

STULZ the natural choice

## Instructions

# CyberAir 3 PRO DX

## ASR/ALR series

Precision Air Conditioning Units

380-415/3/50

Index G17D  
Issue 11.2015

Original instructions



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Subject to technical modifications.

# 1. Safety

## 1.1 Marking



Danger - threatening danger, grievous bodily harm and death



Attention - dangerous situation, light bodily injury and material damage



Information - important information and application notice



ESD note - risk of damaging electronical components

## 1.2 Safety instructions

### General

These operating instructions contain basic information which is to be complied with for installation, operation and maintenance. They must therefore be read and complied with by the fitter and the responsible trained staff/operators before assembly and commissioning. They must be permanently available at the place where the system is used.



**This cooling unit contains fluorinated greenhouse gas covered by the Kyoto protocol.**

In STULZ units the refrigerant R410A is used as standard. Refrigerants are volatile, or highly volatile fluorinated hydrocarbons which are liquefied under pressure. They are incombustible and not hazardous to health when used as intended.



- Works have to be carried out by competent staff only
- Observance of the regulations for accident prevention
- Stay out of danger when lifting and setting off the unit
- Secure the unit to avoid the risk of overturning
- Safety devices may not be bypassed.
- Respect the corresponding VDE-, EN- and IEC standards for the electrical connection of the unit and observe the conditions of the power supply companies
- Switch off the voltage from the unit when working on it.



- Observe the national regulations of the country where the unit will be installed
- The refrigerant circuit contains refrigerant and refrigerating plant oil, observe professional disposal for maintenance and when setting the unit out of service.
- Cooling water additives have an acidic effect on skin and eyes, wear safety glasses and safety gloves
- Observe personal protective equipment when working on the refrigerant circuit.
- The unit may only be used to cool air according to the Stulz specification.



- Respect material compatibility in the whole hydraulic circuit.
- The male triangular wrench is to be placed in a visible location in the immediate vicinity of the unit.

## 1.3 Handling refrigerants

According to EN 378, refrigerants are divided in groups in respect of health and safety: R134a belongs to Group L1.

- Adherence to the regulations by law and guide-lines
- Execution only by competent staff

- Responsibility for correct disposal of refrigerant and system parts is incumbent on the operator.
- Refrigerants have a narcotic effect when inhaled in high concentrations.
- The room is to be evacuated immediately if high concentrations of refrigerant suddenly occur. The room may only be entered again after adequate ventilation.
- If unavoidable work is required in the presence of a high concentration of refrigerant, breathing apparatus must be worn. This does not mean simple filter masks. Comply with breathing protection data sheet.
- Safety glasses and safety gloves are to be worn.
- Do not eat, drink or smoke at work.
- Liquid refrigerant must not get onto the skin (risk of burns).
- Only use in well ventilated areas.
- Do not inhale refrigerant vapours.
- Warn against intentional misuse.
- It is absolutely essential to comply with the first aid measures if accidents occur.
- Refrigerants containing FCs contribute to the global warming and with this to climate changes. The FCs must therefore be disposed of in accordance with the regulations, i.e. only by companies specially qualified and licensed as recognised disposal companies for refrigerants.

## 1.4 Safety and environmental requirements

The following requirements relate to the operation of refrigerating plants within the European Community.

- The used components must correspond to the pressure equipment guide-line EC/97/23 and EN 378 part 1-4.
- Independent of the design, the equipment and inspection before the delivery, also the operator of such plants has duties according to EN 378 and national regulations.

This concerns the installation, the operation and the repeated inspection:

- Installation: according to EN 378
- Operation:
  - Determination of emergency measures (accidents, malfunctions)
  - Creation of an abbreviated instruction and notification (template page)
    - A unit protocol must be kept.
    - To be stored in the proximity of the unit
    - Access for competent staff in case of repairs and repeated inspection must be ensured.
- Repeated inspection: according to EN 378  
The operator is responsible for the execution.

The operator must ensure that all maintenance, inspection and assembly work is carried out by authorised and qualified specialist staff who have made an in-depth study of the operating instructions.

It is absolutely essential to comply with the procedure for shutting down the system described in the operating instructions. Before maintenance work, the unit must be switched off at the main switch and a warning sign displayed to prevent unintentional switching-on.

### First aid measures

- If health problems occur during or after handling fluorinated hydrocarbons, a doctor is to be consulted immediately. The doctor is to be informed that the work involved the use of fluorinated hydrocarbons.
- In the case of acute effects, the casualty is to be brought into the fresh air as quickly as possible.
- Splashes of fluorinated hydrocarbons in the eyes can be blown out or fanned out by an assistant. Then rinse with water.

### Independent conversion and manufacture of replacement parts

The system may only be converted or modified after consultation with STULZ. Original replacement parts and replacement parts/accessories authorised by STULZ are an aid to safety.

### Unacceptable operating methods

The operating safety of the system is only guaranteed when it is used as intended. The limit values stipulated in the technical data must not be exceeded under any circumstances.



## 2. Residual risks

### Transport, Installation

Area	Cause	Danger	Safety note
Under the unit	Defective lifting device	Bruising	Keep away from under the unit
Beside the unit	Uneven or insufficient foundation or raised floor stand	Bruising by tipping over of the unit	Make sure, the foundation is even and stable and that the raised floor stand is correctly mounted. Wear protective equipment (helmet, gloves, safety shoes).
In the lower part of the unit	Heat by soldering flame, sharp edges, built-in parts	Burns, cuts, concussion damage	Wear safety glasses and gloves, don't put your head into the unit.
Electrical box	Connection cable under voltage, sharp edges of the openings for the cable introduction	Electric shock, cable damage at positioning	Check and make sure the unit is de-energized. Stand on isolated ground. Take care that sharp edges are always protected by rubber grommets

### Start-up

Area	Cause	Danger	Safety note
In the lower part of the unit, refrigerant piping	Defective filling line for refrigerant, leaks in the refrigerant piping, closed stop valves, defective safety valve	Discharge of refrigerant under high pressure, burns in case of contact to the skin, formation of acid vapours with open flames	Open stop valves. Wear safety glasses and gloves, don't put your head into the unit.
In the lower part of the unit, water piping	Leaks in the water lines, closed stop valves	Discharge of water under high pressure, contact with the skin of ethylen glycol, irritation of eyes and respiratory system by glycol vapours, increased risk of electric shock in combination with electricity, risk of slipping	Open stop valves. Wear rubber gloves, ethylen glycol is absorbed by the skin. Avoid swallowing water with glycol additives.
Electrical box	Short circuit	Electric arc, acid vapours	Retighten terminal connections, Wear protective gloves

### Operation

Area	Cause	Danger	Safety note
In the lower part of the unit, refrigerant piping	Leaks in the refrigerant piping, defective safety valve/high pressure switch, fire	Discharge of refrigerant under high pressure, explosion of pipe sections, formation of acid vapours with open flames	In case of fire wear protective mask.
Unit bottom, eventually raised floor	Accumulation of condensate and water discharge by too small or clogged drain pipe	Corrosion and development of mould by moistness. Humidity in combination with electric connections.	De-energize water discharge area.
Electrical alimentation	Falsely dimensioned cables or protection devices	Short-circuit, fire, acid vapours	Correctly design alimentation cables and protection elements. Wear protective mask.

### Maintenance

Area	Cause	Danger	Safety note
In the lower part of the unit, refrigerant piping	Leaks in the refrigerant piping, defective safety valve/high pressure switch.	Discharge of refrigerant under high pressure, burns in case of contact to the skin, formation of acid vapours with open flames	Wear safety glasses and gloves, don't put your head into the unit.
Pressure lines, compressor, reheat behind heat exchanger	Heat	Burns in case of contact to the skin	Wear safety gloves. Avoid contact to hot unit parts.
Heat exchanger	Sharp edges, fins	Injuries by cutting	Wear safety gloves.
Steam humidifier	Discharge of steam	Burns	Avoid area around the steam lance.
Electrical box	Live components, supposed to be voltage-free.	Electric shock	Secure master switch against being switched on again.

### Dismantling

Area	Cause	Danger	Safety note
In the lower part of the unit, refrigerant piping	Soldering off or cutting the refrigerant pipes still under pressure.	Discharge of refrigerant under high pressure, burns in case of contact to the skin.	Depressurize pipes before disconnecting them. Wear safety glasses and gloves, don't put your head into the unit.
In the lower part of the unit, water piping	Unscrewing the water pipes still under pressure.	Discharge of water under high pressure, contact with the skin of ethylen glycol, increased risk of electric shock in combination with electricity, risk of slipping	Drain of cooling water by drain valve. Wear rubber gloves.
Electrical box	Live electrical alimentation cable	Electric shock	Check de-energized state of the alimentation before dismantling, Wear safety gloves.

## 3. Transport / Storage

### 3.1 Delivery of units

Stulz A/C units are mounted on pallets and packed several times in plastic film. They must always be transported upright on the pallets.



**Unit version A, AS: The refrigerant circuit is filled with nitrogen up to atmospheric pressure.**  
**Unit version GE, GES: The refrigerant circuit is filled with refrigerant ready for use.**

Construction of protective covering  
 (from inside to outside)

1. Neoprene cushioning
2. Shrink film
3. Additional board in container shipments

The following information can be found on the packing.

- 1) Stulz logo
- 2) Stulz order number
- 3) Type of unit
- 4) Packing piece - contents
- 5) Warning symbols

also upon request

- 6) Gross weight
- 7) Net weight
- 8) Dimensions
- 9) Customer order number
- 10) Additional customer requirements



**When delivery is accepted, the unit is to be checked against the delivery note for completeness and checked for external damage which is to be recorded on the consignment note in the presence of the freight forwarder.**

- The delivery note can be found on the A/C unit when delivered.
- The shipment is made ex works, in case of shipment damages, please assert your claim towards the carrier.
- Hidden damage is to be reported in writing **within 6 days** of delivery.

### 3.2 Transport

The Stulz A/C units can be moved by lifting devices with ropes, for this the ropes have to be fixed at the pallet, and the upper unit edges have to be protected by wooden laths or metal brackets in such a way that they could not be caved in.

You can move the unit still packaged on the pallet with a fork lift, if you take care that the centre of gravity is within the fork surface. Take care that the unit is in an upright position at the transport.



**Never move the unit on rollers and never transport it without pallet on a fork lift, for the risk of distorting the frame.**

### 3.3 Storage

If you put the unit into intermediate storage before the installation, the following measures have to be carried out to protect the unit from damage and corrosion:

- Make sure that the water connections are provided with protective hoods. If the intermediate storage exceeds 2 months, we recommend filling the pipes with nitrogen.
- the temperature at the storage point should not be higher than 42°C, and the site should not be exposed to direct sunlight.
- the unit should be stored packaged to avoid the risk of corrosion especially of the heat exchanger fins.

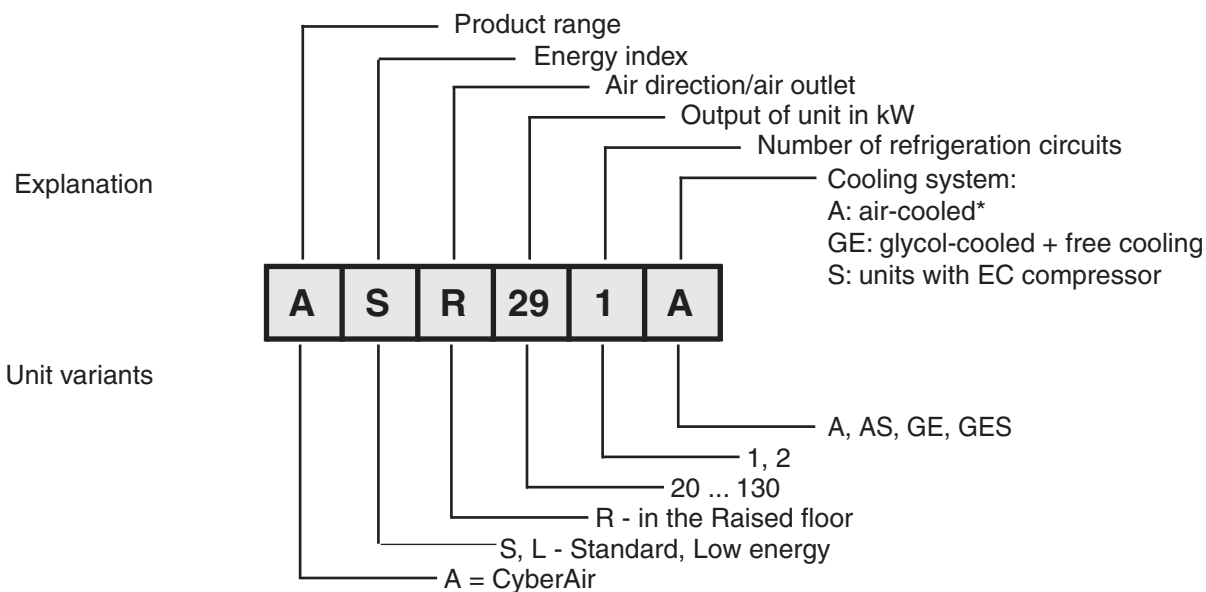
## 4. Description

### 4.1 Type code

The type code represents the unit variant of your A/C unit and can be found on the rating plate.

The rating plate is located in the door in front of the electrical compartment.

		<b>Typenschild / type plate</b> <b>plaque d'appareil</b>	
	Lieferant manufacturer vendeur	<b>STULZ GmbH Hamburg</b> Holsteiner Chaussee 283, D-22457 Hamburg	
Unit type	Typ type type	<b>ASR 291 A</b>	Versorgungsspannung supply voltage tension de service
			<b>400 V ± 10%</b> <b>50 Hz ± 1%</b>
internal part no.	Artikel-Nr. Item-no. numéro d'article	<b>B99403</b>	Kältemittel refrigerant refrigerant
			<b>R410A</b>
Order number + alternative	Kommission/Alt commission/alt commission/alt	<b>0530111234/01</b>	Max. Betriebsdruck max. operation pressure pression de fonction max.
			<b>40 bar</b>
Serial no.	Baujahr model modele	<b>2015</b>	Max. Füllgewicht max. filling charge charge max. de rempliss.
	S.Nr. s.-no. no. serie	 <b>1234567890</b>	<b>---</b> kg
			<b>Made in Germany</b>



\* one condenser per refrigerant circuit is required.

### Page code

Language:

- EN - English
- FR - French
- ES - Spanish
- PL - Polish
- IT - Italian
- PT - Portuguese
- RU - Russian
- DE - German

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Manufacturing base:

- G - Germany
- C - China
- I - Italy

### Manufacturer address:

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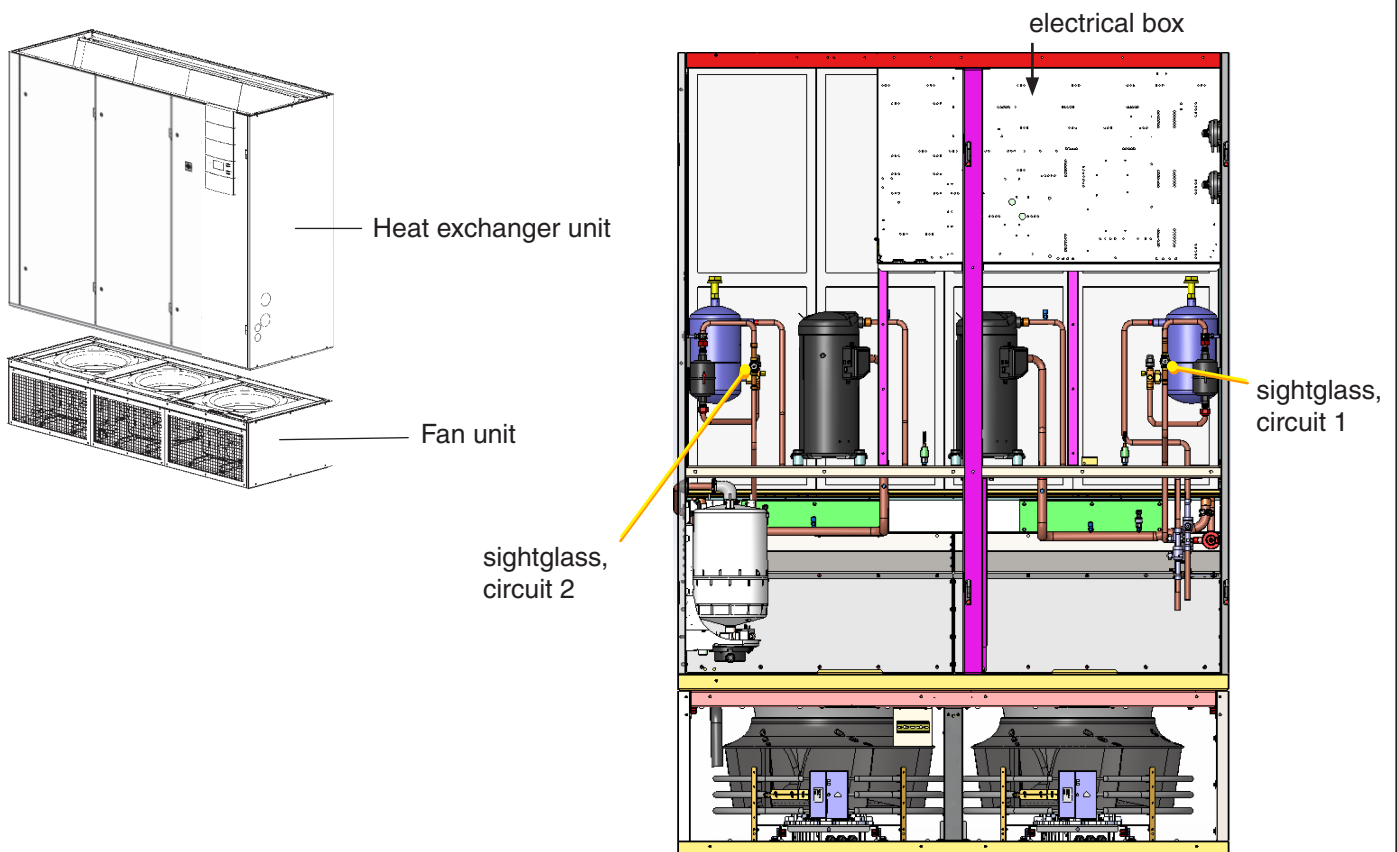
## 4.2 Intended use

This A/C unit is used to control room temperature and air humidity. The A/C unit is designed for indoor installation. Any use beyond this is not deemed to be use as intended. STULZ is not liable for any damage resulting from such misuse. The operator alone bears the risk.

## 4.3 Design

The fan unit contains the fans and optional electric heating elements which are located around the fans. The heat exchanger unit contains the heat exchanger and all components of the refrigerant circuit.

In units with two refrigerant circuits and with a speed-controlled compressor only the first refrigerant circuit is equipped with a speed-controlled compressor. The second circuit contains an on/off compressor.



## 4.4 Function

The A/C unit is exclusively operated by the controller in the front panel and the main switch (operable from outside the unit) in the electric box.

In the air inlet a temperature/humidity sensor is located which provides the measured values for the temperature/humidity control. In general the cooling is achieved by compressor operation in the refrigerant circuit. In the unit version GE a direct cooling by a chilled water coil is also possible.

The A/C unit control is effected by the on board I/O controller. The operational conception is designed such as to allow to control up to 19 units from one unit. These units can be installed separately with a maximum control line length of 1000 m.

### Dehumidification

To achieve a dehumidification, the electronic expansion valve is partially closed in the first step. The reduction of the refrigerant mass flow makes the evaporation temperature drop, which lets the surface temperature in a part of the evaporator fall below the dew point of the air. This causes dehumidification.

For a bigger dehumidification, the fan speed is reduced. With a constant cooling capacity, the temperature of the air which flows through the heat exchanger coil, passes below the dew point. The moisture contained in the air condenses on the heat exchanger gathers in the condensate pan and is carried away by the drain.

## 5. Technical data

### 5.1 Application limits

- Admissible return air conditions:
  - Temperature:
    - Lower limit: 20°C
    - Upper limit: 40°C
  - Humidity:
    - Lower limit: 5,5°C dew point
    - Upper limit: 60% r.h. and 16°C dew point
- Outdoor ambient conditions:
  - lower limit: -10°C, depending on selected option  
down to -45°C
  - upper limit: depending on selected condenser
- Storage conditions:
  - Temperature [°C]: -20 - +42
  - Humidity [% rel. h.]: 5 - 95
  - Atmosphere pressure [kPa]: 70 - 110
- Required minimum thermal load:
  - Units with on/off compressor: 20% of nom. cooling cap.
  - with speed controlled compr.: 30% of nom. cooling cap.
- Max. length of piping between A/C unit and air-cooled condenser: 30 m equivalent.
- Max. level difference between condenser and A/C unit: 5 m (when condenser is below the A/C unit).
- Chilled water- /cooling water pipes:
  - max. water head pressure: 16 bar
- Chilled water conditions:
  - min. temperature at the unit inlet: 5°C
  - min temp. difference with 5°C EWT: 4 K
- Hot water conditions for optional heating coil:
  - max. inlet water temperature: 110°C
  - max. water head pressure: 16 bar

- Voltage: 380 - 415V / 3ph / 50Hz; N; PE
- Voltage tolerance: +/- 10%  
(not for permanent operation)
- Frequency tolerance: +/- 1%

The following voltages are also available for this A/C unit series with on/off compressors:

230V/3Ph/50Hz; PE (not supported by StulzSelect)  
 208V/3Ph/60Hz; PE  
 230V/3Ph/60Hz; PE  
 380V/3Ph/60Hz; N; PE  
 460V/3Ph/60Hz; PE (also for units with speed-controlled compressor)

Other voltages on request.

Voltage/frequency tolerances as for 400V/3Ph/50Hz.

The cooling capacity, air flow, water flow, pressure loss, sound pressure level and valve sizes change with a voltage different from the standard voltage (400V/3Ph/50 Hz). In this case, see the technical data by the help of the "Stulz Select" planning tool.

The unit design, the external dimensions, the weight, the position and size of the supply connections are independent of the supply voltage and can be found in this manual.

#### Requirements for UPS systems:

(in case of permanent operation of the EC fans with a UPS system)

- the output voltage of the UPS system must be grounded neutral (wye).
- the voltage distortions must be within the limits stated below and no inadmissibly high DC voltage portions may exist.
- all-pole sinus filters must be provided at the UPS system output.

transient peak over-voltage phase to ground:

max. 4 kV (1,2/50µs wave form; Z=12 Ohms in acc. to ANSI)

transient peak over-voltage phase to phase:

max. 2 kV (1,2/50µs wave form; Z=2 Ohms in acc. to ANSI)

ripple voltage phase to ground:  $dV/dt < 1V/\mu s$  ( $\approx 1000V/ms$ )

voltage harmonics: THD(V) < 8%

The warranty is invalidated for any possible damage or malfunction that may occur during or in consequence of operation outside the application ranges.



## Design conditions for A/C units:

Electrical connection: 400V/3ph/50Hz  
 Return air conditions for evaporator capacity: 33°C, 30% rel. h.  
 with an external static pressure: 20 Pa

Cooling fluid circuit	GE, GES
Cooling fluid	water, 30% ethylen glycol
Fluid temperature inlet/outlet (summer operation)	34°C/40°C
Water temperature inlet (winter operation)	11°C
Condensation temperature	45°C

The sound pressure levels are valid at a height of 1 m and distance of 2 m in front of the unit under free field conditions and with nominal data. The values take into account the effects of all installation and design parts contained in the standard unit.

## Adjustment of the pressure switches:

### LP switch:

releases at:  
 automatic reset at:

	R134a	R410A
bar	0,5	3,0
bar	1,5	6,0

### HP switch:

releases at:  
 manual reset possible at:

bar	24,5	36,0
bar	18,0	29,0

### Safety valve:

bar	28	40
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## 5.2 Technical Data - ASR ... A - 1-circuit

Type			201	291	351	381	451	561	431	551
DX-cooling cap. R410A 33°C/30% r.h.	total	kW	30,8	36,2	41,6	48,7	55,0	68,9	56,7	65,8
	sensible		30,8	36,2	41,6	48,7	55,0	68,9	56,7	65,8
DX-cooling cap. R134a 33°C/30% r.h.	total	kW	30,2	33,5	38,6	46,3	—	64,2	46,3	—
	sensible		30,2	33,5	38,6	46,3	—	64,2	46,3	—
Airflow	m³/h		6200	7500	8800	10000	11500	12500	13000	15000
Return air filter class			M5	M5	M5	M5	M5	M5	M5	M5
Sound pressure level	dBA		48,9	52,0	54,6	53,1	55,4	56,7	48,1	51,7
Weight - heat exchanger unit	kg		302	313	313	428	433	476	476	479
Weight - fan unit	kg		95			123			162	
Total weight	kg		397	408	408	551	556	599	634	641
Cabinet size			1			2			3	

## 5.3 Technical Data - ASR ... A² - 2-circuits

Type			532	602	682	722	802	892	822	1082	1252
DX-cooling cap. R410A 33°C/30% r.h.	total	kW	64,4	75,5	99,6	87,2	94,2	104,9	98,4	128,3	150,4
	sensible		64,4	75,5	99,6	87,2	94,2	104,9	98,4	128,3	150,4
DX-cooling cap. R134a 33°C/30% r.h.	total	kW	62,2	66,7	89,4	77,5	91,5	—	92,8	—	133,1
	sensible		62,2	66,7	89,4	77,5	91,5	—	92,8	—	133,1
Airflow	m³/h		13500	16000	18000	19000	20000	22000	21000	27000	32000
Return air filter class			M5	M5	M5	M5	M5	M5	M5	M5	M5
Sound pressure level	dBA		49,8	54,2	57,3	55,1	56,5	59,0	53,5	59,6	62,1
Weight - heat exchanger unit	kg		524	540	573	595	621	632	669	676	930
Weight - fan unit	kg		162			230			310		397
Total weight	kg		686	702	735	825	851	863	979	986	1327
Cabinet size			3			4			5		7

<sup>2</sup> Two condensers required.

The units contain a protective gas filling under atmospheric pressure.

For electrical data, (compressor and fan power consumption) see e-data sheet.

The electrical power consumption of the fans must be added to the room load.

## 5.4 Technical Data - ALR ... GE - 1-circuit

Type			201	291	331	381	431	551
DX-cooling cap. R410A 33°C/30% r.h.	total	kW	22,1	37,5	39,6	48,5	52,2	66,2
	sensible		22,1	37,5	39,6	48,5	52,2	66,2
DX-cooling cap. R134a 33°C/30% r.h.	total	kW	19,1	33,3	33,4	46,4	46,2	—
	sensible		19,1	33,3	33,4	46,4	46,2	—
CW-cooling capacity 33°C/30% r.h.	total	kW	25,9	38,4	44,4	50,7	62,1	73,4
	sensible		25,9	38,4	44,4	50,7	62,1	73,4
Nominal refrigerant charge <sup>1</sup>	kg		4,7	4,9	6,4	6,4	7,3	7,3
Water flow	m³/h		4,1	6,8	7,1	8,7	9,3	11,9
Pressure loss water side - summer	kPa		43	74	58	85	59	94
Pressure loss water side - winter	kPa		35	63	48	75	52	82
GE coil content	dm³		18,8		24,5		32,6	
G-Valve size (2-way)	DN		32	32	40	40	40	40
GE-Valve size (2-way)	DN		32	32	40	40	40	40
Airflow	m³/h		5000	7500	9000	10000	12500	14500
Return air filter class			M5	M5	M5	M5	M5	M5
Sound pressure level	dBA		43,1	49,1	40,7	43,3	45,1	48,8
Weight - heat exchanger unit	kg		474	486	553	566	660	663
Weight - fan unit	kg		123		162		230	
Total weight	kg		597	609	715	728	890	893
Cabinet size			2		3		4	

## 5.5 Technical Data - ALR ... GE - 2-circuits

Type			422	532	572	722	822	1082	1252
DX-cooling cap. R410A 33°C/30% r.h.	total	kW	44,2	64,3	68,2	89,9	99,3	123,3	140,2
	sensible		44,2	64,3	68,2	89,9	99,3	123,3	140,2
DX-cooling cap. R134a 33°C/30% r.h.	total	kW	46,8	62,5	62,4	77,9	92,3	—	—
	sensible		46,8	62,5	62,4	77,9	92,3	—	—
CW-cooling capacity 33°C/30% r.h.	total	kW	51,8	70,3	78,0	96,6	107,4	122,2	135,6
	sensible		51,8	70,3	78,0	96,6	107,4	122,2	135,6
Nominal refrigerant charge <sup>1</sup>	kg		4,1	4,1	5,9	6,0	7,6	7,6	7,6
Water flow	m³/h		8,2	11,6	12,2	16,1	17,8	22,4	25,5
Pressure loss water side - summer	kPa		59	81	58	98	75	116	134
Pressure loss water side - winter	kPa		57	80	57	96	83	131	168
GE coil content	dm³		32,6		37,6		47,3		
G-Valve size (2-way)	DN		40	40	50	50	50	50	50
GE-Valve size (2-way)	DN		40	40	50	50	50	50	50
Airflow	m³/h		10000	13700	15900	19300	21000	23000	25500
Return air filter class			M5	M5	M5	M5	M5	M5	M5
Sound pressure level	dBA		39,6	47,4	48,5	53,0	56,7	58,0	59,6
Weight - heat exchanger unit	kg		693	697	779	794	970	984	1008
Weight - fan unit	kg		230		310		397		
Total weight	kg		923	927	1089	1104	1367	1381	1405
Cabinet size			4		5		7		

<sup>1</sup> The indicated refrigerant charge refers to each refrigerant circuit for R410A and R134a.

For electrical data, (compressor and fan power consumption) see e-data sheet.  
The electrical power consumption of the fans must be added to the room load.

## 5.6 Technical Data - ASR ... AS - 1-circuit

Type			271	401	511
DX-cooling cap. R410A 33°C/30% r.h.	total	kW	36,2	55,9	69,6
	sensible		36,2	55,9	69,6
Airflow		m³/h	7500	11500	17000
Return air filter class			M5	M5	M5
Sound pressure level		dBA	52,0	55,4	58,5
Weight - heat exchanger unit		kg	310	440	481
Weight - fan unit		kg	95	123	162
Total weight		kg	405	563	643
Cabinet size			1	2	3

## 5.7 Technical Data - ASR ... AS<sup>2</sup> - 2-circuits

Type			542	742	552	732	832	1092	1302
DX-cooling cap. R410A 33°C/30% r.h.	total	kW	73,2	98,7	90,4	101,4	106,4	131,6	145,0
	sensible		73,2	98,7	90,4	101,4	106,4	131,6	145,0
Airflow		m³/h	17500	19000	19000	21500	23000	28000	32000
Return air filter class			M5	M5	M5	M5	M5	M5	M5
Sound pressure level		dBA	59,3	60,3	58,4	60,0	58,0	61,7	62,1
Weight - heat exchanger unit		kg	526	555	588	601	671	679	870
Weight - fan unit		kg	162		230		310		397
Total weight		kg	688	717	818	831	981	989	1267
Cabinet size			3		4		5		7

<sup>2</sup> Two condensers required.

The units contain a protective gas filling under atmospheric pressure.

For electrical data, (compressor and fan power consumption) see e-data sheet.

The electrical power consumption of the fans must be added to the room load.

## 5.8 Technical Data - ALR ... GES - 1 circuit

Type			271	401	511
DX-cooling cap. R410A 33°C/30% r.h.	total	kW	35,4	46,8	55,0
	sensible		35,4	46,8	55,0
CW-cooling capacity 26°C/60% r.h.	total	kW	38,1	50,7	65,9
	sensible		38,1	50,7	65,9
Nominal refrigerant charge R410A		kg	4,8	6,4	7,3
Water flow		m³/h	6,6	8,7	10,4
Pressure loss water side - summer		kPa	70	85	72
Pressure loss water side - winter		kPa	60	75	64
GE coil content		dm³	18,8	24,5	32,6
G valve size (2-way)		DN	32	40	40
GE valve size (2-way)		DN	32	40	40
Airflow		m³/h	7500	10000	13000
Return air filter class			M5	M5	M5
Sound pressure level		dBA	49,2	52,9	54,1
Weight - heat exchanger unit		kg	475	550	655
Weight - fan unit		kg	123	162	230
Total weight		kg	598	712	885
Cabinet size			2	3	4

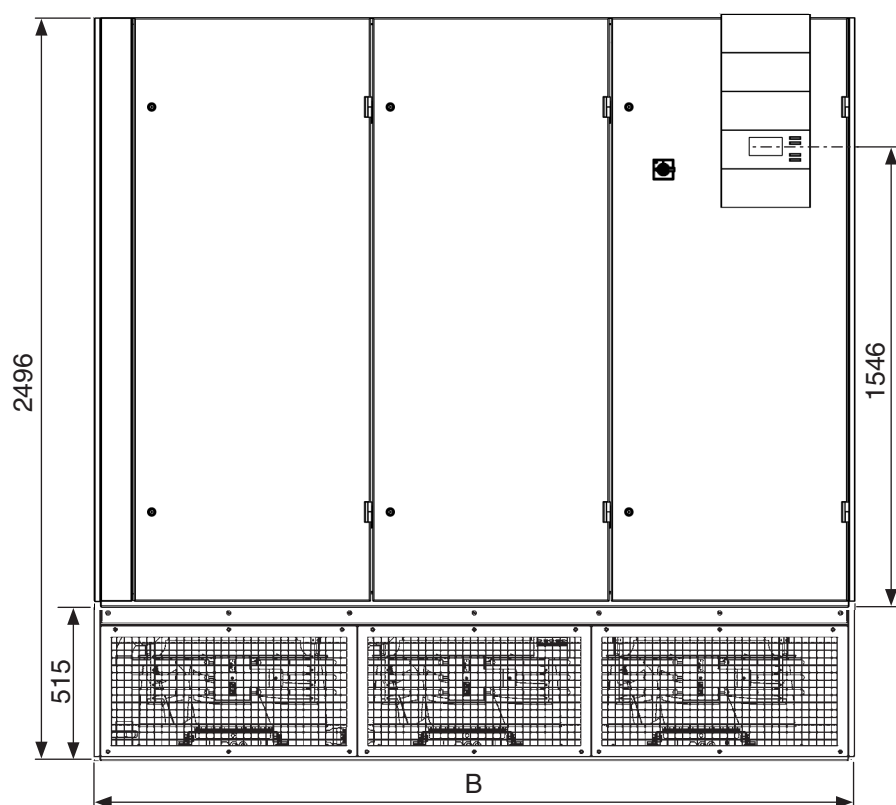
## 5.9 Technical Data - ALR ... GES - 2 circuits

Type			432	542	552	732	832	1092	1302
DX-cooling cap. R410A 33°C/30% r.h.	total	kW	50,1	64,5	68,1	85,3	96,3	115,5	136,2
	sensible		50,1	64,5	68,1	85,3	96,3	115,5	136,2
CW-cooling capacity 33°C/30% r.h.	total	kW	58,8	71,7	78,5	90,2	103,8	122,2	135,6
	sensible		58,8	71,7	78,5	90,2	103,8	122,2	135,6
Nominal refrigerant charge R410A <sup>1</sup>		kg	4,1/4,4	4,3/4,4	5,9/6,1	5,9/6,1	7,6/7,6	7,6/7,6	on request
Water flow		m³/h	10,3	11,8	12,3	15,8	17,6	22,4	25,5
Pressure loss water side - summer		kPa	75	75	51	82	65	104	134
Pressure loss water side - winter		kPa	88	82	57	92	82	131	168
GE coil content		dm³	32,6		37,6		47,3		
Valve size (2-way) G circuit		DN	32	32	40	40	40	40	50
Valve size (2-way) GE circuit		DN	40	40	50	50	50	50	50
Airflow		m³/h	11000	14000	16000	17500	20000	23000	25500
Return air filter class			M5	M5	M5	M5	M5	M5	M5
Sound pressure level		dBA	52,1	55,0	52,7	54,2	56,0	58,1	59,6
Weight - heat exchanger unit		kg	695	698	782	790	950	968	1002
Weight - fan unit		kg	230		310		397		
Total weight		kg	925	928	1092	1100	1347	1365	1399
Cabinet size			4		5		7		

<sup>1</sup> refrigerant circuit 1/ circuit 2.

For electrical data, (compressor and fan power consumption) see e-data sheet.  
The electrical power consumption of the fans must be added to the room load.

## 5.10 Dimensional drawings

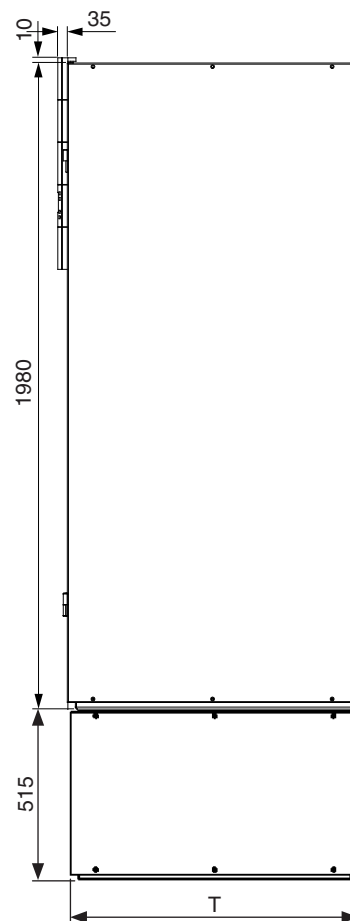


Side view

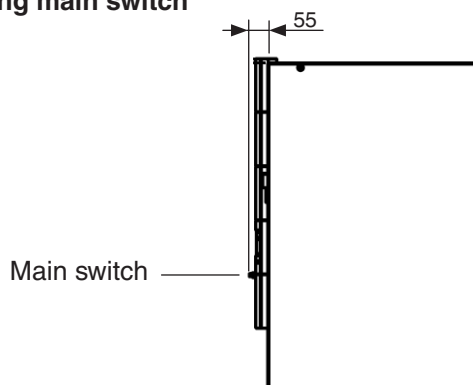
Cabinet size	B	T	T*	N°
1	950	890	945	1
2	1400	890	945	1
3	1750	890	945	2
4	2200	890	945	2
5	2550	890	945	3
7	3110	980	1035	4

T\*: Depth including main switch

N°: Number of fans



Projecting main switch





## 6. Installation

### 6.1 Positioning

Check that the installation site is appropriated for the unit weight, which you can read in the technical data.

The A/C unit is designed for the inside installation on a level base. The solid base frame contributes significantly to an even weight distribution. When selecting the installation site take into account the necessary clearances for the maintenance and the air flow.

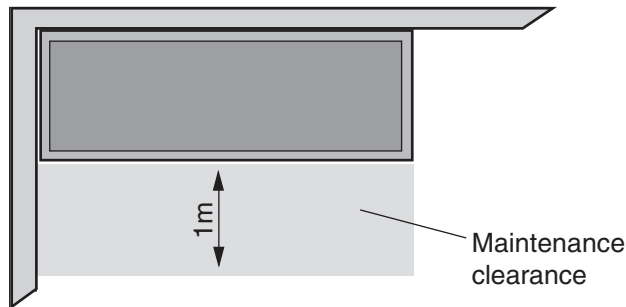
Children, unauthorized persons and animals may not have access to the installation site of the A/C unit.

Vibrations emanate from the A/C unit due to compressor operation. To avoid such vibrations, install the unit on a vibration absorbing base, as it is realized in case of a positioning on a raised floor socket e.g. by Mafund strips.

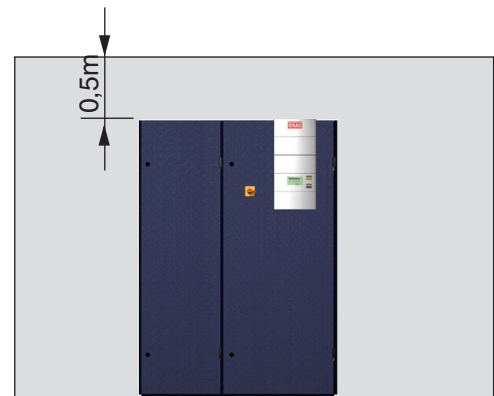
Do not operate the A/C unit in office rooms or other rooms sensitive to noise.



**The unit may not be operated in an explosive atmosphere!**

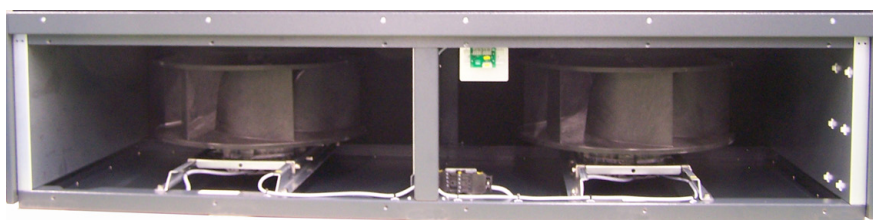


The maintenance clearance of 1 m must also be maintained in front of the fan unit in the raised floor.

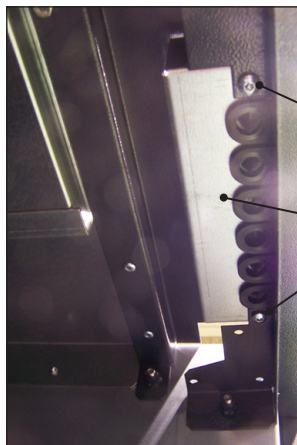


Air intake area

Before the positioning prepare the fan unit for the electrical wiring by unscrewing the fan protection grilles and by removing the cable feedthrough plates.



The two cable feedthrough plates are located in the frame of the fan unit and secured by two Torx screws that are screwed in from below.



Bottom view

2 screws

cable feedthrough plate with 6 openings



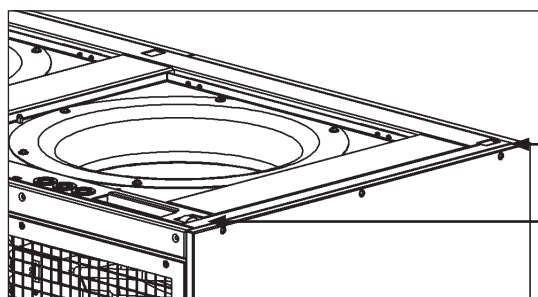
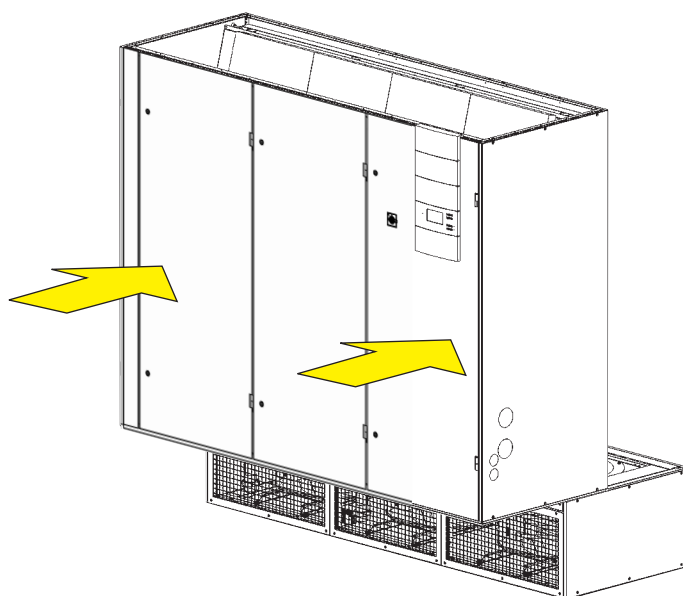
cable feedthrough plate top view

Locate the fan unit in the raised floor first. The distance from the upper edge of the raised floor to the base should at least be 515 mm.

If the raised floor is higher you can additionally use a raised floor socket to equalize the height difference. Place the heat exchanger unit on the raised floor in front of the cut off for the fan unit.

Both the heat exchanger unit and the fan unit are equipped with rolls and the corresponding cut offs in which the rolls of the other unit disappear.

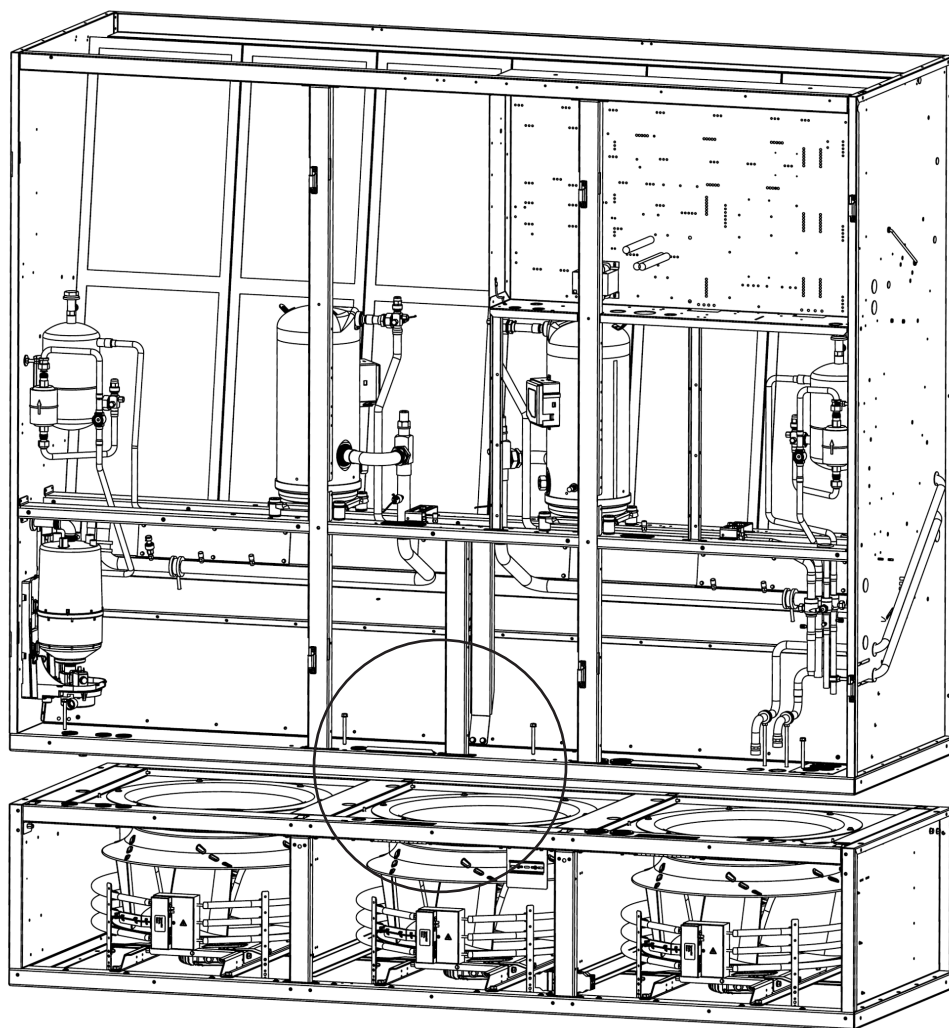
Now push the heat exchanger unit with two persons from the front onto the fan unit.



Cut-out for rolls of the heat exchanger unit

Roll in the fan unit

## Bolting of heat exchanger unit and fan unit



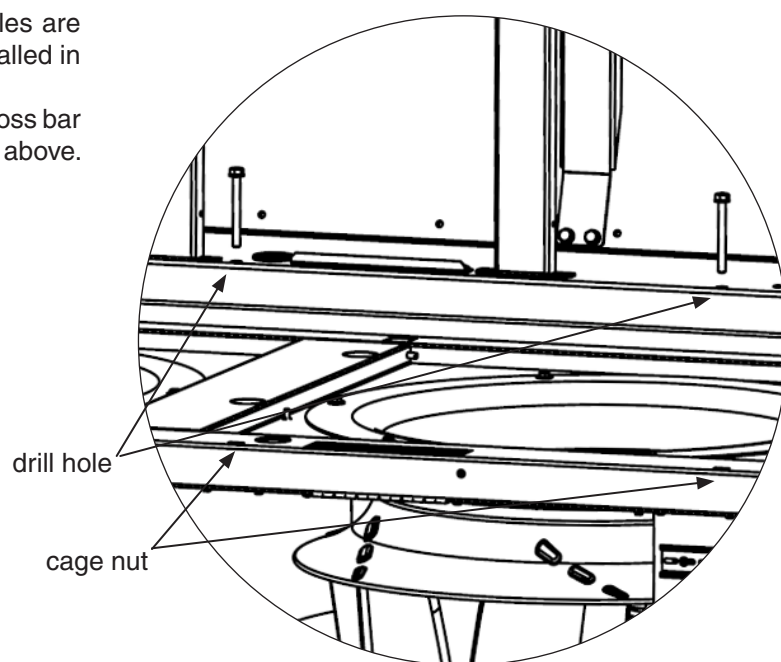
The heat exchanger unit and fan unit may be bolted together, to prevent a move of both parts to each other (e.g. in case of a shock from the front).

The screws and washers are included, drill holes are existant, appropriate cage nuts are already installed in the fan unit.

The M10 screws must be inserted in the lower cross bar on the front side of the heat exchanger unit from above.

The number of screws varies with the size:

Size	Number
1 - 3	2
4	3
5	4
7	5



Detail drawing

## 6.2 Connection of the piping

### 6.2.1 Refrigerant piping (A/AS units)

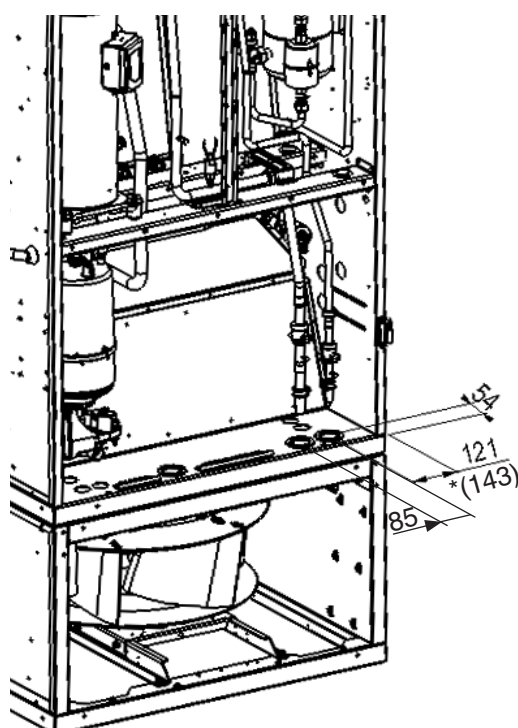
A/C units of the versions A and AS are equipped with an open refrigerant circuit. To close the circuit these units must be connected to an external condenser.

#### 6.2.1.1 Design

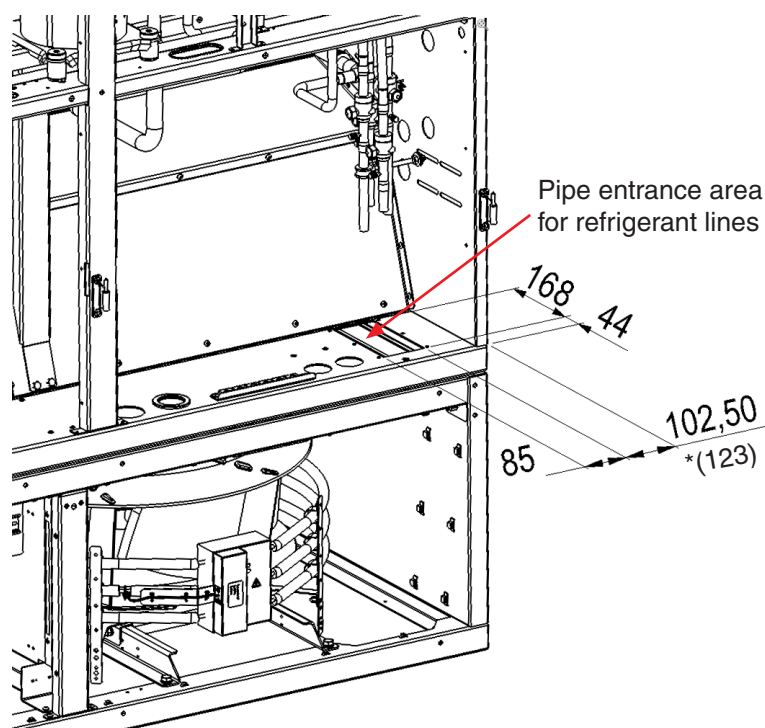
To design the piping between the A/C unit and the condenser follow the instructions in chapter "2. Refrigerant piping" of document "General-DX". This document is available in the e-Stulz area.

#### 6.2.1.2 Position of the refrigerant connections

Size 1



Sizes 2 - 7



\*distance from the exterior side of the side panel to the zone of introduction. This dimension is decisive if several units are installed fitting exactly side by side.

#### Refrigerant line connection (1 circuit) in mm

A unit	201	291	351	381	451	561	431	551
Pressure line	16	22	22	22	22	22	22	22
Liquid line	16	16	16	16	16	22	16	16

AS unit	271	401	511
Pressure line	16	18	22
Liquid line	16	16	22

**Refrigerant line connection (2 circuits) in mm**

<b>A unit</b>	<b>532</b>	<b>602</b>	<b>682</b>	<b>722</b>	<b>802</b>	<b>892</b>	<b>822</b>	<b>1082</b>	<b>1252</b>
Pressure line	16	22	22	22	22	22	22	22	22
Liquid line	16	16	16	16	16	16	16	16	22

<b>AS unit</b>	<b>542</b>	<b>742</b>	<b>552</b>	<b>732</b>	<b>832</b>	<b>1092</b>	<b>1302</b>
Pressure line	16	18/22*	18/22*	18/22*	18/22*	22	22
Liquid line	16	16	16	16	16	22/16*	22

\* refrigerant circuit 1/ circuit 2.

The refrigerant connections are located near the compressor and are labelled by the inscriptions "pressure pipe" and "liquid pipe" respectively "pressure pipe 1" and "pressure pipe 2" etc. for 2-circuit units.

The lines to be connected have to be soldered.

For the connection of the external pipework respect the pipe entrance area shown on top of page 20.

### A/C units with speed controlled compressor (AS version)

The units contain an oil separator which is installed at the hot gas side of the compressor and serves to recuperate oil in all operating states. The separated oil is injected on the suction side of the compressor.

For the hot gas line and the liquid line each a non return valve is supplied loose with the A/C unit. For the liquid line we recommend to install the non return valve near the condenser, this avoids the return flow of refrigerant in to the condenser and a possible low pressure error at the unit start.

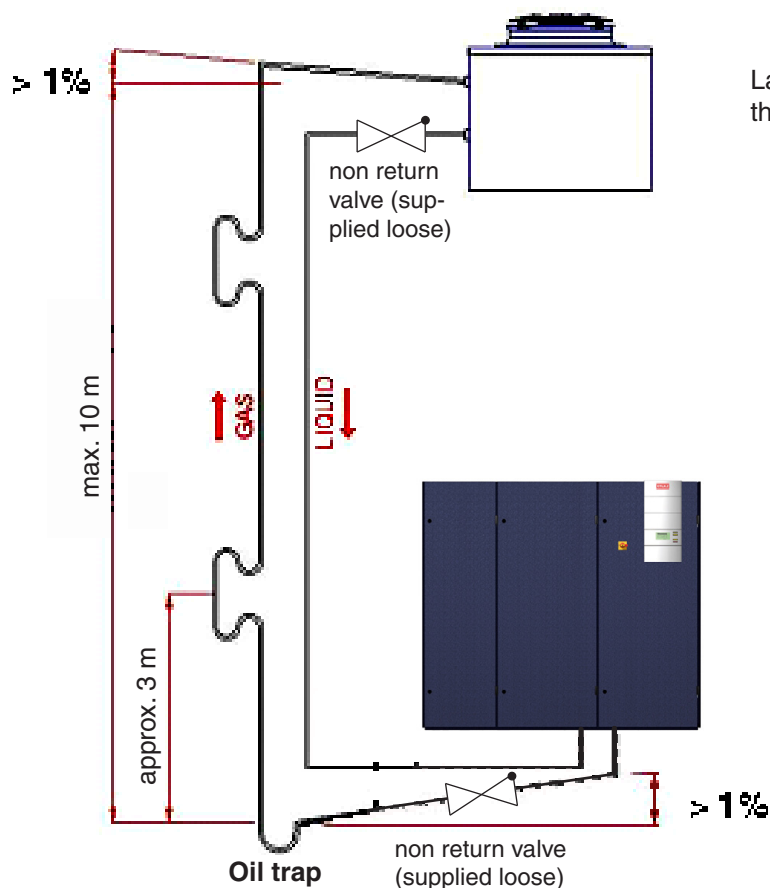
For the hot gas line we recommend to install the non return valve as close as possible to the A/C unit. The non return valve avoids the return flow of liquid refrigerant from the condenser when the A/C unit is not in operation.

#### Measures to take with hot gas pipes if the condenser is positioned higher than the A/C unit

- Ascending pipes must have oil traps every 3 m (see drawing).
- Install an oil trap at the end of horizontal gas pipes whenever the following pipe is an ascending pipe (see drawing).



**Install a remote condensing unit designed for R410A refrigerant. For correct operation of the whole refrigerant circuit, the remote condenser must be provided with variable speed fan, to adapt condensing pressure to variable outdoor conditions.**



Laying pipes when the condenser is located higher than the A/C unit.

#### Oil charge



**The A/C unit is prefilled with 0.6 l oil. Further addition of oil damages the compressor and may invalidate guarantee coverage for the product.**



### 6.2.1.3 Strength pressure test

The compressor has been strength-tested in the factory. It is not necessary for the customer to strength- or leak-test the compressor again.

### 6.2.1.4 Tightness/pressure test

Use only dry nitrogen for pressure testing of the refrigerant circuit.



**Do not subject the compressor to dry air. Otherwise you risk a bearing malfunction!**

### 6.2.1.5 Filling the refrigerant circuit

- Before the system is filled with refrigerant, it must be clean and dry inside.
- Connect the unit electrically as described on top of page 31 and following pages.
- Turn the main switch to the ON position (the C7000 controller should now be in the Stop mode).
- Switch on the control-circuit fuses.
- Do not switch on neither power switches nor the controller.

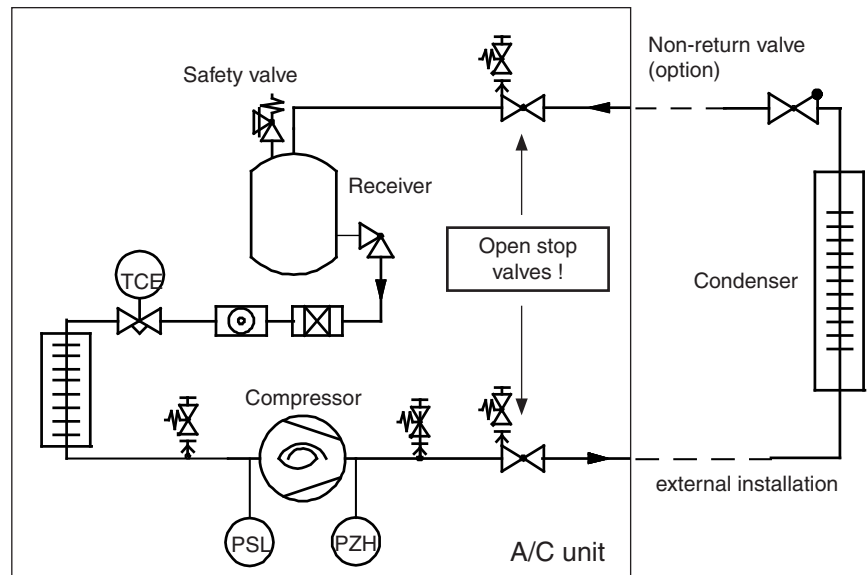
#### C7000AT:

- Select the Config menu.
- Enter the password.
- Go to menu "Components/Manual oper./Cooling/Valves.
- Change the parameter in the column "EN" line "EEV 1" from "0" to "1".
- Set the parameter in the column "Value" of the same line to 100%.

#### C7000IOC:

- Enter the command: "eev 1 hand 1" and "eev 1 handon 100".

**A/C units with On/Off compressor**



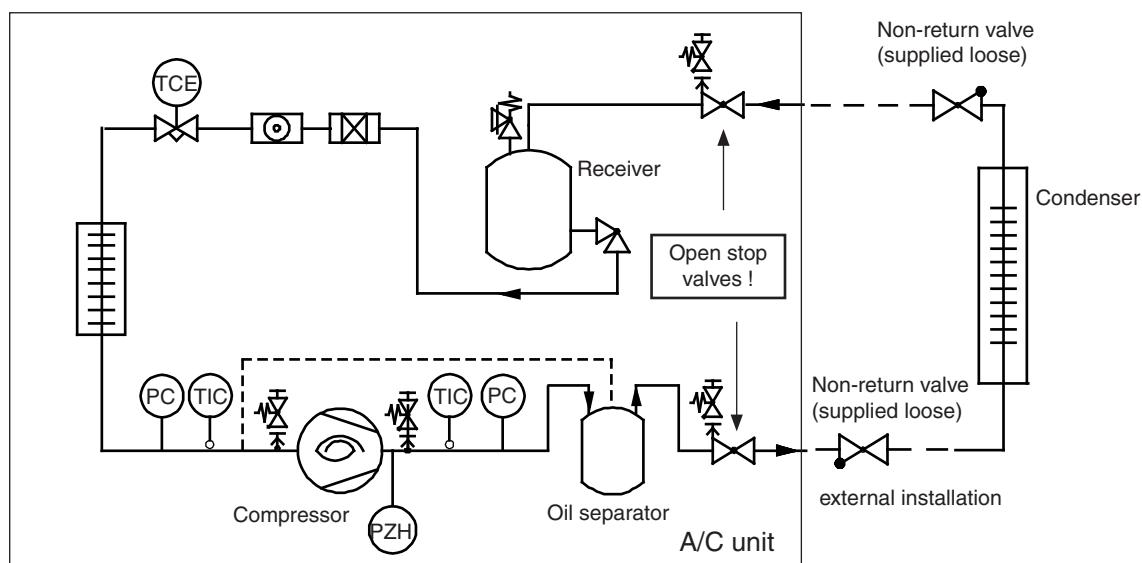
The expansion valve is now completely open.

- Open the stop valves.
- The refrigerant circuit is filled with a nitrogen filling under atmospheric pressure. Evacuate the refrigerant circuit by the Schrader valves until approximately 0 bar.
- Fill the refrigerant circuit with refrigerant by the Schrader valves.
- Systems without refrigerant receiver or sight glass must always be filled according to weight.
- Systems with refrigerant receiver should be filled according to weight but can also be filled by checking the sight glass.



**If you use the refrigerant R410A, note that R410A is a binary blend. Take care that you add refrigerant in a liquid state, as the ratio of the refrigerant components changes if one of the two compounds passes over into the gaseous phase.**

## A/C units with speed controlled compressor



- Because R410A is a blend and scrolls have discharge check valves, systems should be liquid-charged on both the high and low sides simultaneously to ensure a positive refrigerant pressure is present in the compressor before it runs. The majority of the charge should be placed in the high side of the system to prevent bearing washout during first-time start.
- The standing refrigerant bottle is connected to the suction side via a pressure gauge station. The weight is noted shortly before filling. The specified amount of refrigerant is now added when the system is operating. During filling the pressure in the refrigerant bottle will adjust to that of the system. Filling is then no longer necessary. This can be seen by the icing up of the bottle or by checking the pressure gauge. The bottle valve must then be closed until a pressure increase has taken place which is above the suction pressure of the system. This process can be accelerated if the bottle is wrapped in hot moist towels or it is placed in a water bath at a maximum temperature of 50°C.



**Never heat up the refrigerant bottle with a naked flame as there is a risk of explosion.**

To estimate the required refrigerant charge in advance, consider following volumes:

Components / Type		201	291	351	331	381	451	431	551
Evaporator	dm <sup>3</sup>	10,5			19,3			20,6	
Liquid receiver	dm <sup>3</sup>	5			5			5	

Components / Type		271	401	511
Evaporator	dm <sup>3</sup>	10,5	19,3	20,6
Liquid receiver	dm <sup>3</sup>	5	5	5

A/C units with two refrigerant circuits:

Components / Type		422	532	602	572	722	802	822	1082	1252
Evaporator	dm <sup>3</sup>	12,9			13,5			19		24
Liquid receiver	dm <sup>3</sup>	5			5			5		5

Components / Type		432	542	552	732	832	1092	1302
Evaporator	dm <sup>3</sup>	12,9		13,5		19		24
Liquid receiver	dm <sup>3</sup>	5		5		5		5

The indicated values are valid for a single refrigerant circuit. Both circuits contain the same components.

### 6.2.1.6 Crankcase heater

#### only for A/C units with on/off compressor

- Note down the quantity of refrigerant filled into the system.
- Read the compressor model on the compressor rating plate.
- If the filled refrigerant quantity exceeds the refrigerant charge limit for the corresponding compressor model of the table below, a crankcase heater is required.

Compressor model R410A	Refrigerant charge limit
ZP72K - ZP91K	4,5 kg
ZP104K - ZP182K	7,0 kg

### Compressor rating plate



Compressor model

## 6.2.2 Water piping (GE/GES units)

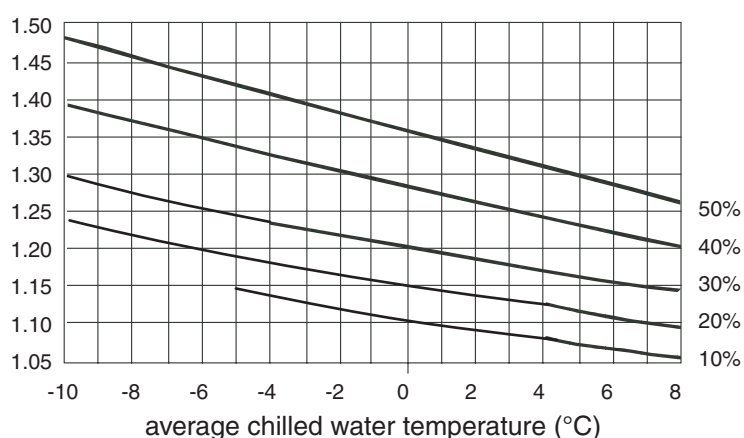
### External water circuit

To seal the water circuit you must connect the unit to a chilled water ring mains, which contains for the generation of cold water either a chiller, a dry cooler or cooling tower. If the water quality is insufficient, we recommend the additional installation of a fine mesh strainer.

For an efficient protection against corrosion, the anti-freezing agent is mostly sufficient, which should be used if the water temperature passes under 5°C or if the outside temperature is less than 0°C. We recommend to add the following quantities of ethylenglycol (indicated as percentage of weight of the water quantity) :

water or outside air temperature	ethylenglycol
from +5 to -5°C	10%
from -5 to -10°C	20%
from -10 to -15°C	28%
from -15 to -20°C	35%
from -20 to -25°C	40%

correction coefficient for the pressure drop in the water circuit when using ethylenglycol



### Recommendation for GE and GES Condenser Water Systems

On new or renovated condenser water systems, ensure that the external pipework is thoroughly flushed, to remove construction debris and other particulate matter, before connecting to the new Stulz cooling units. A strainer should be fitted at the unit inlet, to protect the heat exchangers from fouling and possible blockage.

The strainer should have a mesh size of 0.5 mm. Be aware that any fouling or blockage of the heat exchanger result in a reduced water flow, loss of efficiency, possible damage to the heat exchanger and subsequent unit failure.

For connecting the unit to the external system remove the protective caps of the screwed connections.

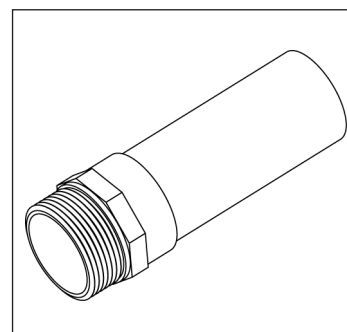


**Water remaining from the test run may escape when the protective caps are removed.**

The water connections end with an external thread. Screw the lines of the external system to the lines of the unit respecting the designation at the unit.

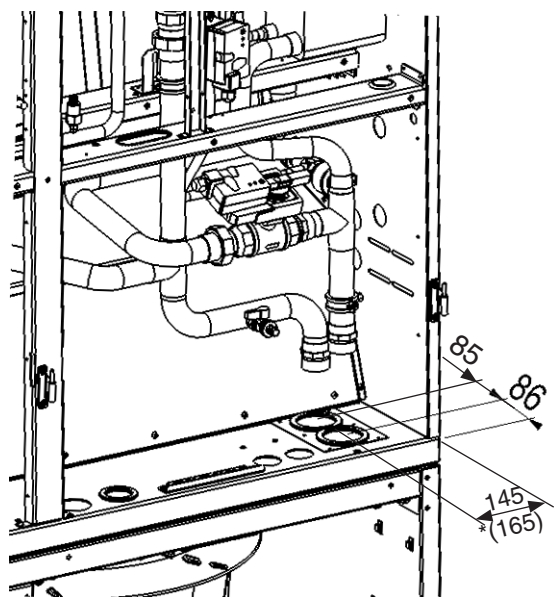
Insulate the water pipes with the diffusion tight insulating material, to prevent the introduction of ambient air heat and the formation of condensate at the pipes.

Fill and bleed air from the cooling water circuit by means of the filling connections and the schrader valves for bleeding (see refrigerant diagram).



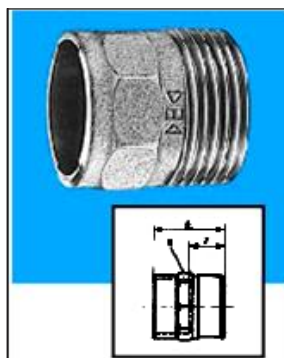
Connection with external thread

## GE, GES version



\*distance from the exterior side of the side panel to the zone of introduction.  
This dimension is decisive if several units are installed fitting exactly side by side.

To connect the piping notice the labels on the pipe ends.



Diameter [mm]	ext. thread [inch]
28	1
35	1 ¼
42	1 ½
54	2

## Water pipe connection (1 ref. circuit) in inches

Unit	201	291	331	381	431	551	271	401	511
GE pipes	1 ¼	1 ¼	1 ½	1 ½	1 ½	1 ½	-	-	-
GES pipes	-	-	-	-	-	-	1 ¼	1 ½	1 ½

## Water pipe connection (2 ref. circuits) in inches

Unit	422	532	572	722	822	1082	1252
GE pipes	1 ½	1 ½	2	2	2	2	2

Unit	432	542	552	732	832	1092	1302
GES pipes	1 ½	1 ½	2	2	2	2	2

### 6.2.3 Condensate drain connection

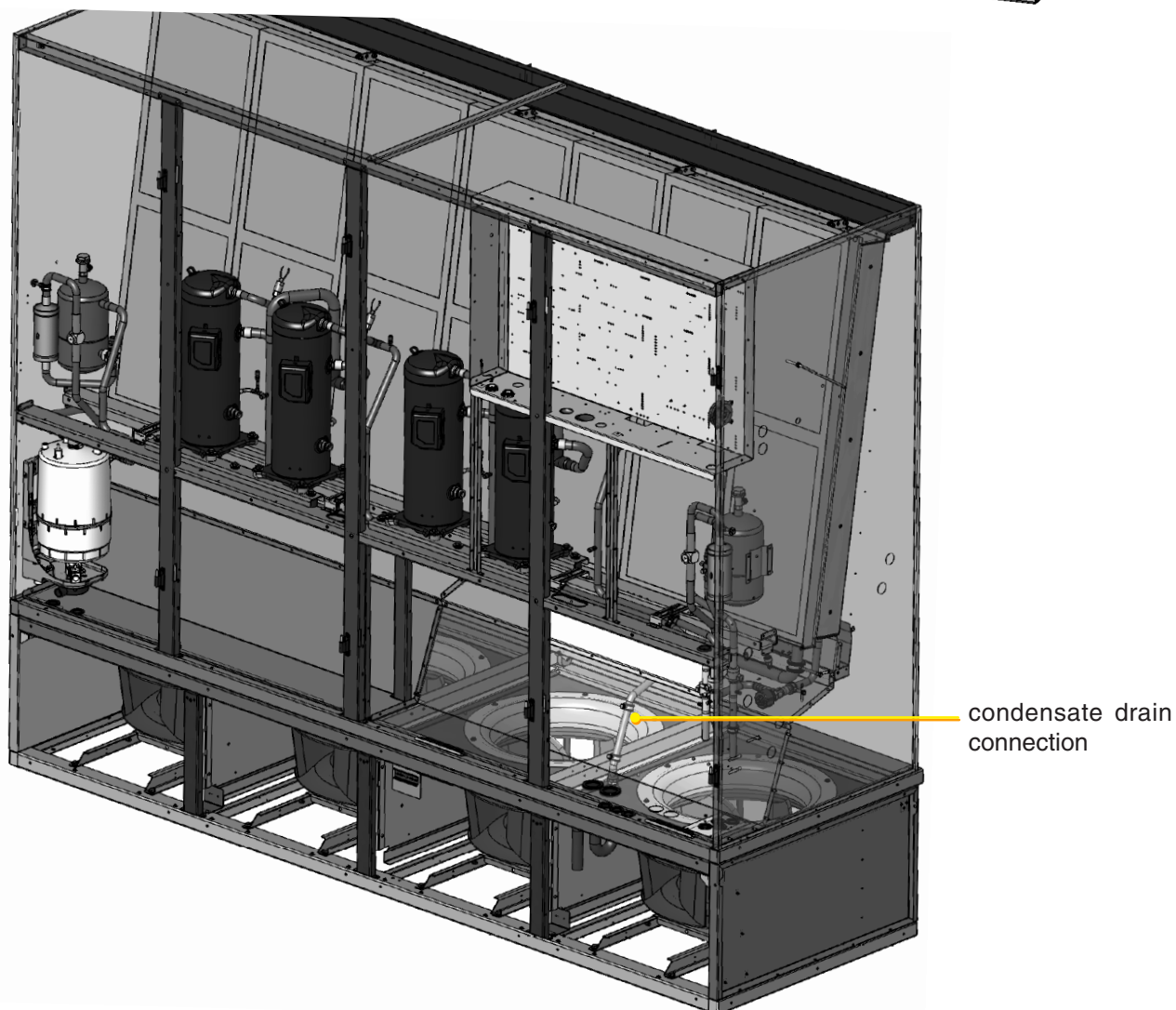
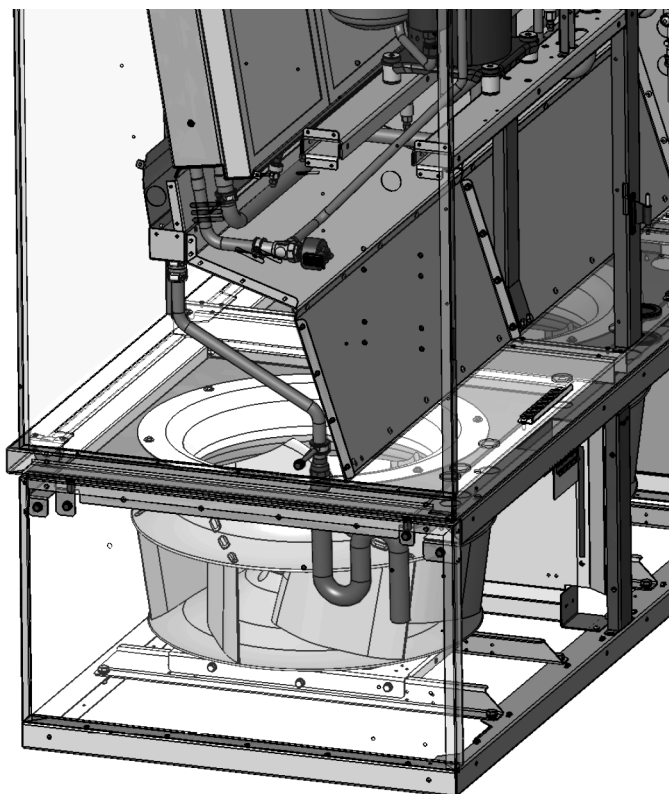
The condensate drain connection in the unit size 1 - 5 is located on the left side.

The syphon is supplied with the unit and has to be mounted in the raised floor on site after the A/C unit has been installed.

The illustration beside shows an A/C unit of the sizes 1 - 5 with a syphon already installed.

In A/C units of size 7 the condensate drain connection is located on the left side of the first fan.

The illustration below shows an A/C unit of size 7, the condensate drain connection can be seen in the brighter area behind the air separation plate.

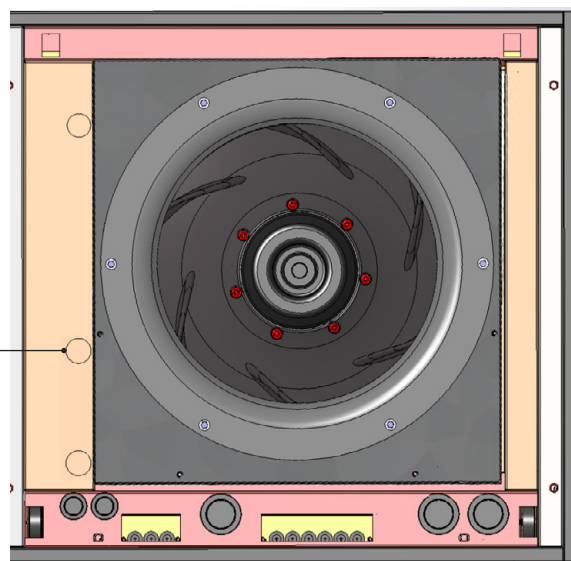




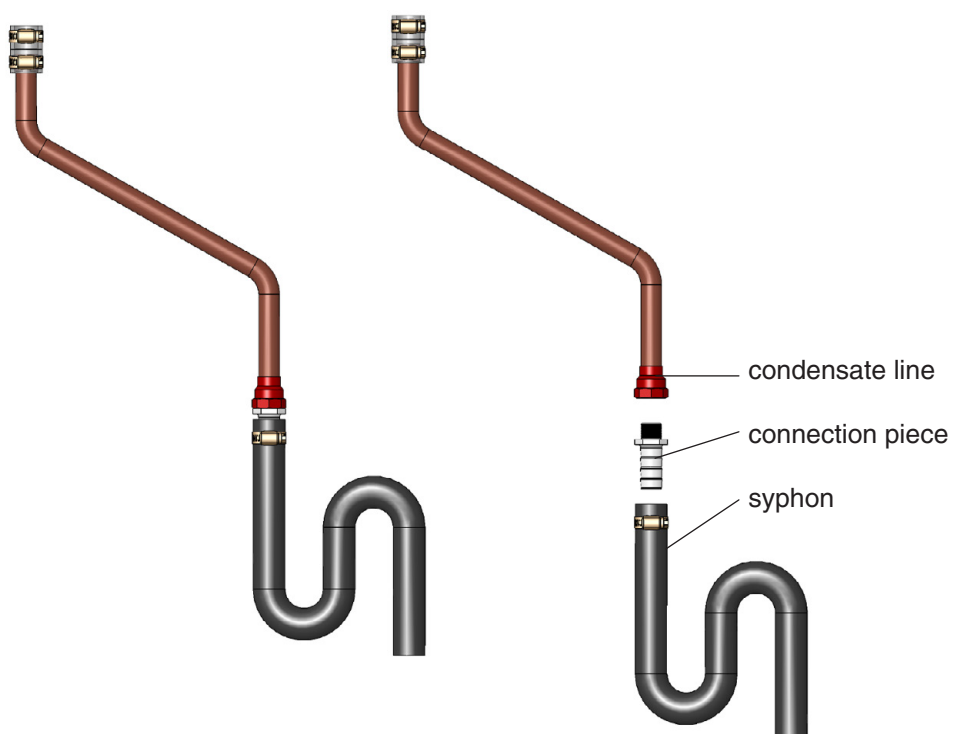
## Syphon installation

- If you have not already done it, remove the four screws of the grille before the fan next to where the syphon must be installed and remove the grille
- Knock out the perforated opening for the condensate line.
- Put the connection piece from the bottom through the opening into the threaded part of the condensate pipe und screw it tight.
- Put the syphon over the connection piece and fix it with the hose clamp.

Knock-out opening  
for condensate line

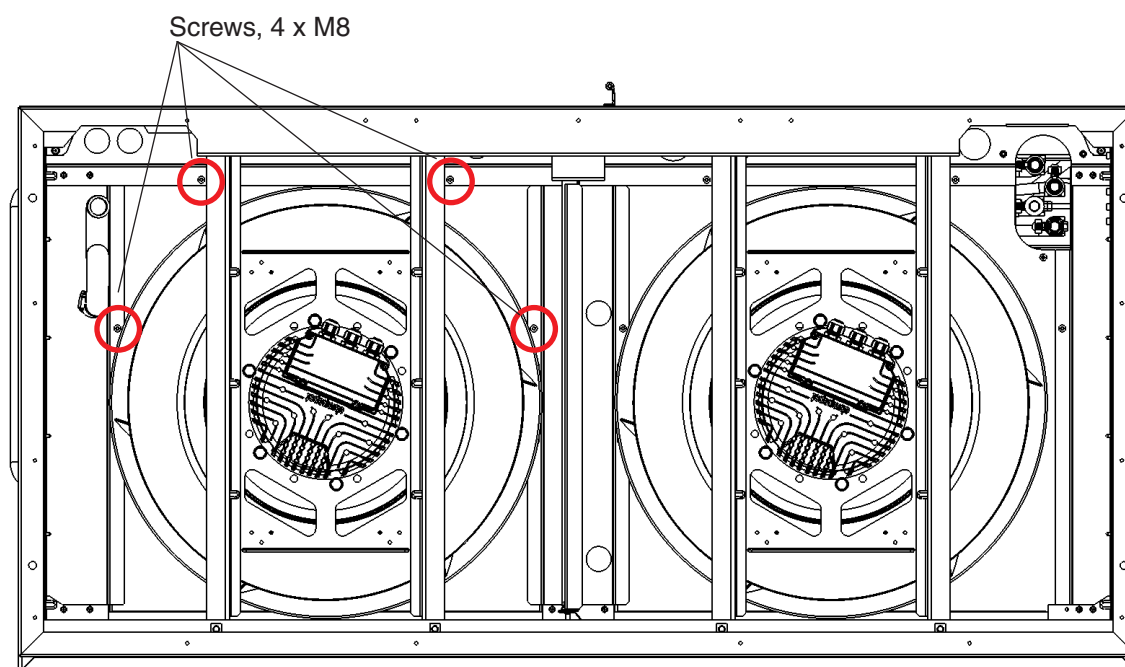


Top view of fan unit



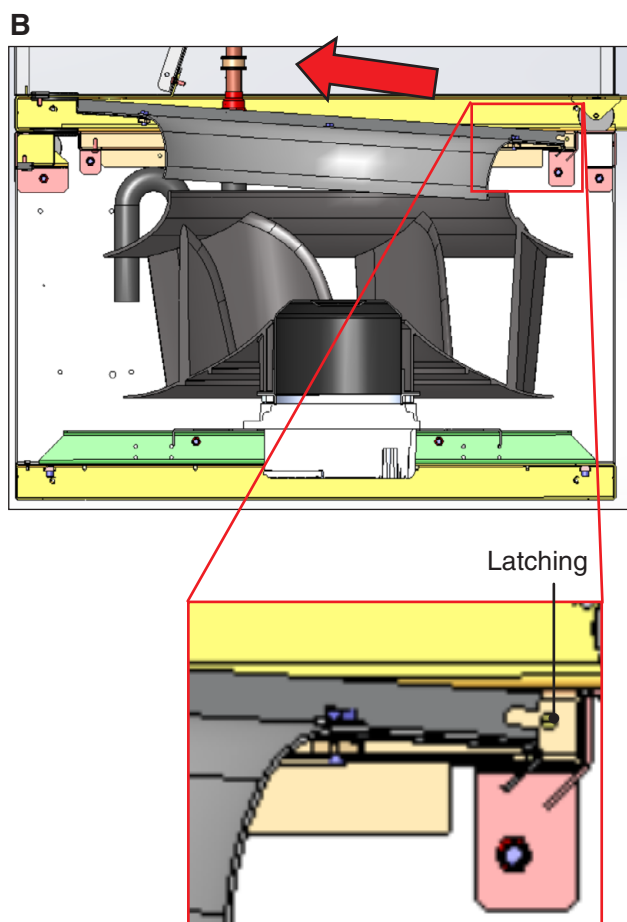
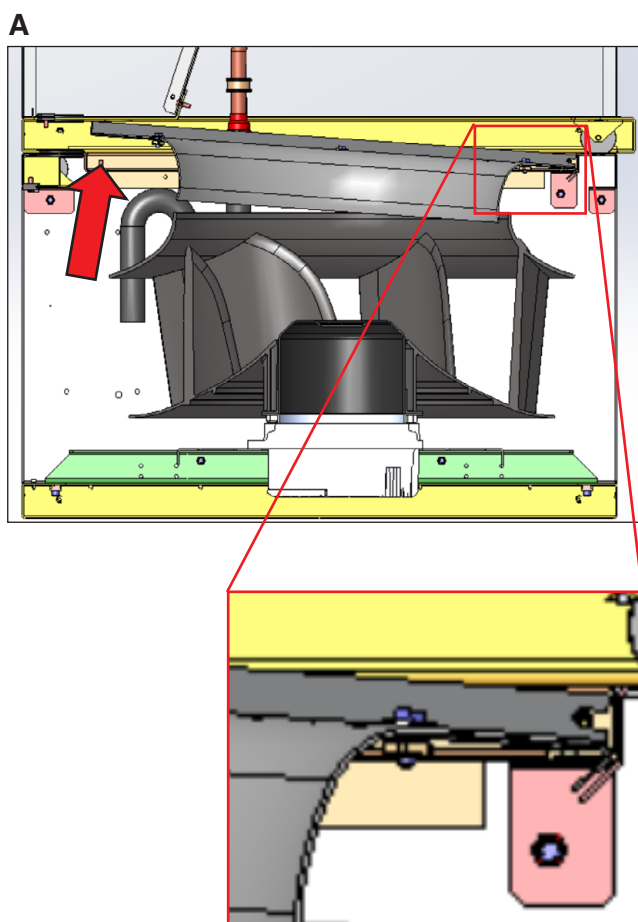
- If the condensate pipe is installed too high, the above described procedure is not feasible.
- Follow the instructions on the next page.

- Remove the four screws (marked in the drawing shown below) of the plate on which the inlet cone of the fan is mounted.

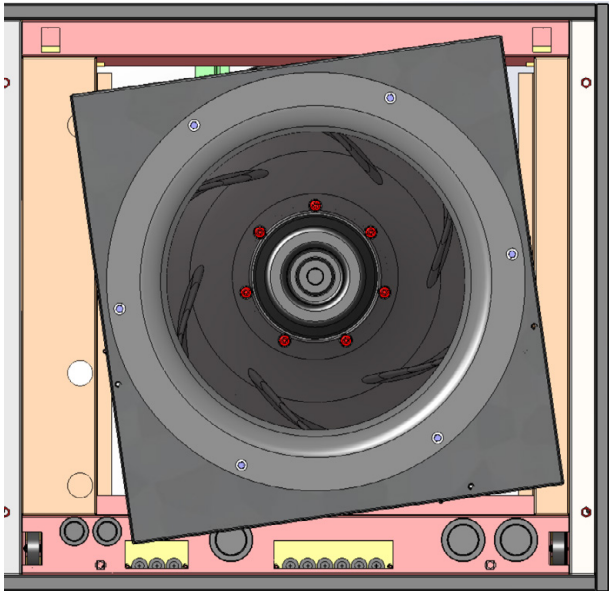


Bottom view of fan unit

- Push the cone support plate at the unit front upwards (A) and pull it from the rear latching (B).



- Drop the plate slantwise on the frame of the fan unit (C).
- Push the plate upwards at the side which points towards the condensate pipe.
- Screw the connection piece into the condensate pipe and fix the syphon.

**C**

- Push the cone support plate into the rear latching.
- Retighten the screws to attach the cone support plate.

Connect the condensate water drains to the local waste water system.



**Comply with the regulations of the local water supply authority.**

## 6.3 Electrical connection



Ensure that the electric cables are de-energized.

The electric cables are only to be connected by an authorised specialist.

The unit must dipose of an effective earthing.



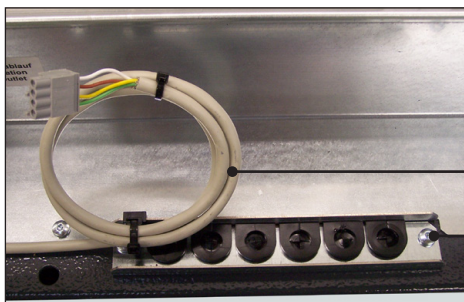
Do not touch electronical components, without taking care of protective ESD measures.

The power supply system on site and the pre-fuses must be designed for the total current of the unit (see e-data sheet).

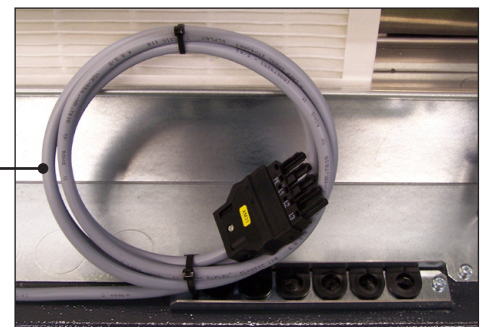
### Connection of electric cables in the fan unit

The cable, which must be connected lie curled up in the heat exchanger unit and are separated by power cables and control cables. The power cables are shown in red in the following drawings, the control cables are marked in green.

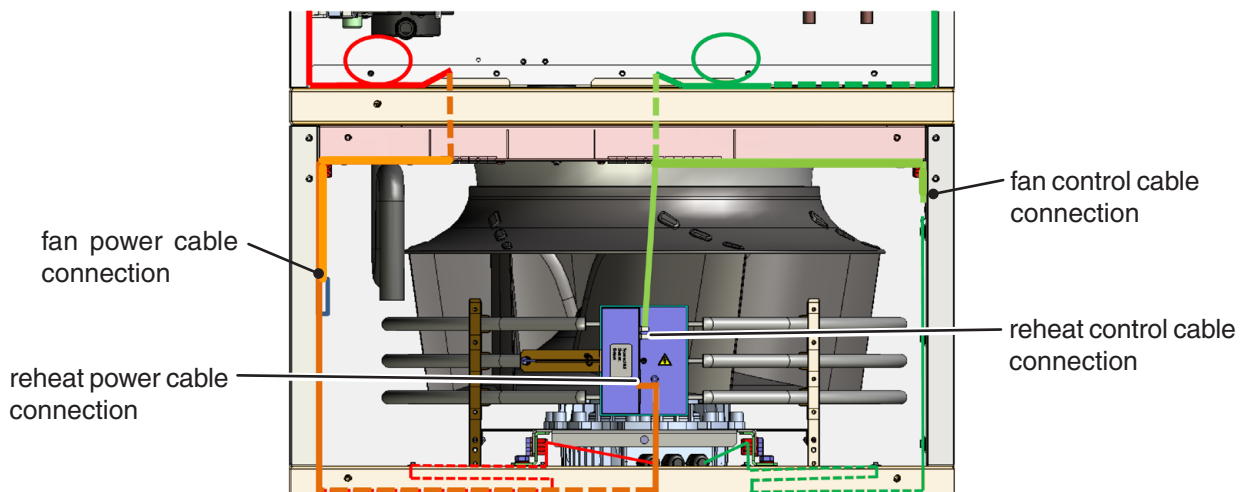
1. Unscrew both cable feedthrough plates in the heat exchanger unit.
2. Route the power cable for the fan and possibly the power cables for the electric heating in the frame of the fan unit, as shown on the drawings (orange line).
3. Route the control cable for the fan and possibly the control cable for the electric heating in the frame of the fan unit, as shown on the drawings (green line).



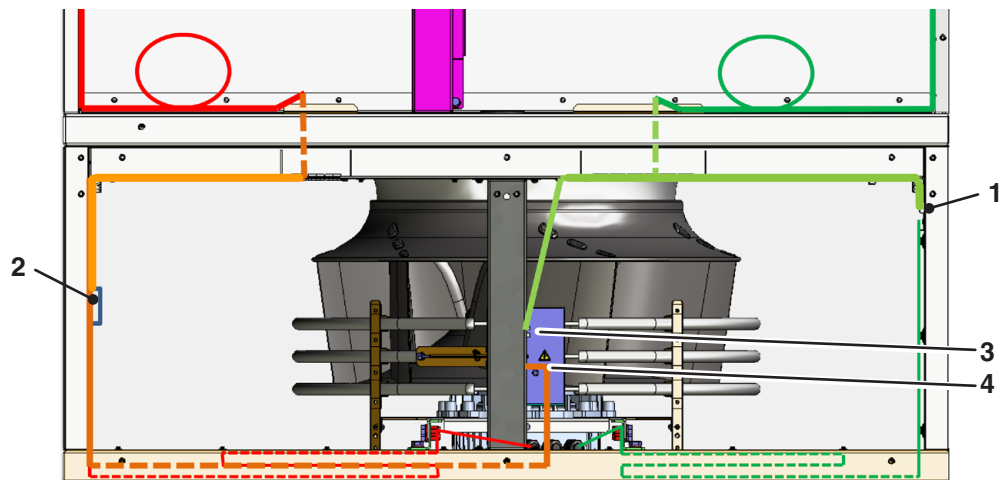
power cable  
control cable  
cable feedthrough plate



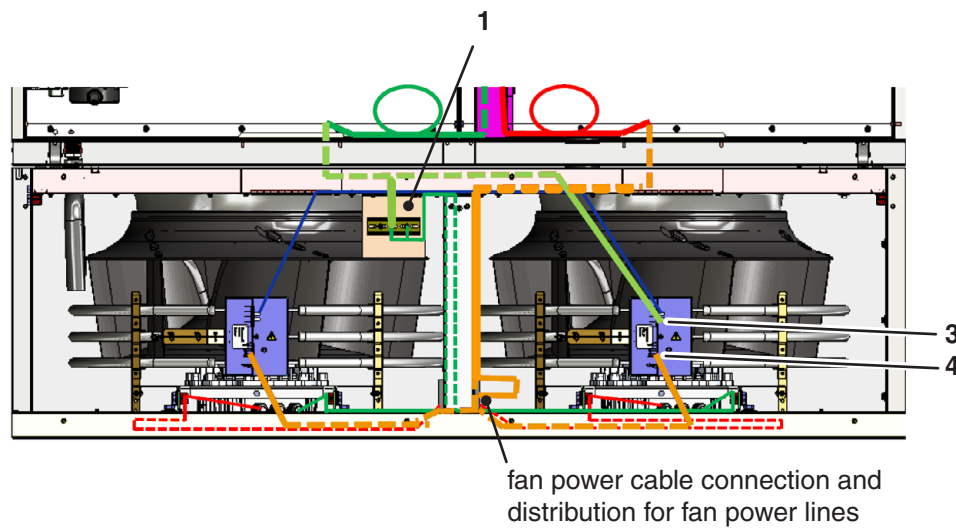
### Size 1



## Size 2



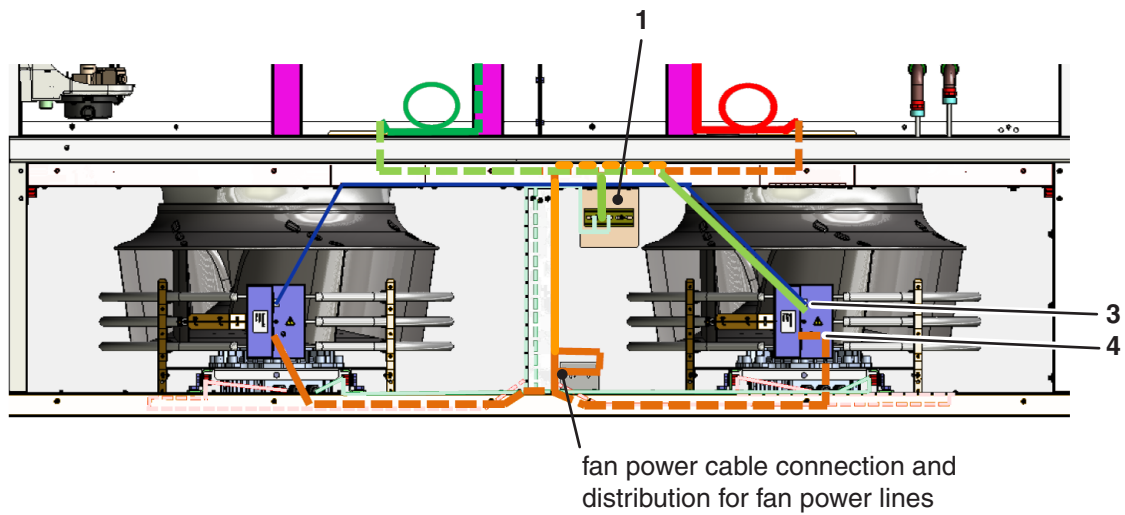
## Size 3



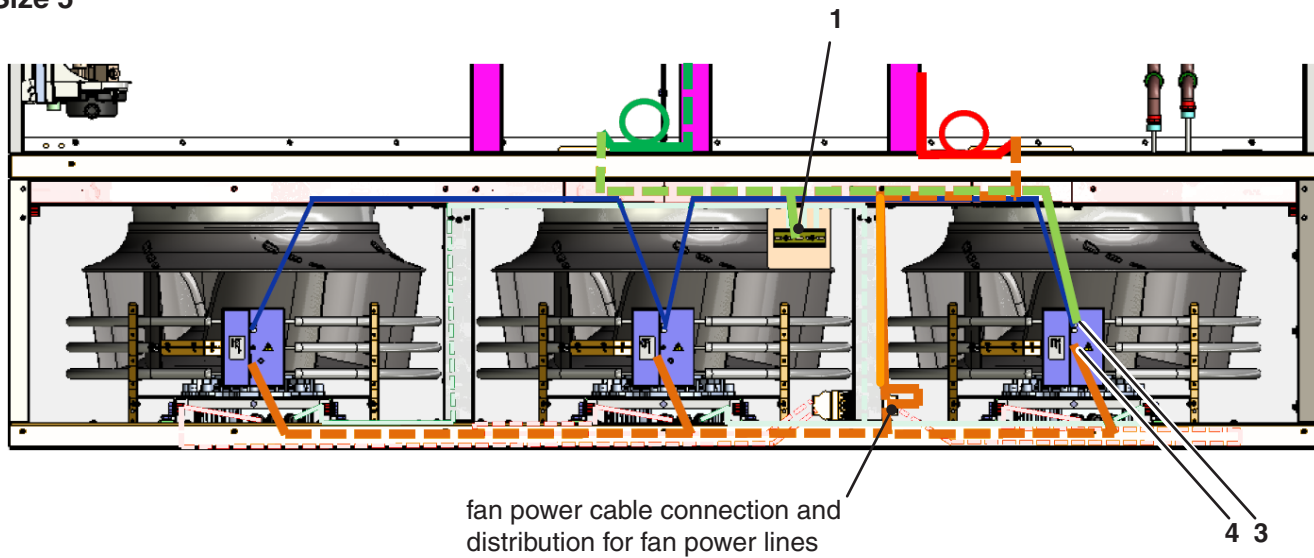
## Legend:

- 1 - fan control cable connection
- 2 - fan power cable connection
- 3 - reheat control cable connection
- 4 - reheat power cable connection

## Size 4



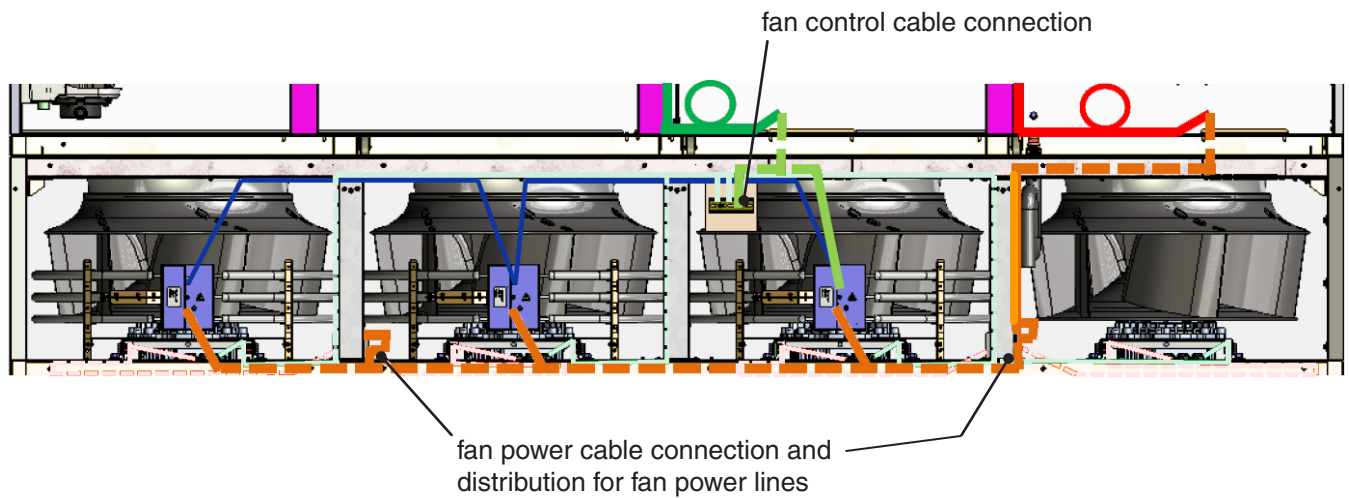
## Size 5



## Legend:

- 1 - fan control cable connection
- 2 - fan power cable connection
- 3 - reheat control cable connection
- 4 - reheat power cable connection

## Size 7



4. Plug the fan power cable to the distribution point for the fans. For size 7, there are two power cables.
5. Plug the power cable for the electric heating, if existant, directly to the free socket on the electric heating. A power cable must be connected for each electric heating.
6. Plug the fan control cable onto the circuit board.
7. Plug the control cable for the electric heating to the socket above the power cable of the first e-heating. The first electric heating is on the right.

circuit board  
for fan control  
cable



control cable connection of el. heating

power cable connection of el. heating

8. Now connect any customer's control lines (BMS) according to the cable routing outlined on the following pages.



Route the electric cable into the electrics box from below and connect the three phases to the main switch, the PE conductor at the PE rail and the neutral conductor at the neutral terminal, in accordance with the wiring diagram (part of the unit documents) and secure these cables by the pull relief screw.



**Make sure that the phase rotation is correct, the rotating field must turn right !**

The scroll compressor is dependent on correct phase rotation. The sense of rotation will be checked at the factory before dispatch. On site, if the rotating field of the compressor is incorrect, it must be corrected by changing two phases of the power supply at the isolator. An inverse rotating field can be detected by a raised compressor noise level and results in overheating and destruction of the compressor after several hours of operation.



**For use of leakage-current (FI) circuit breakers, EN 50178 5.2.11.2 must be taken into account. Only type B pulse-current FI circuit breakers are permitted. FI circuit breakers do not provide protection against bodily harm during operation of the unit or frequency converters.**

Make sure that the power supply corresponds to the indications on the rating plate and that the tolerances according to the "Application limits" are not exceeded.

In addition to this, the **asymmetry of phase** between the conductors may amount to **2% maximally**. The asymmetry of phase is determined by measuring the voltage difference between the phase conductors. The average value of the voltage differences may not exceed 8 V.

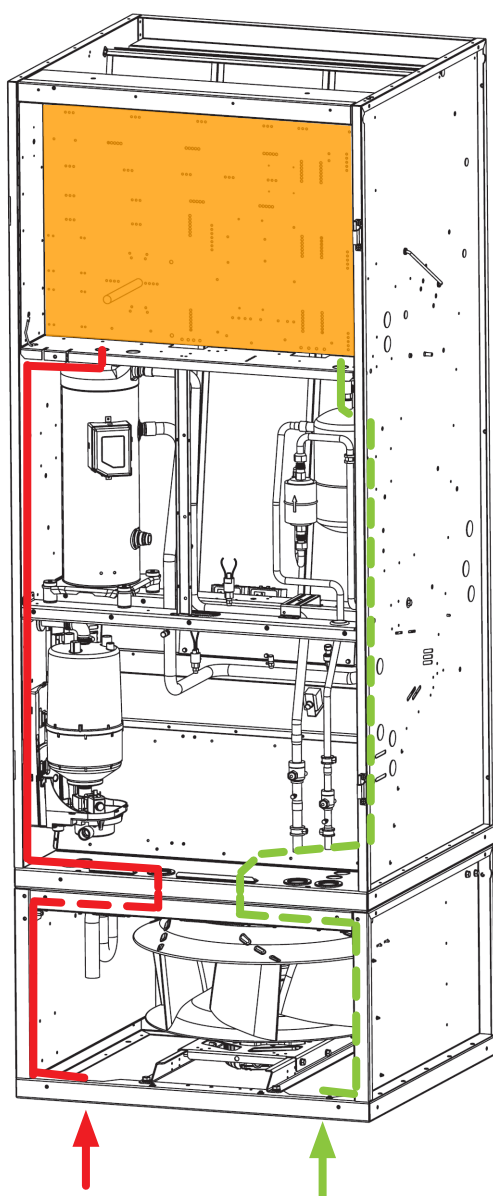
## Insertion of the power supply cable

In the bottom of the heat exchanger unit and in the fan unit frame there 2 knock-out holes each, with a diameter of 59 mm (in size 1 and 2 there is only one knock-out hole).

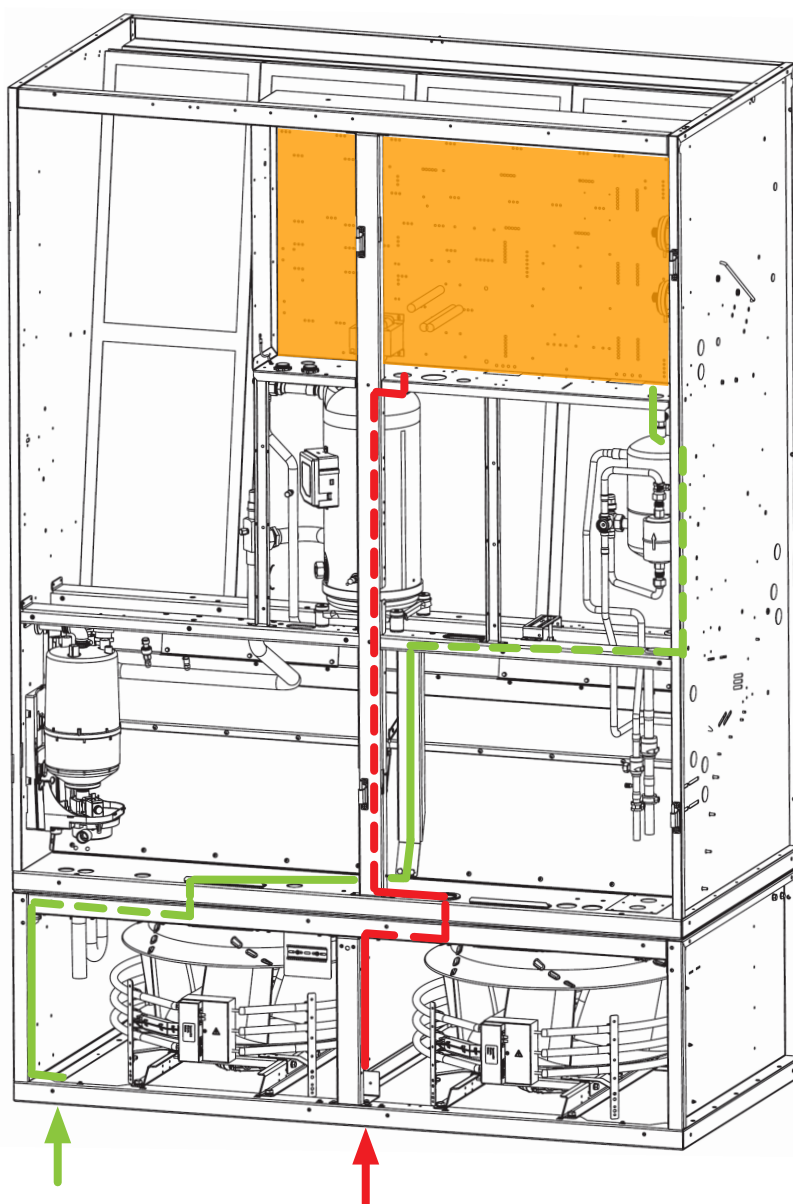
9. Knock out the necessary quantity of holes for the power supply cable and provide the openings with suitable rubber grommets.

10. Now route the power supply cable as outlined on the drawing.

Sizes 1 and 2

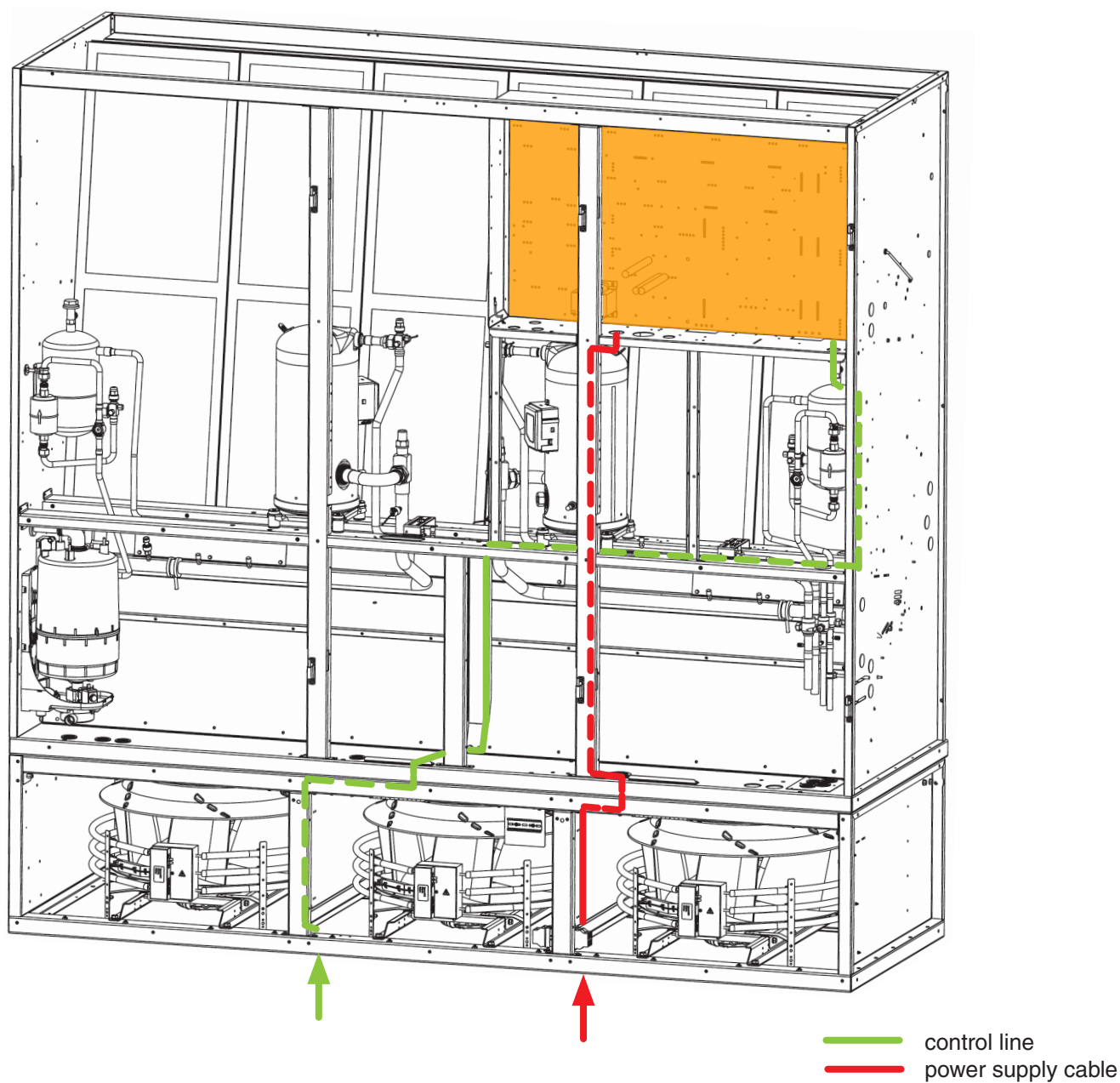


Sizes 3 and 4



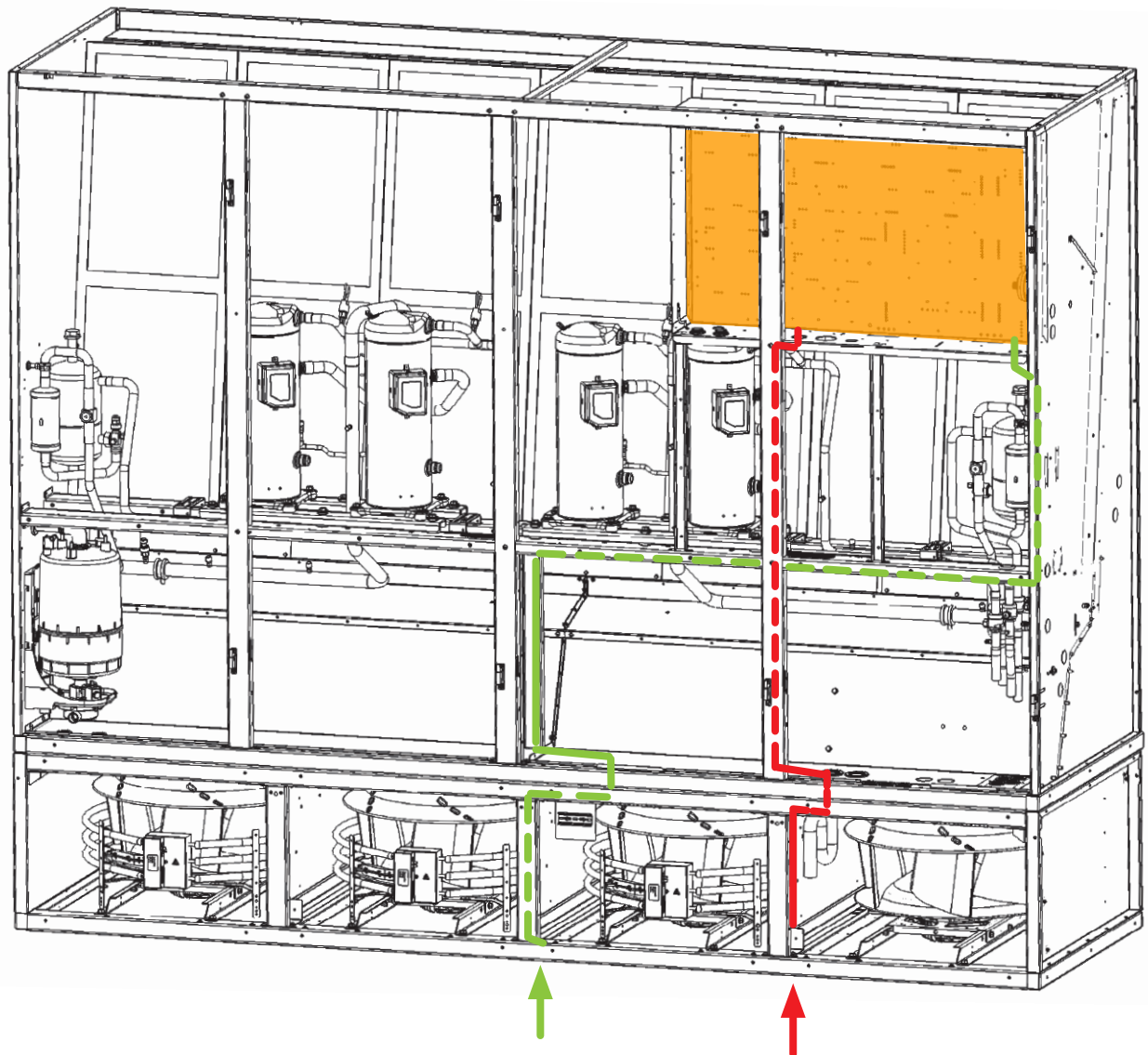
— control line  
— power supply cable

## Size 5



11. Screw the cable feedthrough plates in the fan unit after you have placed the rubber grommets around the cables.
12. Now screw the cable feedthrough plates in the heat exchanger unit.
13. Tie the excess cable lengths together and stow them away in the frame of the fan unit.
14. Re-install the fan protection grilles/front panels of the fan unit.

## Size 7



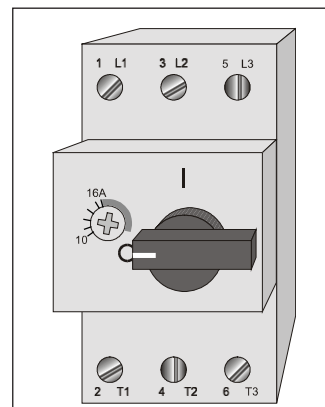
— control line  
— power supply cable

## 7. Commissioning



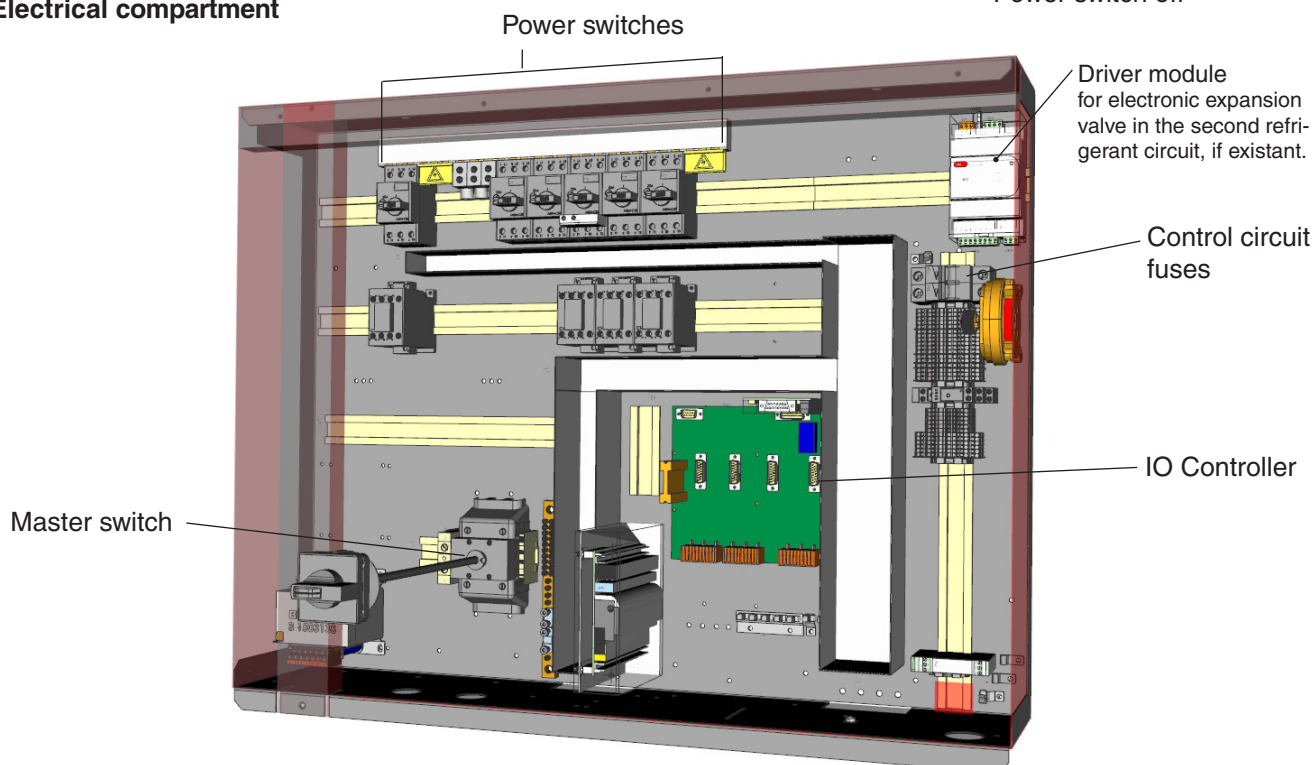
**The unit must be installed and connected in accordance with the chapter on "installation" before initial commissioning.**

- Make sure that the master switch is off and the unit is de-energized.
- Open the electrical compartment door of the unit using the key provided.
- Check whether all power switches and control-circuit fuses in the electrical section of the unit are switched off.
- Retighten all screw connections in the electric cabinet.
- Verify the smooth function of the contactors.



Power switch off

### Electrical compartment



**Do not turn the adjustment screw beyond the end of the calibrated scale range, as it may result in overheating and short-circuit at the consumer or in the destruction of the power switch.**

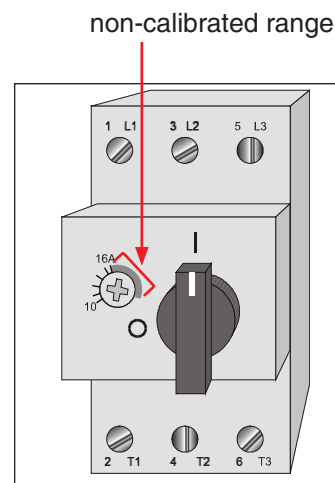
- Adjustment of the power switches according to electrical data sheet.
- Switch on the control-circuit fuses and the power switches of the fan and the compressor in sequence.
- Close all doors of the A/C unit.
- Switch on the A/C unit at the master switch.

The controller is now supplied with power, so you can use it for adjustments.

Make sure that the heat rejecting system is operating.

**A, AS** - air-cooled condenser

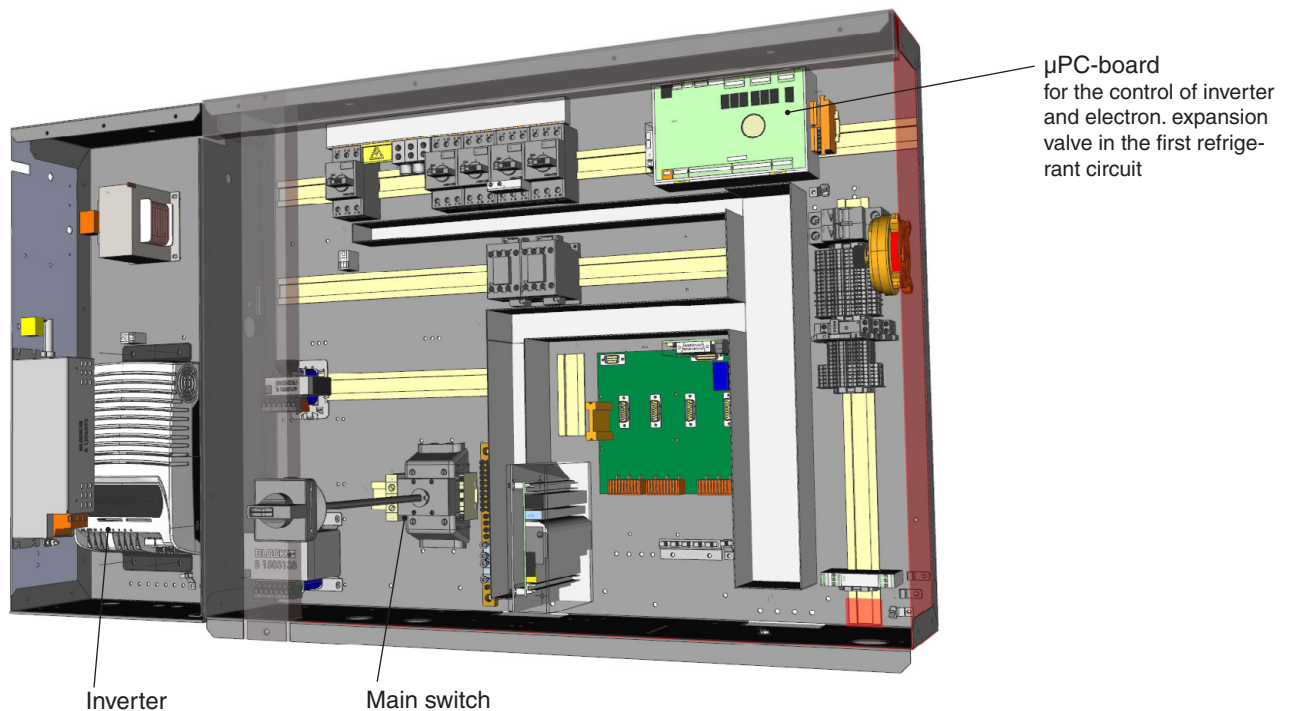
**GE, GES** - dry cooler



Switching on power switch



## E-box for A/C units with speed controlled compressor



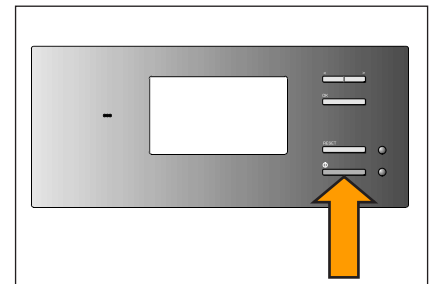
**The doors can only be opened with the key provided and represent a protective device. During operation the doors may not be opened and the rear panels may not be removed.**

- Adjust the desired return air temperature at the controller.



### **Oil dilution! Bearing malfunction!**

- It is important to ensure that new compressors are not subjected to liquid abuse. If the compressor is equipped with a crankcase heater, turn it on 12 hours before starting the compressor.
  - Start the A/C unit by pressing the Start/Stop-key on the controller.
  - Check after 20 minutes operation, whether bubbles are visible in the sight glass of the liquid line. If this is the case, refrigerant might have escaped by a leak. Check the circuit on leaks, eliminate these and top up the circuit with refrigerant in regard of the chapter "Maintenance".
  - Check the oil level at the compressor in respect of the right level. The oil level should be between the lower quarter and the middle of the sight glass.
- There is no oil sight glass in A/C units with speed controlled compressor.
- Check the current consumption of the compressors and the fans comparing it with the values of the e-data sheet.
  - Instruct the operational staff of the controller manipulation (refer to the controller manual).



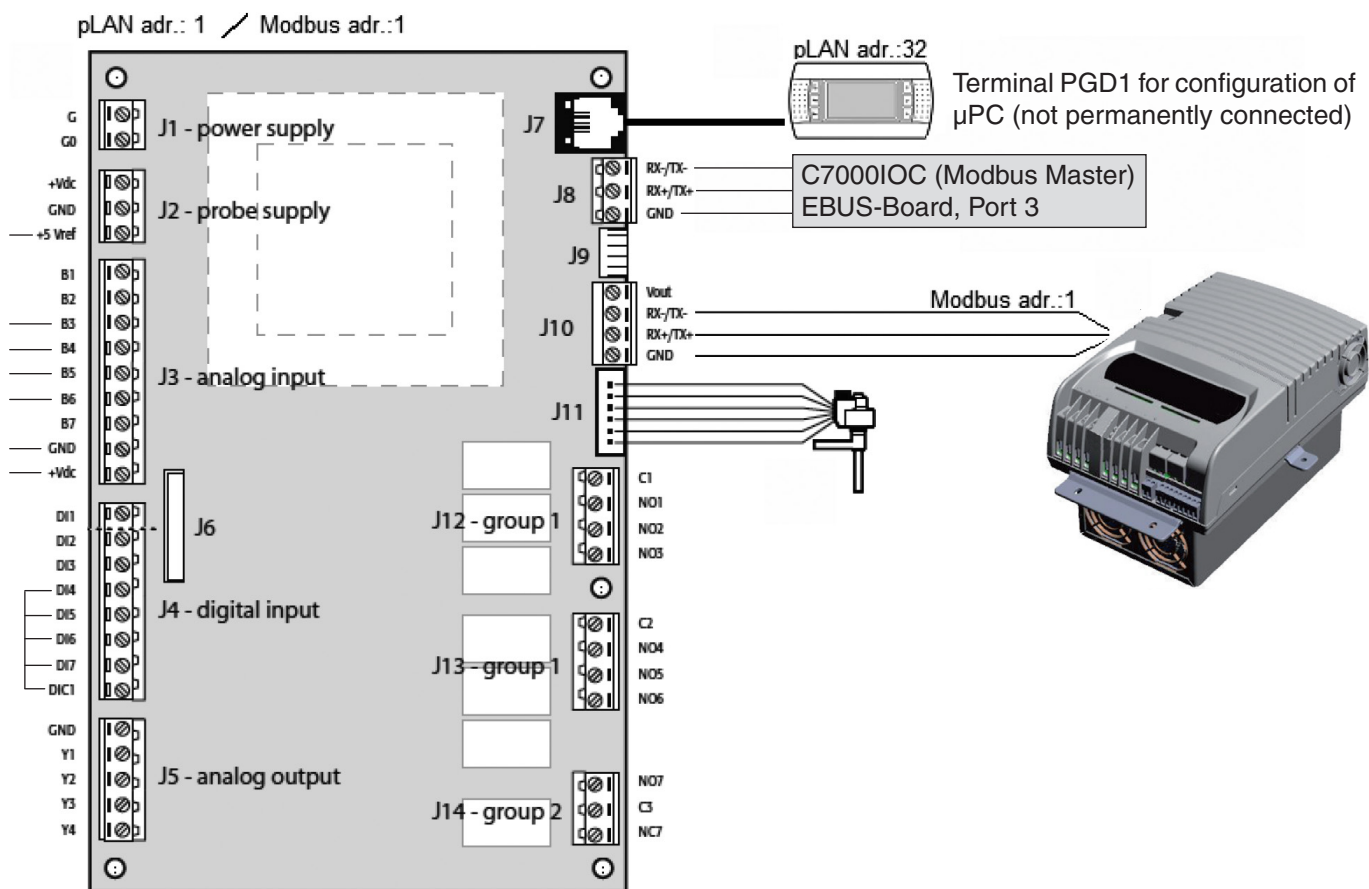
Controller C7000, Start/stop-key



Oil sight glass, On/Off compressor

## µPC electronic board

This electronic board is connected to the C7000 via RS485 line to exchange data. The µPC controls the compressor speed acting on the inverter. It receives also signals from pressure transducers and NTC temperature probes to check whether compressor works within the admitted range and to control the electronic expansion valve according to the superheating temperature.



Digital input	Assignment of block J4
ID1	-
ID2	-
ID3	-
ID4	Compressor start/stop (with ramp)
ID5	Compressor start/stop (without ramp)
ID6	Alarm reset
ID7	Serial or pLAN/Modbus commutation

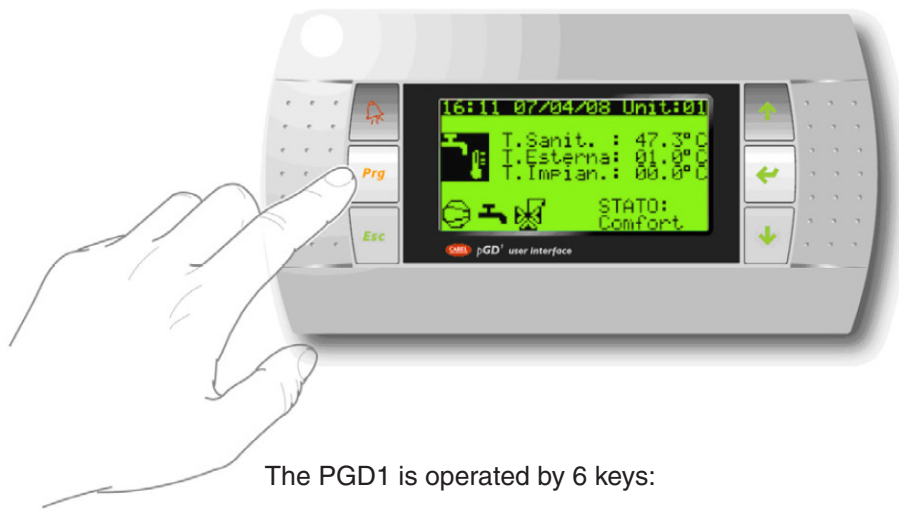
Dig output	Assignment of blocks J12, J13, J14
NO1	not used
NO2	not used
NO3	not used
NO4	not used
NO5	not used
NO6	not used
NO7	not used

Analog input	Assignment of block J3
B1 (NTC)	-
B2 (NTC)	-
B3 (NTC)	Suction gas temperature
B4 (NTC)	Hot gas temperature
B5 (4-20mA)	Condensation pressure
B6 (0-5V)	Evaporation pressure
B7 (0-5V)	not used

Ana output	Assignment of block J5
Y1 (0-10V)	"out of operation range" position signal (not used)
Y2 (0-10V)	Compressor speed (not used)
Y3 (0-10V)	Expansion valve opening (not used)



## Operation of the terminal PGD1



The PGD1 is operated by 6 keys:



displays the list of active alarms.

**Prg**

with this key you enter the configuration menu (M01, M02 etc.)

**Esc**

with this key you come to the precedent view



scroll up in a list or increase the value in the display.



scroll down in a list or reduce the value in the display.



ENTER key for access to the selected sub menu, to the modification mode or for confirmation of the adjusted value.

After the software update with the Smartkey (description available in the e-Stulz area) some settings must be adapted. For this the connection from the C7000IOC to the  $\mu$ PC must be removed.

- De-energize the  $\mu$ PC.
- Open terminal ID7, remove the 0V voltage.
- Pull the connector of the ModBus® connection from J8.
- Push the telephone connector of the PGD1 on to block J7.
- Switch on the  $\mu$ PC.

```
Initialization
DEFAULT INSTALLATION
Erase permanent memory
and install global
default value.
Please wait...
```

```
Warning
INITIALIZATION DONE
switch-off unit
to confirm data
```

After the  $\mu$ PC is powered, the PGD1 terminal executes an initialization which lasts approximately 30 seconds. After this the  $\mu$ PC must be switched off and on again to correctly complete the procedure.

```
WIZARD Wz01
Control mode via:
Modbus (serial 0/1)
```

After the restart, a program for quick configuration is started, which is called Wizard, displaying eight windows from Wz01 to Wz08. In Wz01 the control mode must be set. The  $\mu$ PC is controlled by a ModBus® connection to the C7000. First the setting "Analog input (B7)" appears. Press ENTER key, adjust "Modbus (serial 0/1)" with the arrow keys, confirm by the ENTER key. with "down arrow" key (press 2 times) to Wz03.



To navigate among the different windows by the arrow keys, the cursor must be in the left top corner.

```

WIZARD      Wz03
BMS Settings
Serial Address: 001
Baudrate:      9600
  
```

Here the BMS settings must be selected. The serial Modbus address of the  $\mu$ PC is set on 001 as standard and has not to be changed. In the C7000IOC however, the command "icc 1 id 1" must be entered to enable a communication.

The baudrate must be set on 9600.

```

WIZARD      Wz04
Power+ Config
Motor Type:
SIAM ANB52F-400V
Set defaults: Yes
Poles numbers: 6
Type drive: PSD0*224**
  
```

Here the used compressor must be adjusted. The compressor type can be seen on the type plate of the compressor.

SIAM ANB33-400V or

SIAM ANB42-400V or

SIAM ANB52-400V

(Set default: Yes) By this setting the inverter suitable to the compressor is initialized suitable. It is compellingly required to select "Yes". Following the data is written in the inverter.

The program verifies the compatibility of Kcompressor and inverter, displays the result of the verification in Wz04a and requires the confirmation for writing the default setting.

```

WIZARD      Wz04a
Power+ Config
Power+ type: 400V 14A
Power+ set: 400V 14A
Write defaults: Yes
  
```

Write default: Yes

After the confirmation with the ENTER key, the display shows "Wait default install", then the value for "Write default" switches back to "No".

By ESC you get back to view Wz04.

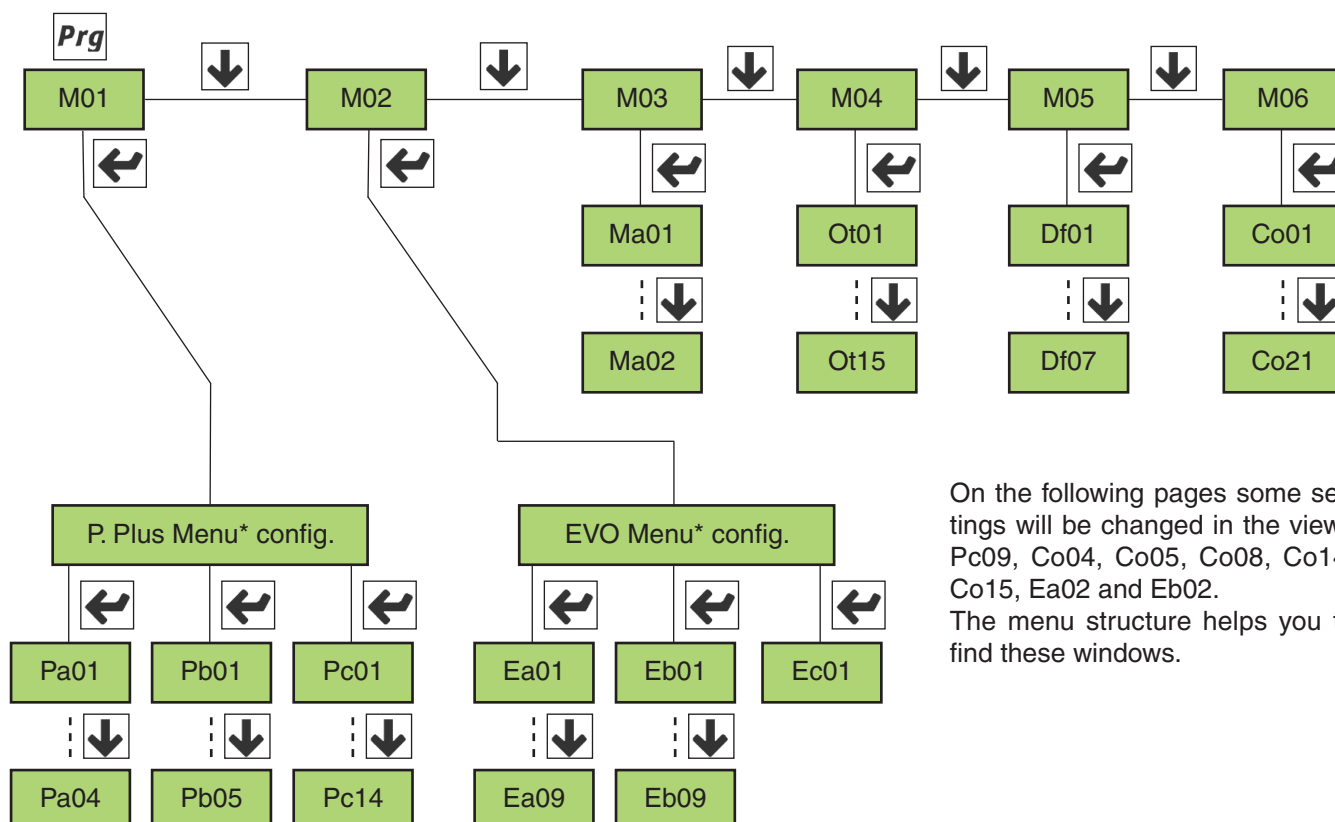
```

WIZARD      Wz08
Initial config. done
Please confirm: No
  
```

Scroll to view Wz08 with the "down arrow" key.

Confirm the configuration with "Yes".

## Menu structure



On the following pages some settings will be changed in the views Pc09, Co04, Co05, Co08, Co14, Co15, Ea02 and Eb02. The menu structure helps you to find these windows.

```

Configuration      M01
Power+ n°1

Press ENTER to
configure
Power+ Inverter

```

By the PRG-key you come to view M01, the first window in the main menu branch. With the Enter key you proceed to the next menu.

```

P.Plus Menu' config
Power+ n°1

c Custom
a Configuration
b Regulation

```

The selection **a. Configuration** gives you again the possibility to set the compressor type, (as in Wz04) and it leads you to further three menus in which special settings can be made.

Select now **c. Custom**.

```

Power+ Custom      Pc01
Power+ n°1

Motor control mode:
[000]
PM MOTOR

```

Pc01 appears. Scroll down to Pc09.

```

Power+ Custom      Pc09
Power+ n°1
Magnetizing time:
[051] 00000msec
Starting current:
[057] 000.0%
Freq. for start curr.:
[058] 000.0%

```

Adjust the starting current depending on the installed compressor.

SIAM ANB33-400V	55,0%
SIAM ANB42-400V	55,0%
SIAM ANB52-400V	75,0%

Go back to M01, using ESC or faster with Prg.

```

EVO Menu' config.

c.Manual Cmd
a.Configuration
b.Regulation

```

Now you must modify two settings for the expansion valve. By the windows **M02, EVO Menu' config.** and selecting the menu item "**a. Configuration**" you first get to **Ea01** and then to view **Ea02**.

```

EVO config.      Ea02
Main Regulation
AC/CHILLER WITH BLDC
SCROLL COMP
Auxiliary Regulation
---

```

Here the main regulation must be set on "AC/CHILLER WITH BLDC SCROLL COMP".

By the menu **EVO Menu' config.** and selecting the menu item "**b. Regulation**" you first get to **Eb01** and then to view **Eb02** (no picture). In **Eb02** set the valve opening at start-up on 75%.

```

Compressor Reg.    M06

Press ENTER to
configure
BLDC COMPRESSOR

```

Now select M06.

BLDC means "Brushless direct current"

```
Compressor reg. Co04
Pressure Limits
Max Discharge
  Pressure: 43.5bar
Min. Suction
  Pressure: 0.2bar
Min. Suction Compr
  Start Delay 000s
```

**View Co04**

Set the limit value for minimum suction pressure on 3,0 bar.

Set the delay for low pressure alarm  
(Min. Suction Compr Start Delay on 180s.

```
Compressor reg. Co05
Start-up Pressure
differential control
Max Pressure differ.
admitted: 009.0bar
```

**View Co05**

Here you adjust the admitted maximum pressure difference between hot gas and suction gas to allow the compressor start. A higher pressure difference would overcharge the inverter with reference to the current and leads to an alarm message.

Set 7,0 bar.

```
Compressor reg. Co08
Start-up failure
control
Pressure difference
min.variation: 0.3bar
Control period: 10s
```

**View Co08**

Set the control period on 30 seconds. This means the following: If 30 seconds after the compressor start, the hot gas pressure is less than the adjusted 0,3 bar higher than the value before the start, the compressor will be stopped and the alarm message „Start failure alarm“ will appear.

The alarm will be automatically reset 5 times and the compressor will be restarted 30 seconds after the stop. After the fifth failed attempt the alarm „Compressor start failure - Check motor wiring“ is displayed and there is no other start attempt.

```
Compressor reg. Co14
Envelope control
in zone 1c
Evaporat.limits: 12.0°C
Maximum admitted
speed: 090rpm
```

In the **view C014** the operation range of the compressor (Zone 1c) can be extended.

Set the maximum admitted speed on 120 rpm.

```
Compressor reg. Co15
Envelope control
Low ratio management
by EEV closing: No
by compr. speed up: No
```

In **view Co15** you can adjust, how the control with a low pressure ratio shall function.

1. by closing the expansion valve.
2. by increasing the compressor speed.

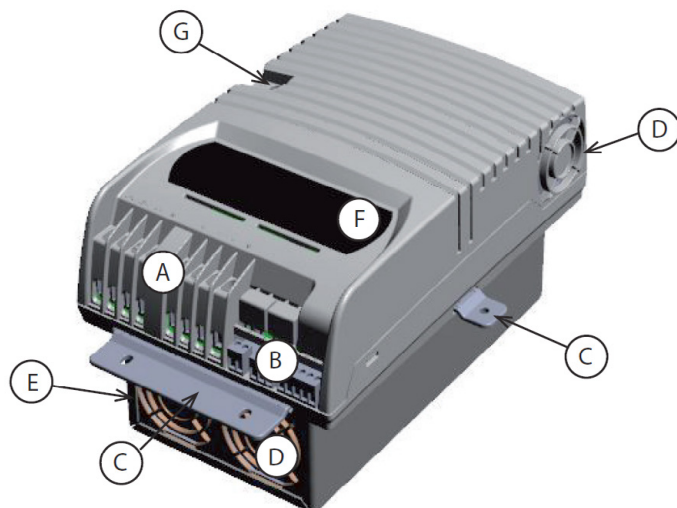
Set both parameters to "Yes".

The configuration is now finished.

- De-energize the  $\mu$ PC.
- Pull the telephone connector of the PGD1 from block J7.
- Re-establish the 0V connection to terminal ID7.
- Put the connector of the ModBus® connection onto J8.
- Switch on again the  $\mu$ PC.

## Inverter (EC compressor driver)

According to a signal from the  $\mu$ PC controller, the inverter modulates the rotation speed of compressor, in order to adjust cooling capacity to the actual thermal load.

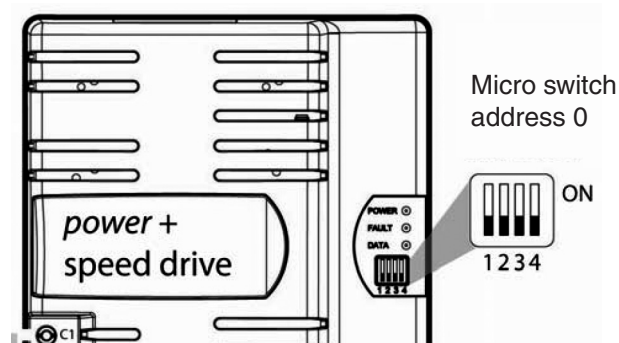


Reference	Description
A	Terminal block for power lines
B	Terminal block for control lines
C	Fastening bracket
D	Cooling fan
E	PE connection
F	Operating status LEDs
G	Terminals for connecting a shunt reactor

## Setting the network address

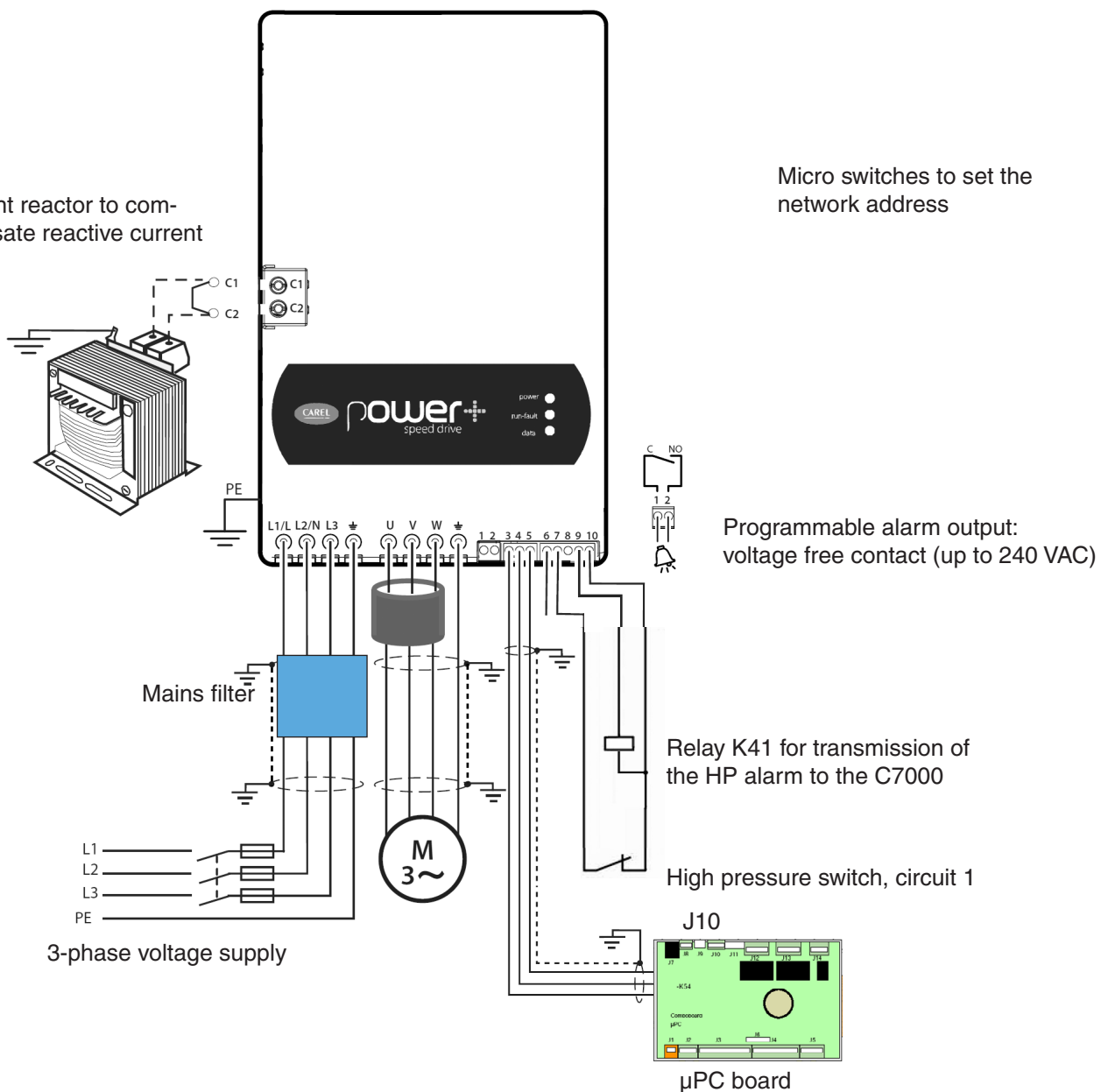
The network address is composed by the base address which can be modified via the ModBus® connection and the address which can be adjusted by the micro switches.

Address	Micro switches			
	1	2	3	4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
...	...	...	...	...
15	ON	ON	ON	ON



In the default setting, the base address is set on 1. In combination with the default setting (0) of the micro switches results the network address 1.

## Inverter connections



Terminal	Assignment	Use
3	0V	RS485/ModBus® connection
4	RX+/TX+	
5	RX-/TX-	
6	PTC input	not used
7	24VDC	auxiliary voltage
8	0V	
9	STOa	input for HP alarm
10	STOb	
1, 2	Relay output	not used

## 8. Maintenance

### 8.1 Safety instructions

All maintenance work is to be carried out under strict compliance with the country-specific accident prevention regulations. In particular we refer to the accident prevention regulations for electrical installations, refrigerating machines and equipment. Non-compliance with the safety instructions can endanger people and the environment.

Maintenance work is only to be carried out on the units by authorized and qualified specialist staff.

#### Procedure instructions

Work on the system must always only be carried out when it is shut down. To do this, the unit must be switched off at the controller and at the master switch. A „DO NOT SWITCH ON“ warning sign must be displayed.



Live electrical components are to be switched to de-energized and checked to ensure that they are in the de-energized state.

Some verifications must be effected with the unit in operation (measuring the current, pressures, temperatures). In such a case the unit must only be switched on at the master switch after all mechanical connections have been carried out. The unit must be switched off immediately after the measuring procedure.

#### Warning notes!

**When the master switch is switched on and the controller is stopped the power contactors are live, even if the components are not operating.**

**At the fan contactor, dangerous voltages occur. Do not open the unit within the first 5 minutes after disconnection of all phases. Be sure that the unit is being isolated.**

**In units with 2 or 3 fans dangerous charges of >50µC can occur between AC line terminals and PE after disconnection.**

**The electronics housing can get hot.**

**The fans have an operation delay after the unit is stopped ! (Risk of injury)**

### 8.2 Maintenance intervals

Component	Maintenance interval		
	quarterly	half-yearly	yearly
<b>Refrigerant circuit</b>			
Refrigerant charge		x	
HP/LP switch			x
Sight glass		x	
Compressor			x
Expansion valve		x	
<b>Air circuit</b>			
Heat exchanger			x
Fan			x
Air filter	x		
<b>Water circuit</b>			
Tightness		x	
Condenser			x
<b>Unit in general</b>			
Electrics			x
Mechanics			x



## 8.3 Refrigerant circuit

### Refrigerant charge - Quantity and Purity

**Quantity** - Check the **sight glass** and the **LP switch** (there is no LP switch in units with EC compressor).

An insufficient charge causes the formation of bubbles in the sight glass or in extreme cases the triggering of the LP-switch. An operation with an insufficient refrigerant quantity over a longer period leads to a reduction of cooling capacity and to high superheating temperatures, which have a disadvantageous effect on the compressor lifetime.

If a leak is detected:

- let out the refrigerant in a collecting device down to a pressure of 1 bar<sub>absolut</sub>
- connect a vacuum pump via a pressure gauge station on the high and low pressure side
- extract the refrigerant by the vacuum pump (not by the compressor !) to approx. 0 bar<sub>absolut</sub>
- dispose the refrigerant according to the national regulations
- fill the circuit with nitrogen to 1 bar<sub>absolut</sub>
- repair the leak
- the circuit has to be run dry by several (at least 3x) fillings and extractings of nitrogen, eventually change the filter drier.
- fill with refrigerant according to weight (see technical data)



**R410A must be charged in a liquid state, in order that the composition of the refrigerant does not change.**

### Quantity - Check the HP switch

An overfilling of the circuit makes the condensation pressure rise and by that the power consumption of the compressor. In the extreme the HP-switch triggers.

### Purity - Check the sight glass and the filter drier.

Bubbles in the sight glass indicate that the charge is insufficient or that the filter drier is clogged.

A pollution of the filter drier, whose origin task is to clear the refrigerant from impurities and humidity, can be detected by a temperature difference upstream and downstream the filter drier.

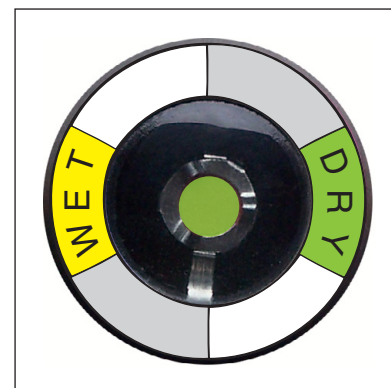
Compare the colour indicator in the centre of the sight glass with the outer ring scale.

green ---> ok.

yellow ---> humidity critical.

With too much humidity in the circuit, the expansion valve can freeze. In addition to this the ester oil in the compressor, which comes in touch with the refrigerant, takes up humidity and loses its ability to lubricate.

In this case the refrigerant must be completely evacuated and recharged according to the above described evacuation instruction.



Sight glass

## Compressor

In the compressor there is an ester oil charge, which does not have to be renewed under normal operation conditions and holds out for the unit's lifetime. However, it is possible that the ester oil, as it reacts hygroscopically, has taken up humidity of the air after repeated recharging of the refrigerant circuit due to repair works. The interaction between ester oil and water results in the formation of acid. Owing to a hyperacidity, corrosive processes take place inside the compressor. In this case the ester oil should be exchanged.

The oil level can be checked by looking at the sight glass of the compressor.



**Units with a speed controlled compressor are not equipped with an oil sight glass. For these A/C units it is not allowed to recharge oil in case of refilling a refrigeration circuit after a leakage. In such cases the compressor has to be exchanged.**

## Expansion valve

The refrigerant circuit is equipped with a electronic expansion valve, which controls the superheating in the evaporator. The superheating is adjusted to 7 K at the factory and may not be modified. The expansion valve can freeze, if the humidity in the system is excessive.



**Do not thaw by soldering flame, danger of explosion ! Thaw with moist warm cloth. Check the sight glass.**

## 8.4 Air circuit

### Heat exchanger (Evaporator / GE-coil)

The heat exchanger consists of copper tubes with aluminium fins. If refrigerant leaks occur, they should be searched for at the heat exchanger. Beyond that, the heat exchanger is exposed to the air pollution, the particles of which settle at the fins and reduce the heat transmission the same as raise the air resistance. The latter shows when the fan current increases.

The heat exchanger can be cleaned by pressurized air which has to be blown opposite to the normal air flow direction along the fins.



**Do not distort the fins while cleaning, this also increases the air resistance !**

### Fan

The bearings of the fans are lifetime lubricated and do not need maintenance. Check the operation current. An increased operation current indicates either a higher air resistance by a clogged pre-filter or a winding short circuit in the fan motor.

The fans are speed controlled in dependance of the required cooling capacity. You can manually modify the speed at the controller for test purposes, so as to compare the measured current with the values on the pages with the technical data or with those of the planning tool.

### Air filter

A filter monitor controls the state of the filter. As soon as the pressure loss exceeds an adjustable value, a filter alarm via the controller is released. The controller can be configured such as to compensate the pressure loss by a higher fan speed, however you should not wait too long for exchanging the filter. The filters can be accessed by the front doors, depending on the cabinet size the number of filter elements varies.

The clogged filter elements can not be cleaned with pressurized air, as the filter structure would be destroyed otherwise. When you re-install the filter elements after the exchange, take care that the side with the coloured mark (dirt side) is turned away from the heat exchanger.

## 8.5 Water circuit

### Tightness

Check the water circuit visually for tightness. Beyond that a level indication at the storage tank, if existent, can give information about changes of the water quantity. A lack of water in the circuit is replaced by air, which reduces the heat capacity of the chilled water circuit and is detrimental to the pump.

### Condenser (only at GE, GES)

Check the water side pollution of the plate condenser by comparing the cooling water inlet temperature to the outlet temperature. If the difference is less than 3 K, it indicates a limited heat transmission and thus pollution.

Another possibility to verify this consists in the comparison of the outlet temperature with the medium condensation temperature (by measuring the condensation pressure at the high pressure side of the compressor). If this difference exceeds 7 K, the condenser is probably polluted.

In this case the condenser has to be cleaned chemically.

## 8.6 Unit in general

### Electrics

Check the connection terminals for tight fixation when the unit is installed and once again after an operation time of 30 days.

### Mechanics

Clean the unit's inside with a vacuum cleaner. Clean pipes simplify the search for leaks. Check the pipes, the compressor and the condenser for a tight seat. Vibrations of pipes and circuit components can result in leaks. Check also the insulation of the water piping. Condensing air humidity on cold water pipes means a loss of cooling capacity.

## 8.7 Competences

Repairs on the refrigerant circuit (tightness, filter drier exchange)	Trained refrigeration technician
Repairs on the main components of the refrigerant circuit (compressor, expansion valve, condenser, evaporator)	Stulz service technician
Repairs on the water circuit (tightness)	Trained service technician
Repairs on the electrics	Trained electrician

## 9. Malfunction

Alarm message	Cause for alarm	Cause	Elimination
C7000: Compressor # error	High pressure switch has triggered or	1. outside temperature too high 2. cooling water temperature too high 3. condenser fan defective. 4. condenser pressure switch adjusted too high. 5. condenser coil soiled. 6. overcharge of refrigerant circuit 7. electric connection of high pressure switch loose. Cable defective. 8. trigger point adjusted too low.	Install bigger condenser. Check drycooler.  Check function. Modify setting.  Clean condenser. Discharge and dispose refrigerant. Check connection and cable.  Check setting of high pressure switch. Press blue release button at HP switch after elimination of error.
	Compressor power interruptor has triggered.	1. compressor motor defective.  2. feeding voltage too low.	Check compressor motor on voltage continuity and current consumption. Check alimentation under load.
C7000: Low pressure # error (not for units with EC compressor)	Low pressure switch has triggered.	1. condenser pressure switch adjusted too low. 2. Insufficient refrigerant charge 3. electric connection of low pressure switch loose. Cable defective. 4. trigger point adjusted too high.  5. Expansion valve defective. 6. Solenoid valve in liquid line defective.	Modify setting.  Refill refrigerant. Check connection and cable.  Check setting of low pressure switch. Exchange expansion valve. Check electric alimentation with voltage meter.
C7000: Airflow failure	Differential pressure for airflow switch has triggered.	1. Fan motor defective. Fan speed too low.  2. Air filter extremely clogged. 3. Hoses to the airflow monitor dirty or kinked.	Check fan motor on voltage continuity and current consumption. Fan mechanically blocked? Check air filter. Clean hoses and check whether they are kinked .
C7000: Sensor # error	The tolerance to the average value adjustable in the controller has been exceeded.	1. Big difference of measured values in selected zone. 2. sensor defective.	Check room on Hotspots or chilled air zones, moist zones. Check measured value with an external measuring instrument.
C7000: Sensor # defective	The measured voltage/current is outside the range defined in the controller.	1. electrical connection defective. 2. sensor cable defective. 3. sensor defective.	Check connections. Check cable on continuity. Check measured value with external thermometer, hygrometer, pressure gauge.

Depending on the option configured in the controller further alarm messages exist.

# stands for a number in case of several components of the same kind.

For A/C units with EC compressor exist further alarm messages, which are explained in the C7000 Service manual.

## 10. Dismantling and disposal

The A/C unit can only be dismantled by qualified specialists.

Switch off the A/C unit at the controller and at the master switch. Switch off power conducting cables to the unit and secure them against being switched on again. Disconnect the A/C unit from the de-energized network.

Dispose of the refrigerant in the unit in accordance with the disposal and safety regulations applicable on site



**The refrigerant may not be discharged into the atmosphere, but must be returned to the manufacturer, if it is not reused.**

**The ester oil in the compressor must also be disposed. As it contains dissolved refrigerant, it can not be disposed like usual oils, but must be returned to the oil manufacturer.**

Disconnect the depressurized refrigerant pipes from the external system (version A/AS).



**If glycol or similar additives had been used, this liquid also has to be collected and disposed in an appropriate manner and may under no circumstances be introduced in the local waste water system.**

Disconnect the unit from the external water circuit by closing the shut-off valves and drain the water circuit of the unit (version GE/GES).

Disconnect the depressurized cooling water pipes of the unit from the external system.

Move the unit, as described in the chapter "transport", with a lifting device of sufficient load-carrying capacity.

Dispose of the A/C unit in accordance with the disposal and safety regulations applicable on site. We recommend a recycling company for this. The unit basically contains the raw materials aluminium (heat exchanger), copper (pipelines, wiring), and iron (condenser, panelling, mounting panel).

# 11. Contents of the CE Declaration of Conformity

The undersigned

**STULZ GmbH  
Klimatechnik  
Holsteiner Chaussee 283  
22457 Hamburg**

2015



hereby confirms that the units listed below, in the version marketed by us, fulfil the requirements of the harmonised EC directives and EC safety standards listed below.

In the case of a modification of the equipment not co-ordinated with us this declaration loses its validity.

## Air conditioning unit

### Cyber Air 3 ... A

ASR 201 A	ASR 532 A
ASR 291 A	ASR 602 A
ASR 351 A	ASR 682 A
ASR 381 A	ASR 722 A
ASR 431 A	ASR 802 A
ASR 451 A	ASR 822 A
ASR 551 A	ASR 892 A
ASR 561 A	ASR 1082 A
	ASR 1252 A

### Cyber Air 3 ... GE

ALR 201 GE	ALR 422 GE
ALR 291 GE	ALR 532 GE
ALR 331 GE	ALR 572 GE
ALR 381 GE	ALR 722 GE
ALR 431 GE	ALR 822 GE
ALR 551 GE	ALR 1082 GE
	ALR 1252 GE

### EC-Directives

EC machinery directive 2006/42/EC  
EC directive for low voltage 2006/95/EC  
EC EMC directive 2004/108/EC  
EC pressure equipment directive 97/23/EC

### National regulation

BGR 500 chapter 2.35  
BGV A3

### Harmonised EN

EN 378 -1, -2, -3, -4  
EN ISO 12100  
EN ISO 13857  
EN 60204 -1  
EN 61000-6-2  
EN 61000-6-4

# Contents of the CE Declaration of Conformity (A/C units with EC compressor)



The undersigned

**STULZ GmbH  
Klimatechnik  
Holsteiner Chaussee 283  
22457 Hamburg**

hereby confirms that the units listed below, in the version marketed by us, fulfil the requirements of the harmonised EC directives and EC safety standards listed below.

In the case of a modification of the equipment not co-ordinated with us this declaration loses its validity.

## **Air conditioning unit**

### **Cyber Air 3 ... AS**

ASR 271 AS	ASR 542 AS
ASR 401 AS	ASR 552 AS
ASR 511 AS	ASR 732 AS
	ASR 742 AS
	ASR 832 AS
	ASR 1092 AS
	ASR 1302 AS

### **Cyber Air 3 ... GES**

ALR 271 GES	ALR 432 GES
ALR 401 GES	ALR 542 GES
ALR 511 GES	ALR 552 GES
	ALR 732 GES
	ALR 832 GES
	ALR 1092 GES
	ALR 1302 GES

#### **EC-Directives**

EC machinery directive 2006/42/EC  
EC directive for low voltage 2006/95/EC  
EC EMC directive 2004/108/EC  
EC pressure equipment directive 97/23/EC

#### **National regulation**

BGR 500 chapter 2.35  
BGV A3

#### **Harmonised EN**

EN 378 -1, -2, -3, -4  
EN ISO 12100  
EN ISO 13857  
EN 60204 -1  
EN 61000-6-2  
EN 61000-6-4  
EN 61800 - 3 - C2

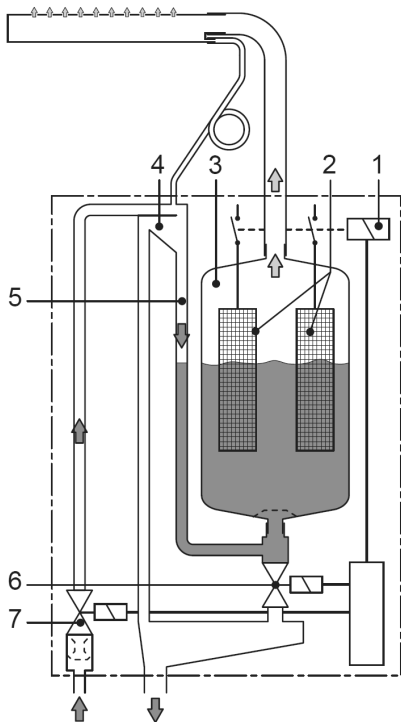


## 12.1 Steam humidifier

The steam humidifier is an optional extra for your A/C unit. It is installed complete and integrated within the function and method of operation of the A/C unit. Details concerning the connection assignment for the power supply can be found in the electrical diagrams in the appendix.

### 12.1.1 Description

The steam humidifier OEM2 is a pressureless steam generator that utilizes an electrode heating and is designed for air humidification via a steam distributor (steam distribution pipe, steam nozzle).



#### Steam generation

Any time steam is requested, the electrodes (2) are supplied with voltage via main contactor (1). Simultaneously, the inlet valve (7) opens and water enters the steam cylinder (3) from the bottom via water cup (4) and supply line (5). As soon as the electrodes come in contact with the water, current begins to flow between the electrodes, eventually heating and evaporating the water. The more the electrode surface is exposed to water, the higher is the current consumption and thus the steam capacity.

Upon reaching the requested steam capacity, the inlet valve closes. If the steam generation decreases below a certain percentage of the required capacity, due to lowering of the water level (e.g. because of the evaporation process or drainage), the inlet valve opens until the required capacity is available again.

If the required steam capacity is lower than the actual output, the inlet valve is closed until the desired capacity is achieved by lowering of the water level (evaporation process).

#### Level monitoring

A sensor provided in the steam cylinder cover detects when the water level gets too high. The moment the sensor comes in contact with water, the inlet valve closes.

#### Drainage

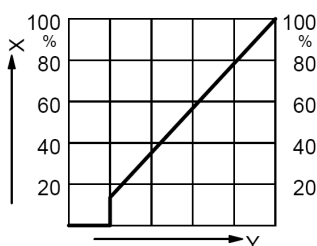
As a result of the evaporation process, the conductivity of the water increases due to an escalating mineral concentration. Eventually, an inadmissibly high current consumption would take place if this concentration process were permitted to continue. To prevent this concentration from reaching a value, unsuitably high for the operation, a certain amount of water is periodically drained from the cylinder and replaced by fresh water.

During the drainage process, the drain valve (6) is opened. Following a pre-determined time of drainage, the drain valve is closed again.

#### On/Off control



#### Proportional control



X = steam capacity in %  
Y = Output signal controller

#### Control

With the ECCM/S control unit either On/Off control or proportional control can be employed for steam production.

Below a minimum controllable steam output, proportional control will work in two-point operation (on/off control).

## Danger that may arise from the unit



### **DANGER! Danger of electric hazard!**

The steam humidifier OEM2 is operated with mains voltage. One may get in touch with live parts when the unit is open. Touching live parts may cause severe injury or danger to life.

**Prevention:** Before carrying out any work set the steam humidifier OEM2 out of operation as described in chapter 12.1.3.5 (switch off the unit, disconnect it from the mains and stop the water supply) and secure the unit against inadvertent power-up.



### **WARNING! Danger of burning!**

The steam humidifier OEM2 produces steam. When producing steam, the steam cylinder inside the humidifier gets very hot (up to 100 °C). If the unit is opened immediately after having produced steam there is danger of burning when touching the steam cylinder.

**Prevention:** Before carrying out any work set the steam humidifier OEM2 out of operation as described in chapter 12.1.3.5, then wait until the steam cylinder has cooled down sufficiently thus preventing danger of burning.

## 12.1.1.1 Technical data

Steam capacity [kg/h]	Nominal power [kW]	Nominal current [A]	Max. current [A]
200 ... 230V / 1N~ / 50 ... 60Hz			
2,0	1,5	7,5 ... 6,5	9,4 ... 8,2
4,0	3,0	15,0 ... 13,0	18,8 ... 16,3
200 ... 230V / 3~ / 50 ... 60Hz			
4,0	3,0	8,7 ... 7,5	10,8 ... 9,4
8,0	6,0	17,3 ... 15,1	21,7 ... 18,8
10,0	7,5	21,7 ... 18,8	27,1 ... 23,5
380 ... 460V / 3~ / 50 ... 60Hz			
4,0	3,0	4,6 ... 3,8	5,7 ... 4,7
8,0	6,0	9,1 ... 7,5	11,4 ... 9,4
15,0	11,25	17,1 ... 14,1	21,4 ... 17,6

Operating conditions	
Admissible water pressure	1 ... 10 bar
Water quality	Drinking water with a conductivity of 125 - 1250µS/cm
Admissible water temperature	1 ... 40 °C
Admissible ambient temperature	1 ... 50 °C (control unit 1 ... 40 °C)
Admissible ambient humidity	max. 75% rh, non-condensing
Adm. back pressure at steam connection	- 0,5 kPa ... 1,0 kPa
Type of protection	IP00
Conformity	produced according VDE regulations 0700 and 0700 part 98
Maximum discharge water flow	0,5 l/min (1,2 l/min for the model with 15 kg/h)



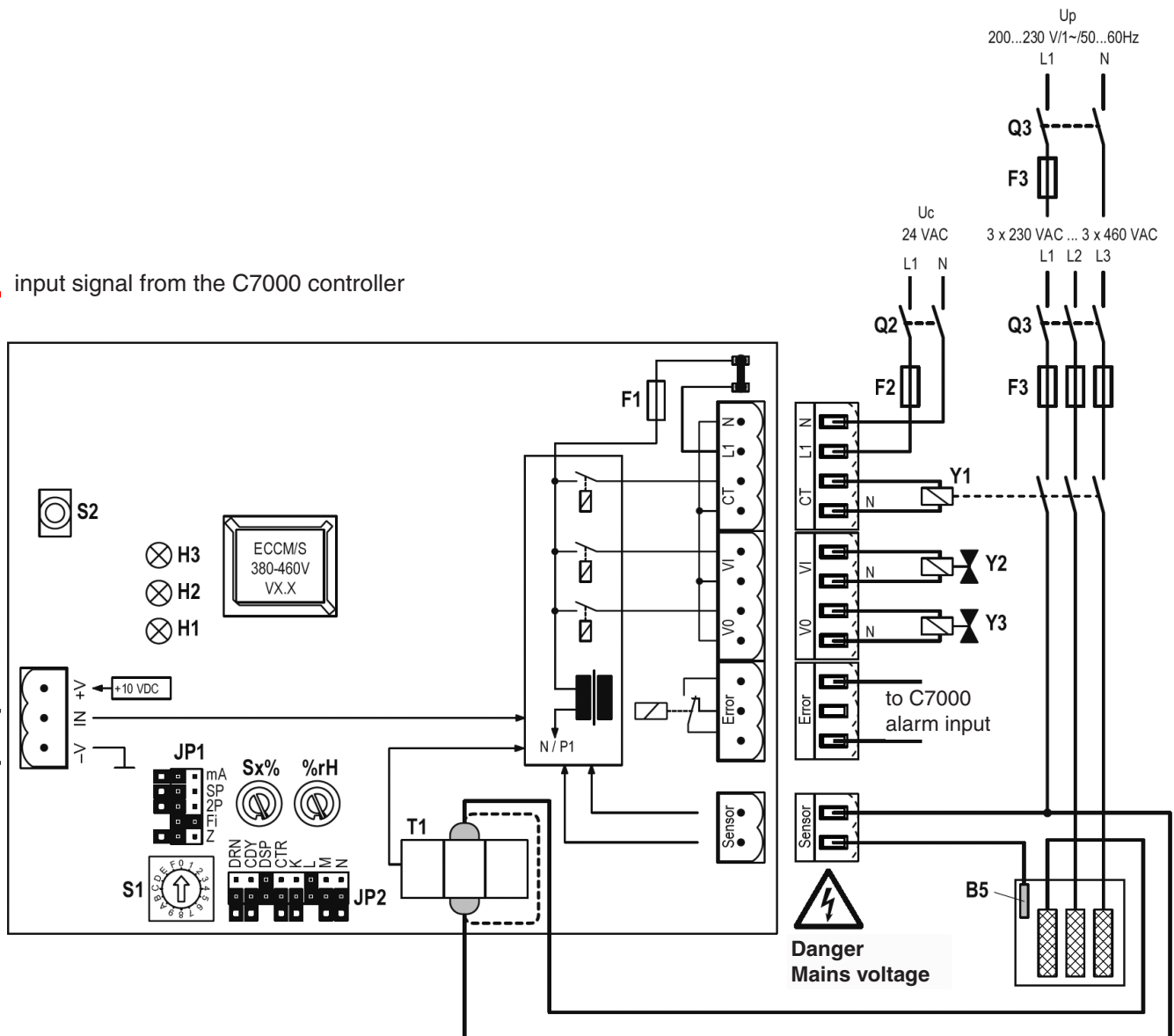
### **Do not treat the water with softeners !**

**This results in corrosion of the electrodes and in the formation of foam with insufficient filling of the steam cylinder.**

A reverse osmosis plant (ROP) can be used to soften water. The water from the ROP has a low conductivity and must be mixed with raw water for evaporation.

### 12.1.1.2 Wiring diagram of the control unit ECCM/S

input signal from the C7000 controller



- B5 Level sensor steam cylinder
- F1 Fuse control board (2 A, time-lag)
- F2/Q2 Automatic fuse control voltage
- F3/Q3 MCB humidifier
- H1 Red LED: Error
- H2 Yellow LED: Service, Warning
- H3 Green LED: Steam production
- JP1 Jumper block 1
- JP2 Jumper block 2

- S1 Rotary switch unit type
- S2 Drain/Info key
- Sx% Potentiometer power limitation
- %rH Potentiometer humidity value
- Y1 Main contactor heating voltage
- Y2 Inlet valve
- Y3 Drain valve
- T1 Current sensor

### 12.1.1.3 Configuration of the control unit ECCM/S

#### Setting the capacity limitation "Sx%"

Use the potentiometer "Sx%" to set the capacity limitation in % of the maximum capacity (setting range: 25...100%, factory setting: 100%).

#### Setting the control signal

With the jumpers on jumper block "JP1" you can set the control signal. The control signal is adjusted on 0-10V, none of the jumpers "mA", "SP", "2P" on jumper block "JP1" may be set for this.

#### General unit settings

With the jumpers on the jumper blocks "JP1" and "JP2" you can set different unit parameters.

Pos.	with jumper	without jumper
<b>Fi</b>	Connection to a mains supply with ground fault circuit interrupter **	Connection to a mains supply without ground fault circuit interrupter
<b>DRN</b>	Increased drain operation factor	Regular drain operation factor **
<b>CDY</b>	Low water conductivity (<125 µS/cm)	Normal water conductivity (≥125 µS/cm) **
<b>DSP</b>	Exchangeable steam cylinder **	Cleanable steam cylinder
<b>K</b>	Fault No. 4 "steam cylinder maintenance due": the unit triggers a warning only (the error switch on the control unit ECCM/S is not activated).	Fault No. 4 "steam cylinder maintenance due": 72 hours after the warning an error is triggered and the unit is switched off (red LED lights). However, the error switch on the control unit ECCM/S is activated already in warning status. **
<b>L</b>	Fault No. 3 "Fill time": a warning is triggered after 20 minutes filling time exceeding. After 220 minutes filling time exceeding an error is triggered and the unit is switched off (red LED lights and the error switch on the control unit ECCM/S is activated). **	Fault No. 3 "Fill time": the unit directly triggers an error after 20 minutes filling time exceeding (red LED lights and the error switch on the control unit ECCM/S is activated). However, the unit is switched off after 220 minutes filling time exceeding.
<b>Z, M, N</b>	no function (spare)	

\*\* Factory settings

#### Setting the rotary switch S1

Power supply	Steam capacity [kg/h]				
	2,0	4,0	8,0	10,0	15,0
200V 1N~	0	0			
208V 1N~	1	1			
220V 1N~	2	2			
230V 1N~	3	3			
200V 3~		4	8	C	
208V 3~		5	9	D	
220V 3~		6	A	E	
230V 3~		7	B	F	
380V 3~		0	4		8
400V 3~		1	5		9
415V 3~		2	6		A
460V 3~		3	7		B

## 12.1.2 Supply connections

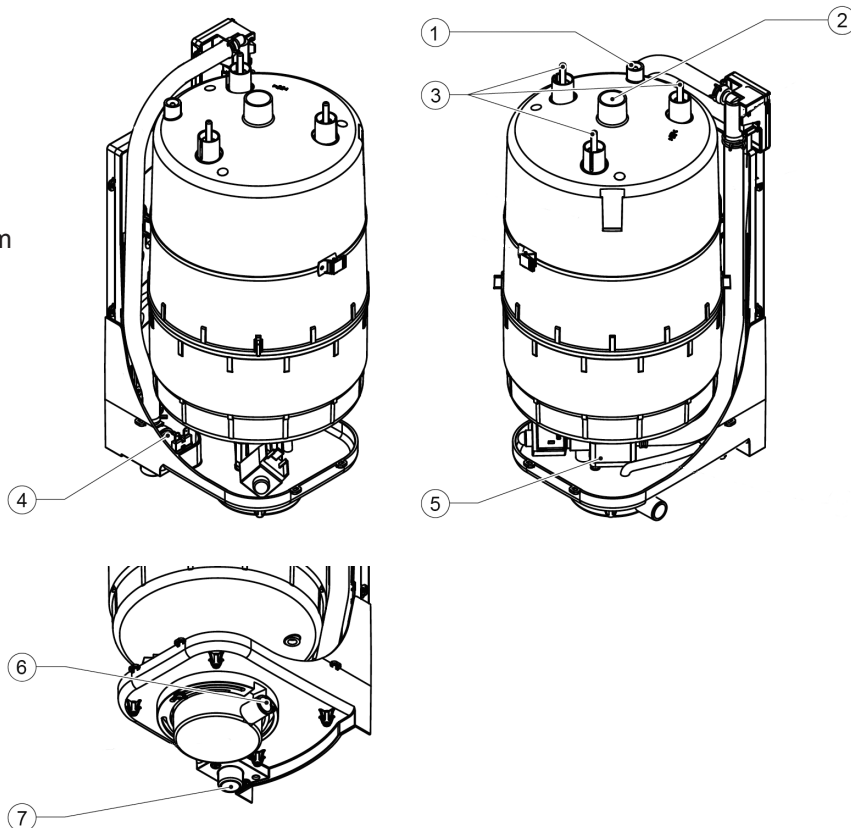
The steam humidifier is installed and electrically connected in the A/C unit. The local regulations of the water supply company are to be complied with when making the hydraulic connection.



**We recommend the installation of an Aqua-stop valve in the water supply of the humidifier. In addition to this, the room, in which the A/C unit with the humidifier is installed, should be equipped with a water detection system.**

### Legend:

- 1 Level sensor
- 2 Steam outlet connector  $\varnothing 22.5 - 30$  mm
- 3 Heating electrodes
- 4 Inlet valve
- 5 Outlet valve
- 6 Drain connector  $\varnothing 30$  mm
- 7 Water supply connector G 3/4"



### Water supply

The water connection at the cold water mains must be equipped with a shut-off valve and must be carried out according to the EU directive 98/83/EC and EN1717. It is recommended to install a filter to retain solid particles of pollution. The humidifier can be connected directly to the mains by a threaded tenon of 3/4" when the water pressure is between 1 and 10 bar. The pipe should have a diameter of at least 6 mm.

If the line pressure is more than 10 bar, the connection must be made via a pressure reducing valve (set to 4-6 bar). In each case it is to be ensured that the manufactured water pipe upstream of the connection to the humidifier is flushed properly. We recommend only using copper pipes. The water supply temperature must not exceed 40°C.

### Water drain

The drain connection has an outside diameter of 30 mm. A plastic hose can be connected to the drain connection which can be routed out of the unit by means of the openings in the unit provided for this purpose.

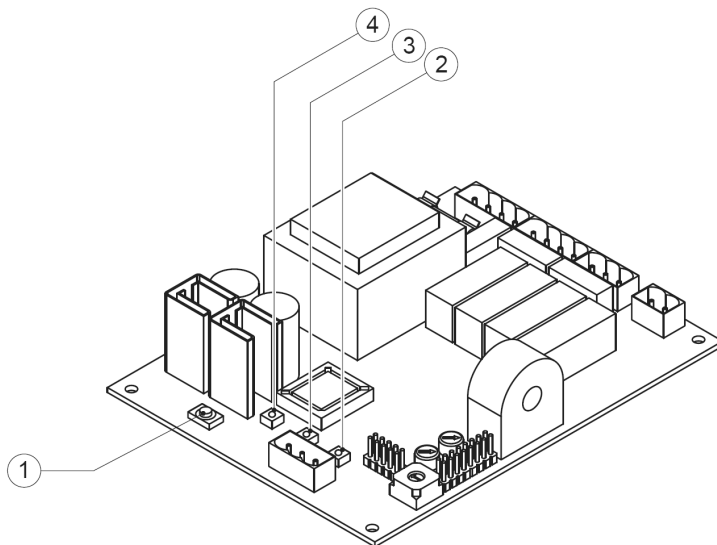
When creating the drain, attention is to be paid to provision for cleaning.

As the water drain is depressurized, we recommend routing the drain hose first into an open collector funnel and then passing through a syphon to the drainage system to ensure free discharge.

The drainage pipe should be routed to the sewerage system with sufficient gradient (at least 5%) and should be located approx. 30 cm below the humidifier. Attention is to be paid to temperature resistance when plastic pipes are used. If copper pipe is used, it must be earthed. For the drainage pipe an inside diameter of at least 30 mm is required.

## 12.1.3 Operation

### 12.1.3.1 Function of the display and operating elements on the control unit ECCM/S



#### 1 Drain/Info key

- press key shortly: opens and closes the drain valve (manual draining).  
**Note:** the drain valve is automatically closed after 10 minutes.
- press key for a extended period of time: activating the info mode

#### 2 Error indication (red LED)

- in normal operating mode  
 The LED lights in case of a malfunction of the unit. Further operation is no longer possible, the heating voltage is interrupted. An alarm signal is sent to the C7000 controller. At the C7000AT the alarm "HUMIDIFIER 1 FAILURE" is displayed.
- in info mode  
 LED blinks in intervals if a malfunction is present. The number of "blinks" per interval indicates the number of the error (see chapter 12.1.4.4).

#### 3 Warning and info indication (yellow LED)

- in normal operating mode
- The LED blinks, if manual draining is in progress.
- The LED lights if the cylinder maintenance is due or the maintenance indication is not reset after the maintenance.
- in info mode  
 LED blinks in intervals if a malfunction with status warning is present. The number of "blinks" per interval indicates the number of the error (see chapter 12.1.4.4).

#### 4 Steam production (green LED)

- in normal operating mode  
 The LED lights if the unit produces steam.
- in info mode  
 LED blinks in intervals. The number of "blinks" per interval multiplied by 10 indicates the current steam output in % (see chapter 12.1.3.3).

### 12.1.3.2 Commissioning

Proceed as follows when putting the unit into operation:

1. Examine the steam humidifier and installation for possible damage.
2. Open the shut-off valve (if existant) in the water supply line.
3. Switch on control fuse and humidifier power switch in electric box. Switch on main switch.
4. Adjust the humidity set value at the C7000 controller. To force humidifer operation for a functional test you can either increase the set value or start the humidifier by the manual operation function of the C7000.

After switching on the control unit ECCM/S carries out a system test, during which all the LEDs on the control unit light up in sequence.

If, after the system test (or during operation) the yellow or red LED lights up, an error has occurred (see information in chapter 12.1.4 "Fault elimination").

After switching on the steam humidifier is ready for operation. As soon as the C7000 controller requires humidity, power is switched on and the green LED lights on the control unit ECCM/S. The inlet valve opens after approx. 60 seconds and the steam cylinder fills with water. The submerged electrodes heat the water up and after a few minutes (approx. 5–10 minutes, depending on the conductivity of the water) steam is produced.

**Note:** If the water has low conductivity, it is possible in the first few hours of operation that the maximum steam output is not achieved. This is normal. As soon as the water reaches adequate conductivity through the vaporization process, the steam humidifier will work at maximum output.

### 12.1.3.3 Function of the LEDs in info mode

The info mode is activated by pressing the drain/info key for an extended period of time (> 3 seconds). In info mode the LED's on the control unit indicate the current operating status of the steam humidifier.

**Note:** The info mode is automatically reset after 15 minutes, or manually by pressing the drain/info key again.

- the green LED blinks. The number of blinks indicates the current steam output in % of the maximum steam capacity:

green LED blinks...	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x
Steam capacity in %	10	20	30	40	50	60	70	80	90	100

### 12.1.3.4 Manual draining

1. Briefly press the drain/info key. The heating voltage is interrupted and the drain valve opens. The yellow LED blinks.

Note: the drain valve closes after 10 minutes automatically

2. To stop the drain cycle briefly press the drain/info key again.

### 12.1.3.5 Taking the unit out of operation

1. If the unit has to be switched off because of a malfunction, please activate the info mode (see chapter 4.4.1) and note the number (number of blinks of the red LED) of the actual error.
2. Close the shut-off valve in the water supply line.
3. Start manual draining and wait until the steam cylinder is empty (approx. 5-10 minutes).
4. Disconnect the steam humidifier from the mains: Switch off the humidifier power switch in the electric box.



## 12.1.4 Fault elimination

**Important!** Most operational malfunctions are not caused by faulty equipment but rather by improper installation or disregarding of planning guidelines. Therefore, a complete fault diagnosis always involves a thorough examination of the entire system. Often, the steam hose connection has not been properly executed, or the fault lies with the humidity control system.

### 12.1.4.1 Fault indication

LED on control unit ECCM/S		Description
yellow	red	
blinks permanently	—	Drain/info key has been pressed shortly (manual draining in progress)
lights	—	Steam cylinder maintenance due or maintenance indication not reset.
lights	lights	Steam cylinder maintenance not executed or maintenance indication not reset.
—	lights	Fatal malfunction.

If the yellow or red LED lights, press drain/info key (at least 3 seconds) until yellow (“Warning”) or red (“Error”) LED starts blinking intermittently (info mode). The amount of “blinks” per interval indicates the type of malfunction.

– Yellow LED “Warning” blinks intermittently

A malfunction is present. The control unit checks whether there is a temporary problem (e.g. water supply interrupted for a short time) or whether it can resolve the problem by taking necessary measures.

– Red LED “Error” blinks intermittently

The control unit, after several attempts, fails to solve the problem (number of attempts depends on the type of malfunction) or the problem obstructs further operation. In this case the heating voltage is interrupted via the main contactor.

### 12.1.4.2 Resetting the maintenance indication

After completing maintenance work, the maintenance indication (yellow LED) must be reset as follows:

- De-energize the humidifier board.
- Press drain key and keep pressed.
- Switch on humidifier board.
- Keep drain key pressed until the system test is completed (approx. 10 seconds).

### 12.1.4.3 Notes on fault elimination



**DANGER! Danger of electric hazard!**

For the elimination of faults set the steam humidifier out of operation as described in chapter 12.1.3.5, separate the unit from the mains (test with voltage tester) and secure it against inadvertent power-up.



**Do not touch electronical components, without taking care of protective ESD measures.**

### 12.1.4.4 Malfunction lists

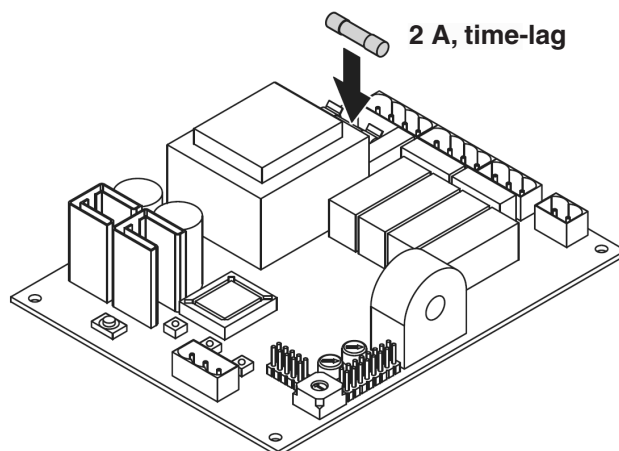
“Warning” yellow LED blinks	“Error” red LED blinks	Cause	Remedy
1x Control board defective	---	Control board defective	Please contact your unit supplier.
2x Max. filling level of steam cylinder reached	---	Water conductivity too low (after initial operation). Water conductivity too low for type of steam cylinder. Phase failure heating voltage.	Wait.  Select correct steam cylinder type. Check mains fuse(s) and replace if applicable.
3x Permissible filling time exceeded for more than 20 minutes (first automatic cleaning cycle)	3x Permissible filling time exceeded for more than 220 minutes.	Phase failure heating voltage.  Water supply obstructed, water pressure too low, inlet valve defective.  Excessive steam back pressure, causing water loss via filling cup. Drain valve is leaking.	Check mains fuse(s) and replace if applicable. Open shut-off valve in the water supply pipe, clean water inlet filter, check water pressure, inspect/replace inlet valve. Inspect steam installation.  Clean/replace drain valve.
<b>Note:</b> if the Jumper “L” is removed from the ECCM/S control unit, the unit automatically triggers an error without prior warning if the admissible filling time has been exceeded for more than 20 minutes (red LED lights and the error switch on the control unit ECCM/S is activated). However the unit switches off after 220 minutes of filling time exceeding (see chapter 12.1.1.3).			
4x Steam cylinder needs servicing	4x Interval for steam cylinder service exceeded for more than 72 hours	Interval for steam cylinder service exceeded. Mineral deposits and/or electrodes spent.	Replace steam cylinder type A, clean steam cylinder type D (see chapter 5, humidifier service manual). <b>Important!</b> Refer to chapter 12.1.4.2 for resetting the maintenance indicator.
<b>Note:</b> if the Jumper “K” is installed on the ECCM/S control unit, the unit remains in warning status even if the interval time has been exceeded for more than 72 hours. No error is triggered (red LED does not light) and the error switch on the control unit ECCM/S is not activated (see chapter 12.1.1.3).			
6x Electrode current too high	6x Electrode current too high	Steam cylinder (electrodes) defective. Faulty auto-drain function. Faulty drain valve/coil. Steam cylinder outlet obstructed. Water conductivity too high for type of steam cylinder.	Replace steam cylinder or electrodes. Inspect installation/control system. Replace drain valve/coil. Clean/replace steam cylinder. Select correct steam cylinder type.
7x Foam detection in the steam cylinder	7x Foam control impossible	Formation of foam in steam cylinder.	Empty/flush steam cylinder. Set jumper on “DRN” (see chapter 12.1.1.3).
---	8x Main contactor jammed	Main contactor jammed in activated position.	Check/replace main contactor.
9x Drain valve blocked	9x Drain valve blocked	Drain valve blocked or defective. Steam cylinder outlet blocked.	Clean/replace drain valve. Clean steam cylinder outlet.
---	10x Rotary switch in wrong position	Rotary switch on control unit ECCM/S is set to an invalid position.	Set rotary switch on control unit ECCM/S to the position for the corresponding steam cylinder type (see chapter 12.1.1.3).

### 12.1.4.5 Replacement of fine-wire fuse on the control unit ECCM/S

If the fine-wire fuse on the control unit ECCM/S blows this is usually due to a faulty coil of the inlet or drain valve or the main contactor. Therefore you should test these components before replacing the fuse.

To replace the fine-wire fuse proceed as follows:

1. Set the steam humidifier OEM2 out of operation as described in chapter 12.1.3.5, separate the unit from the mains and secure it against unintentional switching on. Take care that the electricity supply to the control unit ECCM/S is disconnected (check with voltage tester).
2. Replace fine-wire fuse (see figure below) with a fuse of the given type with the specified nominal current rating.



**CAUTION!**

It is not permitted to use repaired fuses or to short-circuit the fuse holder.

### 12.1.4.6 Resetting fault indication (red LED lights in normal operating mode)

To reset the error indication:

Disconnect the steam air humidifier from the mains. Wait approx. 5 seconds, then reconnect the unit to the mains.

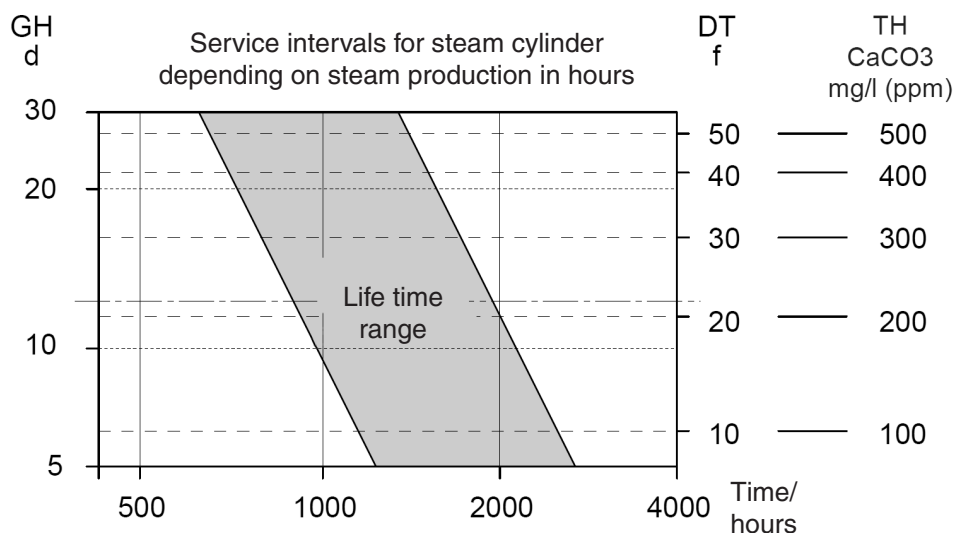
**Note:** If the fault has not been eliminated, the error indication reappears after a short while.

## 12.1.5 Maintenance

You find a detailed description of the maintenance procedures in chapter 5 of the humidifier service manual. This manual is available on the website [www.stulz.com](http://www.stulz.com) in the e-Stulz area under „Downloads/Precision A/C“ as a pdf document.

Here you can only see a diagram, which shows the average life cycle of a steam cylinder in dependence of the runtime and the total hardness.

The humidifier runtime can be read in the Info menu of the C7000AT or by the command "humi h" in the C7000.



GH: Gesamthärte  
DT: Dureté totale  
TH: Total hardness

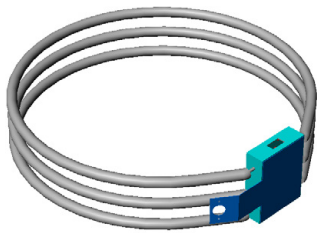
## 12.2 Reheat

The reheat is an optional extra for your A/C unit. It is installed complete and integrated in the function and method of operation of the A/C unit. It is used to heat up the air. The following versions of the heater are available:

- Electrical reheat
- Hot water reheat (HW)
- Hotgas reheat (HG)

### Description

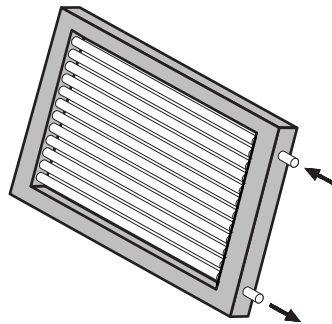
#### Electrical reheat



The reheat is connected in accordance with the electric diagram. It is controlled and monitored by the controller. The values for switching on and off are adjusted in the "operate/components/heating" menu on the controller. Refer to the operating instructions C7000.

C1002: menu item 12-14 (E, F, H)

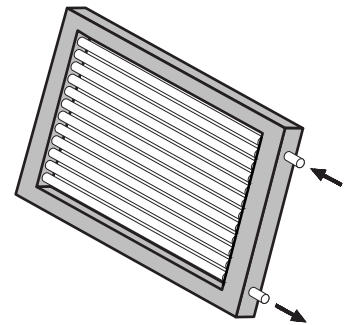
#### HW reheat



The HW reheat is to be connected to an external hot water circuit. The water supply is controlled via an electrically actuated HW valve. The HW valve is controlled via the controller. The control parameters are adjusted in the "operate/components/heating/HWR valve" menu on the controller. Refer to the operating instructions C7000.

C1002: menu item 12-14 (E, F, H)

#### HG reheat



The hotgas reheat is integrated in the refrigerant circuit in accordance with the refrigerant diagram in the appendix. The refrigerant supply is controlled via an electrically-actuated 3-way solenoid valve. The solenoid valve is controlled via the controller. The control parameters are adjusted in the "operate/components/heating" menu on the controller. Refer to the operating instructions C7000.

C1002: menu item 12-14 (E, F, H)

### Operation

The reheat is controlled and monitored by the controller. No further measures are required for operation.

### Maintenance

Clean the reheat annually from contaminations and check it for damage.

## Installation

The reheats are installed and connected in the A/C unit. The HW reheat is to be connected on site to the external hot water circuit. The pipelines are to be routed out of the A/C unit. The thread sizes for the connection piping of the HW reheat are listed in the following table.

### Temperatures:

Water inlet: 60°C

Water outlet: 40°C

Air inlet: 13°C

Glycol: 0%

Cabinet size		1	2	3	4	5	7
Pipe - Ø	mm	16	22	22	22	22	22
Thread size	inch	1/2	3/4	3/4	3/4	3/4	3/4

## Commissioning

The reheats are controlled and monitored by the controller of your A/C unit. No further measures are required for commissioning.

## Malfunction causes

### Alarm: Reheat defect

All reheat alarms are received by the controller and can be requested according to the equipment.

C7000-control system: no display (display only externally)

C7000 advanced terminal: indication on the display

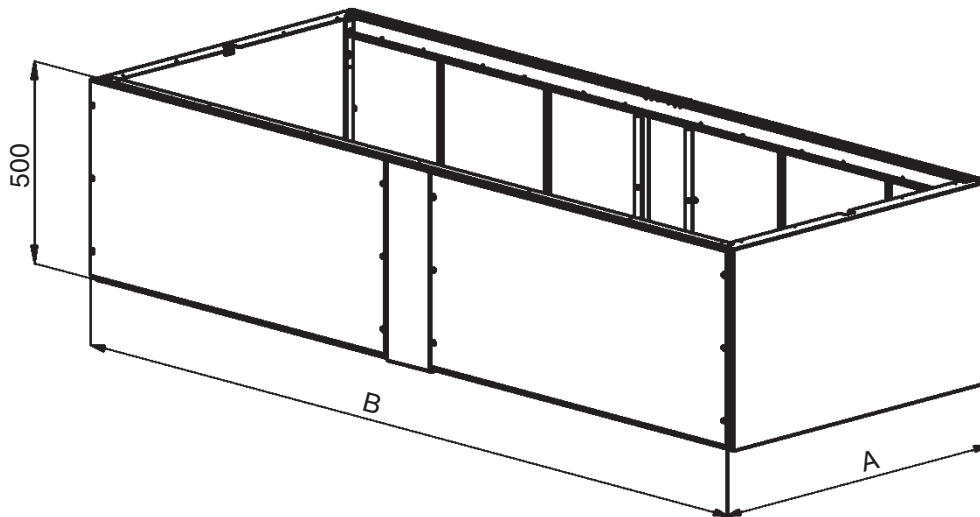
C1002: display: HEA

## 12.3 Air side connection

For the air side connection on **top of the unit** exist different options, which are delivered in a completely assembled condition. On the installation site these set-ups must be set upon the unit and must be connected to it.

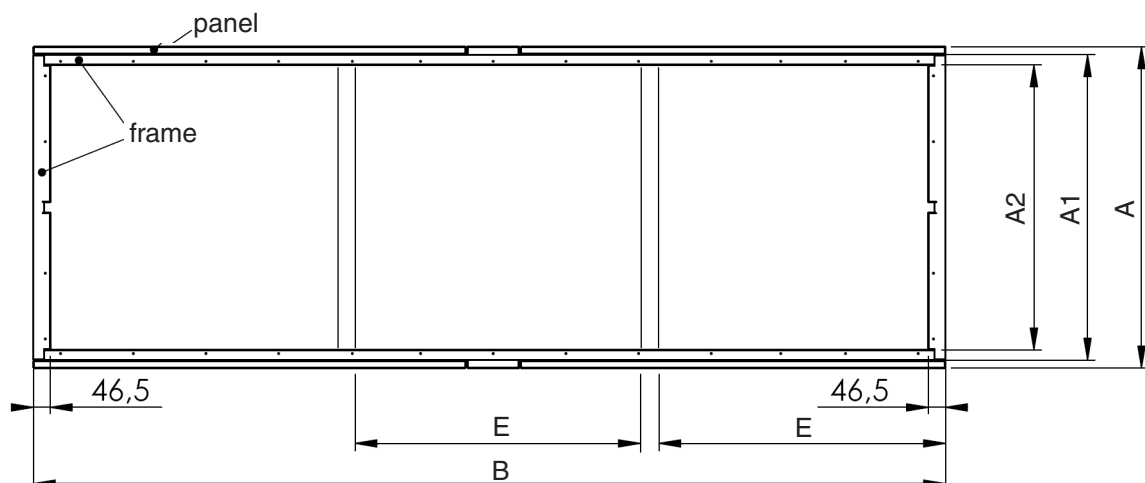
### 12.3.1 Duct

The duct will be set on top of the unit and be screwed with the unit.



Cabinet size		1	2	3	4	5	7
A	mm	884	884	884	884	884	974
A1	mm	840	840	840	840	840	930
A2	mm	784	784	784	784	784	874
B	mm	950	1400	1750	2200	2550	3110
E	mm	-	-	-	-	-	939

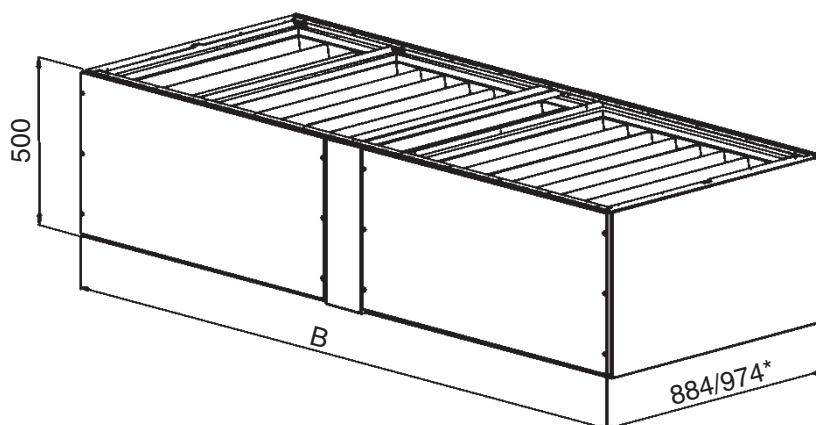
Top view:



### 12.3.2 Bag filter top

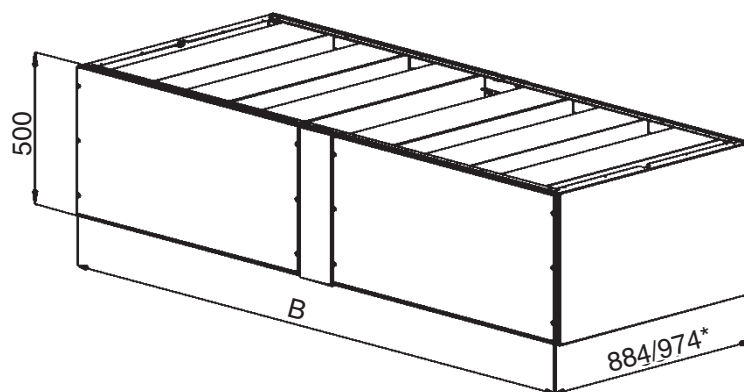
The bag filter is available for all downflow units. The bag filter serves for the pre- filtration of the air which is sucked in and can be obtained in the qualities F6, F7 and F9 (according to EN779).

The bag filter top will be set on top of the unit and be screwed with the unit.



### 12.3.3 Sound insulation plenum

The sound insulation plenum is available for all units. The plenum will be set on top of the unit and be screwed with the unit.



B = unit width

\*for cabinet size 7



### 12.3.4 Adapter plate with damper or flexible connection

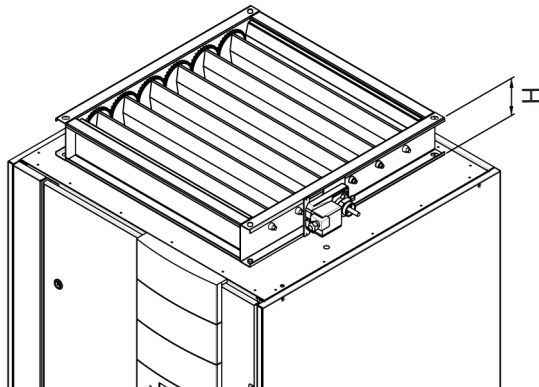
#### - Connection on the unit

The adapter plate serves to attach a damper or a flexible connection on top of the unit or a duct. First install the actuator onto the louver shaft on the right side looking at the unit front. Then fix the louver with the actuator on the adapter plate. Now mount the adapter plate with pre-mounted louver on the unit top by means of a screw connection.

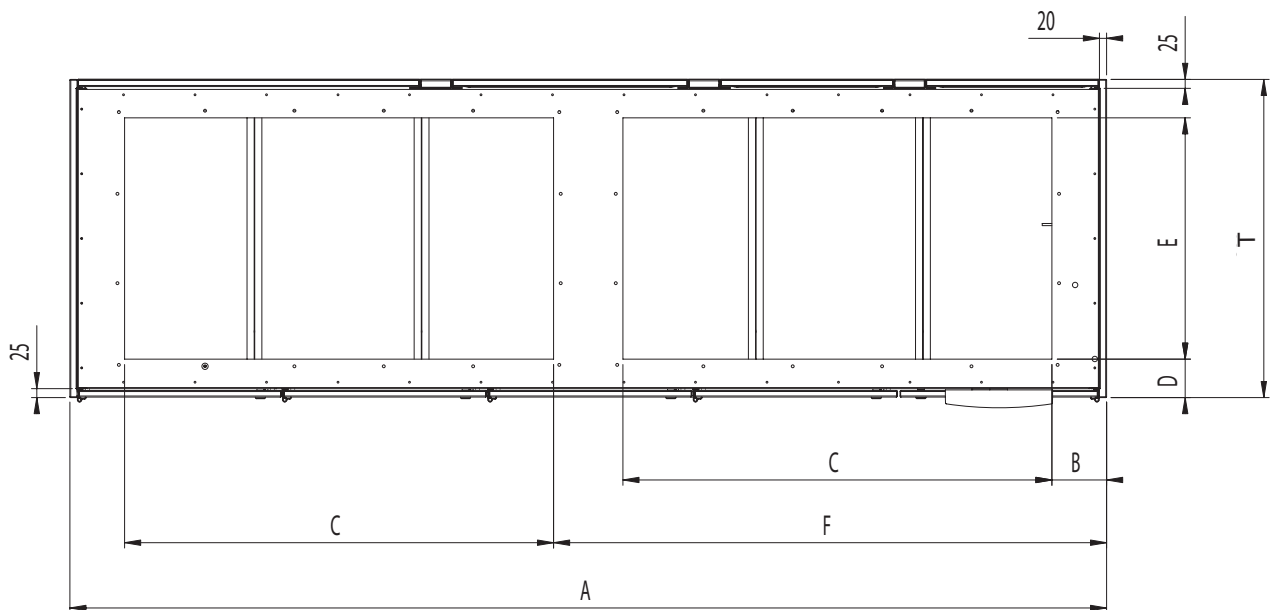
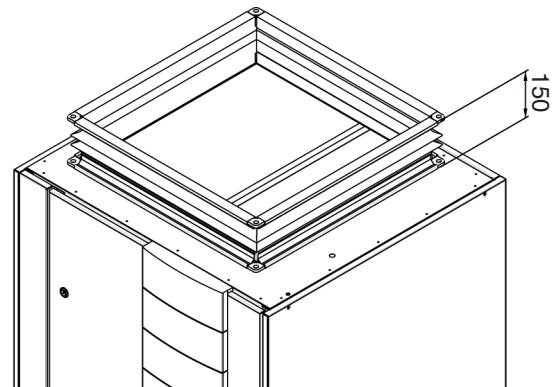
The damper actuator, which is controlled via a 24 V signal by the controller, has to be electrically connected. For this the delivered cable must be connected at the motor, be routed through an opening in the adapter plate into the unit and then be connected at the controller in the electric box according to the electric diagram.

In **downflow** units route the cable through the side panel.

Adapter plate with damper



Adapter plate with flexible connection



Cabinet size		1	2	3	4	5	7
A	mm	950	1400	1750	2200	2550	3110
B	mm	190	187	237	237	275	187
C	mm	650	1100	1400	1800	2000	1200/1300
D	mm	147	97	107	107	107	198
E	mm	650	675	675	675	675	675
F	mm	-	-	-	-	-	1797
T	mm	890	890	890	890	890	980
H	mm	120	175	175	175	175	175

If the air side has to be continued by a duct, the installation of a flexible connection is necessary. Take into account the installation of pressure compensations in the flexible connection.



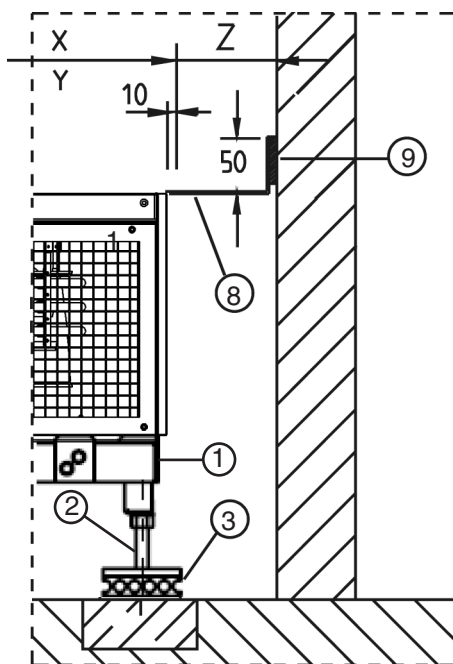
## 12.4 Raised floor stand

The floor stand is used to adjust the height of the A/C unit to the existing raised floor and consists of an encircling rectangular profile of welded steel. Before the positioning of the stand the adjustable threaded supports must be screwed in the raised floor stand. The floor stands exists in 6 different heights which can be fine adjusted by the threaded supports. The cut-out in the raised floor must be designed 10 mm larger at each side than the fan unit.

### Minimum distances and mounting instructions

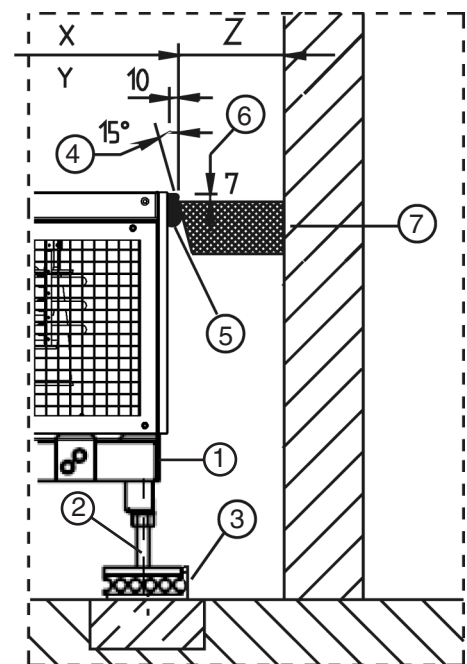
- Observe that the fan unit must be decoupled from the surrounding floor plates by damping insertions and that mafund plates are laid under the floor supports.
- The raised floor cutting (notch) should at least be 15° and must not have any contact to the fan unit, which could result in bone-conduction.
- If the floor stand is placed near a wall, a minimum distance of 50 mm should be respected. The gap between wall and fan unit should be closed by tin stripes.
- The dimensions of the openings in the raised floor must be 10 mm larger than the fan unit. The joint must be closed by customers with a continuous seal.
- A concrete foundation is recommended in the area of the raised floor supports.
- The raised floor supports have to be installed on vibration dampening material (do not screw down the supports!).
- Prior to installation of the A/C unit, the fan unit must be installed 7 mm higher than the raised floor plates, as the mafund plates are compressed by the weight of the A/C unit.

### Detail of raised floor connection



Sealing  
when distance  $Z < 100$  mm

- 1 Raised floor stand
- 2 Threaded support
- 3 Mafund strips
- 4 Raised floor cut out angle
- 5 Continuous seal profile
- 6 Before unit installation
- 7 Raised floor plate
- 8 Angled bracket
- 9 Permanently elastic seal



Sealing  
when distance  $Z \geq 100$  mm

### Positioning of the fan unit on the floor stand

When positioning the fan unit on the floor stand, it must be brought precisely into the correct position above the floor stand from the front (under no circumstances diagonally). Hereby use mounting aids to bring in the unit and secure these by fixing belts. We recommend further to lay in advance at least two securing instruments (e. g. square steel bars) on the stand to avoid a slip-off.

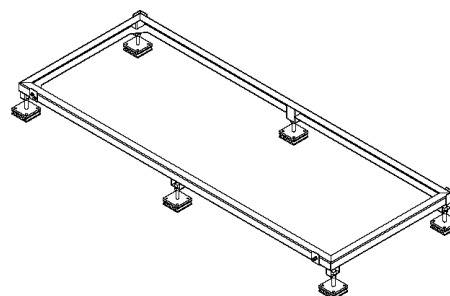
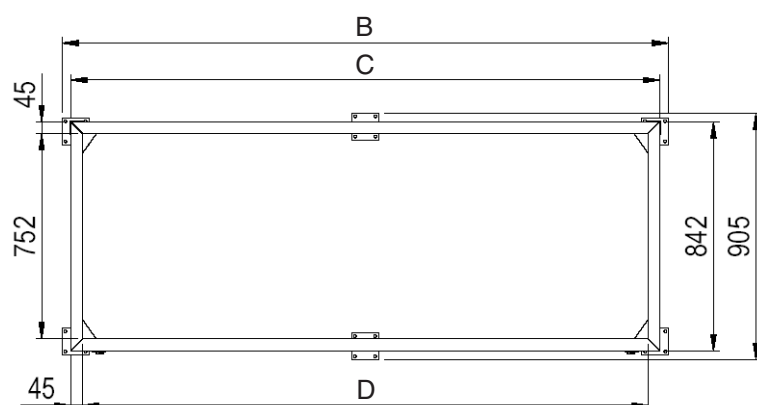
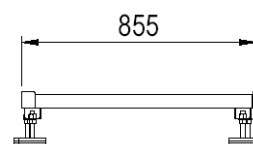
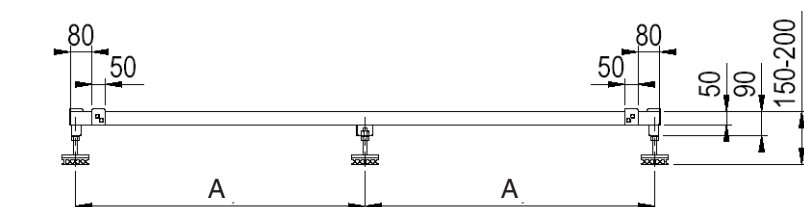
When the unit is in the right position the securing aids can be taken away and the fan unit can be set down. Now the mounting aids can be pulled away under the unit.

Height 150 - 200 mm

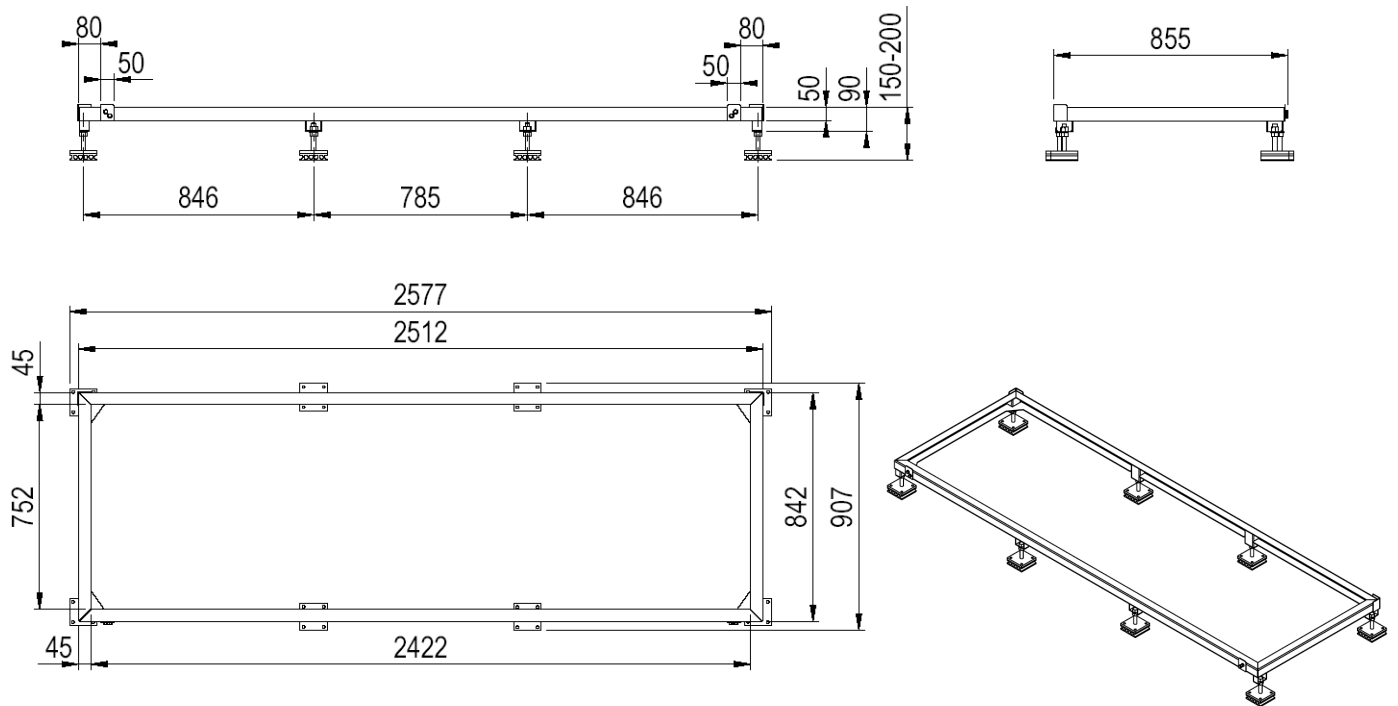
Size 1

drawing not yet available

Size 2 - 4



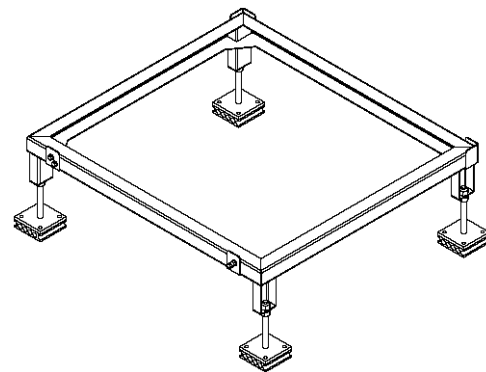
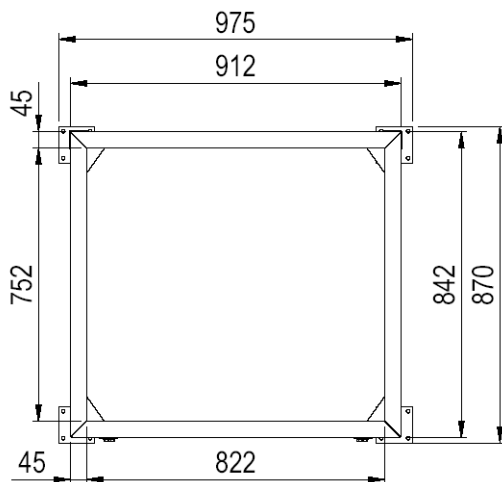
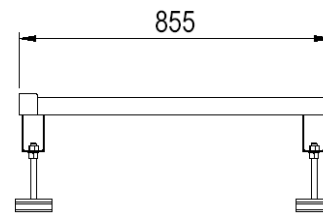
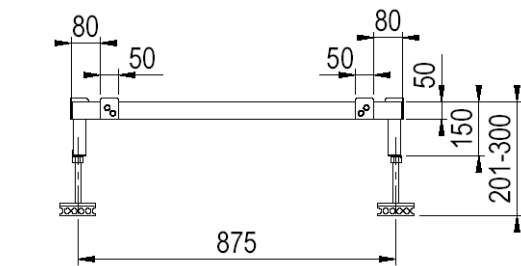
Size		2	3	4
A	mm	662,5	837,5	1062,5
B	mm	1425	1775	2225
C	mm	1362	1712	2162
D	mm	1272	1622	2072

**Size 5****Size 7**

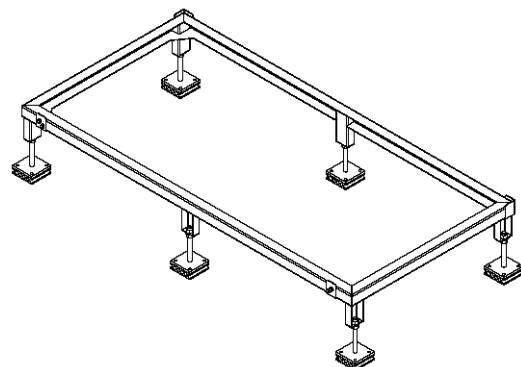
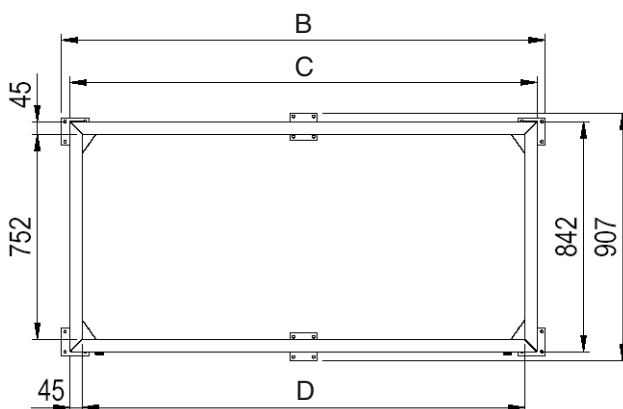
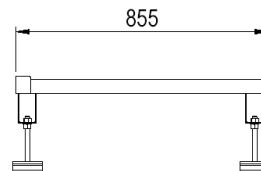
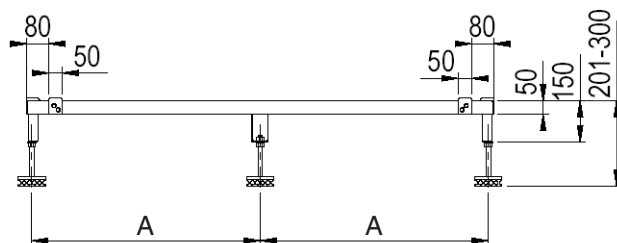
drawing not yet available

## Height 201 - 300 mm

### Size 1

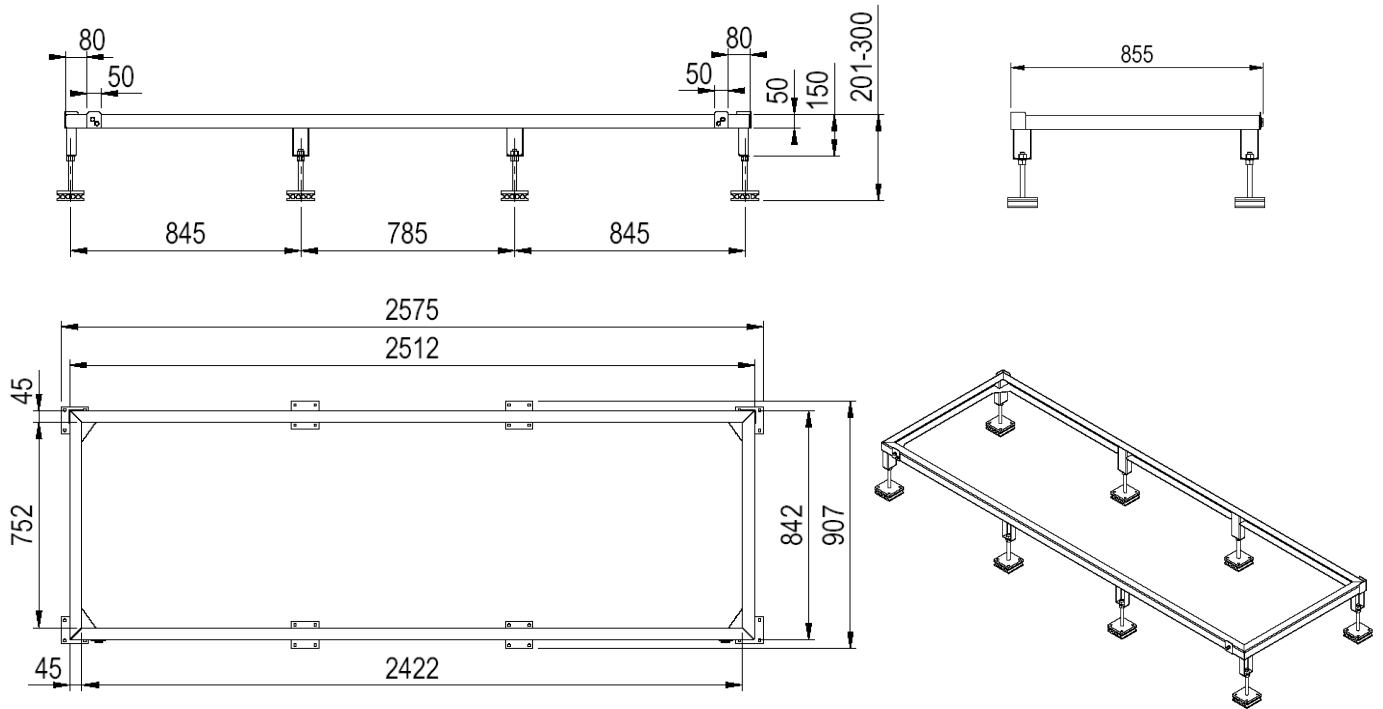


### Size 2 - 4

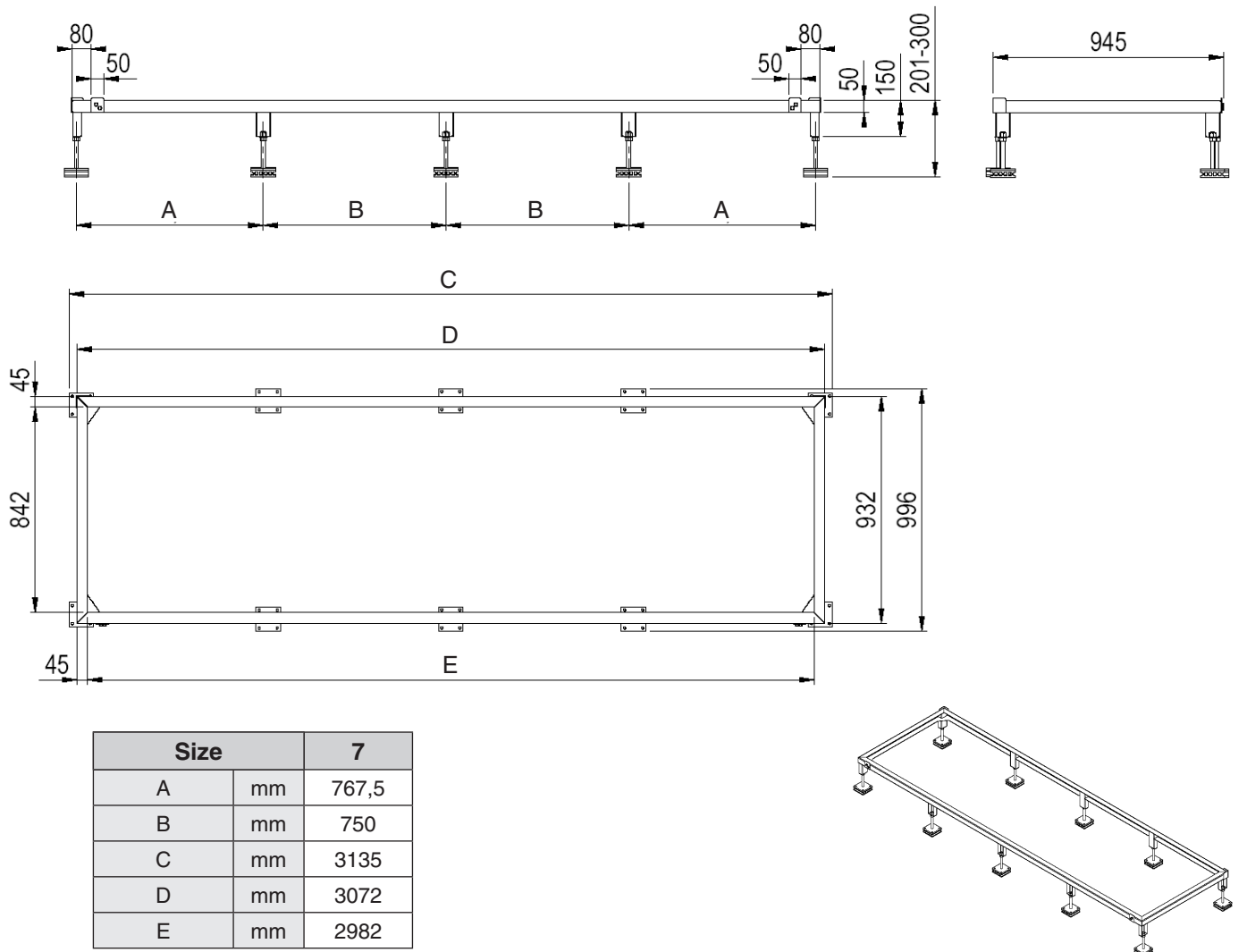


Size		2	3	4
A	mm	662,5	837,5	1062,5
B	mm	1425	1775	2225
C	mm	1362	1712	2162
D	mm	1272	1622	2072

## Size 5



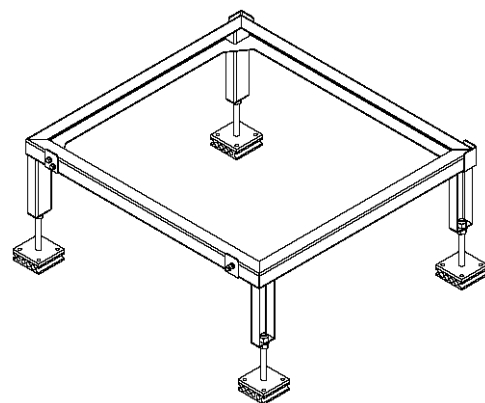
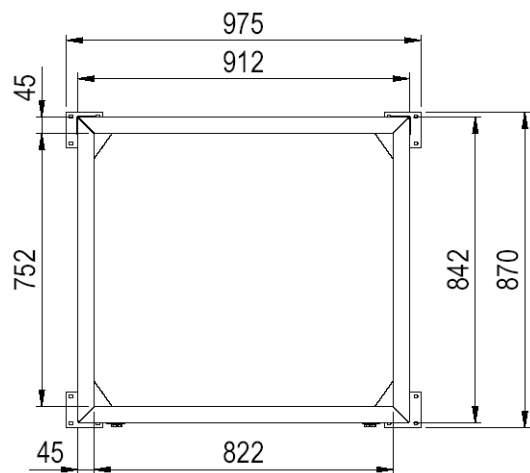
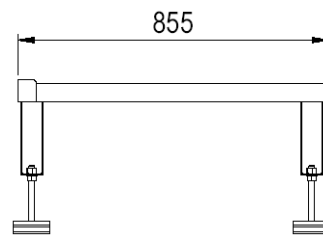
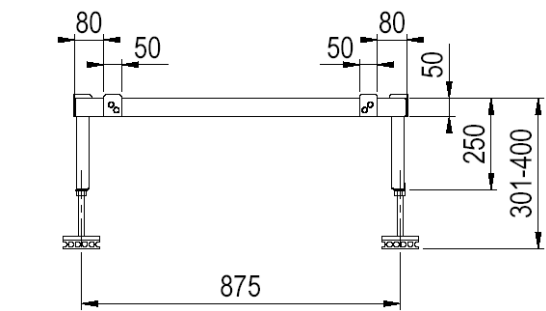
## Size 7



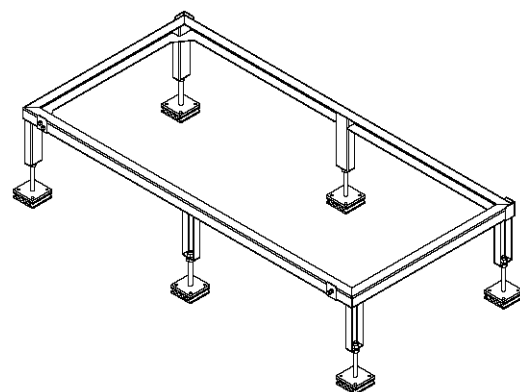
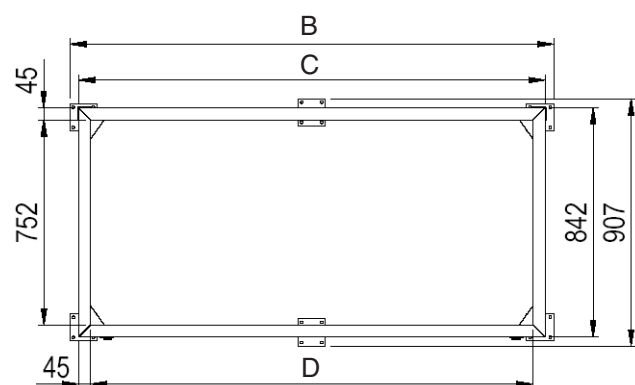
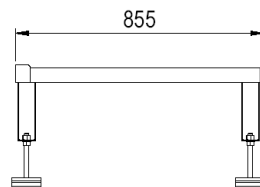
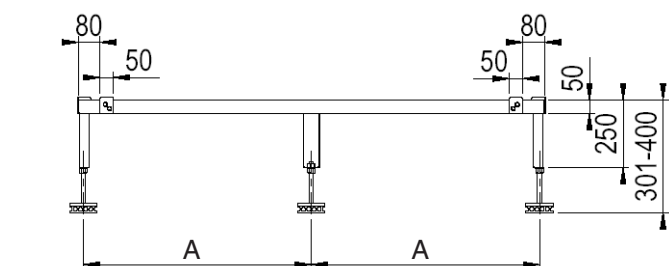


## Height 301 - 400 mm

### Size 1

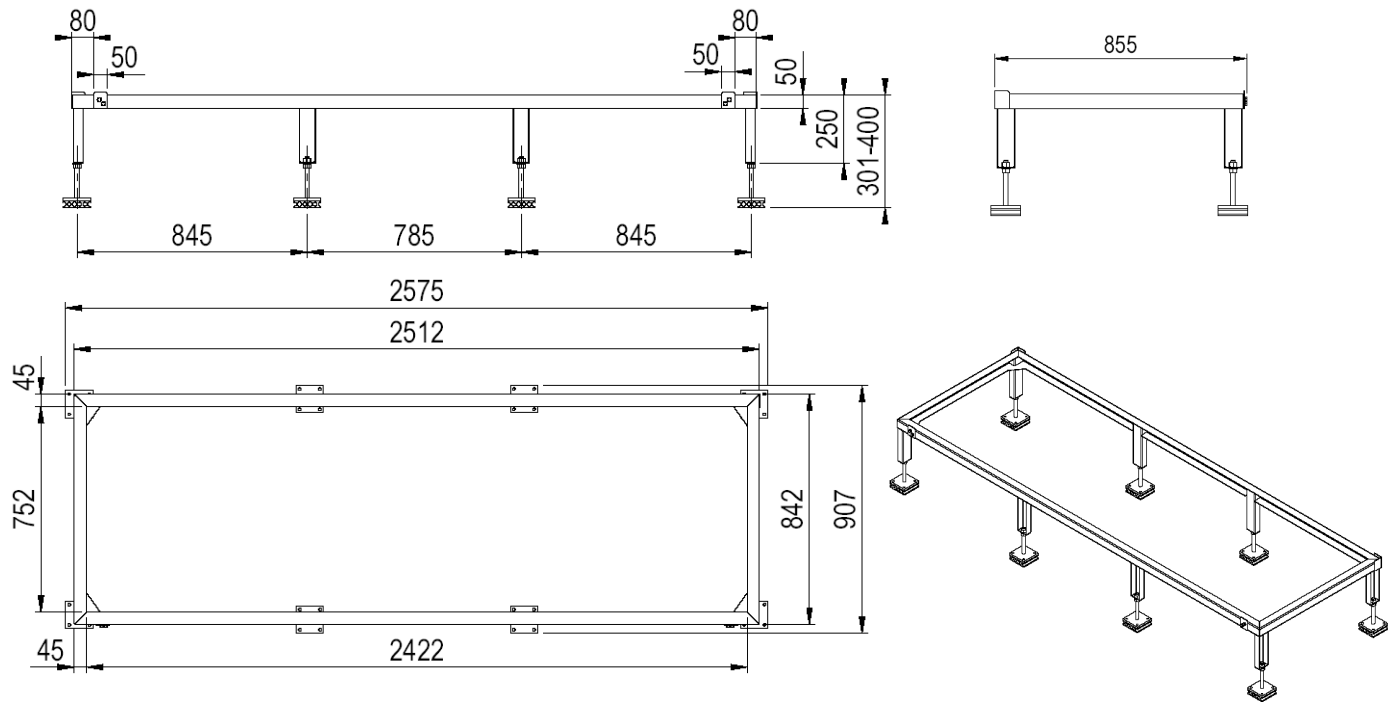


### Size 2 - 4

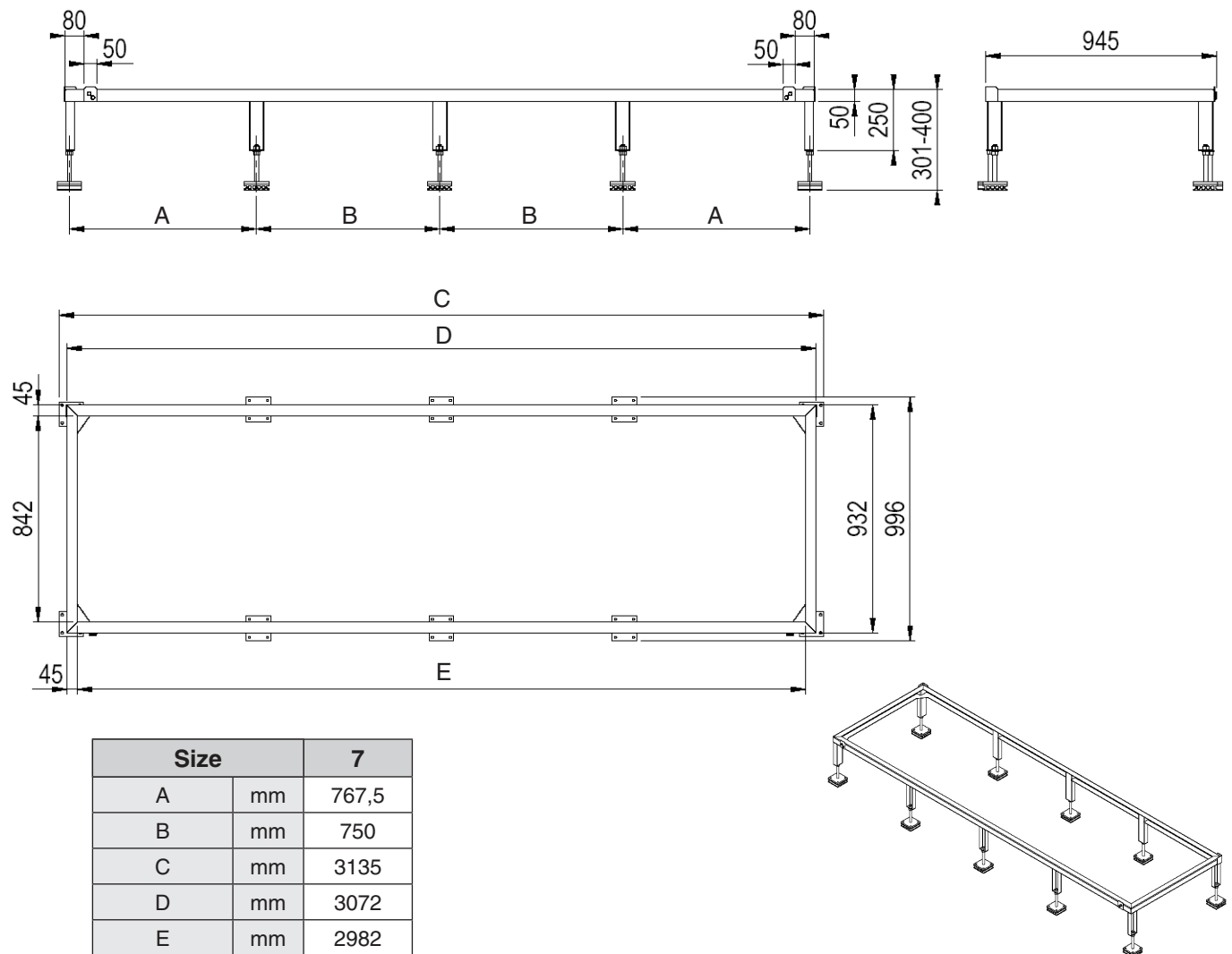


Size		2	3	4
A	mm	662,5	837,5	1062,5
B	mm	1425	1775	2225
C	mm	1362	1712	2162
D	mm	1272	1622	2072

## Size 5

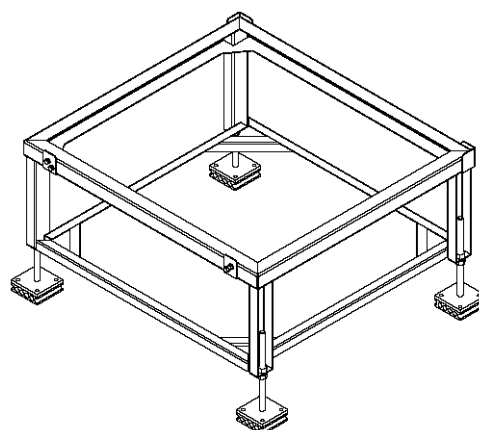
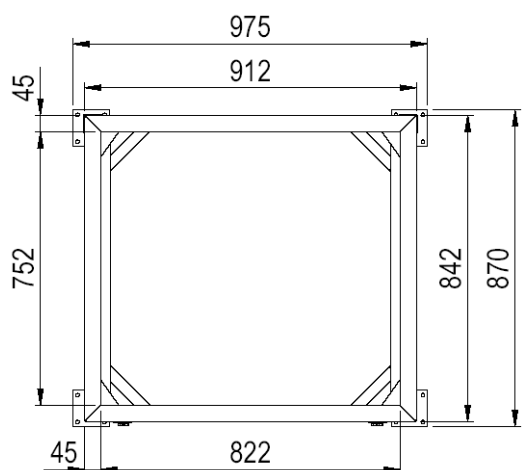
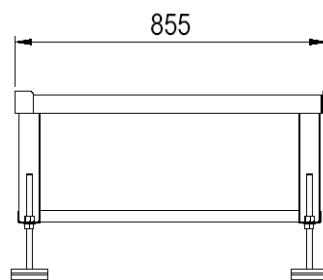
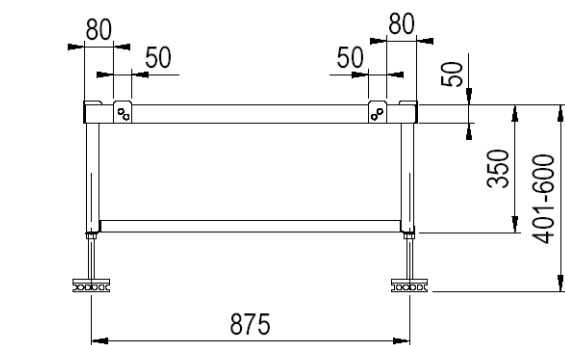


## Size 7

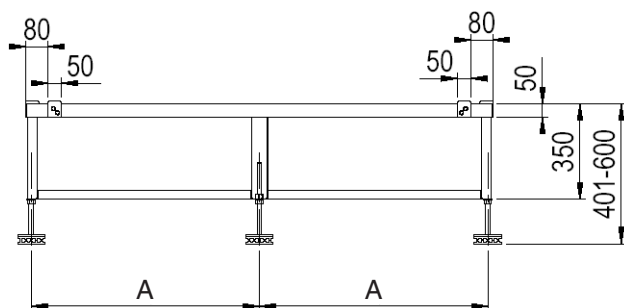


# Height 401 - 600 mm

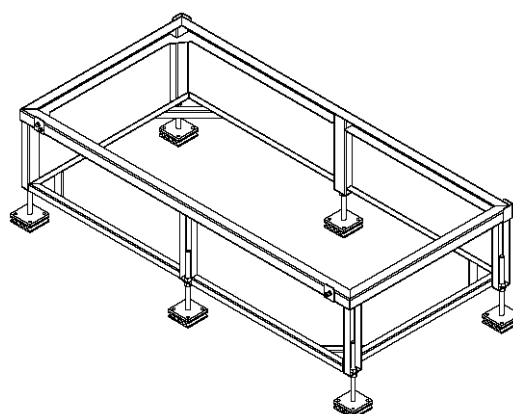
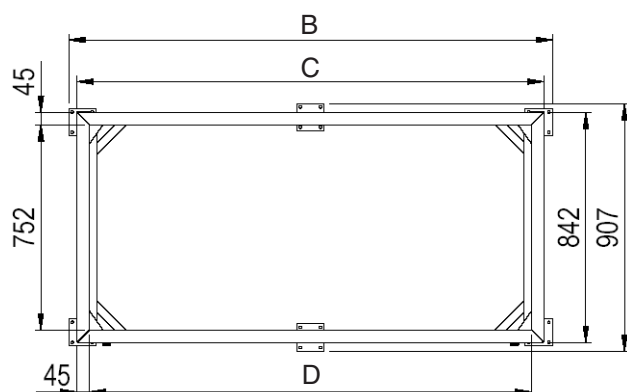
## Size 1



## Size 2 - 4

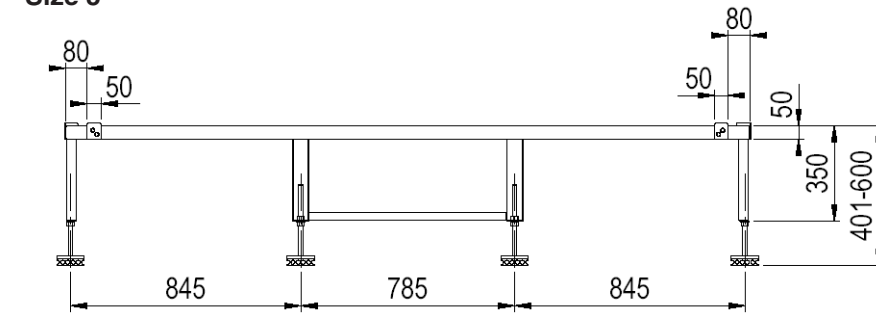


Side view same as for size 1

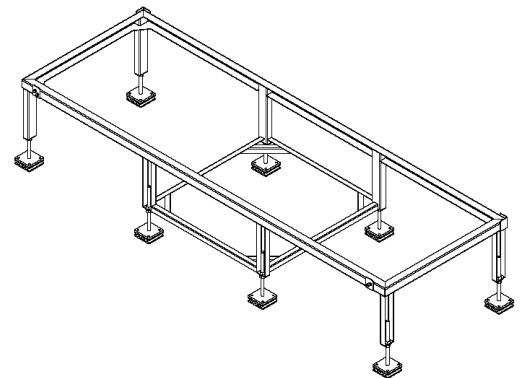
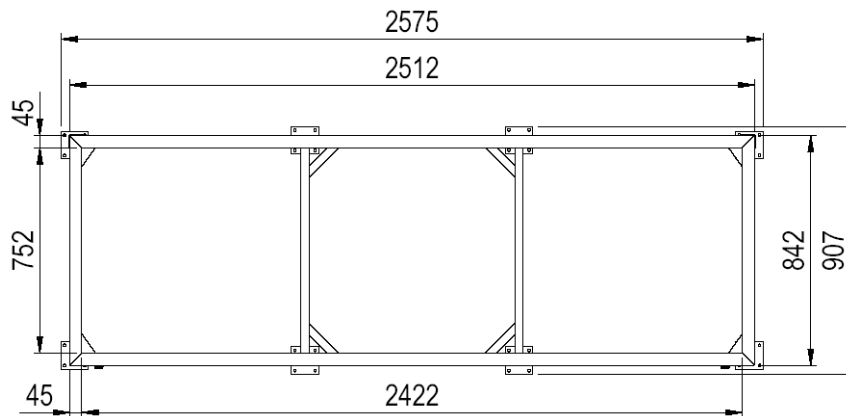


Size		2	3	4
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B	mm	1425	1775	2227
C	mm	1362	1712	2162
D	mm	1272	1622	2072

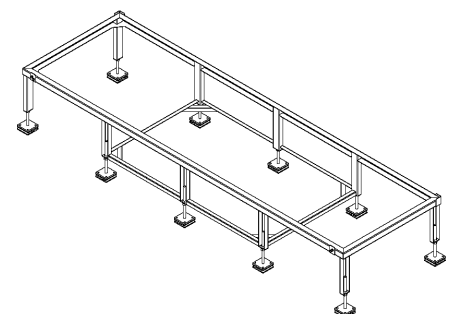
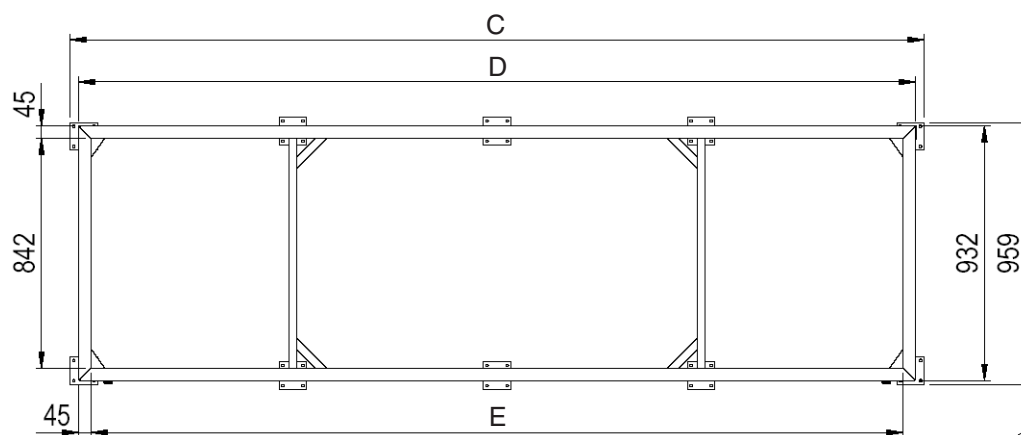
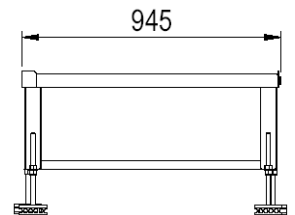
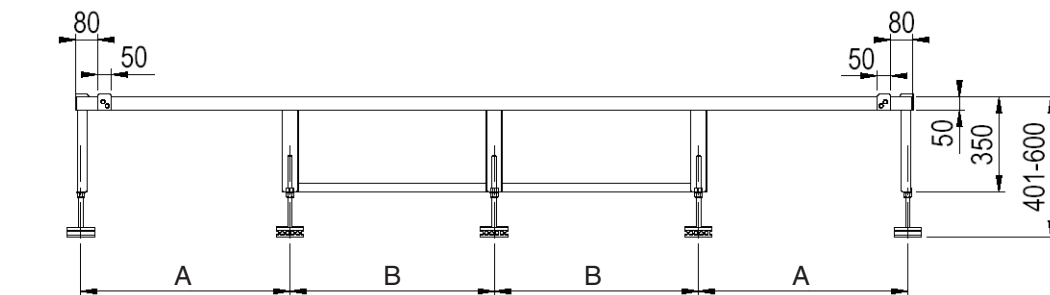
## Size 5



Side view same as for size 1



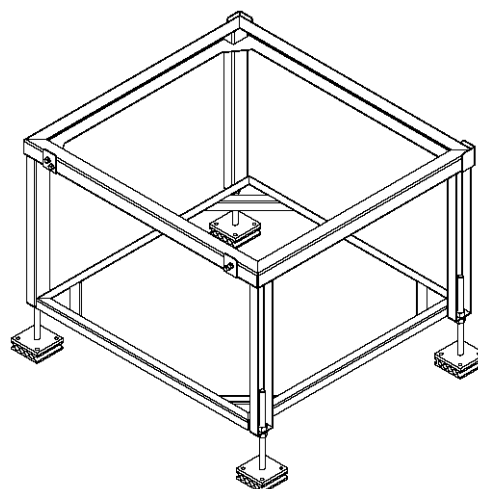
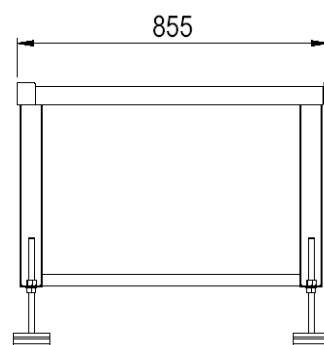
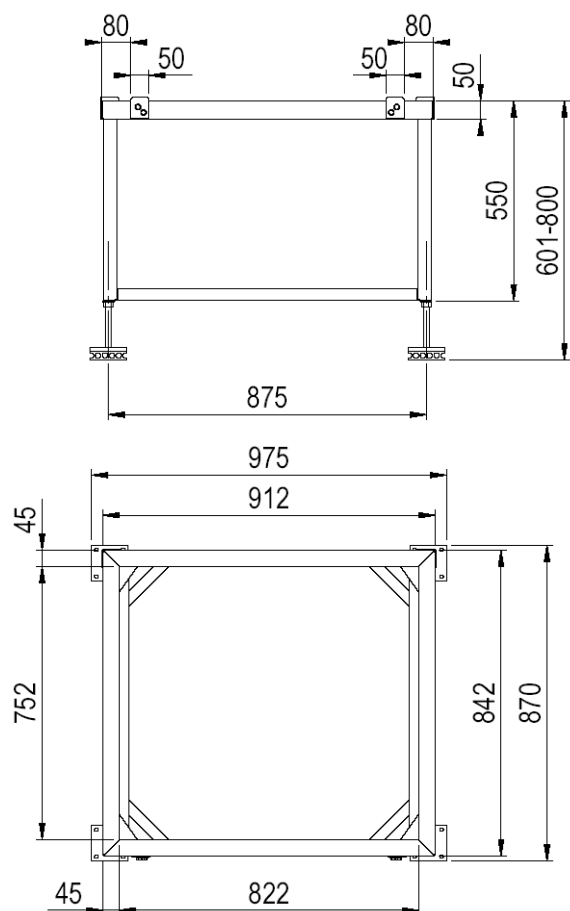
## Size 7



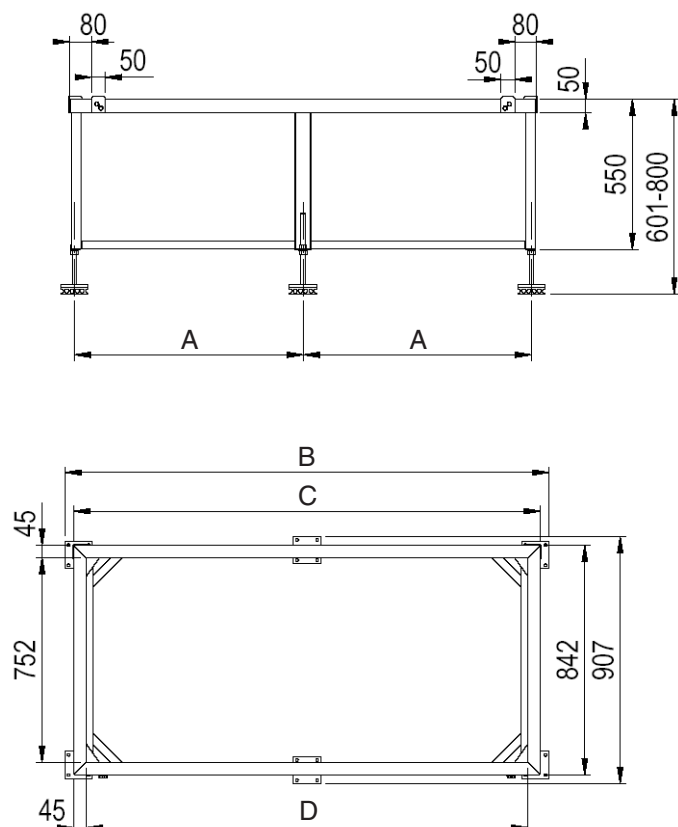
Size		7
A	mm	767,5
B	mm	750
C	mm	3135
D	mm	3072
E	mm	2982

# Height 601 - 800 mm

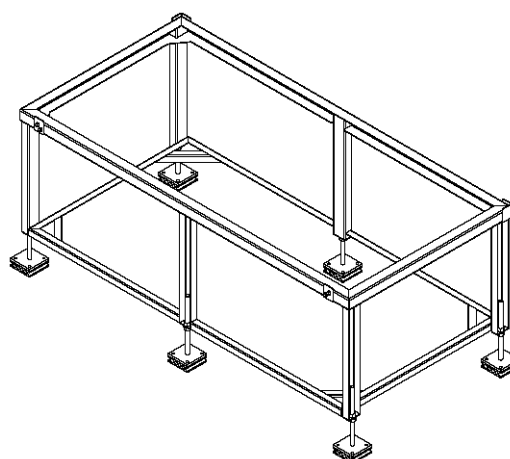
## Size 1



## Size 2 - 4

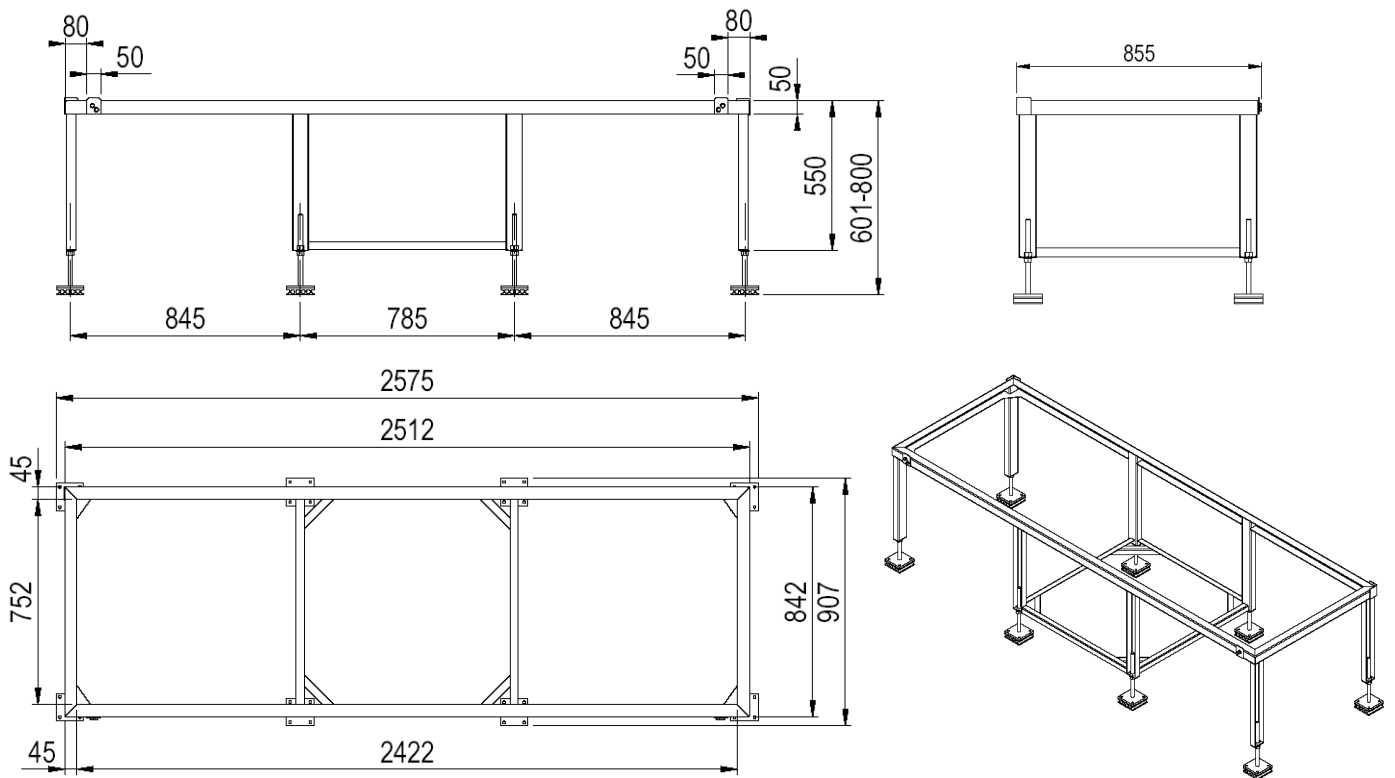


Side view same as for size 1

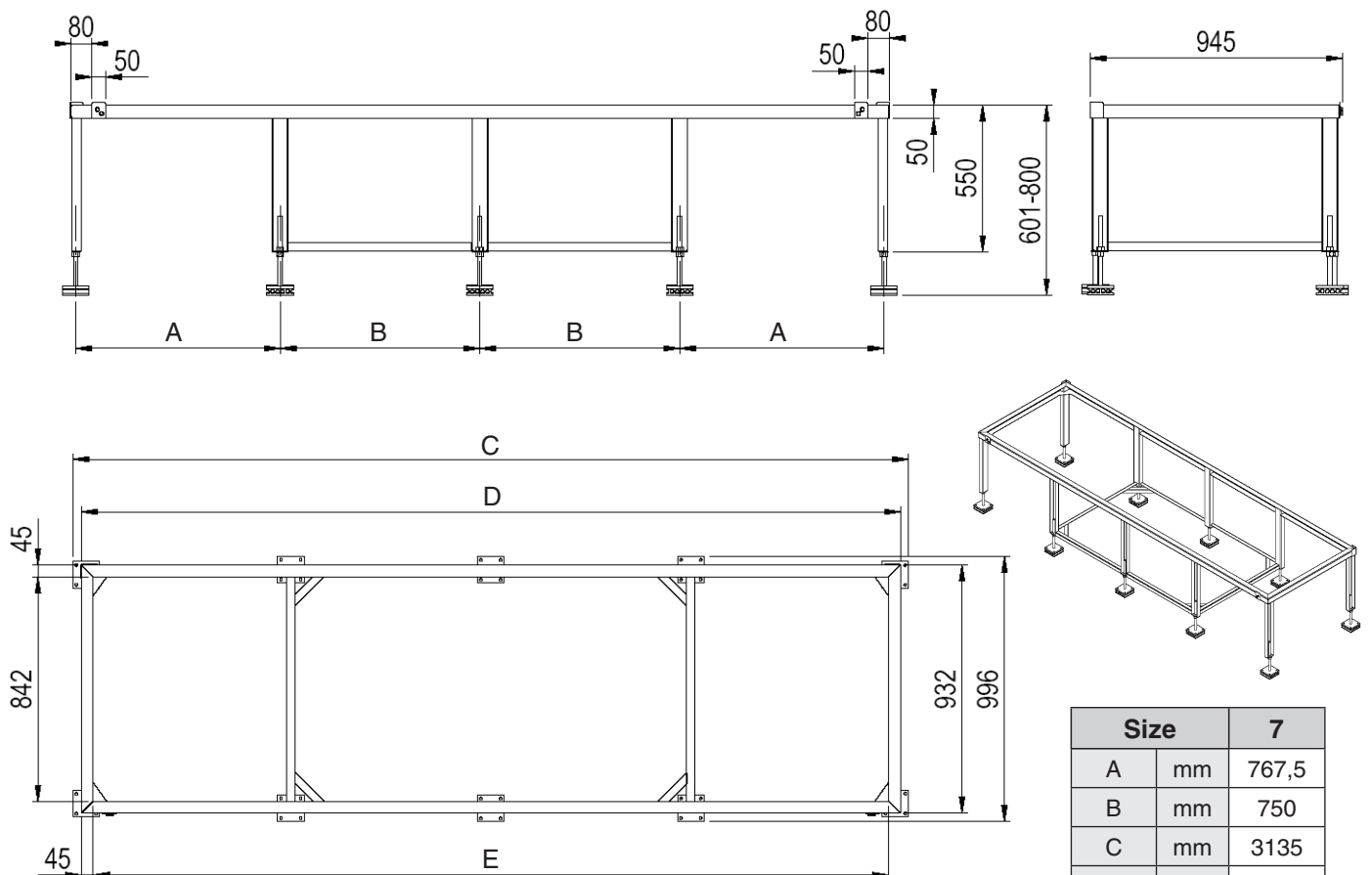


Size		2	3	4
A	mm	662,5	837,5	1063,5
B	mm	1425	1775	2227
C	mm	1362	1712	2162
D	mm	1272	1622	2072

## Size 5



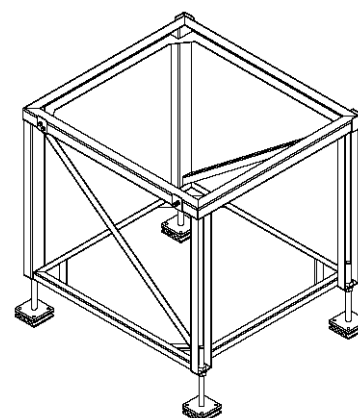
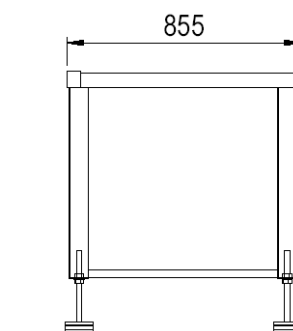
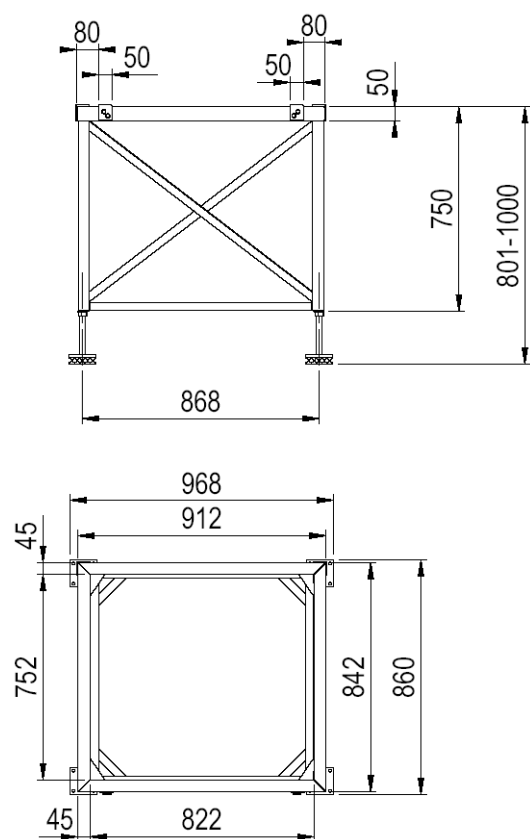
## Size 7



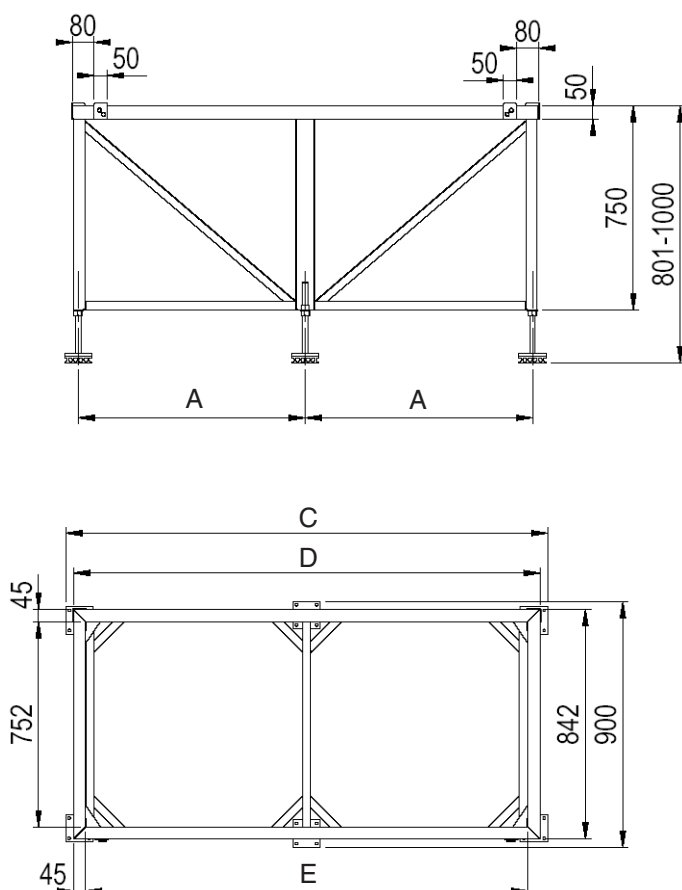
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B	mm	750
C	mm	3135
D	mm	3072
E	mm	2982

# Height 801 - 1000 mm

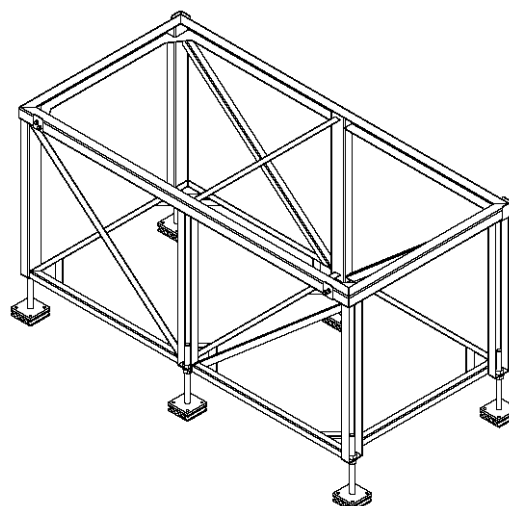
## Size 1



## Size 2 - 4



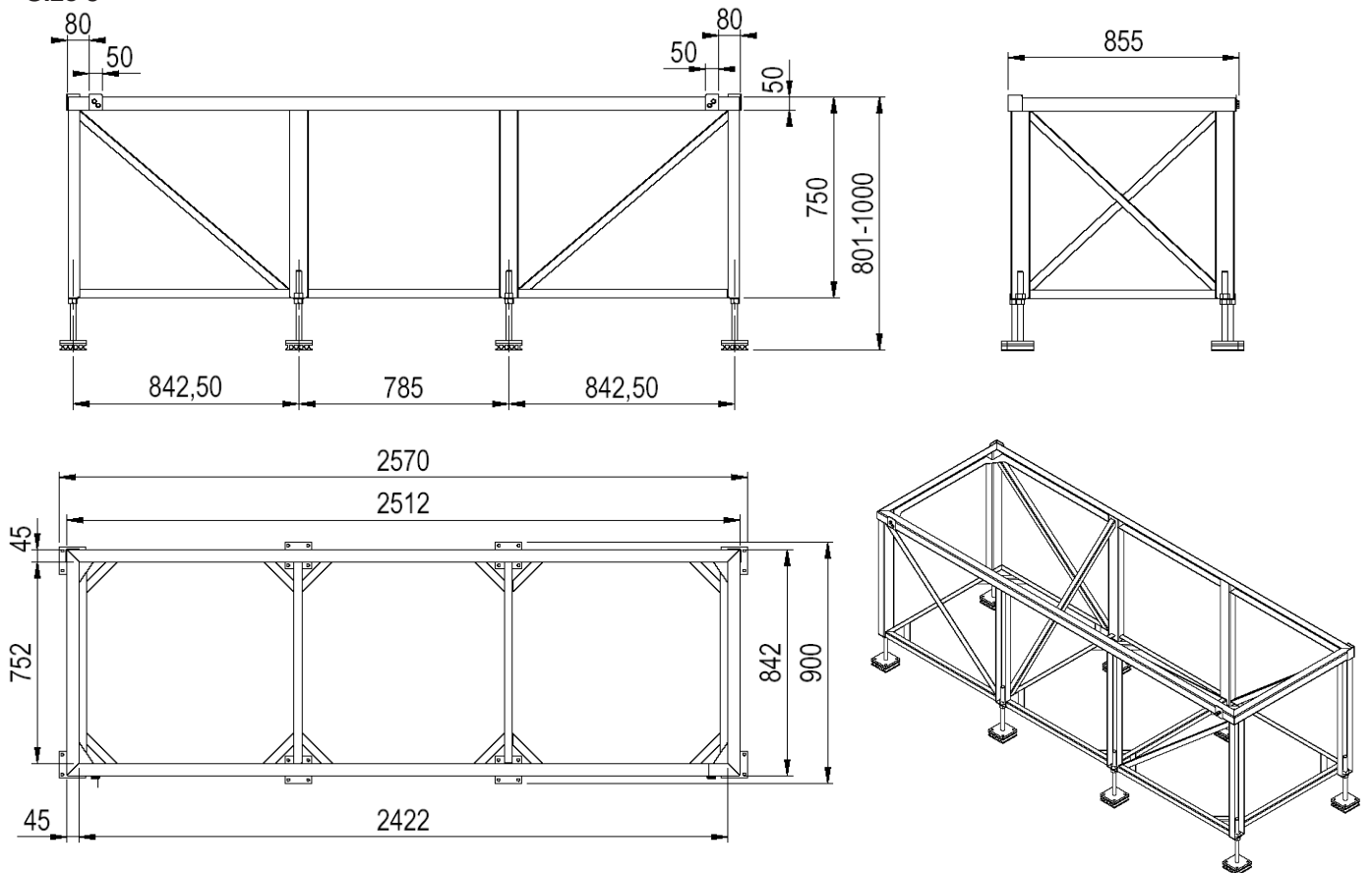
Side view same as for size 1



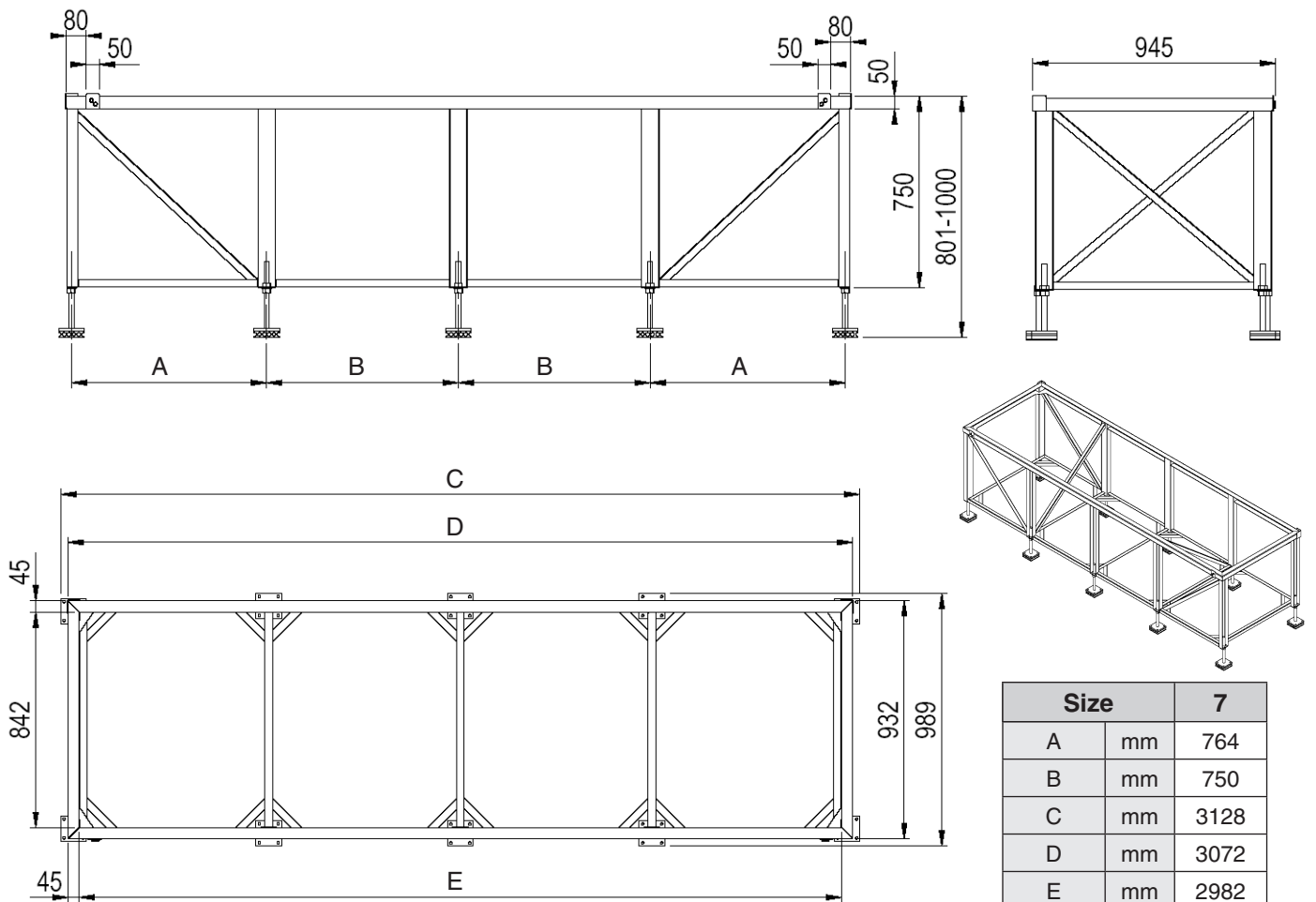
Size		2	3	4
A	mm	659	834	1059
B	mm	1418	1768	2218
C	mm	1362	1712	2162
D	mm	1272	1622	2072



### Size 5



### Size 7





## 12.5 Electrical Options

### 12.5.1 Three Phase Control

The phase monitoring relay monitors a phase failure and a phase reversal. Excess voltage, undervoltage and the phase imbalance are monitored in relation to the set values.

In case of a phase failure the phase monitoring relay is de-energized without delay and triggers an alarm. If the monitoring relay detects a wrong phase sequence during the A/C unit start, it is not energized and prevents the unit start. You can adjust a triggering delay on the relay for the errors excess voltage, undervoltage and phase imbalance (excess of the adjusted limit values).

#### Automatic restart

When the defective phase returns and if the voltage is within the limit values and the phase imbalance within the adjusted tolerance, the A/C unit is restarted automatically.

Herefor the parameter "Phase restart" must be set to "1", either in the menu "Config/Values/Misc." of the C7000AT or by the command "phase start 1".

Error	Adjustment range	Factory setting for supply voltage				
		460V	400V	380V	230V	200V
Excess voltage (upper limit value)	160 - 690V	490V	425V	404V	245V	212V
Undervoltage (lower limit value)	160 - 690V	430V	375V	356V	215V	188V
Phase imbalance	off, 5 - 20%	5%				
Triggering delay	0,1 - 20 s	3 s				

### 12.5.2 Second Power Supply

This option provides the connection of a second power supply. Both power supplies are switched on to the A/C unit. A contactor circuit ensures that the priority is set on power supply 1.

All three phases of both power supplies are checked constantly on undervoltage, phase failure, phase balance and correct rotation. In case of failure of supply 1 the unit is switched off. After a lapse of time which can be set at the time relay (preadjusted: 10 seconds) power supply 2 is switched onto the unit. The unit starts by the automatic restart which is integrated in the controller.

When the voltage of power supply returns, the unit is switched off again. On a second time relay a delay can be set (preadjusted: 10 seconds), after which power supply 1 is switched onto the unit. The unit starts by the automatic restart.

### 12.5.3 Compressor Softstart

This option consists of a softstart controller which is installed in the electrical cabinet and limits the current when the compressor starts. In units with two compressors each compressor needs a softstart controller.

The control characteristic of the softstart controller can be modified by 16 dip switches.

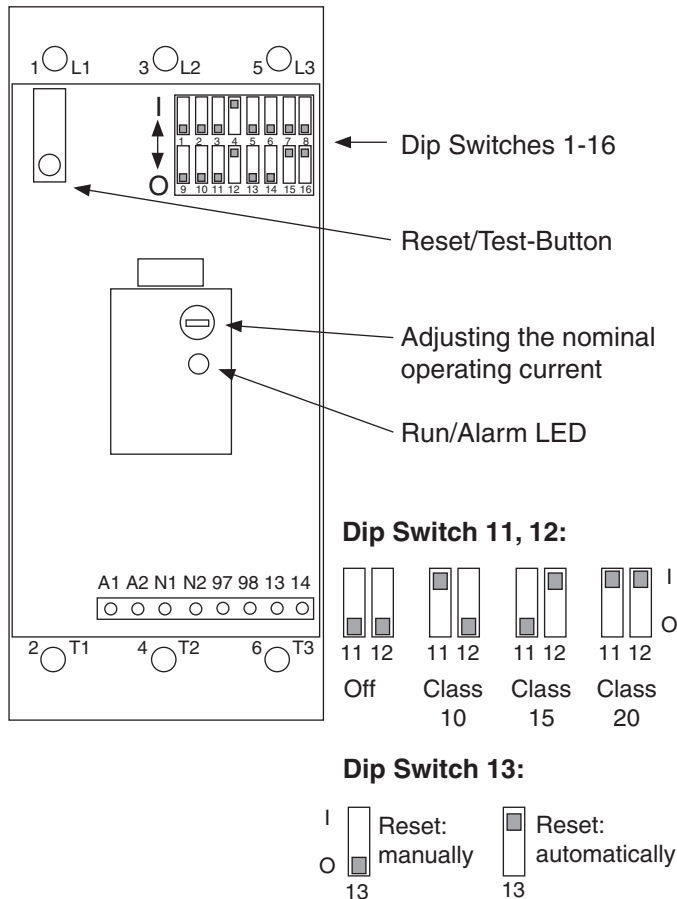
Moreover the softstart controller includes an overload protection and devices to monitor the thyristor temperature, the phase rotation, the existence of all phases, the phase balance and to check all thyristors and load connections for shorts.

When an alarm is detected according to the above mentioned criteria the alarm is indicated by a LED. The number of flashes indicates the cause of error.

Flashes	Error
1x	Overload
2x	Excess temperature
3x	Phase reversal
4x	Phase loss / open load
5x	Phase imbalance
6x	Shorted thyristor

## Adjusting the softstart controller

The softstart controller can be set as a current limitation or as softstart device. The factory setting is current limitation. In this function the softstart controller allows the current to exceed the nominal operating current for an adjustable time after the compressor start. In the softstart function the initial torque (by means of the voltage) at the compressor start is reduced to an adjustable value and will be increased to the nominal voltage within an adjustable time.



The nominal operating current (FLA) can be adjusted by the potentiometer as shown on the left.

The adjusted current is a reference not only for the above mentioned current limitation but also for releasing the overload protection.

If the current achieves 120% of the adjusted value the overload protection is activated and the voltage supply will be cut.

With selectable overload-trip-curves, which in case of exceeding the nominal operating current also takes into account the time of the exceeding, the trip behaviour can be chosen. The higher the trip class, the slower the tripping takes place.

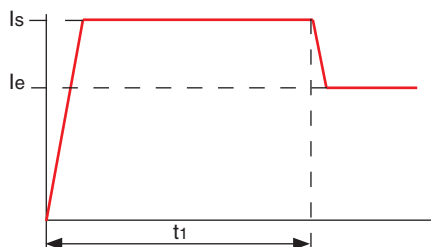
The trip class can be adjusted by the dip switches 11 and 12. Trip class 15 is factory set.

With dip switch 13 you can set, whether the alarm shall be reset manually by the reset button or automatically (when motor thermal model drops below 75% of motor thermal capacity). The manual reset is the factory setting.

With dip switch 3 you can set the principal function (Current limitation or soft start).

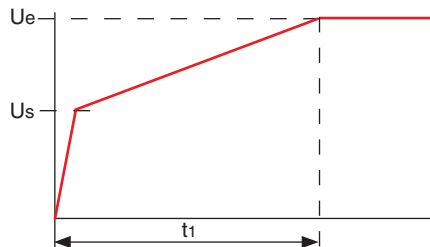
### Dip Switch 3:

☒ Current limitation  
(Factory setting)



$I_e$ : Nom. operating current (Potentiometer)  
 $I_s$ : Maximum current (Dip switch 4, 5)  
 $t_1$ : Start time (Dip switch 1, 2, 8)

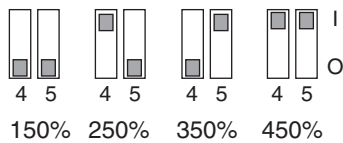
☐ Soft start



$U_e$ : Nominal voltage  
 $U_s$ : Initial voltage (Dip switch 4, 5)

**in case of function as current limitation:**

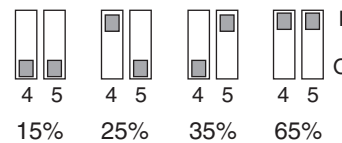
**Dip Switch 4, 5 (Is):**



The maximum current can be set as percentage to the nominal operating current.  
(Factory setting: 350%)

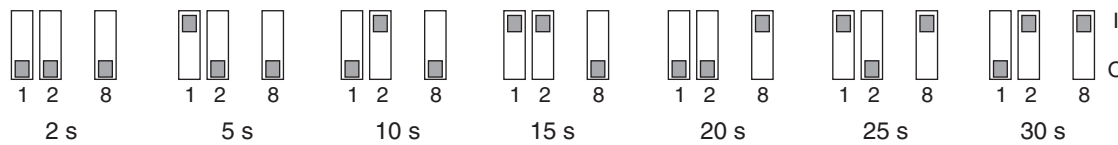
**in case of function as soft start:**

**Dip Switch 4, 5 (Us):**



The initial voltage can be set as percentage to the nominal voltage.

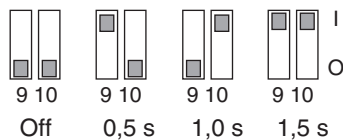
**Dip Switch 1, 2, 8 (t1):**



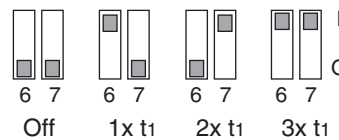
The start time can be set in seconds.  
(Factory setting: 2 sec.)

For the sake of completeness the possibility to adjust a kickstart and a soft stop must also be mentioned. However these functions are not used. In the factory setting both functions are disabled.

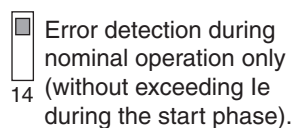
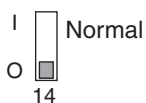
**Dip Switch 9, 10 (t2 for Kickstart):**



**Dip Switch 6, 7 (t3 Reduction time):**

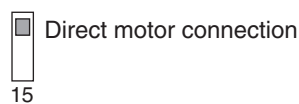
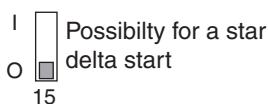


**Dip Switch 14:**



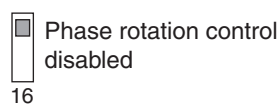
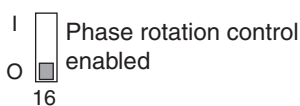
The soft start controller is checked for overload in position "Normal" (Factory setting) during the start sequence. If an error is detected it is sent to the C7000 controller and indicated there.

**Dip Switch 15:**



From the factory the dip switch 15 is set for a direct connection of the compressor motor.

**Dip Switch 16:**



With dip switch 16 you can disable the phase rotation control.

### 12.5.4 Manual override board

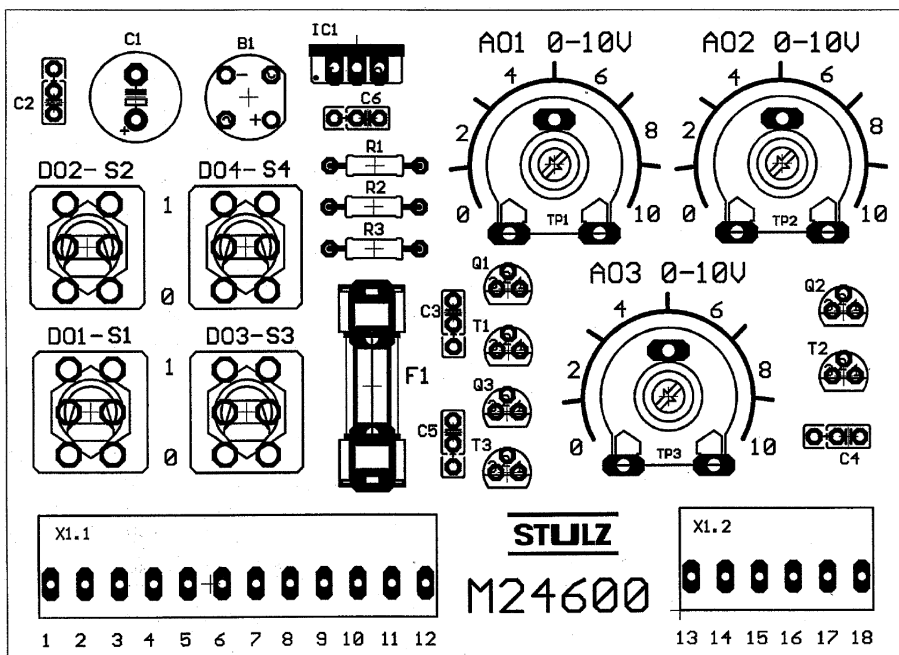
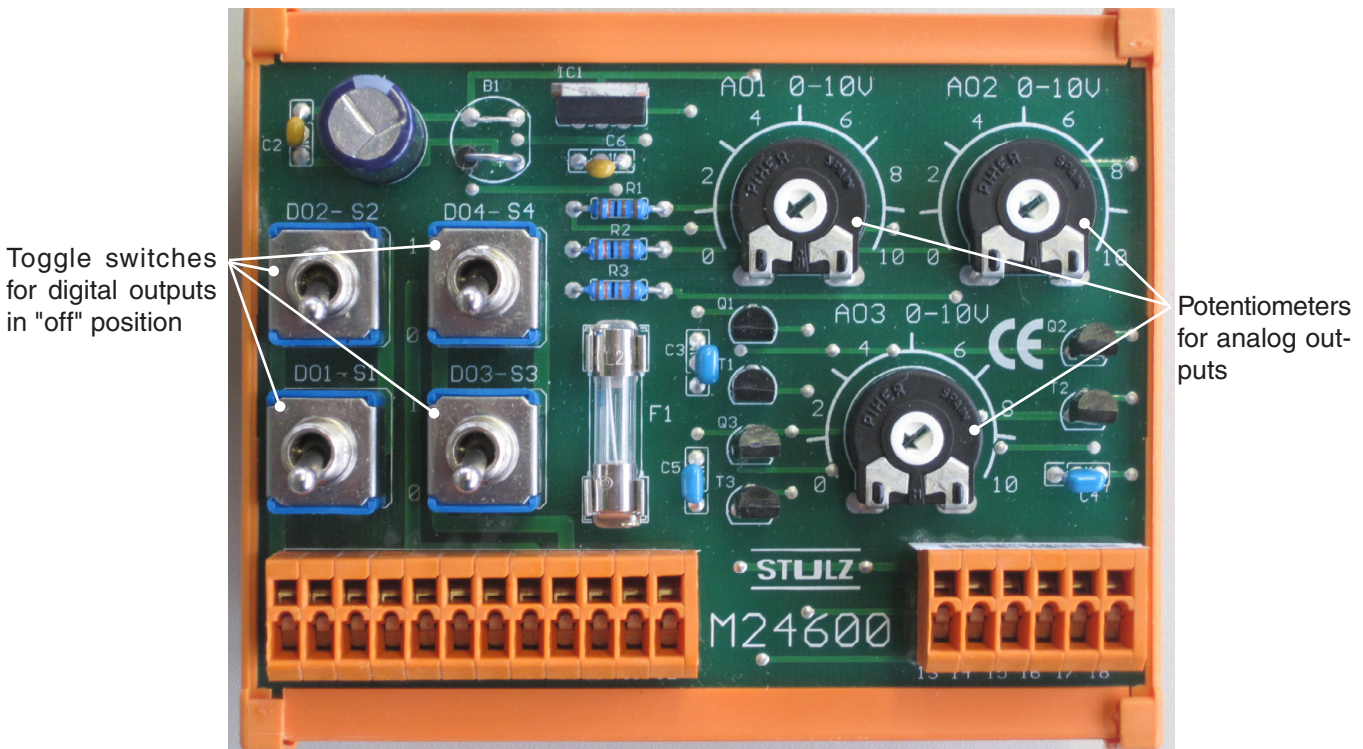
The manual override board is located in the E box and is used for the manual control of components in the event of a controller failure. With the help of this board, 4 digital outputs and 3 analog outputs can be operated manually. If the A/C unit is equipped with a damper, a timer in the E-box ensures the delayed start of the fans, after the damper is opened.

The image shows the board in the delivery condition, all toggle switches for the digital outputs are switched off. The assignment of the outputs can be set customer-specifically and is documented in the E-plan.

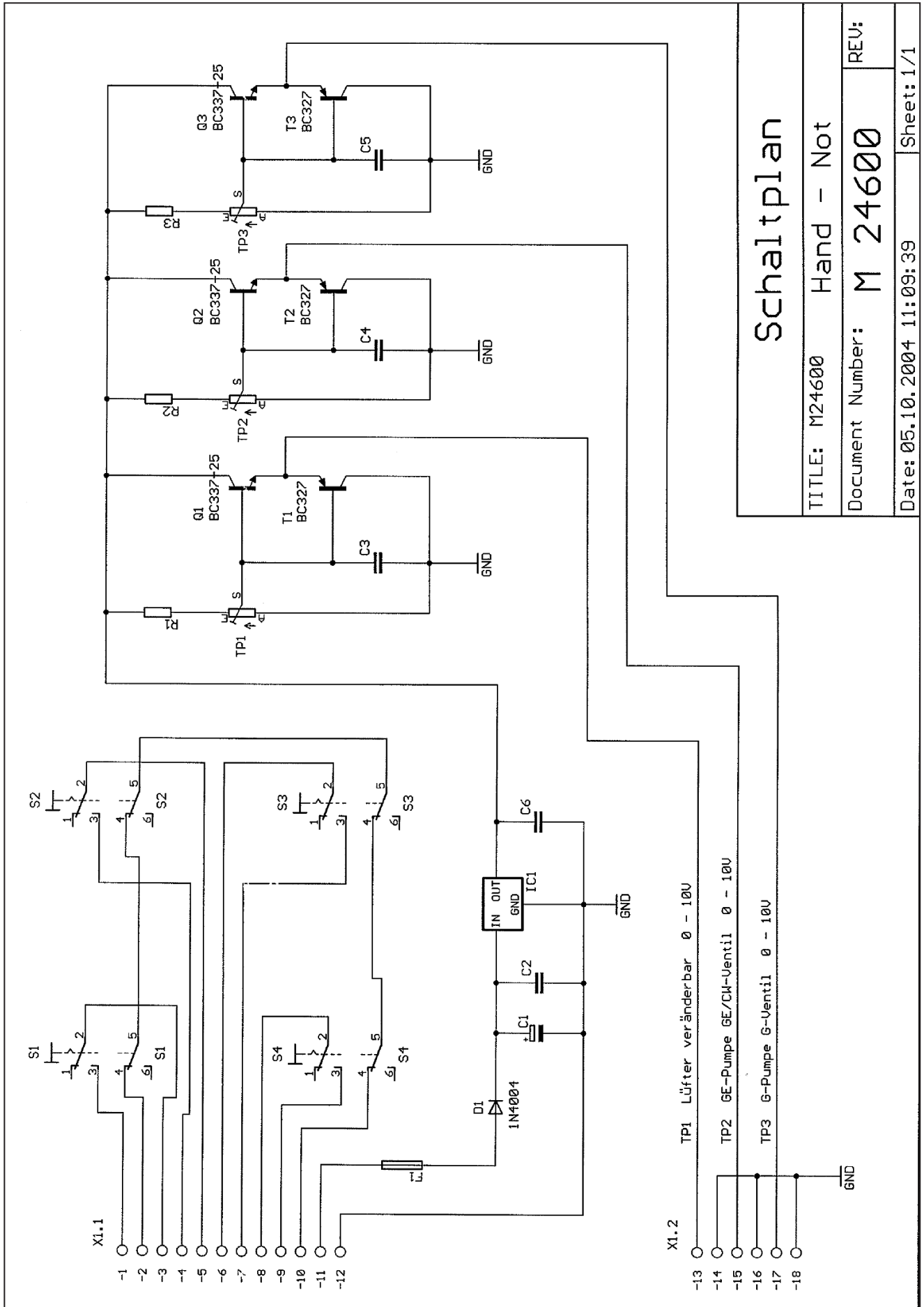


**The fan must run for 15 seconds, before the compressor may be switched on.**

As soon as the controller is ready for use again, you must end the manual control by setting all toggle switches into the "off" position.



## Wiring diagram of the circuit board





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