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Water chiller EB 210 – 260 – 310 – 360 - 410 - 440

Version 1.0, July 2019



EN

Operating and Maintenance Instructions

Chiller
Series EB 210 - EB 440

Versione 1.0, Giugno 2019

Preface

The skills and information provided in the ORIGINAL OPERATING MANUAL are required for assembly and safe operation of Pfannenberg chillers.

The information is presented in a brief, clearly arranged format. The chapters are numbered throughout.

Various unit types may be documented in this operating manual.

Pfannenberg chillers are subject to continuous improvement. Please understand that we must reserve the right to changes in design, equipment and technology. For this reason, no claims to specific features of the unit can be derived from the content of this operating manual.

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1. General

1.1 Scope

This documentation contains all the relevant information necessary for the installation, connection, commissioning and maintenance of the chiller.

Prior to any work on the chiller, careful reading and observance of this documentation is mandatory.



NOTICE

Hereby, the manufacturer declares that any form of liability will be refused if it can be attributed to improper use, unauthorized modifications or disregard of the instructions given in this manual.

The warranty expires as soon as one of the above conditions applies.

The customer / operator is obliged to provide this manual and all related documents to those responsible for installation, operation, maintenance and repair.

1.2 The chiller

The chiller is a cooling unit that extracts heat from a liquid by means of a vapor compression refrigeration cycle.

The cooled liquid is referred to as a coolant and is used for heat removal of liquid-cooled components.

The heat absorbed by the customer application of the components is discharged to the environment on the warm side of the refrigeration cycle.

The chillers described in this manual are intended to cool water or mixtures of water and glycol, generally used as coolant in machines or production processes.

1.3 Proper/Improper operation

The specified application and storage limits must not be exceeded or fallen below.

Information on this can be found on the rating plate and in the Technical data.

Improper operation

Installation / operation:

on moving units

in areas with high heat radiation

in areas with strong magnetic fields

in areas with open flames

in potentially explosive atmospheres

near flammable products

in areas with a salty atmosphere

in areas with an aggressive atmosphere

in excessively dusty areas

1.4 Symbols in use

Safety instructions and markings



DANGER

Identifies an exceptionally hazardous situation. Severe, irreversible injuries or death will occur if this notice is not observed



DANGER

Identifies an exceptionally hazardous situation in connection with electrical voltage. Severe, irreversible injuries or death will occur if this notice is not observed



WARNING

Identifies an exceptionally hazardous situation. Severe, irreversible or deadly injuries could occur if this notice is not observed.



CAUTION

Identifies a hazardous situation. Minor or moderate injuries could occur if this notice is not observed.



NOTICE

Notice is used to address practices not related to physical injury.

☒ Before explanations

* Legend notice

⇒ *Placed before results of actions*

2. Safety

The chiller instructions must be read by the installer and personnel in charge for operation, before starting the chiller.

All safety and security instructions given in this manual must be observed!

Only qualified personnel are allowed to install, operate and do the maintenance work.

Non-observance of the instructions may cause injuries and will cancel the manufacturer's liability for subsequent damage.

National regulations on accident prevention, regulations of the local power supply authorities as well as any specific safety instructions for chiller must be observed.

The safety of the unit is only guaranteed, if it is used as intended.

The following points must be observed before commissioning and while operating the chiller:

Familiarize yourself with all operating controls.

Make sure that all working limits indicated within unit label are observed.

Use protective devices to check electrical insulation. Do not carry out any work on any part of the equipment that are live with wet clothing, hands and feet.

Never spill or pour any cooling medium into the environment as this may cause health hazard.

The components of the chiller must not be modified in any way.

Disconnect the power supply and release pressure from any pressurized component before carrying out any service work on the Chiller.

A qualified commissioning engineer must ensure that the chiller has been connected to the electrical mains in accordance with the standard EN 60204 and all other applicable national regulations.

It is also mandatory to comply with Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on certain fluorinated greenhouse gases.

The above mentioned Regulation lays down specific measures and restrictions to be considered while commissioning, operating, maintaining and disposing any equipment containing greenhouse gases, such as HFCs, as specified in Annex I. It also specifies mandatory leakage-check frequency to be performed by certified personnel and mandatory records providing the evidence of exact fluorinated gas charge and subsequent added and/or recovered quantities (e.g. Article 3).



CAUTION

Compliance with legal requirements

In accordance to the F-GAS regulation (EU) No 517/2014, every year the operator (the owner of the equipment) is responsible to ensure a gas leakage test, the recording of the gas quantity change inside the unit and the communication to the responsible agency of the state in the European community where the unit is in operation.

If you need any consultancy in terms of a maintenance and leakage check according (EU) No. 517/2014 please contact our Pfannenberger Service Team (see chapter [Contact](#)).



WARNING

Spare parts from third-party manufacturers can damage the unit

Only original parts are subject to the manufacturer's quality control.







Only use specially agreed harmonized manufacturer parts for safe and reliable operation.

- For Pfannenberger spare part numbers, see supplied document [Spare part list](#) (part of the delivery)

If you have questions about spare parts, please contact our Pfannenberger Service Team (see chapter [Contact](#)).

2.1 Safety instructions for the operator and personnel

For Health and Safety reasons, please find below a list of potential risks that the operator is exposed to while commissioning and/or operating and/or dismantling the unit:

	<p>CAUTION</p> <p>Sharp edges Heat exchanger fins and internal metal plates live edges have sharp edges. Avoid contact or wear safety equipment such as gloves and protective clothes.</p>
	<p>CAUTION</p> <p>Hot surface To avoid possible skin burns, do not touch parts such as electric motor body of pump or compressor and refrigeration copper pipes. Wear safety equipment such as gloves and protective clothes.</p>
	<p>CAUTION</p> <p>Pressurized device Refrigerant under pressure within refrigeration circuit (PS indicated on chiller data label). Always verify functionality of High Pressure Switch. Release pressure before maintaining or servicing the refrigeration circuit. Due to toxicity of refrigerant and oil still inside circuit, it is recommended to use suitable gloves and mask while servicing refrigerant equipment.</p>
	<p>CAUTION</p> <p>Pressurized device Cooling water/glycol mixture under pressure within hydraulic circuits (max pressure indicated on chiller data label). Release pressure (use purge system and refill ball valve) before sectioning, maintaining or servicing the hydraulic equipment. Due to toxicity of refrigerant and oil still inside circuit, it is recommended to use suitable gloves and mask while servicing refrigerant equipment.</p>
	<p>DANGER</p> <p>Electrical shock hazard Always unplug or disconnect power supply before opening the unit. Post a 'MAINTENANCE WORK IN PROGRESS' sign on a visible position next to the main switch during service.</p>
	<p>WARNING</p> <p>Rotating fan blades Can cause serious injury or cut. Keep hands clear. Always disconnect power supply and make sure all mechanical equipment is stopped before service.</p>

**DANGER****Toxic hazard**

Toxicity of refrigerant and cooling liquid.

Avoid contact, inhalation or swallowing.

It is recommended to use suitable protection equipment (such as gloves, glasses, mask)

**NOTICE**

For environmental reasons never discharge refrigerant into atmosphere (follow local regulations to properly dispose of refrigerant). It is recommended to familiarize with all technical documentation provided with the unit (such as **Controller manual**, **Hydraulic & Electric diagrams**) to avoid improper operation of this unit.

2.2 Safety instructions for auxiliary and operating materials**2.2.1 Glycol**

Get familiar with the MSDS of the glycol in use and follow all relevant safety instruction.

2.3 Residual risk

There are some residual risks after the installation of the unit that must be considered:

Residual risks according to 2006/42/CE Directive:

The condenser has fins on his external surface, so there is the possibility for the operator to touch sharp edges during service of the unit.

Although the unit is designed with all the possible safety requirements, in case of external fire there is the possibility that the internal pressure and temperature of the unit will increase in a dangerous and uncontrollable way; in that case use the extinguishing tools suitable for that conditions.

Safety valve should be maintained according to the maintenance instruction (see chapter **Maintenance**) to avoid malfunctions in case of necessity (e.g. in case of external fire the pressure of the refrigerant circuit could rise to a critical value).

For units without emergency switch-disconnector: chiller user must install the emergency switch-disconnector installation close to the chiller, in an accessible and clearly visible place, to allow emergency stop of the unit and safety for the operator.

Even if the instructions contained in this manual are enough explanatory for safety, high pressure switches are mounted, to guarantee intervention in case of wrong filing, or in case of malfunction due to not controlled increase of pressure and temperature.

Even if in this manual is clearly indicated to switch off the unit before doing any maintenance or control operation, protection elements of the unit, as fixed panels, are not provided with safety devices that block the operation of the unit if they are not mounted, in that case the operator could be exposed to contact with internal rotating parts.

In case of damage of fans protection grids, possible risk for the rotating part should be considered by the utilizer; in this situation the unit should be immediately switched off and repaired.

Residual risks according to 2014/68/UE Directive:

Although the unit is designed with all the possible safety requirements, in case of external fire there is the possibility that the internal pressure and temperature of the unit will increase in a dangerous and uncontrollable way; in that case use the extinguishing tools suitable for that conditions.

For the series production of the standard units of category I, the pressure resistance test (typically the hydrostatic pressure test) is made on a statistic base, not on all units.

This can be accepted, also considering all the safety devices mounted on the units.

For units without emergency switch-disconnector: chiller user must install the emergency switch-disconnector installation close to the chiller, in an accessible and clearly visible place, to allow emergency stop of the unit and safety for the operator.

Even if the instructions contained in this manual are enough explanatory for safety, high pressure switches/safety valves are mounted, to guarantee intervention in case of wrong filing, or in case of malfunction due to not controlled increase of pressure and temperature.

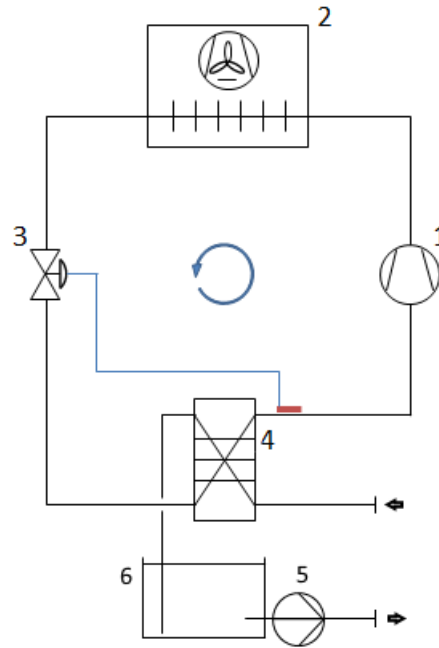
3. Description of the chiller

Pfannenberg chillers are intended to cool down liquid for industrial applications. The frigorific circuit removes the heat from the water and rejects the condensing power to the ambient through the air ventilation circuit. The unit is complete of a hydraulic circuit with pump and atmospheric tank to pump the cold water to the user's device and back to the cooling circuit.

3.1 Design Concept

The chiller is a cooling unit that extracts heat from a liquid by means of a vapor compression refrigeration cycle.

3.2 Functional Diagram



Main components:

- | | |
|---|-------------------------------|
| 1 | Compressor |
| 2 | Air cooled condenser with fan |
| 3 | Expansion valve |
| 4 | Evaporator |
| 5 | Pump |
| 6 | Tank |

Refrigerant circuit

The compressor (1) compresses the refrigerant under high pressure. The temperature increases. This heat is released to the ambient air in the condenser (2). The refrigerant liquefies. The condenser fan draws ambient air through the condenser (2) and releases it to the environment. A pressure drop occurs when the refrigerant passes through the expansion valve (3). Inside the evaporator (4), the refrigerant absorbs heat from the coolant and evaporates.

Hydraulic circuit

The pump (5) supplies chilled coolant to liquid cooled components on the customer application. The coolant absorbs heat and runs back into the chiller. While passing the evaporator, the coolant dissipates heat to the refrigerant. The chilled coolant runs back into the tank where the hydraulic circulation starts again.

3.3 The Chiller: Overview

3.3.1 Refrigeration circuit – main components

Compressor

The choice of the compressor used depends on the cooling capacity of the chiller. Depending on the capacity, reciprocating, rotary or scroll compressors are used. Each compressor is equipped with a thermal overload protection.

Condenser

As a heat exchanger so-called Microchannel condenser are used, which consist of aluminum tubes and aluminum fins.



NOTICE

The chiller is not intended to be installed or operated in an aggressive atmosphere, as this may damage the condenser.

Fan

The fan is mounted on the top of the chiller and blows warm air upwards into the environment. A protective grid prevents direct contact with any rotating parts.

Expansion valve

The valve is responsible for the optimum refrigerant charge of the evaporator and is factory set for each unit. A change in the setting is only to be carried out by appropriate specialist personnel.

Evaporator

The evaporator used is a plate heat exchanger. This ensures the heat exchange between the coolant and the refrigerant and consists of copper-brazed stainless steel plates.

3.3.2 Hydraulic circuit – main components

Pump

As standard, peripheral pumps are used which have different delivery rates depending on the device performance. The flow rate is always assigned to a specific pressure which is directly dependent on the design of the pump used and thus on the characteristic curve.

The information on the pump output always considers the internal pressure losses of the chiller. In addition to the standard pump, more powerful pumps are available for higher pressure losses.

Tank

All chillers are equipped with a plastic tank. This serves as a buffer for the cool brine to always provide enough liquid ready and reduces the number of ON-OFF cycles of the compressor.

The tank size is matched to the device performance.

3.3.3 Safety and protection devices

Refrigerant circuit

High pressure switch

To avoid excessive pressure of the refrigeration system, the high-pressure switch switches off the compressor and the condenser fan and triggers a common alarm message.

After checking the cooling circuit, it must be reset manually by pressing the appropriate button on the machine display.

Antifreeze protection

The antifreeze protection device prevents the evaporator from freezing.

It verifies that the temperature of the coolant in the evaporator does not reach critical values and switches off the refrigerant circuit when a preset minimum temperature value is reached. At the same time, a common alarm message is triggered.

Refrigerant filter/dryer

To prevent a malfunction of the refrigerant circuit, a filter dryer is installed which binds dirt particles and moisture.

3.3.4 Main switch

The main switch (on the front panel) serves as a safety device to disconnect the chiller from the power supply.

3.3.5 Control unit / Display

The built-in controller takes over all relevant functions to ensure the operation of the chiller.

These include the function of the cooling circuit, the function of the hydraulic circuit and the transmission of error messages.

Depending on the device configuration, the controller may differ in design and functionality.

A detailed description of the function and parameterization can be found in a separate document available online using the machine's serial number or model.

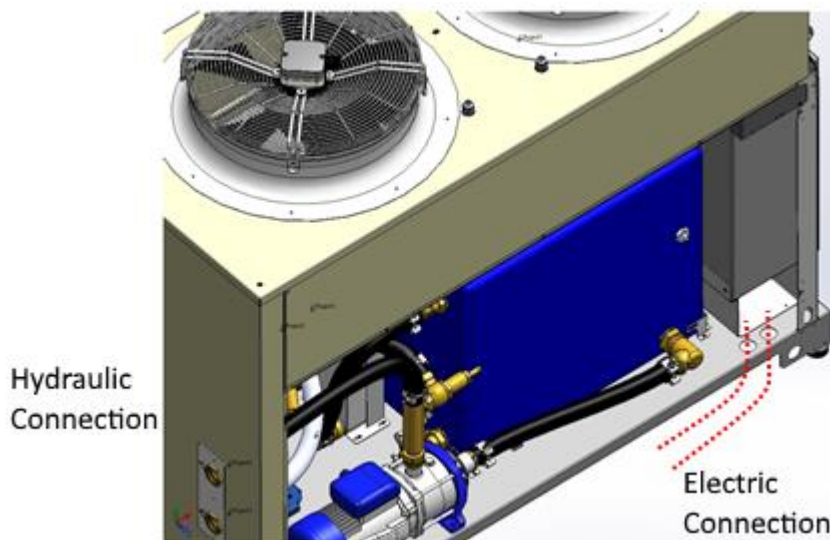
3.3.6 Connections

Electric connection

The electrical panel is equipped with a cable gland for the input of the power cables and a multiple cable gland for any other wiring, such as signals and alarms. Cable entry is provided on the side of the machine, in correspondence with the front area where the electrical panel is located. Removing the side panel makes it easy to route the cables inside the unit and then enter the electrical panel.

Hydraulic connection

The hydraulic connections are located on the back of the unit. These are not flat sealing and must therefore be sealed during commissioning. The size depends on the chiller type.



3.4 Electrical and mechanical components

Refrigeration and hydraulic circuits are accessible by removing the two lateral panels.

<p>Compressor</p> 	<p>Condenser</p> 	<p>Dehydrator Filter</p> 
<p>Sight glass</p> 	<p>High pressure switch</p> 	<p>Low pressure switch</p> 
<p>Thermostatic Valve and Evaporator</p> 	<p>Fan</p> 	<p>Pump</p> 

4. Technical data

4.1 Application limits

4.1.1 Ambient temperature limitation

Chiller is designed to operate in the ambient temperature range indicated on the type label. When ambient temperatures are out of that range, manufacturer must be consulted.

4.1.2 Voltage limitations

According to CEI EN 60204-1, Pfannenberg standard chiller operation is guaranteed within these ranges:

Nominal voltage $\pm 10\%$ [V]

Nominal frequency $\pm 1\%$ [Hz]

Please refer to the type label to see the nominal operating conditions of the unit.

Nominal conditions	V min [V]	V max [V]	f min [Hz]	f max [Hz]
230 V / 1 ~ / 50 Hz	207	253	49.5	50.5
230 V / 1 ~ / 60 Hz	207	253	59.4	60.6
400 V / 3 ~ / 50 Hz	360	440	49.5	50.5
460 V / 3 ~ / 60 Hz	414	506	59.4	60.6



NOTICE

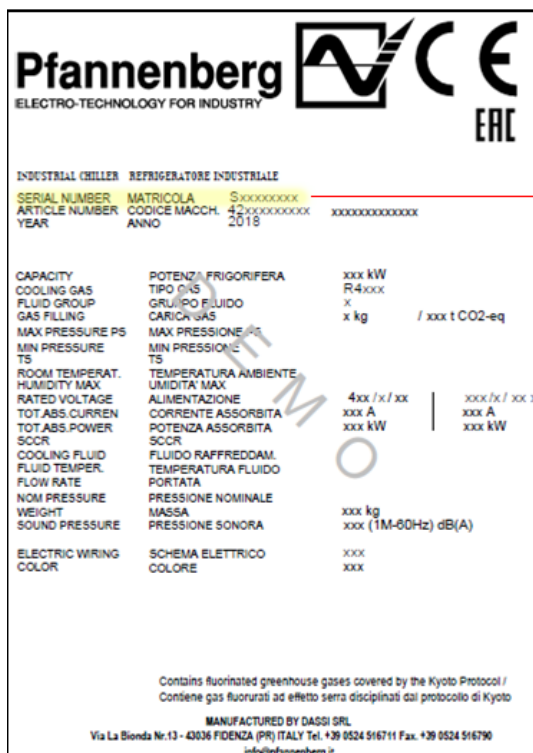
Special voltage

For units with special voltages please refer to the type label.

4.2 Type label

This is an example of a type label.

Important is the information of the chiller serial number, which is needed for all technical questions.



SERIAL NUMBER MATRICOLA Sxxxxxxx

4.3 Technical data sheet (short form)

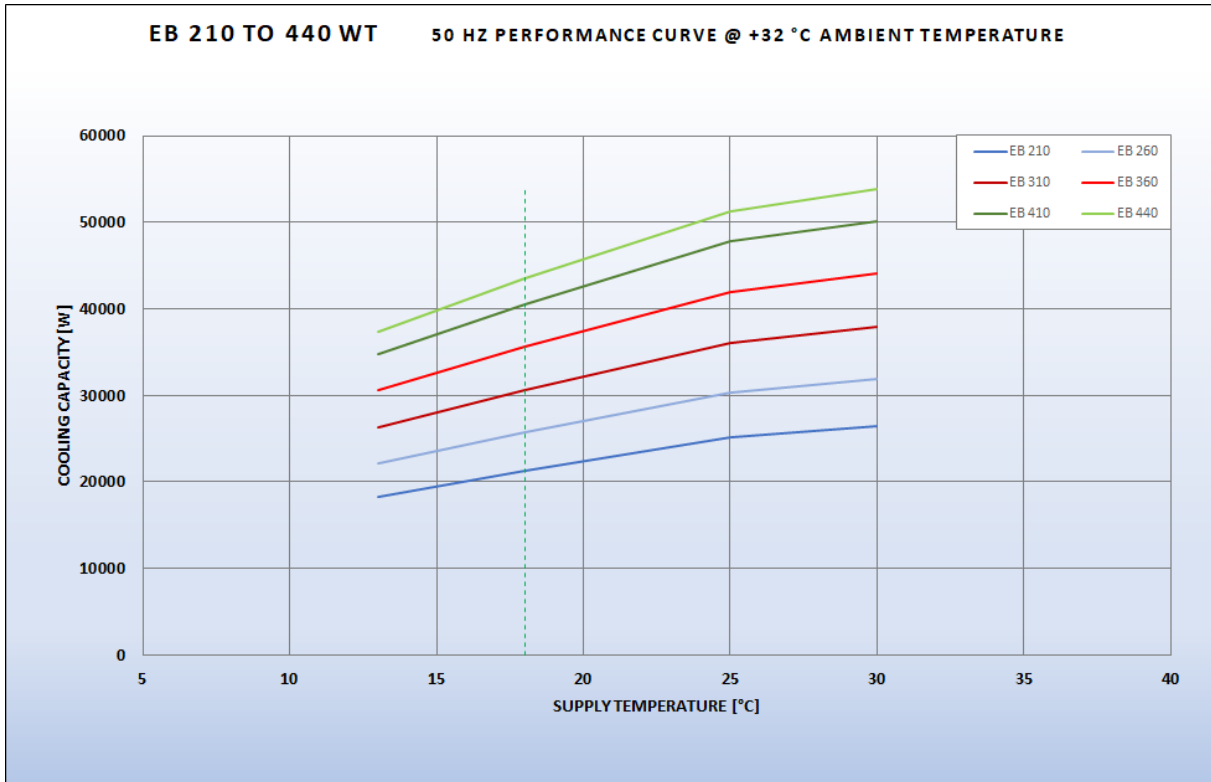
	EB 210 WT B	EB 260 WT B	Unit
Rated voltage	400 / 3 / 50 460 / 3 / 60	400 / 3 / 50 460 / 3 / 60	V / ~ / Hz
Cooling capacity (with pump) ⁽¹⁾	21.3 / 23.4	25.7 / 28.5	kW
Flow rate (pump)	54 / 64	70 / 84	l/min
Pump pressure	2.5	2.5	bar
Ambient temperature	+15 ... +45	+15 ... +43	°C
Target value tolerance	±2	±2	K
Refrigerant	R407C	R407C	
Max power consumption	9.9 / 12.6	12.1 / 14.2	kW
Max current consumption	20 / 22	22 / 22.5	A
Starting current	72.8 / 80.5	89.9 / 89.7	A
Control voltage	24 AC	24 AC	V
Airflow external	7,000	7,000	m ³ /h
Tank volume	80	80	l
Connections (medium)	1 ¼"	1 ¼"	BSP
Sound pressure 1m @ 50 Hz (EN ISO 3741)	64	70	dB(A)
Weight (without packaging)	389	403	kg
E-box degree of protection EN 60529	IP54	IP54	
Colour	RAL7035	RAL7035	

	EB 310 WT B	EB 360 WT B	Unit
Rated voltage	400 / 3 / 50 460 / 3 / 60	400 / 3 / 50 460 / 3 / 60	V / ~ / Hz
Cooling capacity (with pump) ⁽¹⁾	30.6 / 36.7	35.6 / 42.7	kW
Flow rate (pump)	82 / 98	90 / 107	l/min
Pump pressure	2.5	2.5	bar
Ambient temperature	+15 ... +45	+15 ... +45	°C
Target value tolerance	±2	±2	K
Refrigerant	R407C	R407C	
Max power consumption	17.4 / 22.2	17.9 / 20.6	kW
Max current consumption	31 / 33	30 / 31	A
Starting current	126.7 / 132	122.6 / 125.7	A
Control voltage	24 AC	24 AC	V
Airflow external	12,000	12,000	m ³ /h
Tank volume	200	200	l
Connections (medium)	1 ½"	1 ½"	BSP
Sound pressure 1m @ 50 Hz (EN ISO 3741)	71	72	dB(A)
Weight (without packaging)	434	448	kg
E-box degree of protection EN 60529	IP54	IP54	
Colour	RAL7035	RAL7035	

	EB 410 WT B	EB 440 WT B	Unit
Rated voltage	400 / 3 / 50 460 / 3 / 60	400 / 3 / 50 460 / 3 / 60	V / ~ / Hz
Cooling capacity (with pump) ⁽¹⁾	40.5 / 48.5	43.5 / 52.2	kW
Flow rate (pump)	105 / 125	101 / 125	l/min
Pump pressure	2.5	2.5	bar
Ambient temperature	+15 ... +43	+15 ... +43	°C
Target value tolerance	±2	±2	K
Refrigerant	R407C	R407C	
Max power consumption	18.1 / 21.8	19.1 / 23	kW
Max current consumption	31.5 / 33	34.5 / 35	A
Starting current	131.1 / 134.5	142.9 / 146.6	A
Control voltage	24 AC	24 AC	V
Airflow external	12,000	12,000	m³/h
Tank volume	200	200	l
Connections (medium)	1 ½"	1 ½"	BSP
Sound pressure 1m @ 50 Hz (EN ISO 3741)	72	74	dB(A)
Weight (without packaging)	476	500	kg
E-box degree of protection EN 60529	IP54	IP54	
Colour	RAL7035	RAL7035	

4.4 Cooling performance curve

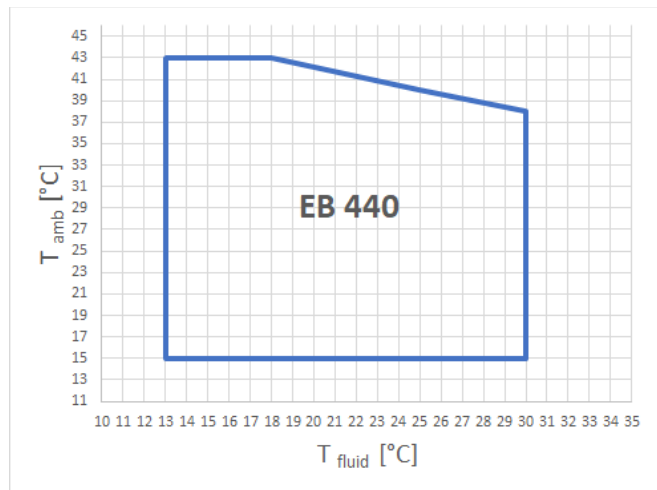
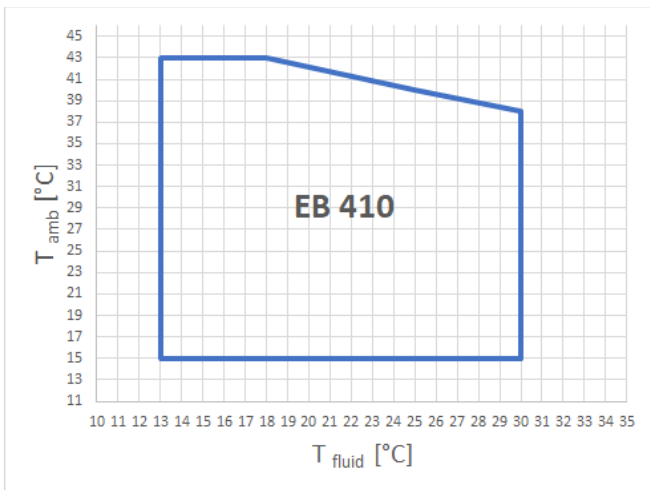
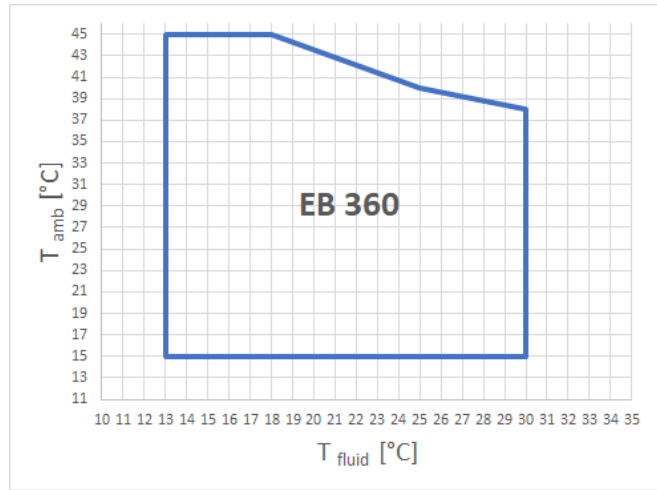
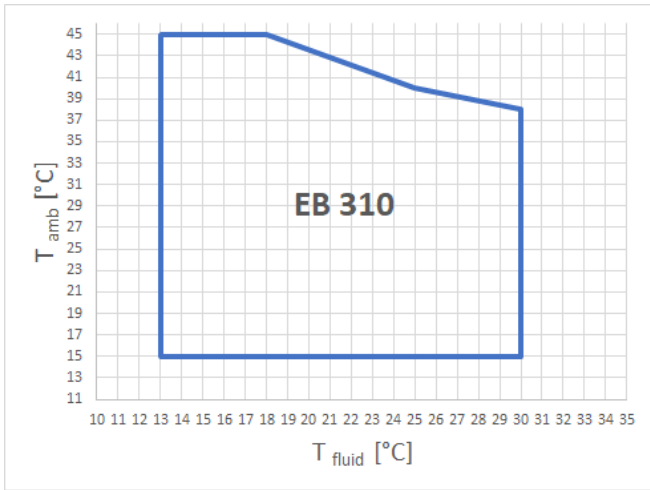
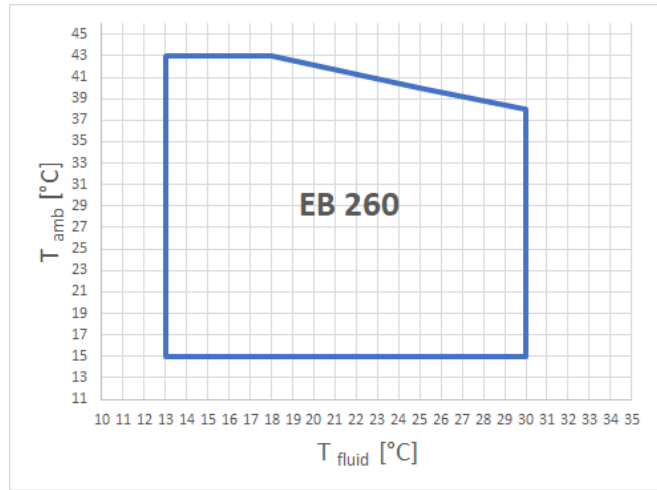
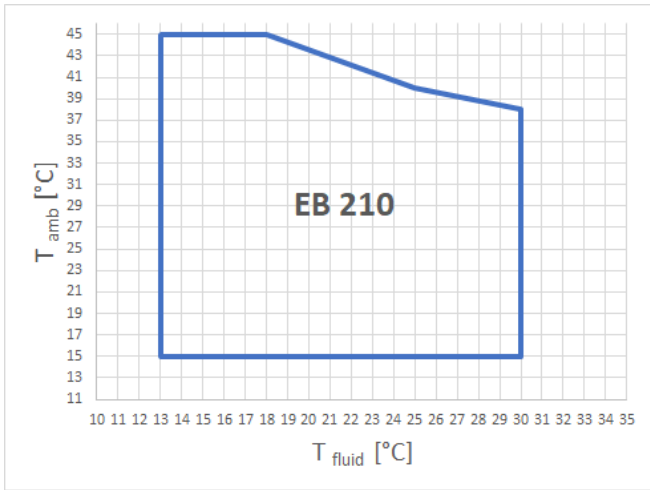
4.4.1 EB 210 to 440



4.4.2 Correction factors

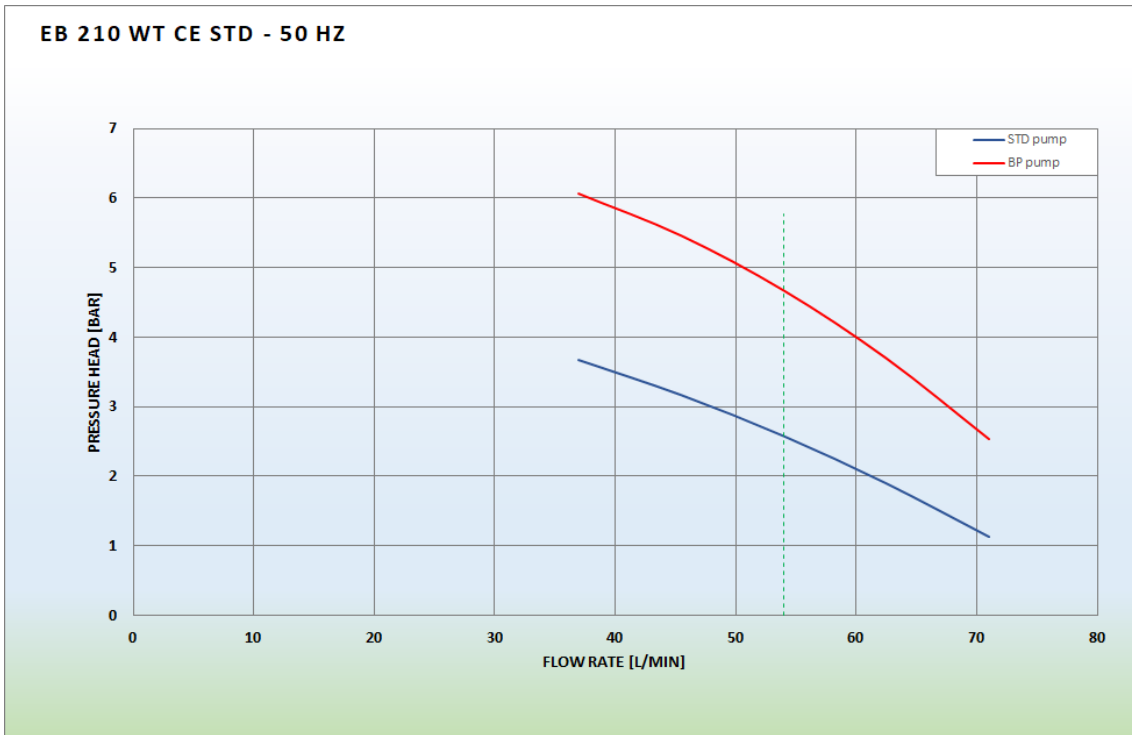
	Ambient air temperature [°C]							
	15	20	25	30	32	35	40	45
Cooling capacity	1.095	1.09	1.08	1.03	1	0.95	0.87	0.79
	Ethylene glycol [%]			Propylene glycol [%]				
	20	30	50	20	30	50		
Cooling capacity	0.99	0.98	0.96	0.99	0.98	0.96		

4.4.3 Chiller envelope

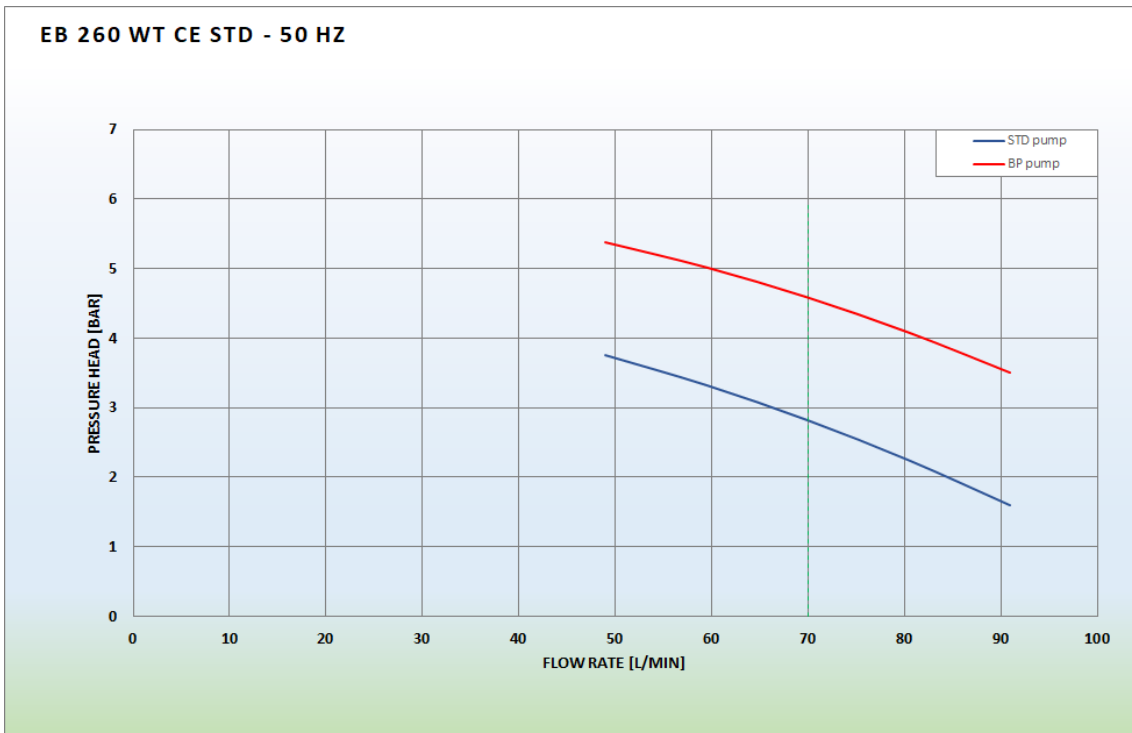


4.5 Pump performance curve

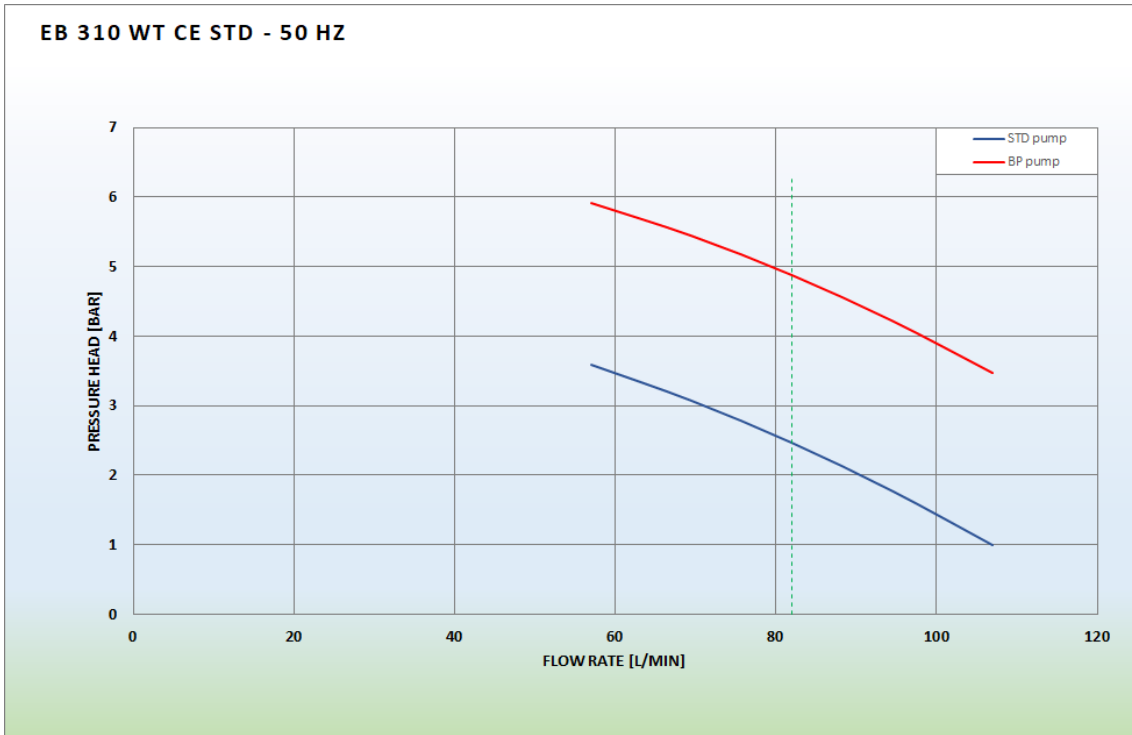
4.5.1 EB 210



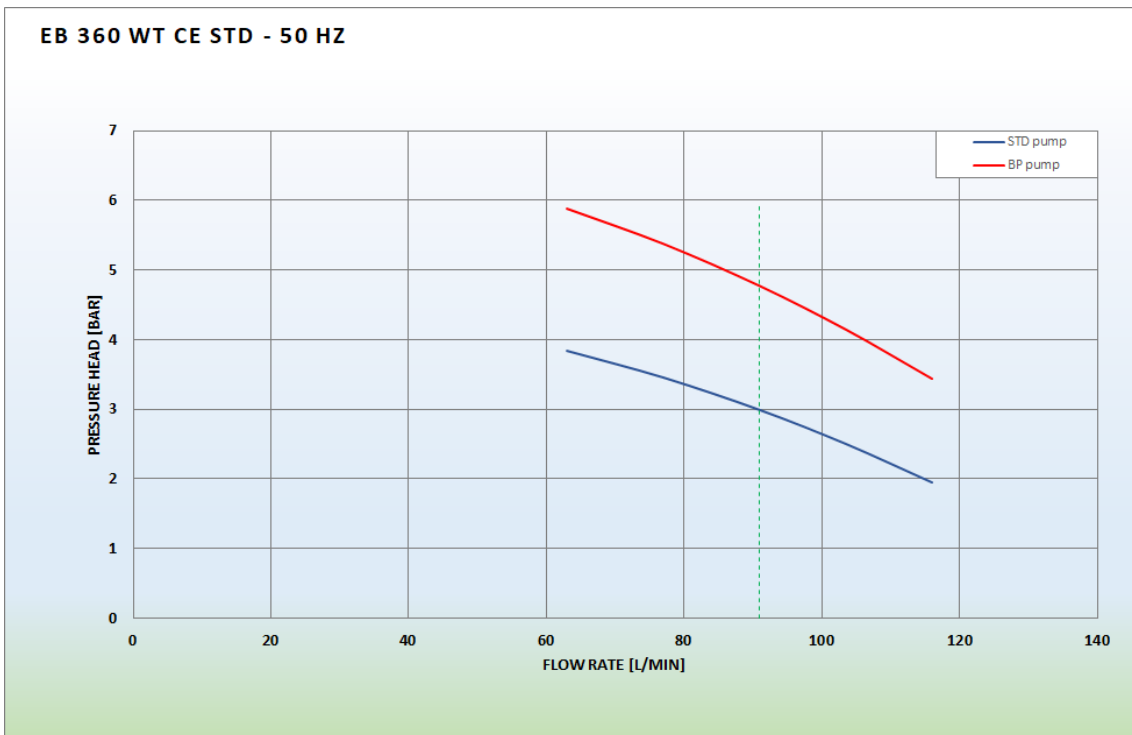
4.5.2 EB 260



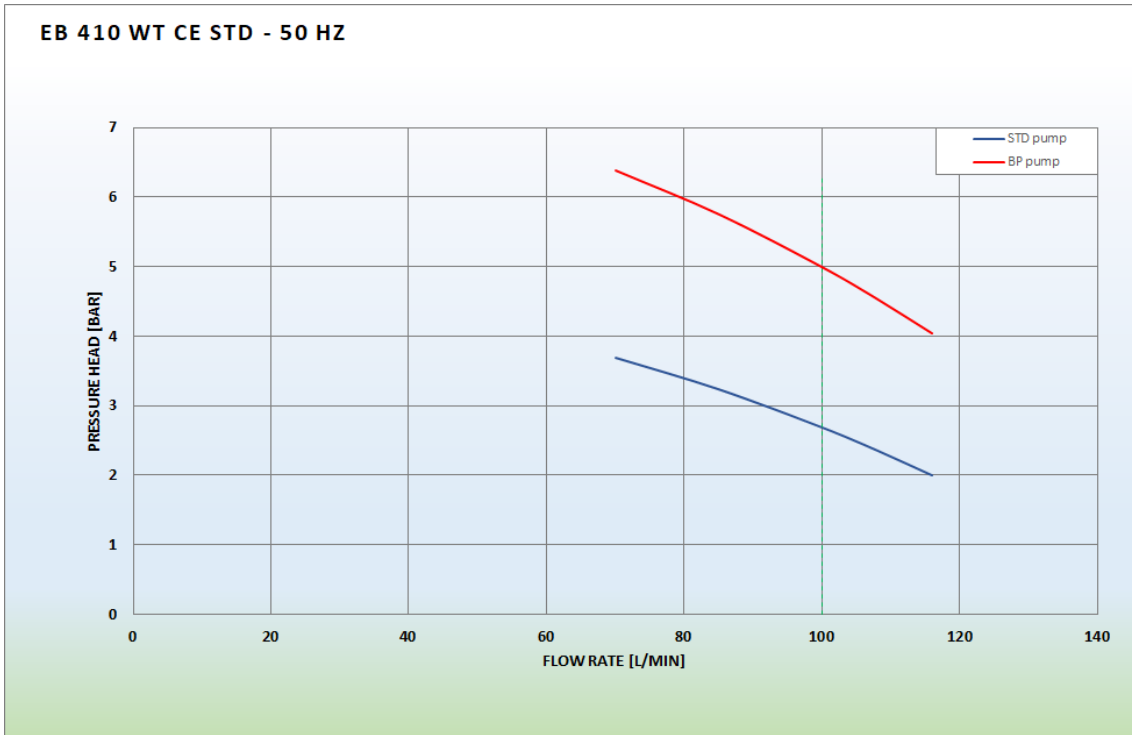
4.5.3 EB 310



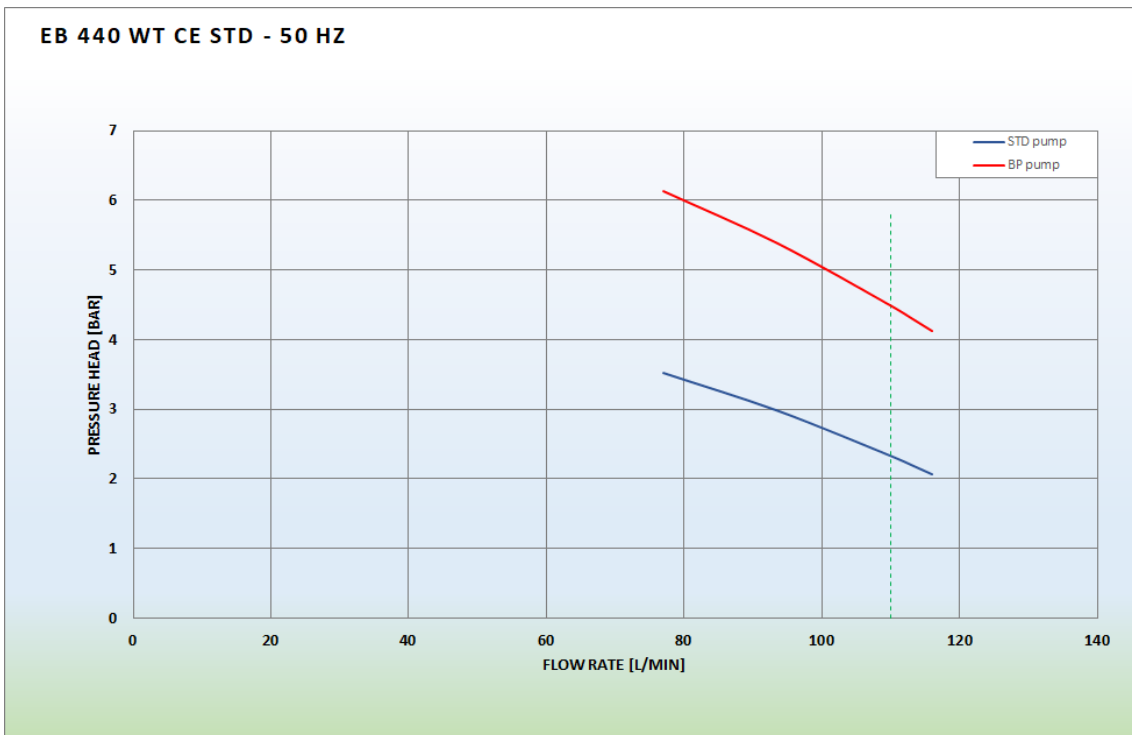
4.5.4 EB 360



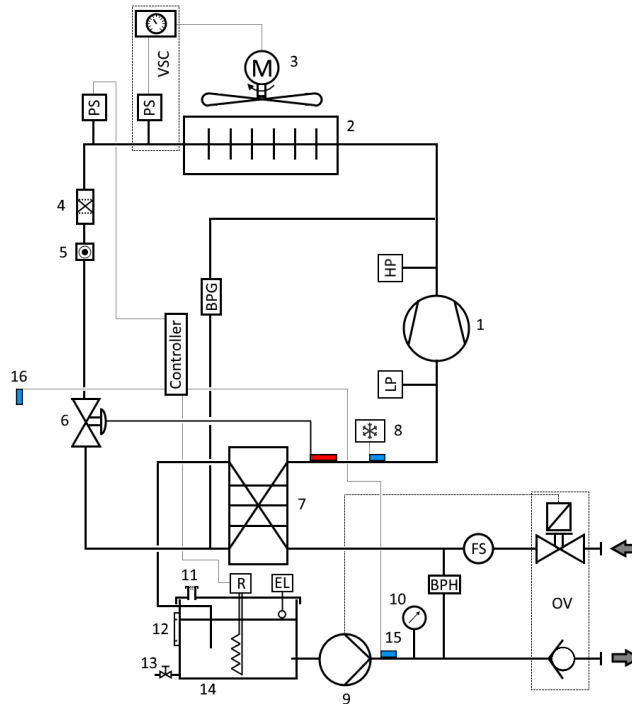
4.5.5 EB 410



4.5.6 EB 440



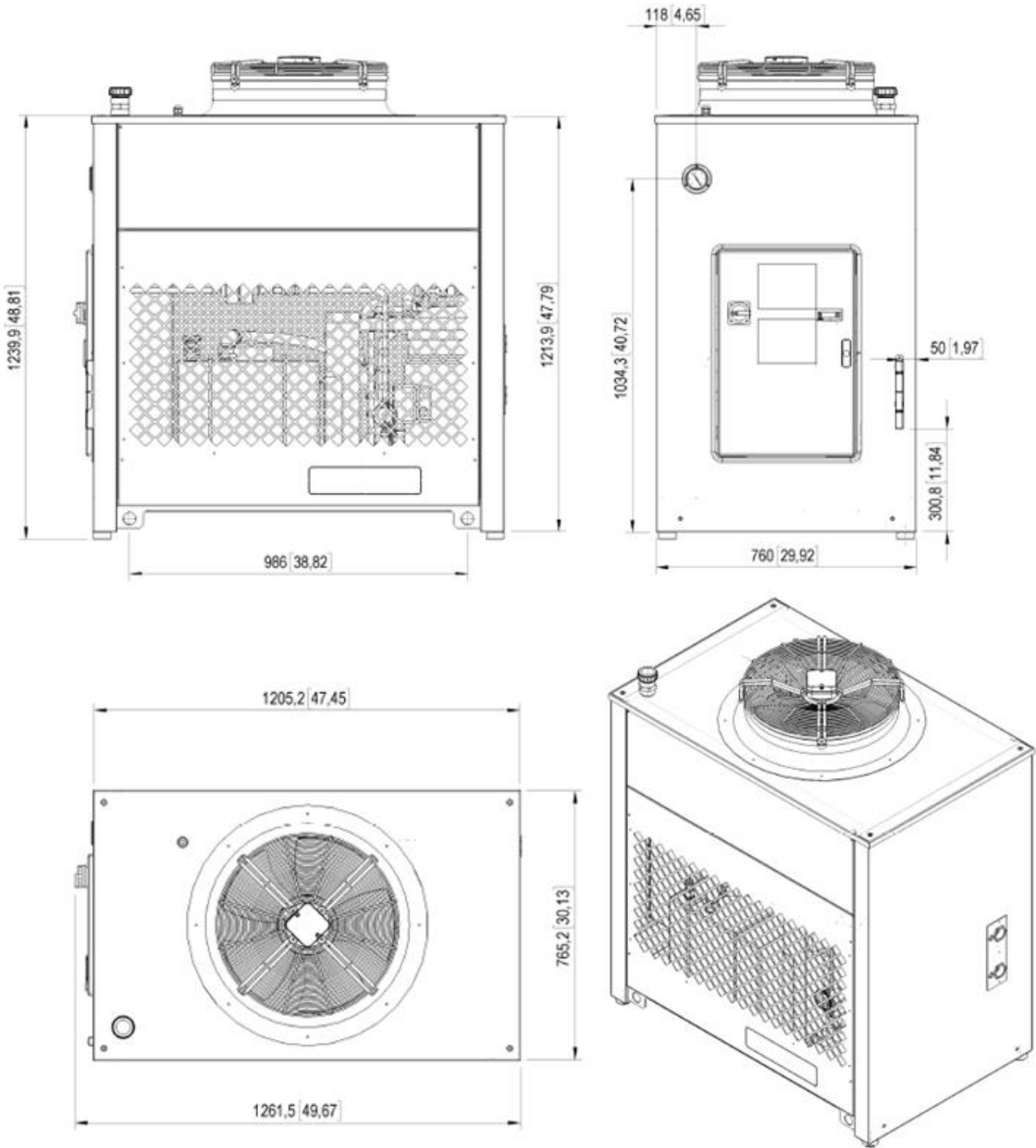
4.6 P&ID diagram
4.6.1 Diagram



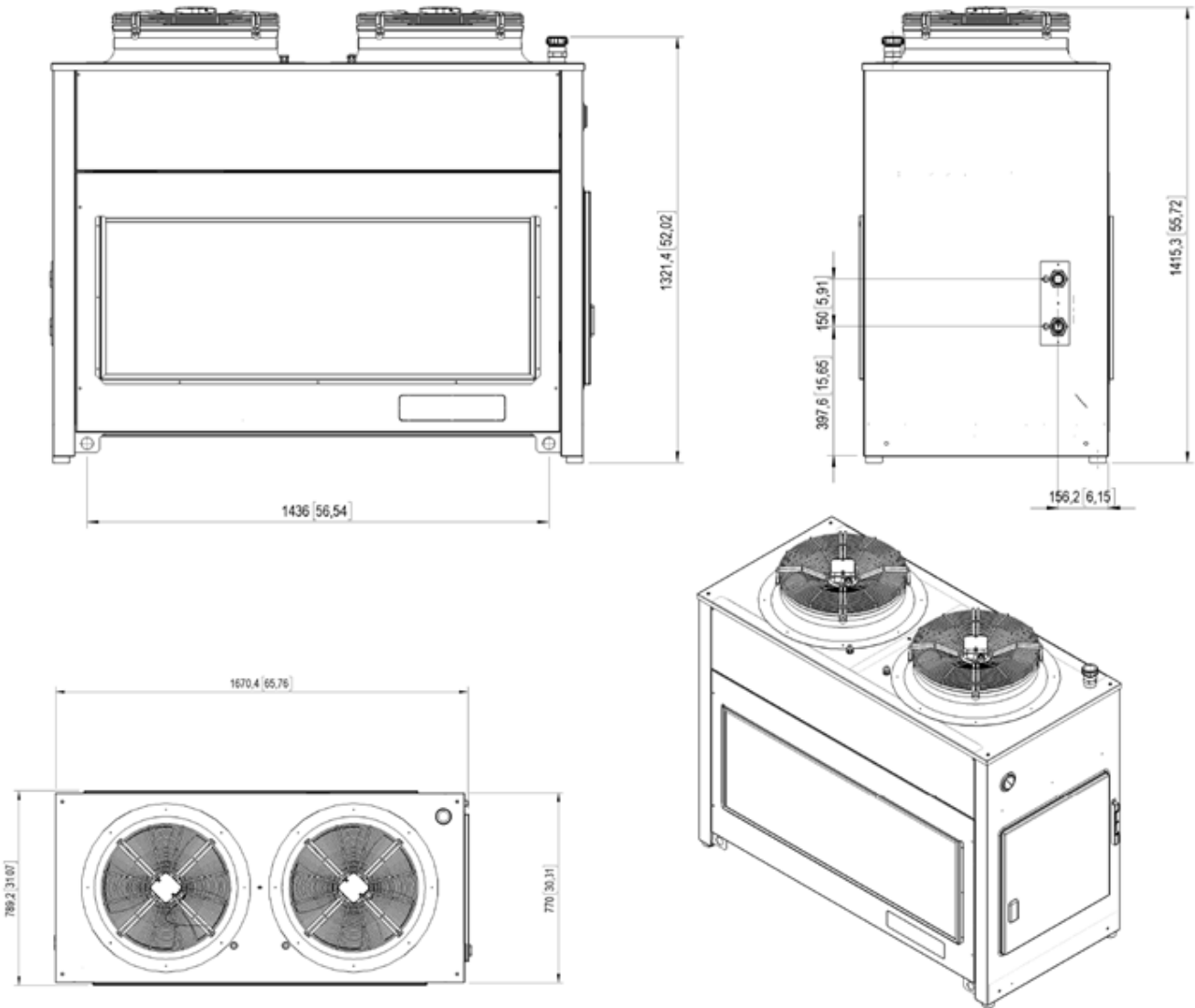
4.6.2 Key

	Pos	Description	EB 210 to 440
Standard components / devices	1	Compressor	X
	2	Condenser (pipes/fins)	X
	3	Fan	X
	4	Filter/Dryer	X
	5	Sight glass	X
	6	Expansion valve (thermostatic)	X
	7	Evaporator (plate hx)	X
	8	Anti-freeze thermostat	X
	9	Pump	X
	10	Manometer	X
	11	Tank cap (vented)	X
	12	Level indicator	X
	13	Drain valve (ball)	X
	14	Tank	X
	15	Temperature probe (coolant supply temperature)	X
	BPH	Hydraulic bypass (adjustable)	X
	Controller	Digital controller	X
	HP	High pressure switch	X
LP	Low pressure switch	X	
PS	Pressure sensor	X	
Options	16	External temperature probe (reference temperature)	X
	BPG	Hot gas bypass (solenoid valve)	X
	EL	Electric level	X
	FS	Flow switch (adjustable)	X
	OV	Overflow valve	X
	R	Tank heater	X
	VSC	Variable speed control fan	X

4.7 Dimensional drawing
4.7.1 EB 210 to 260 - Dimensions

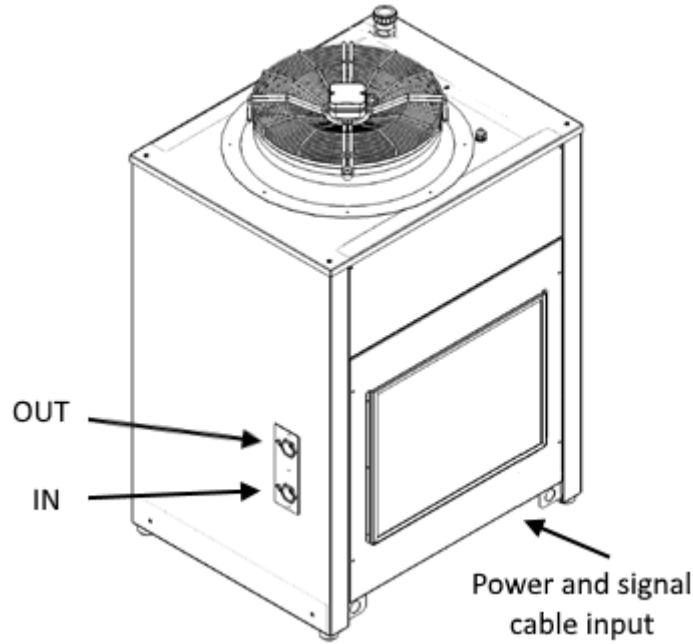


4.7.2 EB 310 to 440 - Dimensions



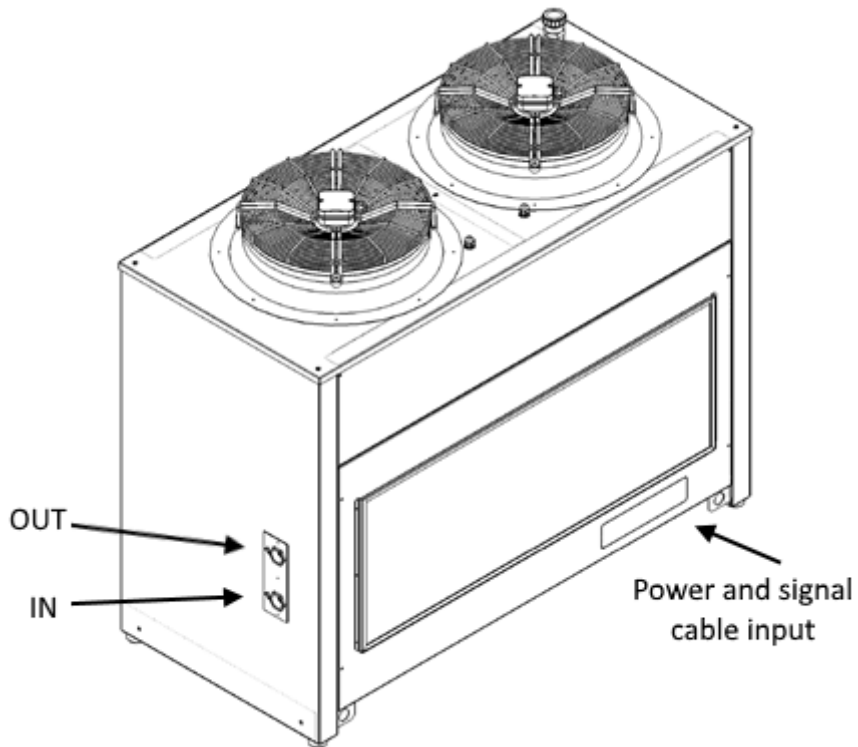
4.7.3 EB 210 to 260 – Connection

Chiller Model	Hydraulic connection
EB 210 to 260	1 ¼"



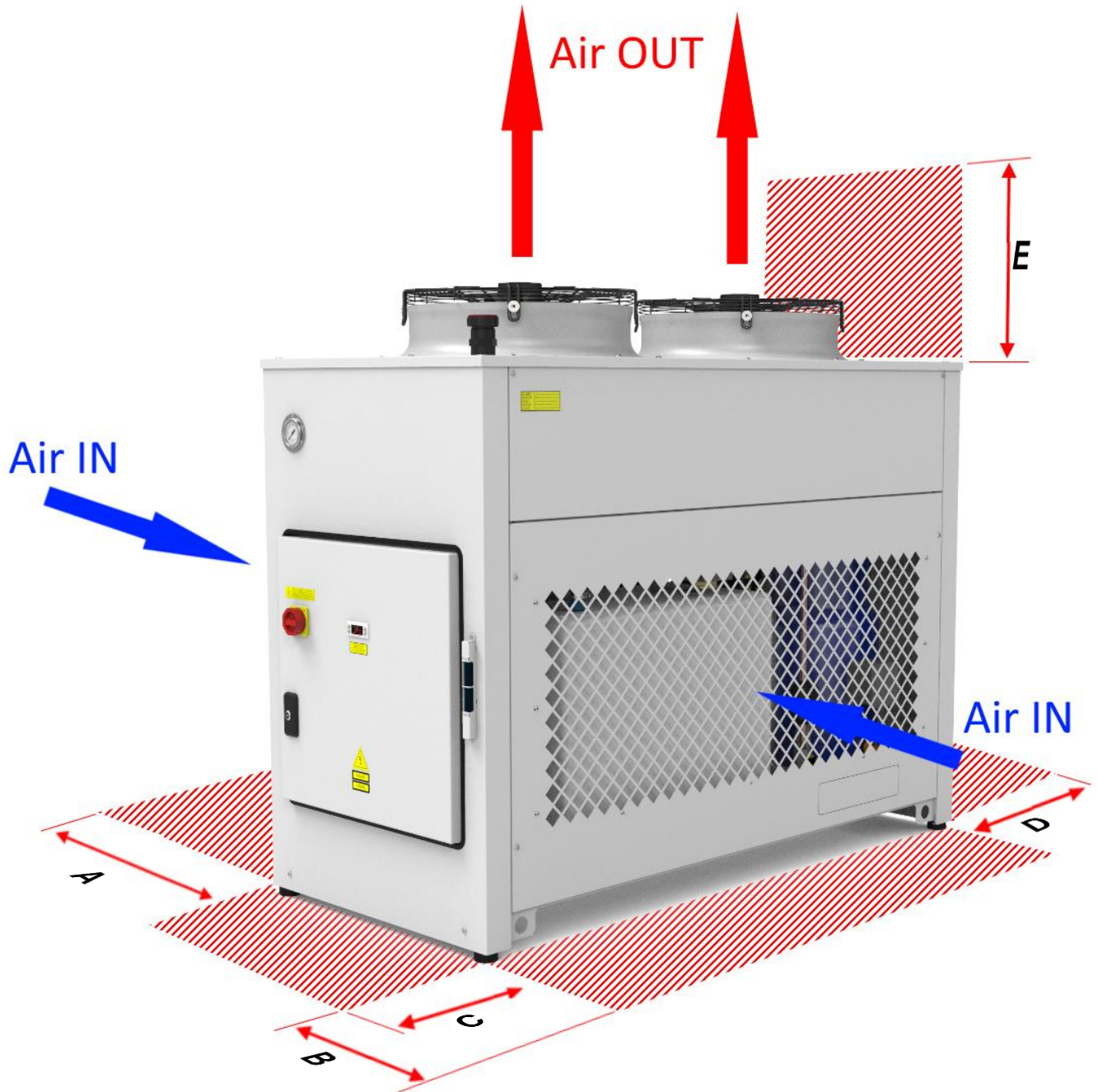
4.7.4 EB 310 to 440 – Connection

Chiller Model	Hydraulic connection
EB 310 to 440	1 ½"



4.8 Minimum distance from obstacles or other objects

Chiller model	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
EB 210 to 440	1,000	1,000	1,500	1,500	1,500



5. Installation

5.1 Transport



WARNING

Danger due to uncontrolled movements

Improper securing of the unit can result in severe accidents.
 Loading must only be carried out by trained, qualified personnel.
 Maintain the packaged unit in vertical position.
 Lash the unit correctly for transport on a truck or trailer.
 Only use lashing straps with an adequate rated strength.
 Use slip-resistant materials for securing, e.g. anti-slip mats.
 When loading by crane, do not walk or stand under the raised units.



CAUTION

Danger of component damage during transport

The chiller must be transported and moved without liquid in the tank.



NOTICE

Danger of material damage during transport and setting down of the unit

Improper device-securing or uncontrolled movements can cause damage.
 Exercise maximum caution during movement and transport of the unit.
 Always transport the unit in the position of use.
 Always transport the unit using the packaging provided by the factory.
 The packaged chillers are not suitable for piling up on top of each other.

5.2 Unpack the chiller



WARNING

Danger of accidents due to the heavy weight of the units

Uncontrolled movements of the unit during assembly can cause accidents.
 Use suitable lifting equipment and secure unit to prevent accidents.
 Also, secure assembled components.



CAUTION

Danger of injury due to sharp edges

For manufacturing reasons, the metal edges of the unit may have burrs.
 Wear gloves during service and assembly work.

Perform a visual inspection for transport damage when unpacking the chiller. Take note of any loose parts, dents, scratches, visible loss of liquid etc.

Inspect and secure the packaging material for any loose functional parts before disposal.

External visual damages:

Report any damages to the freight carrier immediately and accept the material with reserve. Observe the "Terms for Cases of Damage".

Precise information about defects, including possible photos must be provided for the handling of warranty claims.

Always specify the type designation and serial number.

Internal not visible damages:

If the package is damaged report any damages to the freight carrier immediately and accept the material with reserve. Observe the "Terms for Cases of Damage".

Internal damages should be notified within 8 days from the incoming date.

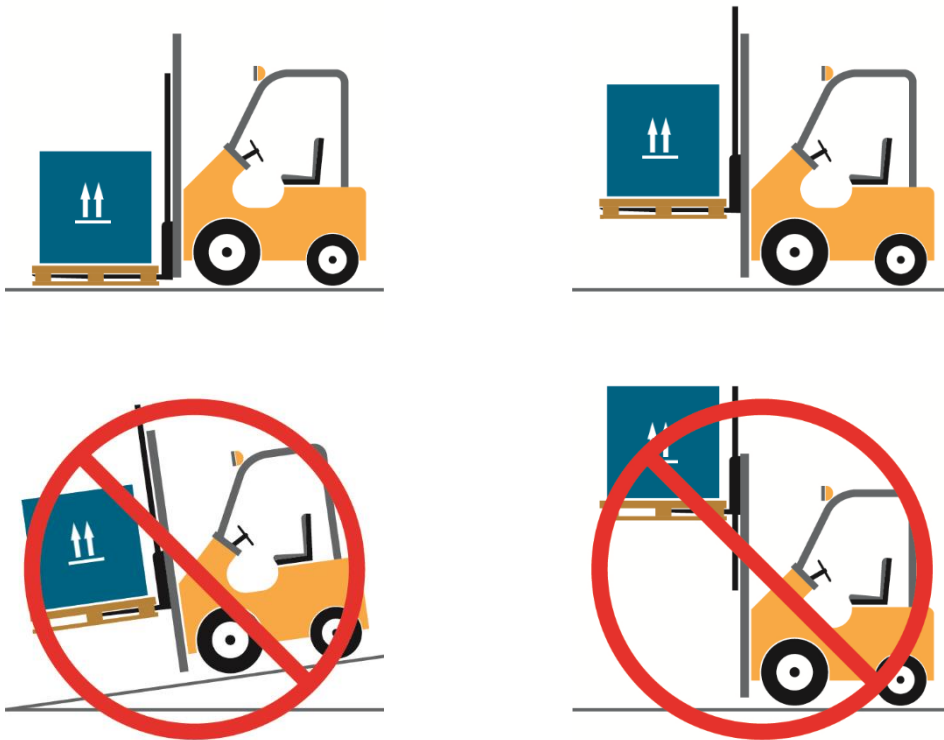
The "General Terms for Deliveries and Services" of ZVEI (Zentralverband der Elektrotechnischen Industrie; Central Association of the Electrical Engineering and Electronics Industry in Germany) according to the latest revision apply.

Each chiller is supplied on a wooden pallet, wrapped with protective film, strapped, and protected on lateral sides, rain film protection.

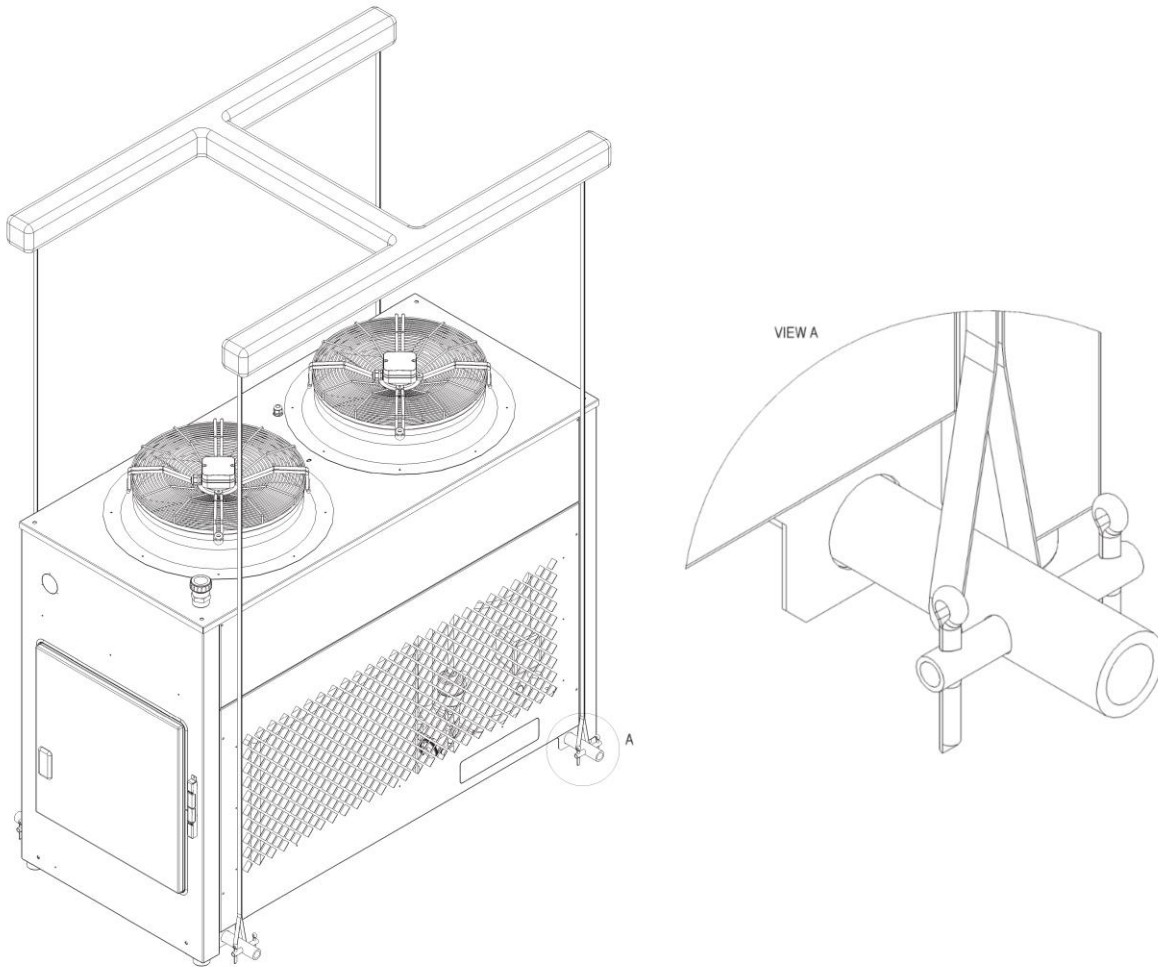
Store the chiller in a dry place, away from heat sources. All waste materials should be recycled in the appropriate manner.

For the operations of lifting and movement it is necessary to use

- a) a fork lift truck with proper load capacity and with forks longer than the base of the chiller. Avoid sudden movements which can damage the framework and the internal components.



b) a crane and an adequately dimensioned lifting beam (provided by the customer).



Minimum requirements of lifting pipes	
Diameter	33,7 mm
Thickness	5 mm
Material	S355JR (1.0045)



NOTICE

Leakage or improper function due to loosen parts/junctions

Check after the final positioning of the chiller the internal connections to avoid damage during operation.

5.3 Set up the chiller

Chillers are designed for indoor installation only (not outdoor).

For proper operation of the unit the following points must be observed.

Place the chiller in an area shielded from any possible manufacturing residuals (shavings, dust, etc.) and well-ventilated, away from heat sources and direct influence of sun light.

Chillers should be placed in an area without chemical and corrosive substances, flammable gas, hot air and liquid coming from nearby processes.

Position the unit as close as possible to the user system, to avoid pressure losses along the hydraulic connection pipes.

Use the adjustable feet (where installed) to level off the unit.

Provide enough space for access and air circulation, see chapter [Technical data](#).

The chiller can optionally be equipped with a polypropylene air filter which is designed for dry dust. In case of an oil mist environment a special washable aluminum filter is required.



CAUTION

Malfunction due to unspecified environmental conditions

Standard units are designed for indoor use only. They are not able to handle any conditions such like low temperatures, high humidity or sun light which are covered under the term "outdoor". For a standard unit the outdoor installation is absolutely forbidden, even if under a roof.

Only special designed outdoor units can be used in outdoor installation.

For regular maintenance or adjustment, the chiller shall be located between 0.3 m and 1.0 m above the servicing level.

5.4 Connect the chiller to the hydraulic pipes

For proper operation of the unit the following minimum requirements for the hydraulic circuit must be observed.

The chiller has been cleaned by means of specific cleaning products. Make sure that the pipes used do not contain dirt or processing residues; if in doubt, perform one or more cleaning cycles.

- Install a filter on the chiller inlet return pipe, with metal mesh of 100 µm.
- Flush the system with FUCHS "Maintain professional washer LI" (Pfannenberg part number: 46783000135 – 25 kg Tank) at least for 10 minutes.
 Dilution percentage:
 2 % Professional Washer
 98 % Water (it is recommended to use demineralized water)
- Clean the filter if necessary and remove it after finishing the cleaning procedure.

Use pipes with same diameter of the circuit connections (connection size see chapter [Technical data](#)).



NOTICE

Malfunction due to incorrect hydraulic connection

For the hydraulic connection please refer to the chapter [Technical data](#) or the enclosed [hydraulic diagram](#).

The flow rate and the fluid circulation direction must be respected during connection in accordance with INLET-OUTLET identification plates.

Recommendation for a proper function

It is recommended to install one shut-off valve at each connection inlet and outlet to isolate the chiller from the system.

It is recommended to install a filter on the chiller inlet return pipe, with metal mesh of 100 µm.

It is recommended to insulate the pipes to prevent condensation.

If user's circuit is at least 500 mm over the hydraulic connection of the chiller, the fluid in the piping may drain back and overflow the chiller reservoir if the chiller is shut down. This can be prevented by using a check valve in the supply line, and either a solenoid valve on the return line.

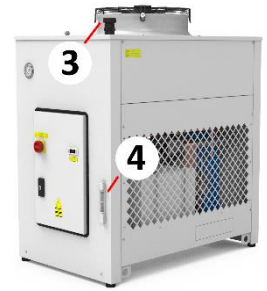

WARNING
Malfunction due to incorrect sequence of commissioning steps

Remove tank cap [3], which is located at the front of the chiller (external).

Fill tank with coolant (water-glycol mixture in the appropriate concentration) until the minimum level (check level indicator [4]) is reached (water quality and treatment should be established according to the application specifications).

Remove the caps inside the hydraulic fittings connection before to connect the chiller to your device.

Hydraulic connections are the first ones to be assembled during installing operation, to be followed by electric connections.


5.5 Fill the tank and the hydraulic circuit

Fill tank with coolant (water-glycol mixture in the appropriate concentration) until the minimum level (check level indicator [4]) is reached (water quality and treatment should be established according to the application specifications).

Chiller circuit is designed with non-ferrous materials: stainless steel, brass, copper, bronze, polyethylene, rubber, etc.

To speed up the filling procedure it is recommended to fill-in the user circuit as well.

5.5.1 Process Water / Fluids

PFANNENBERG chillers should be filled to the proper level with an **inhibited glycol** designed for Industrial chiller systems. **Do not use automotive antifreeze!** The inhibitors used in automotive antifreeze can break down quickly and accelerate the degradation of the coolant base (glycol); as well as promote corrosion in a system. Silicates used in automotive antifreeze coat heat exchangers, resulting in reduced heat transfer. Also, silicates can gel causing fouling and plugging of a system.

The ratio of inhibited glycol to water should be adequate to prevent freezing at the lowest ambient temperature. Check the level with all lines filled. **The glycol mixture should be checked periodically (3 to 6 months) for proper concentration.** When filling the system, always use a pre-mixed solution in the proper ratio to maintain freeze and corrosion protection. Demineralized/deionized water is **recommended** because many municipal water supplies contain large amounts of chlorine, which can react unfavorably with glycol.

When using water to create or dilute the mixture, please consider the following:

It's recommended to use demineralized/deionized water (DM/DI) but not distilled water.

If pure water is used, do not exceed these properties:

Fresh water free of contamination

pH-level: 7-9

Hardness: <8 °dH

Conductivity: <300 µS/cm

Chloride: <50 mg/l

Do not allow mechanical contamination to get in the water. Use water filters if this could be an issue.

Watch for chemical contamination. If this is to become an issue, treat the water with passivators and/or inhibitors.

Do not allow biological, slime bacteria and algae contamination. If this does happen, treat the water with biocides.

5.5.2 Corrosion protection

PFANNENBERG recommends that Pfannenberg Protect Glycol is also used as a rust inhibitor.

The percentages of glycol into the mixture is related to the minimum ambient temperature of the chiller (that must be in line with the minimum working set point of the unit, please see the technical data of the unit):

Propylene glycol	dilution %	Working range temperature		Freezing point
		Min [°C]	Max [°C]	
PP20P	20	-7	+107	-10
PP30P	30	-12	+115	-15
PP50P	50	-30	+120	-33
Ethylene glycol	dilution %	Working range temperature		Freezing point
		Min [°C]	Max [°C]	
PP20E	20	-7	+107	-10
PP30E	30	-15	+115	-18
PP50E	50	-35	+120	-38



CAUTION

Malfunction due to glycol concentration

The higher the concentration of glycol the lower the amount of heat rejection you will be able to get out of the fluid.



CAUTION

Safety issues due to wrong glycol selection

Ethylene glycol (Pfannenberg Protect PP...E) and Propylene glycol (Pfannenberg Protect PP...P) differs for viscosity and toxicity. Ethylene glycol is less viscous than Propylene one, so it provides a higher efficiency in heat exchanging, and has better performance at low temperatures. For applications where is necessary to ensure a non-toxic process, the propylene glycol based fluids are used because of their low toxicity if ingested; it can be used for example where fluid can enter into accidental contact with beverages, or for industrial processes for food and beverages processing. In some applications propylene glycol use is mandatory.

5.6 Connecting the chiller to the power supply



DANGER

Life-threatening danger due to electric shock

Live units and exposed connection cables can generate an electric shock and cause severe accidents.

Work on electrical connections must be carried out exclusively by trained, qualified electricians.

Before assembly, de-energize all supply lines to the separate fuse or a main switch, disconnect the system and secure to prevent re-connection.

Test to ensure the absence of voltage on the unit and on all power supply cables.

Lightning protection of the unit (outdoor installation) must be carried out by qualified engineers.



NOTICE

Additional information

If units are provided without power and alarm cables (or industrial connectors), cable on terminal blocks into the electrical box, according to the enclosed **Electric diagram**.

Electrical installation must respect all valid safety standards.

It's necessary to install protective fuses (indicated on the electrical diagram) or a circuit breaker upstream of the power cable.

Make sure the system is adequately earthed.

In case of outdoor installation it is strictly recommended to follow the local regulation for the proper protection of the system (unit + piping) against lightnings.

Check that the voltage and frequency of the power supply correspond to the specifications on the unit's data plate and/or enclosed **Electrical diagram**.

Pfannenberg chiller units are designed for TN Earthing Systems. Use the Maximum fault loop chiller Impedance value for sizing purposes on site (refer to Z_{pe} value specified within **Electrical diagram** attached)

For units with (black) control main switch, emergency switch-disconnector (in accordance with IEC 60947-1, IEC 60947-2, IEC 60947-3) will be provided by customer in proximity of the unit.

Check the correct sequence of electrical power: L1=R – L2=S – L3=T; unit provided by phase sequence monitor will not start with wrong sequence; in this case an alarm on the sequence monitor device will occur.

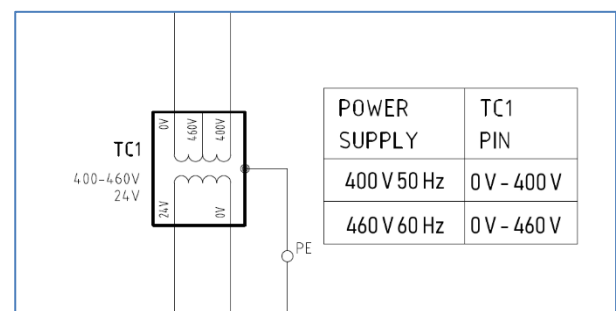
In this condition change the position of supply conductors (leave all the internal wiring as it is).



CAUTION

Malfunction due to incorrect transformer setting

In case units that can work with different voltages (400 V 50 Hz or 460 V 60 Hz), connect the transformer of the auxiliary circuit located inside the e-box in the right way.



NOTICE

Transformer factory setting

Unit CE: Factory setting 400/3/50

Unit UL: Factory setting 460/3/60

6. Commissioning



DANGER

Life-threatening danger due to electric shock

Live units and exposed connection cables can generate an electric shock and cause severe accidents. Work on electrical connections must be carried out exclusively by trained, qualified electricians. Before assembly, de-energize all supply lines to the separate fuse or a main switch, disconnect the system and secure to prevent re-connection. Test to ensure the absence of voltage on the unit.



DANGER

Life-threatening danger due to refrigerant under pressure or high/low refrigerant temperature

Work on refrigerant circuits must be carried out exclusively by trained, qualified personnel.



CAUTION

Coolant under pressure

Work on hydraulic circuits must be carried out exclusively by trained, qualified personnel.



CAUTION

Undefined operating status

To avoid an undefined operating status, a functional restriction or a device fault, after switching **OFF** the chiller, wait for about 30 seconds before turning it **ON** again.

The following instruction will guide you through the start-up procedure in detailed steps.



Power connection: chiller without cable



Power connection: chiller with Harting connector

- Turn main switch [1], control switch, all circuit breakers inside the e-box [2] to the - 0 - (OFF) position.



- Connect main power feed and alarm cable to the customer application.
 - If the chiller is provided without cables, customer must provide power and alarm cable and has to connect the cables on terminal blocks inside the electrical box [2] of the chiller. Cable entry position is [12a].
 - If the chiller is provided with external connector [12b], customer must provide power and alarm cable connected to the female part of the connector [12b] (delivered with the chiller).


DANGER
Electrical shock hazard due to incorrect connector handling

Always turn the main switch [1] to the - 0 - (OFF) position before connecting or disconnecting the plug [12b].

- Chiller with pump:
 - Purge pump by loosening purging screw that is located on the pump body. Be advised that the pump has been purged correctly when only water is visible.
 - Switch circuit breaker for the pump to - 1 - (ON) position. All other circuit breakers must stay in the - 0 - (OFF) position.
 - Main switch [1] should be turned to the - I - (ON) position and the pump should be checked for the correct rotation. (Please note that there is an arrow located at the back part of the pump for direction indication).


CAUTION
Damage due to incorrect pump operation

The pump must not run dry or in inverse direction; therefore, the checking of the correct rotation must be quick. In case of wrong rotation, turn the main switch [1] immediately to the - 0 - (OFF) position. Swap two phases R-S-T on the terminal board of the electrical box [2] to establish the correct phase sequence. On chiller with phase check relay the control is automatic.

- Make sure to have main switch [1] turned to the - I - (ON) position. While pump is running; the fluid level must always stay over the minimum level (check level indicator [4]). After the hydraulic circuit has run for approx. 5 minutes, turn main switch [1] to - 0 - (OFF) position and check again the visual level of the tank [4]; refill the tank in case of need.
- Make sure to have main switch [1] turned to the - 0 - (OFF) position. Switch all circuit breakers to the - 1 - (ON) position.
- Turn main switch [1] to the - 1 - (ON) position.
- Fan [5] should be checked for the correct rotation. (Please note that there is an arrow located at the side part of the fan-shroud for direction indication).

At this time the chiller is ready to operate automatically according to the controller's "set point values". If necessary, set controller [7] according to customer's temperature requirements. (Please refer to the manual of the thermostat delivered with the unit).

**CAUTION****Malfunction due to incorrect parameter settings**

Any adjustment on settings of the thermostat(s), pressure switch(es) or other components of the refrigerating circuit, must be performed by qualified personnel of the PFANNENBERG Service only.

For further information on chiller installation, start-up or troubleshooting please contact the PFANNENBERG Sales Support.

**NOTICE****Quick commissioning**

For a quick commissioning instruction please see appendix [Step by step instruction](#).

6.1 Preparation before switching on the chiller

Y/N	Start-up Check list
	Chiller is placed on a solid ground in upright position without tilting.
	Chiller is placed on antivibration damper(s).
	Chiller is placed with the minimum required distance from obstacles and proper access for maintenance.
	Chiller is equipped with air filter.
	Hydraulic circuit is properly designed according to pump performances and minimum water flow required.
	Hydraulic circuit has been cleaned up (pipes and final devices to be cooled).
	Pipe caps have been removed before hydraulic connections.
	Hydraulic pipes have been properly connected: delivery side (cold water) – return side (warm water).
	Water filter (if present) is clean and the package of filter cartridge has been removed.
	Tank is filled to max level of visual level indicator.
	Tank cap is present and tightened.
	Hydraulic pipes are installed at the right position in accordance with INLET-OUTLET identification plates and connections are tightened.
	The pump has been properly purged.
	All the valves in the piping system are open.
	Power supply, earth conductors and alarm cable have been connected and tightened.
	Supply voltage, frequency and electrical power are according to the type label of the chiller.
	Motors are running in the right rotating direction.
	All the circuit breakers are switched in -1- (ON) position.
	<i>Only for chillers with installed RCU option (remote control ON-OFF)</i> External dry contact is present and in closed position.
	Electrical box is closed.
	All panels are assembled.

6.2 Switch on chiller

Use the main switch to turn the chiller **ON**.

Depending on the chiller configuration, some units do have a functional delay of app. 10 seconds.

In this time the controller is running a boot sequence to check all functions.

After this the controller will start the chiller operation automatically.



CAUTION

Start-up behavior of common alarm for chillers with Eliwell SMP controller

After the main power supply is turned **ON**, the common alarm contact (dry contact) is open as long as the controller is running the boot sequence.

If after the boot sequence no error occurs, the common alarm contact will switch to close position and the chiller will operate automatically.

6.3 Stop and switch off chiller

Use the main switch to turn the chiller **OFF**.

7. Operating

7.1 Carry out settings

If other settings are needed, e.g. lower or higher supply temperature or different operating mode, this can be done by changing the corresponding parameters.

For detailed description of how to change parameters please check the enclosed [Controller manual](#).

7.2 Starting the chiller after an interruption



CAUTION

Undefined operating status

To avoid an undefined operating status, a functional restriction or a device fault, after switching **OFF** the chiller, wait for about 30 seconds before turning it **ON** again.

7.3 Stop chiller and switch it OFF

Use the main switch to either stop the chiller or turn the chiller **OFF**.

8. Troubleshooting



DANGER

Life-threatening danger due to electric shock

Live units and exposed connection cables can generate an electric shock and cause severe accidents. Work on electrical connections must be carried out exclusively by trained, qualified electricians. Before assembly, de-energize all supply lines to the separate fuse or a main switch, disconnect the system and secure to prevent re-connection. Test to ensure the absence of voltage on the unit.



DANGER

Life-threatening danger due to refrigerant under pressure or high/low refrigerant temperature

Work on refrigerant circuits must be carried out exclusively by trained, qualified personnel.



DANGER

Life-threatening danger due to toxicity of refrigerant, coolant and oil

Work on refrigerant circuits must be carried out exclusively by trained, qualified personnel. Work on hydraulic circuits must be carried out exclusively by trained, qualified personnel.



CAUTION

Coolant under pressure

Work on hydraulic circuits must be carried out exclusively by trained, qualified personnel.



CAUTION

Undefined operating status

To avoid an undefined operating status, a functional restriction or a device fault, after switching **OFF** the chiller, wait for about 30 seconds before turning it **ON** again.



CAUTION

Follow all electrical legislation when working on the unit based on valid laws of the countries where the unit is placed.

Troubleshooting tips		
Symptoms	Possible cause	Proposed remedy
The unit does not start	No supply voltage	Check the supply main voltage line
	Broken controller	Inspect the connection, verify the auxiliary circuit fuses and, if there is no fault, replace the controller
Unit works, but does not cool	Lack of refrigerant	Service by a refrigeration engineer
	Faulty thermostatic valve	Service by a refrigeration engineer
	Too much heat load or too high ambient temperature	Possible wrong application, to be checked with our staff
	Controller malfunction	Check and correct the parameter settings
	Not correct flow rate on hydraulic circuit	Verify the regulation of hydraulic bypass where installed
Fluid temperature too low	Broken controller (contact blocked)	Replace the controller
	Wrong set-point	Change cooling setpoint (Controller manual)
Fluid temperature too high	Broken controller	Replace the controller
	Wrong set-point	Change cooling setpoint (Controller manual)
	Lack of refrigerant	Please ask for the service by a refrigeration engineer
	TD function active (set-point temperature follows the ambient temperature)	Deactivate the TD function if not required (Controller manual)
	Too much heat load	Possible wrong application, to be checked with our staff
Compressor does not start	<p>The compressor protection (KLIXON, where installed) has switched off: overheating due to an inadequate cooling of the compressor motor.</p> <p>Blocked compressor due to high temperature of the motor or high current</p> <p>Loose connections which may cause high currents</p>	<p>Important: After the shut-down of the compressor, the resetting time will very much depend on the environment of the compressor. In a hot closed environment, it will be 2 hours, in ventilated 1 hour</p> <p><i>Note: The compressors are protected against high temperatures and currents with an internal or external device (Klixon).</i></p>
Unit works for short period then stops and starts again after a while	<p>Switching of low pressure switch:</p> <p>Low gas level in the equipment</p> <p>•Outlet line of the compressor is blocked due to saturated filter or blocked thermostatic valve</p>	Service by a refrigeration engineer

Troubleshooting tips		
Symtoms	Possible cause	Proposed remedy
Unit stops and does not start again due to switching of high pressure switch	Dirty condenser	Clean the condenser with a) a soft bristle (not wire!) brush b) compressed air blown from the inside out c) water rinse from inside out and top to bottom Do not use any chemicals or a pressure washer!
	Broken fan	Replace the fan
	Reversed fan rotating direction	Verify the connection on the terminal board of the electrical box
	Ambient temperature too high	Provide adequate ventilation with air at max or lower temperature as specified
		Set up the chiller in a colder place
	Water setpoint too high (in combination with high ambient temperature)	Reduce the water temperature set-point
	Chiller operating without lateral panels	Mount the panels on the unit
Note: after solving the cause of the fault, start the chiller by pressing the reset button.		
No coolant circulation	Pump is down	Verify the connection on the terminal board of the electrical box
	Reversed pump rotating direction	Check the right rotation of the electrical motor
	Pressure loss of application too high	Verify the regulation of hydraulic bypass where installed
		Verify circuit pressure drop to reach the nominal flow rate



NOTICE

High pressure switch reset

After the high pressure switch has switched off the refrigerating cycle, it needs a manual reset to start the cooling cycle again by pressing the appropriate button on the machine display.

9. Maintenance

9.1 Maintenance instructions for your safety



WARNING

Danger of accidents due to unlocked main switch

Before carrying out any maintenance work that does not require the unit to be operated, disconnect the power supply and secure the main switch against reconnection (lock). In addition, the sign "**MAINTENANCE IN PROGRESS**" should be affixed next to the main switch.



CAUTION

Legal problems due to improper operation of the unit

It is of utmost importance to comply with Regulation (EU) No 517/2014, regarding mandatory regular leakage-check program, as described in chapter 2 **Safety** of this document.



NOTICE

Early breakdown due to missing maintenance activities

Carrying out the tests and check program listed below will extend the lifespan of the equipment and avoid possible breakdowns.

Check mechanical working of the compressor. Control the absence of metallic vibrations and not too high noises and temperatures on the compressor head during running to verify its regular working.

Check the operation of the fan.

Check the electrical alarm systems and controls.

Check the filling of the tank (visual level). If the system is filled with a glycol-mix, refill only with the same mix. Only water will reduce the concentration of glycol.

Check that pressure, flow rate and temperature values of the hydraulic circuit are in the limits indicated on the type label or in chapter **Technical data**.

If the chiller is equipped with an air filter, the filter has to be changed/cleaned monthly, or, if required in a shorter time interval.

Do a visual inspection of the condenser monthly on the external side, to see whether it is clean or not. The fins of the condenser must not have any dust deposits or residual products or sludges on their surface.

The condenser must be cleaned in monthly intervals, or, if required in shorter time intervals.

If the chiller is equipped with a filter on the hydraulic side, the filter has to be checked/cleaned monthly, or if required, in a shorter time interval.

To allow best operating conditions it's recommended to change the coolant mixture depending on the glycol concentration in the following intervals:

- every year for a glycol concentration of 20 %
- every 2 years for a glycol concentration of 30 % or 50 %

Longer standstill of the unit requires draining of the tank and the entire hydraulic circuit. Open the ball valve (or the plug) at the end of the draining hose to drain the circuit. When the drain operation is finished close again.

For a new installation, it is recommended to empty the hydraulic circuit. Please, refer to chapters **Installation** and **Commissioning** for the lifting of the unit, the connection and the start up.

It is recommended to check safety discharge valve (in the refrigerant circuit, where installed) every 24/36 months. Leakages and/or visible scale may suggest potential malfunction.

Please familiarize with chapter **Electrical and mechanical components** to identify the main components of the unit.

No device with internal volume greater than 25 l is installed on the refrigeration circuit, thus no further inspection from notified bodies is required according to D.M. nr.309 – December the 1st 2004.

The customer is obliged to comply with all additional local requirements.

**NOTICE****Safety discharge valve**

It is necessary to replace safety discharge valve after it has triggered. The safety discharge valve is no longer covered by the warranty after the first activation.

10. Decommissioning, disposal**10.1 Decommissioning and storage****WARNING****Danger of injury due to materials and substances**

Improper work on the unit or opening of the refrigerant circuit can be damaging to health.

Always ensure that the unit is de-energized before working on the unit.

The unit must only be disposed of by qualified personnel and in accordance with applicable environmental regulations.

If the unit is no longer needed for a longer period, it must be disconnected from the voltage supply.

☒ Ensure that improper start-up by third parties is not possible.

10.2 Final decommissioning or disposal**WARNING****Danger of accidents due to the heavy weight of the units**

Uncontrolled movements of the unit during decommissioning can cause accidents.

Use suitable lifting equipment and secure unit to prevent accidents.

Also, secure assembled components.

**CAUTION****Danger of injury due to sharp edges**

For manufacturing reasons, the metal edges of the unit may have burrs.

Wear gloves during service and assembly work.

If units are to be definitively decommissioned or disposed of, the following must be observed:

Applicable statutory regulations of the user country and environmental protection regulations must be observed.

Refrigerant must be professionally extracted from the refrigerant system. Avoid refrigerant emissions.

The unit must only be disposed of by authorized, qualified personnel.

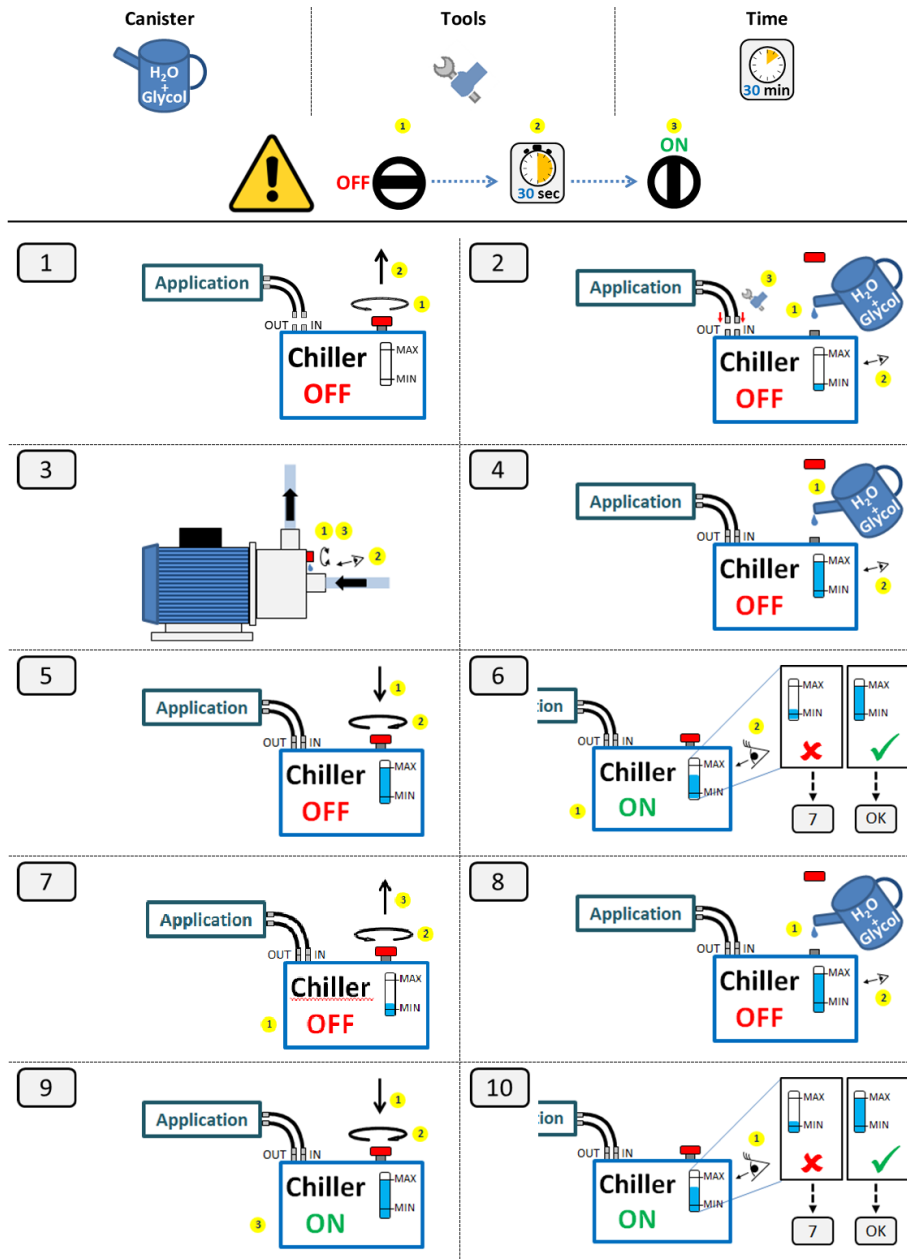
Waste equipment must also be disposed of correctly by Pfannenberg. Freight charges for delivery to one of our manufacturing facilities must be pre-paid.

11. Warranty

For information about warranty please visit Pfannenberg website:
<http://www.pfannenberg.com/en/company/general-conditions/>

12. Appendix

12.1 Step by step instruction



13. Contact

MANUFACTURER

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For Service, please contact the nearest Pfannenber Service Company.