# Technical Manual

## Operation and installation hybrid cooling units
## **DHS 3000 HYBRID-SERIES**

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Pfannenberg
ELECTRO-TECHNOLOGY FOR INDUSTRY

## Preface

The skills and information provided in the ORIGINAL OPERATING MANUAL are required for assembly and safe operation of Pfannenberg's DHS 34x1 Series Hybrid Cooling Units. Read carefully before use, keep for future reference.

The information is presented in a brief, clearly arranged format. The chapters are numbered throughout. If you have the operating manual in digital format, the links are interactive.

DHS unit variants include the DHS 3441, DHS 3461 and DHS 3481. These are intended for indoor, outdoor and washdown conditions, respectfully.

Pfannenberg cooling units are subject to continuous improvement. Please understand that we reserve the right to make changes to the 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.

## Safety Instructions and Symbols

**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***

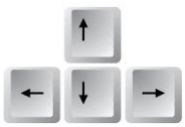
Notice is used to address practices not related to physical injury.

This symbol on warning labels on the unit directs the operator or technician to refer to this manual before proceeding.

### Digital operating manual:

If you have the operating manual in digital format, the links are interactive.

Clicking on links takes you to the target text position.



- The table of contents is also interactive.

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# 1 : INTENDED USE

## 1.1 General Overview

The attachment and installation of the  Pfannenberg DHS series cooling units are intended as stationary cooling units for the dissipation of heat from switch cabinets. NOT TO BE ACCESSIBLE TO THE GENERAL PUBLIC.

For exact specifications on power consumption and performance, see Technical data in section 2.6 of this manual.

Use of aluminum filters, fleece filters and fluted filters is possible with an additional adapter.

These cooling units have thermostat controllers that can be adjusted via a display. These controllers are regulating units for the adjustment of refrigeration functions and operating data. It also indicates error codes to assist in troubleshooting diagnosis.

- For detailed specifications for the controller, see Technical data and Operation.

All Pfannenberg cooling units are ROHS & TSCA compliant and free from:

- PCT, asbestos, formaldehyde, cadmium
- Moisture-impairing substances.
- PBT, TTBP, Deca-BDE, PIP-3:1, PCTP, HCBD.

## 1.2 Duty of the Operator

The operator must ensure that the cooling units are used exclusively as intended and dangers of all types to the life and limb of users or third parties are avoided. In addition, accident prevention regulations and recognized safety rules are to be observed.

The operator must ensure that all users have read and understood this operating manual. Non-observance of this operating manual will void the warranty. The same applies if improper work has been carried out on the unit by the customer and/or third parties without the approval of the manufacturer.

# 2 : UNIT DESCRIPTION

## 2.1 Description of Use

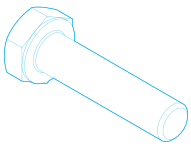
**WARNING**

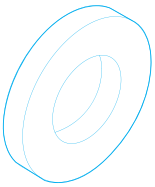
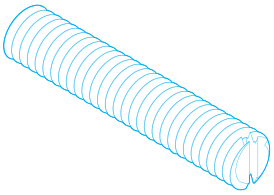
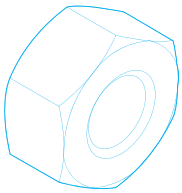
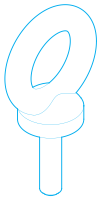
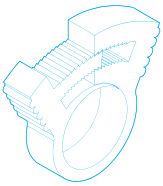
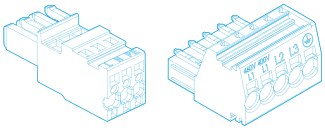
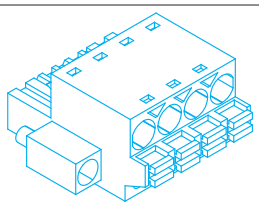
**Hazardous due to impermissible use of units**
Inappropriate use of the units can cause severe accidents.
• Cooling units must only be used in stationary operation.

Pfannenberg DHS series cooling units are designed to dissipate heat from switch cabinets. with intention to maintain the air temperature inside the switch cabinet to allow for normal operation of sensitive components in the switch cabinet.

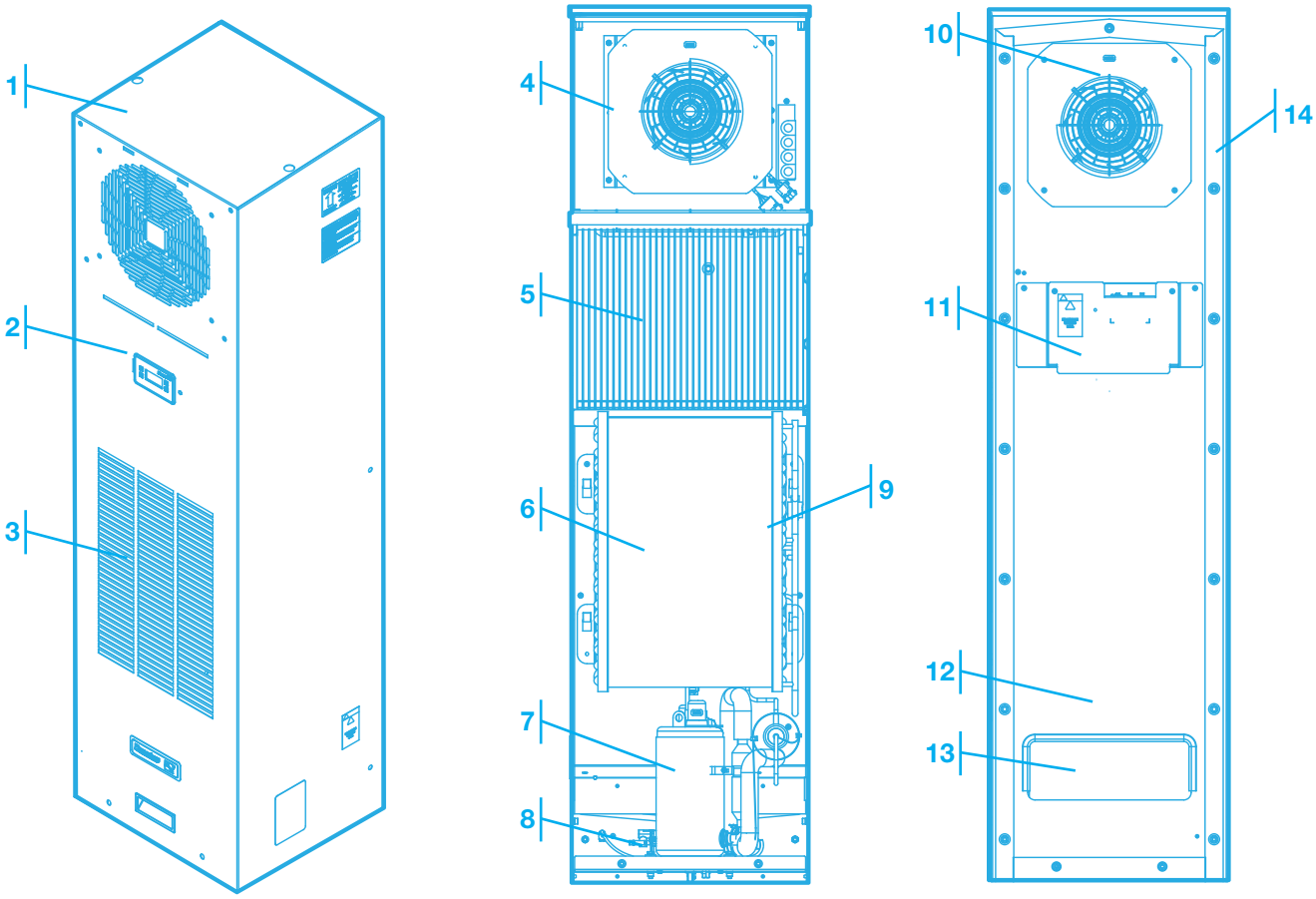
These cooling units are only approved for stationary and upright operation with closed switch cabinets. As cooling units with protection rating IP 56, the cooling units are essentially dust-protected and can withstand waterjet spray of water for a limited time. Limitation: Dust and water can still penetrate after continuous exposure.

## 2.2 Scope of Delivery

| Description | Image | QTY. |
|---|---|---|
| DHS 3000 Hybrid Cooling Unit with cabinet interface gasket installed |  | 1 |
| Cabinet cut out template DHS 3000 |  | 1 |
| Manual quick guide |  | 1 |
| CE Letter of Conformity - DHS |  | 1 |
| 10mm Hex screw M6x25mm |  | 15 |
| Split lock washer 6mm |  | 17 |

| Description | Image | QTY. |
|---|---|---|
| Flat washer M6XØ18mm |  | 17 |
| Slotted grub screw M6x30mm |  | 2 |
| 10mm Hex nut M6 |  | 2 |
| Eye bolt M8 |  | 2 |
| Hose clip 17-18,5mm |  | 1 |
| PVC clear hose 12x2mm |  | 260mm |
| Power connector (X50)<br>(115/230V) / (400/460V) |  | 1 |
| Alarm connector (X12) |  | 1 |

## 2.3 Unit Description




| | | | |
|---|---|---|---|
| 1 | Unit cover | 8 | Condensate evaporation tray w/ drain |
| 2 | Display / control interface (LP2) | 9 | High pressure switch |
| 3 | Condenser outlet | 10 | Evaporator fan |
| 4 | Condenser fan | 11 | Connection compartment with cover |
| 5 | Passive cooling coil | 12 | Evaporator (internal) |
| 6 | Condenser | 13 | Cool air outlet |
| 7 | Compressor | 14 | Pre-installed gasket |

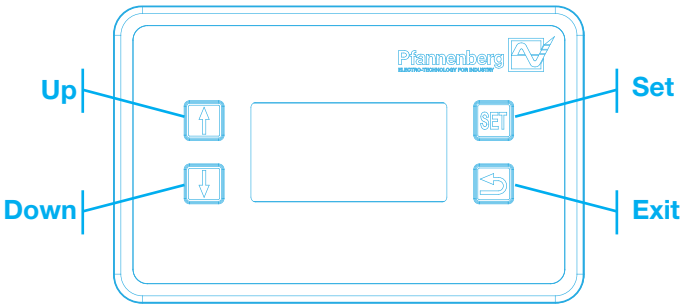
**CAUTION**

**Danger due to the release of very warm air.**

- The condenser outlet can become very warm
- Keep body parts away from the air outlet.
- For the ambient temperature and air outlet ratio, see Technical data.

### 2.3.2 Temperature Regulation

The display is for the adjustment of refrigeration functions, operating data, as well as alarm and error codes. The actual temperature of the enclosure side will be displayed while the cooling unit is in normal operation. Use the up and down arrows to scroll through the parameter options. To change a parameter, press ‘set’ while on the desired parameter and use the up/ down arrows. Once the value of the parameter is as desired press ‘set’ again to save.




Display Element Descriptions

| Element | Description |
|---|---|
| Up | Key that allows to scroll through parameters or increase a value to be set |
| Down | Key that allows to scroll through parameters or decrease a value to be set |
| Set | Key that allows to select a parameter or store a configured value |
| Exit | Key that allows to exit a parameter or discard a configured value without storage |

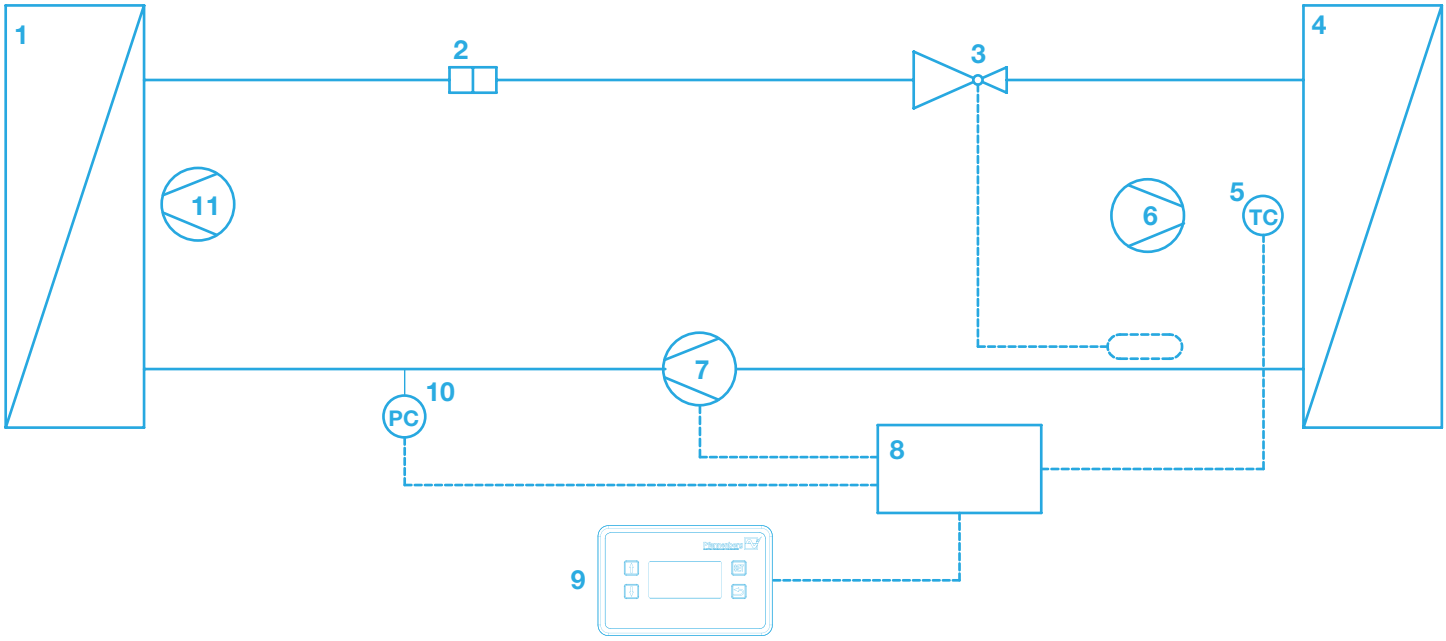
| | |
|---|---|
|  | Indicates that an Energy mode is active |
|  | Indicates that the Compressor is active |
|  | Indicates that the Internal fan is active |
|  | Indicates that the parameter setting function is locked. To unlock, enter PIN |
|  | Indicates that a Warning or Alarm is raised. See display error |

## Display Functions

| Parameter | Display read out | Description |
|---|---|---|
| Actual Temperature | TEMP | Live Temperature measured by the sensor used to manage the device functionality. |
| Setpoint | SETP | Shows the configured setpoint temperature |
| High Temp Alarm | MaxA | Shows the configured high temperature alarm level<br>- minimum setting:  default: 42.0°C<br>- maximum setting: default: 69.0°C |
| Low Temp Alarm | MinA | Shows the configured low temperature alarm level<br>- minimum setting: default: 5.0°C<br>- maximum setting: default 25.0°C |
| Unit Temperature | Unit | Shows the Unit used to display temperatures<br>Supported are:<br>- °F Degrees Fahrenheit<br>- °C Degrees Celsius |
| Energy Mode | EMOD | Shows it the device runs in Energy saving mode<br>- 0 Energy mode disabled<br>- 1 Energy Mode enabled |
| Access Code | Pass | Allows to enter a Passcode (PIN) to enable the parameter configuration functionality. Unit ships without any passcode. |

### 2.3.3 Refrigeration Circuit

The following lays out the active refrigeration circuit within the DHS cooling unit




The following lays out the active refrigeration circuit within the DHS cooling unit.

| | | | | | |
|---|---|---|---|---|---|
| 1 | Condenser | 5 | Temperature sensor | 9 | Display Interface |
| 2 | Filter drier | 6 | Evaporator fan | 10 | High pressure switch |
| 3 | Expansion valve | 7 | Compressor | 11 | Condenser fan |
| 4 | Evaporator coil | 8 | Electronic controller | | |

This active refrigeration works in conjunction with a heat pipe that passively removes heat from the enclosure based on the difference of internal and ambient temperatures.

### 2.4.3 Safety Concept

**WARNING**

**Hazards due to modified safety equipment**

Non-functioning or defective safety equipment can cause severe accidents.

- Any changes to the unit, particularly the safety equipment, are prohibited.
- In case of defective safety equipment, shut down the unit and decommission it immediately.
- Fans and compressors are protected from overloading and overheating.
- These cooling units have a pressure switch tested in accordance with UL 60335-2-40. The pressure switch reacts to excessive pressure in the refrigeration system by switching off automatically.

## 2.5 Type Plate

This figure shows the standard version of type plate.


| Item Number | Designation | Item Number | Description |
|---|---|---|---|
| 1 | Manufacturer logo | 11 | Refrigerant type and weight |
| 2 | Unit type | 12 | Global Warming Potential |
| 3 | Part number | 13 | CO2 equivalent value |
| 4 | Serial number | 14 | CE Mark |
| 5 | Rated operating voltage & frequency | 15 | UL Mark |
| 6 | Current Ratings | 16 | QR code to website |
| 7 | Design Pressures | 17 | Internal Fuse |
| 8 | Exterior / Interior Temperatures | 18 | UL Pre-Fuse |
| 9 | Power ratings | 19 | Heater Power |
| 10 | Protection types (IP, NEMA) | 20 | Cooling capacity |

## Further Explanation of Type Plate Field

| Designation | Explanation |
|---|---|
| Rated operating voltage & frequency | Criteria for the power supply that must be connected to the unit by the customer. |
| Current ratings | Inom max: Amperage pull of the cooling unit as a whole at maximum rated ambient condition. Istart max: The maximum amperage pulled for a split second upon compressor start. |
| Exterior / Interior Temperatures | Temperatures of the external ambient and internal cabinet air for the standard rating conditions where power consumption and cooling capacity were measured. |
| Power ratings | Power consumption at the standard rating points, and the rated voltage/ frequency inputs. |
| Protection Types | The level of protection from environmental conditions as designated by the NEMA and IP ratings. |
| Refrigerant type and weight | The type of refrigerant in the unit followed by the mass in grams in the active system / the passive coil, respectively. |
| Global Warming Potential | A value that compares the refrigerant type to CO2 on the basis of how long it lasts in the atmosphere, how well it absorbs the sun's radiation, and how it reacts with the atmosphere while breaking down. |
| QR Code | Scan this to register the product to activate warranty. |
| Internal Fuse | Fuses internal to the cooling unit that protect control or branch circuits. |
| UL Pre- Fuse | Fuse to be installed by the customer on the cooling unit's incoming power to comply with UL listing. |
| Heater Power | Maximum heating power of the enclosure heater. (optional) |
| Cooling capacity | The amount of heat the unit can effectively remove at the standard rating points. |

## 2.5 Technical Data and Spare Parts

Technical data, spare parts, and cutouts can be found on our website here:
http://pfannenbergusa.com/thermal-management-downloads/

| Cooling Data | DHS 34x1 Series | | |
|---|---|---|---|
| Cooling capacity (Q0) A35°C(95°F)/A35°C(95°F) | 2100 W / 7165 BTU/h | | |
| Cooling capacity (Q0) A50°C(122°F)/A40°C(104°F) | 1540 W / 5254 BTU/h | | |
| Refrigerant type<br>Refrigerant amount | Active Cooling System<br>R-513a: 650 g / 22.9 oz. | | Passive Cooling Coil<br>450 g / 15.9 oz. |
| Adjustable thermostat setting LP2 (factory setting) | +35°C / +95°F | | |
| COP / EER A35°C(95°F)/A35°C(95°F) | 2.15 / 7.30 | | |
| COP / EER A50°C(122°F)/A35°C(95°F) | 1.33 / 4.55 | | |
| Failure indication: Enclosure internal temp. (factory set) | > +50°C / +122°F | | |
| Ambient air temperature | -25°C / -13°F . . . +50°C / +120°F | | |
| Air volume, external circulation maximum | 721 m³/h / 424 CFM | | |
| Air volume, internal circulation maximum | 721 m³/h / 424 CFM | | |
| Condensation discharge | active evaporation tray; Condensate overflow via hose | | |
| **Electrical Data** | | | |
| Voltage (All SIngle Phase) | 115V | 230V | 400/460V |
| Mains frequency | 60 Hz | 50/60 Hz | 50/60 Hz |
| Operating range | 103 V .. 127 V | 207 V .. 253 V | 360 V.. 440 V / 414 V .. 506 V |
| Power consumption @ A50°C(°F)/A40°C(104°F) | 1200 W | | |
| Nominal Running Current | 10.4 A | 5.3 A | 2.1 A |
| Maximum starting current | 44A | 22A | 11A |
| Recommended Maximum Fuse Size | 17.5 A (Time Delay Fuse Class CC) | 10 A (Time Delay Fuse Class CC) | 4.5 A (Time Delay Fuse Class CC) |
| Certifications | CE, cULus | CE, cULus | CE, cULus |
| **Physical Specifications** | **DHS 3441 (Indoor application)** | | |
| Height | 1444 mm / 56.82 inch | | |
| Width | 396 mm / 15.59 inch | | |
| Depth | 350 mm / 13.75 inch | | |
| Weight (230V models are 5.1 kg / 11.3 lb lighter) | 63.2 kg / 139 lb | | |
| Unit construction / | G90 Galvanized Steel | | |
| Corrosion protection | Electrostatically powder coated. Baked (200°C / 392°F) | | |
| Protection classification (against the enclosure, under correct operating conditions) | Type 12 , IP 54 (EN 60529) | | |
| | **DHS 3461 (Outdoor application)** | | |
| Height | 1444 mm / 56.82 inch | | |
| Width | 396 mm / 15.59 inch | | |
| Depth | 414 mm / 16.29 inch | | |
| Weight (230V models are 5.1 kg / 11.3 lb lighter) | 70 kg / 154 lb | | |
| Unit construction / | G90 Galvanized Steel | | |
| Corrosion protection | Electrostatically powder coated. Baked (200°C / 392°F) | | |
| Protection classification (against the enclosure, under correct operating conditions) | Type 3R/4 , IP 56 (EN 60529) | | |
| | **DHS 3481 (Corrosive washdown application)** | | |
| Height | 1444 mm / 56.82 inch | | |
| Width | 396 mm / 15.59 inch | | |
| Depth | 414 mm / 16.29 inch | | |
| Weight (230V models are 5.1 kg / 11.3 lb lighter) | 71.1 kg / 141 lb | | |
| Unit construction / | G90 Galvanized Steel | | |
| Corrosion protection | 304 Stainless Steel / Rostfreier Stahl / Acieo inoxydable | | |
| Protection classification (against the enclosure, under correct operating conditions) | Type 4/4X, IP 56 (EN 60529) | | |

# 3 : ASSEMBLY AND INITIAL COMMISSIONING

## Safety Information

**DANGER**

**Danger of fatal injury due to electric shock**

- Parts may be under voltage when the unit is opened and can cause an electric shock if touched.
- Observe the following points when working on the open unit:
  - Work on the electrical system may only be carried out by authorized electricians.
  - Before commencing work on the electrical system, switch off the power supply, check that no voltage is applied and
  - Secure against being switched back on.
  - Cordon off the working area and post a warning sign.
  - The electrical connection must be made according to nationally valid regulations

**CAUTION**

**Danger of crushing!**

Danger of crushing between the switch cabinet and the unit frame during assembly of the unit.

- Do not place any body parts between the frame and the unit cut-out.
- Work carefully and wear cut-proof gloves.

***NOTICE***

**Damage to the switch cabinet equipment by metal chips**

Metal chips can get into the switch cabinet when fitting the assembly cut-outs.

- Protect the switch cabinet from contamination during assembly and use protective covers.

## 3.1 Storage

- Do not expose the cooling unit to temperatures below -40°C or above +70 °C during storage*.
- Unit must be in the upright position.
- The warranty will no longer apply if these instructions are not observed.

## 3.2 Transport

**WARNING**

**Hazards due to uncontrolled movements**

Improper securing of the unit can result in severe accidents.

- Loading must only be carried out by trained, qualified personnel.
- 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

***NOTICE***

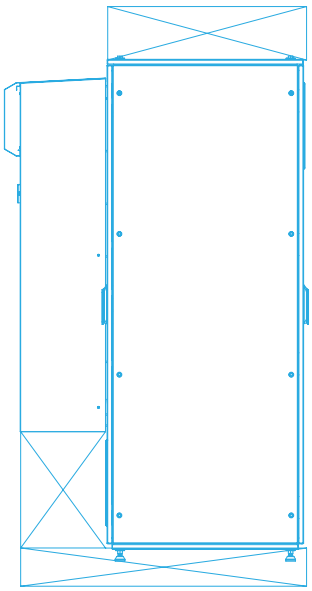
**Danger of material damage during transport and setting down of the units.**

- Improper device securing or uncontrolled movements can cause damage.
- Exercise maximum caution during movement and transport of the units.
- See Technical Data for unit weight.

---

## Requirements:

- Cooling units must be in the packaging provided by the factory, banded to pallet.
- Unit must be in the upright position.
- If the unit is being shipped after installation to an enclosure, it shall be packed with a support to prevent mounting failure see figure below.



**REQUIRED TOOLS AND MATERIAL:**

- Lashing straps, loading crane, if applicable

PROCEDURE:

- Always raise cooling units by the pallet they are secured to from the factory.
- Always raise cooling units slowly and evenly and set down safely.
- Secure correctly for transport with lashing straps.
- Verify no physical damage to cooling unit.

## 3.3 Unpacking

**WARNING**

**Hazard of accidents due to the heavy weight of the units**

Uncontrolled movements of the units during assembly can cause accidents.

- Use suitable lifting equipment and secure units to prevent accidents.
- Secure assembled components.

**CAUTION**

**Hazard 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.

***NOTICE***

- Perform a visual inspection for transport damage when unpacking the cooling units. Take note of any loose parts, dents, scratches, visible loss of oil etc.
- Inspect and secure the packaging material for any loose functional parts before disposal.
- Report any damages to the freight carrier immediately. Observe the “Terms for Cases of Damage”.
- When reporting, use precise information about defects, including possible photos must be provided for the handling of warranty claims. Always specify the type designation and serial number.

**Unpacking Procedure:**

- Cut banding straps
- Remove staples from bottom
- Pull box sleeve up and off the unit.
- Remove protective cardboard collar, careful not to damage interface gasket.
- Employ team lift, or replace the bolts on the top of the unit with the bolts from the access pack to use a crane, to lift the unit out of the bottom packaging and off the pallet.

Crane transport:

**DANGER**

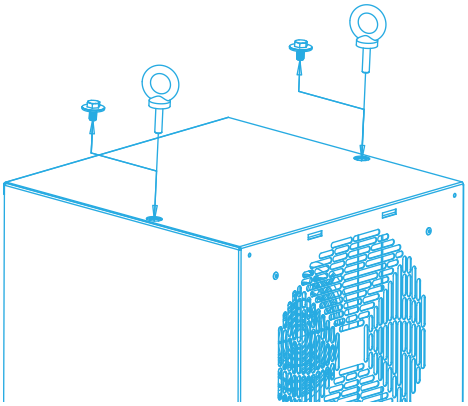
**Danger to life due to suspended loads Tipping or falling loads can cause severe to fatal injuries**

- Never stand beneath suspended loads.
- Only use approved lifting gear and slings which are designed for the total weight of the attached load.
- Only use slings/load handling devices in technically perfect condition.
- Observe the sling points and center of gravity of the load.
- Secure loads with suitable devices.

**WARNING**

**Risk of injury due to improper crane transport. Moving switch cabinets with integrated cooling units can lead to accidents.**

- Lifting by M8 jack rings is only permitted for the cooling unit.
- Make sure that jack rings and unit threads are not damaged and deformed.
- Use only jack rings with sufficient thread length in accordance with DIN 580 and check their fit.
- Be sure to replace hex screws and sealing washers.



## 3.4 Assembly

**CAUTION**

**Hazard of crushing during assembly of the unit**

There is a hazard of crushing between the switch cabinet and frame of the unit during assembly.

- Keep body parts out of the space between the frame and unit cut-out.
- Work carefully and wear gloves.
- Employ crane or team lift to position unit.
- Secure the cabinet against tipping.
- If mounting on a door, the hinges must be able to support the weight of the unit in the open position.

### 3.4.1 General Assembly Requirements

- Select an assembly location for the switch cabinet which will guarantee adequate ventilation of the cooling unit.
- A minimum clearance of 500mm from the display to the opposite obstruction, and 200mm clearance around the unit (top & side) to the nearest obstruction must be observed.
- Installed components in the switch cabinet must not impede air circulation.
- Protect the installation location from heavy contamination with covers.
- Inside of the switch cabinet a minimum clearance of 200mm between the back of the cooling unit to the nearest component must be observed to prevent obstruction of airflow and allow access to the electrical panel of the unit during service and maintenance.
- If ducting is used, contact Pfannenberg for information.
- Installed location should not be accessible to the general public.

## Make cut-outs for the DHS cooling unit

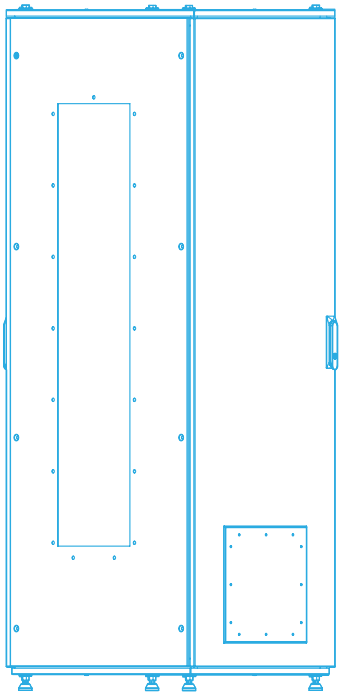
**REQUIRED TOOLS AND MATERIAL:**

- Saw or switch cabinet cutter
- Drill and 5/16” (8mm) drill bit
- Protective covers
- Accessory kit: Threaded bolts, screws, nuts, washers, cut out template. Eye bolts optional for crane lift optional.

**PROCEDURE**

Cabinet Cut Out

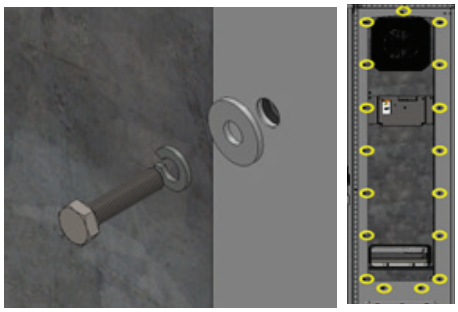
- Use a protective cover to protect the switch cabinet from chips.
- Use the provided template to mark the prescribed cut out. Check for level square and center, if applicable.
- Cut along lines and drill holes at center points.
- Deburr the cut edges.
- Remove chips and assembly waste from the switch cabinet



## DHS COOLING UNIT INSTALLATION

REQUIRED TOOLS AND MATERIAL

**PROCEDURE**

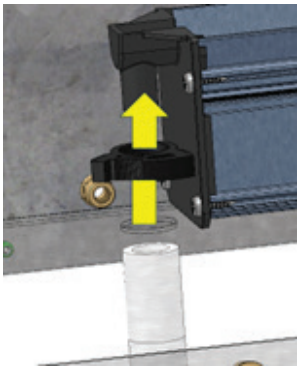
| | |
|---|---|
| • Screw in the two supplied threaded bolts (accessory kit) in the upper fastening points of the DTS cooling unit |  |
| • Follow crane lift instructions for eye bolts, or team lift into position.<br>• Be sure to replace the bolts and washers removed to ensure stated IP protection. |  |
| • Suspend the cooling unit on the switch cabinet with the threaded studs installed from outside.<br>• Install flat washer, lock washer and nut to each stud. |  |
| • Tighten the screws on the DHS cooling unit on the switch cabinet interior. Use the supplied screws, nuts and washers (accessory kit) to fasten the unit. Firmly tighten the screw fasteners to 12 ft-lbf (16Nm), or until seal is tightly squeezed. |  |

## CONDENSATE DRAIN HOSE INSTALLATION

**NOTICE**

Unit comes standard with an active condensate management system which collect and burn-off normal amount of condensation. In situation where excessive condensation is formed condensate may drain from unit and cause slippery conditions.

- Be sure to install condensate drain tube to collect or manage water draining from unit.

| | |
|---|---|
| • Remove covers screws (x8) to lift or tilt up bottom of cover.<br>**CAUTION**<br>• If completely removing cover, display cable must first be disconnected from the display attached to the cover, to avoid damage to the cable connection.<br>• Use plyers to pull connection from its base. |   |
| • Push the plastic tube through the hole in the baseplate, and the hose clamp. Then push the tube over the nipple on the condensate tray. |  |
| • Position hose clamp over the nipple but so that there is still some tube showing at the end.<br>Squeeze hose clamp by its tabs so that it is tight and secure to the nipple. |  |
| • Re-install cover.<br>**NOTICE**<br>• Be sure to reconnect display and cover grounding wire if removed. | |

- The DHS cooling unit is now fully installed and ready for electrical connection; see Electrical connection.

## 3.5 Electrical Connection

### 3.5.1 Main supply connection

**DANGER**

**Danger of fatal injury due to electric shock!**

- Work on electrical connections must be carried out exclusively by trained, qualified electricians
- Equipment grounding must be provided in accordance with NFPA 79 chapter 8.2 or DIN EN 60204-1, chapter 8.2.
- Each element of electrical equipment must be connected to the equipment grounding.
- If parts are removed, e.g. for maintenance work, ensure that equipment grounding is not interrupted for the remaining parts.

**Electric arcing can cause electric shock and burns.**

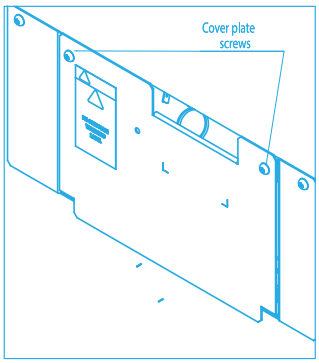
- The plug connector for mains connection must never be plugged in or disconnected under load/voltage.
- Before assembly, de-energize all supply lines to the separate fuse or a main switch, disconnect the system and secure to prevent re-connection of the Cooling unit electrical connection
- Switch off the power supply and secure against switching back on before working on the mains connection.
- Work on the connectors must only be carried out under sufficient lighting.

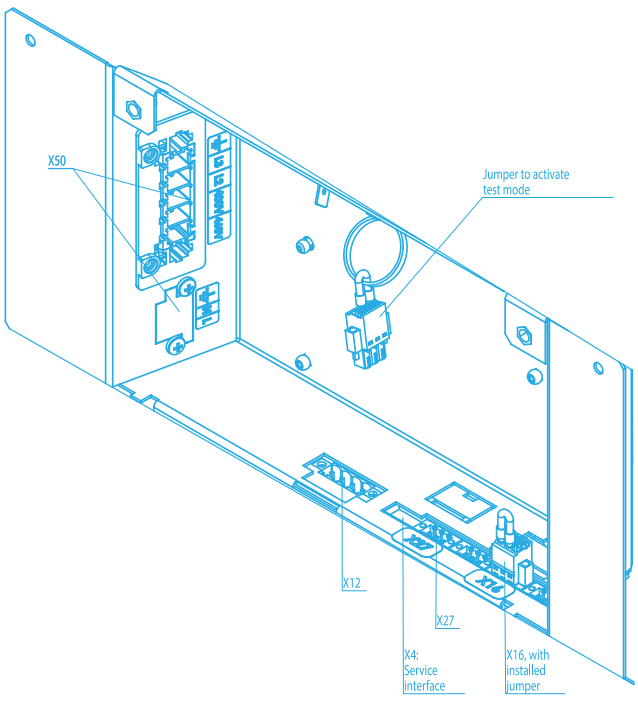
**WARNING**

**Risk of fire!**

An incorrect cable cross-section will cause the cable to overheat. Scorched insulation can cause fires.

- The cable cross-section matches the output required for the power consumption and is 1.5 – 2.5mm² or AWG 16 to AWG 14.
- Applying incorrect power will void warranty and can cause operational issues.



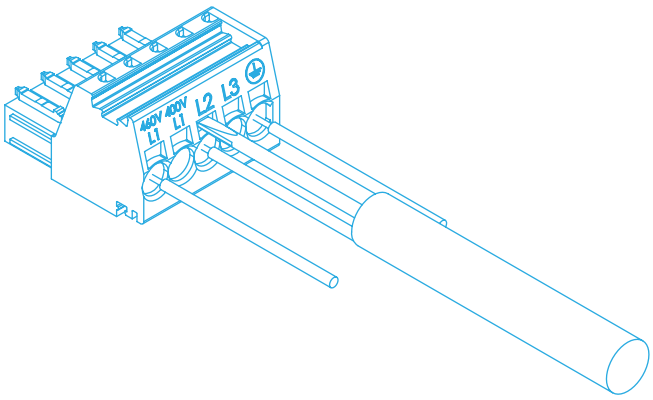



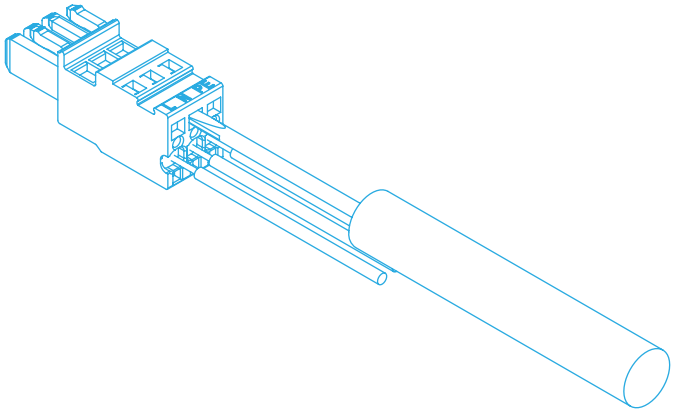
**Electrical connection of the cooling unit**

The device corresponds to overvoltage category II.

Follow these general requirements to ensure safe and reliable operation of the cooling unit:

- Connection of an upstream temperature control on the feed side is prohibited.
- Connect the fuse or circuit breaker specified on the type plate as line protection to the voltage mains.
- Always connect the cooling unit to the mains via a disconnecting device (switch/contactor).



## Refer to Connection Diagrams:

| | 400V | 460V |
|---|---|---|
| 460V | Blank | L1 |
| 400V | L1 | Blank |
| L2 | L2 | |
| L3 | L3 Placeholder | |
| PE | ⏚ | ⏚ |

| | 115V | 230V | 230V |
|---|---|---|---|
| L | L | L | L1 |
| N | N | N | L2 |
| PE | ⏚ | ⏚ | ⏚ |

**Procedure**

1. Connect to the mains according to the circuit diagram, see chapter “Electrical circuit diagram.” Page 23.
2. Use at minimum 16AWG or 1.5mm2. Strip insulation back 1/2” to 9/16” or 13 – 15mm from ends.
3. Open the cage clamp terminal of the mating plug with the flat screwdriver and connect the cables on the mating plug.

– Firmly insert the screwdriver into the cage clamp terminal. Never turn, this will damage the cage clamp terminal.
– Select the terminal L1 according to the mains voltage (400/460 V)

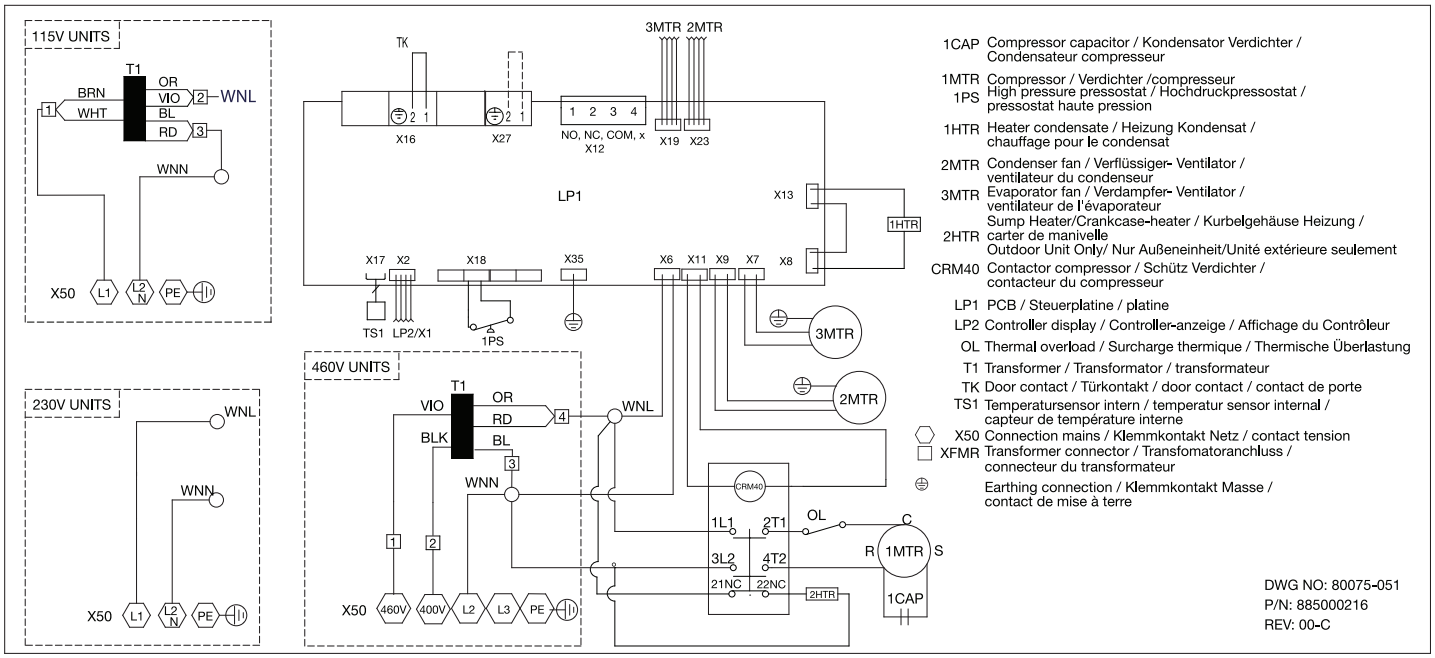
4. With power switched off, plug the mating plug into the mains plug at X50.
5. Before switching on, make sure that the mains voltage and upstream fuse matches the data on the type plate.
6. The cooling unit is now connected electrically, and ready to operate.

## DANGER

**Life-threatening hazard due to electric shock**

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

- Work on electrical connections must be carried out exclusively by trained, qualified electricians.
- Ensure that the unit is voltage-free before routing all electrical connections.




| Circuit Diagram Legend | | | | | |
|---|---|---|---|---|---|
| 1CAP | Compressor run capacitor | T1 | Transformer | X16 | Door contact |
| CRM40 | 1MTR contactor | TK | Door contact | X17 | Temperature sensor |
| 1HTR | Condensate evaporating heater | TS1 | Temperature sensor | X18 | Pressostat contact |
| 2HTR | Compressor sump heater | X2 | Display interface | X19 | 2MTR speed control |
| LP1 | PCB main controller | X6 | Controller power in | X23 | 3MTR speed control |
| LP2 | Interface display | X7 | 3MTR power | X27 | Precool/ test mode con-nection |
| 1MTR | Compressor | X8 | 1HTR power | X35 | Controller grounding |
| 2MTR | Condenser fan | X9 | 2MTR power | X50 | Unit power connection |
| 3MTR | Evaporator fan | X11 | Compressor switch | XFMR | Connector to transformer |
| OL | 1MTR thermal overload | X12 | Alarm | ⏚ | Earthing connection |
| 1PS | High pressure switch | X13 | 1HTR Fuses | | |

### 3.5.2 Door Contact Switch

**WARNING**

**Hazard due to connection of external voltage at the input of the door contact**

External voltage can cause severe accidents.

- Connection of external voltage to the input for the door cabinet will cause damage to the unit.
- Installation of a door contact switch increases safety and prevents increased accumulation of condensate.
- If a door contact switch has not been connected, the connection contact (X16 / TK) must be jumped.

Fitting a door contact switch increases safety and prevents increased condensate formation. The door contact switch switches off the cooling unit motors (fan, compressor) when the switch cabinet is opened. The door contact switch must interrupt the connection between the terminals X16:1 and X16:2 when the switch cabinet door is open.

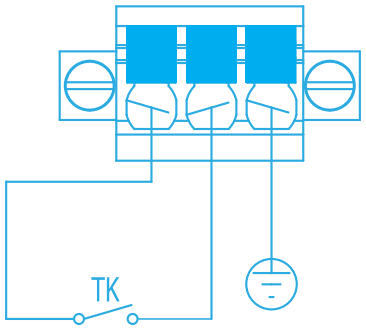
### Door contact switch installation

REQUIREMENTS:

- The cooling unit is de-energized.

PROCEDURE:

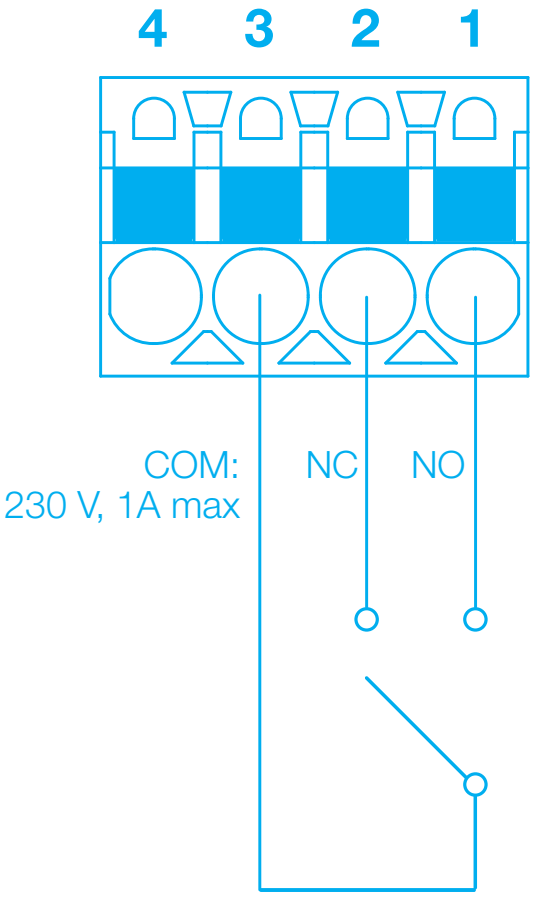
- The door contact switch (TK) is connected to the X16 connection at 1 & 2 (see electrical circuit diagram in the housing cover or technical datasheet)
- The door contact is supplied with low voltage from the control board on DHS units.
- The door contact switch is connected. The motors switch off when the switch cabinet is opened.



## Alarm Relay

The unit is equipped with a potential-free changeover contact for the collective fault signal.

Three connections are provided for connecting the collective fault signal. The alarm relay is accessible through the four position X12 connector included with the access pack. The X12 port consists of a common input rated up to 5A 230V , a normally closed output and a normally open output. The fourth pin is blank. See electrical circuit diagram.



# 4 : OPERATION

## 4.1 General Functions

***NOTICE***

**Danger of damage to the cooling unit**

Operation without the unit cover prevents the adequate supply of air to the condenser, and limits stated capacity.

- Only operate the cooling unit with the unit cover installed.
- The ambient temperature must be less than 50°C.

## 4.2 Operation of the cooling unit

- After connection and switching on of the mains voltage, the device switches to operating mode.
- The cooling unit is equipped with an electronic control unit. A temperature sensor detects the temperature of the air sucked in from the interior of the switch cabinet. The unit provides active or passive cooling based on this.
- Active cooling mode as needed; this will take place depending on whether a temperature switching threshold (SETP) is reached or undercut.
- Active cooling mode switches off when the temperature switching threshold (SETP) is undercut.
- Passive cooling mode runs at internal temps below the setpoint and increases fan speed as the temperature approaches the setpoint until active cooling is needed.
- All unit motors switch off when the door contact is opened.
- If the upper or lower limit temperature is exceeded or undercut, a fault indication is triggered.
- Faults are shown in the form of error numbers on the display, see troubleshooting section.
- Full unit functionality can be tested by jumping X27 1 & 2 with the provided connector zip tied to the electrical panel.
- When the jumped X27 connector is plugged in, the unit will enter “test mode”:
  - The unit will power cycle through all components (30sec of cooling follow by 60sec of both fan operating) to ensure functionality before returning to normal operation.
  - The X27 connector could be left plug-in after and should not impact normal operation.

**Operating conditions**

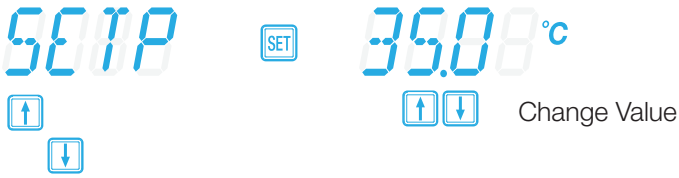
- The mains voltage must lie within the specified range.
- A deviation of ±10 % is permissible.
- The ambient temperature must be below 50°C.
- The cooling unit must only be used in such a manner as to ensure that the specified cooling capacity is able to meet actual demands.
- Only the specified refrigerant may be used.

## Display Interface Menu Overview

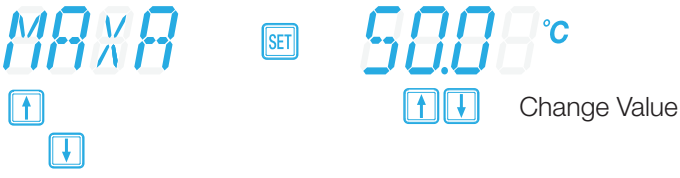
The display interface has five menu options with adjustable parameters. Follow this navigation.

The temperature of the air getting pulled in by the internal fan is displayed during normal operation

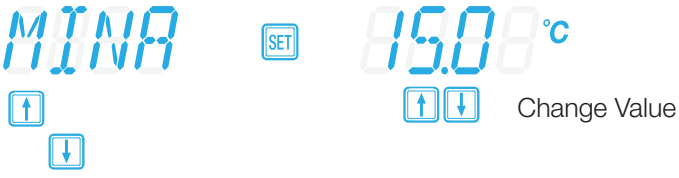

The setpoint at which the unit will cool to can be adjusted. Active cooling will be triggered when this value is overtaken by 2°C.



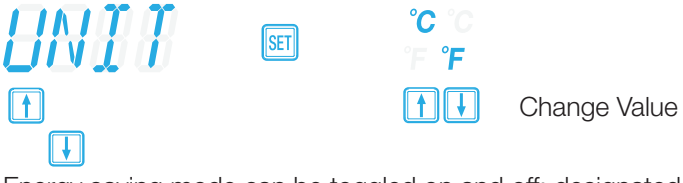

The maximum temperature alarm of the enclosure can be adjusted. When overtaken the unit alarm will be triggered.




The minimum temperature alarm of the enclosure can be adjusted. When undercut the unit alarm will be triggered.




The unit of measurement for temperature can be toggled between Celsius and Fahrenheit.




Energy saving mode can be toggled on and off; designated as 1(on) and 0(off) respectively. When set to 1, the unit enter into extra energy saving mode. Warning: in Energy saving mode the air circulation inside the cabinet will be reduced and could results in hotspots in densely pack enclosure.


A Passcode can be programed in to protect set parameters. Unit is shipped without any passcode programmed. To set a 4 digit passcode to set parameters, go to the “PASS” function and press the set button. 4 zeros will appear with the first one blinking. Use the up and down button to select digits and press set to select each. After pressing set on the last digit this value will be stored and the user will be prompted to enter the passcode to change all other parameters.

# 5 : SERVICE AND MAINTENANCE

## 5.1 General

The refrigeration circuit is a maintenance-free, hermetically sealed system.
The units are 100%-tested at the factory

**Manufacturer recommendation to the owner for maintenance work:**

- Perform maintenance work regularly every 12 months according to the maintenance checklist, see section “Maintenance Schedule”. Shorter maintenance intervals are required for cooling units exposed to ambient air containing oil and dust. A shorter guide value of two to six months applies these cases.
- Pfannenberg add-on filters are designed to fit the cooling unit and have a positive effect on the scope of cleaning maintenance.

## 5.2 Safety information

**DANGER**

**Life-threatening hazard 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 working on the unit, 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.

**CAUTION**

**Hazards of crushing during removal of the unit cover•**

Hands and other body parts can be crushed during removal and re-installation of the unit cover.

- Keep body parts out of the space between the frame, springs and unit cut-out.
- Work carefully and wear gloves.

---

***NOTICE***

**Danger of unit damage due to incorrectly performed maintenance**

Disregard of the recommended maintenance work reduces the cooling capacity of the cooling unit and could result in reduced machine availability.

- Maintenance work must be carried out regularly, as specified in the maintenance checklist.
- Warranty claims are only valid for units that have been maintained according to specification.

## 5.3 Maintenance checklist template

### Cooling Unit Maintenance Checklist

**Maintenance Interval:**

- Conduct maintenance every twelve months.
- Conduct maintenance every two to six months in oil and dust-laden environmental air.

**Type:** _____

**Serial number:** _____

**Date of maintenance:** _____

**Technician:** _____

| | Unit range designation/ Required maintenance tasks | Visual inspection | To Do | Result |
|---|---|---|---|---|
| 1 | **Assess before maintenance** | | | |
| 1.1 | General visual inspection of the cooling unit | | | |
| 1.2 | Inspection for corrosion damage | | | |
| 2 | **Refrigeration circuit** | | | |
| 2.1 | Check refrigerant carrying parts for oil traces | | | |
| 2.2 | **Check refrigerant carrying parts for leaks** | | | |
| 2.3 | Check electrical connections for damage | | | |
| 3 | Condenser & passive heat exchanger | | | |
| 3.1 | Inspection for general corrosion damage | | | |
| 3.2 | Inspect for blockage from contaminants | | | |
| 3.3 | **Check, clean and align fins*** | | | |
| 4 | Condenser fan (external) | | | |
| 4.1 | Inspect mount for loose parts | | | |
| 4.2 | Inspect the electrical connection for damage | | | |
| 4.3 | Check motor bearings for noises | | | |
| 4.4 | Check the drive for signs of overheating | | | |
| 4.5 | Clean fan* | | | |
| 5 | Evaporator fan (internal) | | | |
| 5.1 | Inspect mount for loose parts | | | |
| 5.2 | Inspect the electrical connection for damage | | | |
| 5.3 | Check motor bearings for noises | | | |
| 5.4 | Check the drive for signs of overheating | | | |
| 5.5 | Clean fan* | | | |

* Maintenance intervals are more frequent, depending on the degree of contamination.

## 5.4 Removing and Installing Cover

**WARNING**

**Hazard due to improper maintenance work**

Damage of components and faulty replacement of components can cause accidents.

- Always switch off the disconnector/contactor before beginning maintenance work.
- Wait For unloading phase of 5 minutes for the electric components, to open unit cover.
- Ensure that the fans are in idle position and are no longer rotating.
- After replacement of defective parts or components, inspect the unit for correct and safe operation.
- After all maintenance check to ensure the full capability of the condensate drain.
- Condenser coil may be as hot as 80℃ (176F) after running for extended periods. Wait to cool before operating in it's space.

**Procedure**

1. See illustrated procedure for cover removal in the condensate hose installation section.
2. Remove the six T25 torx screws and 2 hex screws on top of the unit cover (2).
3. Lift the unit cover (2) about 15 mm
4. Pull the cover off, away from enclosure

ATTENTION – Damage to display cable

Always pull off the display cable and grounding wire(3) from the inside of the unit cover before fully removing the unit cover.

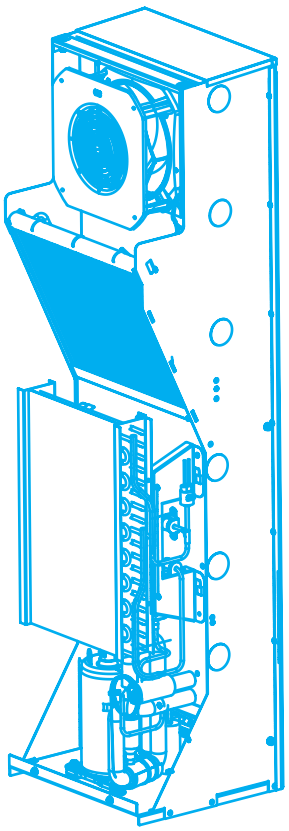
5. Re- Installing: move the cover into position and connect display and grounding connections. Be sure that they do not get caught in the cover.
6. Replace cover and be sure to hook the flange on the front of it over the unit. Then line up and re install the 8 screws and 2 sealing washers on top.

## 5.5 Cleaning fans and heat exchangers

**Hazards of accidents due to component damage during cleaning**

Cleaning of cooling units with water jet, steam jet, high-pressure washer or sharp objects can damage the electrical and electronic assemblies. Malfunctions can cause accidents.

- Do not clean with a water jet, pressure washer or flammable cleaning agents.
- Protect electrical components from the penetration of moisture.
- Do not use pointed or sharp-edged objects to clean the fins. They must not be pinched or damaged.



Procedure

1. Clean heat exchanger fins and condenser fan with a soft brush, with compressed air or with a vacuum cleaner with brush attachment.

CAUTION – risk of injury. Do not touch the sharp heat exchanger fins.

CAUTION – dust development when cleaning with compressed air. Wear eye, mouth and nose protection when cleaning with compressed air.

2. Check heat exchanger for bent fins; straighten fins with fin comb.
3. Refit the unit cover.
4. Check that the cooling unit works properly and safely after cleaning.

The heat exchanger is cleaned.

# 6 : TROUBLESHOOTING

## General

**NOTE:**

Flashing of the red LED light on the controller card is not a fault indication or error message.
The red LED light indicates that the cooling unit is carrying voltage

| Fault | Possible causes | Corrective measures |
|---|---|---|
| Unit does not cool; evaporator fan (internal) running | Temperature setting too high | Check the temperature setting |
| Unit does not cool sufficiently | Operating limits exceeded | Check the ambient temperature and internal load |
| | Too little refrigerant | Call in authorized qualified personnel; check the unit for leakage |
| | Heat exchanger dirty | Clean the heat exchanger |
| | Evaporator fan (internal) defective<br>Condenser fan (external) defective | Call in authorized, qualified personnel; replace fan |
| | Disruption in the air circulation inside the cabinet | Check the installation and the path of air circulating in the switch cabinet |
| | | Check air flow path of the outlet and return air of the cooling unit and the air paths through the cooling unit |
| Excessive Condensation is accumulating inside of the switch cabinet | Temperature setting is too low | Check the set point value |
| | Switch cabinet is not sufficiently sealed | Check that electrical enclosure is properly sealed to prevent ingress of humitidy |
| Condensate fails to drain | Condensate drain is clogged | Clean condensate drainage hose; ensure that drainage hose is angled downward without bending |

## 6.1 : DISPLAY STATUS CODES

### Display Error Codes

| Display Code | Name | Description | Corresponding Controller Port / Circuit |
|---|---|---|---|
|  | Door | Door contact circuit is open | X16 |
|  | High Pressure | Refrigerant high pressure safety switch has opened | X18 |
|  | Temp sensor 1 failure | Temperature sensor open. Need control board replacement. | X17 |
|  | Temp sensor 1 limit min | Internal air circuit has exceeded the minimum temperature setting | X17 |
|  | Temp sensor 1 limit max | Internal air circuit has exceeded the maximum temperature setting | X17 |
|  | Operation limit external fan | External fan has reached the preset operation counter limit | X9 |
|  | Operation limit internal fan | Internal fan has reached the preset operation counter limit | X7 |
|  | Operation limit Compressor | Compressor has reached the preset operation counter limit | X11 |
|  | Fan external tacho low | External fan tachometer signal reading below expected value | X19 |
|  | Fan internal tacho low | Internal fan tachometer signal reading below expected value | X23 |

## 7 : SPARE PARTS AND ACCESSORIES

**WARNING**

**Spare parts from third-party manufacturers can damage the unit and cause accidents.**

- Only original parts are subject to the manufacturer's quality control.
- Only use specially agreed manufacturer parts for safe and reliable operation.

Note: Always specify the Pfannenberg part numbers when ordering spare parts and accessory parts.

| No. | Description | No. | Description |
|---|---|---|---|
| 18310000151 | Filter adapter | 18310000004 | Premium TTL-USB Converter, Service Interface |
| 18881500010 | Filter adapter w/ 5 pack of fluted filters | 18811000109 | Internal and External Fan |
| 18300000149 | Aluminum Mesh Filter | 18800500212 | PCB |
| 18314000100 | Condensate Collection Bottle | 18830700018 | Transformer |
| 18314000001 | External Condensate Evaporation System-KV PTC, 115 230 V 50/60Hz | | |

## 8 : TERMS OF WARRANTY

**The warranty does not apply or is voided in the following cases:**

- Improper use of the unit.
- Failure to observe operating conditions or disregard of the operating manual.
- Lack of regular maintenance on the cooling units.
- Damage due to disregard of maintenance recommendations.
- Damage to cooling units due to soiled or clogged filters.
- Damage due to unauthorized opening of the refrigerant circuit.
- Modifications carried out on the unit or a change to the serial number.
- In the event of damage during transport or other accidents.
- Replacement of parts by unauthorized personnel.
- Only original Pfannenberg parts are permitted for use. Violations void the warranty.
- Applying incorrect power will void warranty and can cause operational issues.

**For recognition of warranty claims and return of the unit, observe the following:**

- Begin warranty claim by submitted a ticket at https://www.pfannenbergusa.com/service-request-form/
- Include a reference document (delivery note or invoice copy).
- Follow instruction provided by Pfannenberg, once ticket is started.
- Observe transport instructions; see Transport.

## 9 : DISMANTLING AND DISPOSAL

The unit must be dismantled and disposed of in an environmentally friendly way at the end of its useful life.

Units marked by the symbol opposite may not be disposed of with unsorted domestic waste. They must be taken to a separate electrical and electronic waste collection depot. For further information about disposal, scan the QR code or call www.pfannenberg.com/disposal.

**DANGER**

**Danger of fatal injury due to electric shock!**

Parts may be under voltage when the unit is opened and can cause an electric shock if touched. Observe the following points when working on the open unit:

- Work on the electrical system may only be carried out by authorized electricians.
- Before commencing work on the electrical system, switch off the power supply, check that no voltage is applied and secure against being switched back on.
- Cordon off the working area and post a warning sign

### 9.1 Temporary Decommissioning

**WARNING**

**Hazard of injury due to materials and substances**

Improper work on the unit 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 cooling 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.

### 9.2 Final Decommissioning

**CAUTION**

**Hazard of crushing during the decommissioning of units**

Hands and other body parts can be crushed during removal of units.

- Keep body parts out of the space between the frame, springs and unit cut-out.

If cooling 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 cooling unit must only be disposed of by authorized, qualified personnel.
- Waste equipment can be disposed of correctly by Pfannenberg. Freight charges for delivery to one of our manufacturing facilities must be pre-paid.

## 9.3 Safety Information

All work may only be performed by persons with certified qualifications under consideration of:

- the minimum qualification
- this manual
- the valid local regulations and laws
- company-internal work, operation and safety regulations

Use the necessary personal protective equipment for the respective activity for all work.

**Risk of cutting and injury!**

**CAUTION**

Risk of cutting and injury due to production-related, sharp sheet metal edges on the unit.

- Inspect unit for signs of corrosion damage.
- Use personal protective equipment (cut-proof gloves).
- Handle with care.

**CAUTION**

**Risk of injury due to improper working!**

Risk of injury due to improper working on the refrigeration unit.

- The refrigeration unit may only be dismantled by specialized refrigeration companies.

***NOTICE***

**Hazards for the environment**

Refrigerants are harmful to the environment as soon as they escape into the atmosphere.

- Only have work on the refrigeration unit carried out by experts in accordance with the chemicals climate protection directive.
- Do not damage refrigerant lines.
- Pass on refrigerants for professional treatment.

**NOTE:** Dismantling and disposal are to be carried out by the owner or persons authorized by them.
Contact the local authorities or special disposal companies for information on issues of environmentally friendly disposal.

## 9.4 Dismantling

**DANGER**

**Danger to life due to electric shock. Make sure that the unit is voltage-free.**

Procedure

1. Switch off the unit, secure against switching back on and wait until all parts have a temperature below 40 °C.
2. Physically disconnect all energy and media supplies from the unit, discharge stored residual energy.
3. Clean dirt and contamination from the unit.
4. Remove operating and auxiliary materials and dispose of them in an environmentally friendly way.
5. Dismantle the unit into the different separable materials.
   - Observe the valid work safety and environmental protection regulations.

## 9.5 Disposal

Dismantled components should be recycled unless return or disposal agreements have been made:
- Scrap metals
- Hand over plastic elements for recycling
- Dispose of other parts sorted according to their material properties

***NOTICE***

**Hazards for the environment**

Improper disposal of chemicals (e.g. additives) can cause environmental pollution.
- Chemicals must not be thrown in with the domestic trash and must not be allowed to get into the sewer system or ground.
- Wear appropriate protective clothing (gloves, eye protection, etc.) for disposal.
- Dispose of the used chemicals (as special waste if necessary) and pass on for recycling separately.
- Refrigerants may not escape into the atmosphere. Pass on refrigerants for professional treatment.
- Work on the refrigeration circuit may only be carried out by experts in accordance with the chemicals climate protection directive.
- Observe safety data sheets as well as valid national and local regulations.

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The components of the plant or the unit basically consist of the following materials:
- plastic
- non-ferrous metals
- stainless steel
- steel and aluminum parts
- electronic sub-assemblies
- refrigerants in the refrigeration circuit

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