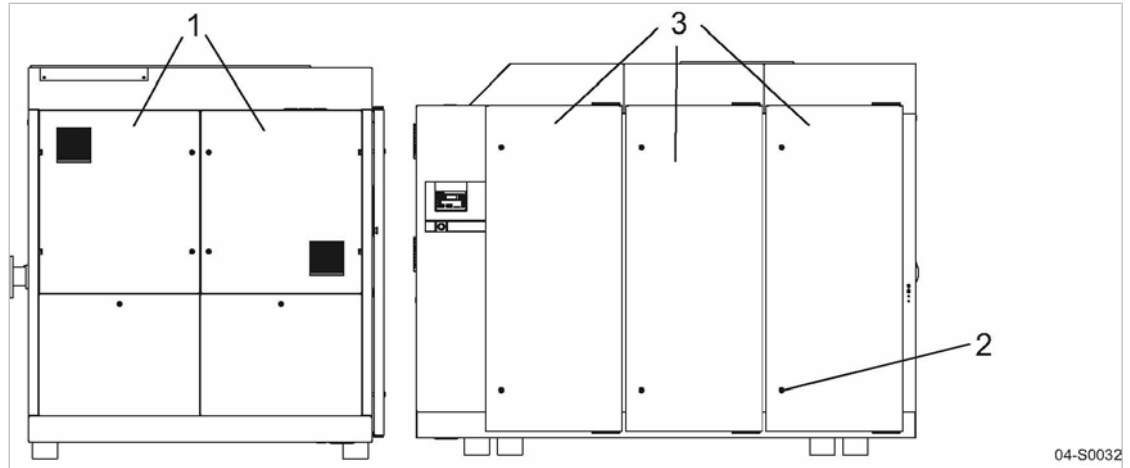


Fig. 5 Enclosure

- ① Control cabinet door
- ② Latch
- ③ Access door

The enclosure, when closed, serves various functions:

- sound insulation,
- protection against contact with components,
- cooling air flow control.

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.

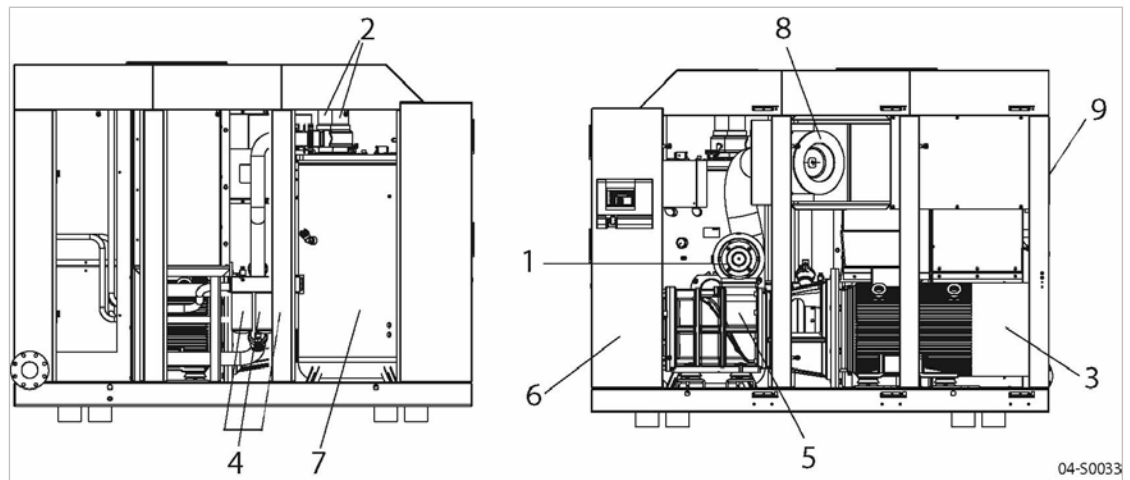


Fig. 6 Machine layout

- | | |
|--------------------------------|----------------------|
| 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 is then 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 9 to 18 F above ambient. Most of the moisture carried in the compressed air is removed in this way. The condensate drain ejects the precipitate.

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 K2 Water-cooling

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

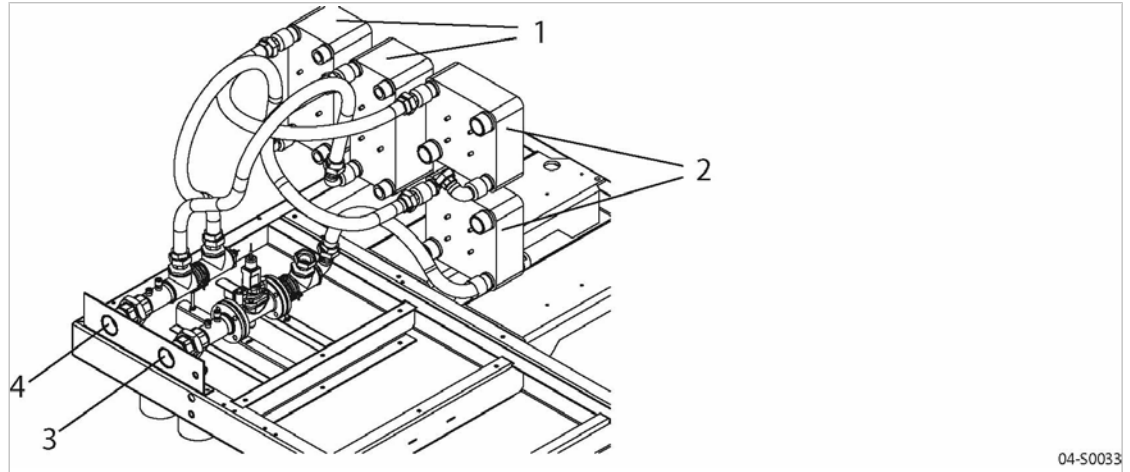


Fig. 7 Water-cooling (option K2)

- | | |
|-------------------------|----------------------------|
| ① Oil cooler | ③ Cooling water connection |
| ② Compressed air cooler | ④ Cooling water connection |

4.4.2 Option K3 Cooling air filter mat

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

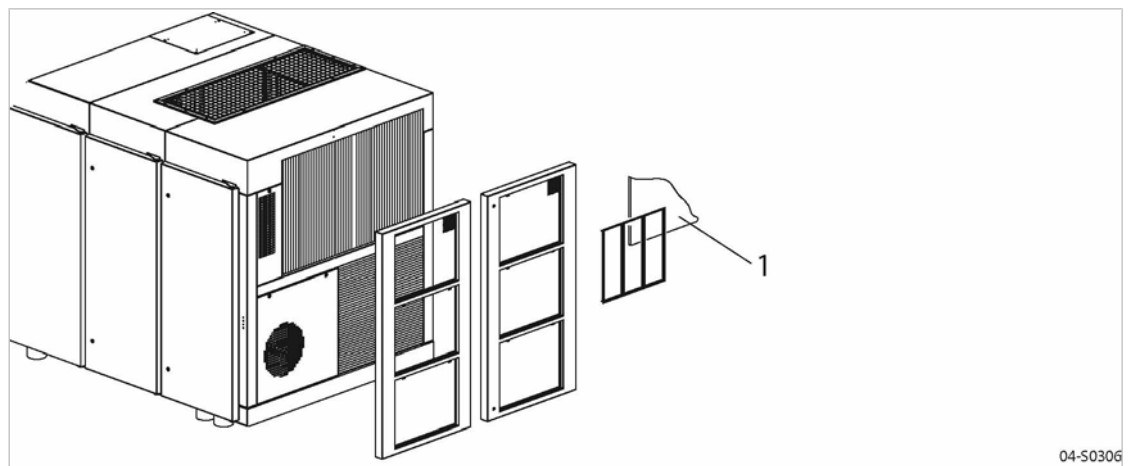


Fig. 8 Cooling air filter mat (option K3)

- | |
|--------------------------|
| ① Cooling air filter mat |
|--------------------------|

4.4.3 Option W1 Prepared for external heat recovery

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

A thermostatic valve in the machine keeps the cooling oil at the ideal working temperature. The thermostatic valve does not function when the machine is delivered. The necessary working element must be installed when installing the heat recovery system.

The external heat recovery system takes heat from the cooling oil via a heat transfer medium. The available heat to be recovered depends on the operating conditions of the machine.

4.4.4 Option C5 Automatic oil level monitoring

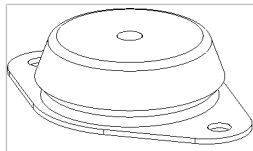


The automatic oil level monitor initiates a warning as the minimum level is reached. It does not replace regular visual oil level checks.

A sensor registers the cooling oil level in the separator tank. The SIGMA CONTROL displays a warning message as soon as the minimum level is reached.

4.5 Option H1 Machine mountings

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



04-S0034

Fig. 9 Machine mountings

4.6 Operating modes and control modes

4.6.1 Operating modes

The machine operates in the following modes:

- **LOAD:**
The inlet valve is open. The airend delivers compressed air to the distribution network.
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 oil separator tank is vented.
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 oil separator tank is vented.
The drive motor is stopped.
- Option C1 ■ **PROPORTIONAL:**
With the help of a control valve (proportional controller), the degree of opening of the inlet valve is continuously varied in relation to the actual air demand. The airend delivers compressed air to the distribution network.
The load and power consumption of the drive motor rises and falls with the air demand.
The regulating valve is factory set. The setting should not be changed without consultation with KAESER Service.

4.6.2 Control modes

Using the selected control mode, the controller switches the drive motor according to definite rules (the control mode) between the various operating modes in order to compensate for air being drawn off by consumers and maintain the machine's working pressure between the preset cut-in and cut-out pressures.

SIGMA CONTROL can work in the following control modes:

- DUAL
- QUADRO
- VARIO
- DYNAMIC
- Option C1 ■ MODULATING control

DUAL

In the DUAL control mode, the machine is switched back and forth between LOAD and IDLE to maintain pressure between the preset minimum and maximum values. When maximum pressure is reached, the machine switches to IDLE. When the preset *idle period* has elapsed, the machine switches to STANDSTILL.

The shorter the *idle period* setting, the sooner (and more frequently) the motor is stopped.

QUADRO

In the QUADRO mode, the controller operates as in the DUAL mode during periods of high air demand by switching between LOAD and IDLE, but during periods of low air demand it switches directly to STANDSTILL.

This mode of control requires two preset time periods: the *running period* and the *idle/standstill period*.

The shorter these time period settings, 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 period is automatically lengthened or shortened to compensate for higher or lower drive motor starting frequencies.

DYNAMIC

The DYNAMIC mode is based on the DUAL control mode. As opposed to DUAL, this control mode switches the compressor directly to STANDSTILL when the drive motor temperature is low. At higher motor temperatures, it switches to IDLE until the motor has cooled down enough.

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

Option C1 MODULATING control

MODULATING control is based on the DUAL control mode. The difference to DUAL is that the gas delivery is continuously varied within the control range of the machine.

This control mode is not available on variable speed machines with a frequency-controlled drive (SFC).

Compressed air demand	Operating states
Rises	MODULATING LOAD
Falls	MODULATING IDLE STANDSTILL

Tab. 28 Operating states under MODULATING control

Control air may be taken from a remote network connection point in order to exactly determine the compressed air demand. A connection for control air is provided as standard.

4.7 Safety devices

The following safety devices are provided and may not be modified in any way.

- **EMERGENCY STOP button**
For immediate shut-down of the machine. The motor remains stopped. The pressure system is vented.
- **Safety relief valve**
This valve protects the system from excessive pressure. It is preset at the factory.
- **Enclosures and covers over moving parts and electrical connections**
These protect against accidental contact.

4.8 SIGMA CONTROL Keys and Indicators

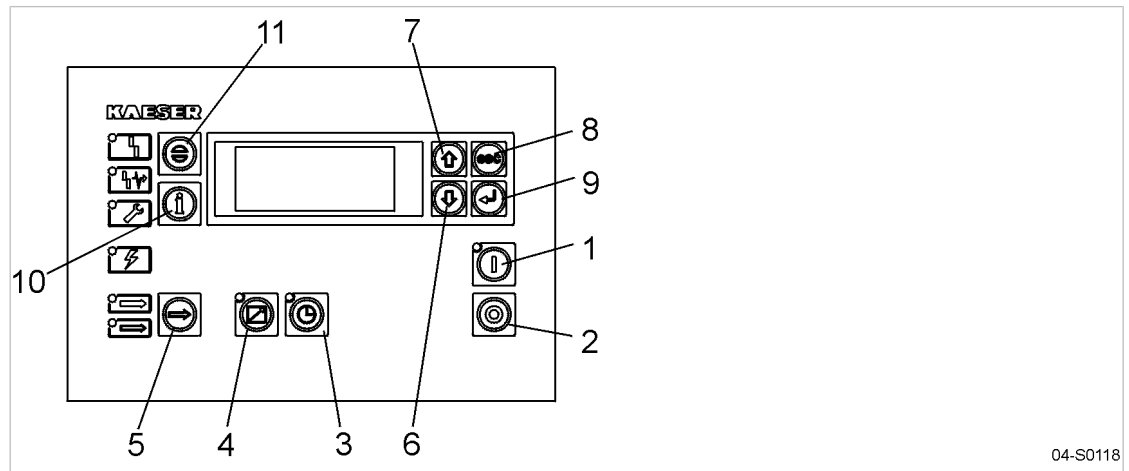


Fig. 10 Keys

Item	Description	Function
1	«ON»	Switches on the machine. The programmed operating mode is active.
2	«OFF»	Switches the machine off.
3	«Clock»	Switches clock control on and off.
4	«Remote control»	Switches remote control on and off.
5	«LOAD/IDLE»	Toggles the compressor between LOAD and IDLE operating modes.
6	«DOWN»	Scrolls down the menu options. Reduces a parameter value.
7	«UP»	Scrolls up the menu options. Increases a parameter value.
8	«escape»	Returns to the next higher menu option level. Exits the edit mode without saving. Returns to the main menu when held down at least 10 seconds.
9	«enter»	Only affects the value in the third line of the display. Enters the selected menu option. Exits the edit mode and saves.
10	«Events and information»	Displays the event memory. Selection is possible from every menu. Return with «esc» key.
11	«Reset»	Signifies recognition of alarms and warning messages. Resets the event memory (when permitted).

Tab. 29 Keys

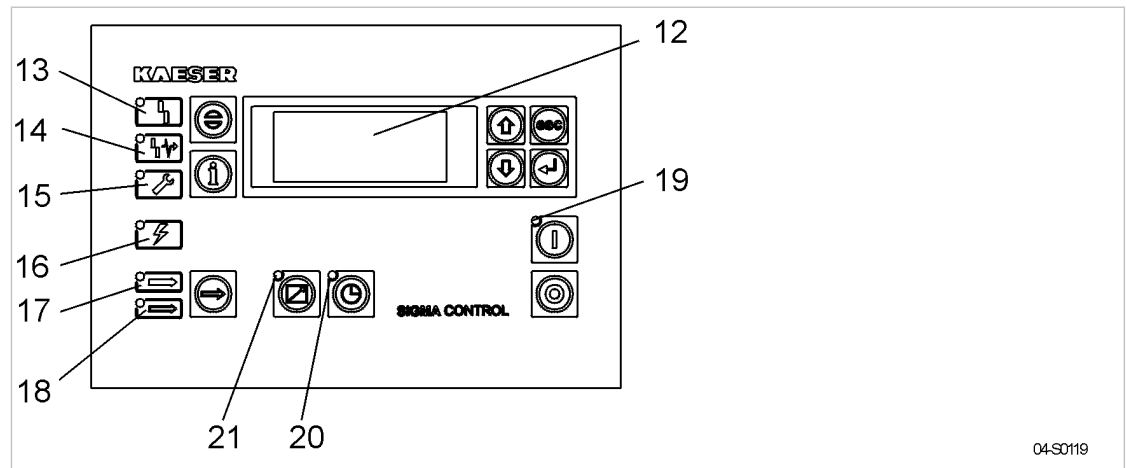


Fig. 11 Indicators

Item	Description	Function
12	Display field	Alphanumeric display with 4 lines.
13	<i>Alarm</i>	Flashes red when an alarm occurs. Lights continuously when acknowledged.
14	<i>Communication</i>	Lights red if communication via the Profibus interface is interrupted.
15	<i>Warning</i>	Flashes yellow for: <ul style="list-style-type: none"> ■ maintenance work due, ■ warning messages Lights continuously when acknowledged.
16	<i>Controller power</i>	Lights green when the power supply to the controller is switched on.
17	<i>LOAD</i>	Lights green when the compressor is running under LOAD.
18	<i>IDLE</i>	Lights green when the compressor is running in IDLE. Flashes when the «LOAD/IDLE» toggle key is pressed.
19	<i>Machine ON</i>	Lights green when the machine switched on.
20	<i>Clock</i>	The LED lights when the machine is in clock control.
21	<i>Remote control</i>	The LED lights when the machine is in remote control.

Tab. 30 Indicators

5 Installation and Operating Conditions

5.1 Safety

- 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 vapors or parts 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 that required ambient conditions are maintained with regard to:
 - ambient temperature and humidity,
 - clean inlet air with no damaging contaminants,
 - inlet air free of explosive or chemically unstable gases or vapors,
 - inlet air free of acid/alkaline forming substances, particularly ammonia, chlorine or hydrogen sulfide.
- Keep suitable fire extinguishing agents ready for use.

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 they cannot be kept to.

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

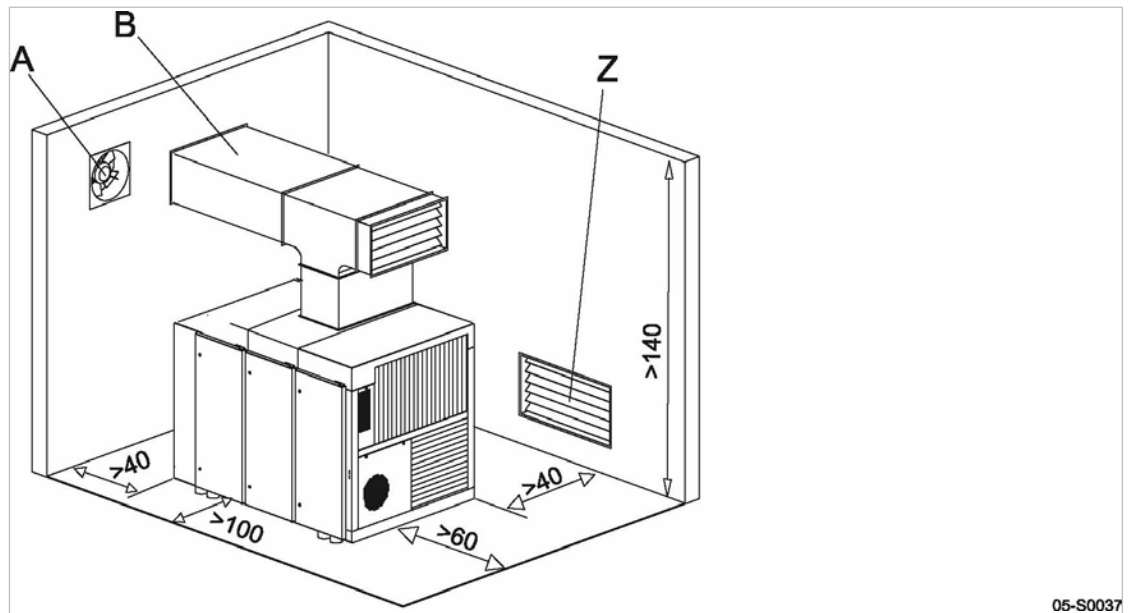


Fig. 12 Recommended machine placement and dimensions [mm]

- A Exhaust fan
- B Exhaust air duct
- Z Inlet air aperture



CAUTION

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 +37 °F before starting.
- Heat the machine room adequately or install an auxiliary heater.

1. If installed outdoors, protect the machine against frost, direct sunlight, dust and rain.
2. Ensure accessibility so that all work on the machine can be carried out without danger or hindrance.

5.2.2 Ensure adequate ventilation.



If the ventilation is insufficient, a partial vacuum can be created in the room.

- Ensure that the volume of air flowing into the compressor room is at least equivalent to that being removed by the machine.
- Make sure that the machine can only operate when the inlet aperture is actually open.
- Keep the inlet and exhaust apertures free of obstructions so that the cooling air can flow freely through the room.

5.2.3 Exhaust air duct

The machine can only overcome the air resistance at the cooling air inlet and exhaust determined by the duct design. Any additional air resistance will reduce airflow and deteriorate machine cooling.

Use only motorized ventilation flaps and louvers on variable frequency drive (SFC) machines.

Flaps or shutters that are opened by the action of airflow against the force of gravity do not open sufficiently at low cooling fan speeds.



- Consult the KAESER service representative before deciding on:
 - the design of the exhaust air ducting
 - the intersection between the machine and the exhaust air duct
 - the length of the ducting
 - the number of duct bends
 - the design of flaps or shutters

5.2.3.1 Option K1**Designing an exhaust duct (air-cooled machine)**

Air-cooled machines produce so much warm exhaust air that they may only be used when fitted with an exhaust duct.

- Consult KAESER Service about a suitable design.

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

5.2.3.2 Option K2**Designing an exhaust duct (water-cooled machine)**

- Consult KAESER Service about a suitable design.

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

5.3 Using the Compressor to Supply A Compressed Air System.

When the machine is connected to a compressed air system, the system operating pressure must not exceed 232 psig.

Initial filling of a fully vented air network generally creates a very high rate of flow through air treatment devices. These conditions are detrimental to correct treatment. Air quality suffers.

To ensure maintenance of desired air quality when filling a vented compressed air system we recommend the installation of an air main charging system.

- Please allow KAESER to advise on this subject.

6 Installation

6.1 Safety

The following instructions must be followed for safe installation.

Warning instructions are always given before a potentially dangerous action.

Basic Safety Instructions

1. Follow the instructions in chapter 3 'Safety and Responsibility'.
2. Installation work may only be carried out by authorized personnel.
3. Before switching on, make sure that:
 - no one is working on the machine,
 - all access doors and panels are closed and secure.

Working on electrically conducting components

1. Work on electrically conducting components may only be carried out by authorized electricians.
2. Switch off and lock out the supply disconnecting device and check that no voltage is present.
3. Check that there is no voltage on floating relay contacts.

Working on pressure systems

1. Close shut-off valves or otherwise isolate the machine from the compressed air system to ensure that no compressed air can flow back into the machine.
2. Vent all pressurized components and chambers completely.
3. Check all machine hose connectors with a handheld pressure gauge to ensure that all read zero.
4. Do not open or dismantle such valves.

Working on the drive

1. Switch off and lock out the supply disconnecting device and check that no voltage is present.
2. Do not open the enclosure while the machine is switched on.

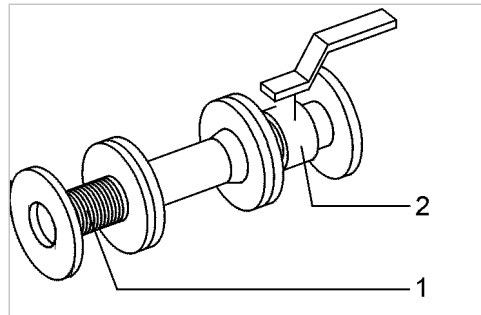
Further information Specification of authorized personnel is found in chapter 3.4.2.
 Specification of dangers and their avoidance is found in chapter 3.5.

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 Making the Compressed Air Connection

Precondition The compressed air system is vented completely.



06-S0047

Fig. 13 Compressed air connection

- ① Axial compensator or hose
- ② Shut-off valve

**WARNING**

Serious injury or death can result from loosening or opening components under pressure.

- Vent all pressurized components and chambers completely.

1. A shut off valve must be installed by the user in the connection line.
2. Make the compressed air connection with an axial compensator or hose.

6.4 Connecting the Power Supply

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

1. Have the power supply connected only by authorized installation personnel or an authorized electrician.
2. Carry out safety measures as stipulated in NEC, OSHA and any applicable local codes. In addition, observe the regulations of the local electricity supplier.
3. Check the permissible reaction time of overload protection devices.
4. Select supply cable conductor cross-sections 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 disconnect switch with fuses. If a circuit breaker is used it must be suitable for the motor starting characteristics.
6. Check that the correct terminals on the control voltage transformer are connected according to the supply voltage.
If not, change the terminals to suit the power supply voltage.

**DANGER**

Danger of fatal injury from electric shock!

- Switch off and lock out the power supply disconnecting device and check that no voltage is present.

7. Connect the machine to the power supply.

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 the drain hose to the condensate drain outlet.



Condensate must drain freely.

The illustration shows typical installations.

Condensate flows into the collecting line from above, thereby preventing any backflow to the compressor.

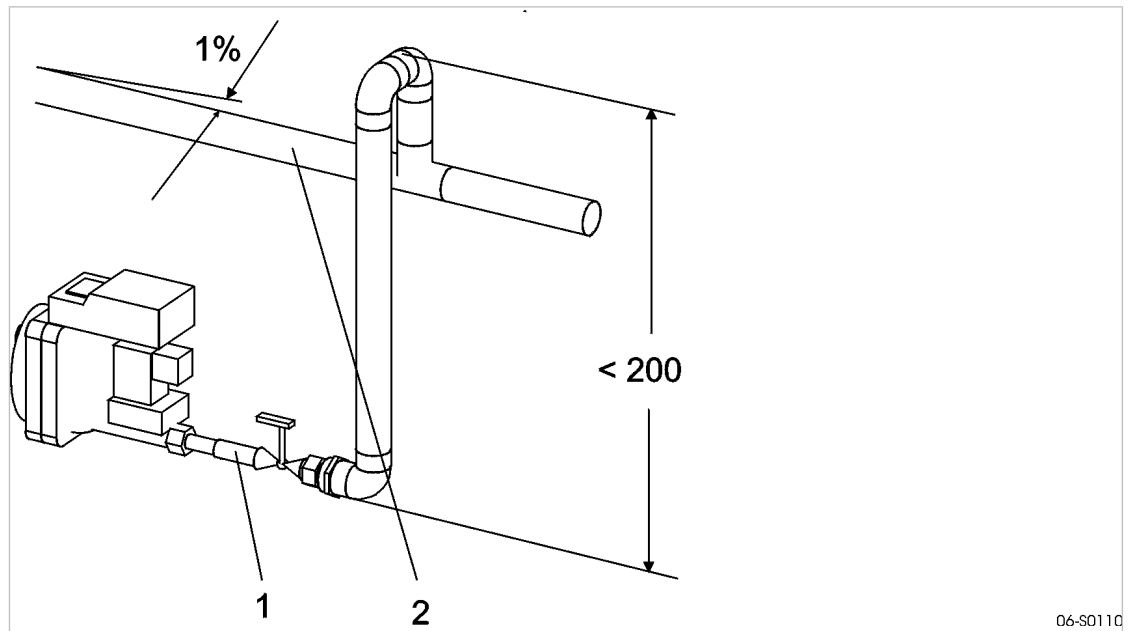


Fig. 14 Condensate drain dimensions [inch]

- ① Threaded connection
- ② Condensate collecting line

➤ Connecting the condensate drain line.



➤ Collect 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 surge on the cooler as low as possible.
- Install an expansion tank to act as a damper if pressure surges cannot be avoided.

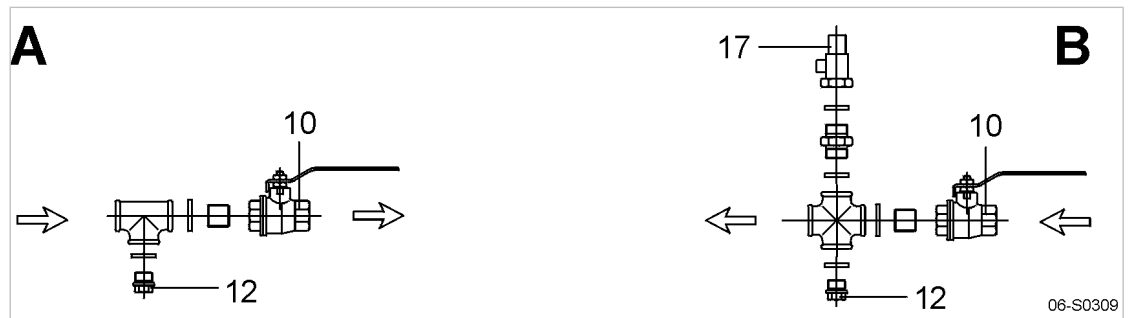


Fig. 15 Connecting the cooling water

- | | |
|--------------------------|-----------------------------------|
| (A) Cooling water outlet | (12) Connection port with stopper |
| (B) Cooling water inlet | (17) Safety relief valve |
| (10) Shut-off 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,
 - safety relief valve (17) to prevent build-up of excessive pressure.
Blowoff pressure and capacity are related to the user's installation design. The technical specification of the cooler must be taken into consideration.
2. Connect the cooling water line to the fitting.
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. Vent the water lines.

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

6.6.3 Option W1 Connecting the external heat recovery system



- An unsuitable heat exchanger or incorrect installation may influence the cooling oil circuit within the compressor. Damage to the machine will follow.
- Consult KAESER on a suitable heat exchanger and expert installation.

Material Working element for the thermostatic valve are delivered with the KAESER heat recovery system or should be ordered separately.

Heat recovery system with installation material

Precondition The supply disconnecting device is switched off,
the device is locked off,
a check has been made that no voltage is present.



WARNING

Pressure in the cooling oil circuit

Components under pressure can injure or cause death if the contained energy is released suddenly or uncontrolled.

- Vent all pressurized components and chambers completely.

Fitting the working element in the thermostatic valve

The machine is delivered without a working element in the thermostatic valve.

The working element moves the valve plunger in response to the temperature of the cooling oil. This makes the connection to the heat exchanger.

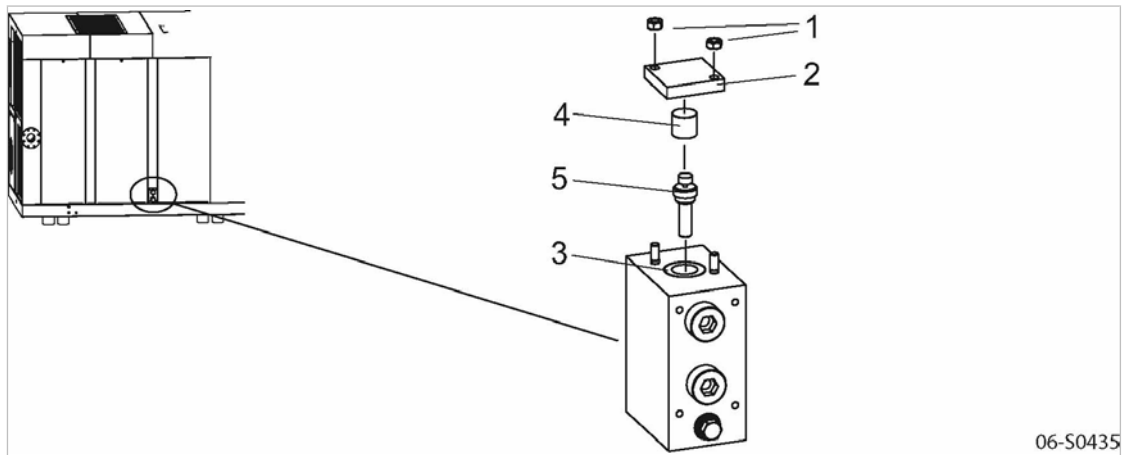


Fig. 16 Fitting the working element in the thermostatic valve

- | | |
|-----------------|-------------------|
| ① Screw | ④ Spacer |
| ② Cover | ⑤ Working element |
| ③ Valve plunger | |

1. Undo the screws ① and remove the cover ②.
The valve plunger ③ is lifted by spring force.
2. Take out the valve plunger and the spacer ④.
3. Place the working element ⑤ and the spacer in the valve plunger.
4. Replace the valve plunger in the thermostatic valve and screw down the cover.

Connecting the heat exchanger

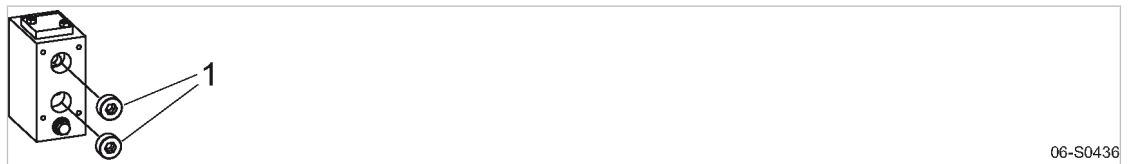



Fig. 17 Heat exchanger connection

- ① Screw plug

1. Remove the screw plug .
2. Connect the heat exchanger according to specifications from KAESER and the exchanger manufacturer.

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

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 19 ft long - inside diameter >0.3 in
Longer than 19 ft - internal diameter >0.5 in
Suitable material for the control air line
Copper with brass fittings, or
Plastic

Precondition The supply disconnecting device is switched off,
the 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. A KAESER FV filter should be fitted to prevent this.

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



WARNING

Compressed air!

Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly.

- Vent all pressurized components and chambers completely.

1. Fit a suitable filter in the control air line and then connect the line to a suitable point in the air network.
2. Connect the control air line to the machine.

Result 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 given in chapters 13.2 and 13.3.
Instructions on switching the machine to external control are given in chapter 7.10.

7 Initial Start-up

7.1 Safety

The following instructions must be followed for safe machine commissioning.
Warning instructions are always given before a potentially dangerous action.

Basic safety instructions

1. Follow the instructions in chapter 3 'Safety and Responsibility'.
2. Commissioning may only be carried out by authorized personnel.
3. Before switching on, make sure that:
 - no one is working on the machine,
 - all access doors and panels are closed and secure.

Working on electrically conducting components.

1. Work on electrically conducting components may only be carried out by authorized electricians.
2. Switch off and lock out the supply disconnecting device and check that no voltage is present.
3. Check that there is no voltage on floating relay contacts.

Working on pressure systems

1. Close shut off valves or otherwise isolate the machine from the compressed air system to ensure that no compressed air can flow back into the machine.
2. Vent all pressurized components and chambers completely.
3. Check all machine hose connectors with a handheld pressure gauge to ensure that all read zero.
4. Do not open or dismantle such valves.

Working on the drive

1. Switch off and lock out the supply disconnecting device and check that no voltage is present.
2. Do not open the enclosure while the machine is switched on.

Further information Specification of authorized personnel is found in chapter 3.4.2.
 Specification of dangers and their avoidance is found in chapter 3.5.

7.2 To be noted before commissioning

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

7 Initial Start-up

7.3 Checking positioning and operating conditions

- Commissioning of the machine may only be carried out by trained and authorized installation or maintenance personnel.

Special measures for re-commissioning after storage

Storage period longer than...	Remedy
12 months	<ul style="list-style-type: none"> ➤ Change the oil filter. ➤ Change the oil separator cartridge. ➤ Change the cooling oil. ➤ Have the motor bearings checked by an authorized KAESER Service representative.
36 months	<ul style="list-style-type: none"> ➤ Have the overall technical condition checked by an authorized KAESER Service representative.

Tab. 31 Re-commissioning after storage

7.3 Checking positioning and operating conditions

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

To be checked	See chapter	Confirmed?
➤ Are the operators fully familiar with safety regulations?	–	
➤ Have all the positioning conditions been fulfilled?	5	
➤ Is a user's lockable power supply disconnecting device installed?	6.4	
➤ Does the power supply conform to the specifications on the name-plate?	2.1	
➤ Are the power supply cable conductor cross-sections and fuse ratings adequate?	2.14	
➤ Have all electrical connections been checked for tightness?	–	
➤ The check must be repeated after 50 operating hours.		
➤ Is a shut-off valve fitted to compressed air outlet?	6.3	
➤ Has the connection to the air system been made with a 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)	10.14	
➤ Drive motor overload protection switch set according to the power supply voltage?	7.4	
➤ Fan motor overload protection switch set according to the power supply voltage?	7.5	
➤ Is there sufficient cooling oil in the airend?	7.6	
➤ Is the machine firmly anchored to the floor? (option H1)	6.6.1	

To be checked	See chapter	Confirmed?
➤ 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. 32 Positioning and operating conditions checklist

7.4 Setting the overload protection cut-out

In the star-delta configuration, the phase current is fed to the drive motor via the overload protection cut-out. This phase current is 0.58 times the rated motor current (see nameplate in the control cabinet).



To prevent voltage fluctuations, temperature influences or component tolerances operating the overload protection cut-out, 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

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



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

- Check the motor overload protection switch setting.



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

- Contact KAESER Service.

7.6 Pouring 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 pour a quantity of cooling oil into the airend.

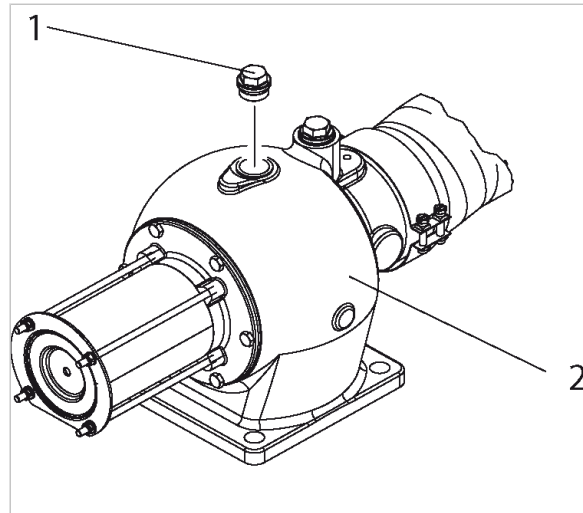


A label showing the type of oil used is found near the oil separator tank filling port.

- Use the same type of oil.

Material 5.3quarts Cooling oil

Precondition The supply disconnecting device is switched off,
the device is locked off,
a check has been made that no voltage is present.

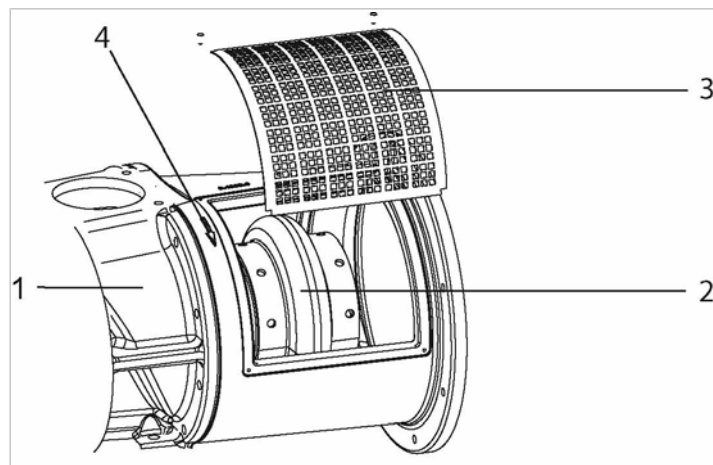


07-S0048

Fig. 18 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. 19 Coupling

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

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

7.7 Checking direction of rotation

The machine is designed for a clockwise phase sequence.

Ideally, the direction of phase rotation should be measured with a phase sequence meter.

Alternatively, the machine can be started very briefly and the rotation direction of the motor cooling fans noted.

1. Check the direction of phase rotation with a phase sequence meter.
2. If the direction is incorrect, reverse supply phases L1 and L2.



You have no phase sequence meter?

- Switch the machine on and off again the moment the drive motor begins to turn.
- Compare the direction of rotation of the motor with the arrows on the motor and the airend casing.
- If the direction is incorrect, reverse supply phases L1 and L2.

7.8 Starting the machine for the first time

Precondition No one is working on the machine,
all access doors are closed,
all removable panels in place and secured.

1. Open the shut-off valve to the compressed air system.
2. Switch on the main power supply disconnecting device.
After the controller has carried out a self-test, the green LED *Power ON* lights.
3. As required
Change the display language as described in chapter 7.11.
4. Press the «LOAD/IDLE» toggle key.

The green LED *IDLE* lights.

5. Press the «ON» key.

The green LED *Machine ON* lights and the machine runs in IDLE. This ensures that cooling oil is distributed throughout the machine.

6. After allowing the machine to IDLE for at least 1 minute:
Press the «LOAD/IDLE» key.

The machine switches to LOAD and delivers compressed air.



- Keep an eye on the machine during the first few hours of operation to ensure that it is operating correctly.
- After the first 50 operating hours, all screw-type electrical connections should be checked and tightened if necessary.

7.9 Setting the Setpoint Pressure

The setpoint pressure p1 is factory set to the highest possible value.

Adjustment is necessary for individual operating conditions.



Do not set the setpoint pressure of the machine higher than the maximum working pressure of the 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 setpoint pressure as described in the SIGMA CONTROL operating instructions.

7.10 Option C1

Switching MODULATING control to external control air

1. Set the pressure switching point to 80 psig in the menu *<configuration — control mode — modulating>*.
2. Open the shut-off valve in the control air line within the machine ((24.1) in chapter 13.2).

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

7.11 Changing the display language

The controller can display text messages in several languages. The display language can be changed first during initial start-up.

A label explains how this is done with the help of icons.

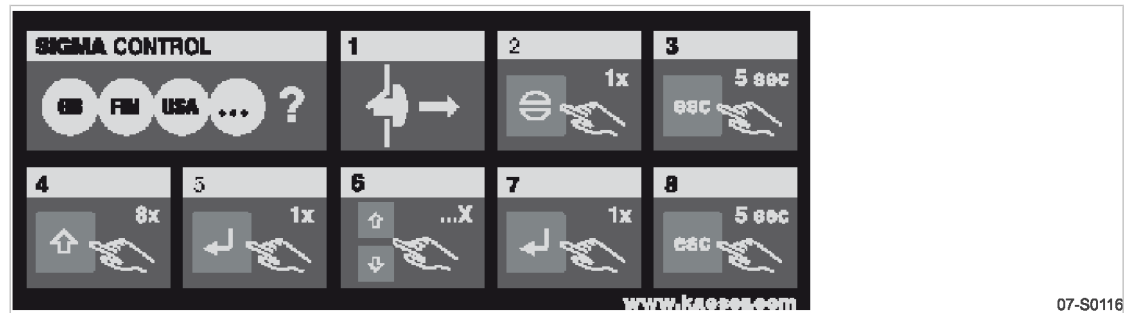


Fig. 20 Label: Changing the display language

- | | |
|---|--|
| <ol style="list-style-type: none"> ① If required:
Unlatch the EMERGENCY STOP button. ② If required:
Acknowledge alarm message. ③ Depress the «escape» key for 5 seconds to change to the main menu. ④ Press the «UP» key 8 times. | <ol style="list-style-type: none"> ⑤ Press «Enter» to enter language selection. ⑥ Press the «UP» or «DOWN» keys as often as necessary to reach the required language. ⑦ Press «enter» to select the language. ⑧ Depress the «escape» key for 5 seconds to change to the main menu. |
|---|--|

➤ Change the display language on SIGMA CONTROL as required.

8 Operation

8.1 Switching On and Off

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

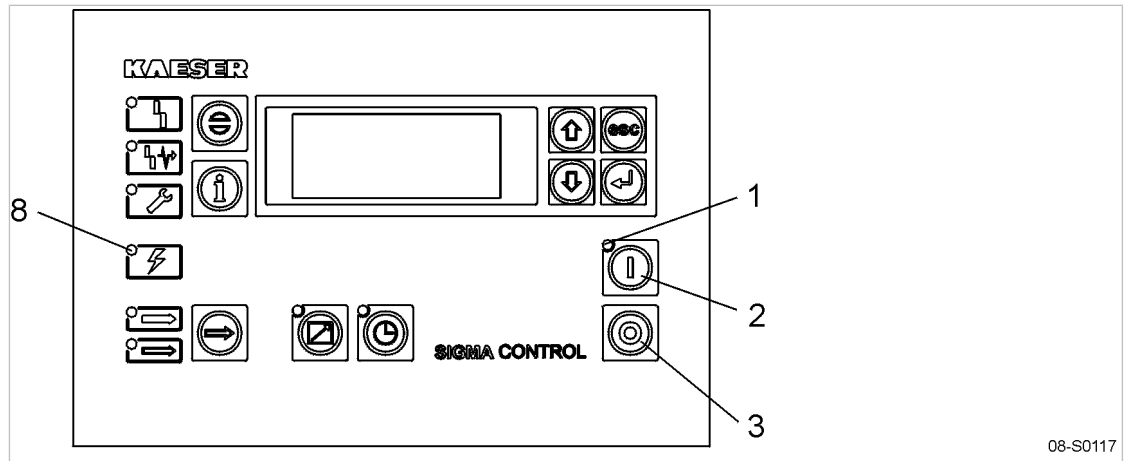


Fig. 21 Switching on and off

- | | |
|---------------------------------|------------------------------------|
| ① LED <i>Machine ON</i> (green) | ③ Key «OFF» |
| ② Key «ON» | ⑧ LED <i>Controller ON</i> (green) |

8.1.1 Switching on

Precondition No one is working on the machine,
 all access doors and panels are closed and secure.

1. Switch on the main power supply disconnecting device.
 After the controller has carried out a self-test, the green LED *Power ON* lights.
2. Press the «ON» key.
 The green LED *Machine ON* lights.



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

Result The compressor motor starts as soon as the network pressure is lower than the setpoint value (cut-out pressure).

8.1.2 Shutdown

1. Press the «LOAD/IDLE» key.
 The machine switches to IDLE and the *IDLE* LED flashes.
2. After allowing the machine to IDLE for at 20 minutes:
 press the «OFF» key.
 The *Machine ON* LED extinguishes.
 The machine is ready for operation. You can switch the machine on again.

3. Switch off and lock out the power supply disconnecting device.

The machine is switched off and isolated from the power supply. The *Controller ON* LED extinguishes.

8.2 Switching Off in an Emergency and Switching On again

The EMERGENCY STOP pushbutton is located below the control panel.

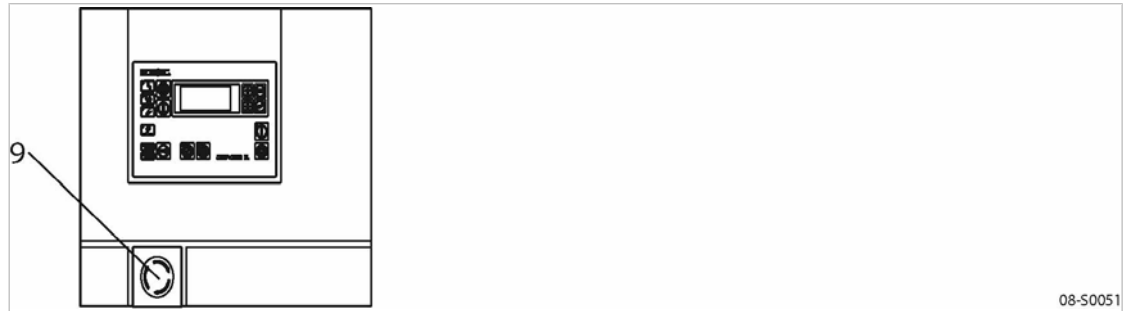


Fig. 22 Switching off in an emergency

⑨ EMERGENCY STOP pushbutton

Shutdown

- Press the EMERGENCY STOP pushbutton.
The pushbutton remains latched in.
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 pushbutton in the direction of the arrow to unlatch it.
2. Press the reset key to reset any alarm messages.
The machine can now be started again.

8.3 Switching on and off from a remote control center

Precondition A link to the remote control center exists.

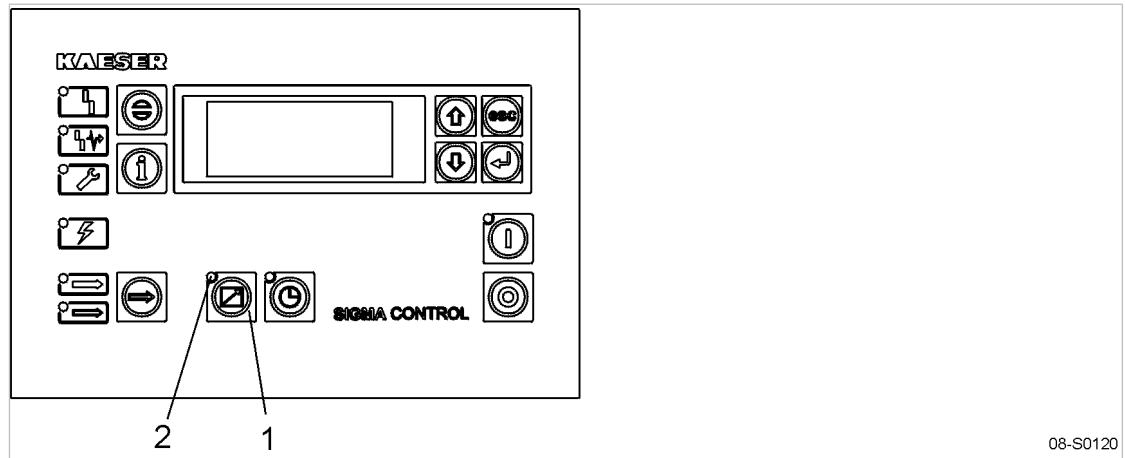


Fig. 23 Switching on and off from a remote control center

- 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. 33 Machine identification

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

⚠ WARNING

Remote control: danger of unexpected starting!

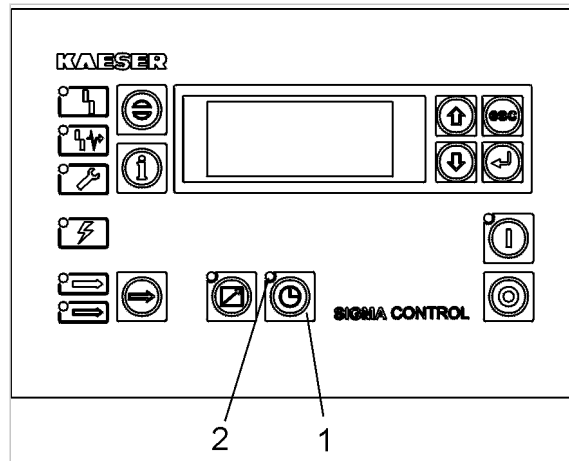
- Before starting, make sure that no one is working on the machine and that it can be safely started.

Tab. 34 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. 24 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. 35 Machine identification

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

8.5 Acknowledging alarm and warning messages

Messages are displayed on the "new value" principle:

- Message received: LED flashes
- Message acknowledged: LED lights
- Message gone: LED extinguished

or

- Message received: LED flashes
- Message gone: LED flashes
- Message reset: LED extinguished

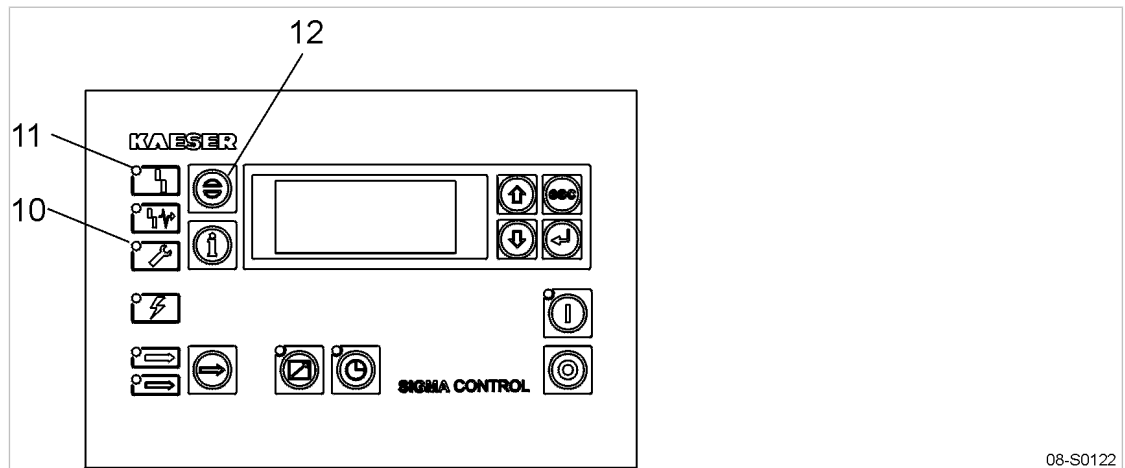


Fig. 25 Acknowledging messages

10 *Warning* LED (yellow)

11 *Alarm* LED (red)

12 «Acknowledge» key

Alarm message

An alarm shuts the machine down automatically. The red LED *alarm* flashes.

The last line in the display shows the actual fault causing the alarm.

Precondition The fault has been rectified

- Acknowledge the message with the «acknowledge» key.

alarm LED extinguishes.

The machine is ready for operation again.



If the machine has been shut down with the «EMERGENCY STOP» pushbutton:

- Unlatch the «EMERGENCY STOP» pushbutton (turn in direction of the arrow) before acknowledging the alarm message.

Further information A list of possible alarm messages occurring during operation are shown in chapter 9.2.

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 last line in the display shows the warning 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 warning messages occurring during operation are shown in chapter 9.3.

9 Fault Recognition and Rectification

9.1 Basic Information

The following tables are intended to assist in locating causes of faults.

There are three types of fault:

- Alarm: red LED flashes - see chapter 9.2.
- Warning: yellow LED flashes - see chapter 9.3.
- Other faults: no indication - see chapter 9.4.

The messages valid for your machine are dependant on the controller and individual equipment.

1. Do not attempt fault removal measures other than those given in this manual.
2. In all other cases:
have the fault rectified by an authorized KAESER Service representative agent.

9.2 Alarm messages (machine shut-down)

Message	Possible cause	Remedy
blowoff prot. \uparrow	The activating pressure of the safety relief valve on the oil separator tank has been exceeded.	Change the oil separator cartridge Open the shut-off valve in the venting line.
AI1 open cct. AI2 open cct.	Analog input open circuit. Short to ground.	Check line and connections.
AI1 short cct. AI2 short cct.	The connection between the sensor and the analog input is shorted.	Check line and connections.
AI3/AI4 error	Line-break between the analog input and the sensor. Short circuit to ground.	Check line and connections.
AI5 open cct. AI6 open cct.	Analog input open circuit. Short to ground.	Check line and connections.
AI5 short cct. AI6 short cct.	The connection between the sensor and the analog input is shorted.	Check line and connections.
AI7/AI8 error	Line-break between the analog input and the sensor. Short circuit to ground.	Check line and connections.
model	Machine model uncertain	Call authorized KAESER Service representative.
PD T \downarrow	Package discharge (PD) temperature too low.	Call authorized KAESER Service representative.
PD T \uparrow	Package discharge (PD) temperature too high.	Check the cooling oil level Clean the cooler. Check the fan motor.
DO0.6/DO0.7 I \uparrow	Short circuit in the line between the digital output and the consumer.	Check line and connections.

9 Fault Recognition and Rectification

9.2 Alarm messages (machine shut-down)

Message	Possible cause	Remedy
DO1.6/DO1.7 I ↑	Short circuit in the line between the digital output and the consumer.	Check line and connections.
airend rotation	The drive motor is turning in the wrong direction.	Swap phase lines L1 and L2.
ext. message 0 ext. message 1 ext. message 2 ext. message 3 ext. message 4 ext. message 5	Customer specific: no details possible.	–
FC	Frequency converter faulty.	Call authorized KAESER Service representative.
back press. stop	Back pressure in the oil separator tank caused by defective venting.	Check venting line.
back press. run	Drive belts or coupling broken.	Drive belts: Replace drive belts. Coupling: Call authorized KAESER Service representative.
HT cell	Fault in the high tension cell.	Call authorized KAESER Service representative.
no press.buildup	The machine produces no compressed air. The working pressure does not rise above 50 psig within a default period.	Check the machine for leaks. Check coupling/V-belts Call authorized KAESER Service representative.
condensatedrain	The condensate drain is defective.	Check the condensate drain.
coolingwater low	Cooling water pressure is too low.	Check cooling water supply. Cooling water stop valve: Check open/closed.
RD condens.drain	Condensate drain faulty.	Check the condensate drain.
RD p ↑	The pressure switch for the refrigerant compressor has activated.	Keep ambient conditions within specified limits. Clean the refrigerant condenser. Clean the cooler.
RD T ↓	Temperature in refrigeration dryer too low.	Call authorized KAESER Service representative.
fan M2 I ↑	Overload shut-down of the first fan motor.	Investigate cause of shut-down. Reset overload protection cut-out. Call authorized KAESER Service representative.
fan M3 I ↑	Overload shut-down of the second fan motor.	Investigate cause of shut-down. Reset overload protection cut-out. Call authorized KAESER Service representative.

9 Fault Recognition and Rectification

9.2 Alarm messages (machine shut-down)

Message	Possible cause	Remedy
fan M4 I ↑	Overload shut-down of the third fan motor.	Investigate cause of shut-down. Reset overload protection cut-out. Call authorized KAESER Service representative.
fan M7 I ↑	Overload shut-down of the control cabinet fan motor.	Investigate cause of shut-down. Call authorized KAESER Service representative.
motor I ↑	Overload shut-down of the compressor drive motor.	Investigate cause of shut-down. Change the oil separator cartridge. Call authorized KAESER Service representative.
motor T ↑	Drive motor overheated.	Clean the motor. Keep ambient conditions within specified limits.
motor bearings	Drive motor bearings overheated.	Re-grease the motor bearings. Call authorized KAESER Service representative.
mains cont. on?	Mains contactor not pulling in.	Check mains contactor and wiring.
mains cont. off?	Mains contactor not dropping out.	Check mains contactor and wiring.
mains voltage ↓	2nd. power failure.	Check power supply voltage. Check the door interlock switch.
mains monitor	Fault in mains power supply.	Have the mains power supply checked.
Emergency stop	EMERGENCY STOP push-button pressed.	Unlatch the push-button.
OS dp ↑	Oil separator cartridge clogged.	Change the oil separator cartridge.
OS T ↑	Maximum air temperature at the oil separator tank outlet is exceeded.	Check the line to the trip relay.
oil p ↓	The machine cannot switch to LOAD until the minimum oil pressure is reached.	Check the oil circulation. Check the pressure switch, line and connection.
p-switch	Customer specific: no details possible.	–
pRV ↑	The activating pressure of the safety relief valve on the oil separator tank has been exceeded.	Change the safety relief valve.
oil content ↑	The oil content limit for pure air has been exceeded.	Change the oil separator cartridge.
SIGMA CONTROL h ↑	The maximum permissible SIGMA CONTROL housing temperature has been exceeded.	Keep ambient conditions within specified limits. Control cabinet: Check filter mats and fan.
Softstart	Fault in the soft start equipment.	Call authorized KAESER Service representative.

9 Fault Recognition and Rectification

9.3 Warning messages (yellow LED lights)

Message	Possible cause	Remedy
start T ↓	Airend discharge temperature (ADT) too low. Ambient temperature <36 °F	Keep ambient conditions within specified limits.
T-switch	Customer specific: no details possible.	–
ADT ↓	The airend discharge temperature (ADT) did not reach the minimum value required within the specified time.	Call authorized KAESER Service representative.
ADT ↑	Maximum permissible airend discharge temperature (ADT) exceeded.	Keep ambient conditions within specified limits. Clean the cooler. Check the cooling oil level.
ADT dT/dt ↑	Airend discharge temperature (ADT) rising too quickly.	Check the cooling oil level. Call authorized KAESER Service representative.
access doors	Door open / interlocked panel removed while the machine is running.	Fit and secure all panels and close access doors.

Tab. 36 Alarm messages and measures

9.3 Warning messages (yellow LED lights)

Message	Possible cause	Remedy
blowoff prot. ↑	The activating pressure of the safety relief valve will soon be reached.	Change the oil separator cartridge. Open the shut-off valve in the venting line.
bus alarm	The bus link from the Profibus DP interface is interrupted.	Check bus highway and plug.
PD temperature ↓	Package discharge (PD) temperature too low.	Call authorized KAESER Service representative.
PD temperature ↑	Package discharge (PD) temperature too high.	Clean the cooler. Check the cooling oil level.
DO test	The 'controller outputs' test function is activated.	Stop the 'controller output' mode.
restart inhibit	Too frequent manual on and off switching.	Do not exceed the maximum number of motor switchings per hour when manual on/off switching.
elect. equip. h ↑	The maintenance interval for checking electrical equipment and wiring has expired.	Carry out the check and reset the maintenance interval counter.
error: FEPROM	Internal controller memory error.	Call authorized KAESER Service representative.

9 Fault Recognition and Rectification

9.3 Warning messages (yellow LED lights)

Message	Possible cause	Remedy
error: RS 485-PP	Wrong configuration or transmission error.	Check the link/interface connections between the two controllers. Check maximum cable length and screening. 1 master and 1 slave configured.
error SMS	SMS can not be sent.	Call authorized KAESER Service representative.
ext. message 0 ext. message 1 ext. message 2 ext. message 3 ext. message 4 ext. message 5	Customer specific: no details possible.	–
FC AI1 fault	SFC machine: Network pressure sensor on AI1 defective.	Call authorized KAESER Service representative.
FC MM service	SFC machine: Frequency converter service mode.	Deactivate the service mode as soon as the frequency converter settings are completed.
FC mains	SFC machine: Frequency converter power supply failed.	Check power supply.
annual maint	Last maintenance was 1 year ago.	Carry out the necessary maintenance and reset the corresponding maintenance interval counter.
no press.buildup	The compressor cannot build-up to working pressure.	Check for air leaks. Check the value for internal pressure given in the <i><analog data></i> menu against the reading on the oil separator tank pressure gauge.
condensatedrain	The condensate drain is defective.	Check the condensate drain and drain line.
RD condens.drain	Refrigeration dryer: The condensate drain is defective.	Check the condensate drain.
RD p ↓	Refrigeration dryer: Pressure in refrigerant circuit too low Pressure switch activated.	Call authorized KAESER Service representative.
RD p ↑	Refrigeration dryer: Pressure in refrigerant circuit too high Pressure switch activated.	Keep ambient conditions within specified limits. Clean the refrigerant condenser. Check the fan motor. Call authorized KAESER Service representative.
RD T ↓	Refrigeration dryer: Compressed air temperature too low.	Call authorized KAESER Service representative.

Message	Possible cause	Remedy
RD T ↑	Temperature in the refrigeration dryer too high.	Ensure adequate ventilation. Clean the refrigerant condenser. Clean the cooler. Install an extractor fan.
bearing.maint. h ↑	The maintenance interval for re-greasing the bearings has expired.	Re-grease the motor bearings.
ext.load signal?	Uncertain external load signal: The high cut-out pressure was exceeded. The external load control has not switched to idle (off load).	Check settings of the external controller. Take into account pressure drops across filters and dryer.
air filter dp ↑	Air filter clogged.	Carry out air filter maintenance
air filter dp ↑	Air filter clogged.	Carry out air filter maintenance
air filter h ↑	Maintenance interval for air filter check has elapsed.	Check the air filter.
modem problem	SIGMA CONTROL does not recognise the modem.	Check the link between SIGMA CONTROL and the modem.
motor T ↑	Drive motor overheating.	Clean the motor. Keep ambient conditions within specified limits.
motor bearings	Drive motor bearing defective.	Call authorized KAESER Service representative.
motor starts /h ↑	The permissible number of motor starts was exceeded in the last 60 minutes.	Extend the idle period. Increase the capacity of air receiver. Increase the cross-section of piping between compressor and air receiver.
motor starts /d ↑	The permissible number of motor starts was exceeded in the last 24 hours.	Extend the idle period. Increase the capacity of air receiver. Increase the cross-section of piping between compressor and air receiver.
bearingchange h ↑	The maintenance interval for checking the motor bearings has expired.	Have the motor bearings checked by an authorized KAESER Service Technician.
system press. ↓	Network pressure has fallen below the set 'low' value. Air consumption too high.	Check air demand. Check cable runs and sensor connections. Check the 'sys.press. low' warning setting.
system press. ↑	Network pressure is above the "sys.press. high" value.	Check for air leaks. Check the 'sys.press. high' warning setting. Check whether the machine switches to LOAD.
mains voltage ↓	1. Power supply failure: Machine was re-started automatically.	Check power supply. Check the door interlock switch.

9 Fault Recognition and Rectification

9.3 Warning messages (yellow LED lights)

Message	Possible cause	Remedy
separator dp ↑	The pressure drop across the oil separator cartridge has risen. Oil separator cartridge clogged.	Change the oil separator cartridge.
separator h ↑	The interval for the next oil separator cartridge check has expired.	Change the oil separator cartridge.
oil filter dp ↑	The pressure drop across the oil filter has risen. Oil filter clogged.	Change the oil filter
oil filter h ↑	The interval for the next oil filter check has expired.	Change the oil filter.
oil level ↓	Cooling oil level too low.	Top up the cooling oil.
oil T ↓	Cooling oil temperature too low.	Check temperature switch, line and connection. Check the oil circulation. Increase room temperature.
oil change h ↑	The interval for the oil change has expired.	Change the cooling oil
p-switch	Customer specific: no details possible.	–
buffer battery	Data retention battery is almost discharged.	Change the battery.
error: RAM	Internal RAM defective.	Call authorized KAESER Service representative.
oil content ↑	The oil content limit for pure air will soon be reached.	Check the scavenge tube in the oil separator cartridge. Check the dirt trap strainer in the scavenge line. Check air treatment upstream of the measuring point.
V-belt tension	Belt tension is too low.	Re-tension drive belts.
blt.coup.insp. h ↑	The maintenance interval for V-belt tension / coupling inspection has expired.	Carry out a visual check. Re-tension drive belts.
blt.coup.chng. h ↑	The maintenance interval for changing the belts/coupling has expired.	Drive belts: Replace the drive belts. Coupling: Call authorized KAESER Service representative.
start T ↓ ↓	The airend temperature is too low (<15 °F) for the machine to be operated.	Keep ambient conditions within specified limits.
start T ↓	The airend temperature is too low (<36 °F).	Keep ambient conditions within specified limits.
T-switch	Customer specific: no details possible.	–

Message	Possible cause	Remedy
TRAP interrupt	System message: TRAP interrupt	Call authorized KAESER Service representative.
ADT ↑	Airend discharge temperature has almost reached maximum.	Clean the cooler. Check the cooling oil level. Replace the oil filter. Ensure adequate ventilation. Keep surrounding temperature within recommended limits.
access doors	Doors opened with the machine stopped.	Close access doors.

Tab. 37 Warning messages

9.4 Other Faults

Fault	Possible cause	Remedy
Machine runs but produces no compressed air.	Inlet valve not opening or only opening partially.	Call authorized KAESER Service representative.
	Venting valve not closing.	Call authorized 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 authorized KAESER Service representative.
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.

Fault	Possible cause	Remedy
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 authorized 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. 38 Other faults and actions

10 Maintenance

10.1 Safety

The following instructions must be followed for safe machine maintenance.
Warning instructions are always given before a potentially dangerous action.

Basic safety instructions

1. Follow the instructions in chapter 3 'Safety and Responsibility'.
2. Maintenance work may only be carried out by authorized personnel!
3. Before switching on, make sure that:
 - no one is working on the machine,
 - all access doors and panels are closed and secure.

Working on electrically conducting components.

1. Work on electrically conducting components may only be carried out by authorized electricians.
2. Switch off and lock out the supply disconnecting device and check that no voltage is present.
3. Check that there is no voltage on floating relay contacts.

Working on pressure systems

1. Close shut-off valves or otherwise isolate the machine from the air main to ensure that no compressed air can flow back into the machine.
2. Vent all pressurized components and chambers completely.
3. Check all machine hose connectors with a handheld pressure gauge to ensure that all read zero.
4. Do not open or dismantle such valves.

Working on the drive

1. Switch off and lock out the supply disconnecting device and check that no voltage is present.
2. Do not open the enclosure while the machine is switched on.

Further information Specification of authorized personnel is found in chapter 3.4.2.
 Specification of dangers and their avoidance is found in chapter 3.5.

10.2 Maintenance Schedule

10.2.1 Logging maintenance work



- The maintenance intervals given are those recommended for average operating conditions.
- Maintenance tasks should be carried out more frequently where operating conditions are unfavorable (e.g. dusty atmosphere) or when the equipment is heavily utilized.
 - Adjust the maintenance intervals with regard to operating conditions.

- Keep a log of all maintenance and repair 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 major components. Necessary maintenance tasks are indicated by the SIGMA CONTROL.

Maintenance interval counters count down the operating hours to the next maintenance task.

Reset the counter to the original value once the task has been carried out.

Precondition Maintenance carried out?
Service message acknowledged.
Password level 4 activated.

1. Select the appropriate entry from the maintenance menu.
2. Select 'reset' and 'y' and confirm with the «enter» key.

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

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.	10.14
	Cooler: Check the filter mat and clean or change (option K3).	10.6
	Control cabinet: Clean or renewing the filter mats.	10.4
Monthly	Maintain the condensate drainage	10.7
Up to 1,000 h	Clean the cooler.	10.3
Indicator: SIGMA CONTROL	Change the air filter element.	10.9
	Maintain the motor bearings.	10.10
	Check the coupling.	10.11
Indicator: SIGMA CONTROL At least annually	Change the oil filter.	10.18
Indicator: SIGMA CONTROL At the latest every 3 years	Change the oil separator cartridge.	10.19
h = operating hours		

Interval	Maintenance task	See chapter
Variable, see table 40	Change the cooling oil.	10.17
Annually	Check the pressure relief valve.	10.12
	Check the overheating safety shutdown function.	10.13
	Check the cooler for leaks.	10.3
	Maintain the water cooling (option K2)	CROSS_REFERENCE_FAILED
	Maintain the heat recovery system (option W1)	10.8
	Check that all electrical connections are tight.	–

h = operating hours

Tab. 39 Regular maintenance tasks

10.2.4 Cooling oil changing interval

Machine utilization and ambient conditions are important criteria for the number and length of the change intervals.



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

- Please observe national regulations regarding the use of cooling oil in oil-injected screw compressors.
- Check operating conditions and adjust intervals as necessary.

KAESER LUBRICANTS

SIGMA Lubricant	Description	Maximum Recommended Change Interval	
		First oil change	Subsequent oil change
M-460	ISO 46 Semi-Synthetic Lubricant	2,000 Hours	3,000 Hours
S-460	ISO 46 Synthetic Lubricant	6,000 Hours	8,000 Hours
S-680	ISO 68 Synthetic Lubricant	6,000 Hours	8,000 Hours
FG-460	ISO 46 Food Grade Synthetic Fluid	2,000 Hours	3,000 Hours

Tab. 40 Oil change intervals lubricants

10.2.5 Regular service tasks

The table below lists necessary service tasks.

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

- Carry out service tasks punctually taking ambient and operating conditions into account.

Interval	Service task
Up to 12,000 h	Check the valves
Up to 36,000 h At the latest every 8 years	Drive motor: Have the bearings checked. Fan motor: Have the bearings checked.
	Have hose lines checked.

h = operating hours

Tab. 41 Regular service tasks

10.3 Option K1 Cooler maintenance

Regular cleaning of the cooler 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.

Material Brush and vacuum cleaner
Face mask (as required)

Precondition The supply disconnecting device is switched off,
the device is locked off,
a check has been made that no voltage is present.
The machine has cooled down.

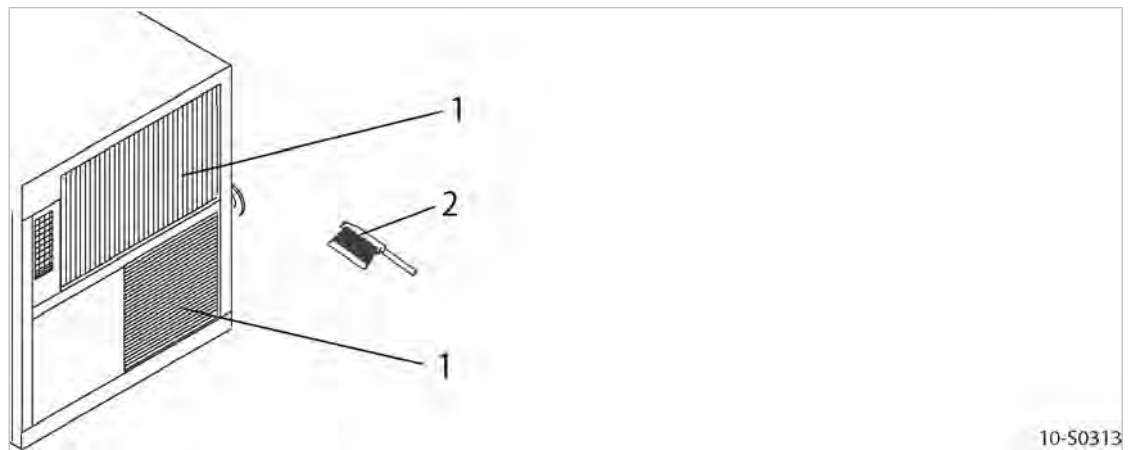


Fig. 26 Cooler cleaning

- ① Cooler
- ② Brush

Cooler cleaning

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 stubborn clogging removed by an authorized KAESER Service Technician.

Check the cooler for leaks

- Can cooling oil be seen to be leaking?



Is a cooler leaking?

- Have the defective cooler repaired immediately by KAESER Service.

10.4 Cleaning or Replacing the Control Cabinet Filter Mats

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 disconnecting (isolating) device is switched off, the disconnect device is locked in the off position, a check has been made that no voltage is present.
The machine has cooled down.

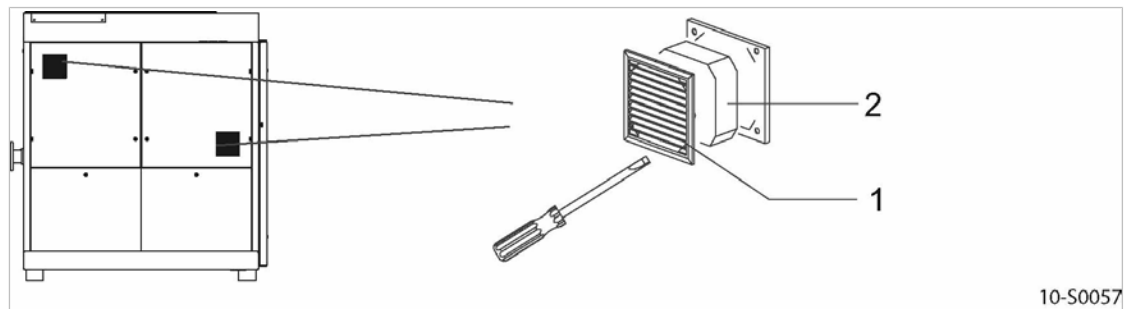


Fig. 27 Control cabinet ventilation grill

- ① Ventilation grill
- ② Filter mat

1. Carefully remove the ventilation grill ① and take out the filter mat ②.
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. Lay the filter mat in the frame and latch in the ventilation grill.

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 authorized KAESER Service representative check the cooler for internal leaks at least once a year.

Cleaning

- An authorized KAESER Service representative should clean the cooler when the airend discharge temperature is 10 K 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 with household detergent.
Spares (as required).

Precondition The machine is switched off.

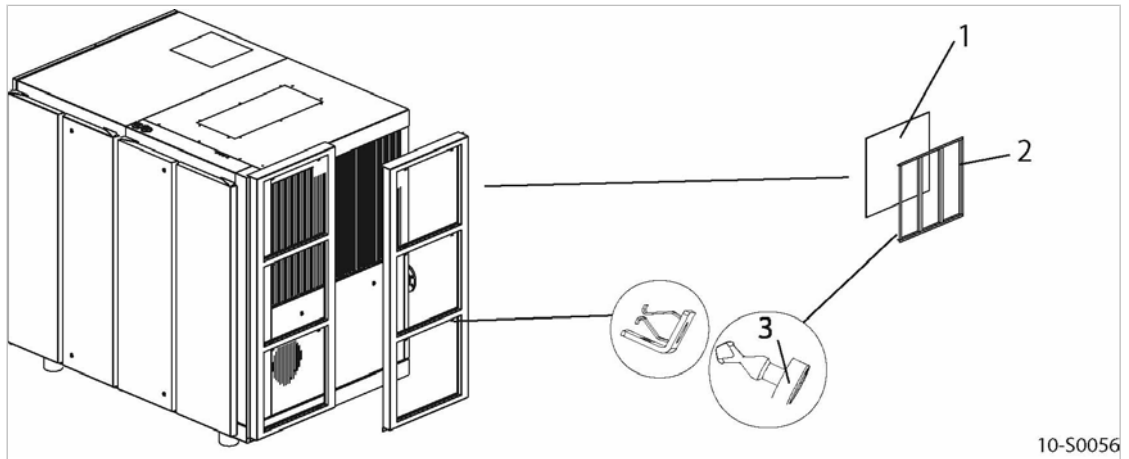





Fig. 28 Cooling-air filter mat

- ① Cooling-air filter mat
- ② Retaining frame
- ③ Fixing

Removal

1. Unlock the fixings 
Use a screwdriver to turn the fixing 90° anti-clockwise.
2. Remove the frame .

Cleaning

- Renew the mat if cleaning is not possible or has already been carried out five times.
- Beat the mat  or use a vacuum cleaner to remove loose dirt.
If necessary, wash the mat in lukewarm water (about 105 °F) 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 Maintain the condensate drainage

Condensate drainage maintenance is done in 2 steps:

1. Check the condensate drainage (chapter 10.7.1)
2. Maintain the condensate drain unit if necessary (chapter 10.7.2)

10.7.1 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.

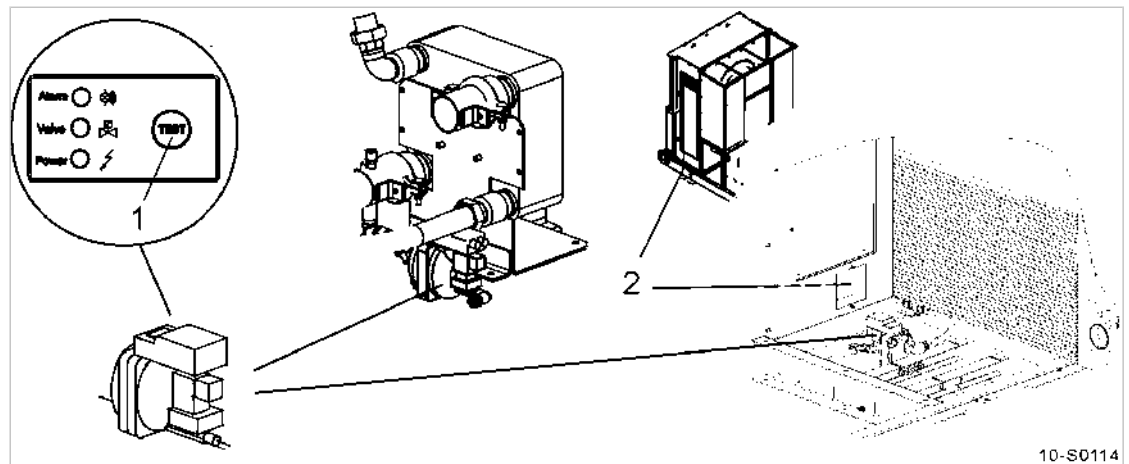


Fig. 29 Checking condensate drainage

- ① «TEST» button
- ② Plate

➤ 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.
- Condensate drainage manual check: Lift up the cover plate ② and press 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.

10.7.2 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).

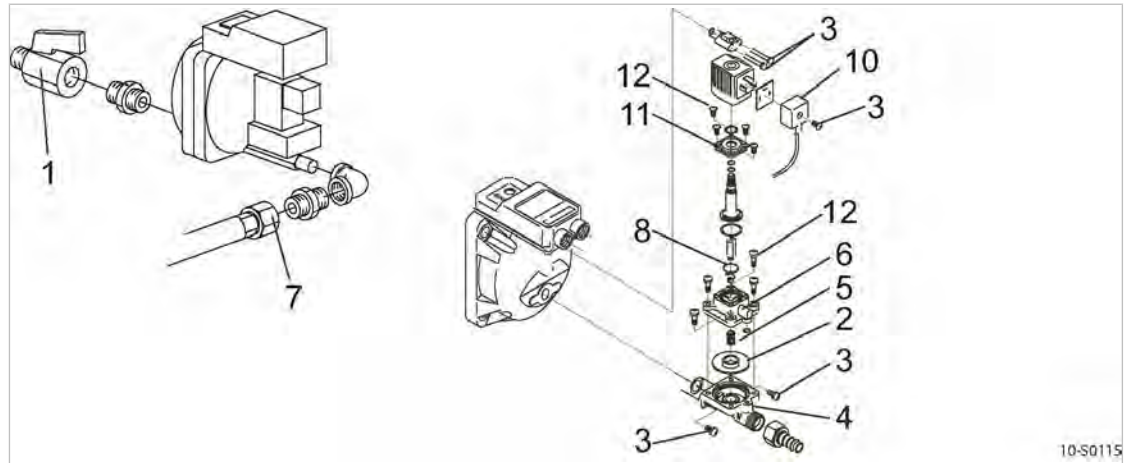


Fig. 30 Cleaning the condensate drain

- | | |
|----------------------------------|-----------------------------------|
| ① Shut-off valve | ⑦ 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. Remove the screws ⑫ loosen.
2. Remove and clean:
 - compression spring ⑤
 - diaphragm ②
 - valve core ⑨ with compression spring ⑧
3. Blow out the casing with compressed air (< 72.5 psig).

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.

10.8 Option W1

Maintaining the external 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.

- Monitor the pressure in the heat transfer medium line to detect any drop in pressure.
- Have the external heat recovery system checked annually by an authorized KAESER Service Technician.

10.9 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 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, a check has been made that no voltage is present. The machine has cooled down.

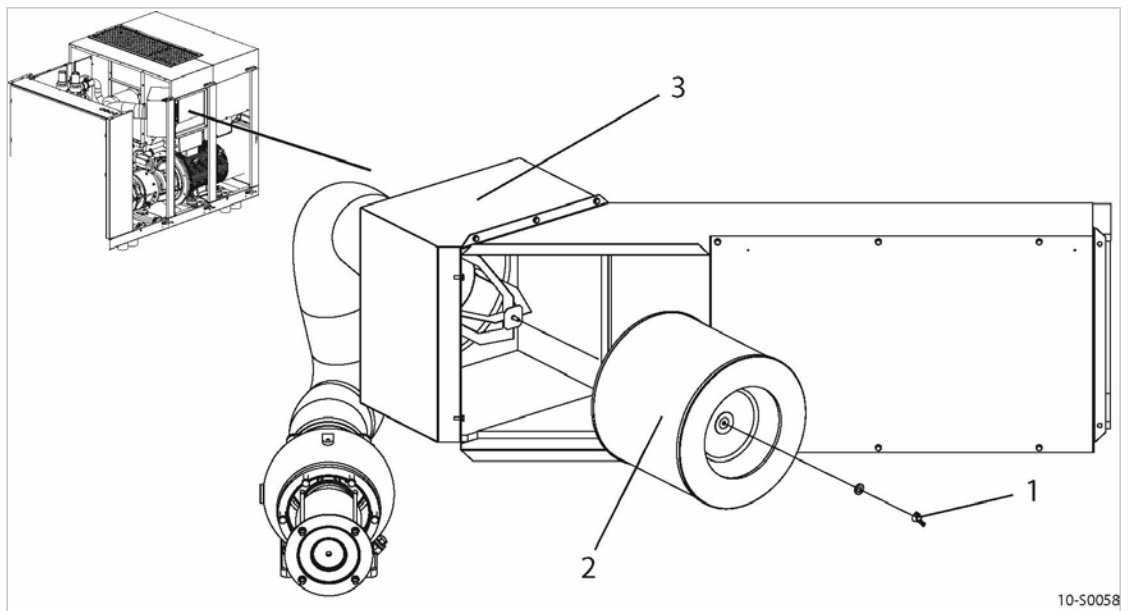


Fig. 31 Air filter maintenance

- ① Nut
- ② Air filter element
- ③ Air filter housing

1. Unscrew the nut ① and remove the filter element.
2. Clean all parts and sealing surfaces.
3. Insert the new air filter element in the housing ③ and secure with the nut ①.
4. Close all access doors and replace all enclosure panels.
5. Switch on the power supply and reset the maintenance interval counter.

10.10 Motor maintenance



Use only the high temperature grease EXXON 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 EXXON UNIREX N3
Cleaning cloths

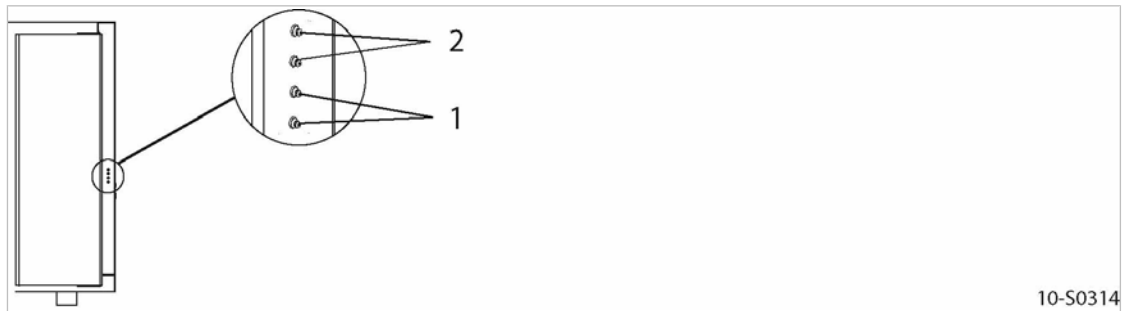


Fig. 32 Drive motor maintenance

- ① Grease nipple (drive motor)
- ② Grease nipple (fan motor option 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.



The required quantity of grease is 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.



The required quantity of grease is 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.

10.11 Checking the coupling

A defective coupling is recognizable by:

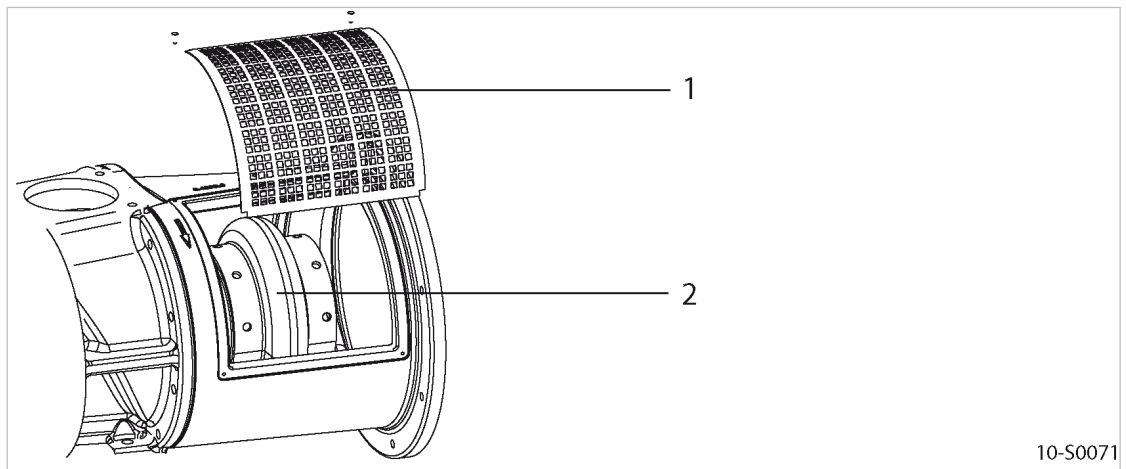
- noisy running,
- surface cracks,
- color change.



WARNING

Danger of injury from rotating coupling!

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



10-S0071

Fig. 33 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 supply disconnecting device is switched off, the device is locked off, 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 by hand and look for damage or color change.
3. Refit the safety screen.
4. Close all access doors and replace all enclosure panels.



Does the coupling have cracks or color changes?

- Have a damaged coupling changed by an authorized KAESER Service Technician.

10.12 Checking the Safety Relief Valve

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



Blowoff protection and network pressure monitoring are switched off during the test.

- Follow the detailed procedure instructions in the SIGMA CONTROL manual.
- Operate the machine only with a fully functioning safety relief valve.

Precondition The machine is switched off.
Password level 4 is activated.



WARNING

Safety relief valve blows off.

Excessive noise is caused when the safety relief valve blows off.

There is danger of scalding from hot oil.

There is danger of injury from bursting components and compressed air.

- Close all access doors; replace and secure all removable panels.
- Wear ear and eye protection.
- Abort the test if the working pressure reaches 10% above the blowoff pressure of the valve.

1. Close the user's shut-off valve between the machine and the compressed air system.
2. Read the blowoff pressure on the valve.
(the blowoff pressure is usually to be found at the end of the part identification)
3. Observe the pressure indicator on the SIGMA CONTROL and call up the test function.
4. Stop the test as soon as the safety relief valve blows off or working pressure reaches 10 % above the blowoff set point.
5. If necessary, vent the machine and replace the safety relief valve.
6. Deactivate the test function.
7. Open the user's shut-off valve between the machine and the compressed air system.

10.13 Checking the Overheating Safety Shutdown Function

The machine should shut down if the airtend discharge temperature reaches a maximum of 230 °F.

- Check the safety shutdown function as described in the SIGMA CONTROL manual.



The machine does not shut down?

- Have the safety shutdown function checked by an authorized KAESER Service representative.

10.14 Checking the cooling oil level



The oil level indicator in frequency-controlled compressors (SFC) 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. The SIGMA CONTROL displays this value.

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

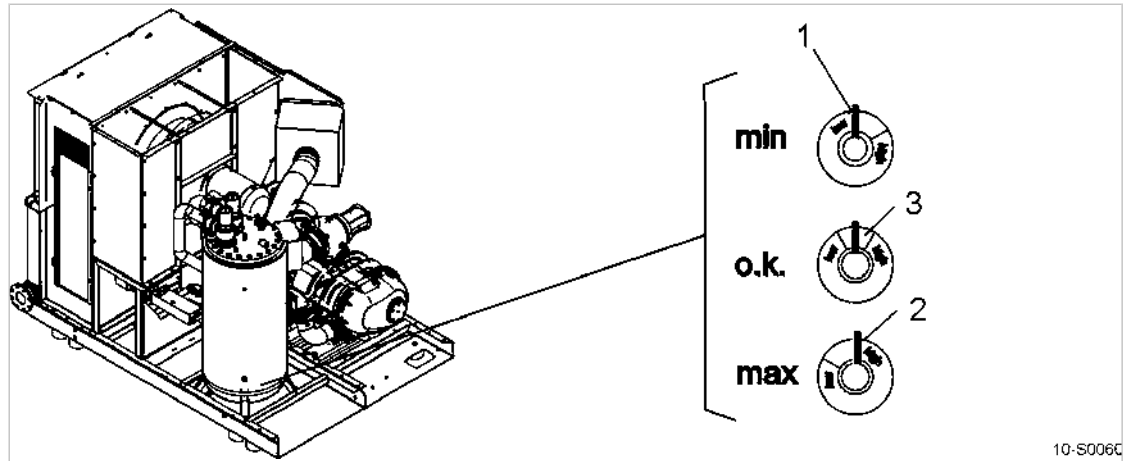


Fig. 34 Checking the cooling oil level

- ① Minimum oil level
- ② Maximum oil level
- ③ Optimum level



WARNING

Danger of burning from hot surfaces!

- Wear long-sleeved clothing and protective gloves.

- Check the oil level with machine running.

Result Top up when the indicator shows minimum level.

10.15 Venting the machine (depressurizing)



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

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

Venting takes place in three stages:

- Isolate the compressor from the compressed air system.
- Vent air from the oil separator tank.
- Vent air manually from the air cooler.

Material The hose coupling, shut-off valve and maintenance hose lie beneath the oil separator tank.

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



WARNING

Compressed air!

Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly or uncontrolled.

- Vent all pressurized components and chambers completely.

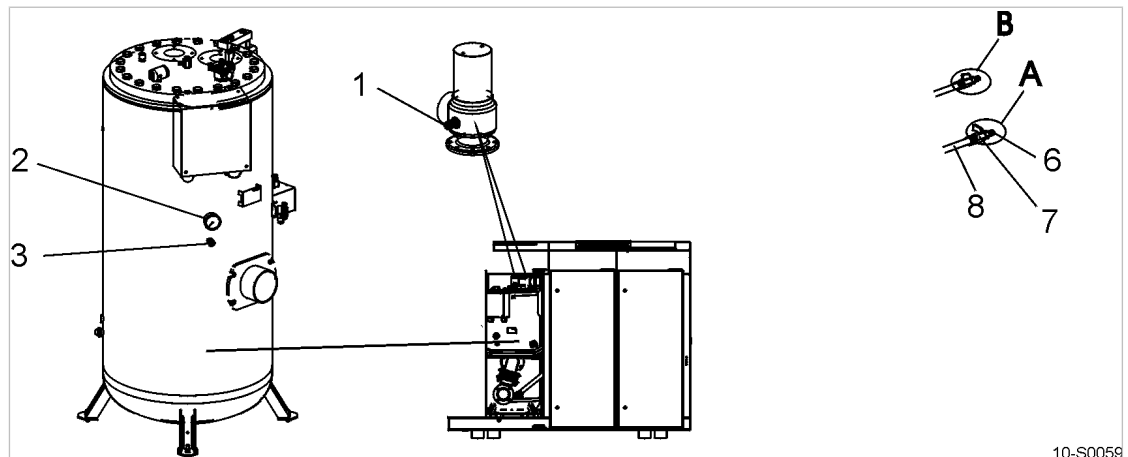


Fig. 35 Venting the machine

- | | |
|--|-------------------------|
| ① Hose coupling (air cooler venting) | ⑦ Shut-off valve. |
| ② Pressure gauge | ⑧ Shut-off valve open |
| ③ Hose coupling (oil separator tank venting) | ⑨ Shut-off valve closed |
| ④ Male hose coupling/fitting | ⑩ Maintenance hose |

Isolate the machine from the compressed air system.

- Close the user's shut-off valve between the machine and the compressed air system.



If no shut-off valve is provided, the complete compressed air system must be vented.

Vent air from the oil separator tank.



WARNING

Escaping oil mist is damaging to health.

- Do not direct the maintenance hose at a person while venting.
- Do not inhale the oil mist.

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



After automatic venting the pressure gauge does not read zero?

- Make sure that the shut-off valve is closed or that the compressed air system is vented to atmospheric.
- With the shut-off valve closed, insert the male hose fitting ④ into the hose coupling ③.
- Slowly open the shut-off valve ⑦ to release pressure.
- Withdraw the male hose fitting ④ and close the shut-off valve ⑦.
- If manual venting does **not** bring the oil separator tank pressure gauge to 0 psig, call an authorized KAESER Service representative.

Vent air manually from the air cooler.



After shutting down the compressor and venting the oil separator tank, there is still pressure on the machine from the compressed air system or in 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 ④ into the hose coupling ①.

2. Slowly open the shut-off valve 7 to release pressure.
3. Withdraw the male hose fitting 6 and close the shut-off valve 7.

10.16 Topping up the Cooling Oil



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

Material The hose coupling, shut-off valve and maintenance hose lie beneath the oil separator tank.

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

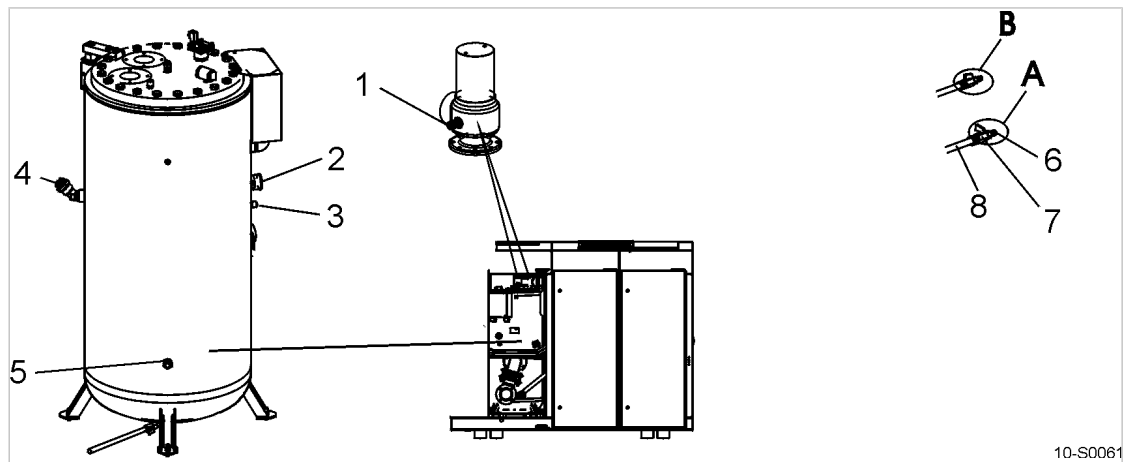


Fig. 36 Topping up the Cooling Oil

- | | |
|--|------------------------------|
| 1 Hose coupling (air cooler venting) | 6 Male hose coupling/fitting |
| 2 Pressure gauge | 7 Shut-off valve. |
| 3 Hose coupling (oil separator tank venting) | A Shut-off valve open |
| 4 Oil filler with plug | B Shut-off valve closed |
| 5 Cooling oil level indicator | 8 Maintenance hose |

1. Vent the machine as described in 10.16.1.
2. Fill with cooling oil and test run as described in 10.16.2.

10.16.1 Venting the Machine (depressurizing)

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

Venting takes place in three stages:

- Isolate the compressor from the compressed air system.
- Vent air from the oil separator tank.
- Vent air manually from the air cooler.

**WARNING**

Compressed air!

Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly or uncontrolled.

- Vent all pressurized components and chambers completely.

Isolate the machine from the compressed air system

- Close the user's shut-off valve between the machine and the compressed air system.



If no shut-off valve is provided, the complete compressed air system must be vented.

Vent air from the oil separator tank**WARNING**

Escaping oil mist is damaging to health.

- Do not direct the maintenance hose at a person while venting.
- Do not inhale the oil mist.



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

After automatic venting the pressure gauge does not read zero?

- Make sure that the shut-off valve is closed or that the compressed air system is vented to atmosphere.
- 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.
- Withdraw 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 0 psig, call an authorized KAESER Service representative.

Vent air manually from the air cooler

After shutting down the compressor and venting the oil separator tank, there is still pressure on the machine from the compressed air system or in 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. Withdraw the male hose fitting ⑥ and close the shut-off valve ⑦.

10.16.2 Top up with cooling oil and test run**Topping up the Cooling Oil**

A sticker on the oil separator tank gives the type of oil it contains.

**CAUTION**

The machine could be damaged by unsuitable oil

- Never mix different types of oil.
- Top up only with the same type of oil as already in the machine.

1. Unscrew the filler plug ④ slowly.
2. Top up to bring the oil to the correct level.
3. Replace the plug sealing ring if necessary and screw in the plug.

Start the machine and carry out a test 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 compressed air system.
3. After about 10 minutes, check the oil level again and top up if necessary.
4. Switch off the machine and visually check for leaks.

10.17 Changing the cooling oil



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

Drain the oil completely from the following components:

- Oil separator tank
 - 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.

Material

Cooling oil

Cooling oil receptacle

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

**WARNING**

There is risk of burns from hot components and oil.

- Wear long-sleeved clothing and gloves.

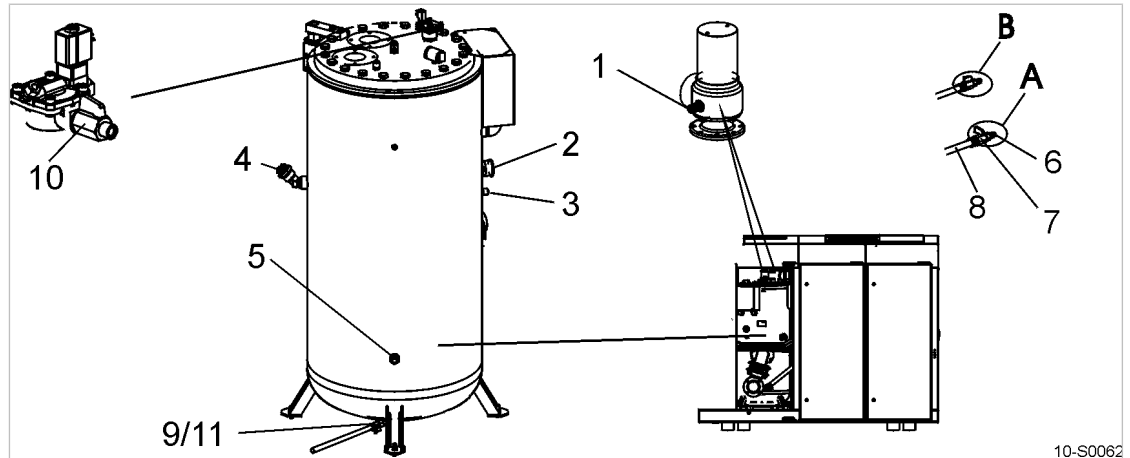


Fig. 37 Changing the cooling oil, oil separator tank

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

Changing the oil with internal pressure	Changing the oil using an external compressed air source
<p>The machine has been running for at least 5 minutes under LOAD.</p> <p>The machine is fully vented, the pressure gauge on the oil separator tank reads 0 psig.</p> <ol style="list-style-type: none"> 1. Close the shut-off valve ⑩ in the venting line. 2. Start the machine and watch the oil separator tank pressure gauge ② until it reads 43–72 psig. 3. Switch off and lock out the power supply disconnecting device and check that no voltage is present. 4. Wait at least 2 minutes to allow the oil to flow back to the separator tank. 	<p>The supply disconnecting device is switched off, the device is locked off, a check has been made that no voltage is present.</p> <p>The machine is fully vented, the pressure gauge on the oil separator tank reads 0 psig.</p> <p>An external source of compressed air is available.</p> <ol style="list-style-type: none"> 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 43–72 psig. 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 ⑦ 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 airend

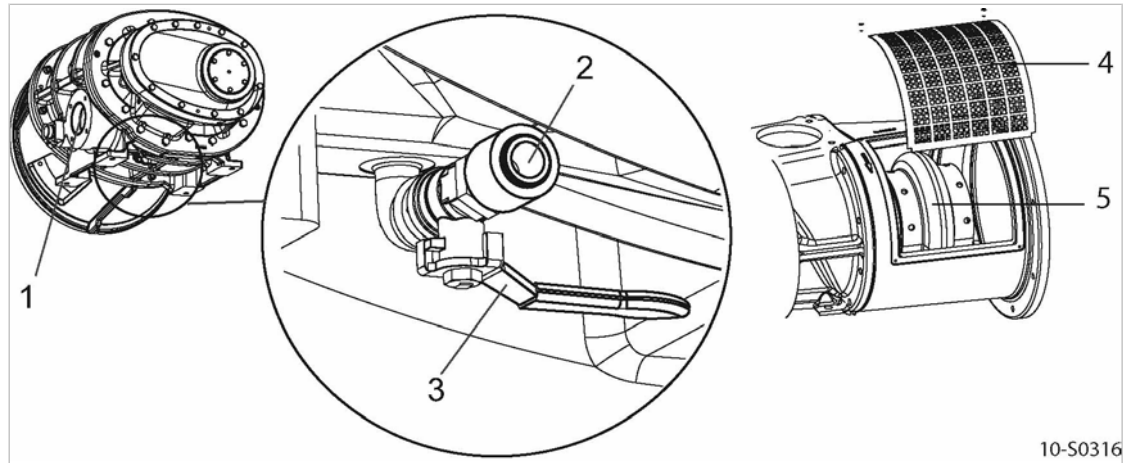


Fig. 38 Changing the cooling oil, airend

- | | |
|--|------------------------|
| 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 **7**, insert the male hose fitting **6** (Fig. 37) 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. 37)
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.

A small amount of cooling oil may flow back into the oil cooler and oil separator tank as a result of turning the coupling.

Remove this by repeating the steps for draining oil from the separator tank and oil cooler.

Option W1 Draining the oil from the heat recovery system

- Drain oil from the appropriate point in the heat recovery system.

Filling with cooling oil

1. Open the filler plug **4** (Fig. 37) slowly.
2. Fill with cooling oil.
3. Check the filler plug and ring seal for damage and screw the plug back in again.

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. 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 environmental protection regulations.

10.18 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.

The illustration shows the number of oil filters that must be changed simultaneously.

Material

Spares

Cooling oil receptacle

Precondition

The supply disconnecting device is switched off, the 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 psig.



WARNING

There is risk of burns from hot components and oil.

- Wear long-sleeved clothing and gloves.

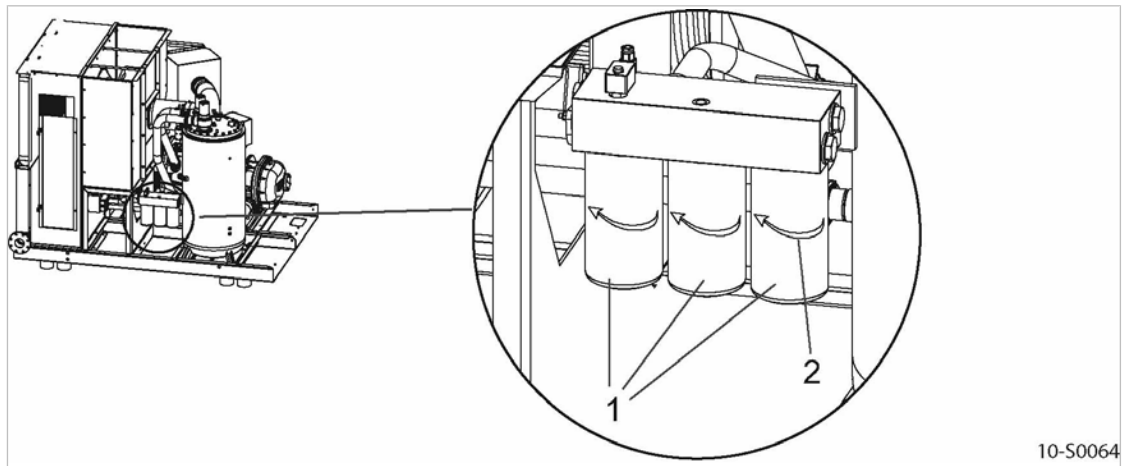


Fig. 39 Changing the oil filter

- ① Oil filter
- ② Direction to unscrew

Changing the oil filter

1. Unscrew the oil filter anti-clockwise, catch oil spillage and dispose of in accordance with environmental protection regulations.

2. Lightly oil the new filter's gasket.
3. 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 about 10 minutes, check the oil level again and top up if necessary.
5. Switch off the machine and check visually for leaks.

10.19 Changing the oil separator cartridge



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

The oil separator cartridge cannot be cleaned.

If multiples of the same component are fitted, the instructions apply to all. The illustration shows the actual quantity.

The life of the oil separator cartridge is influenced by:

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

Material Spares
 Cleaning cloths

Precondition The supply disconnecting device is switched off,
 the 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 psig.

Opening the enclosure

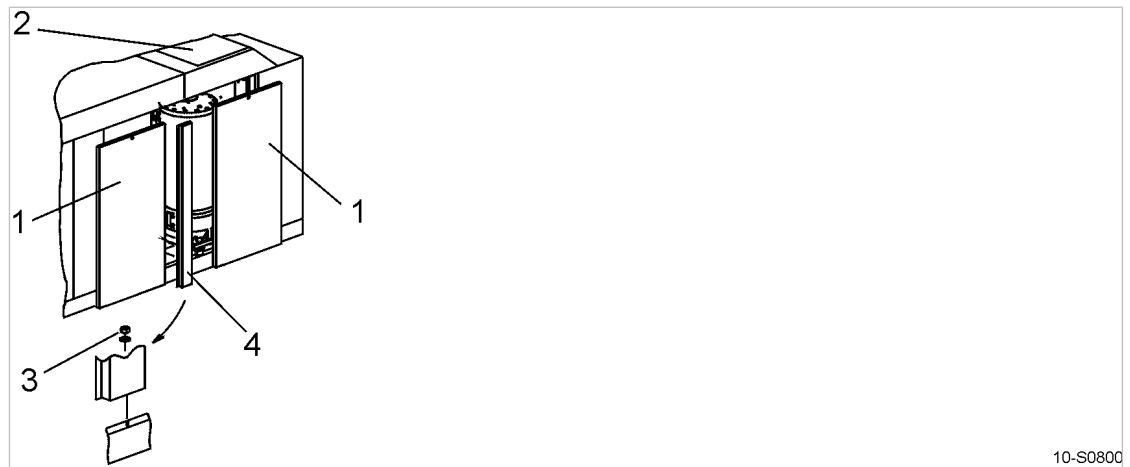


Fig. 40 Open the enclosure (oil separator cartridge changing)

- | | |
|---------------|----------|
| ① Panel | ③ Screw |
| ② Cover plate | ④ Pillar |

1. Remove enclosure panels ①.
2. Remove the cover plate ②.
3. Undo the securing screws ③ and remove the pillar ④.

Changing the oil separator cartridge



- Lift the oil separator cartridge with lifting tackle or the aid of at least one other person.

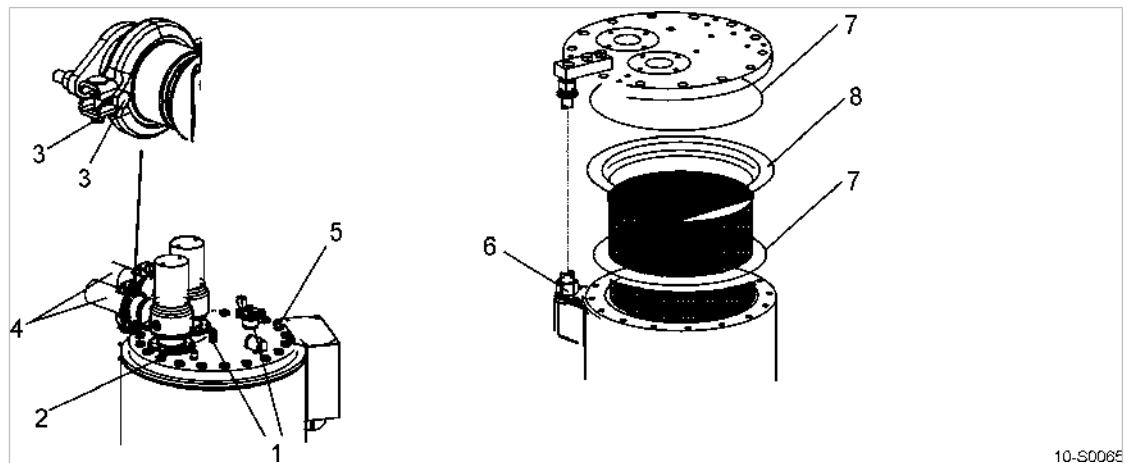


Fig. 41 Changing the oil separator cartridge

- | | |
|-------------|---------------------------|
| ① Fitting | ⑤ Screw |
| ② Dirt trap | ⑥ Nut |
| ③ Fitting | ⑦ Gasket |
| ④ Air pipe | ⑧ Oil separator cartridge |

1. Unscrew the fitting ① and carefully put the parts to one side, then pull out the copper pipe from the dirt trap ②.
2. Loosen the fitting ③ and disconnect the air pipe ④ completely if necessary.

3. Remove the tank cover securing screws ⑤.
4. Use the nut ⑥ to lift the cover and swing it to the side.
5. Take out the old oil separator cartridge ⑧ together with the gaskets ⑦ and dispose of according to environmental protection regulations.
6. Clean all sealing faces.
7. Insert the new cartridge and gaskets.
8. 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.
9. Renew the O-ring and strainer in the dirt trap ②.
10. Secure the air pipe ④ with a new self-locking nut.



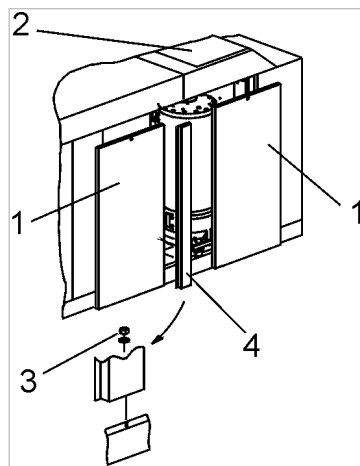
- Follow the instructions in chapter 10.20 concerning flexible pipe connections.

11. Replace and tighten all fittings.



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

Closing the enclosure



10-S0800

Fig. 42 Open the enclosure (oil separator cartridge changing)

- | | |
|---------------|----------|
| ① Panel | ③ Screw |
| ② Cover plate | ④ Pillar |

1. Fit the pillar ④ and secure with screws ③.
2. Fit the cover plate ②.
3. Replace enclosure panels ①.

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. Stop the machine after 10 minutes and visually check for leaks.

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.

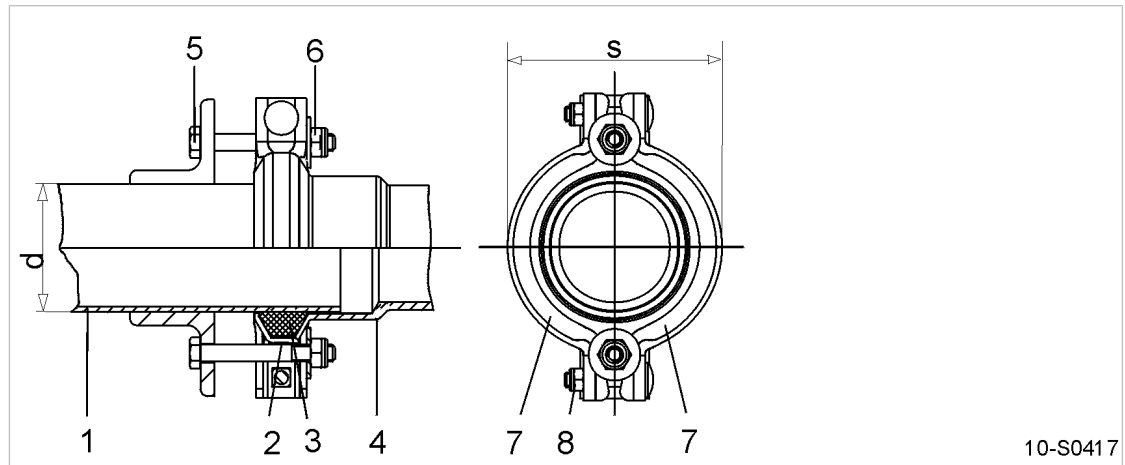


Fig. 43 Assembling flexible pipe connections

- | | |
|------------------|---|
| ① Pipe | ⑥ Self-locking nut |
| ② Seal holder | ⑦ Pipe clamp halves |
| ③ Gasket | ⑧ Self-locking nut |
| ④ Sleeve | ⑨ Pipe diameter (outside) |
| ⑤ Clamping screw | ⑩ Dimension of the flexible pipe joint under tension. |

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

- Slide the seal holder ② and gasket ③ over the pipe ①.
- Slide the pipe end ① into the bush ④ without pretension.
- Slide the gasket ③ with seal holder ② up the sealing face of the bush ④ taking care of pipe alignment.
- Tighten up the clamping bolts ⑤ with the self-locking nuts ⑥.
- Lay the pipe clamp halves ⑦ over the seal holder ② and bush ④ and tighten the self-locking nuts ⑧ until the dimension ⑩ is reached.

Pipe diameter d [mm]	Clamp diameter s [mm]
88.9	142.0 ± 2 %
48.0	81.5 ± 2 %

Tab. 42 Dimensions of the flexible pipe connection

10.21 Document maintenance and service work.

Machine number:

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

Tab. 43 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 inquiry and order for spares.

11.2 Ordering consumable parts and operating fluids/materials

KAESER consumable parts and operating fluids/materials are all genuine KAESER parts. They are selected for use in KAESER machines.

**WARNING**

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

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

Personal injury may result from machine damage.

- Use only genuine KAESER parts and operating fluids/materials.
- Have an authorized KAESER Service Technician carry out regular maintenance.

Machine

Name	Quantity	Number
Air filter element	1	1250
Filter mat (cooler)	1	1050
Filter mat (control cabinet)	2	1100
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. 44 Consumable parts

11.3 KAESER AIR SERVICE

KAESER AIR SERVICE offers:

- authorized 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

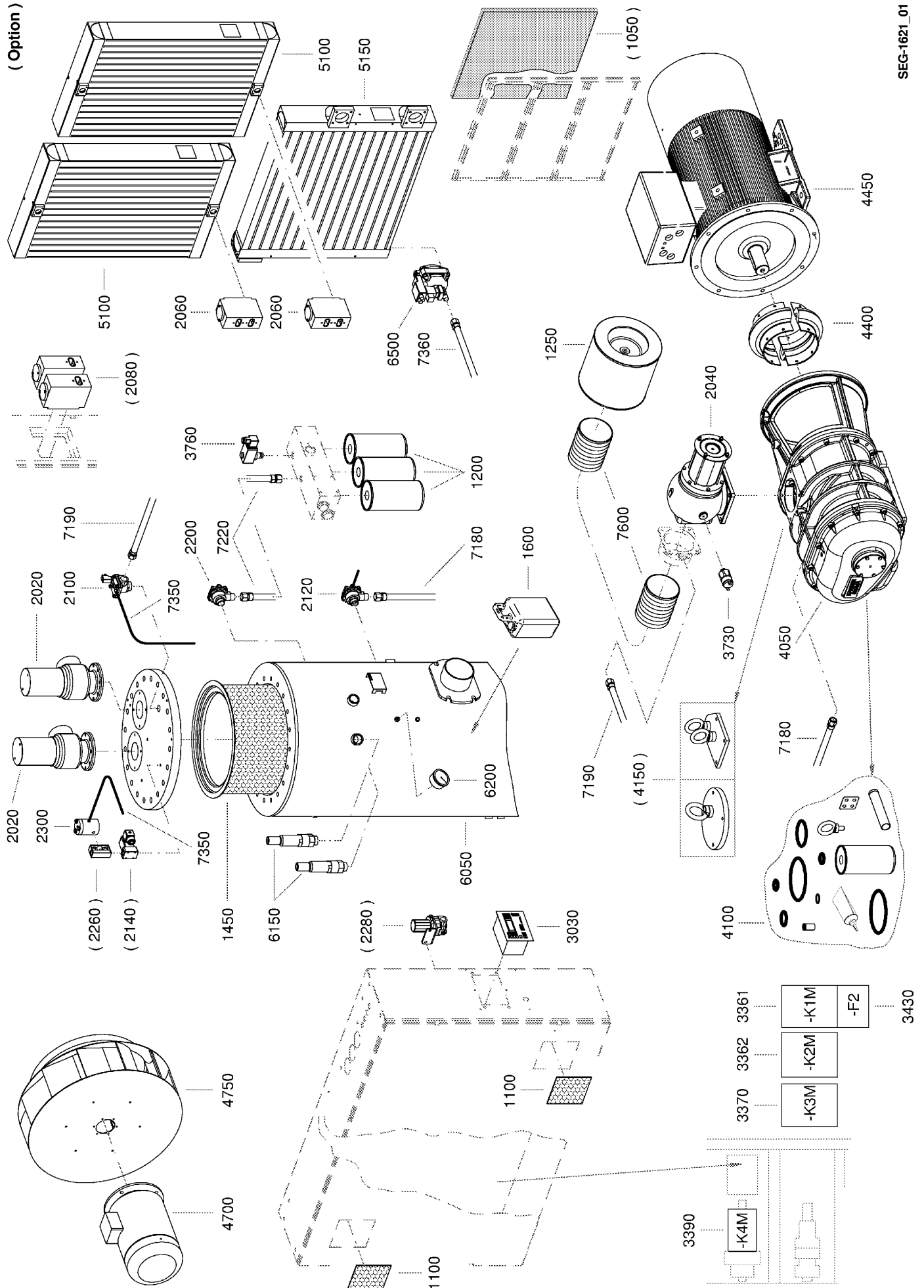
Addresses of KAESER representatives are given at the end of this manual.

11.5 Spares 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 Technician.



SEG-1621_01

		Legend	KAESER
		FSD.1 - (K1)	SEL-1517_01E
Item	Name	Option	
1050	Filter mat	X	
1100	Filter mat, control cabinet		
1200	Oil filter		
1250	Air filter		
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	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	Overhaul kit, control valve		
2200	Control valve		
2202	Maintenance kit, control valve		
2260	Changeover valve	X	
2280	Proportional controller	X	
2300	Pneumatic valve		
2302	Maintenance kit, pneumatic valve		
3030	SIGMA controller		
3361	Contacteur		
3362	Contacteur		
3370	Contacteur		
3390	Contacteur		
3430	Overload protection cutout		
3730	Safety pressure switch		
3732	Protective cap		
3760	Pressure differential switch		
4050	SIGMA airtend		
4100	Airtend installation kit		
4150	Airtend lifting plate	X	
4400	Drive coupling		
4450	Motor		
4451	Bearing set, drive motor		
4700	Fan motor		
4701	Bearing set, fan motor		
4750	Fan wheel		
5100	Oil cooler		
5150	Compressed air aftercooler		
6050	Oil separator tank		
6150	Pressure relief valve		
6200	Pressure gauge		
6500	Condensate drain		
9601	Maintenance kit, condensate drain		
9603	Gasket kit, condensate drain		
9605	Sealing element, control valve		
9607	Repair kit, control valve		
9611	Overhaul kit, condensate drain		
9625	Protective hood		
9629	Control board		
9631	Condensate drain power unit		
9659	Heating		
7180	Prepared hose		
7190	Prepared hose		
7220	Prepared hose		
7350	Control line kit		
7360	Control line kit		
7600	Inlet hose		

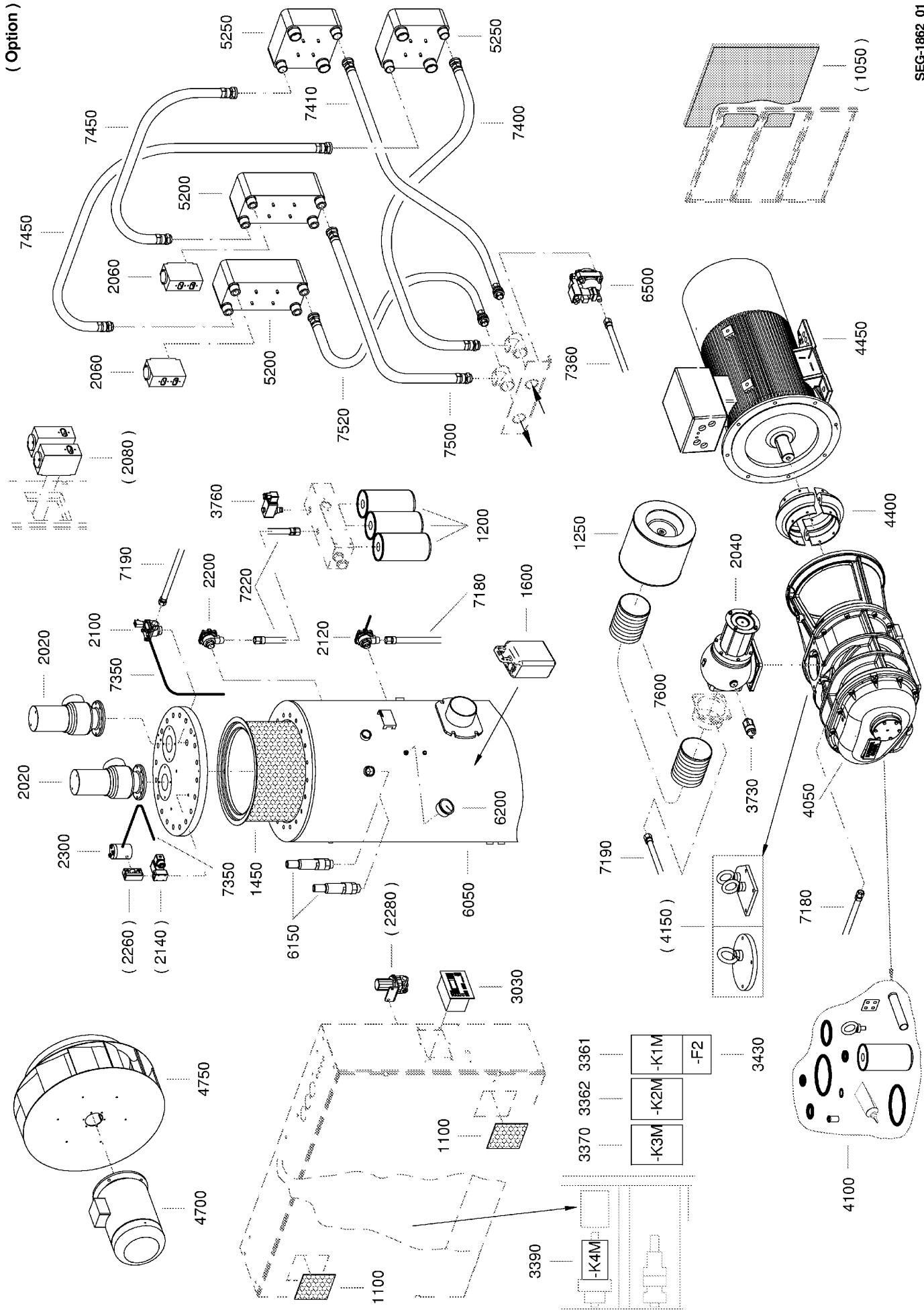
Please quote the part number and serial number of the machine together with the item number and the description of the part when ordering.

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

Maintenance intervals under good ambient and operating conditions, such as low to moderate ambient temperature and dry, clean inlet air.

Maintenance intervals may decrease due to ambient and operating conditions.

*) See cooling fluid recommendations



SEG-1862_01

		Legend	KAESER
		FSD 350/450 - (K2)	SEL-1705_01USE
Item	Name	Option	
1050	Filter mat, cooling air	X	
1100	Filter mat, control cabinet		
1200	Oil filter		
1250	Air filter		
1450	Oil separator cartridge		
1600	Sigma Fluid *)		
2020	Minimum Pressure/Check Valve		
2022	Maintenance kit, MP/C valve		
2024	Overhaul kit, MP/C valve		
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	X	
2082	Maintenance kit, therm. valve		
2084	Overhaul kit, therm. 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	Overhaul kit, control valve		
2200	Control valve		
2202	Maintenance kit, control valve		
2260	Changeover valve	X	
2280	Proportional controller	X	
2300	Pneumatic valve		
2302	Maintenance kit, pneum. valve		
3030	SIGMA controller		
3361	Contacteur		
3362	Contacteur		
3370	Contacteur		
3390	Contacteur		
3430	Overload protection cutout		
3730	Safety pressure switch		
3732	Protective cap		
3760	Pressure differential switch		
4050	SIGMA airtend		
4100	Airtend installation kit		
4150	Airtend lifting plate	X	
4400	Drive coupling		
4450	Drive motor		
4451	Bearing set, drive motor		
4700	Fan motor		
4701	Bearing set, fan motor		
4750	Fan wheel		
5200	Oil cooler		
5250	Compressed air cooler		
6050	Oil separator tank		
6150	Pressure relief valve		
6200	Pressure display		
6500	Condensate drain		
9601	Maintenance kit, condensate drain		
9603	Gasket kit, condensate drain		
9605	Sealing element, control valve		
9607	Repair kit, control valve		
9611	Overhaul kit, condensate drain		
9625	Protective hood		
9629	Control board		
9631	Condensate drain power unit		
9659	Heating		
7180	Prepared hose line		
7190	Prepared hose line		
7220	Prepared hose line		
7350	Control line kit		
7360	Control line kit		
7400	Prepared hose line		
7410	Prepared hose line		
7450	Prepared hose line		
7500	Prepared hose line		
7520	Prepared 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.

Maintenance intervals under good ambient and operating conditions, such as low to moderate ambient temperature and dry, clean inlet air.

Maintenance intervals may decrease due to ambient and operating conditions.

*) 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 power supply 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 ground transport to protect the machine from mechanical damage.
Consult an authorized KAESER Service representative for advice on packing for sea or air transport.

Material Desiccant

Plastic sheeting

Wooden transport crate

Precondition The machine is decommissioned.

Machine is dry and cooled down.

1. Place desiccant inside the machine cabinet.
2. Wrap the machine in plastic sheeting.

12.3 Storage

Moisture can lead to corrosion, particularly on the surfaces of the airend and oil separator tank.

Frozen moisture can damage components, diaphragms, valves and gaskets.



Advice can be obtained from KAESER on storage and re-commissioning.

**CAUTION**

Machine damage from moisture and frost.

- Prevent ingress of moisture and condensation.
- Maintain >32 °F storage temperature.

- Store the machine in a dry, frost-proof room.

12.4 Transporting

12.4.1 Safety

Weight and center of gravity determine the suitable transporting method. The center of gravity is shown in the drawing in chapter 13.3.

Precondition Transport only by fork truck or lifting cradle and with personnel trained in the safe use of the transport equipment.

- Make sure the danger zone is clear.

12.4.2 Transporting with a forklift

Precondition The whole machine must be over the forks.

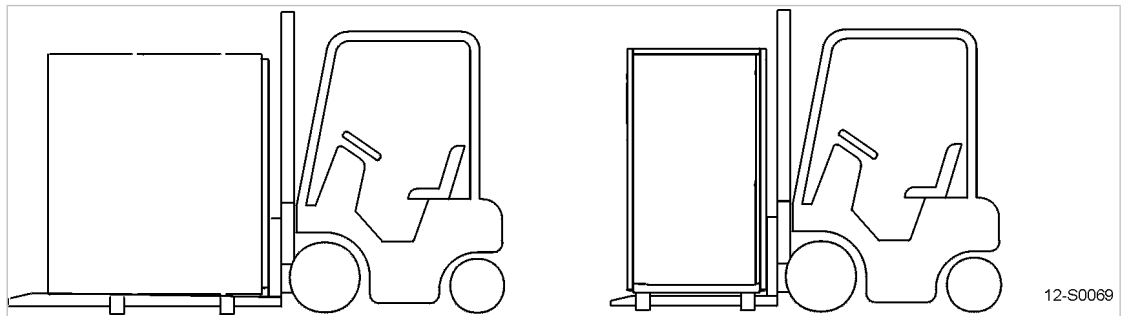


Fig. 44 Transporting with a forklift

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

12.4.3 Transporting with a crane

A suitable lifting cradle ensures correct transportation.

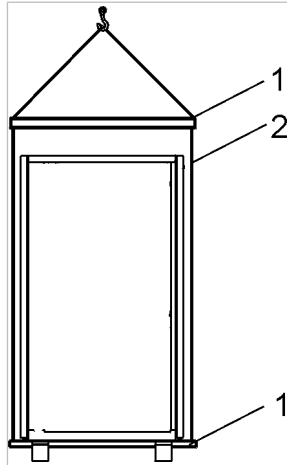
The lifting slings must be fully under the machine.

The slings must not press on the side of the machine.

Examples of unsuitable fixing points:

- Pipe supports
- Flanges
- Attached components such as centrifugal separators, condensate drains or filters
- Rain protection covers

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



12-S0070

Fig. 45 Transporting with a crane

- ① Lifting cradle
- ② Slings



CAUTION

Machine damage by incorrect lifting cradle attachment.

- Do not attach the lifting cradle to any of the machine components.
- The machine manufacturer can advise on application of a suitable lifting cradle.

- Use the lifting cradle correctly and lift the machine carefully.

12.5 Disposal

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

Precondition The machine is decommissioned.

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

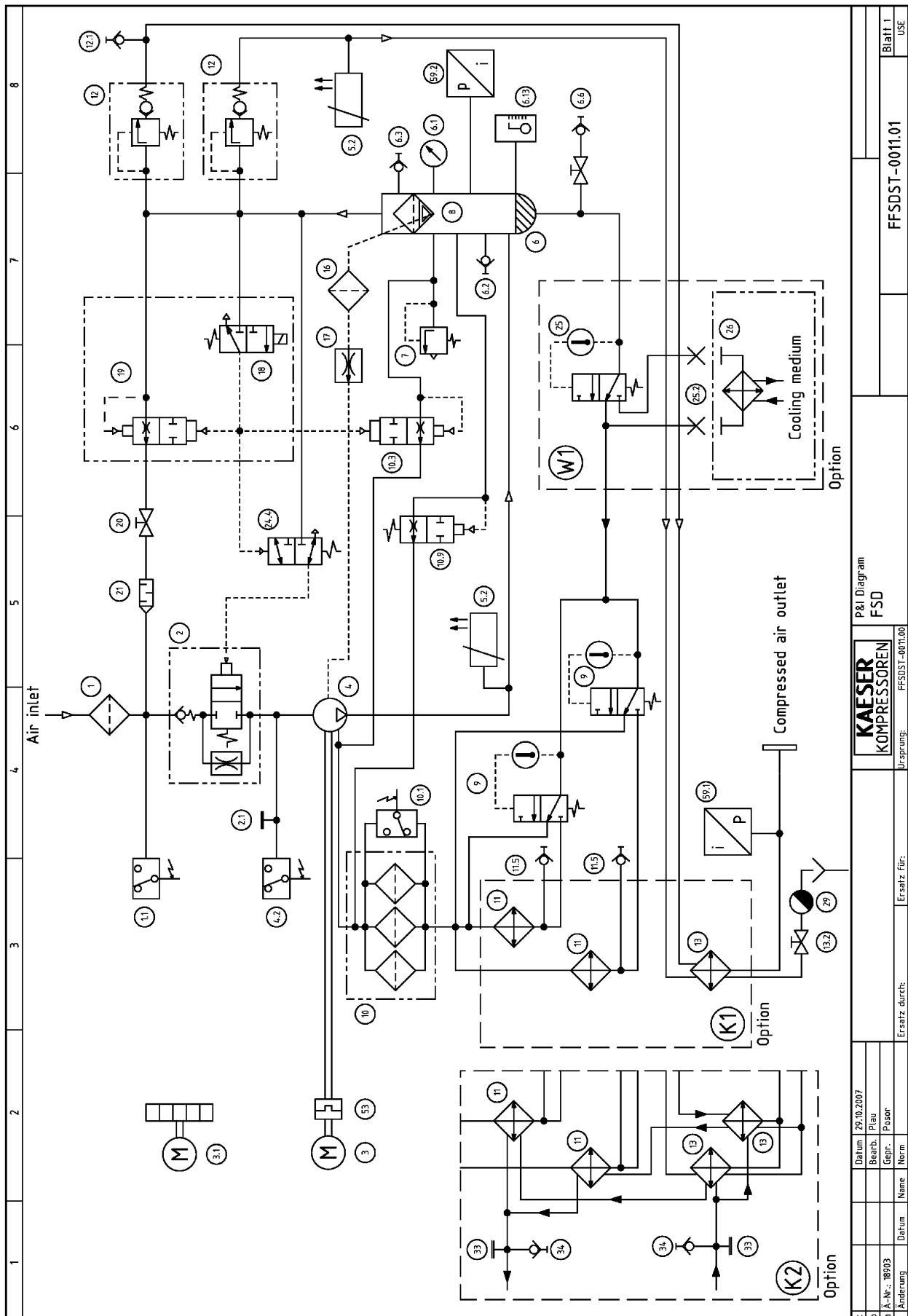


- Parts contaminated with cooling oil must be disposed of in accordance with local environment protection regulations.

Compressors with refrigeration dryers

The sealed refrigerant circuit still contains both refrigerant and oil.

- Refrigerant and oil must be drained and disposed of by authorized personnel.



P&I Diagram
FSD

KAESER
KOMPRESSOREN

Ursprung: FFDST-0011.00
Ersatz durch:

Datum	29.10.2007
Bearb.	Plau
Gepr.	Pasor
Name	
Datum	
Änderung	

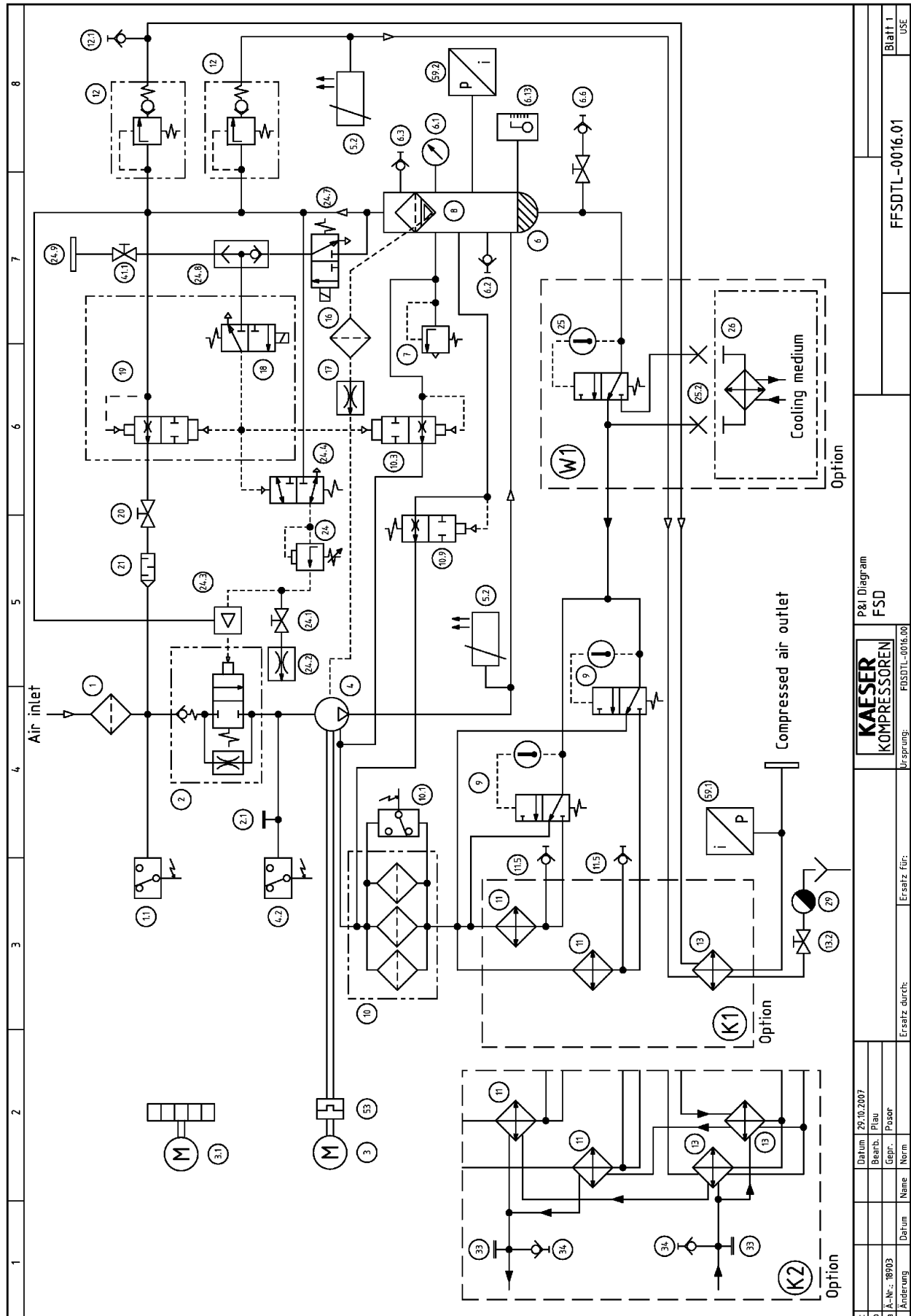
FFDST-0011.01

Blatt 1
USE

1	2	3	4	5	6	7	8
1	Air filter			13	Air aftercooler		
1.1	Vacuum switch – Air filter			13.2	Shut-off valve – Condensate drain		
2	Inlet valve			16	Dirt trap		
2.1	Oil filler port with screw plug			17	Nozzle		
3	Drive motor			18/19	Combined control/venting valve		
3.1	Fan motor			18	Control valve		
4	Airend			19	Venting valve		
4.2	Pressure switch – Wrong direction of rotation			20	Shut-off valve – Venting line		
5.2	PT100-sensor			21	Silencer		
6	Oil separator tank			24.4	3/2-Directional control valve (amplifies volume of control air for the inlet valve)		
6.1	Pressure gauge			25	Oil temperature thermostat for heat recovery system		
6.2	Hose coupling (oil side)			25.2	Screw plug		
6.3	Hose coupling (air side)			26	Heat recovery system		
6.6	Shut-off valve with hose coupling – Oil drain			29	Electronically controlled condensate drain		
6.13	Oil level indicator			33	Dry well for temperature measurement		
7	Safety relief valve			34	Hose coupling		
8	Oil separator cartridge			53	Drive coupling		
9	Oil temperature controller			59.1	Pressure transducer – System pressure		
10	Oil filter			59.2	Pressure transducer – Internal pressure		
10.1	Differential pressure switch – Oil filter			Option			
10.3	Antri rumble valve						
10.9	Ventilating valve						
11	Oil cooler			K1	air-cooled		
11.5	Hose coupling – Oil drain			K2	water-cooled		
12	Minimum pressure check valve			W1	Heat recovery system, external		
12.1	Hose coupling						
c		Datum	29.10.2007	P&I Diagram legend			
b		Bearb.	Plan	FSD			
a		Gepr.	Passen	FFSDST-0011.01			
	Änderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung:
							FFSDST-0011.00
							Blatt 2
							USE

13.2 Option C1

Pipe and instrument flow diagram (P&I diagram): MODULATING control mode



P&I Diagram

FSD

KAESER
KOMPRESSOREN

Ursprung: FSDTL-0016.00

Ersatz durch:

Datum: 29.10.2007

Bearb.: Plau

Gepr.: Pison

Norm

Name

Datum

Änderung

a A-Nr.: 8903

b

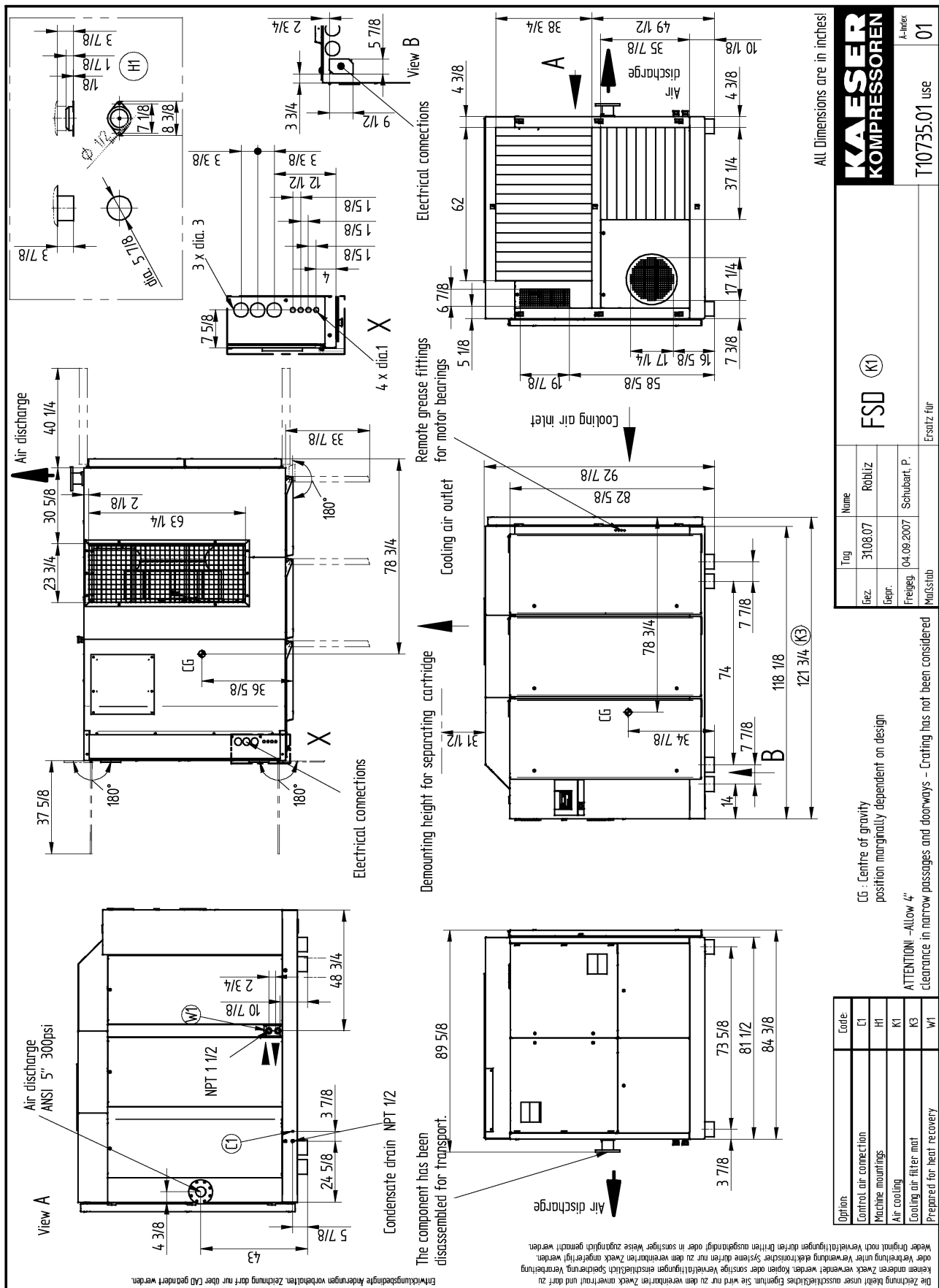
c

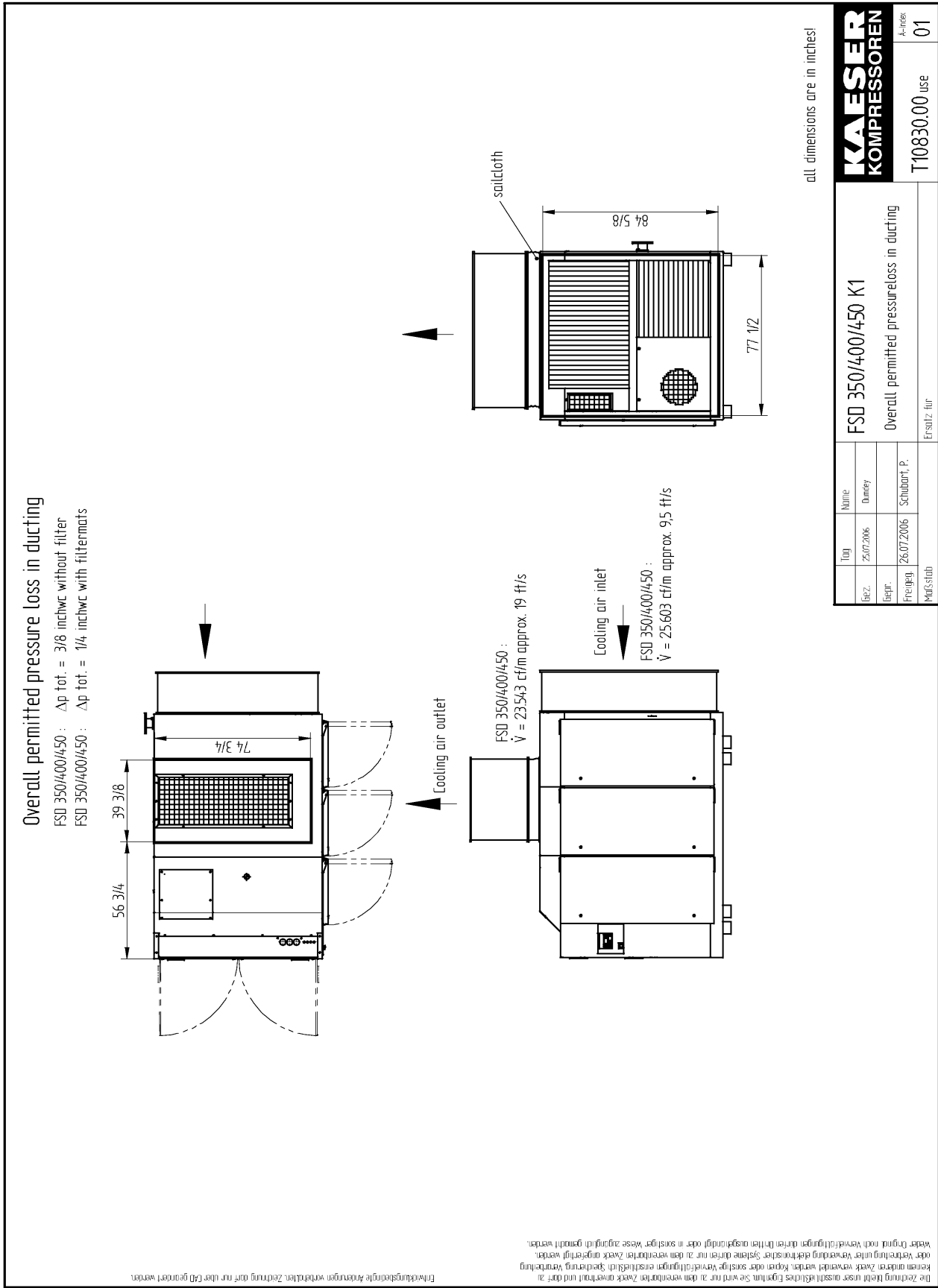
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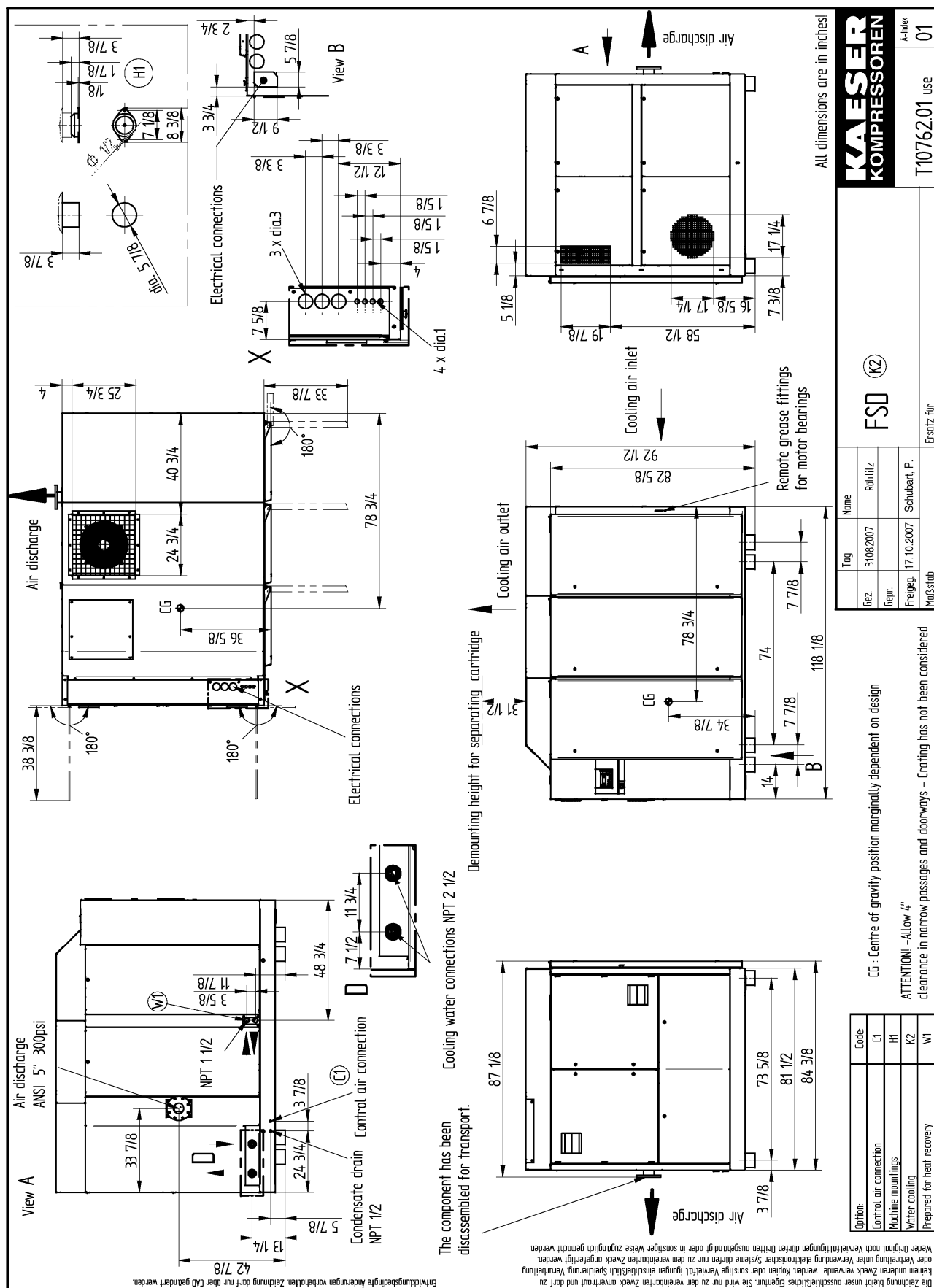
Blatt 1

USE

1	2	3	4	5	6	7	8
1	Air filter		20	Shut-off valve – Venting line			
1.1	Vacuum switch – Air filter		21	Silencer			
2	Inlet valve		24	Proportional controller			
2.1	Oil filter port with screw plug		24.1	Shut-off valve open: machine in modulating control			
3	Drive motor			Shut-off valve closed: package running in DUAL-/QUADRO or VARIO mode			
3.1	Fan motor		24.2	Nozzle			
4	Airend		24.3	Signal amplifier			
4.2	Pressure switch – Wrong direction of rotation			(amplifies volume of control air for the inlet valve)			
5.2	PT100-sensor		24.4	3/2-Directional control valve (amplifies volume of control air for the inlet valve)			
6	Oil separator tank		24.7	Solenoid valve			
6.1	Pressure gauge		24.8	Changeover valve			
6.2	Hose coupling (oil side)			(for optional connection of working pressure either			
6.3	Hose coupling (air side)			via internal or external compressed air connection)			
6.6	Shut-off valve with hose coupling – Oil drain		24.9	Version for control air:			
6.13	Oil level indicator			external control air connection (e.g. from downstream air receiver)			
7	Safety relief valve		25	Oil temperature thermostat for heat recovery system			
8	Oil separator cartridge		25.2	Screw plug			
9	Oil temperature controller		26	Heat recovery system			
10	Oil filter		29	Electronically controlled condensate drain			
10.1	Differential pressure switch – Oil filter		33	Dry well for temperature measurement			
10.3	Anti rumble valve		34	Hose coupling			
10.9	Ventilating valve		4.1.1	Shut-off valve open: running with external control air			
11	Oil cooler		53	Drive coupling			
11.5	Hose coupling – Oil drain		59.1	Pressure transducer – System pressure			
12	Minimum pressure check valve		59.2	Pressure transducer – Internal pressure			
12.1	Hose coupling						
13	Air aftercooler			Option			
13.2	Shut-off valve – Condensate drain						
16	Dirt trap		K1	air-cooled			
17	Nozzle		K2	water-cooled			
18/19	Combined control/venting valve		W1	Heat recovery system, external			
18	Control valve						
19	Venting valve						
c		Datum	29.08.2006	P&I Diagram legend			
b		Bearb.	Plau	FSD			
a		Gepr.	Poser				
Änderung		Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung:
							FFSDTL-0016.01
							Blatt 2
							USE







1	2	3	4	5	6	7	8																																										
<div style="border: 1px solid black; padding: 10px; margin-bottom: 20px;"> <p style="text-align: center; font-size: 1.2em; margin: 0;">Wiring Diagram</p> <p style="text-align: center; font-size: 1.1em; margin: 5px 0;">compressor series FSD</p> <p style="text-align: center; margin: 5px 0;">air cooled or water cooled</p> <div style="display: flex; justify-content: space-around; margin: 5px 0;"> 380V±10% 3ph 60Hz 460V±10% 3ph 60Hz </div> <p style="text-align: center; margin: 5px 0;">575V±10% 3ph 60Hz</p> <p style="text-align: center; margin: 5px 0;">Power supply:</p> <p style="text-align: center; margin: 5px 0;">WYE system with center point solidly grounded</p> </div> <div style="margin-top: 20px;"> <p>manufacturer: KAESER COMPRESSORS 96450 COBURG GERMANY</p> </div>																																																	
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>ATTENTION !!!</p> <p>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.</p> </div> <div style="width: 45%;"> <p>The drawings remain our exclusive property. The are entrusted only for the agreed purpose. Copies or any other reproductions, including storage, treatment and dissemination by use of electronic systems must not be made for any other than the agreed purpose. Neither originals nor reproductions must be forwarded or otherwise made accessible to third parties.</p> </div> </div>																																																	
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">c</td> <td style="width: 30%;">Datum</td> <td style="width: 30%;">21.06.2006</td> <td style="width: 10%;">USE</td> </tr> <tr> <td>b</td> <td>Bearb.</td> <td>Sifher</td> <td></td> </tr> <tr> <td>a</td> <td>ÄN. 8850</td> <td>23.10.07</td> <td>Ge/Si</td> </tr> <tr> <td>A</td> <td>Änderung</td> <td>Datum</td> <td>Name</td> </tr> </table>		c	Datum	21.06.2006	USE	b	Bearb.	Sifher		a	ÄN. 8850	23.10.07	Ge/Si	A	Änderung	Datum	Name	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">KAESER KOMPRESSOREN</td> <td style="text-align: center;">cover page compressor series FSD</td> </tr> <tr> <td colspan="2" style="text-align: center;">Ursprung:</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;">Ersatz durch:</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;">Ersatz für:</td> <td></td> </tr> </table>		KAESER KOMPRESSOREN		cover page compressor series FSD	Ursprung:			Ersatz durch:			Ersatz für:			<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 30%; text-align: center;">SIGMA CONTROL</td> <td style="width: 30%; text-align: center;">=</td> <td style="width: 30%; text-align: center;">+</td> <td style="width: 10%;"></td> </tr> <tr> <td colspan="2" style="text-align: center;">DFSD-U2010.00</td> <td colspan="2"></td> </tr> <tr> <td colspan="2" style="text-align: center;">Blatt 1</td> <td colspan="2"></td> </tr> <tr> <td colspan="2" style="text-align: center;">Bl.</td> <td colspan="2"></td> </tr> </table>		SIGMA CONTROL	=	+		DFSD-U2010.00				Blatt 1				Bl.			
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Lfd. Nr. No.	Benennung Name		Zeichnungsnummer (Kunde) Drawing No. (customer)	Ziehungsnummer (Hersteller) Drawing No. (manufacturer)	Blatt Page	Anlagenkennzeichen Unit designation
1	cover page			DfSD-UZ010.00	1	
2	list of contents			ZFSD-UZ010.00	1	
3	block diagram			UFSD-UZ010.00	1	
4	block diagram			UFSD-UZ010.00	2	
5	block diagram			UFSD-UZ010.00	3	
6	block diagram			UFSD-UZ010.00	4	
7	block diagram			UFSD-UZ010.00	5	
8	wiring diagram			SFSD-UZ010.00	1	
9	wiring diagram			SFSD-UZ010.00	2	
10	wiring diagram			SFSD-UZ010.00	3	
11	wiring diagram			SFSD-UZ010.00	4	
12	wiring diagram			SFSD-UZ010.00	5	
13	wiring diagram			SFSD-UZ010.00	6	
14	wiring diagram			SFSD-UZ010.00	7	
15	wiring diagram			SFSD-UZ010.00	8	
16	wiring diagram			SFSD-UZ010.00	9	
17	wiring diagram			SFSD-UZ010.00	10	
18	wiring diagram			SFSD-UZ010.00	11	
19	wiring diagram			SFSD-UZ010.00	12	
20	wiring diagram			SFSD-UZ010.00	13	
21	wiring diagram			SFSD-UZ010.00	14	
22	wiring diagram			SFSD-UZ010.00	15	
23	electrical component parts list			GfSD-UZ010.00	1	
24	terminal connection			KfSD-UZ010.00	1	
25	terminal connection			KfSD-UZ010.00	2	
26	terminal connection			KfSD-UZ010.00	3	
27	terminal connection			KfSD-UZ010.00	4	
28	lay-out			AfSD-UZ010.00	1	

c Datum 27.06.2006

b Bearb. Sitter

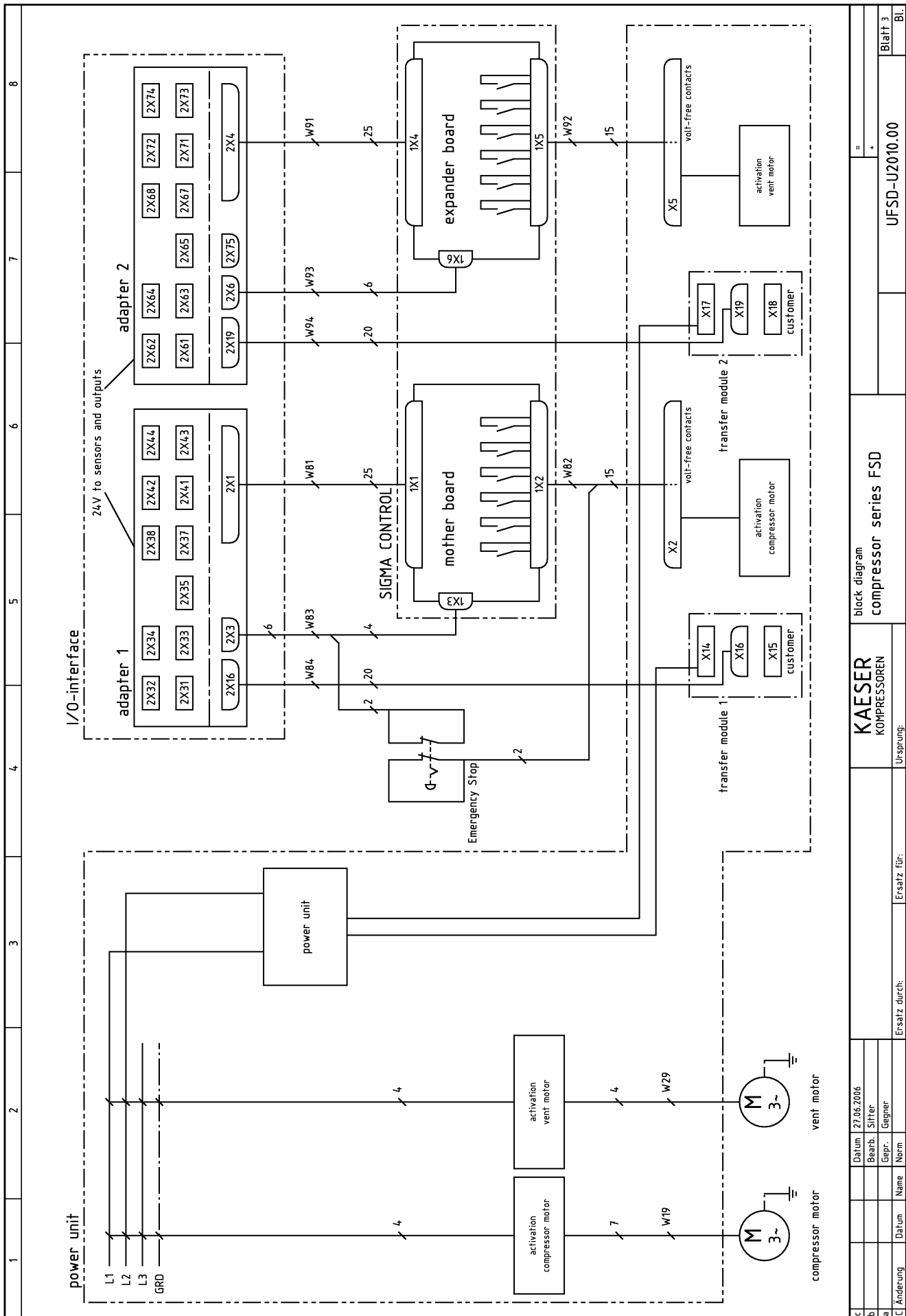
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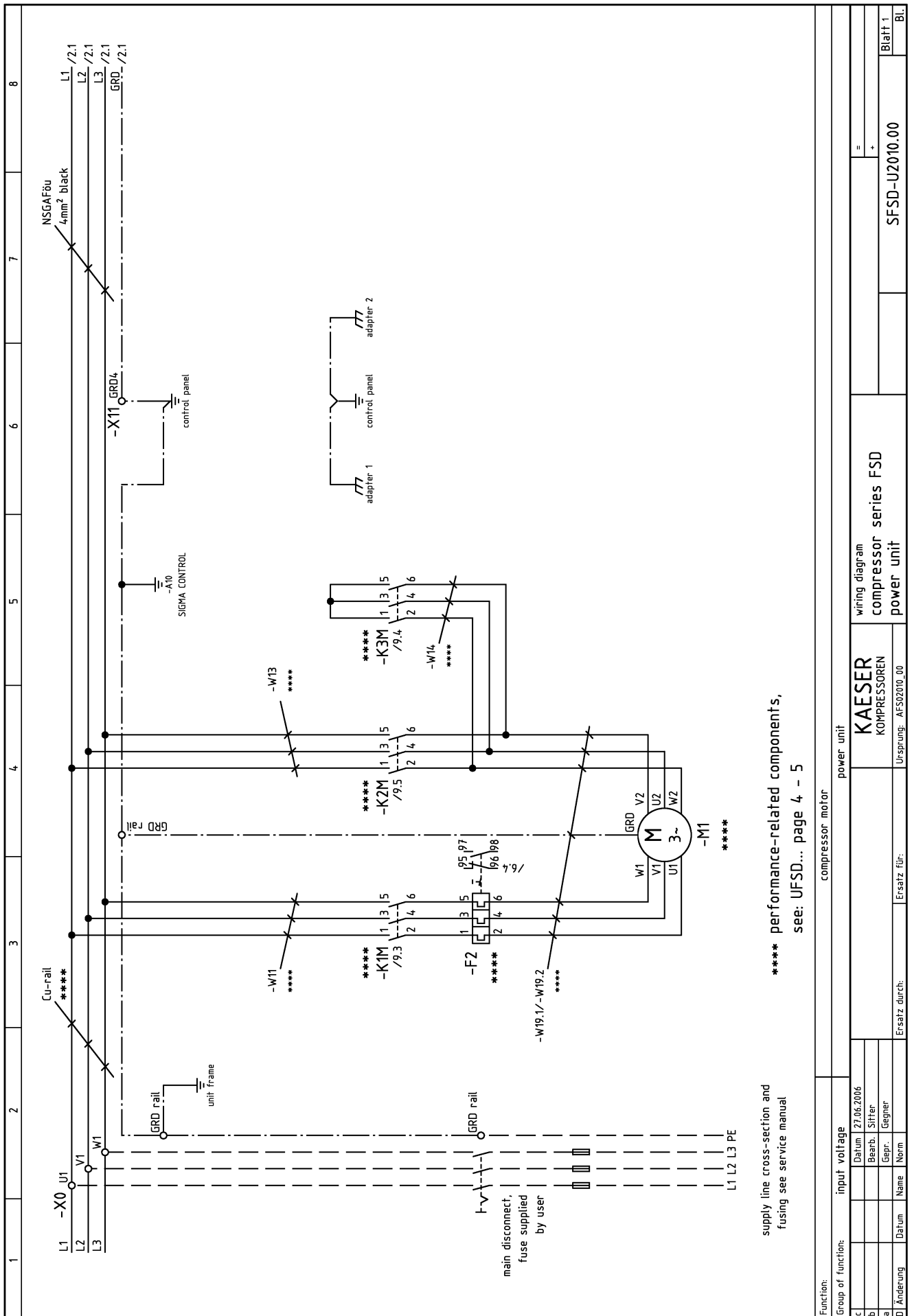
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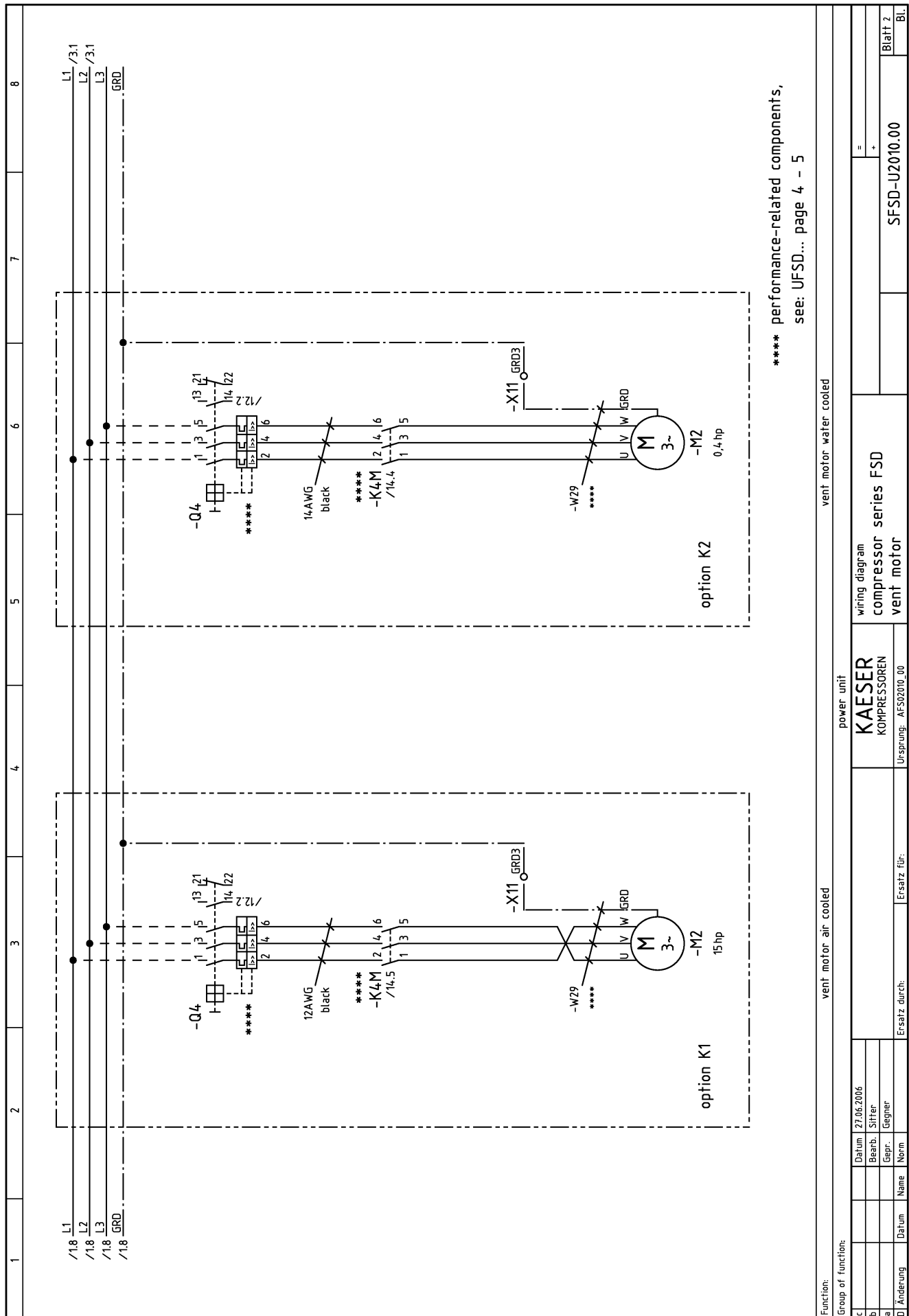
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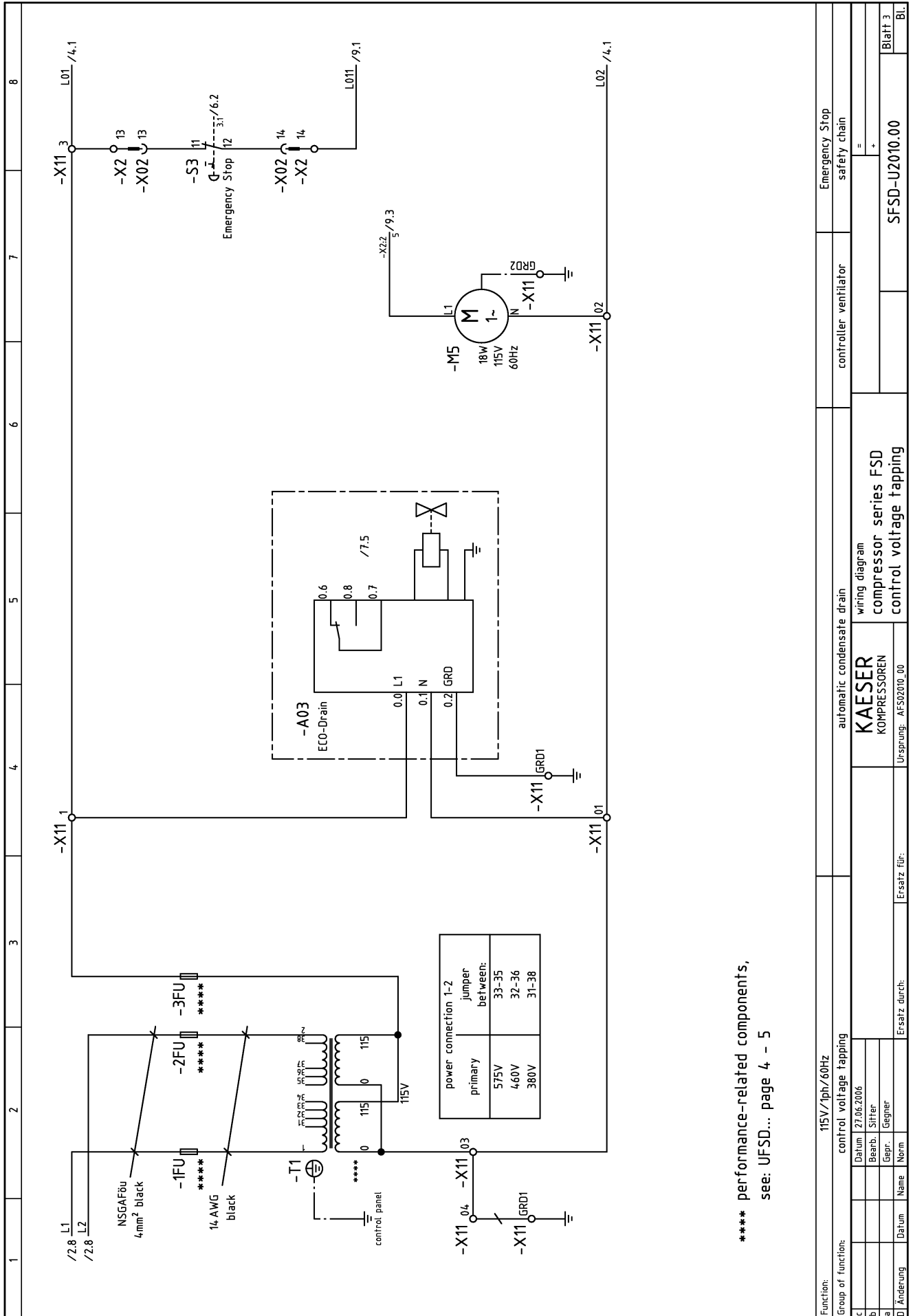
1	2	3	4	5	6	7	8
<div> <div> <p>general instructions</p> <p>ATTENTION !!!</p> <p>Install supplies, grounding and shock protection to local safety regulations.</p> <p>Do not make or break live plug-in connectors.</p> </div> <div> <p>control cabinet wiring for non-designated conductors with multi-standard stranded conductors</p> <p>primary circuits: black</p> <p>control voltage AC: red 1mm² H05V-K, 18AWG UL-Style 1015, CSA-TEW</p> <p>control voltage DC: blue 1mm² H05V-K, 18AWG UL-Style 1015, CSA-TEW</p> <p>external voltage: orange 1,5mm² H07V-K, 16AWG UL-Style 1015, CSA-TEW</p> <p>measuring circuits: violet 1mm² H05V-K, 18AWG UL-Style 1015, CSA-TEW</p> <p>ground conductor: green/yellow H07V-K, UL-Style 1015, CSA-TEW</p> </div> </div>							
<div> <p>option C1 = modulating control</p> <p>option K1 = air cooling</p> <p>option K2 = water cooling</p> </div>							
c					block diagram compressor series FSD		=
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C Änderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	UFSD-U2010.00	
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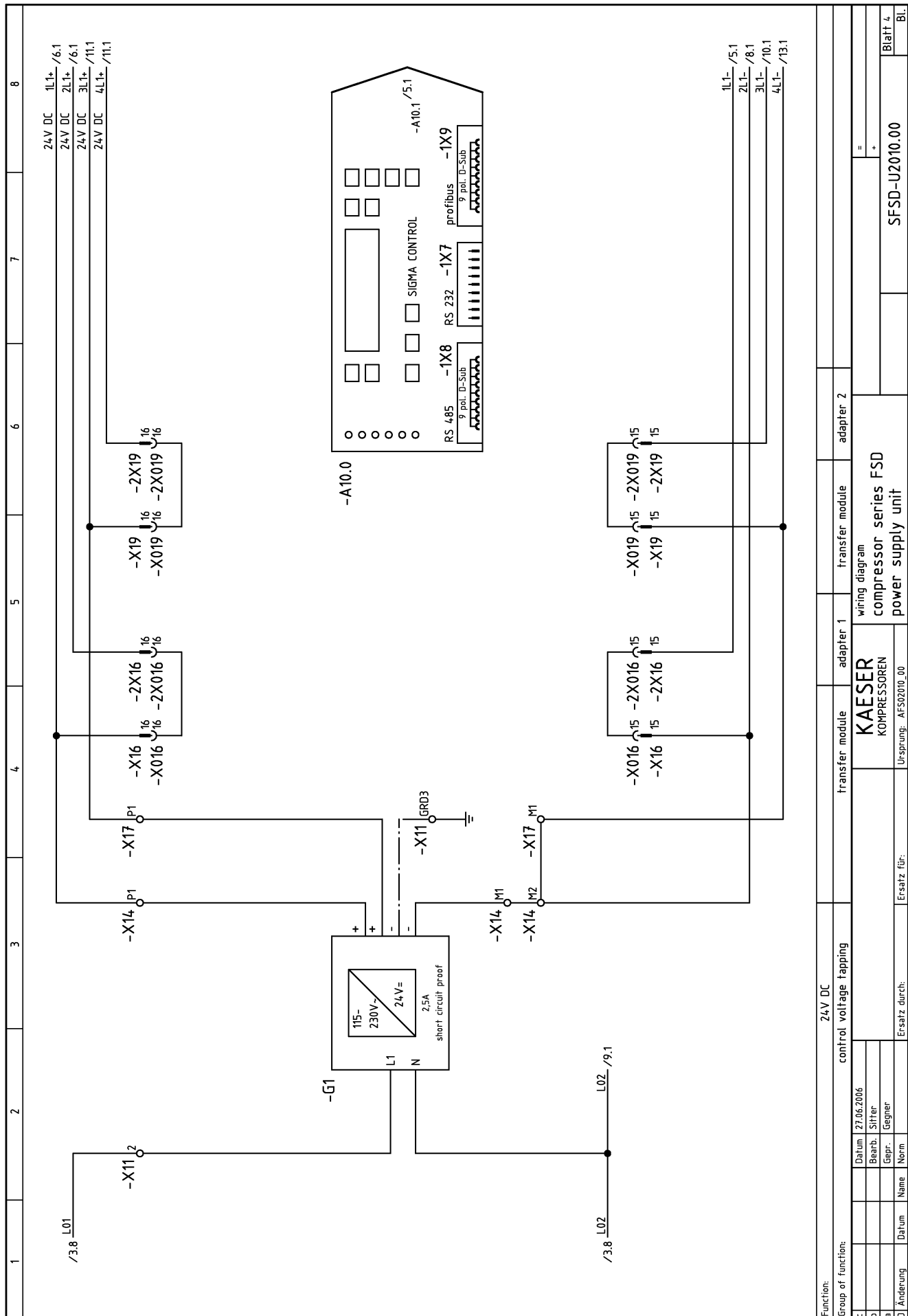
1	2	3	4	5	6	7	8
electrical equipment identification							
general components							
-A03 -A10 -A10.1...-A10.5 -A10.6...-A10.10 -B9.1,-B9.2,-B9.3 -1FU,-2FU -3FU -F2 -G1 -K1M -K2M -K3M -K4M -M1 -M2 -M5 -Q4 -S3 -T1	condensate drain SIGMA CONTROL mother board, inputs/outputs expander board, inputs/outputs temperature probe compressor motor primary control fuse secondary control fuse motor overload relay power unit main contactor delta contactor wye contactor motor starter vent motor compressor motor vent motor controller ventilator circuit breaker vent motor emergency stop pushbutton control transformer	terminal strips/plug-in connections		sensors/actuators			
		SIGMA CONTROL connector strip, mother board connector strip, expander board connector strip interface connector plug adapter 1 connector strip, inside connector strip, inside connector plug, inside connector plug, inside connector strip, external connector plug, external adapter 2 connector strip, inside connector strip, inside connector plug, inside connector plug, inside connector strip, external connector plug, external transfer module 1 terminal strip, digital inputs connector strip digital inputs connector plug transfer module 2 terminal strip, digital inputs connector strip digital inputs connector plug terminal strip, power supply terminal strip, control terminal strip, outputs, volt-free contacts connector plug, outputs/volt-free contacts		-B1 pressure transducer, air main pressure -B2 safety air pressure switch-direction of rotation -B3 high oil filter pressure -B4 pressure transducer, package internal pressure -B5 high air filter pressure -B10 oil separator tank air discharge -B11 temperature probe -U10 air end discharge temperature transducer, temperature probe compressor motor control valve -Y1 solenoid valve -Y7 modulating control (option C1)			
		KAESER KOMPRESSOREN		block diagram compressor series FSD		=	
Änderung		Datum		Name		Blatt 2	
		Ersatz durch:		Ersatz für:		UFSO-U2010.00	
		Datum		Name		Bl.	
		Gepr.		Gepr.			
		Sitter		Sitter			
		27.06.2006					

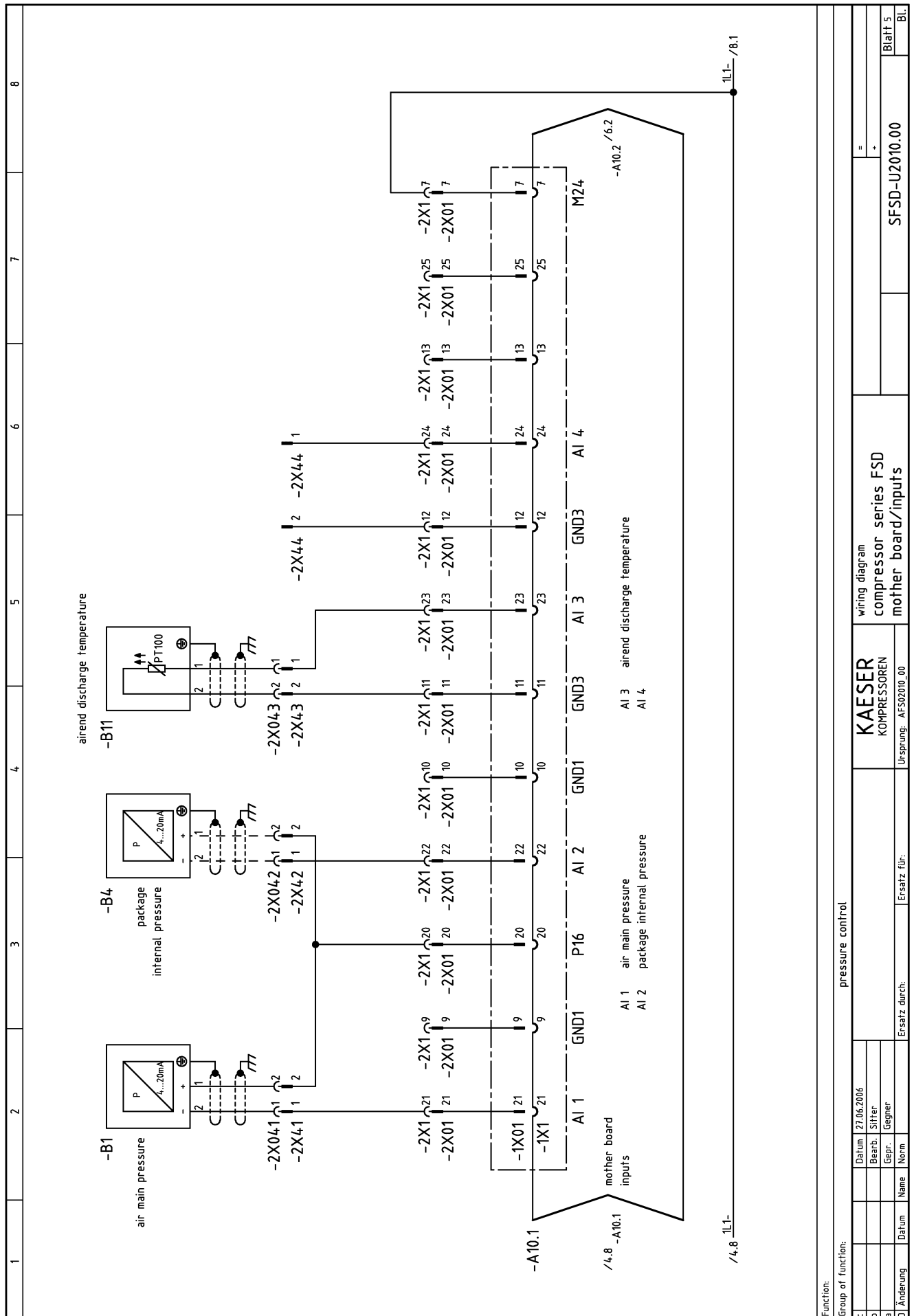


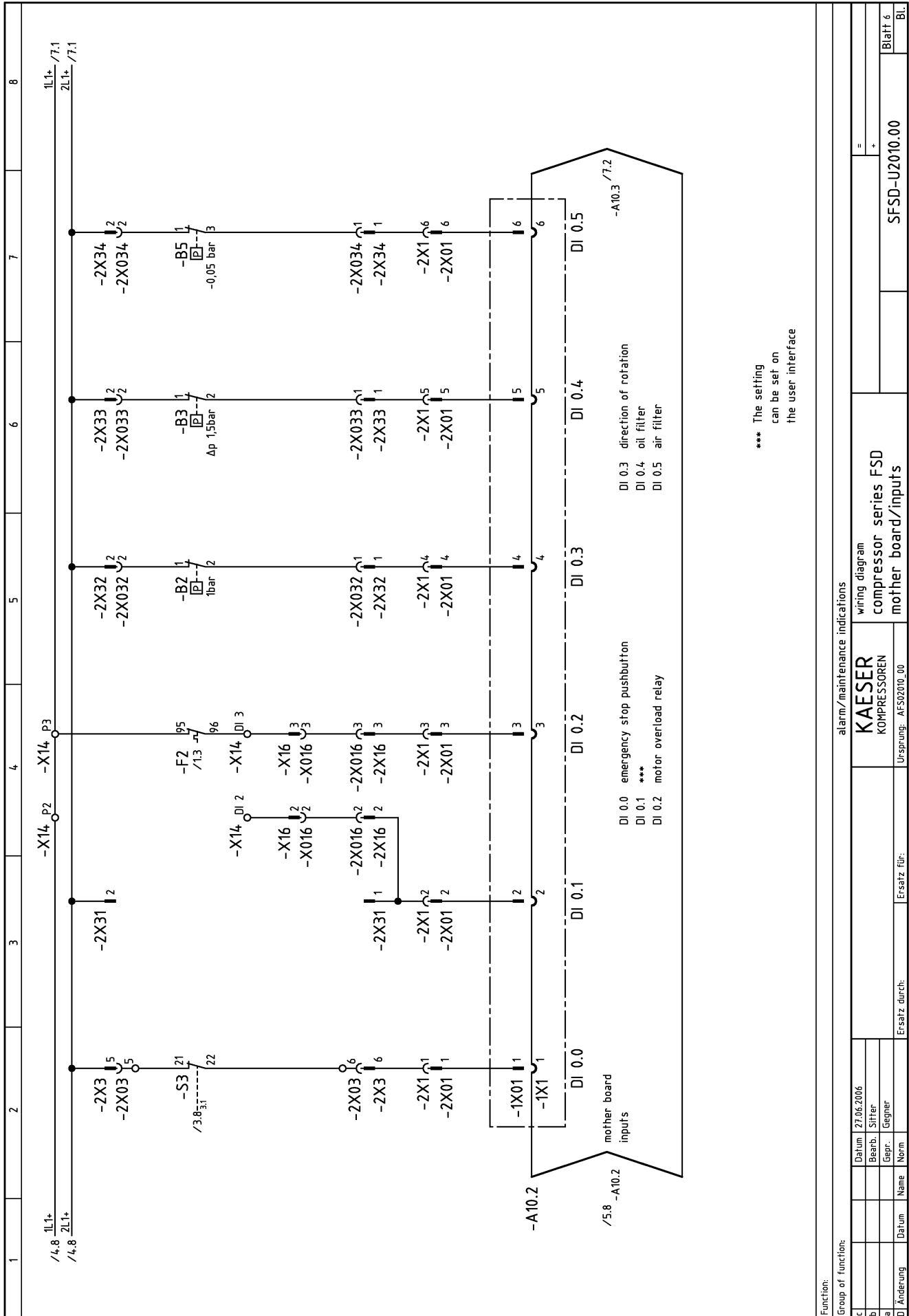


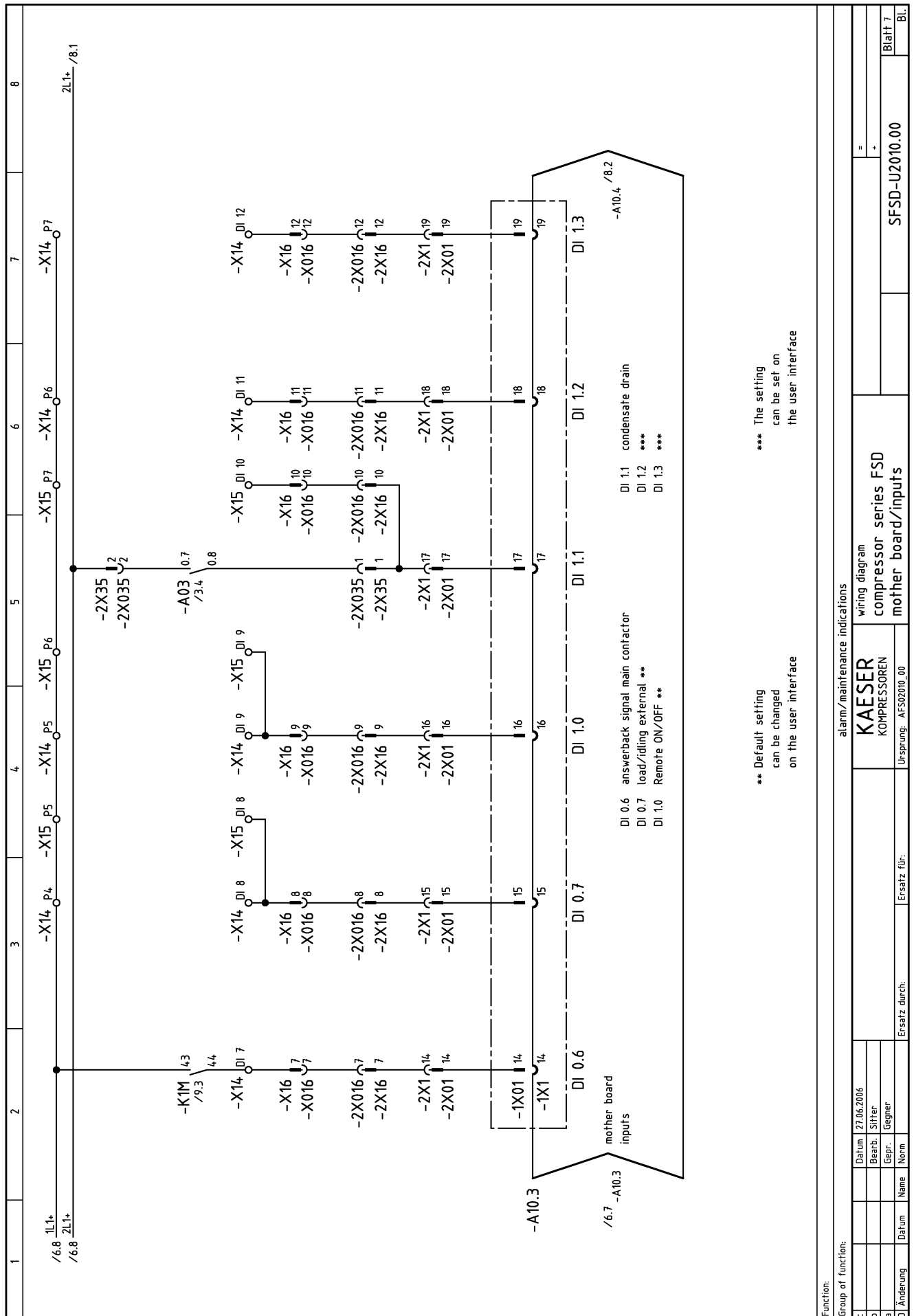


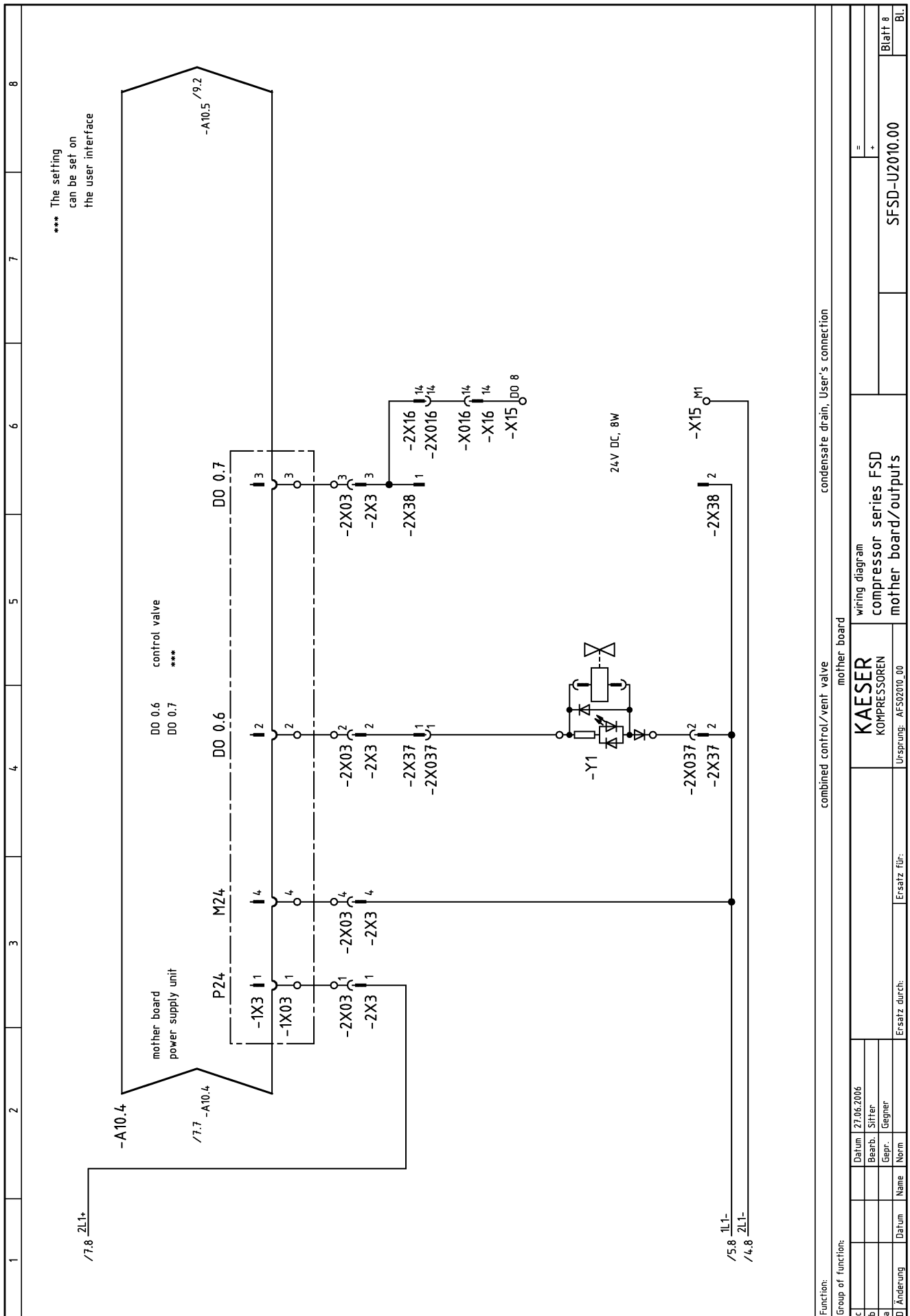


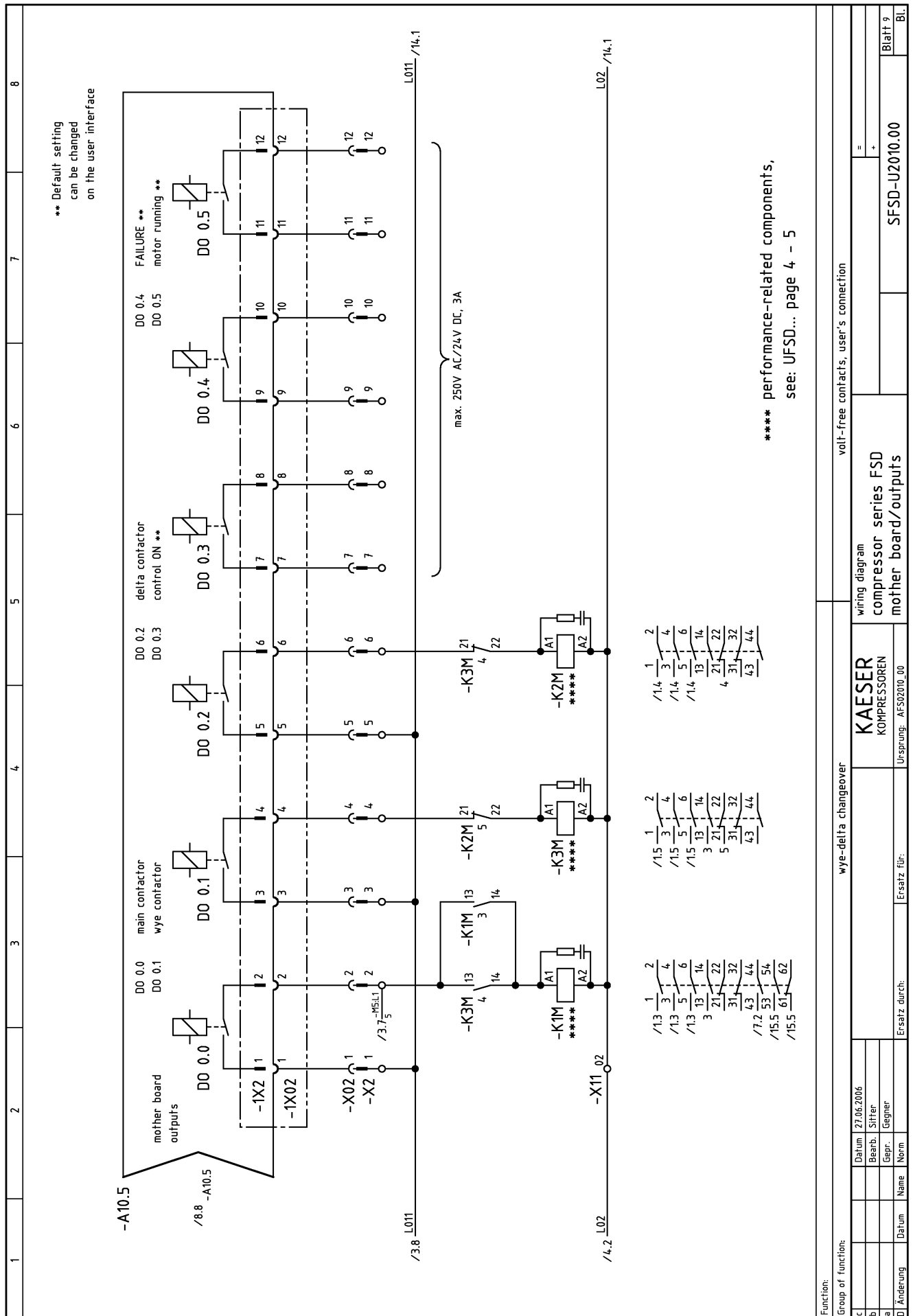


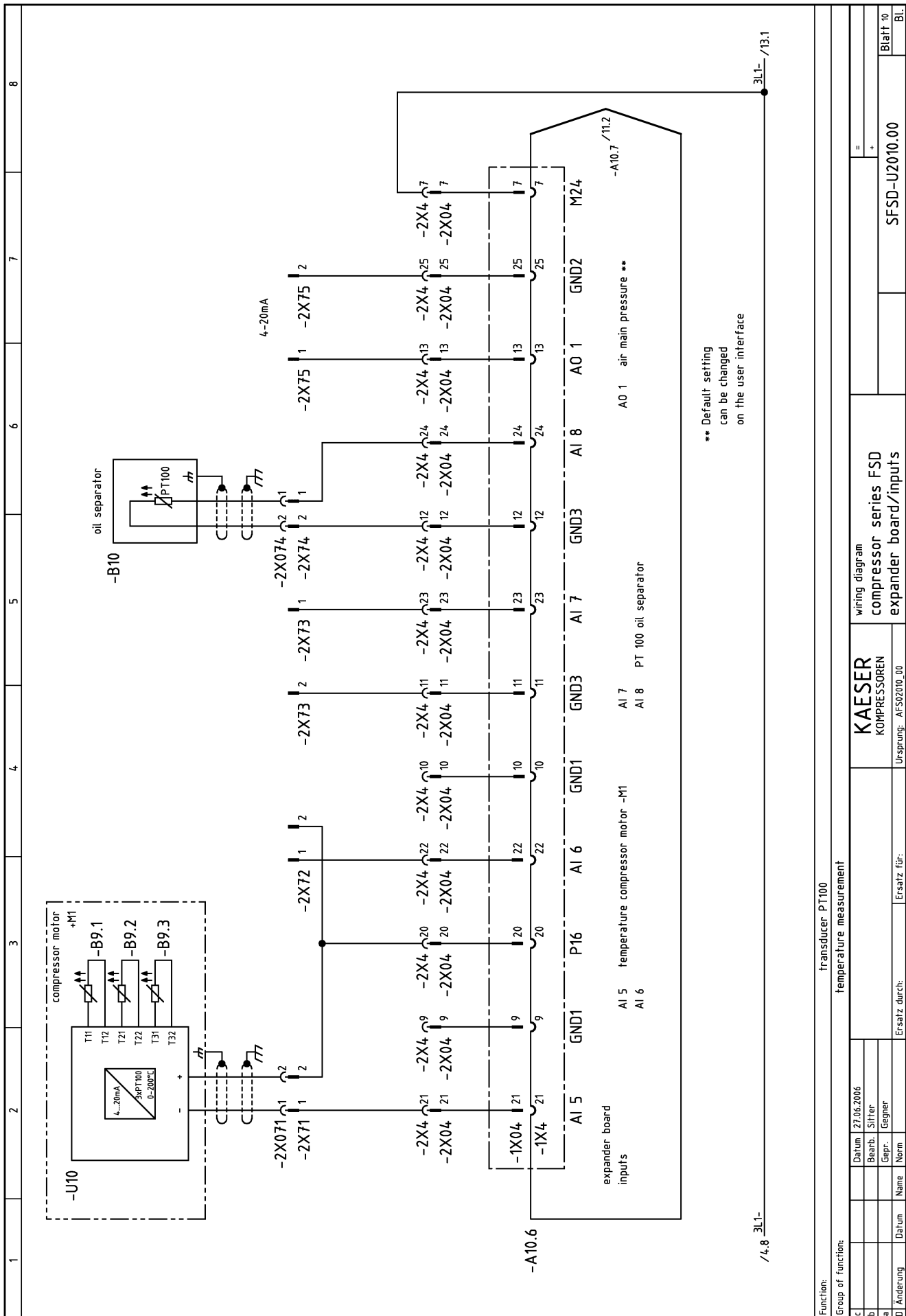


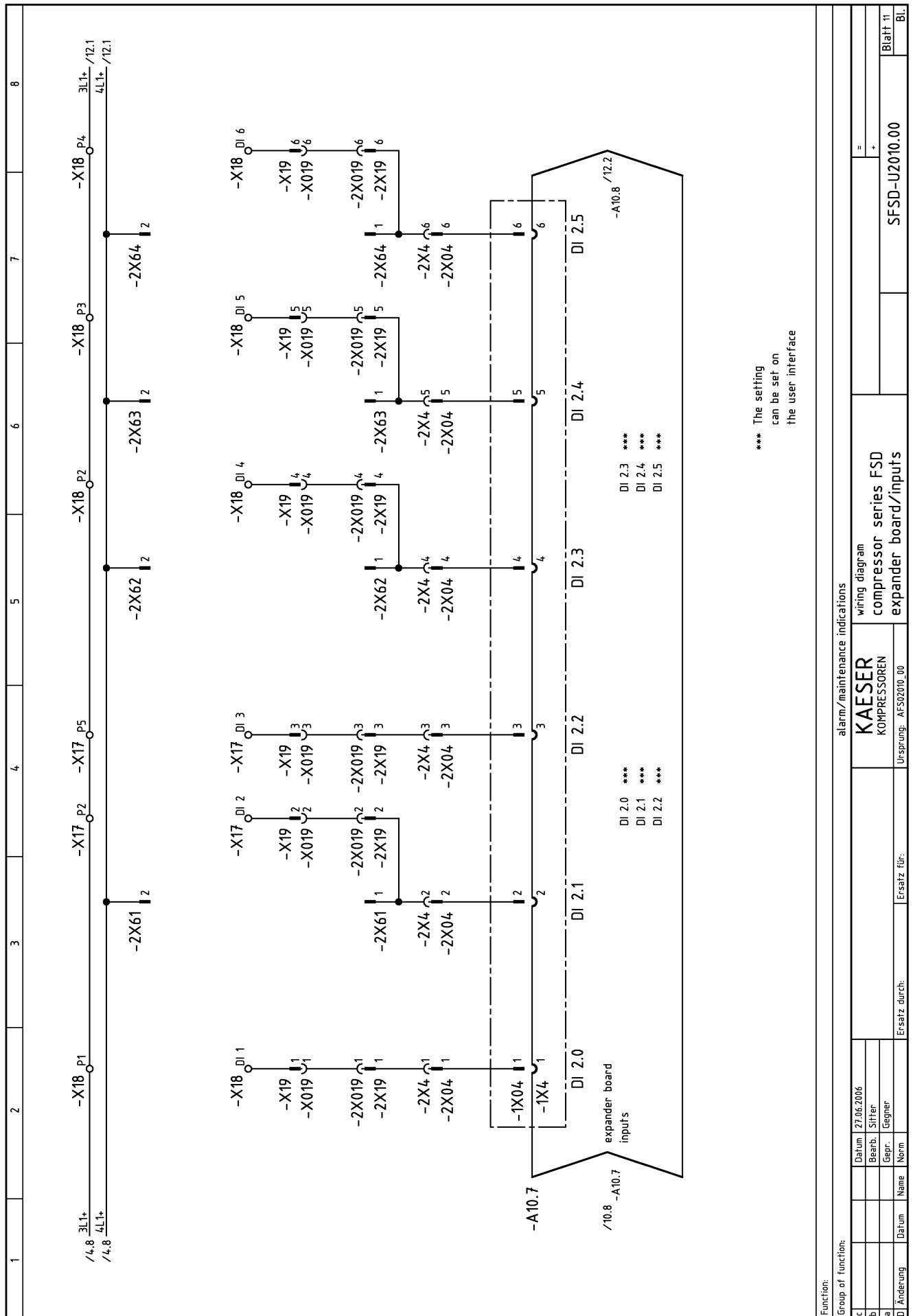


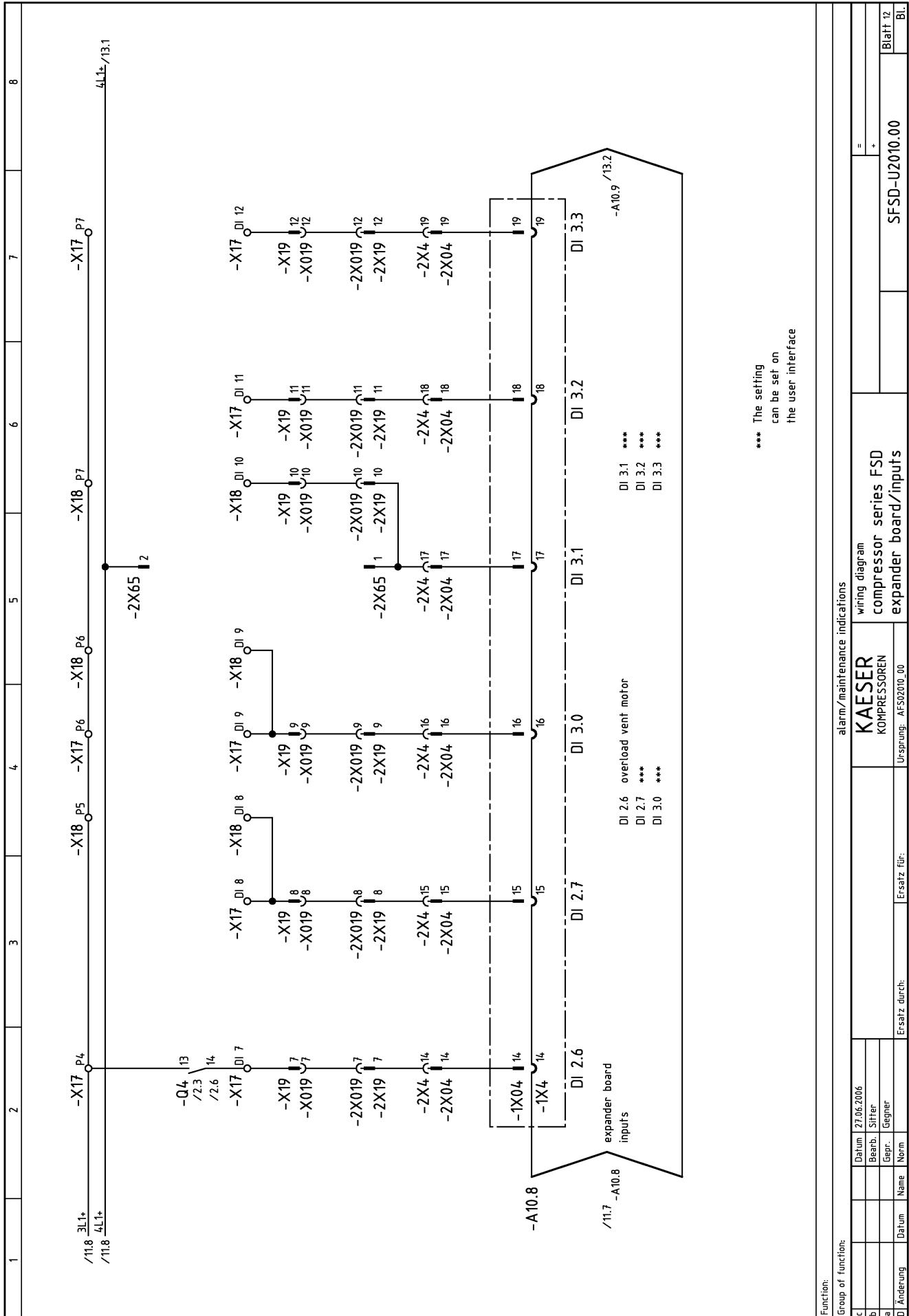


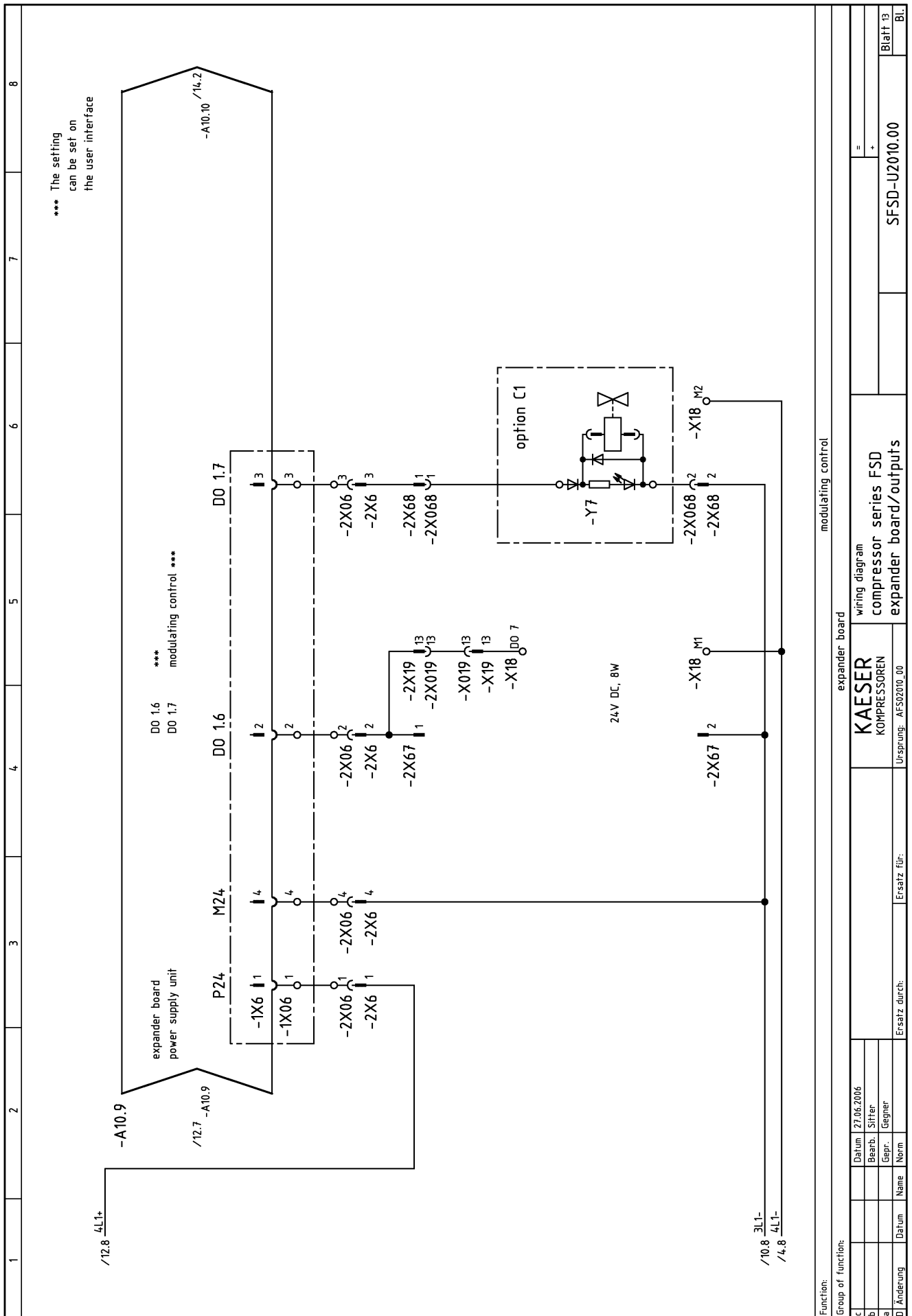


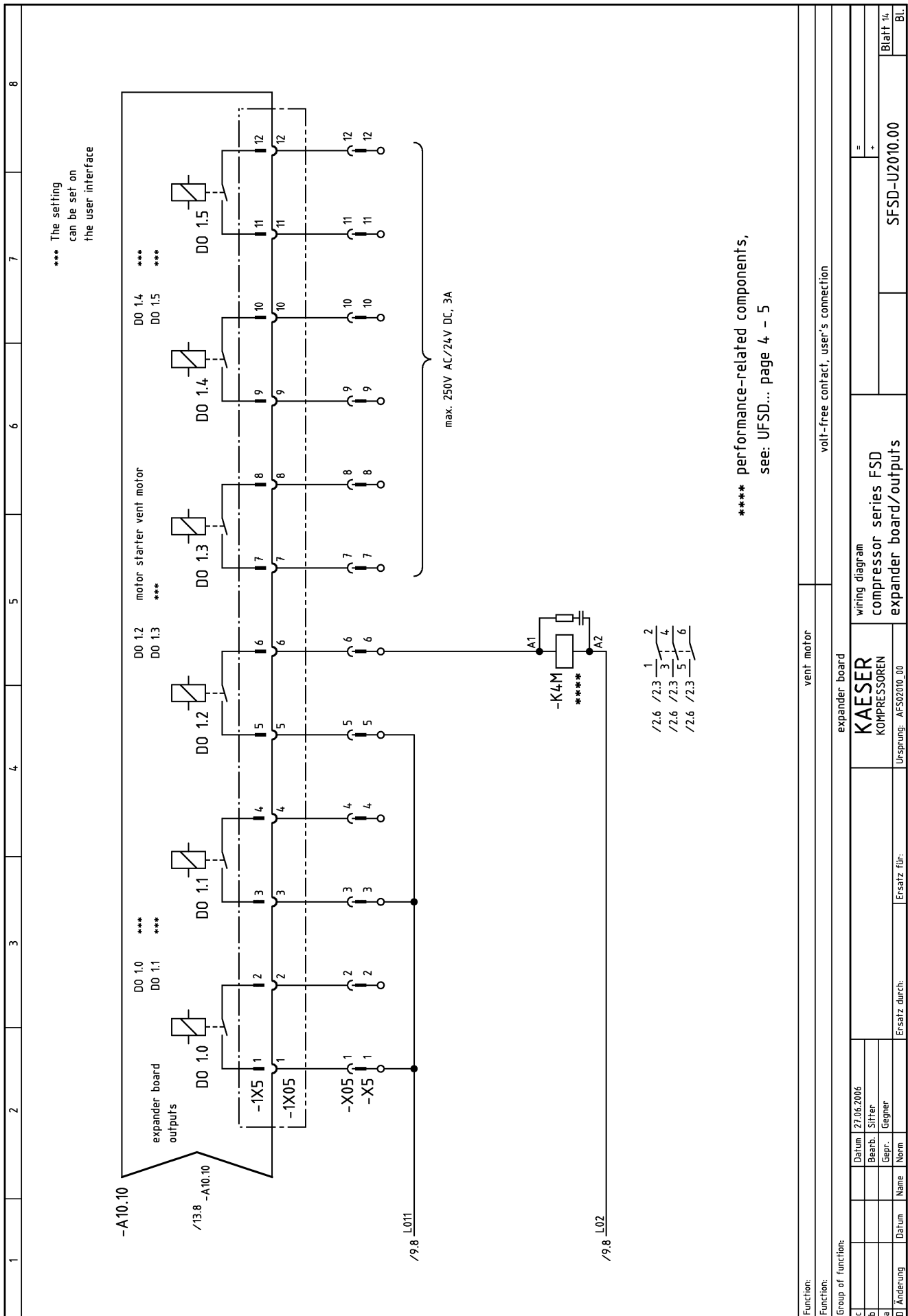












[illegible]

[illegible]

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