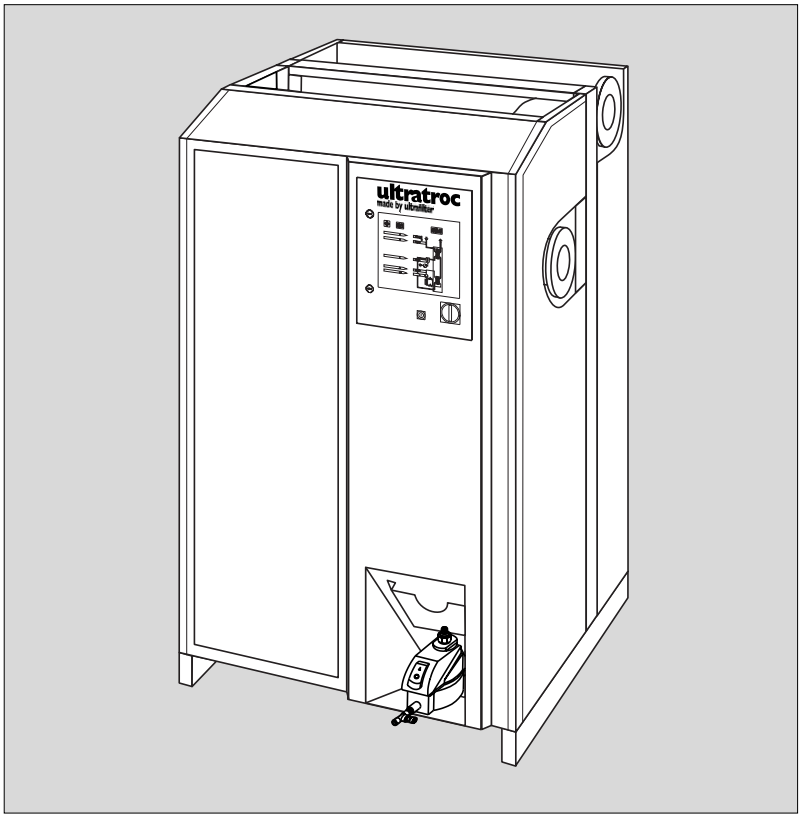
Operators Instruction and Maintenance Manual

BOREAS DSM

SD 1200-60 - SD 3000 W-60
SD 4000-60 - SD 5000 W-60



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Construction Series

BOREAS DSM

Type code	Model	Type-No.	Material-no.
Version aircooled	SD 1200-60	457A	L0457001000
	SD 1400-60	458A	L0458001000
	SD 1600-60	459A	L0459001000
	SD 2000-60	460A	L0460001000
	SD 2400-60	461A	L0461001000
	SD 3000-60	462A	L0462001000
Version watercooled	SD 4000 W-60	593W	L0593001000
	SD 5000 W-60	594W	L0594001000
Version watercooled	SD 1200 W-60	457W	L04570010005000
	SD 1400 W-60	458W	L04580010005000
	SD 1600 W-60	459W	L04590010005000
	SD 2000 W-60	460W	L04600010005000
	SD 2400 W-60	461W	L04610010005000
	SD 3000 W-60	462W	L04620010005000
Version aircooled	SD 4000 A-60	593A	L05930010006000
	SD 5000 A-60	594A	L05940010006000

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All safety notes in this operating instruction which may cause harm to personnel or equipment, when ignored, are marked by the following symbols:

General danger symbol

Electrical danger symbol

1.1 General notes

- This refrigerated compressed air-dryer is referred to below as CA-dryer.
- The Company does not accept responsibility if safety regulations are not met during handling, operation, maintenance and repair, even though these are not strictly stated in these operating instructions.
- We recommend the notice of these operating instructions verified by the operating personnel in writing (personnel file).
- We recommend translation of these operating instruction into native language of foreign workers.
- The usability and the life cycle of the compressed air-dryer as well as the avoidance of premature repairs depends on proper operation, maintenance, care and competent repair under consideration of these operating instructions.
- Hints to figures and locations are in brackets, e.g. (Fig. 5/2)
- Due to our position as suppliers of components we do not always know the final usage and total range of products' applications. We constantly improve our products to the latest state of science and technology and therefore, we assume that our products are free from defects in the sense of product liability. However, it cannot be excluded that during faulty operation in critical areas of application especially at danger to life and limb of persons involved, additionally safety measures may be necessary. Therefore, we request the user of our components / units, to ensure in his own interest, to inform us about the application of our products in order to initiate additional safety measures, if necessary.

1.2 Safety regulations

Attention!
The operator has to observe the national working-, operating- and safety regulations. Also existing internal factory regulations must be met.
Maintenance and repair work must only be carried out by specially trained personnel and, if necessary, under supervision of a person qualified for this work.

- Protective or safety devices must not be removed, modified or readjusted.
- During operation of the CA-dryer none of the protective of safety devices must be removed, modified or readjusted temporarily or permanently.
- Use proper tools for maintenance and repair work only.
- Use original spare parts only.
- All maintenance and repair works must only be executed at stopped machine, disconnected power supply and pulled mains plug. Ensure that the CA-dryer cannot be switched on by mistake.
- Prior to dismounting a part under pressure disconnect the CA-dryer from all pressure sources and depressurize the CA-dryer.
- Do not use inflammable solvents for cleaning.
- Keep the environment absolutely clean during maintenance and repair works. Keep free of dirt by covering the parts and free openings with clean cloth, paper or adhesive tape.
- Never weld at the pressure vessel or modify it in any way.
- Ensure that no tools, loose parts or similar are left in the system.

1.3 Handling with refrigerant

- Wear eye protection and protective gloves
- Avoid contact of liquid refrigerants with your skin (frost-bite).
- Do not inhale refrigerant vapours.
- To avoid higher concentrations, all work rooms must be ventilated very well. The opening of windows and doors may not be sufficient, so an exhausting system must be used directly at the supply point or near the floor.
- Do not smoke, because fire might decompose the refrigerant. The resulting substances are toxic and must not be inhaled.
- Do not have refrigerants escaped during filling or re-pair work. Cover with tape.
- Leave the room immediately and only enter after the room has been sufficiently ventilated when refrigerant concentrations (e.g. pipe line leakages) appear sud-denly.
- Execute welding and soldering works on refrigerating systems in well ventilated rooms only. Refrigerants will be decomposed in flames as well as in electrical arcs.
- The resulting decomposition products are toxic.
- Before welding and soldering at refrigerating systems, the refrigerant must be removed.
- A stinking smell points to decomposition of refrigerant due to overheating:
  - leave room immediately
  - ventilate room very well.

1.4 First aid

- Take victim immediately into the fresh air or into a very well ventilated room.
- Splashes of refrigerant in the eyes must be blown out with the mouth. Then rinse eyes with plenty of water. Do not wipe with cloth!
- If the victim does not breathe, perform a mouth-to-mouth resuscitation or use a respirator until the doctors arrival.
- **Call the doctor and inform him that accident has been caused by refrigerants, for refrigerant type see identification plate!**
- Never leave the victim unattended!

1.5 Disposal

- When disposing of used devices, pay attention to oil and refrigerant in the hermetically sealed refrigerating circuit of the CA-dryers. Therefore, before dismounting, these operation media must be disposed by a special company.
- The used materials are listed on the recycling label inside the CA-dryer.

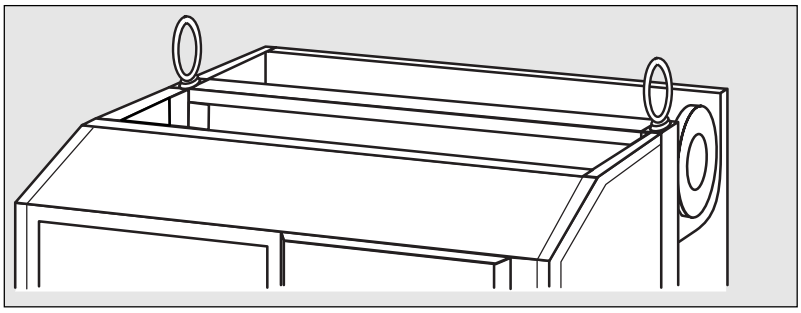
Attention!
Do not dispose waste oil into the environment. Do not mix with household rubbish and do not burn in unauthorized plants.

- The escape of refrigerant into the atmosphere must be prevented by appropriate measures.

2.1 Transportation

The CA-dryer can be transported for a short time in an inclined position of up to 45 °. For transportation or lifting by means of a crane it is possible to use lifting eyes on the upper side of the frame (fig. 1).

Fig. 1 Mounting of lifting eyes (M20)



Attention!
When using lifting eyes the load limitations must be observed!
The lifting eyes must only be loaded vertically (use traverse)!

The CA-dryer may be transported by a fork lift truck or stacker lift truck.
Transportation has to be carried out in the normal operating position of the CA-dryer.

2.2 Requirements on the place of installation

At the site of installation, the CA-dryer can be installed without anchorage or special foundation at the location desired.
The CA-dryer is designed for an ambient temperature of 100 °F.

Attention!
At different ambient conditions pay attention to the layout data!

To prevent the condensate from freezing the room temperature must not drop below 35 °F.

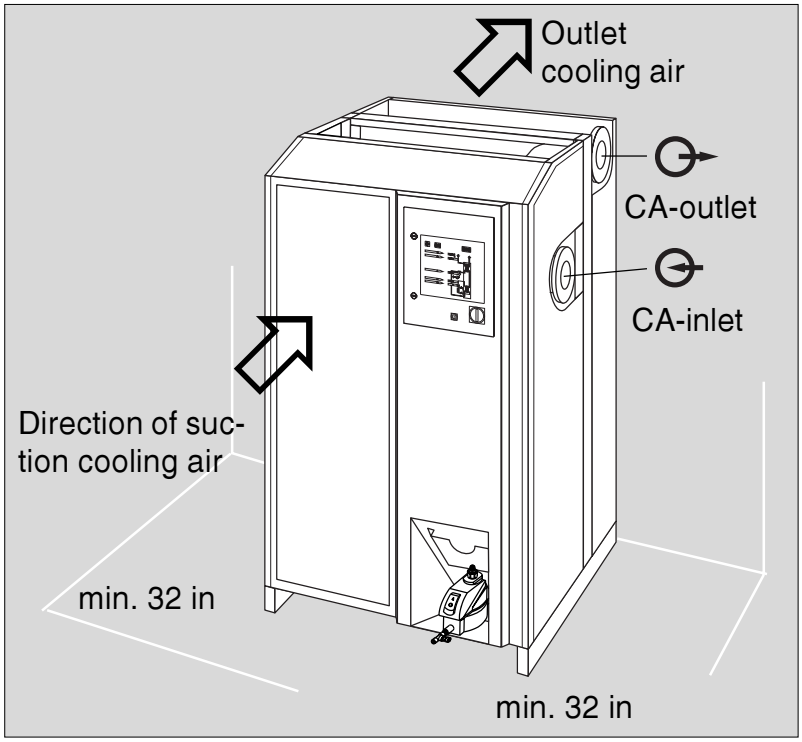
2.3 Installation (mounting)

Install the CA-dryer with access to the front panel to reach the integrated switches and indicators. Furthermore leave space for service purpose on both sides of the CA-dryer (fig. 2).

2.3.1 Version air cooled

The cooling air for the refrigerant condenser will be sucked in at the front panel (fig. 2). This area must be kept free and not be obstructed.
If necessary, the cooling air may be led to the CA-dryer from outside through wall openings.
The cooling air outlet is positioned at the top of the unit (fig. 2). Ensure a free air outlet and do not obstruct the outlet of the cooling air.
If the CA-dryer is connected to an exhaust trunk, an additional fan must be installed, depending on the dimensions of the trunk.

Fig. 2: Installation of the CA-dryer (air cooled)



2.4 Compressed air connection

The connection must be executed acc. to marking at the CA-dryer (fig. 2).
For service purposes the installation of a bypass line is recommended (additional equipment).

Attention!
Before mounting the CA-dryer, welding residual, rust or other pollution must be removed from the pipelines to be connected. If pollution cannot be excluded, proper filter system must be installed
The compressed air pipes must be installed stress-free. Expansion joints are recommended in case of vibrations and pulsations.

2.5 Electric connection

The CA-dryers are completely equipped and wired. They merely have to be connected to a power supply. The CA-dryers are to be protected by slow-blow fuses as defined in the wiring diagram.
Voltage: acc. to name plate or wiring diagram resp.
The power supply is provided in the switch cabinet.

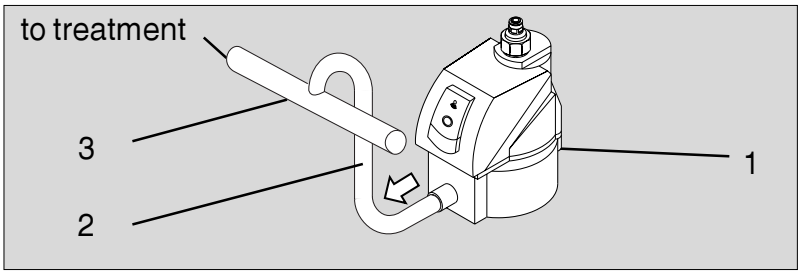
Attention!
The proper phasing as given in the wiring diagram must absolutely be fulfilled!
At correct direction of rotation the cooling air is sucked through the condenser!

2.6 Connection condensate drain

The CA-dryer separates water as well as oil from the compressed air. The water/oil mixture must not be led into the sewage. Water and oil must be separated by suitable separators (additional equipment).

Attention!
Route outflow so that persons or objects will not be struck by condensate (condensate escapes under operating pressure)!

Fig. 3 Connection condensate drain



A minimum operation pressure of 30 psig is required for safe operation. The condensate drain pipe (fig. 3.2) may be fixed to the wall with a rising slope of maximum 15 ft. Thereby the minimum operation pressure increases for 1/2 psi per ft. The collecting pipe (fig. 3/3) should be laid throughout its whole length at least as the cross-section of the condensate outlet.

2.7 Connection cooling water

A minimum cooling water differential pressure of 30 psig is required. The cooling water pressure must not exceed 145 psig.

Attention!
It is essential to adhere to the limit values regarding cooling water quality described in the appendix. In case of deviating conditions please contact the manufacturer. This note applies for all machines with stainless steel plate condensers.

3.1 Designation

Refrigerated compressed air-dryer (CA-dryer).
Version see type code (page 2)

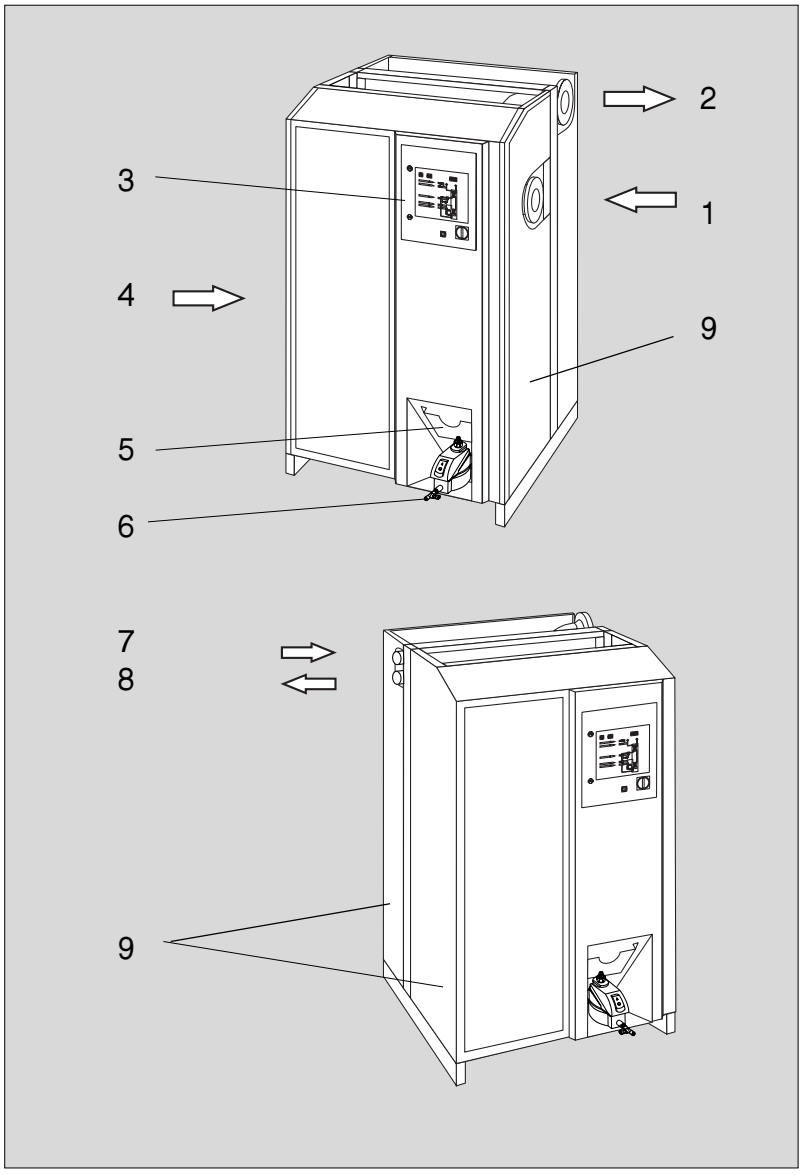
3.2 Purpose

Compressed air will be dehumidified by the CA-dryer.

3.3 Unit Layout

Following components of the CA-dryer are accessible from outside (fig. 4).

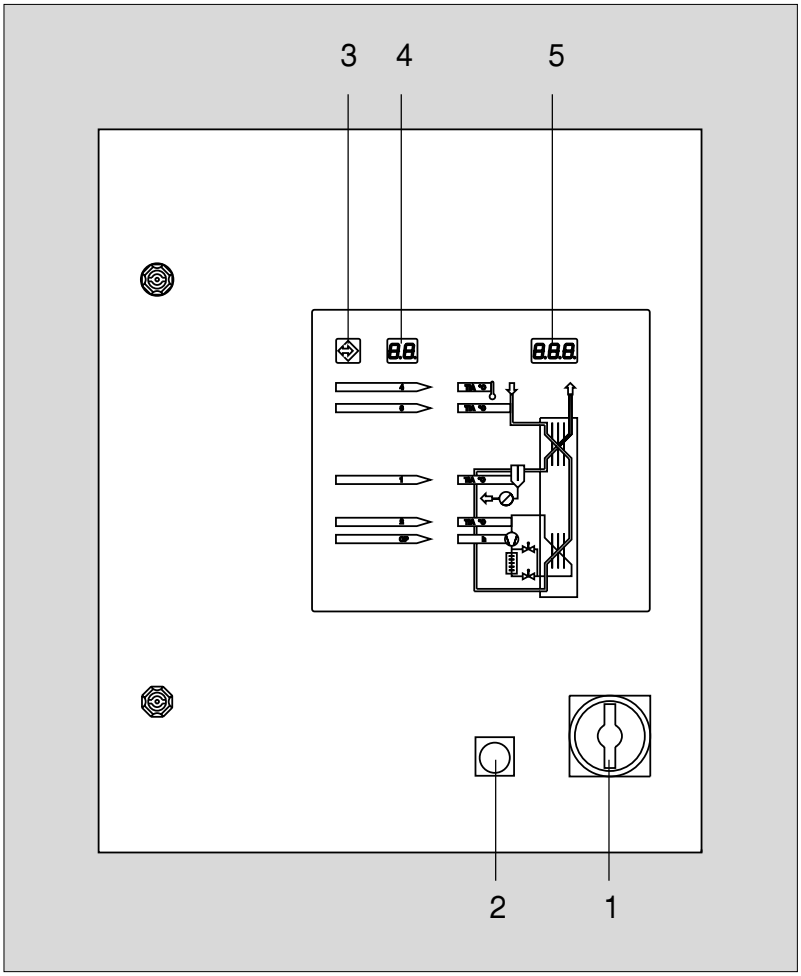
Fig. 4: Complete system



1 Compressed-air inlet
2 Compressed-air outlet
3 Switch cabinet with power supply (Fig. 5)
4 Cooling air inlet
5 Operating instructions
6 Condensate outlet
7 Cooling water inlet (water-cooled version)
8 Cooling water outlet (water-cooled version)
9 Access for service

3.3.1 Switch cabinet

Fig. 5 Switch cabinet



1 Main switch
2 Operation switch
3 Data input and output key
4 Measuring point indication
5 Temperature and working hour indication

3.4 Nominal power of CA-dryer

The nominal power of the CA-dryer mentioned in the technical data is related to a working pressure of 14 1/2 psig, a compressed air inlet temperature of 100°F as well as an ambient temperature of 100 °F acc. CAGI.
Lower working pressure, higher compressed air inlet temperature and/or higher ambient temperatures overload the compressor which causes to an increased pressure dew point and the compressor can be stopped by internal safety devices.
At an essentially modified operation mode as mentioned, contact the deliverer of the CA-dryer for support.

3.5 Principle of operation

The CA-dryer includes a refrigerant system cooling the compressed air flow. The steam saturation limit is lowered causing condensate to fall out, which is removed by the condensate drain.
The higher the cooling temperature difference of the air, the higher is the amount of condensate.
The lower the cooling temperature of air, the lower is the moisture content.
The lower limit of air cooling results from the operating principle of the CA-dryer based on the moisture separation in liquid form. Thus, the freezing point of water, i.e. a temperature of 35 °F, is the lower limit. For reliability reasons, a practical setting is used, which lies above this theoretical limit of 35 °F.

3.6 Mode of operation

3.6.1 Compressed air side

The compressed air precooled in the aftercooler and saturated with moisture enters into the CA-dryer and is precooled in the first cooling stage, the air-to-air heat exchanger without additional energy. Cooling is carried out in counterflow to the already cooled air heated during this process.
The cooling to the pressure dew point is performed in the second cooling stage, the refrigerant-to-air heat exchanger cooled by the refrigerant system installed. Subsequently, the cooled compressed air is reheated in the air-to-air heat exchanger as already described.
The pressure dew point temperature is indicated on the switch cabinet (fig. 5/5).

3.6.2 Refrigerant side

The refrigerant is injected into the refrigerant-to-air heat exchanger where it evaporates, thereby cooling the compressed air. A capacity control system at the refrigerant side controls the capacity required by the compressed air to ensure a constant pressure dew point temperature in all capacity ranges.
The refrigerant compressed by the motor compressor is condensed within the condenser and is available for the evaporation again.

3.6.3 Pressure dew point control

The CA-dryer can be operated under partial load, caused by lower compressed air throughout or lower compressed air inlet temperature, within the range of 0 to 100% capacity in continuous operation.

3.6.4 Capacity levels

3.6.4.1 Types 593A, 593 W, 594A, 594 W

The CA dryer disposes of two parallel refrigerant compressors. If the load is reduced to less than 50 % one compressor is switched off depending on the refrigerant pressure in order to reduce the power consumption of the CA dryer. The values registered by a pressure pick-up are transmitted to a Siemens Logo which ensures the minimum runtimes of the compressors.
The Siemens Logo has a fixed factory setting and must not be changed by unauthorized persons.
If the load rises again to more than 50 % the second compressor is switched on again via the same components.

3.6.4.3 Siemens Logo

The values registered by a pressure pick-up are transmitted to a Siemens Logo which ensures the minimum runtimes of the compressors.
The Siemens Logo has a fixed factory setting and must not be changed by unauthorized persons.

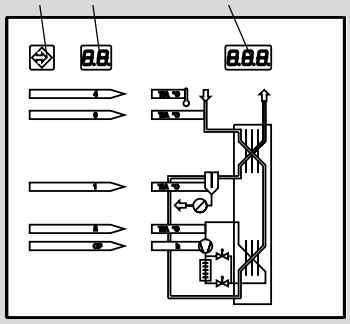
3.7 SAB-Processor

The SAB-Processor measures, shows and stores temperatures, working hours and failures.

3.7.1 Display

The display consists of a 2-digit measuring point indication (fig. 6/2) and a 3-digit indication for the corresponding values (fig. 6/3). The data to be requested can be get by short operation of the data input/output key (fig. 6/1).

Fig. 6 Display



1 Data input/output key
2 Measuring point indication
3 Temperature and working hour indication

3.7.2 Temperature measuring

The SAB-Processor has 4 temperature inputs:
1. Pressure dew point
2. Refrigerant suction gas temperature
3. Compressed air inlet temperature
4. Ambient temperature

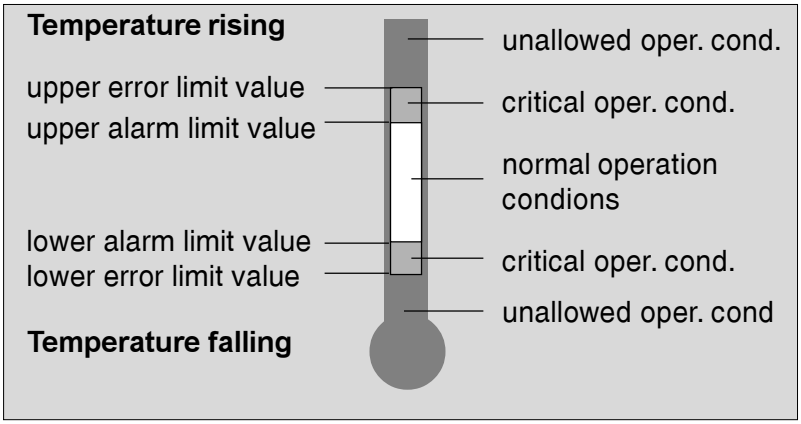
3.7.3 Plausibility and average value

Incoming measured values will be compared and the resulting average values will be processed. Rapid changes of the incoming measured values on steady higher or lower value resp. will be checked. If the value changes are too high it is recognized as measuring failure.

3.7.4 Limit values

2 limit values are provided for each temperature between which the temperatures must be during normal operation. After starting the CA-dryer all errors will be suppressed for 15 minutes.

Fig. 7: Limit values

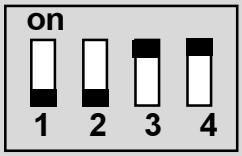


3.7.5 Pressure dew point report

The customer of these CA-dryers has the possibility to adapt the upper error value of the pressure dew point to the company´s needs, if necessary.
The actual status of the DIP-switches is read during the program start only, i.e., after each change of the switch position, a power disconnection must be executed Switches 1 and 2 are used for the upper switching point of the pressure dew point , switches 3 serves for changing between °C and °F . Switch 4 must not be changed in its position.

Fig. 8: Limit value setting

Switch position	1	2	3	4
no alarm	off	off	on	on
64 °F	on	off	on	on
59 °F	off	on	on	on
54 °F	on	on	on	on
no alarm	off	off	off	on
18 °C	on	off	off	on
15 °C	off	on	off	on
12 °C	on	on	off	on



Factory setting

3.7.6 Temperature - History

All 10 minutes the temperatures are read into and updated in a memory.
Additionally date and time of all values are stored, too. So the temperatures of the last 24 hours can be followed up.

3.7.7 Operating status - normal operation

During normal operation the display indicates the dew point temperature. Following values can be recalled consecutively when the data input and output keys are pressed:

1. Pressure dew point (compressed air)
2. Suction gas temperature (refrigerant compressor)
3. Inlet temperature (compressed air)
4. Ambient temperature

OP Operating hours (indicated value x 100)

If key (fig. 6) is not operated, the display shows again the pressure dew point after about 45 seconds .

3.7.8 Operating status - alarm / failure

Corresponding to the set limit values, at critical operation phases an alarm, and at prohibited operation conditions a failure report is triggered by the processor´s monitoring system (see 5.2.2).

3.7.9 SAB-service unit (additional equipment)

The SAB-service unit permits changes of limit values, simple data input and output as well as the recording of all data for service purposes and documentation.
All data can be printed via the SAB-service unit by means of a printer.

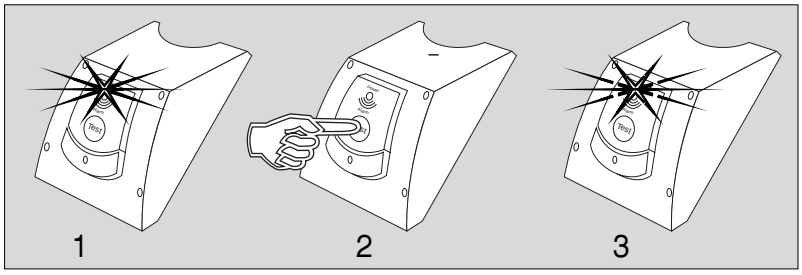
3.8 Condensate draining

The condensate drain automatically drains the condensate. A minimum pressure of 30 psig is required for safe operation.

3.8.1 Condensate drain

Once the container has filled with condensate, so that the capacitive level sensor emits a signal, the internal solenoid valve opens and the condensate is forced by the working pressure into the discharge pipe.
The condensate drain electronic system ensures the closing of the outlet opening before any compressed air can escape.

Fig. 9: Condensate drain indications



1 Condensate drain is ready for operation (LED lights)
2 Manual draining (operate button for max. 30 sek.)
3 Failure (LED blinks, see 5.2.3)

3.8.2 Drain valve

At standstill or very small volume flow of the CA-dryer, a time-controlled solenoid valve avoids the collection of condensate in the inlet pipe to the water separator.
Furthermore the solenoid valve controls the desludging of the heat exchanger.
The solenoid valve is accessible after removing the right side plate (fig. 4/9).

Part 4 Operation

4.1 Commissioning

After installion, the CA-dryer can be switched on with the main switch (fig. 5/1).
So the refrigerating compressor heating and the SAB-Processor is supplied with power.
Before operating the operation switch (fig. 5/2), a waiting period of at least 6 hours is necessary, to enable a pre-heating of the refrigeration compressor.

4.2 Starting

The CA-dryer is switched on via the operation switch (fig. 5/2). After approx. 5 minutes the compressed air admission is possible by connecting the compressed air compressor.

Attention!
A period of 5 minutes must be kept between switching off and switching on the CA-dryer to achieve a pressure compensation within the refrigeraion system.

After some hours of operation under load, it should be controlled that condensate is generated and drained.
The CA-dryer is designed for continuous operation and may remain switched on during periods of no load, as it adapts to the required performance automatically.

4.3 Operation

Operation is indicated by the luminous operation switch (fig. 5/2).
The temperature display at the switch cabinet (fig. 5/5) indicates the pressure dew point reached by the CA-dryer.
During normal operation, the lamp „Power“ (fig. 9/1) lights permanently .

4.4 Stopping

At standstill periods, the CA-dryer is switched off with the operation switch, the main switch remains switched on.
For longer standstill periods or during service resp. the CA-dryer is switched off with the main switch (see 4.1).
At restarting proceed as mentioned in item 4.2.

5.1 Maintenance

Attention!
Prior to any maintenance works all safety regulations for electrical systems and units must be observed.

5.1.1 Daily maintenance

Maintenance intervals highly depend on the mode of operation and the ambient conditions on site, the intervals below are only to be understood as general recommendations.

a) Check function of condensate drain.
Condensate drain:
Operate “Test ”-button (fig. 9/2),
check, if water is drained.

b) Monitoring of all temperatures.

5.1.2 Weekly maintenance

Inspection and cleaning of condensate draining system if necessary.

Attention!
Maintenance work must be performed at the depressurized condensate drain only. For this purpose, the installation of a bypass line is recommended (additional equipment).

5.2 Troubleshooting

5.2.1 Function:

Cause	Remedy
No function	- Check and ensure power supply. - If power supply is o.k., call for service.

5.2.2 Reports of the SAB-processor:

5.2.2.1 Alarm indications

A1	Pressure dew point in critical range	Check load conditions of CA-dryer
A2	Suction gas temperature in critical range	Check control (call for service)
A 3	Inlet temperature in critical range	Check aftercooler of CA-dryer
A 4	Ambient temperature in critical range	Lower machine room temperature

5.2.2.2 Failure indications

H 1	Pressure dew point too high	Check load conditions of CA-dryer
H 2	Suction gas temperature too high	Check control (call for service)
H 3	Inlet temperature too high	Check aftercooler of CA-dryer
H 4	Ambient temperature too high	Lower machine room temperature
L 1	Pressure dew point too low	Check control (call for service)
L 2	Suction gas temperature too low	Check control (call for service)
L 3	Inlet temperature too low	Increase compressed air inlet temperature
L 4	Ambient temperature too low	Increase machine room temperature

After 45 seconds, the indication always goes back to the failure appeared first, which was also stored and counted particularly. If a failure disasppears again, the corresponding indication disappears, too.

5.2.2.3 Failure reports with stopping the refrigerant compressor

Note: At determined operation conditions, the fans can run on.

FF	Pressure dew point too low	Check control (call for service)
FH	Refrigerant overpressure	Check fans or cooling water control valve (water-cooled version) resp., clean condenser, lower machine room temperature
FL	Refrigerant underpressure	Increase machine room temperature Lack of refrigerant - check cooling circuit for leakage, Check control (call for service)
FI	Overcurrent	Check current consumption of refrigerant compressor and replace if necessary (call for service)

5.2.2.4 Failure acknowledgement

FH: operate reset button at pressure limiter
FH, FI: Acknowledgement by switching the operation switch on and off

5.2.3 Reports of the condensat drain

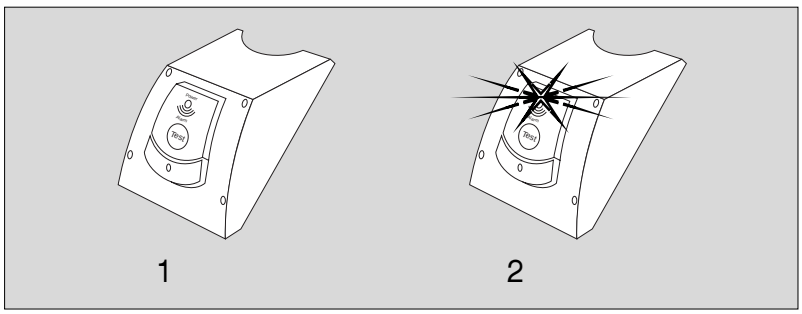


Fig. 10: Condensate drain failure reports

5.2.3.1 No reports (fig. 10/1)

Cause	Remedy
No power supply,	check power supply, replace condensate drain if necessary

5.2.3.2 Failure reports (fig. 10/2)

Indication by blinking LED

Cause		Remedy
5.2.3.3	no condensate	Open ball cock in condensate pipe
	air swinging pipe blocked,	Open ball cock in swinging pipe, clean pipe
	too low operation pressure	Ensure operation pressure of system
5.2.3.4	level- or temperature sensor defect	Replace condensate drain

5.2.4 Water in compressed air system

Cause		Remedy
5.2.4.1	Temporary overload of the CA-dryer due to non-uniform compr. air consumption	Reduce load, check whether CA-dryer´s capacity is properly selected
5.2.4.2	Overload due to high volume flow, or to high compressed air inlet temperature	Reduce CA-consumption or increase CA-dryer capacity

Cause		Remedy
(at installed bypass line)		
5.2.4.3	Bypass valve of bypass line opened	Close bypass valve in the bypass line
5.2.4.4	Bypass valve of bypass line leaking	Seal or replace bypass valve in the bypass line, check CA-dryer´s capacity

5.2.5 Stopping CA-dryer during operation:

Cause	Remedy
Stopping of CA-dryer by installed pressure limiter due to overload	- eliminate cause of trouble - open left side panel
5.2.5.1 CA-volume flow too high	Check whether CA-dryer´s capacity is properly selected, increase CA-dryer´s capacity
5.2.5.2 CA-inlet temperature too high	Install aftercooler behind the compressed air compressor or check if already installed
5.2.5.3 Room temperature too high	Ensure proper ventilation of CA-dryer´s location
5.2.5.4 Defective fan or cooling water regulator resp. (water-cooled version)	Replace fan or cooling water regulator resp., call for service
5.2.5.5 Condenser polluted	Clean condenser
5.2.5.6 Operating pressure too low	Increase operating pressure, check whether CA-dryer´s capacity is properly selected
Failure acknowledgement	**For failure acknowledgement press reset-button at pressure limiter**

5.2.6 High differential pressure at CA-side:

Cause	Remedy
5.2.6.1 CA-volume flow too high	Check whether CA-dryer´s capacity is properly selected, increase CA-dryer´s capacity
5.2.6.2 Operating pressure too low	Increase operating pressure, check whether CA-dryer´s capacity is properly selected
5.2.6.3 Icing of CA-dryer	**Characteristics:** - differential pressure at CA-side increases - volume flow decreases Disconnect unit and maintain compressed air flow. After approx. half an hour, the differential pressure will return to normal value. Restart the unit. If the heat exchanger ices up, again callfor service

US	Technical Data										
Size of Housing				1						2	
Version air cooled											
Pos.			Type-No.	457	458	459	460	461	462	593	594
1	Volume flow		cfm	1,200	1,400	1,600	2,000	2,400	3,000	4,000	5,000
2	Cooling air required		cfm		6,100			5,800		12,000	11,500
3	Power consumption	(total)	A	8.3	8.6	9.7	11.8	12.0	15.9	23.5	29.7
4	Power consumption	(fan)	A	10.4	10.8	12.1	14.8	15.0	19.9	29.1	37.1
5	Power supply		Voltage	460 - 3 - 60 Hz							
6	Allowable pressure (compressed air)	min./ max.	psig	30 / 150							
7	Allowable pressure (refrigerant)	low pressure side, high pressure side	psig	230 / 290							
8	Compressed air connections		ANSI / 150psig		4"			6"		8"	
9			lb	945	990	1,012	1,320	1,342	1,419	2,222	2,596
10	Dimensions	height	in.	75							
		width		48						88	
		depth		48							
11	Refrigerant quantity	R134a	lb oz	14 5 1/4	20 15		37 7 3/4		42 15 3/4	73 13 3/4	105 13 1/4
12	Sound pressure level		dB (A)	< 80							
Version water cooled											
Pos.			Typ-Nr.	457 W	458 W	459 W	460 W	461 W	462 W	593 W	594 W
13	Cooling water connections		NPT	1"							
14	Cooling water capacity approx.		gpm	4 1/2	6	6 1/2	9	10	12	17 1/2	20 1/2
15	Current total	max.	A	6.4	6.7	7.8	9.8	10.1	14.0	19.5	25.9
16	Circuit ampacity	min.	A	8.0	8.4	9.8	12.3	12.6	17.5	24.4	32.4
17	Cooling water pressure	max.	psig	145							
18	Cooling water differential pressure	min.	psi	30							
19	Refrigerant quantity	R134A	lb oz	9 14 3/4	16 8 1/2		30 13 3/4		35 4 1/2	58 6 3/4	66 2 1/4

Specification:

Pos.1 : **Volume flow** reffered to the suction status of the air compressor 68°F 14 1/2 psig
at compressed air inlet temperature 100°F
operating pressure 100 psig
ambient temperature 100°F
pressure dew point at CA-dryer outlet 38°F

Compressed air inlet temperature max. 140°F

Pos. 14, 15: **Cooling water demand**, power at cooling water inlet temperature 85°F

Allowed ambient temperature min. 35°F
max. 120°F

Technical modifications are subject to change without notice!

Table of Constancy

for

Stainless, steel m.-no. (AISI 316) and copper

(materials of water-cooled condenser in plate design)

Content of water:	**Concentration [mg/l]**	**M.-no.: 1.4401**	**Copper**
Organic elements		⇧	⇔
Hydrogen carbonate (HCO_3^-)	< 70	⇧	⇔
	70 – 300	⇧	⇧
	> 300	⇧	⇔ / ⇧
Sulfate (SO_4^{2-})	< 70	⇧	⇧
	70 – 300	⇧	⇔ / ⇩
	> 300	⇩	⇩
HCO_3^- / SO_4^{2-}	> 1.0	⇧	⇧
	< 1.0	⇧	⇔ / ⇩
Electric conductivity	< 10 µS/cm	⇧	⇔
	10 - 500 µS/cm	⇧	⇧
	> 500 µS/cm	⇧	⇩
Ammonium (NH_3)	< 2	⇧	⇧
	2 – 20	⇧	⇔
	> 20	⇧	⇩
Chloride *) (Cl^-)	< 300	⇧	⇧
	> 300	⇔	⇔ / ⇧
Sulphite (SO_3), free chlorine gas (Cl_2)	< 1	⇧	⇧
	1 – 5	⇧	⇔
	> 5	⇔ / ⇧	⇔ / ⇩
Iron (Fe), solute	< 0.2	⇧	⇧
	> 0.2	⇧	⇔
Free aggressive carbon dioxide (CO_2)	< 5	⇧	⇧
	5 – 20	⇧	⇔
	> 20	⇧	⇩
Manganese (Mn), solute	< 0.1	⇧	⇧
	> 0.1	⇧	⇔
Aluminium (Al), solute	< 0.2	⇧	⇧
	> 0.2	⇧	⇔
pH-value	< 6	⇔	⇔
	6.0 – 7.5	⇔ / ⇧	⇔
	7.5 – 9.0	⇧	⇧
	> 9	⇧	⇔
Nitrate (NO_3), solute	< 100	⇧	⇧
	> 100	⇧	⇔
Hydrogen sulphide (H_2S)	< 0.05	⇧	⇧
	> 0.05	⇧	⇔ / ⇩
Glycol part	< 20%	⇧	⇧
	20 - 50 %	⇧	⇧
	> 50 %	⇧	⇧
Total hardness	4,0 - 8,5 °dH	⇧	⇧

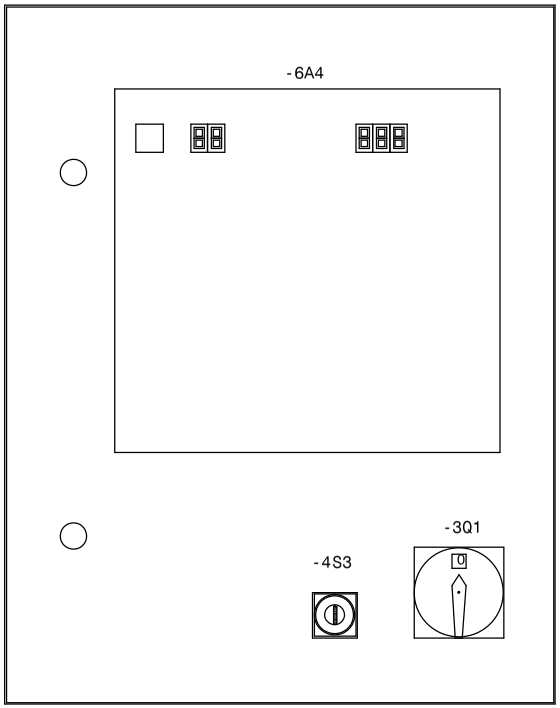
*) max. 60°C

⇧ under normal circumstances good constancy
⇔ danger of corrosion, especially if more substances with ⇔ present
⇩ not suitable

Hint:
The table shows a summary of the limit values for stainless steel 1.4401 (AISI 316) as well as pure copper (99,9%) in water considering several chemical factors. Corrosion is developed from a complex process and arises by coincidence of different factors. On the other hand the influence factors concerned have strengthening or weakening effects on each other. So the table should by considered only as a simplified description. Special attention should be paid to the concentration quantities and the limits. In case of doubt please contact the manufacturer with a water analysis. Warranty claims will only be accepted if following point of the above list is met: “under normal circumstances good constancy”. This table is part of offers and orders.

list of contents

				DATE	21.02.01	TITLE compr. air dryer	TYPE 457 - 462		=
				DR	RAH				+
				CK	JN			DRAWING-NO 22/3/2796	SHEET 1
IND	APPD	DATE	NAME	STD	IEC 1346-1	FILE 2796	REV		OF 11



switch cabinet 010 4962 000

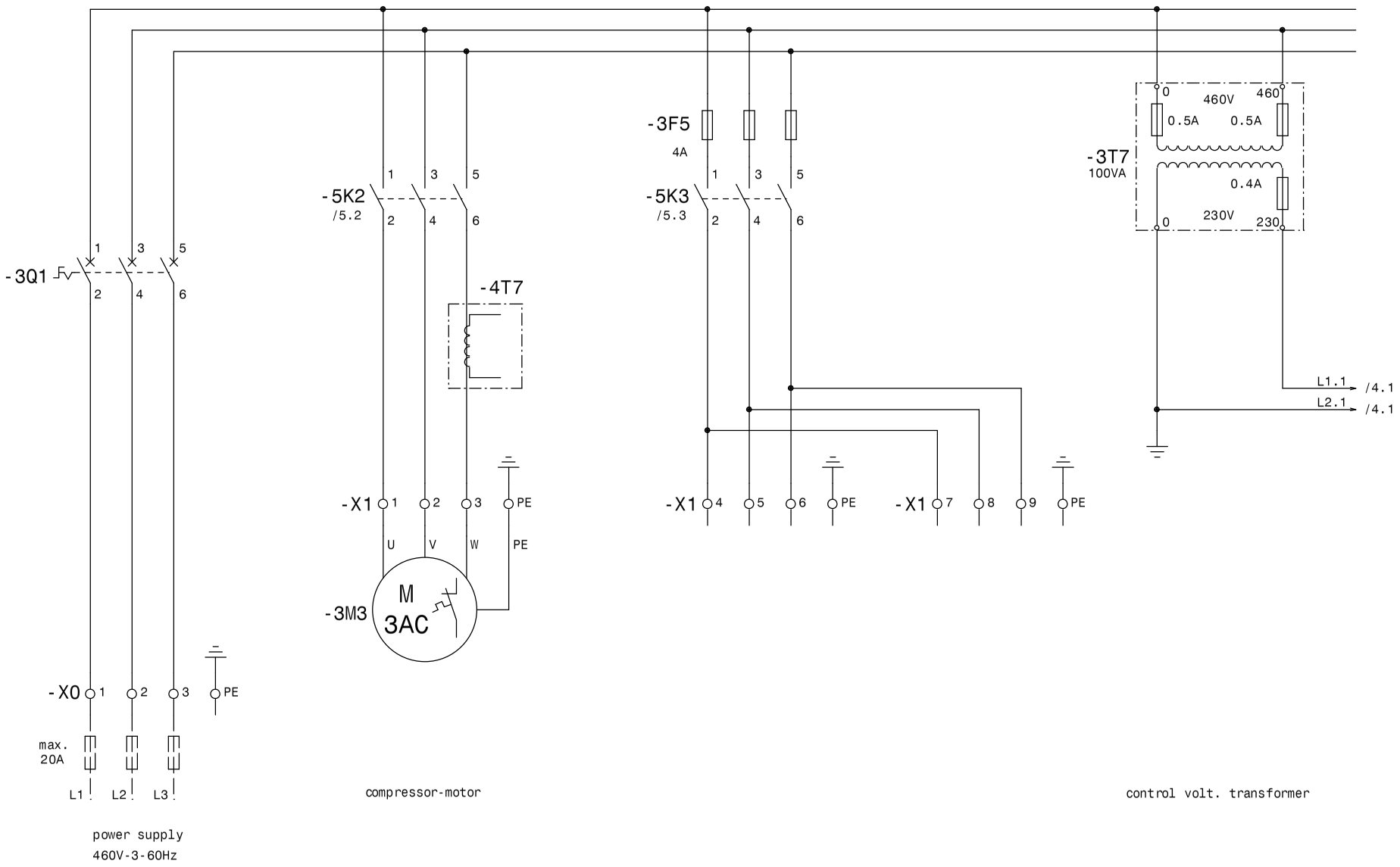
dimension 500x400x200

colour: door=RAL5013

other=RAL7032

assembly plate

				DATE	21.02.01	TITLE compr. air dryer	TYPE 457 - 462			=
				DR	RAH					+
				CK	JN				DRAWING-NO 22/3/2796	SHEET 2
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2796	REV			OF 11



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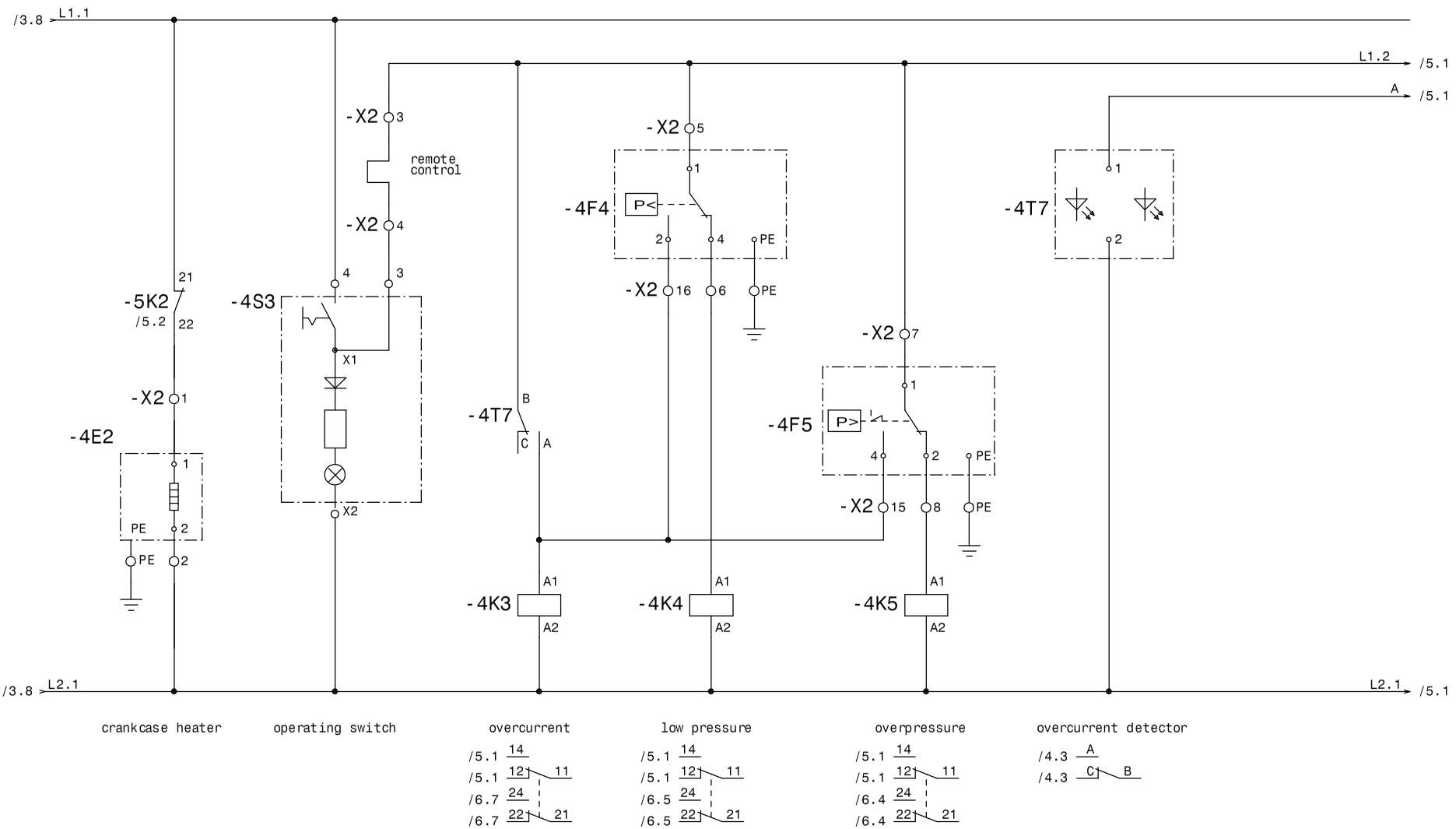
				DR	RAH	compr. air dryer		457 - 462		+
				CK	JN				DRAWING-NO	SHEET 3
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2796		REV	22/3/2796	OF 11



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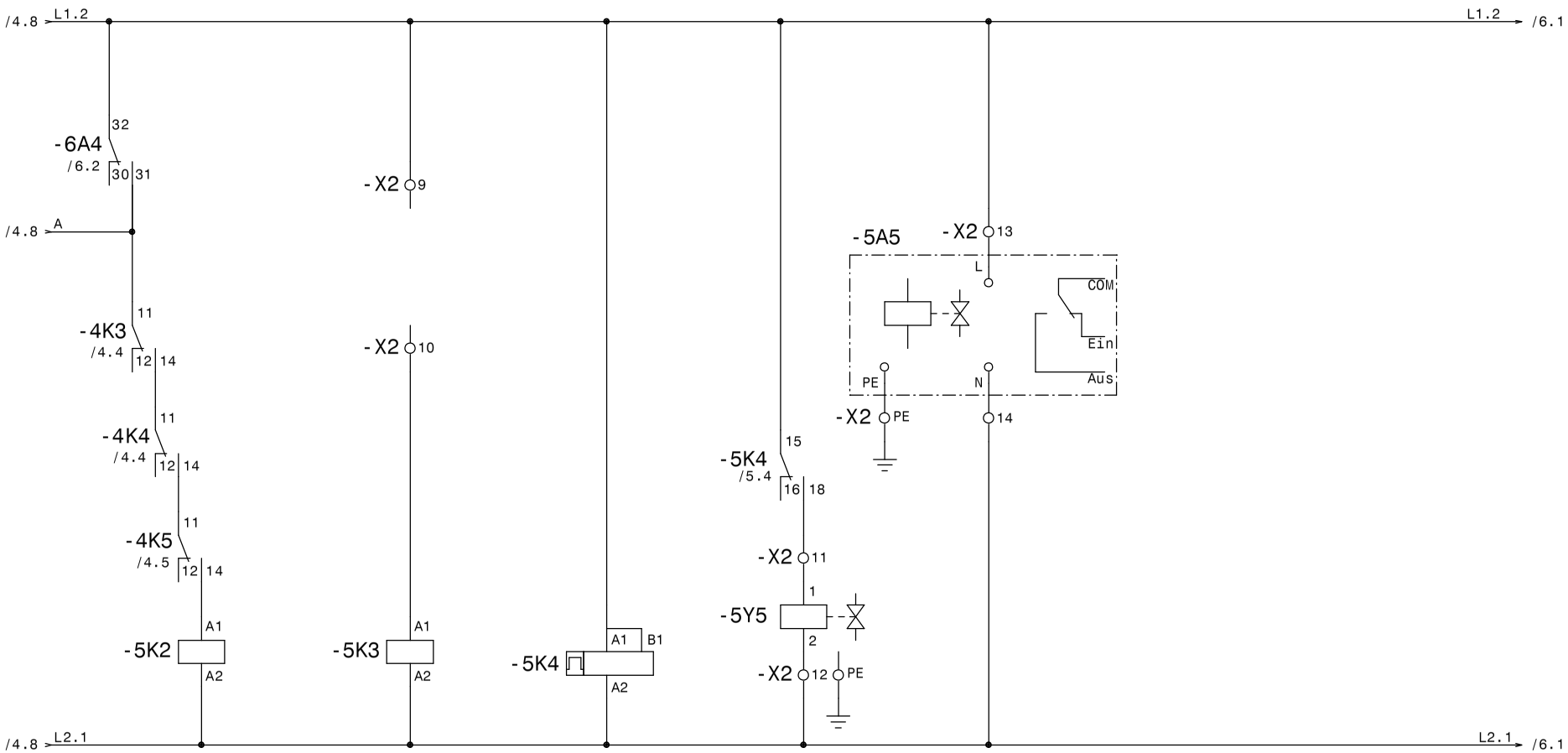
				DR	RAH					+
				CK	JN				DRAWING-NO 22/3/2796	SHEET 4
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2796		REV		OF 11



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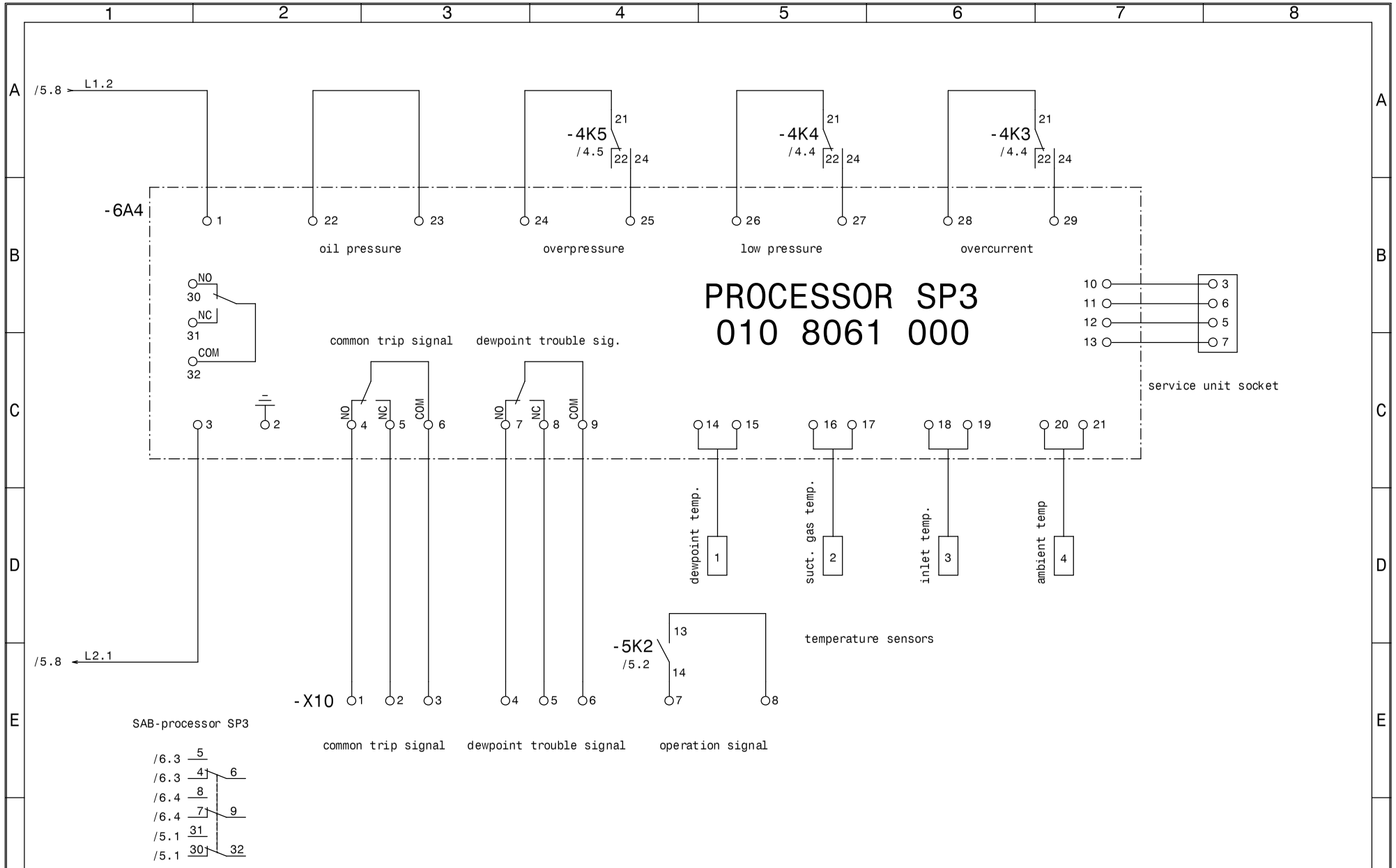
				DR	RAH		compr. air dryer			+
				CK	JN			457 - 462	DRAWING-NO	SHEET 5
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE	2796	REV	22/3/2796	OF 11



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				CK	JN				DRAWING-NO	SHEET 6
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2796		REV	22/3/2796	OF 11

list of material

designation	name	type	ser.no	no.	manufacturer
	switch cabinet	010 4962 000	1	1	ultratroc gmbh
-3Q1	main switch	LE3-40-1753 + LFS2-N6-175	2	1	Rockwell
-3F5	fuse	6.3x32, 4AT, No.19356	3	1	Wickmann
-3T7	control volt. transformer	ST0,1 460V/230V/100VA	4	1	IKS
-4S3	operating switch	800EQ-LFA723B3RL7X10 + 800-N130	5	1	Rockwell Automation
-4K3	relay with socket	700-HA32 A-03-03	6	1	Rockwell Automation
-4K4	relay with socket	700-HA32 A-03-03	7	1	Rockwell Automation
-4K5	relay with socket	700-HA32 A-03-03	8	1	Rockwell Automation
-5K2	compressor contactor	100-C16-KF-01 + 100-FB11	9	1	Rockwell Automation
-5K3	fan contactor	100-M05NA3	10	1	Rockwell Automation
-5K4	pulse relay	700-FSH3VU23	11	1	Rockwell Automation
-6A4	SAB-processor SP3	010 8061 000	12	1	ultratroc gmbh

				DATE	21.02.01	TITLE compr. air dryer	TYPE 457 - 462		=
				DR	RAH				+
				CK	JN			DRAWING-NO 22/3/2796	SHEET 7
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2796	REV		OF 11

terminal strip: -X0

function text	destination external expression	destination external connection	terminalnumber	bridges	destination internal expression	destination internal connection	page.path
power supply			1		-3Q1	2	3.1
power supply			2		-3Q1	4	3.1
power supply			3		-3Q1	6	3.2
power supply			PE			ground	3.2

IND | APPD | DATE | NAME | STD | IEC 1146-1 | FILE 2796 | REV

DR RAH 21.02.01

CK JN

TITLE compr. air dryer

TYPE 457 - 462

DRAWING-NO 22/3/2796

SHEET 8 OF 11

	terminal strip: -X1						
funktion text	destination external		terminalnumber	bridges	destination internal		page.path
	expression	connection			expression	connection	
compressor	3M3	U	1		-5K2	2	3.3
compressor	3M3	V	2		-5K2	4	3.3
compressor	3M3	W	3		-5K2	6	3.3
			4		-5K3	2	3.5
			5		-5K3	4	3.5
			6		-5K3	6	3.5
			7		-5K3	2	3.6
			8		-5K3	4	3.6
			9		-5K3	6	3.6
compressor	3M3	PE	PE			ground	3.3
			PE			ground	3.5
			PE			ground	3.6

IND | APPD | DATE | NAME | STD: CK | DR: DATE | JN | RAH | 21.02.01 | IEC 1146-1

FILE 2796

TITLE: compr. air dryer

TYPE: 457 - 462

REV

DRAWING-NO 22/3/2796

SHEET 9 OF 11

	terminal strip: -X2						
funktion text	destination external		terminalnumber	bridges	destination internal		page.path
	expression	connection			expression	connection	
compressor heater	-4E2	1	1		-5K2	22	/4.2
compressor heater	-4E2	2	2			ground	/4.2
remote control			3		-4T7	B	/4.3
remote control			4		-4S3	3	/4.3
low pressure	-4F4	1	5		-4T7	B	/4.4
low pressure	-4F4	4	6		-4K4	A1	/4.4
overpressure	-4F5	1	7				/4.5
overpressure	-4F5	2	8		-4K5	A1	/4.6
			9		-4T7	B	/5.3
			10		-5K3	A1	/5.3
SV condensate drain	-5Y5	1	11		-5K4	18	/5.5
SV condensate drain	-5Y5	2	12			ground	/5.5
condensate drain	-5A5	L	13		-5K4	15	/5.5
condensate drain	-5A5	N	14			ground	/5.5
overpressure	-4K3	A1	15		-4F5	4	/4.5
low pressure	-4F4	2	16		-4K3	A1	/4.4
SV condensate drain	-4F4	PE	PE			ground	/4.5
condensate drain	-4F5	PE	PE			ground	/4.6
low pressure	-5Y5	PE	PE			ground	/5.5
overpressure	-5A5	PE	PE			ground	/5.5

IND | APPD | DATE | NAME | STD: CK | DR: DATE | IEC 1146-1: JN | RAH: 21.02.01

FILE 2796

TITLE: compr. air dryer

TYPE: 457 - 462

REV

DRAWING-NO: 22/3/2796

SHEET 10 OF 11

	terminal strip: -X10					
funktion text	destination external expression / connection	terminalnumber	bridges	destination internal expression / connection		page.path
common trip signal		1		-6A4	4	6.2
common trip signal		2		-6A4	5	6.3
common trip signal		3		-6A4	6	6.3
dewpoint trouble sig.		4		-6A4	7	6.3
dewpoint trouble sig.		5		-6A4	8	6.4
dewpoint trouble sig.		6		-6A4	9	6.4
operation signal		7		-5K2	14	6.4
operation signal		8		-5K2	13	6.5

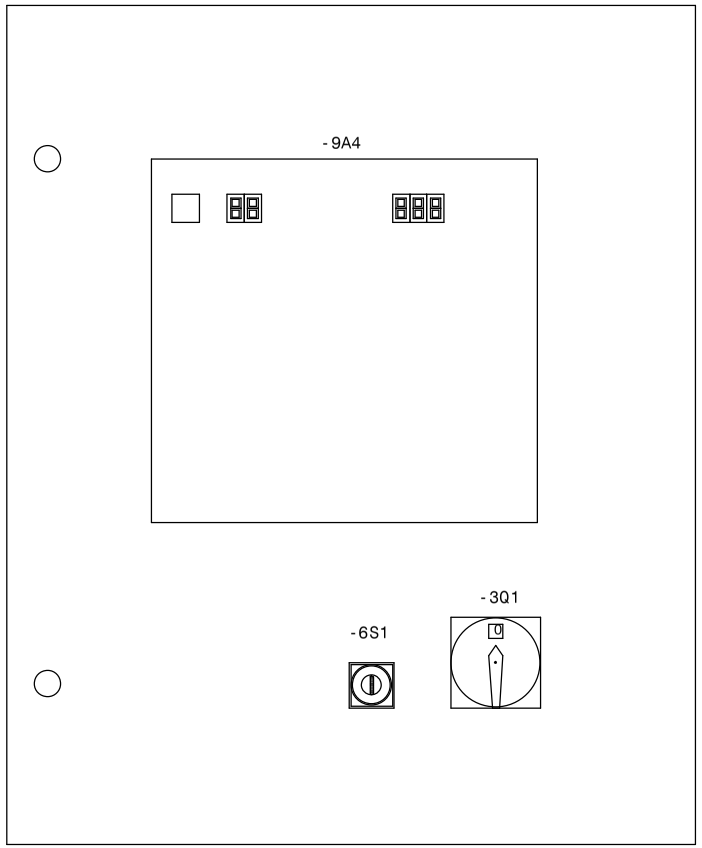
IND | APPD | DATE | NAME | STD: CK | IEC 1146-1: JN | DR: RAH | DATE: 21.02.01

FILE 2796 | TITLE: compr. air dryer | TYPE: 457 - 462 | REV

DRAWING-NO 22/3/2796 | + | = | SHEET 11 OF 11

list of contents

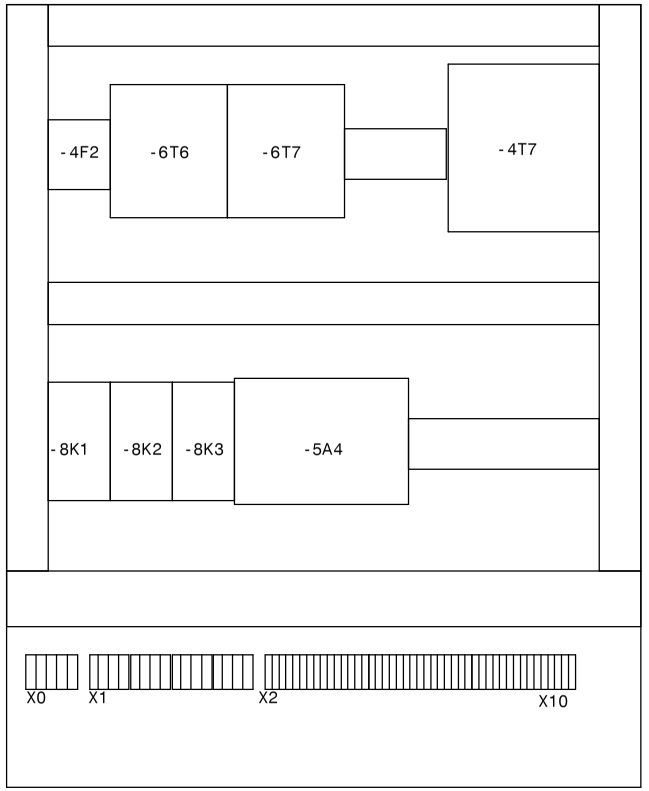
				DATE	22.02.02	TITLE	compr. air dryer	TYPE	593A-594A		=
				DR	RAH						+
				CK	JN					DRAWING-NO	SHEET 1
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE	2837	REV		22/3/2837	OF 15



cabinet view ultratroc 010 0574 000

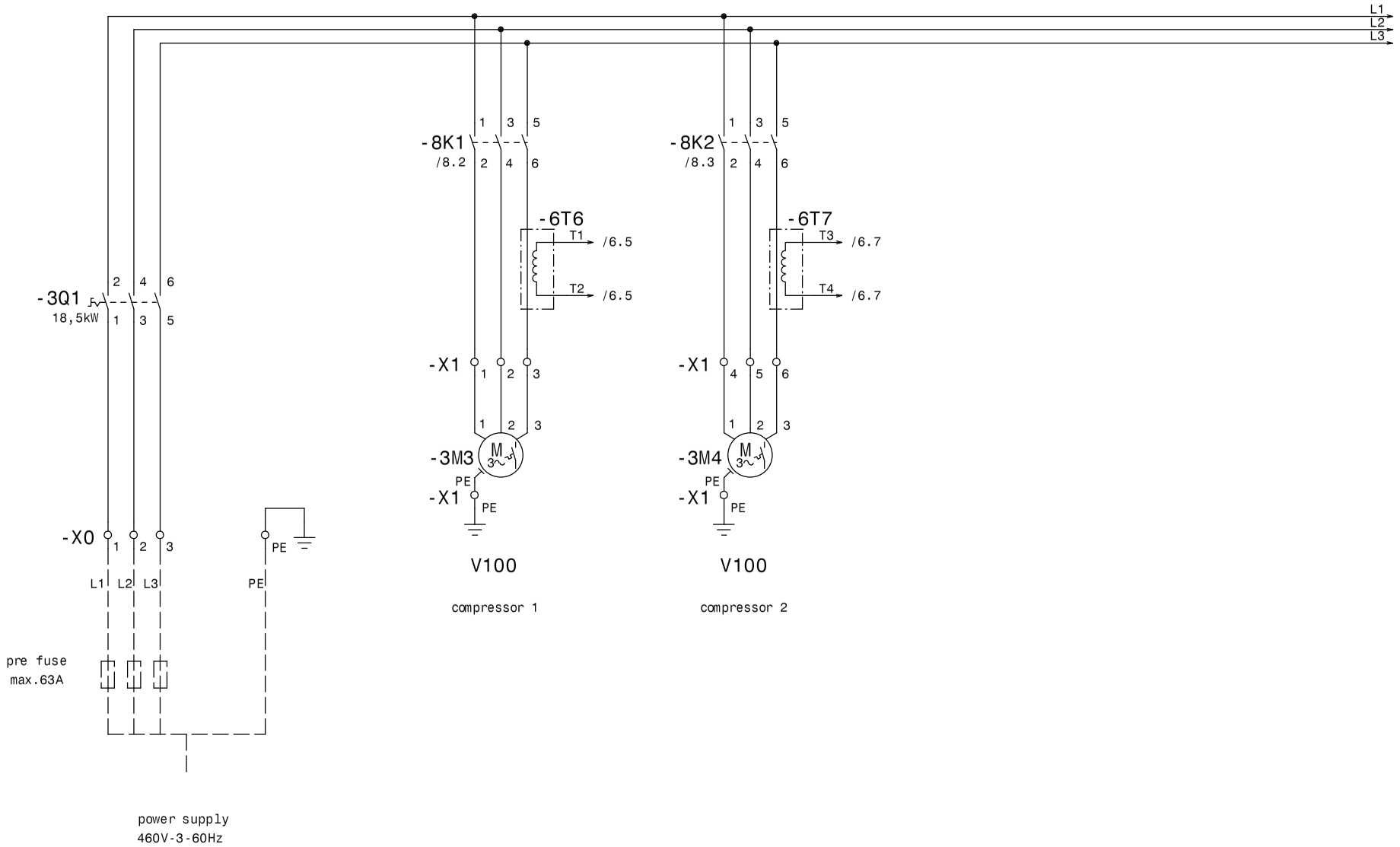
dimension 600x500x200

colour: door=RAL5013
other=RAL7032



assembley plate

				DATE	22.02.02	TITLE compr. air dryer	TYPE 593A-594A		=
				DR	RAH				+
				CK	JN			DRAWING-NO 22/3/2837	SHEET 2
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2837	REV		OF 15



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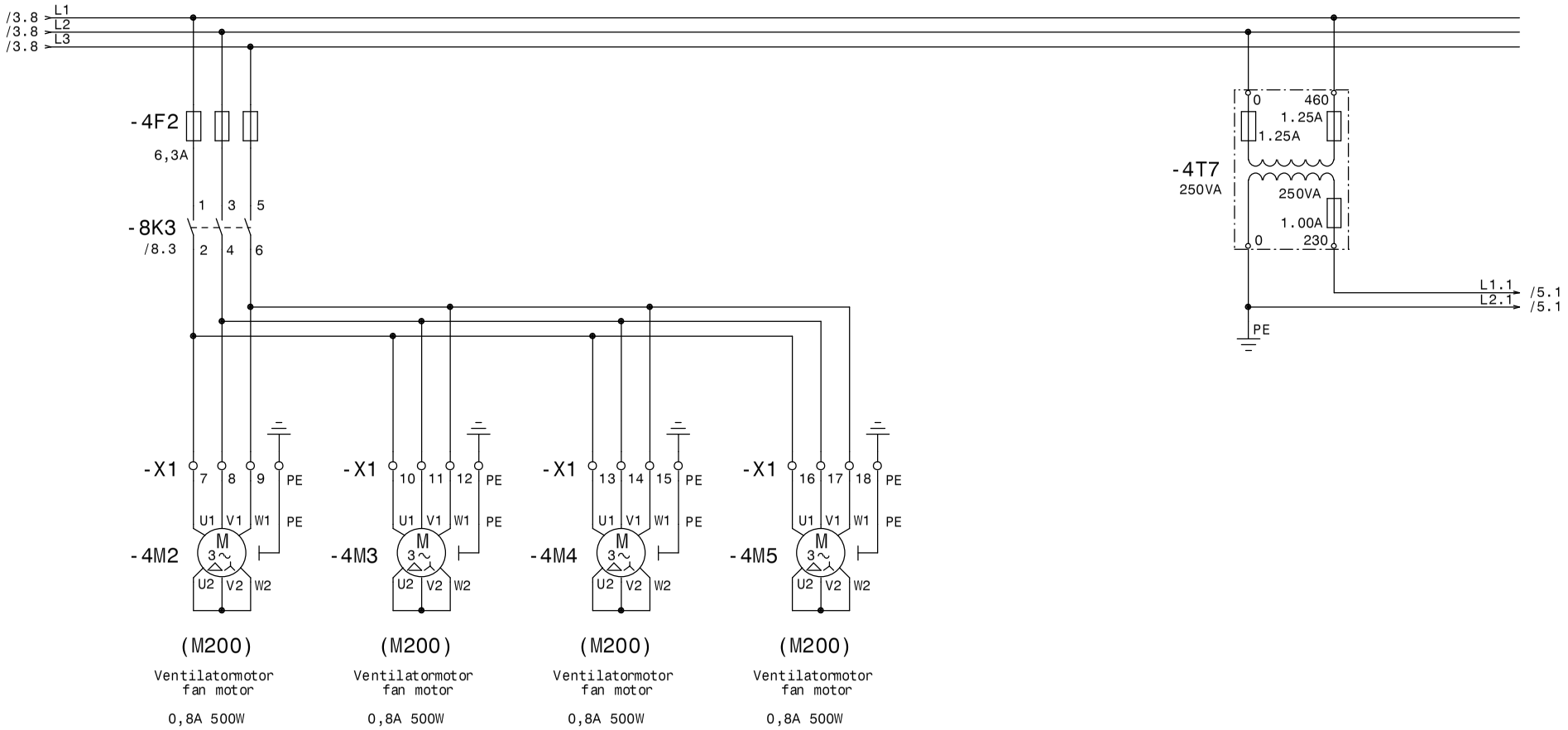
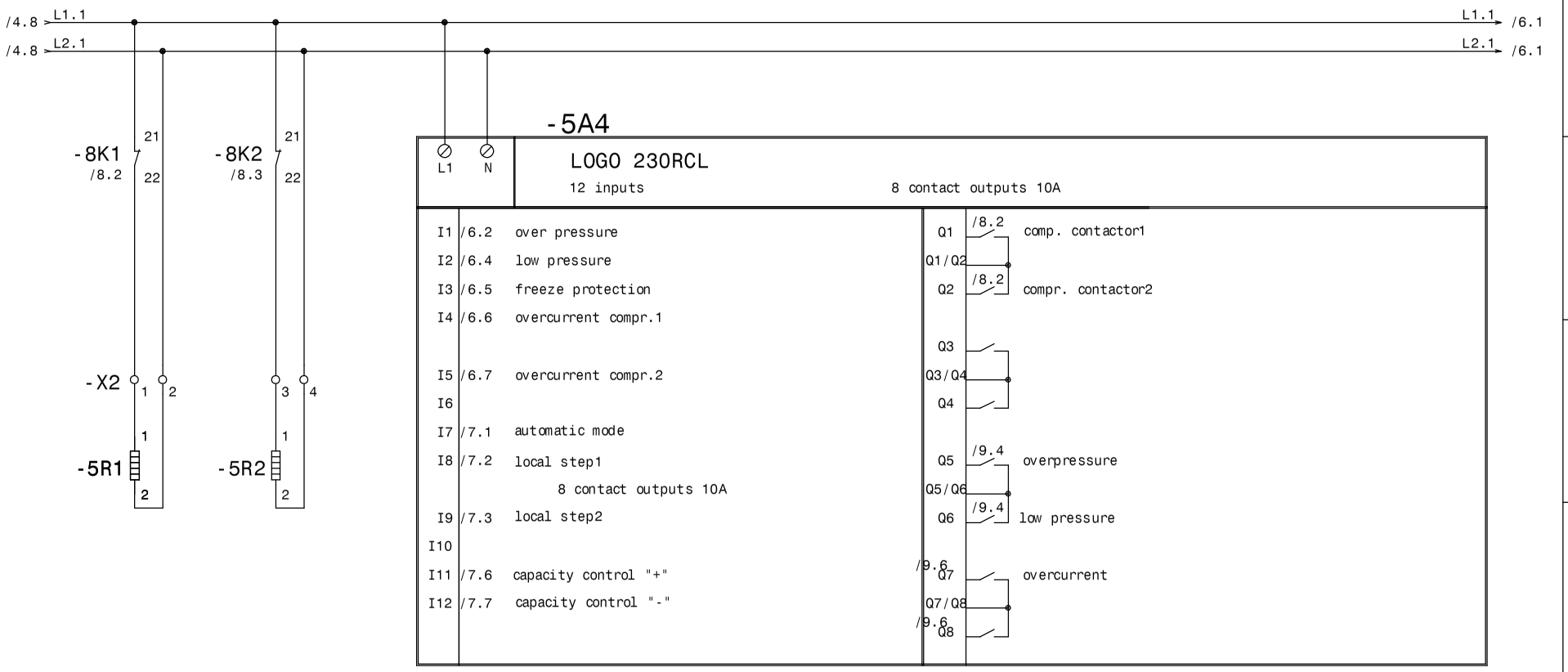
				DR	RAH					+
				CK	JN				DRAWING-NO 22/3/2837	SHEET 3
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2837	REV			OF 15



				DATE	22.02.02	TITLE	compr. air dryer	TYPE	593A-594A		=
				DR	RAH						+
				CK	JN					DRAWING-NO	SHEET 4
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE	2837	REV		22/3/2837	OF 15

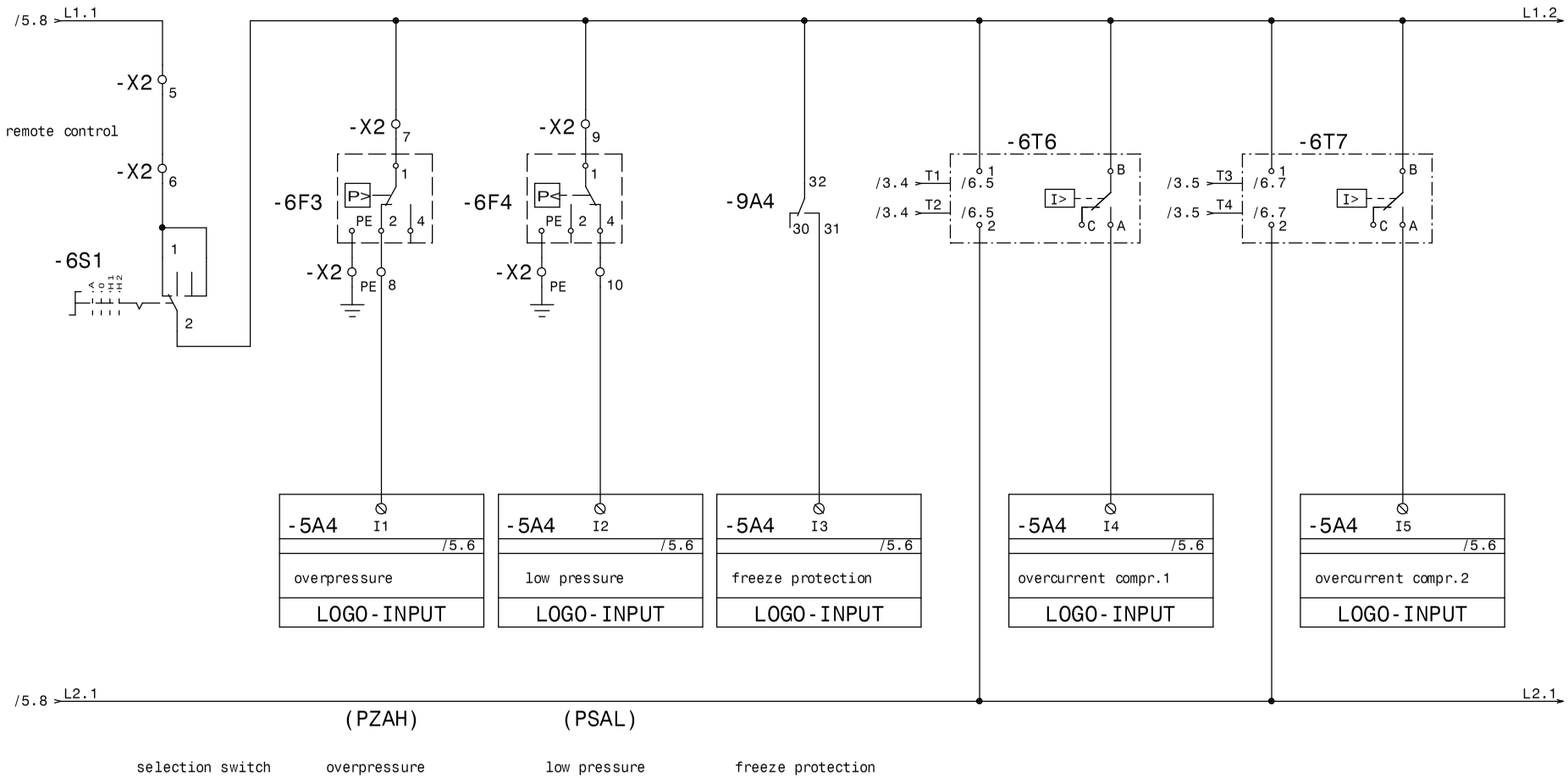


heater compr.1 50W

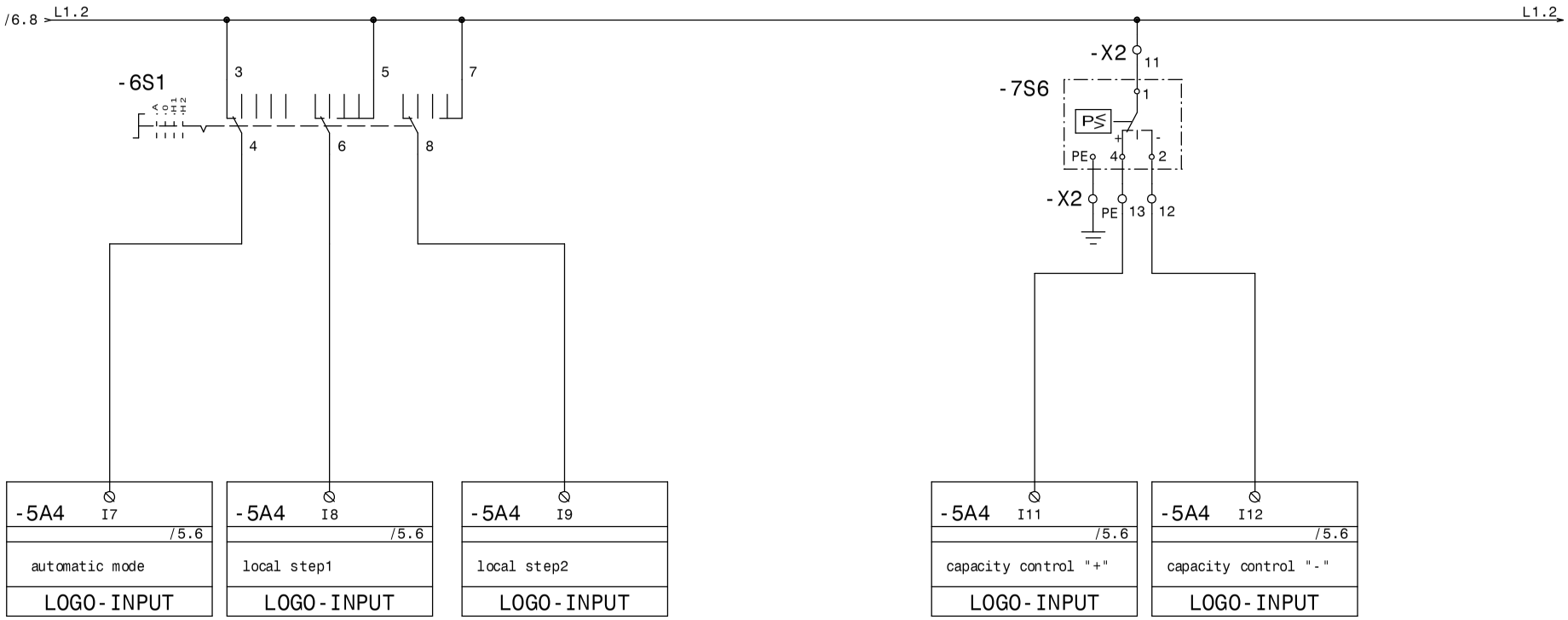
heater compr.2 50W

logic module

				DATE	22.02.02	TITLE	compr. air dryer	TYPE	593A-594A	=
				DR	RAH					+
				CK	JN					
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2837		REV		DRAWING-NO 22/3/2837 SHEET 5 OF 15



				DATE	22.02.02	TITLE	compr. air dryer	TYPE	593A-594A	=
				DR	RAH					+
				CK	JN				DRAWING-NO 22/3/2837	SHEET 6
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2837		REV		OF 15

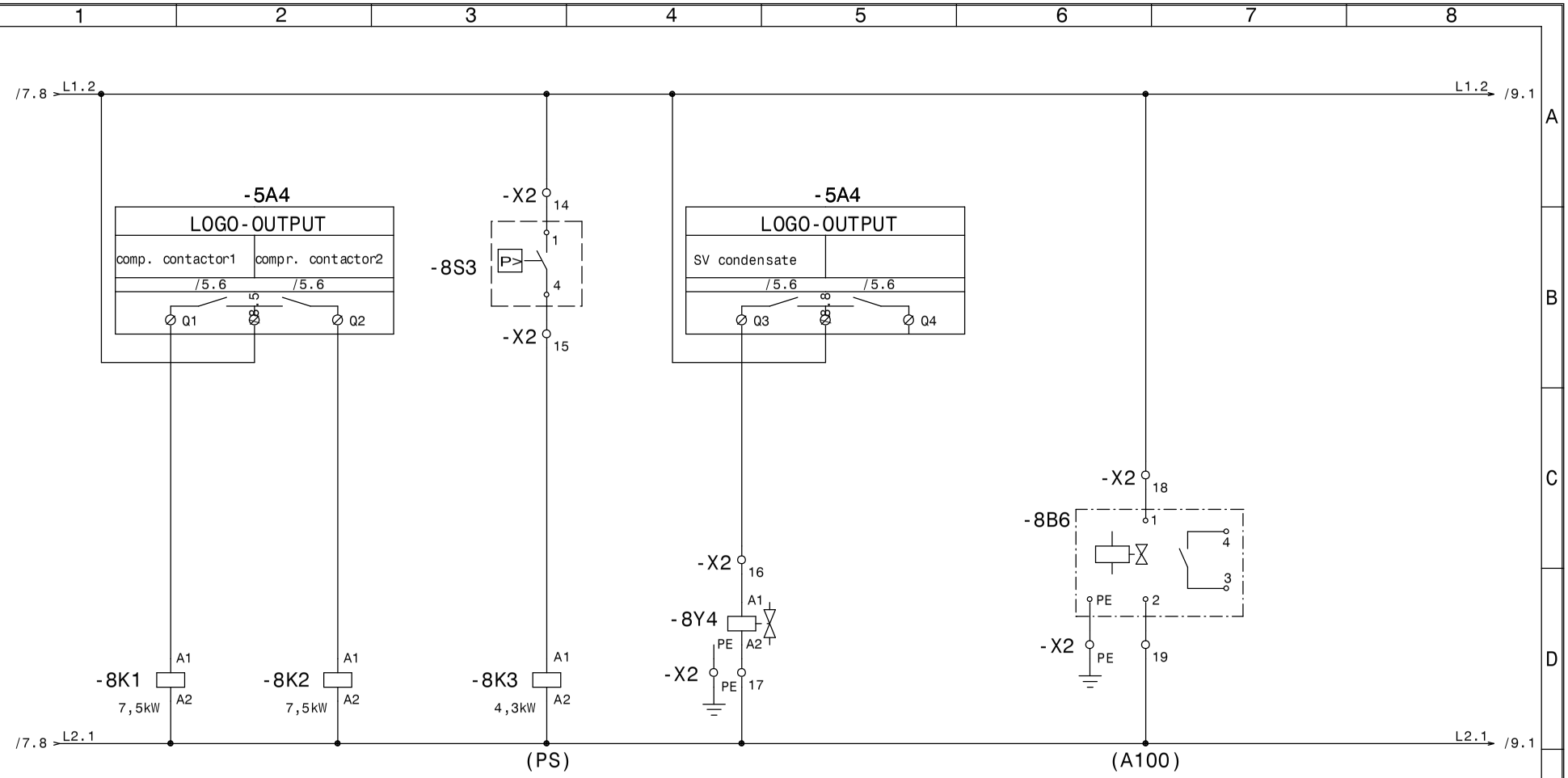


(PSHL-756)

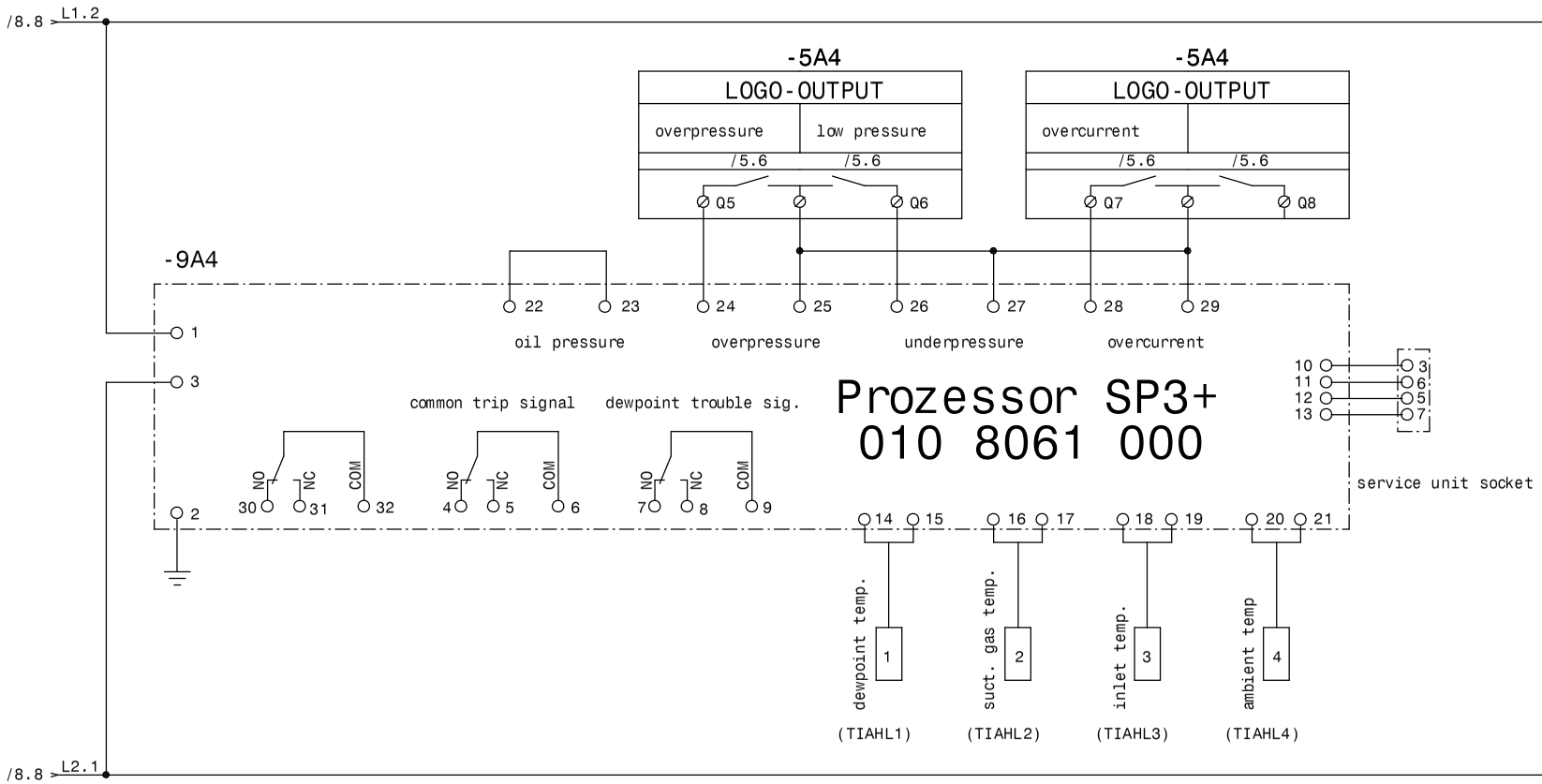
selection switch

pressure sensor

				DATE	22.02.02	TITLE	compr. air dryer	TYPE	593A-594A	=
				DR	RAH					+
				CK	JN				DRAWING-NO 22/3/2837	SHEET 7
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2837		REV		OF 15



				DATE	22.02.02	TITLE	compr. air dryer	TYPE	593A-594A	=
				DR	RAH					+
				CK	JN				DRAWING-NO 22/3/2837	SHEET 8
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2837		REV		OF 15



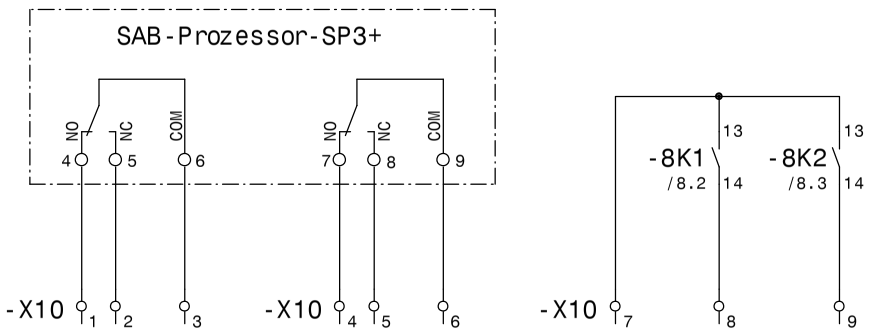
SAB-processor SP3+

temperature sensors

10.1 5
10.1 4 6
10.2 8
10.2 7 9
6.4 31
6.4 30 32

				DATE	22.02.02	TITLE	compr. air dryer	TYPE	593A-594A	=
				DR	RAH					+
				CK	JN				DRAWING-NO 22/3/2837	SHEET 9
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2837		REV		OF 15

-9A4



common trip signal

dewpoint trouble

operation signal

				DATE	22.02.02	TITLE compr. air dryer	TYPE 593A-594A		=
				DR	RAH				+
				CK	JN			DRAWING-NO 22/3/2837	SHEET 10
IND	APPD	DATE	NAME	STD	IEC 1146-1	FILE 2837	REV		OF 15

list of material

Bezeichnung designation	name	type	ser.no	no.	manufacturer
	switch cabinet	011 0574 000	1	1	ultratroc gmbh
-3Q1	main switch	194E-E40-1753 + 194L-HE6N-175	2	1	Rockwell Automation
-4F2	fuse socket	3 x 282-128	3	1	WAGO Kontakttechnik
-4T7	control volt. transformer	ST 0.25	4	1	Block Transformatoren
-5A4	logic module	6ED1 053-1FB00-0BA2	5	1	Siemens AG
-6T7	current detector	CDE230	6	1	WGS elektronik
-6T6	current detector	CDE230	7	1	WGS elektronik
-6S1	selection switch	CH10 D-17A2*01 FT2	8	1	Krauss + Naimer
-8K1	compr. contator1	100-C16KF01 + 100-FB11	9	1	Rockwell Automation
-8K2	compr. contator2	100-C16KF01 + 100-FB11	10	1	Rockwell Automation
-8K3	fan contactor	100-M09 NKF3	11	1	Rockwell Automation
-9A4	SAB-processor SP3+	010 8061 000	12	1	ultratroc gmbh

				DATE	22.02.02	compr. air dryer	TYPE 593A-594A		=
				DR	RAH				+
				CK	JN			drawing no. 22/3/2837	PAGE 11
IND	APPD	DATE	Name	Norm	IEC 1146-1	FILE 2837	REV		OF 15

terminal strip: -X0

function text	destination external expression	destination external connection	terminal number	bridges	destination internal expression	destination internal connection	page/path
power supply		L1	1		-3Q1	1	/3.1
power supply		L2	2		-3Q1	3	/3.1
power supply		L3	3		-3Q1	5	/3.2
power supply		PE	PE			ground	/3.2

IND			
APPD			
DATE			
Name			
Norm	CK	DR	DATE
IEC 1146-1	JN	RAH	22.02.02

FILE 2837

compr. air dryer

TYPE 593A-594A

REV

drawing no. 22/3/2837

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terminal strip: -X1

function text	destination external expression	destination external connection	terminal number	bridges	destination internal expression	destination internal connection	page/path
compressor1	-3M3	1	1		-8K1	2	/3.3
compressor1	-3M3	2	2		-8K1	4	/3.3
compressor1	-3M3	3	3		-8K1	6	/3.4
compressor2	-3M4	1	4		-8K2	2	/3.5
compressor2	-3M4	2	5		-8K2	4	/3.5
compressor2	-3M4	3	6		-8K2	6	/3.5
fan motor 1	-4M2	U1	7		-8K3	2	/4.2
fan motor 1	-4M2	V1	8		-8K3	4	/4.2
fan motor 1	-4M2	W1	9		-8K3	6	/4.2
fan motor 2	-4M3	U1	10				/4.3
fan motor 2	-4M3	V1	11				/4.3
fan motor 2	-4M3	W1	12				/4.3
fan motor 3	-4M4	U1	13				/4.4
fan motor 3	-4M4	V1	14				/4.4
fan motor 3	-4M4	W1	15				/4.4
fan motor 4	-4M5	U1	16				/4.5
fan motor 4	-4M5	V1	17				/4.5
fan motor 4	-4M5	W1	18				/4.5
compressor 1	-3M3	PE	PE			ground	/3.3
compressor 2	-3M4	PE	PE			ground	/3.5
fan motor 1	-4M2	PE	PE			ground	/4.2
fan motor 2	-4M3	PE	PE			ground	/4.3
fan motor 3	-4M4	PE	PE			ground	/4.4
fan motor 4	-4M5	PE	PE			ground	/4.5

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terminal strip: -X2

function text	destination external expression	destination external connection	terminal number	bridges	destination internal expression	destination internal connection	page/path
heater compr.1	-5R1	1	1		-8K1	22	/5.1
heater compr.1	-5R1	2	2	•	-4T7	0	/5.1
heater compr.2	-5R2	1	3		-8K2	22	/5.2
heater compr.2	-5R2	2	4	•	-4T7	0	/5.2
remote control			5	•	-4T7	230	/6.1
remote control			6	•	-6S1	1	/6.1
overpressure	-6F3	1	7	•	-6S1	2	/6.3
overpressure	-6F3	2	8		-5A4	I1	/6.2
low pressure	-6F4	1	9	•	-9A4	32	/6.3
low pressure	-6F4	4	10		-5A4	I2	/6.4
pressure sensor	-7S6	1	11	•	-6T6	1	/7.6
pressure sensor	-7S6	2	12		-5A4	I12	/7.6
pressure sensor	-7S6	4	13		-5A4	I11	/7.6
fan manostat	-8S3	1	14	•			/8.3
fan manostat	-8S3	4	15		-8K3	A1	/8.3
SV condensate drain	-8Y4	A1	16		-5A4	Q3	/8.4
SV condensate drain	-8Y4	A2	17	•	-4T7	0	/8.4
condensate drain 1	-8B6	1	18	•	-6T6	B	/8.6
condensate drain 1	-8B6	2	19	•	-4T7	0	/8.6
overpressure	-6F3	PE	PE			ground	/6.2
low pressure	-6F4	PE	PE			ground	/6.3
pressure sensor	-7S6	PE	PE			ground	/7.6
SV condensate drain	-8Y4	PE	PE			ground	/8.4
condensate drain 1	-8B6	PE	PE			ground	/8.6

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		terminal strip: -X10				
	function text	destination external expression / connection	terminalnumber	bridges	destination internal expression / connection	page/path
	common trip signal		1		-9A4 4	/10.1
	common trip signal		2		-9A4 5	/10.1
	common trip signal		3		-9A4 6	/10.2
	dewpoint trouble		4		-9A4 7	/10.2
	dewpoint trouble		5		-9A4 8	/10.2
	dewpoint trouble		6		-9A4 9	/10.3
	operation signal		7		-8K1 13	/10.3
	operation signal		8		-8K1 14	/10.4
	operation signal		9		-8K2 14	/10.4

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List of spare parts									
Producer information								Specifications	
P&I-Position	Wiring diagram	Quantity	Unit	Spare Parts	For CA- dryer	Denomination	Material- no.	Comments	Order
A100	6A7	1	pcs.	Condensate Drain	593-594, 593W-594W		H334300-67		
5S3		1	pcs.	On/Off Switch	593-594, 593W-594W		0110711000		
	3Q1	1	pcs.	Main Switch	593-594, 593W-594W		0109340000		
M200	4M2 - 4M5	1	pcs.	Fan Assembly	593-594		0111231000		
PS00	6S5	1	pcs.	Fan Pressure switch	593-594		0103087000		
PSAL	5F5	1	pcs.	Low Pressure switch	593-594, 593W-594W		0110140000		
PZAH	5F6	1	pcs.	Pressure limiter	593-594, 593W-594W		0106437000		
	4T7	1	pcs.	Transformer	593-594, 593W-594W		0110366000		
	6K1 , 6K3	1	pcs.	Compressor Contactor	593-594, 593W-594W		0108063000		
	6K2	1	pcs.	Compressor Auxiliary Relay	593-594, 593W-594W		0109346000		
	6K4	1	pcs.	Fan Contactor	593-594		0106305000		
	5K4 - 5K6	1	pcs.	Auxiliary Relay	593-594, 593W-594W		0109968000		
	4F2	1	pcs.	Fuses Primary	593-594, 593W-594W		0111049000		
V500	6Y6	1	pcs.	Refrigerant Circuit Dryer	593-594, 593W-594W		0106280000		
	5T7, 5T8	1	pcs.	Condenser	593, 593W		0108917000		
	7A4	1	pcs.	Condenser	594, 594W		0108918000		
	6K5	1	pcs.	Compressor	593, 593W		0100105000		
				Designation:		Type-No.:	Spare parts:	Date:	Page 1 of
				Refrigerated Compressed Air Dryer		593-594, 593W-594W	I17 1011 YUS	2001-10-04	1