Instructions for use and assembly

Contents

1. Safety

1.1. Safety notes

Important instructions that serve to protect people or ensure technical work safety are marked in this document with the following symbols.

Table 1: Description of warning symbols

	**Live component warning** Carelessness can result in serious injury or death
	**Flammable substances warning** Carelessness can result in serious injury or death
	**Hot surface warning** Carelessness can lead to injury
	**Cold warning** Carelessness can lead to injury
	**Other warnings** Carelessness can result in serious injury or death
Caution!	**Technical instructions!** Failure to comply may result in property damage or work safety restrictions.

Make sure to follow the safety instructions in Table 2 and note that other important sources of danger are highlighted in the appropriate subsections.

Table 2: General safety instructions

	Never work on the device while it is connected to power. Make sure that all poles of the device are disconnected from the mains at least 2 minutes before.
	For safety reasons, the circulation pump of the heat pump is usually continuously supplied with mains voltage (230 V). Pumps can be disconnected from the mains only by disconnecting all poles.
	The outdoor unit is filled with flammable refrigerant. If a source of ignition is present, a fire or even a deflagration may occur. If you suspect a leak in the cooling circuit, immediately disconnect the device from the power supply at all fuses. Close all nearby doors and windows and cordon off the area within 5 m. Contact your system installer, refrigeration specialist or INOVA heat pump manufacturer.

To prevent the creation of an explosive atmosphere in the building, pay attention to the following:

- Penetrations of pipes and power cables through the wall should be completely closed (sealed).
- Do not install automatic vents and safety valves in the boiler room.
- Do not install safety valves or automatic vents on the system in the building (a 2.5 bar safety valve is installed in the outdoor unit).
- The outdoor unit may only be installed outdoors.
- Pay attention to the safety zones at the installation site

Follow the transport regulations. Improper transport can lead to injury due to tipping over and damage to the device.

The device must be fixed to prevent it from sliding, moving and tipping in all directions.

Planning, installation, assembly, commissioning and maintenance work may only be performed by specialized companies in accordance with applicable legal regulations, provisions and guidelines. In addition, the specifications in this document must be adhered to.

Changes to safety parameters and modifications to the device without the consent of the INOVA heat pump company are not allowed. INOVA heat pumps do not assume any responsibility for any resulting damage.

The device must be energized throughout the year, otherwise the important safety functions cannot be fulfilled.
Especially problematic: when the outside temperatures are low, the formation of ice in the heat exchangers cannot be prevented. This can later lead to leaks in the cooling circuit.
In case of longer power outages and outside temperatures below 0°C, the outdoor unit needs to be drained hydraulically.

Hanging loose objects (e.g. chains) must not be carried near the fan.

To prevent burns, check the temperature first before touching the component

Caution! The use of the device must be reported to the power supply company.

Caution! Tilting the outdoor unit by more than 45° during transport is not allowed.

1.2. Area of application

The heat pump may only be used in closed hydraulic systems for heating or cooling of space and heating of drinking water.

For your own protection and to avoid damage to the device, the heat pump must not be used by certain groups of people. This applies to people with a lack of knowledge/handling or with limited mental, physical or sensory abilities (including children), unless they are supervised or instructed by a responsible person

1.3. Notes on legal regulations

The device complies with all relevant guidelines, regulations and standards for use in "domestic use" (according to 2006/42/EC - Machinery Directive). The declaration of conformity with the list of documents taken into account is attached in the appendix.

Assembly and installation of the heating system may only be performed by authorized installation/service companies. In addition to the requirements of this document, other country-specific laws and standards must be followed.

2. Information about the document

This document serves as information for safe and targeted use of

- Transportation
- Planning
- Assembling
- Installation
- Commissioning
- Decommissioning
- Maintenance

of the described product for authorized installation/service companies.

Table 3: Applies to types of product:

Product code	Model code
Air Compact Propan 10kW	ACP10
Air Compact Propan 15kW	ACP15

Instructions remain at the installation site from the time of installation to the time of disposal. The scope of delivery includes a commissioning report, which must be completed by a person authorized for commissioning. In addition, all maintenance and repair work must be recorded in a logbook (see appendix).

Table 4: Version numbers

Version number	Date of issuing
Version 1.0.0	December 12, 2023
Version 1.0.1	February 19, 2024

2.1. Scope of delivery

Table 5: Scope of delivery

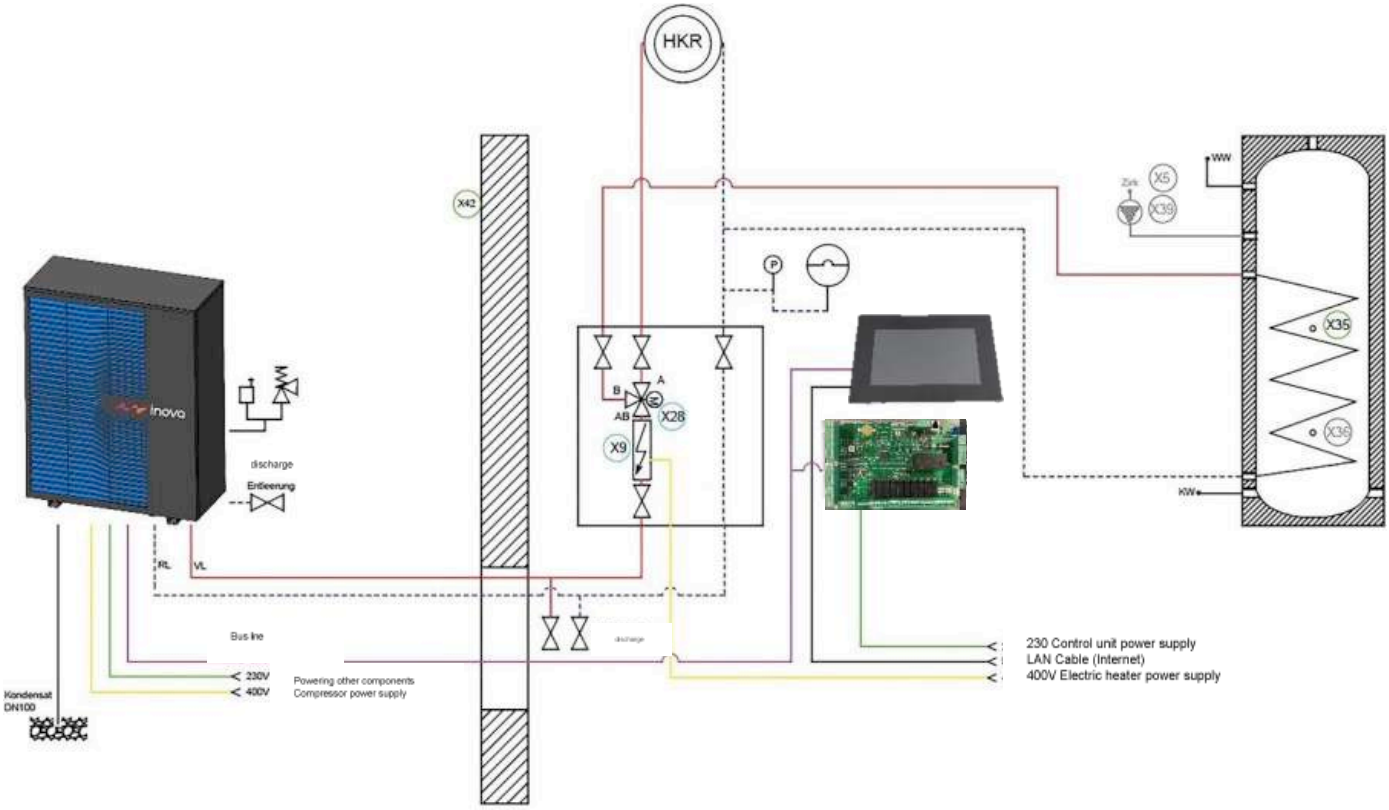
Type	Item	Scope of delivery	Package
Basic equipment	Heat pump	- Outdoor unit - Instructions for use and assembly - Commissioning protocol	- completely wrapped in cardboard - palette
Necessary accessories	Control center	- Touch screen - AHC central control	- package in the heat pump

All products are sold exclusively to specialized companies. Statutory warranty provisions apply (see General Terms and Conditions for further information), unless separate written agreements have been made.

2.2. Description

2.2.1. System

The heat pump consists of an outdoor unit and a control center located in the building. The outdoor unit and the control center are connected to each other only by a communication line (communication cable). The control unit takes control of all the hydraulic components in the facility (circulation pumps, motor valves, ...) and contains a touch-sensitive control screen, while all the refrigerant transfer components including the ARC cooling circuit control unit are located in the outdoor unit.



Layout 1: Principle diagram

2.2.2. Mode of functioning

A heat pump is a device that absorbs heat at a low temperature and releases it at a high temperature. With air/water heat pumps, the surrounding air is used as an energy source. Heat is extracted from the ambient temperature at a low temperature level and heating water is heated at a high temperature level. The outside air at the outlet from the heat pump is cooled by approximately 3°C.

The mode of operation is based on the Carnot process. The liquid refrigerant evaporates completely in the evaporator (plate heat exchanger) at low pressure and low temperature level. For that phase, the required heat is taken from the energy source (air from the environment). The gaseous refrigerant leaving the evaporator is then compressed in the compressor. During this process, the pressure and temperature of the gas/refrigerant increases. The compressor is powered by electricity. "Hot gas" is fed into a heat exchanger (condenser) where, by heating the energy is released into the heating system. In this phase of the process, the refrigerant completely liquefies (turns into a liquid) at a high temperature level. The liquid refrigerant, which is still under high pressure, is further "expanded" through the expansion valve and brought to the original pressure and temperature level. This completes the circular cycle.

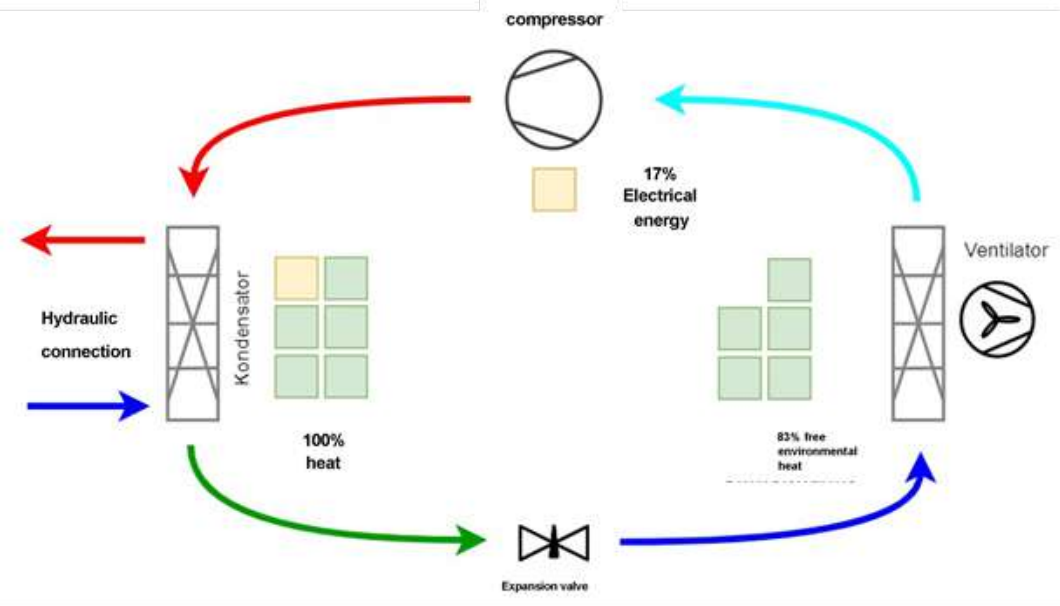


Figure 2: Principle of operation

The thermal energy delivered to the heating system mainly comes from the free heat from the environment (energy content of the air) and, to a lesser extent, from the electrical drive energy required by the compressor. The share of electricity increases with the temperature difference between the heating system and the energy source that needs to be overcome. In other words, the lower the outside temperature and the higher the temperature of the heating system's supply line, the greater the need for electricity for the heat pump.

This device automatically adjusts the heating power to the conditions using speed modulation. This means that the heat exchanger surfaces can be better utilized and inefficient start-up phases can be reduced. In addition, a more even heat transfer to the heating system is possible, which means that the required temperature of the heating water can be reduced. This results in significant operational cost savings.

Due to air cooling, frost may form on the evaporator fins at outside air temperatures below 2°C. The layer of ice has an insulating effect and thus reduces the efficiency of the device. Therefore, from a certain point onwards, the cooling circuit controller automatically starts defrosting.

Caution!	In order to ensure a problem-free defrosting process, the minimum flow on the heating side and the minimum backflow temperature of 12°C specified in the technical data must be maintained.

2.2.3. Outdoor unit

2.2.3.1. Equipment and dimensions

The outdoor unit contains all the components of the cooling circuit including the fan, the cooling circuit controller (ARC) and the frequency controller for the compressor with speed control. The entire quantity of refrigerant is in the outdoor unit. There is also a safety valve (2.5 bar) and two automatic air vents on the hydraulic side of the outdoor unit

Figure 3: Outdoor unit ACP10 1170 x 1150 x 510

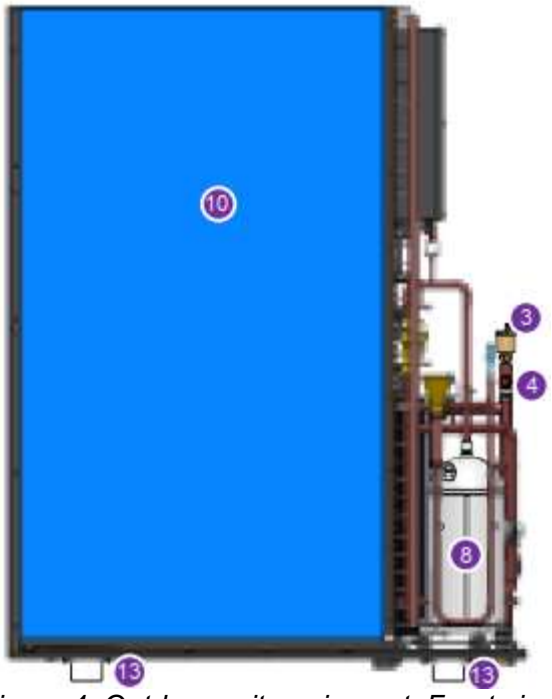


Figure 4: Outdoor unit equipment: Front view

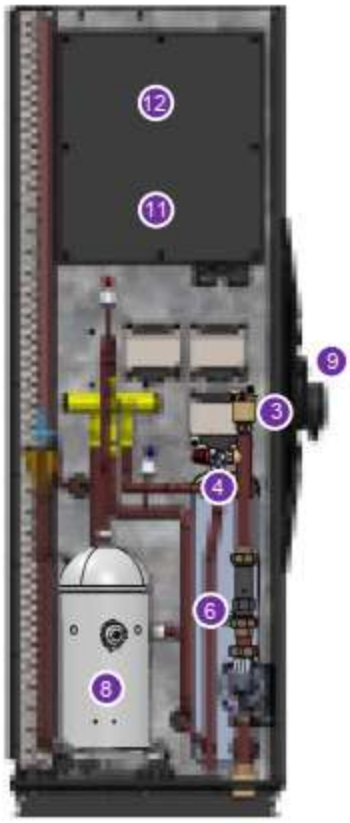


Figure 5: Outdoor unit equipment: View from the right

Figure 5: Outdoor unit equipment: Rear view, cooling circuit

Legend:

1) Inlet
2) Outlet
3) Automatic venting
4) Safety valve
5) Condensate connection DN50
6) Flow meter
7) Capacitor
8) Compressor
9) Fan
10) Vaporizer
11) ARC cooling circuit regulator
12) Inverter
13) Stands
14) Circulation pump WILO PARA-R 25-130/7-50/iPWM

2.2.3.2. Features

natural, environmentally friendly refrigerant R290 (propane)
- possible flow temperature up to 70°C without additional heater
- modulating heat power adjustment using inverter technology
- active cooling mode available as standard
- EHPA quality certificate
- highest possible subsidy rates in the EU.

2.2.4. Control center

2.2.4.1. Equipment and dimensions

The control center is located in the facility and communicates with the cooling circuit controller (ARC) of the outdoor unit via the CAN bus connection. The control center consists of a control unit and a 7" color touch screen.

Figure 7: Control center including display

Figure 8: AHC control unit

2.2.4.2. Features

- 7" color touch screen.
- Storing local trend data (weather station).
- Integrated remote control and maintenance option via VNC connection.
- Possibility of connection of Modbus-RTU and Modbus-TCP with external devices (e.g. photovoltaic devices).
- SG-Ready.
- Electrical outputs can be freely configured; The following drives and sensors can be used as standard:
    - o Additional source of heating.
    - o Control of up to 3 mixing circuits (extension to additional mixing circuits is possible).
    - o Preparation of sanitary water.
    - o Recirculation pump.
    - o Three-way valve for sanitary water preparation.
    - o Circulation heating pump.
    - o PWM control of the recirculation pump and heating circulation pump (PWM / 0-10V).
    - o 12 x temperature inputs for PT1000 sensors.
    - o 24V digital inputs
        - ■ External or PV
        - ■ EVU utility block for unloading
        - ■ Cooling
        - ■ Flow switch for fresh sanitary water
        - ■ Heat and electricity meters.

3. Planning

Inquire about national and regional regulations at an early stage of planning and contact the relevant local authorities.

3.1. Installation instructions

	The outdoor unit may only be installed outdoors.
	The heat pump must not be located in a space where the refrigerant can accumulate in explosive concentrations in case of leakage.
	The heat pump must be installed in safe areas. Areas that are, for example, in the maneuvering area of vehicles without crash protection, are considered unsafe. If areas become unsafe in the short term (e.g. during construction work), the heat pump must be adequately protected

Additional information for installation of the outdoor unit:

- The heat pump must be freely accessible from all sides.

- The sides of the air inlet and outlet must be clear of objects, leaves or snow.

- Installation in recesses, niches or between two walls should be avoided due to possible short circuits of air flow and sound reflection.

- Ensure sufficient drainage of the condensate so that it does not freeze.

- On the outlet side, the air is cooled by approx. 3°C. Accordingly, there is a risk of early ground icing in the immediate vicinity. Make sure that the distance between the outlet side and the pavement, terrace, etc. be at least 2m.

- The outlet side must not be placed against the main wind direction.

3.1.1. Automatic turning on and off

To enable the automatic turning on and off of your Inova heat pump, follow the steps on the touch screen display. This process will allow you to set the operation time of the pump according to your needs, providing additional energy savings.

- On the home screen, touch the option to select the heating circuit. This option allows you to access the controls for the specific heating circuit you want to program.
- On the left side of the screen, there is a bar with various settings. Tap the icon  that represents the heating circuit settings to access the detailed adjustment options.
- When you enter the heating circuit settings, press the clock icon  . This icon will take you directly to the options for automatic turning on and off.

- After opening the automatic adjustment option, you will see a weekly overview. For each day, you can set up to three different time intervals when you want the pump to automatically turn on and off. Enter the exact time for each interval by first selecting the turning-on time, and then the turning-off time.

Figure 10: Ekran opcija za automatsko paljenje i gašenje

Additional note: We recommend selecting the "outside of scheduled time" option as Eco Mode. This setting will ensure an energy-efficient operation during periods when the pump is not active, further reducing energy consumption and extending the lifespan of the device.

3.1.2. Protection zones

	The protection zones described in this section must be strictly adhered to. There must be no sources of ignition such as electrical switches, open flames or hot surfaces within the protection zones. It is especially emphasized that smoking is not allowed in the protective zones.
	It must be ensured that, in the event of a leak, the refrigerant cannot reach closed rooms. Therefore, there must be no windows, doors, light shafts, other openings or sewage drains inside the protective zone.
	The protection zone must not extend onto roads, neighboring properties or public areas.

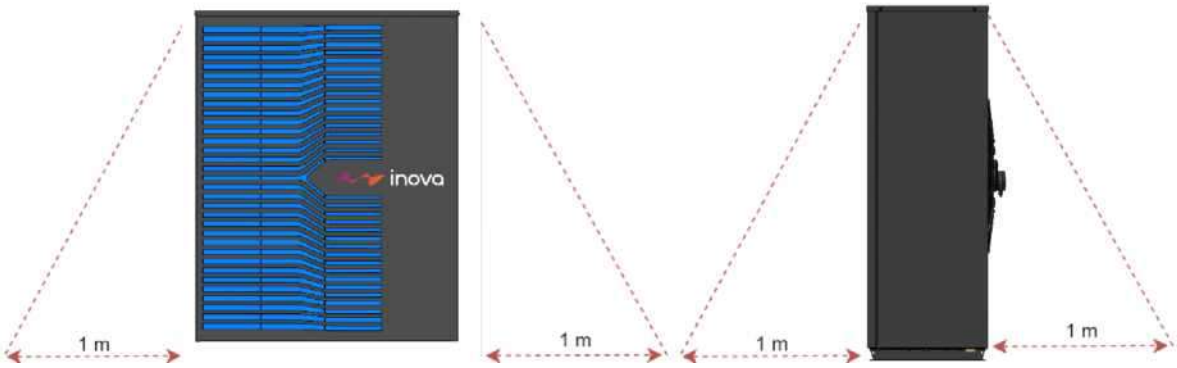


Figure 9: Protection zones (1m distance to the surface of the housing / conical)

3.1.3. Minimum clearance

In order to enable efficient operation without problems, it is necessary to ensure the minimum distances shown in Figure 10.

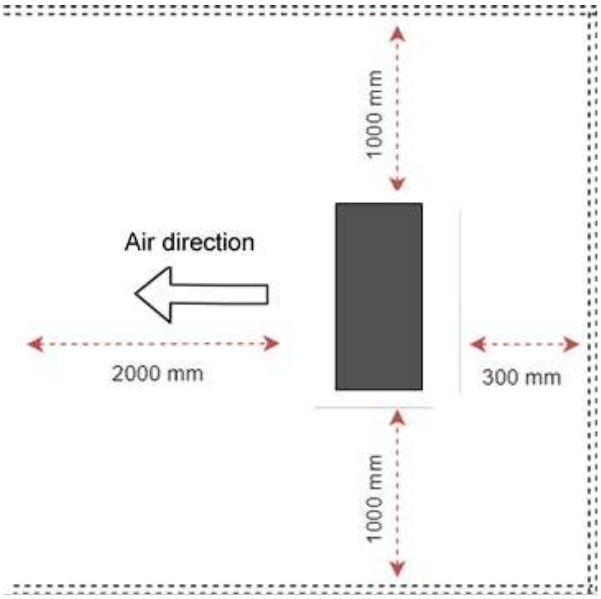


Figure 10: Minimum clearance

3.1.4. Clearance for noise protection

Heat pumps from the INOVA ACP series are some of the quietest heat pumps in their class on the market. However, local sound insulation conditions and national regulations should be examined at an early stage of planning.
Table 6 lists the sound limit values according to ONORM S 5021.

Table 6: Emission guidelines according to ÖNORM S5021

Location	**Sound pressure level – daytime**	**Sound pressure level - night**
	dB(A)	dB(A)
Rest area, spa center	45	25
Rural residential area	50	30
Urban residential area, agricultural and forestry activities	55	35
City centers	60	40
Commercial spaces	65	45
Local recreation areas	50	30

The sound pressure level limit must be respected at the boundary of the property.
All sound data for device types can be found in the technical data in the appendix. The maximum sound power level is usually reached very rarely (at very low outside temperatures). The curve therefore represents the maximum sound pressure level for planning.

The devices have two night modes of operation, in which the power is limited to 70% or 50% of the rated power. By default when shipped, night mode is not activated. In addition, the sound power level changes depending on the orientation of the device.

To avoid sound reflection, one should aim for a free-standing installation as much as possible.

In addition to protection against noise in the space, it is necessary to take into account the negative effects of noise transmitted from structures. Structure-borne noise can propagate through rigid joints into building walls. Here are some measures that can help reduce structure-borne noise:

1. Separation of the heat pump: if the foundation is directly connected to the wall, the heat pump should stand on an insulating layer of rubber or other suitable material to reduce the transmission of vibrations to the ground.

2. Use of vibration isolators: vibration isolators can be placed on the stands or base of the heat pump to absorb and reduce vibrations.

3. Use of flexible hoses: flexible hoses can be used to facilitate the connection between the pipes and the heat pump, thus reducing vibrations.

4. Placement of the heat pump: The heat pump should be placed in a suitable place that allows less transmission of vibrations to the surrounding structures.

4. Transport

	The outdoor unit contains flammable refrigerant. The devices must therefore be stored and transported in well-ventilated areas without sources of ignition.
	Take into account the weight of the device and use protective equipment to avoid injuries (crushing, etc.).
Caution!	After delivery, the device should be inspected immediately for visible signs of damage. In case of noted damages, such must be report to the transporting company. Damaged heat pumps must not be put into operation.
Caution!	The outdoor unit must not be tilted more than 45° to each side during transport.
Caution!	The pipes and slats of the outdoor unit must not be used for transport.

The device is delivered on a pallet.

The following transport options are allowed at the destination:

- Forklift or pallet truck
- Manual carrying

5. Assembly

5.1. Base

	The outdoor unit may only be placed on a permanently solid surface (e.g. a concrete base).

Concrete bases must be elevated at least 20 cm from the ground. Depending on local conditions (possibility of flooding or snow cover), it is necessary to adjust the height of the base.

While the heat pump is working, condensate is generated which must be drained. Up to 8 liters of condensate can be expected per defrosting process. The following options are allowed:

- Condensate is drained below the freezing point using a DN100 pipe. Check if there is enough possibility for infiltration at the end of the pipe (coarse-grained gravel, large excavation, ...)
- Condensate is drained into a canal.

	If the condensate is led into the building or into the sewage system, a siphon must be provided to prevent gaseous refrigerant from escaping in the event of damage.

Please note that it may no longer be possible to lay connecting lines (hydraulic pipes, electrical cables, condensate drainage) after covering the base with concrete. The connection for the above connections is located on the output side of the device.
The base must be a permanently flat, horizontal surface for the outdoor unit.

5.2. Outdoor unit

1) Remove the packaging.
2) Release the outdoor unit housing.
3) Remove the screws securing the unit to the pallet.
4) Remove the transport block.
5) Pull the carrying strap under the heat pump.
6) Carry the device to the installation site with at least 4 people.
7) Adjust the 4 adjustable stands.
8) Attach the outdoor unit to the stand with 4 screws.

6. Electric and hydraulic connecting

	Cables and all openings in the wall must be completely closed and properly sealed

6.1. Hydraulics

6.1.1. Standard hydraulic schemes

Thanks to the extensive AHC hydraulic control unit and modular software structure, as well as freely configurable inputs and outputs, a large number of hydraulic configurations can be mapped.

6.1.2. Hydraulic connection

Caution!	The hydraulic lines must be installed so that they do not freeze, must be properly insulated and connected to the heat pump from the prescribed side. This does guarantee that the lines are frost-proof (allowed only with short connecting lines or using anti-freeze compound).
Caution!	Dimension the hydraulic lines so that the minimum flow according to the technical sheet can be permanently guaranteed. The usable remaining delivery height and the minimum dimensions of the connecting lines can be found in the technical sheet.

6.1.3. Hydraulic components / Requirements

Please note the following regarding the individual hydraulic components:

Separation container (buffer):

The heat pump automatically adjusts its heat output to the conditions in the building. Therefore, a buffer is not required under the following conditions:

- Minimum flow and minimum quantity of water are guaranteed at all times (rooms may not be fully equipped with individual room thermostats).
- Slow heating system (e.g. under-floor heating)
- Keep in mind and adhere to any planned and regular restrictions in the power supply.

Caution!	In buildings that are mostly equipped with room thermostats in the rooms, a buffer is absolutely necessary

At least one 6 mm sensor sleeve must be placed in the upper third of the buffer. The minimum recommended buffer for this heat pump is 300 liters, if necessary at all.

Combined tank:
The combined tank is a buffer tank, which has two temperature levels. The higher temperature level (upper) is used for the preparation of hot sanitary water, and the lower temperature level (lower) for the building's heating system. Mixing these temperatures reduces the efficiency of the system. For this reason, only combined tanks approved by INOVA for its heat pumps should be used. Other combined tanks can only be used after consultation and technical testing by INOVA heat pump.

Hot sanitary water tank:
The following tanks can be used:

- Classic hot sanitary water tank (boiler) with a smooth tube exchanger (exchanger surface approx. 0.4m2/kW; pipe minimum DN25) and a minimum volume of 300 liters.
- Hot water tank with flow preparation of hot sanitary water (through a ribbed stainless steel pipe) (at least 500l).
- Hot water tank with substation for preparing hot sanitary water (at least 500l).

Dimensioning of all other necessary components for the preparation and use of hot sanitary water in relation to the required hot water capacity is the responsibility of the system manufacturer.

At least one 6 mm immersion sleeve must be installed in the upper third of the hot water tank (switch-on and switch-off point). When using the boiler, it is necessary to provide 2 temperature sensors in the upper and lower third (switch-on and switch-off temperature).

Deaerators:
The possibility of deaeration should be ensured at each high point of the system.

Do not use automatic deaeration in the boiler room. Only manual deaeration is allowed.

Safety valve:

A 2.5 bar safety valve is installed in the outdoor unit. An additional safety valve is allowed only if it is set to activate at minimum 3 bar and if the height difference between the safety valve of the heat pump and the safety valve of the boiler room is not greater than +4 m.

Stop valves:
Provide 2 non-return valves and 2 drain taps ½" on the pipes of the heat pump in the building to allow flushing of the outdoor unit. The expansion tank is mounted on the heat pump only with the appropriate tool.

Dirt filter:
In order to protect the device, it is necessary to install a dirt and sludge trap in the backflow line of the outdoor unit.

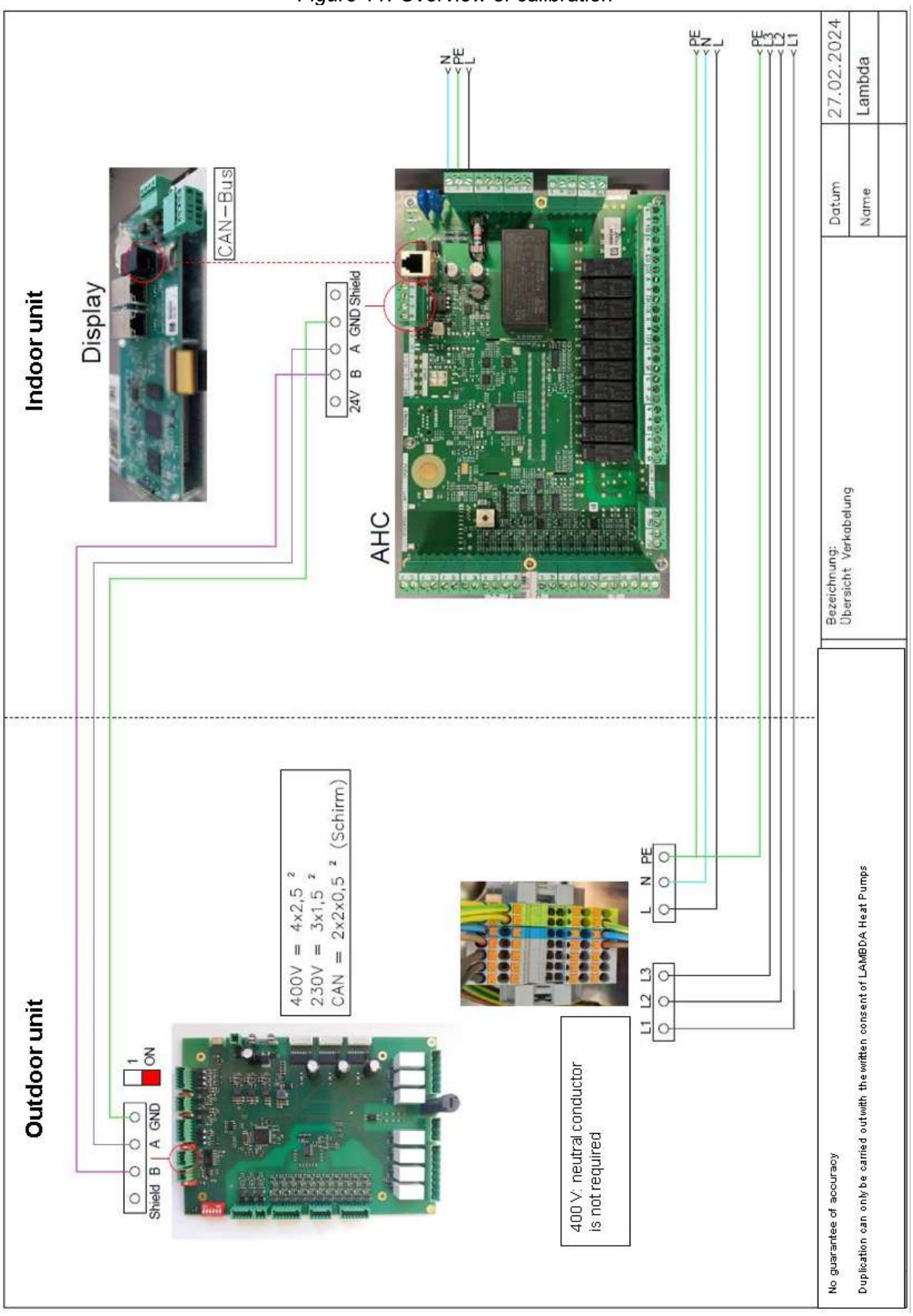
Expansion vessel:
Dimensioning and installation of the expansion vessel is the responsibility of the contractor or designer, depending on the type and size of the installation. The expansion vessel should be placed as close as possible to the suction side of the heat pump.

Sanitary water:
Hot sanitary water can be prepared up to a temperature of 70°C. Adhere to relevant standards to avoid scale build-up (a softening system may be required) and ensure protection against burns.

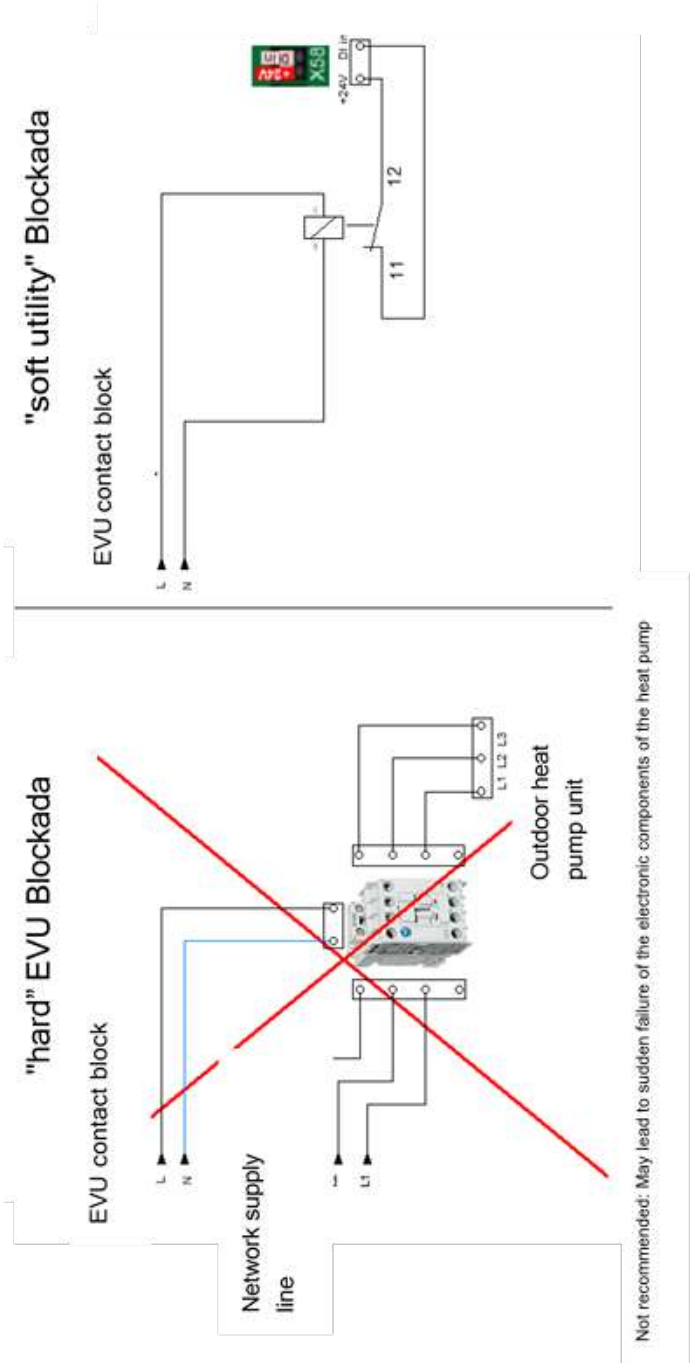
6.2. Electrics

	Never operate the device while the power is connected. Make sure that all poles of the device are disconnected from the mains at least 2 minutes before.
	In the main supply line (230V and 400V) the possibility of disconnection must be ensured on all poles.
	The circuit breaker fuse values must be observed in accordance with the specifications in the data sheet.
	Electrical installation may only be performed by an authorized specialized company. The appropriate standards and specifications of the local power distribution company must be followed.
	For safety reasons, the main circulation pump is normally continuously supplied with mains voltage (230V). Pumps can only be disconnected from the network by disconnecting all poles.
	Frequent (daily) switching on and off the power supply (400V) of the outdoor unit is not recommended and may lead to long-term damage to the electronics and the compressor.
	This also applies to the use of the EVU utility block. In other words, the repeated shutdown of the power supply (400 V) of the outdoor unit, possibly initiated by the local power distribution company in order to relieve the power grid.
	"Soft utility" blocking (signaling via potential-free relay) is allowed.
Caution!	Low-voltage cables (<50V) must not be laid together with 230V or 400V cables. Communication lines must be exclusively insulated/shielded cable.
Caution!	The use of a residual current protective device (FI or RCD) is only allowed for sensitive B-type AC/DC devices.

Figure 11. Overview of calibration



6.2.1. EVU blockade connection



6.2.2. Connecting the outdoor unit

The following electrical connections are required for the outdoor unit.

- CAN bus communication cable
- 400V connection (L1 L2 L3 PE / neutral conductor not required)
- 230V connection (L N PE)

The communication line is connected directly to the ARC controller of the cooling circuit

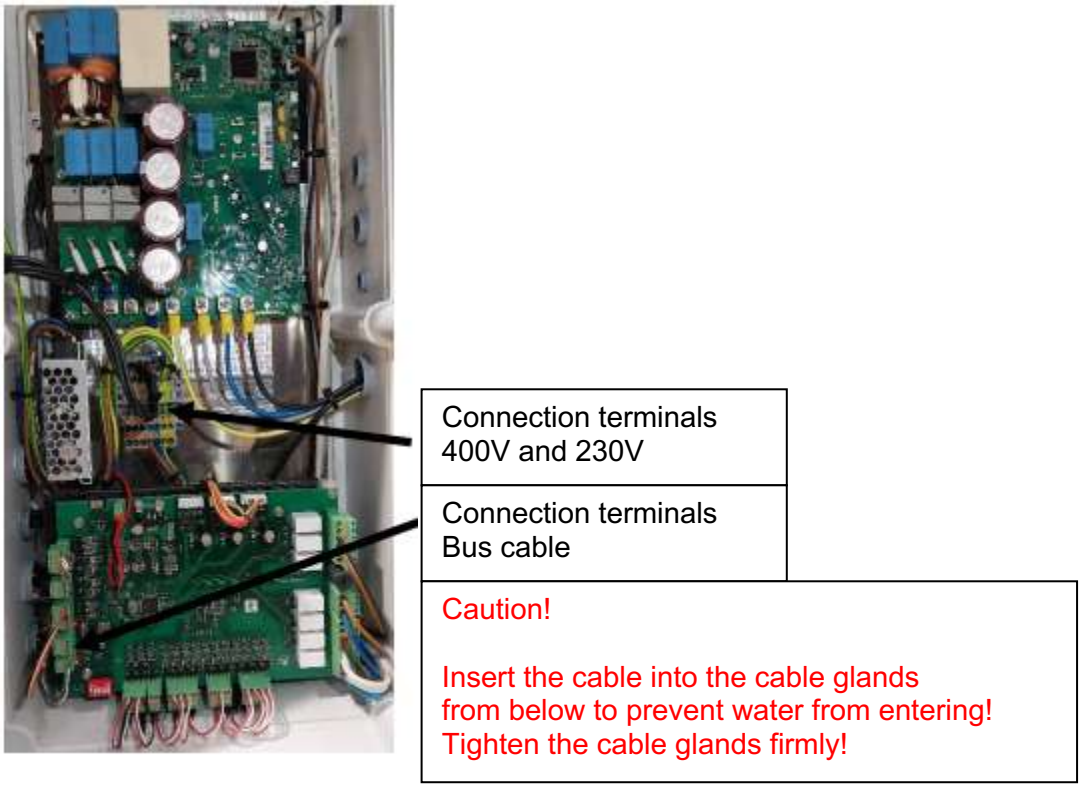
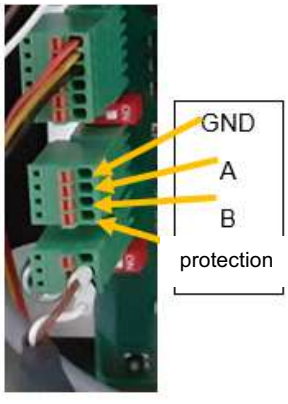
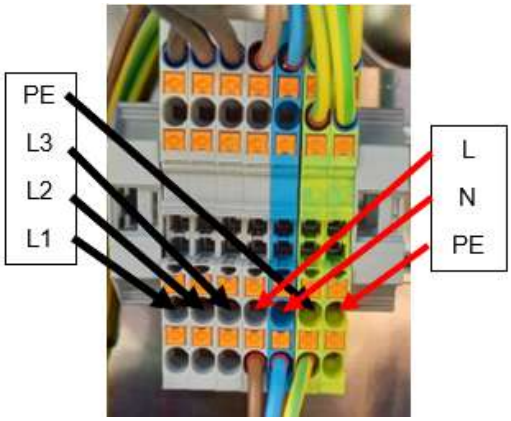


Figure 12. Electrical connection of outdoor unit



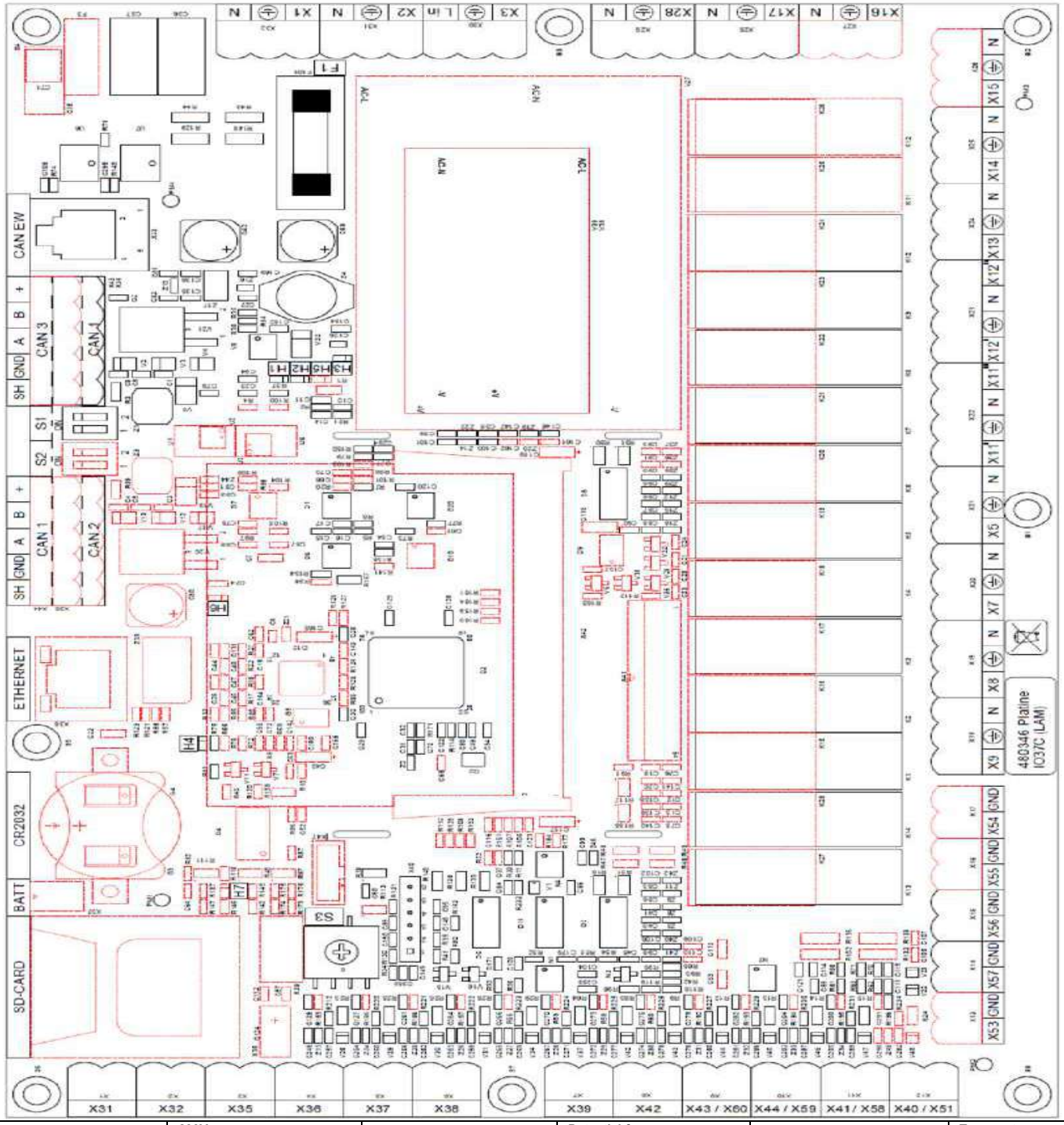


The frequency regulator and the fan are constantly under voltage. Work on electrical components may only be carried out if the mains voltage is switched off at all poles.

Table 8: DIP Switch ARC

Name	No.	Configuration
	DIP switch S1	
CAN ID	1 & 2	ON/OFF: 2 OFF/ON: 3 ON/ON: 4
reserve	3	
reserve	4 & 5	4-ON / 5-OFF:
Power source	6	OFF: Brine or water ON: Air
	DIP switch S2	
Modbus RTU	1	OFF: 0 Ohm
Final resistance		ON: 120 Ohm
	DIP switch S3	
CAN- Final resistance		OFF: 0 Ohm ON: 120 Ohm
	DIP switch S4	
number of revolutions of circulation pump		to the board: PWM from the board: 0-10V
	DIP switch S5	
number of revolutions of the engine of the energy source		to the board: PWM from the board: 0-10V

6.2.3. Connecting the control center



	230V		Potential-free		Temperature sensors 0-10V/PWM
Heating circuit 1 X7 Heating circuit1 pump X11 Heating circuit 1 mixer X37 Heating circuit 1 temperature X40 Room 1 temp Heat pump: X2 Circulation pump (continuous charging) X57 Circulation pump 0-10V/PWM X58 EVU block	Heating circuit 2 X8 Heating circuit 2 pump X12 Heating circuit 2 mixer X38 Heating circuit 2 temperature X41 Room 2 temperature External heating: X13/L1 Circ. external heating pump / USV X54 External heating temperature X51 Input for external heating	Preparation of sanitary water X28/X10 Switching valve for sanitary water X35 Sanitary water temp. up X36 Sanitary water temp. down External cooling X13/L2 Circ. external cooling pump/USV X43 External cooling temperature X59 Input for external cooling	Fresh water system X1 Fresh water pump (continuous charging) X32 Temp. departure of hot sanitary water X56 Fresh water pump 0-10V/PWM X60 Flow switch (Flow switch) Electric heater X9 Electric heater (Klixon + releasing)	Recirculation of PTV X5 Recirculation pump X39 DHW recirculation temperature	Buffer/Accumulation buffer X31 Buffer temperature Other X42 Outside air temperature

Figure 13. Connection terminals AHC hydraulic regulator

Table 9: Micro fuses HYD

Name	No.	Safety value
Primary power supply of the transformer	F1	400mAT
Secondary power supply of the transformer	F2	1AT
Relay output fuse 230V	F3	6.3AT

6.2.3.1. Inputs and outputs of the control center HYD

The connection terminals can generally be assigned to the corresponding actuator and sensor through the software. In other words, if 230 V drives (pumps, mixing valves, diverter valves, ...) are connected to terminals X5 to X28, temperature sensors to terminals X31 to X39, 0-10 V or PWM signal X56-X57 to terminals, and inputs X51, X58 to X60, the corresponding device can be assigned through the software.

The following list describes the standardized terminal assignment.

X1: Mains 230V
230V connection

X2: Output 230V
230V continuous voltage to power the main circulation pump (up to the heat pump) and the fresh sanitary water pump.

X5: Recirculation pump 230V
Connection for a recirculation pump for the circulation of hot sanitary water.

X7: Circulation pump of heating circuit 1; 230V
Connection for the circulation pump in the heating circuit. If the buffer/accumulation tank/intermediate tank is not used (there is a direct heating circuit), this connection is not used (the heating circuit is powered via the main circulation pump).

X8: Circulation pump of heating circuit 2; 230V
Connection for the circulation pump in the heating circuit 2. If the buffer/accumulation tank/intermediate tank is not used (there is a direct heating circuit), this connection is not used (the heating circuit is powered via the main circulation pump).

X11: Actuator of mixing valve in heating circuit 1; 230V
Connection for driving the mixing valve in the heating circuit 1. If the buffer/accumulation tank/intermediate tank (direct heating circuit) is not used, this connection is not used.

X12: Actuator of mixing valve in heating circuit 2; 230V
Connection for driving the mixing valve in the heating circuit 2. If no buffer/accumulation tank/intermediate tank is used (direct heating circuit), this connection is not used.

X13 L1: External heating (Pump/Valve); 230V
Connection for a pump or valve drive for external heating needs (e.g. pool heating, high-temperature tank/buffer, etc.).

X13 L2: External cooling (Pump/Valve); 230V
Connection for pump or valve drive for external cooling needs (e.g. passive cooling, buffer/cooling buffer, direct expansion-DX).

X9: Electric heater
Connection for electric heater. The first two connections are bridged and can be used for an external safety thermostat. Connecting the contact for the electric heater to L and N.

X10: Powering of sanitary water valve
Connection for an additional, third, source of heat (e.g. pellet heating). The voltage-free relay is located between terminals 2 and L. The power supply for driving the sanitary water valve is also located at position X10 (phase (brown wire) -> connection 1 and neutral (blue) -> N).

X28: Switch valve for the preparation of sanitary water
Toggle contact switch for 3-way valve for switching to domestic water heating. Switch (black) to NC.

X51: External heating or PV input; 24V
Switching off the heat pump due to excess current through the PV system or an external heating request (pool thermostat) via a potential-free relay.

X58: EVU-Block Input: 24V
Switching off the operation of the heat pump by interrupting the input. "Hard" EVU blocking (400V off) is not allowed. If the supplier of electricity energy does not foresee a blockage, the contact must be bridged.

X59: External cooling Input: 24V
External demand for cooling (e.g. via external signal from room control)

X60: Fresh water flow switch: 24V
The connection is connected when the flow switch is closed and this happens when the sanitary water tap is closed (for fresh water system).

X31: Buffer temperature: PT1000
Buffer temperature sensor connection. This should be installed in the immersion sleeve in the upper third of the tank. If no buffer is used, do not connect the input.

X32: Fresh water backflow temperature: PT1000
Hot water temperature sensor connection. Only required for domestic hot water systems. The sensor is installed at the outlet of the PTV flow preparation device (plate heat exchanger) on the hot water side.

X35: DHW temperature above: PT1000
Sanitary water sensor connection in the upper third of the hot sanitary water tank. This represents the switch-on limit for domestic water heating.

X36: DHW temperature below: PT1000
Sanitary water sensor connection in the lower third of the hot sanitary water tank. This represents the limit of turning off the heating of sanitary water. Usually only required for boilers; for other types of tank (hot water), the backflow temperature of the heat pump can be used as the cut-off temperature.

X37: Flow temperature sensor for Heating Circuit 1: PT1000
Initial heating temperatures for heating circuit 1. The sensor is used to regulate the operation of the mixing valve.

X38: Flow temperature sensor for Heating circuit 2: PT1000
Initial heating temperatures for heating circuit 2. The sensor is used to regulate the operation of the mixing valve.

X39: DHW recirculation temperature: PT1000
Temperature in the recirculation line. It can only be used as an option when using a recirculation pump.

X40: Room temperature 1 PT1000
Connection for room temperature sensor of heating circuit 1 (optional).

X41: Temperature room 2: PT1000
Connection for room temperature sensor of heating circuit 2 (optional).
X42: Outdoor temperature: PT1000
External temperature sensor connection

X43: Cooling temperature: PT1000
Connection for the cooling temperature sensor in the cooling unit. When the heating buffer is also used for cooling purposes, the buffer temperature is used.

X44: Cooling temperature: PT1000
Connection for temperature sensor for external cooling needs.

X56: Fresh water pump: 0-10V / 10V PWM
To control the speed of the fresh water pump when using a fresh water system.
0-10V or PWM outputs can be switched via software.

X57: Circulation heating pump: 0-10V / 10V PWM
For speed control of the heating circulation pump. 0-10V or PWM outputs can be switched via software.

S1: CAN Coding key
The encoding key is set to 1 by default.

6.2.4. List of cables

Name	No.	Type	Terminal Control center	Terminal Outdoor unit
Network connection				
			AHC (indoor)	**Outdoor unit**
Network 400V	W1	YMM 4x2.5mm²	-	Terminal block (L1 L2 L3 PE)
Network 230V	W2	YMM 3x1.5mm²	X1	Terminal block (L N PE)
Control center – outdoor unit				
			AHC (indoor)	**ARC (outdoor)**
CAN-Bus	W3	LiYCY 2x2x0.5mm²	CAN IN	ARC X30
Control center – Display				
			AHC (indoor)	**Display (outdoor)**
CAN-Bus / 24V	W4	LiYCY 2x2x0.5mm²	CAN OUT	X4 / X1
Control center				
			AHC(indoor)	
230V output		YML 3x1.5mm²	X1 to X13 and X28	
24V input		YML 2x0.75mm²	X51 to X60	
temp. sensors		YML 2x0.25mm²	X31 to X44	
PWM / 0-10V Lines		YML 2x0.25mm²	X56 and X57	
CAN-Bus		LiYCY 2x2x0.5mm²	CAN OUT	CAN OUT
Internet connection		Cat 5		LAN plug

Control center				
			Display	
CAN-Bus		LiYCY 2x2x0.5mm²	X4	-
Internet connection		Cat 5	X2	-
Modbus RTU		LiYCY 2x2x0.5mm²	X5	-

7. Commissioning

7.1. Filling the system

1) Flush the hydraulic piping and exchanger in the outdoor unit, then flush the entire hydraulic system in the facility.
2) Fill the pressure to 2 bar.
3) Check the system for leaks.
4) Vent any high spots (automatic vents are built into the outdoor unit).

7.2. Powering the system

1) Recheck all cable connections before powering on the system.
2) Make sure there is no connection between live conductor (phase + neutral conductor) and PE, e.g. by measuring the resistance.
3) Power up the system with 230V. (400V only when the regulator is configured).
4) Check the voltage on all connection terminals in the control center and in the outdoor unit.

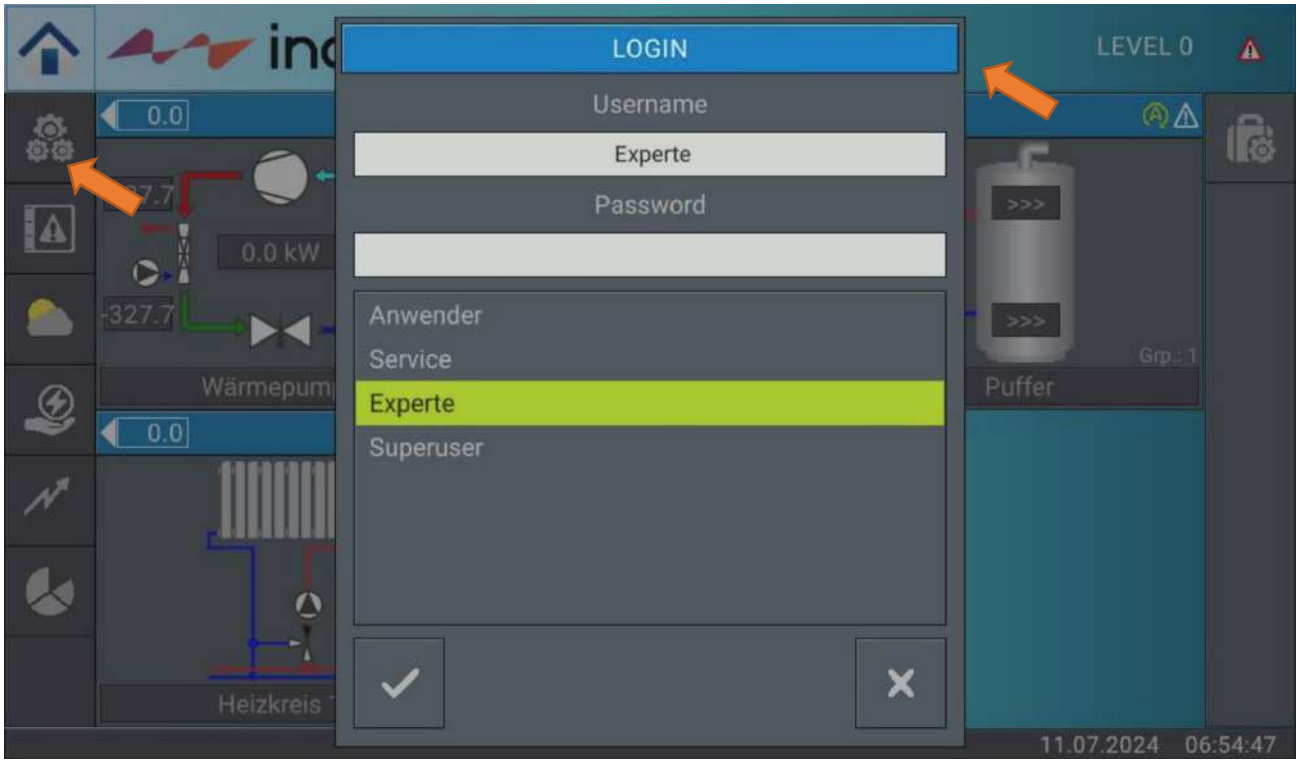
7.3. Configuration of controller

1) For detailed information on the functions and operation of the controller, please refer to the "Controller Description" document.

2) Click on 

(upper middle section) and access the menu Expert, Superuser or Software (password must be requested from INOVA).

3) After that, click on  in the main menu to access the settings menu and click on  to access the further configuration menu.



4) Configure your system:

a. Type of module: Choose all the necessary modules that you need for your system (e.g. 1x heat pump, 1x buffer tank, 1x heating circuit and 1x sanitary water tank). If you need more than 6 modules, you can swipe right to the next page.

b. Master: Configure how the modules are connected to each other. In this example, the buffer tank and the sanitary water tank are served by a heat pump (No. 1) -> 1 must therefore be entered in the main

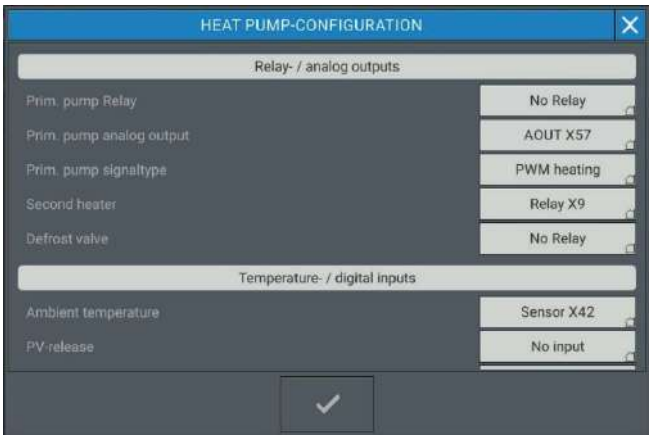
field (Master). The heating circuit serves the buffer (module #3), so enter 3 for the heating circuit for the Master.

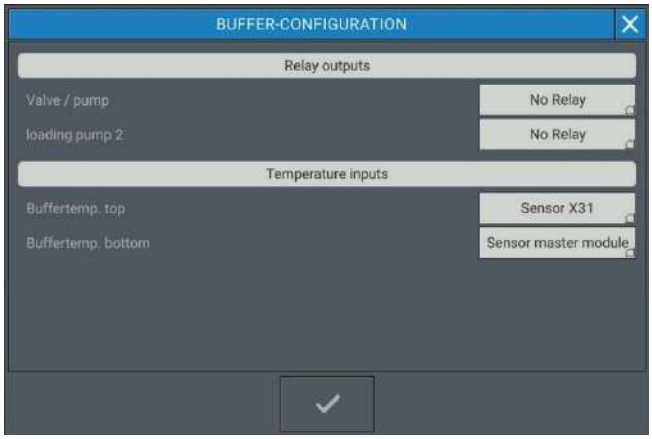
c. The connection type is usually HZS5420 unless additional modules are used. In the event that the primary circulation pump is to be controlled by the heat pump controller, it is necessary to enter "Direct" when connecting to the heat pump.

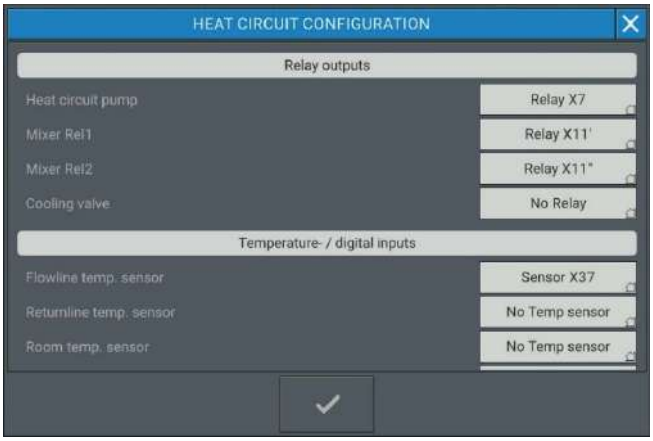
d. Station is usually 1, unless several heat pumps are to be controlled. In this case, the station corresponds to the CAN ID, which is set using the DIP switch on the heat pump controller (ARC), provided that the connection is set to "Direct".

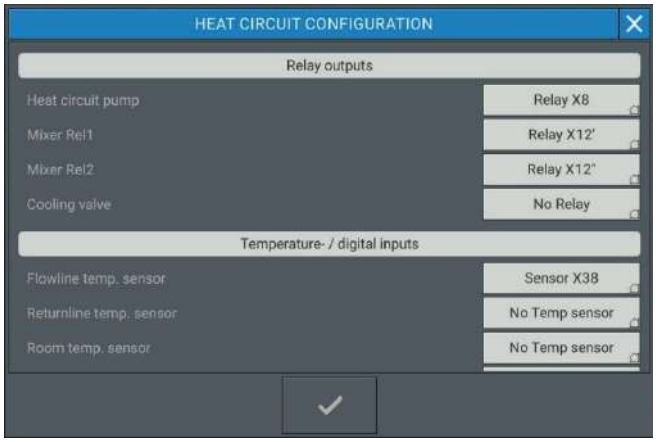
e. In the HW settings the  components used can be assigned to electrical inputs and outputs on the controller. Selecting "Master Module Sensor" means that the temperature value is taken from the assigned master module. For example, the buffer is filled by the heat pump, if you select " Master Module Sensor" the temperature value "upper temp. buffer" is taken from the heat pump outlet temperature. As "lower temp. buffer" would be used as the backflow temperature.

f. Make sure to confirm the entry with 









5) To display individual modules in the main menu, select  .

a. Group: Assign a group to each module. Within the group, the mode of operation in the main menu is adopted for all modules.

b. Module name: Give the module a name

c. Display: Assign a number to decide where in the main menu the module should be displayed

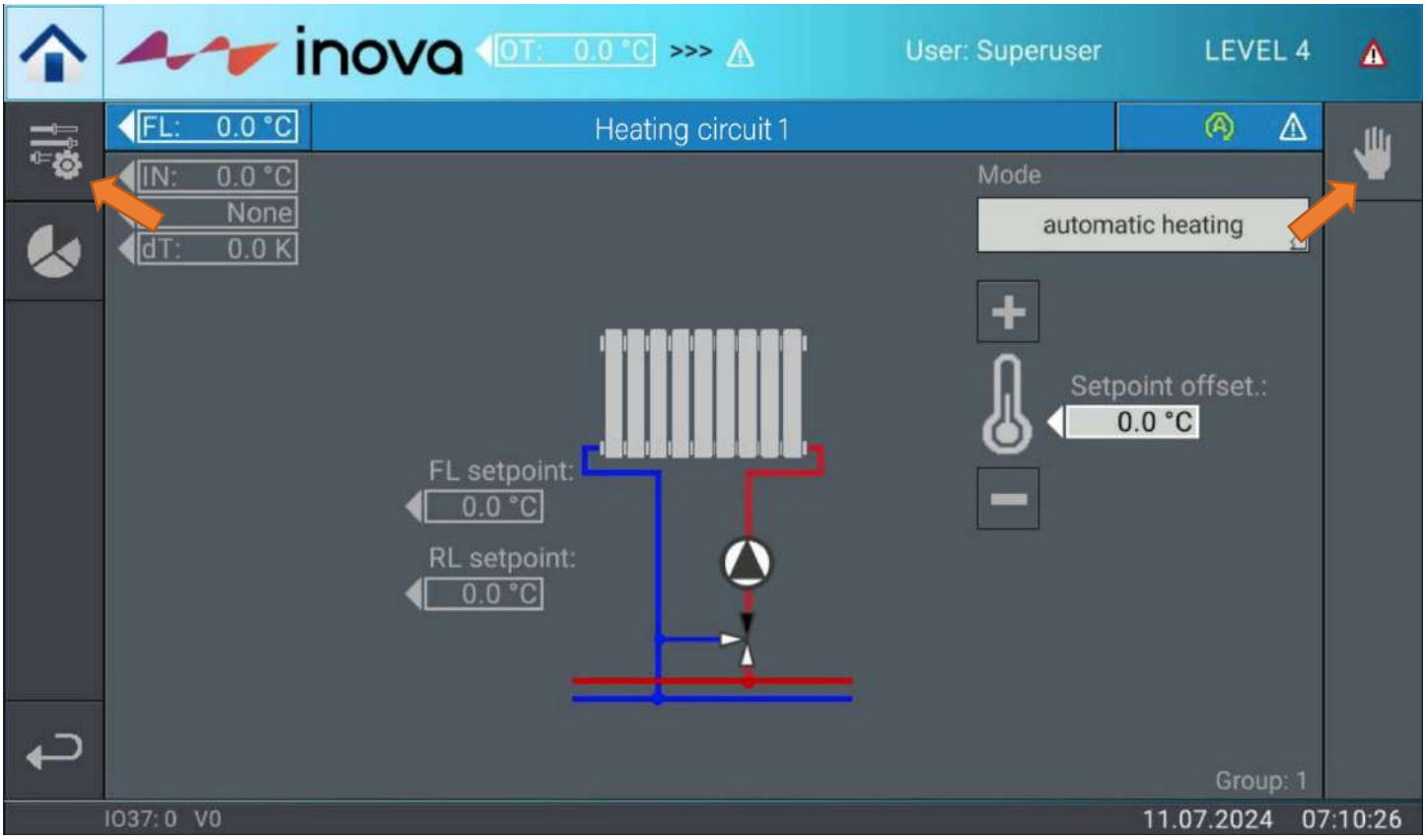
d. Make sure to confirm the entry with  .

6) If several heat pumps are operated or another heating device is available, it can be configured in the cascade menu  .

7) Clicking on  returns you to the main menu.

8) Click on the appropriate module and check the preset settings  .

9) After that, perform another relay test  for all hydraulic components (valve actuators, circulation pumps, etc.) and check the credibility of the sensor readings.



- Connect the heat pump to 400V.

- Make sure the software operation switch (emergency shutdown)  is set to OFF.

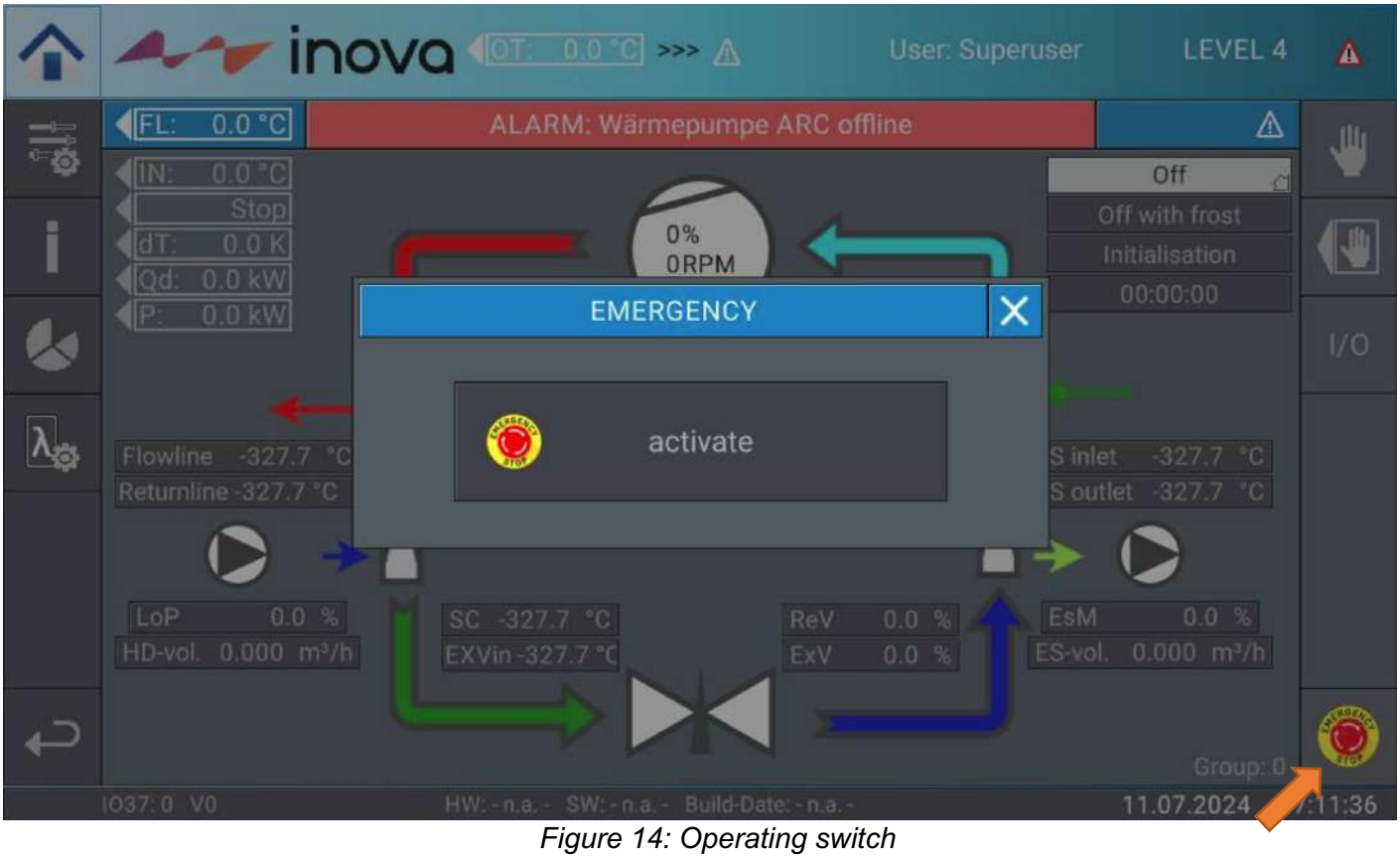


Figure 14: Operating switch

	The operating switch uses a program to prevent the heat pump and associated circulation pumps and valve drives from starting. A switched off operating switch does not mean that the devices are without voltage. Note that important safety functions (freeze protection, etc.) are not implemented when the operating switch is deactivated.

- Check the connection voltage on the heat pump
- Check the credibility/accuracy of the temperature sensor
- Turn on the operating switch again (EMERGENCY OFF).
- Start the 37emperat pump and monitor the operation for all intended modes of operation (heating, cooling, hot sanitary water)
- Complete the attached commissioning protocol

7.4. Setting the heating curve, time programs, operating mode

- see controller instructions

7.5. Delivery to the system user

During handover, the user of the system must be instructed about the operation of the heating/cooling system.

The following are the responsibilities of the system user:

- Carrying out regular visual inspections
- Keeping the inlet and outlet openings of the outdoor unit clean (e.g. due to snow, leaves, heavy ice on the evaporator fins, etc.)
- Repair and maintenance work may only be performed by authorized specialized companies
- Use only original spare parts
- The settings at the specialist levels of the regulator are to be adjusted only by specialized firms
- Keep the documentation carefully
- Regularly check the list of errors and the energy meter
- If remote maintenance is possible, regularly check the connection to the device.

8. Alarms and malfunctions

8.1. Procedures in the event of malfunction

In the event of malfunctions, faults or alarms, the following instructions must be followed:

Caution!	Safety devices must not be bypassed or disabled in any way.
Caution!	Adjustment of the safety chain is only permitted with a written writing approval of the INOVA heat pump company.
Caution!	Alarms may only be reset by qualified personnel. If the alarms are acknowledged several times without correcting the cause of the error, this may lead to component damage.
	Damaged components can only be replaced with original INOVA heat pump parts.

8.2. List of errors

8.2.1. Recording with a controller

INOVA heat pumps have a large number of safety monitoring systems to protect the device from critical operating conditions. All faults are recorded and saved in the list of errors. A distinction is made between:

- Reports: not relevant for security
    - o The device is still operational

- Errors: relevant for security
    - o The device is stopped immediately
    - o Errors are corrected manually.

- Alarms:
    - o If errors occur several times a day, an alarm is activated.
    - o Alarms must be reset manually.

Reports, errors and alarms can be read in the controller's error list menu. Highlight the error in question and press the "info" button to learn more about the error and possible causes.
In case of an error, it can be deleted on the device using the button shown below.
All processes (errors, changing of settings at expert level, etc.) are stored in a log.

Figure 15: Menu list of errors and list of processes

8.3. Danger of freezing of the outdoor unit

If outside temperatures are below 0°C and flow cannot be guaranteed, the heat pump may only be hydraulically filled immediately before commissioning.

If the power supply to the heat pump and the indoor unit goes out for several hours, and the outdoor temperature drops below 0°C, the outdoor unit must be drained hydraulically.

If the water flow is not guaranteed for a long period of time (e.g. circulation pump defective, closed valves, air in the pipes, etc.), the outdoor unit must be hydraulically drained and the error must be rectified as soon as possible.

There is a risk of freezing of the water-conducting components in the heat pump if there is no flow or heating for a long time and the outside temperature is below -5°C. In this case, there is a risk that the heat pump or the connecting lines may be damaged.

A sophisticated safety system ensures that freezing is impossible both in normal operation and in the event of a malfunction or if the mains supply of the indoor or outdoor unit fails.

However, if the power supply to the indoor and outdoor units goes out at the same time, as is the case with a power outage, for example, the safety features of the heat pump will not be effective. If this happens for several hours at outside temperatures below -5°C, the device and connecting lines must be drained.

Below is a diagram showing the time to reach the freezing point depending on the temperature of the water and the outside air. During the measurement, the thermodynamic circulation, which usually prevents freezing even without forced circulation, was actively blocked.

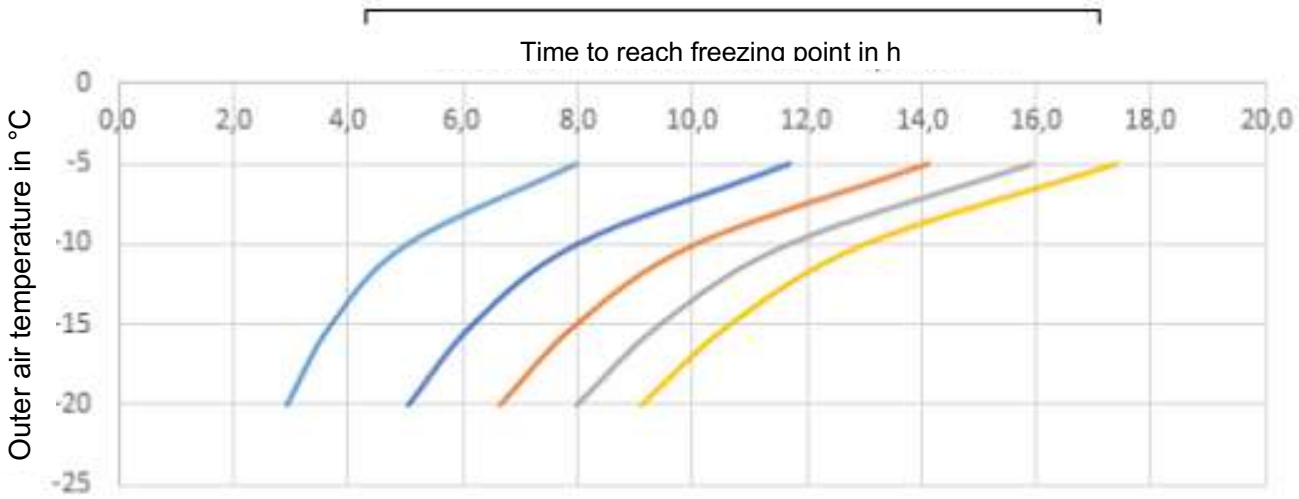


Figure 16: Time to reach freezing point in heat pump components, through which water circulates

Please note that the diagram is only a guideline and may vary widely depending on the circumstances.

In order to reduce the probability of freezing at 0°C, it is also possible to use antifreeze in combination with an intermediate heat exchanger. However, in this case noticeable losses in efficiency and performance can be expected.

9. Maintenance / Repair

9.1. Cleaning / Maintenance

Annual maintenance of the heating system including the heat pump is not strictly necessary, but it is recommended.

Before any system maintenance, read the safety instructions carefully.

System maintenance carried out by specialized firms should include the following:

Visual controls:
- Checking the list of errors, energy meter and time of inclusion and operation.
- Verification of the credibility of all sensors (41emperatures, pressure, flow).
- Checking the settings of the heating regulator.
- Checking water pressure and pre-pressure (expansion vessel).
- Visual inspection of possible leaks of all components through which water circulates.
- Visual inspection in the area of the cooling circuit for oil residues.
- Device stability check.

Electrical checks:
- Checking the tightness of electrical contacts/connectors.
- Visual inspection of all electrical components.
- If remote maintenance is possible, check the connection.

Operation:
- Check the operating conditions in the mode of heating, domestic water and defrosting and compare them with the data in the commissioning protocol.
- Test the defrosting behavior (defrosting time, is there still ice after defrosting).
- Are the components making unusual noises?
- Measurement of voltage and current of each phase during operation.

Cleaning:
- Dirt filter.
- Slats on the evaporator (cleaning is done non-contact with water under low pressure).
- Outer and inner casing (do not use aggressive cleaning agents).

9.2. Repairs

Before repairs, carefully read the safety instructions and, if in doubt, contact the INOVA heat pump support team.

Repairs to the device may only be carried out by qualified personnel.

Repair work can only be carried out in a de-energized state. To do this, turn off the power on all poles.

Refrigeration circuit repairs should only be carried out by qualified refrigeration technicians. Before the procedure, it is necessary to vacuum out all the coolant and flush the cooling circuit with nitrogen several times. During refrigerant extraction, the heat pump must either hydraulically drained or the priming pump must be active to prevent freezing of water in the heat exchangers. It is recommended that the cold block be disconnected as in **Error! Reference source not found**. Basically to separate it from the vaporizer and have the repair done outside the device.

Caution! Engine oil is very hydrophilic. The time during which the cooling circuit is open to the atmosphere should therefore be as short as possible.

After opening the cooling circuit, it can create explosive atmosphere in the surrounding space. Make sure there are no sources of ignition in the surrounding area and avoid them. Start soldering only when it can be determined with certainty that there is no coolant.

The coolant absorbed in engine oil evaporates slowly. Therefore, the storage of machines or cooling circuit components with an open cooling circuit in closed rooms or vehicles is only allowed after a 3-hour nitrogen purge.

Backflow cooling circuit components must be sealed and gas tight (e.g. soldered).

Defective components can only be replaced with original INOVA heat pump spare parts.

After each repair, a thorough functional test or, if necessary, re-commissioning is required.

9.3. Obligation to keep documentation

Commissioning and any maintenance/repairs must be documented in a logbook (appendix).

10. De-commissioning

Before putting the device out of service, read the safety instructions carefully.

1) Turn off the heat pump (operating fuse off).
2) Disconnect the devices from the power supply at all poles and check if there is voltage at the terminals. Attention, it may take up to 3 minutes until the remaining voltage is completely discharged.
3) Secure the supply voltage from being switched on again.

42emperat supply for several hours at outside temperatures below 0°C, the outdoor unit and lines must be hydraulically drained

To discharge the device, proceed as follows:

- Close the flow and backflow to the outdoor unit in the building.
- Drain the water from the pipe using the drain tap in the facility

11. Disassembling and disposal

The outdoor unit is filled with flammable refrigerant that must be disposed of before disassembly. Refrigerant removal may only be performed by qualified personnel. You must ensure that there is no refrigerant in the device. For this purpose, repeated flushing with nitrogen is recommended.

Disposal must be carried out in accordance with applicable local, national and EU regulations.

Defective components must be returned to the manufacturer with a return receipt. When disposing of the entire heat pump, it must be separated into different materials as much as possible and the individual components recycled.

Special attention should be paid to the proper disposal of coolant and engine oil.

Packaging consisting of cardboard and recyclable plastics must be disposed of using appropriate recycling systems.

12. Technical data

12.1. Technical sheet

Type	Measuring unit	ACP10	ACP15
Outdoor unit			
Height x Width x Depth	mm	1170 x 1150 x 510	1170 x 1150 x 510
Weight	kg	170	210
Controller			
Height x Width x Depth	mm	310 x 170 x 130	310 x 170 x 130
Packaging: Height x Width x Depth	mm	350 x 200 x 200	350 x 200 x 200
Weight	kg	3	3
Cooling circuit			
Refrigerant		R290	R290
GWP		3	3
Quantity	kg	0.9	1.1
Engine oil		PAG	PAG
Heating performance and efficiency			
Energy efficiency class at low temperatures (medium climate)		A+++ 209% SCOP 5.30	A+++ 210% SCOP 5.32
Energy efficiency class at medium temperatures (medium climate)		A+++ 157% SCOP 4.00	A+++ 159% SCOP 4.04
Modulation of heating power A7W35	kW	3.1 – 12.7	4.9 – 19.0
Modulation of heating power A2W35	kW	2.7 – 11.4	4.4 – 17.5
Modulation of heating power A-7W35	kW	2.5 – 10.0	3.9 – 15.1
Modulation of heating power A-7W55	kW	2.4 – 9.7	3.9 – 15.0
Cooling performance and efficiency			
Modulation of cooling power A35W18	kW	2.7 – 11.2	4.8 – 17.5
Modulation of cooling power A35W7	kW	1.8 – 8.3	2.8 – 11.4

Noise			
Noise level EN12102	dB(A)	48	51
Noise level per day max.	dB(A)	57	58
Noise level at night (70% effect)	dB(A)	51	53
Maximum noise level at night (50% effect)	dB(A)	48	51
Tonality / Tone constancy	dB(A)	0	0
Scope of work			
Water temperature during heating	°C	+12 to +70	+12 to +70
Water temperature during cooling	°C	+7 to +35	+7 to +35
Outside air temperature during heating	°C	-22 to +40	-22 to +40
Outside air during cooling	°C	+5 to +45	+5 to +45
Hydraulics			
Minimum water flow	m³/h	1,3	1,6
Remaining delivery height at minimum flow	m	6,0	5,2
Working pressure	bar	0.5 to 2.5	0.5 to 2.5
Connections		5/4“ AG	5/4“ AG
Minimum nominal width of connection pipe	DN	25	32
Circulation pump	WILO PARA-R 25-130/7-50/iPWM		
Source of heating			
Air flow volume	m³/h	1500 to 8500	1500 to 8500
Condensate during defrosting	liter	6	8

400V power connection			
Outdoor unit		IP54	IP54
Power connection		400VAC/50Hz (L1,L2,L3,PE)	400VAC/50Hz (L1,L2,L3,PE)
Fuse		16A(B)	16A(B)
Recommended minimum cross section	mm²	2.5	2.5
Maximum current/Start current	A	12	12
Maximum energy consumption	kW	3.7	5.0
230V power connection			
Fuse		13A(B)	13A(B)
Outdoor unit		IP54	IP54
Fuse		13A(B)	13A(B)
Power connection		230VAC/50Hz (L,N,PE)	230VAC/50Hz (L,N,PE)
Minimum cable cross-section	mm²	1.5	1.5
Maximum power	A	1.5	1.5
Controller		IP20	IP20
Fuse		13A(B)	13A(B)
Power connection		230VAC/50Hz (L,N,PE)	230VAC/50Hz (L,N,PE)
Recommended minimum cross section	mm²	1.5	1.5
Maximum power	A	6.3	6.3

12.2. Efficiency according to 813/2013 (Eco Design / Energy Label)

Model					ACP10		ACP15	
Function	Cooling				Yes		Yes	
	Heating	Yes	Medium		Yes		Yes	
			Warmer		Yes		Yes	
			Cooler		Yes		Yes	
Performance control	Fixed				No		No	
	Graded				No		No	
	Modulating				Yes		Yes	
Full load	Cooling		Cooling		12		18	
	Heating	Medium	P designh [kW]		9		14	
		Warmer	P designh [kW]		10		14	
		Cooler	P designh [kW]		8		12	
Seasonal performance	Cooling		SEER		4.87		5.20	
	Operation at low temperatures up to 35°C (NT) Operation at medium temperatures up to 55°C				35°C	55°C	35°C	55°C
	Heating	Medium	SCOP/A		5.30	4.00	5.32	4.04
		Warmer	SCOP/W		6.02	4.46	6.21	4.54
		Cooler	SCOP/C		4.62	3.57	4.75	3.71
Annual energy efficiency	Cooling		Hs		192		205	
	Operation at low temperatures up to 35°C (NT) Operation at medium temperatures up to 55°C				35°C	55°C	35°C	55°C
	Heating	Medium	Hs/A [%]		209	157	210	159
		Warmer	ns/W [%]		238	175	245	179
		Cooler	ns/C [%]		182	140	187	145
Performance at 27°C internal and external temperature Tj	Cooling		Tj = 35°C	Pdc [kW]	12.00		18.00	
			Tj = 30°C	Pdc [kW]	8.84		13.26	
			Tj = 25°C	Pdc [kW]	5.68		8.53	
			Tj = 20°C	Pdc [kW]	2.53		3.79	

Performance at 27°C internal and external temperature Tj	Heating	Tj = 35°C	EERd	3.23	3.71
		Tj = 30°C	EERd	4.17	4.39
		Tj = 25°C	EERd	5.27	5.58
		Tj = 20°C	EERd	5.59	6.01

Performance at 20°C internal and external temp Tj	Use at low temperatures up to 35°C (NT) Use at medium temperatures up to 55°C (MT)				35°C	55°C	35°C	55°C
	Heating	Medium	Tj = -7°C	Pdh [kW]	8.0	8.0	12.4	12.4
			Tj = 2°C	Pdh [kW]	4.8	4.8	7.5	7.5
			Tj = 7°C	Pdh [kW]	3.1	3.1	4.8	4.8
			Tj = 12°C	Pdh [kW]	1.4	1.4	2.2	2.2
			Tj = Tbiv	Pdh [kW]	9.0	9.0	14.0	14.0
			Tj = Ttol	Pdh [kW]	9.0	9.0	14.0	14.0
		Warmer	Tj = 2°C	Pdh [kW]	10.0	10.0	14.0	14.0
			Tj = 7°C	Pdh [kW]	6.4	6.4	9.0	9.0
			Tj = 12°C	Pdh [kW]	2.9	2.9	4.0	4.0
			Tj = Tbiv	Pdh [kW]	10.0	10.0	14.0	14.0
			Tj = Ttol	Pdh [kW]	10.0	10.0	14.0	14.0

		Cooler	Tj = -15°C	Pdh [kW]	6.5	6.5	9.8	9.8
			Tj = -7°C	Pdh [kW]	4.8	4.8	7.3	7.3
			Tj = 2°C	Pdh [kW]	2.9	2.9	4.4	4.4
			Tj = 7°C	Pdh [kW]	1.9	1.9	2.8	2.8
			Tj = 12°C	Pdh [kW]	0.8	0.8	1.3	1.3
			Tj = Tbiv	Pdh [kW]	6.7	6.7	10.1	10.1
			Tj = Ttol	Pdh [kW]	8.0	8.0	12.0	12.0

Performance at 20°C internal and external temp Tj	Use at low temperatures up to 35°C (NT) Use at medium temperatures up to 55°C (MT)				35°C	55°C	35°C	55°C
	Heating	Medium	Tj = - 7°C	COPdh	3.25	2.39	3.13	2.33
			Tj = 2°C	COPdh	5.43	3.96	5.23	3.85
			Tj = 7°C	COPdh	6.47	5.15	7.14	5.74
			Tj = 12°C	COPdh	7.58	6.37	8.16	6.87
			Tj = Tbiv	COPdh	2.82	2.16	2.72	2.10
			Tj = Ttol	COPdh	2.82	2.16	2.72	2.10
		Warmer	Tj = 2°C	COPdh	3.48	2.51	3.55	2.47

			Tj = 7°C	COPdh	5.78	4.14	5.76	4.05
			Tj = 12°C	COPdh	7.13	5.60	7.77	6.11
			Tj = Tbiv	COPdh	3.48	2.51	3.55	2.47
			Tj = Ttol	COPdh	3.48	2.51	3.55	2.47
		Cooler	Tj = -15°C	COPdh	2.78	2.21	2.69	2.12
			Tj = - 7°C	COPdh	4.03	3.10	3.94	3.04
			Tj = 2°C	COPdh	5.55	4.16	5.87	4.49
			Tj = 7°C	COPdh	6.69	5.20	7.00	5.82
			Tj = 12°C	COPdh	7.37	6.34	7.94	7.22
			Tj = Tbiv	COPdh	2.56	2.09	2.54	2.03
			Tj = Ttol	COPdh	2.20	1.75	2.06	1.65

Bivalent temperature	Heating	Medium	Tbiv [°C]	-	-
		Warmer	Tbiv [°C]	-	-
		Cooler	Tbiv [°C]	-16	-16
Operating temperature limit values	Heating	Medium	Ttol [°C]	-10	-10
		Warmer	Ttol [°C]	2	2
		Cooler	Ttol [°C]	-22	-22
Another mode besides "Active mode"	OFF		P OFF [W]	16.4	16.4

	Stand-by	P SB [W]	16.4	16.4
	Temperature regulator OFF	P TO [W]	16.3	16.3
	Compressor heater	P CK [W]	0	0

12.1. Efficiency according to EN14511

		ACP10		ACP15	
EN14511		Power [kW]	COP	Power [kW]	COP
Heating	A7W35	5.5	5.43	7.4	5.53
	A2W35	5.3	4.73	9.5	4.71
	A-7W35	9.7	3.26	15.1	3.03
	A-15W35	7.5	2.68	12.5	2.46
	A7W45	5.7	4.25	6.3	4.27
	A7W55	6.1	3.38	7.2	3.31
	A-7W55	9.7	2.19	15.0	2.08
Cooling	A35W18	7.5	3.72	10.6	4.05
	A35W7	7.2	2.71	9.3	3.17

12.2. Power diagrams

12.2.1. ACP10

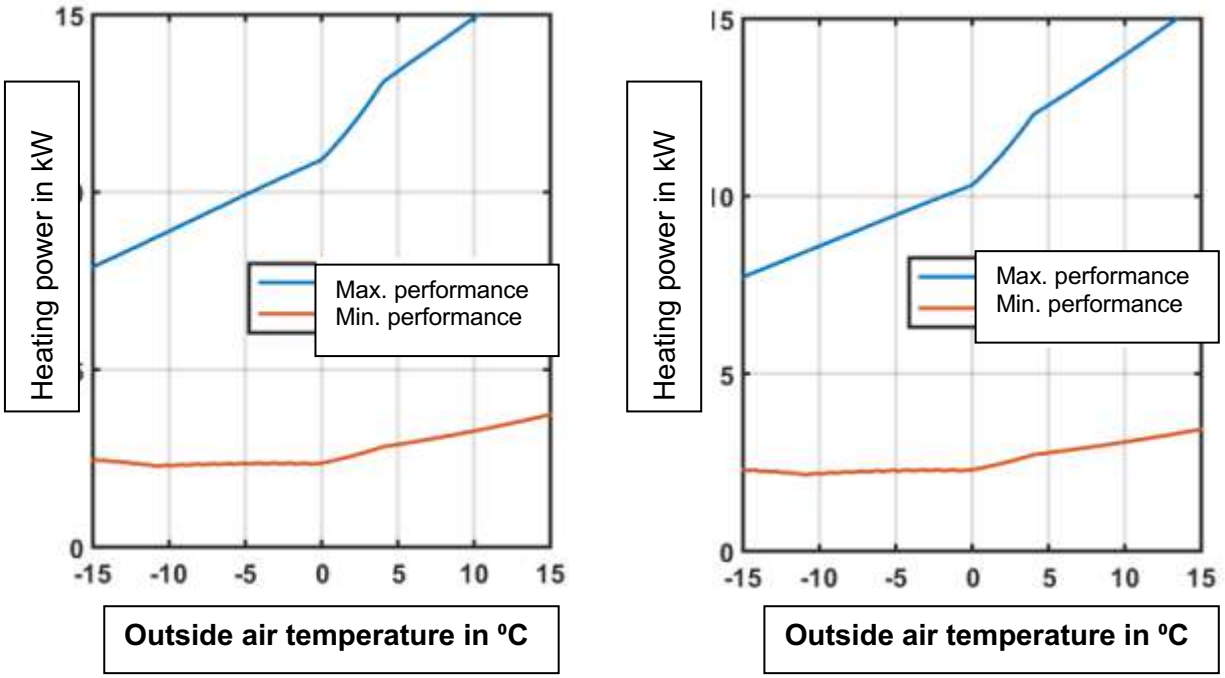


Figure 17: ACP10 at 5K step (left: 35°C flow temperature / right: 55°C flow temperature)

12.2.1. ACP15

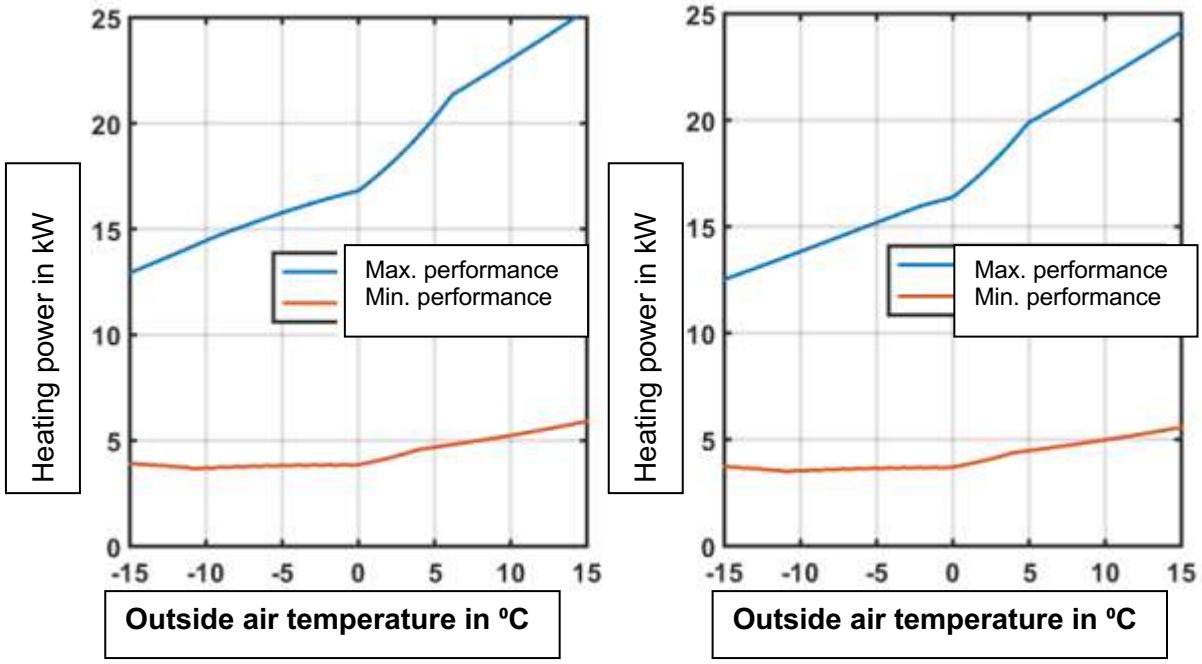


Figure 18: ACP15 at 5K step (left: 35°C flow temperature / right: 55°C flow temperature)

13. Appendix

13.1. Declaration of Conformity

Declaration of Conformity

Number: 202403.1
Publisher: Inova d.o.o
Address: Bage 3, BIH-70101 Jajce

CE

Product: Air/water pump
Types: ACP10, ACP15

Inova d.o.o. declares under its sole responsibility that the above-mentioned product complies with the provisions of the following directives and regulations:

2014/35/EU- Low Voltage Directive
2014/30/EU-EMV-Directive
2011/65/EU-RoHS-Directive
813/2013- Regulation on ecological design
2014/68/EU- Pressure Equipment Directive

The following norms were applied

EN 60335-1/-2-40
EN ISO 12100
EN 378-1/-2
EN 13585
EN 1779
EN 55014-1/-2
EN 61000-3-12
EN IEC 63000
EN 12102-1
EN14825

DRUŠTVO OGRANIČENE ODGOVORNOSTI INOVA JAJCE

Jajce, March 5, 2024

Tomislav Ladan
Director

/*handwritten signature*/

13.2. List of error codes

13.2.1. Error code offset

Group of alarms	Heating circuit
Name	Start offset number
Heating circuit 1	1
Heating circuit 2	6
Heating circuit 3	11
Heating circuit 4	16
Heating circuit 5	21
Heating circuit 6	26
Heating circuit 7	31
Heating circuit 8	36
Heating circuit 9	41
Heating circuit 10	46
Heating circuit 11	51
Heating circuit 12	56

Group of alarms	Boiler
Name	Start offset number
Boiler 1	151
Boiler 2	161
Boiler 3	171
Boiler 4	181
Boiler 5	191

Group of alarms	Buffer tank
Name	Start offset number
Buffer 1	201
Buffer 2	206
Buffer 3	211
Buffer 4	216
Buffer 5	221

Group of alarms	General
Name	Start offset number
Ambient	251
E-manager	501

Group of alarms	Solar
Name	Start offset number
Solar 1	261
Solar 2	266

Group of alarms	Heat pump
Name	Start offset number
Heat pump 1	1000
Heat pump 2	2000
Heat pump 3	3000

13.2.2. Error codes

Module	Code	Name	Description	Possible causes and measures
Heating circuit	0	Modules offline	It is not possible to communicate with the module	- Not related to display - CanBUS problem (A B replaced) - The encoding switch is not set correctly to AHC - AHC faulty
	1	Flow sensor error	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
	2	Backflow sensor error	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
	3	Flow temperature too high	Temperature above the set maximum flow temperature limit	- Mix valve defective/wrongly connected/wrong direction of rotation - Limitation of max. temperature of flow is too low - Buffer tank static with direct heating circuit - Short tolerance time during switching from hot water to heating (extend switching time) - Hydraulic problem
	4	Reserve		
Boiler	0	Offline module	It is not possible to communicate with the module	- Not related to display - CanBUS problem (A B replaced) - The encoding switch is not set correctly to AHC - AHC faulty
	1	Sensor fault up	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
	2	Sensor error down	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
	3	Recirculation sensor error	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
	4	Fresh water sensor error	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured

Buffer tank	0	Module offline	It is not possible to communicate with the module	- Not related to display - CanBUS problem (A B replaced) - The encoding switch is not set correctly to AHC - AHC faulty
	1	Sensor error up	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
	2	Sensor error down	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
	3	Reserve		
	4	Reserve		
Solar	0	Offline module	It is not possible to communicate with the module	- Not related to display - CanBUS problem (A B replaced) - The encoding switch is not set correctly to AHC - AHC faulty
	1	Collector sensor error	Sensor values over the limit	- Unable to establish communication with the ARC cooling board - Sensor defective/not connected/incorrectly configured - Collector temperature above 130°C
	2	Tank 1 sensor error	Sensor values over the limit	-- Sensor defective/not connected/incorrectly configured
	3	Tank 2 sensor error	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
	4	Reserve		
Heat pump	0	ARC offline	Unable to communicate with the ARC heating board	- The 230 V mains voltage is missing from the heat pump / check the power supply - Check the integrity of the CanBUS cable and connectors - Check DiP SWITCH for Can-Bus addressing - 24V power supply is missing on the ARC / check cables and power supply - If the light on the ARC is blue -> the software is not OK or the software is missing - If the light on the ARC is flashing blue green -> and the software cannot start -> check the 24V power supply, the power supply may be faulty - Glass fuse 24V ARC defective - End resistor (DiP SWITCH) on ARC is not set - ARC defective

1	Power-On Reset	ARC restarted	
2	Brown-Out Reset	Voltage drop in mains supply ARC	
3	Master-Clear Reset		
4	Software Reset		
5	Config-Mismatch Reset		
6	Watchdog-Timeout Reset		
7	ADC error report		
8	EEPROM error report	EEPROM Datastore on ARC reports errors	- Initial input of ARC parameters Error while entering parameters - Software versions are not compatible
15	Modbus error Server 1 FU	There is no Modbus communication with the 1st Modbus participant inverter	- Missing FU power supply 400V FU - Check the Modbus communication line of all participants (FU, ventilator, ARC) (A,B,GND) - FU defective - ARC faulty - Ferrite cores (brushes) on the compressor cables are missing
16	Modbus error Server 2 Ventilator	There is no Modbus communication with the 1st Modbus participant ventilator	- Ventilator power missing - Incorrect configuration (analog control method, ventilator type) - Check the Modbus communication line of all participants (FU, ventilator, ARC) (A,B,GND) - Ventilator defective - ARC faulty - The ferrite cores (brushes) on the compressor cables are missing

20	230VAC Power supply OFF	230 Power is not present on ARC board	- Faulty glass fuse (on the right in the black box) - Wiring problem
21	Flow switch activated	The flow switch in the cooling circuit is activated (activated at approx. 70°C condensing temperature) or digital input X11_1 on ARC (usually bridged) is open	- Too little / no energy transfer - The circulation pump is not working - Too low/no flow - Air in the heating system - Too low pressure in the heating system - A hot water boiler with too small a heat exchanger surface and too high a target hot water temperature - The water heater temperature sensor is not set or configured correctly - Diverter valves do not switch or switch incorrectly / check configuration and wiring - Servomotors/valves/thermostats closed in the direct heating circuit - Check the hydraulics - If the error is present even at rest and cannot be reset -> check the wiring of the flow switch, connection on X11_1 and the cable and operation of the flow switch.
22	Motor protection switch Energy source	Digital input X11_2 on ARC (usually bridged) is open	- Not used - Check the plug, cable has fallen out
23	Flow switch Energy source	Digital input X11_3 on ARC (usually bridged) is open	- Not used - Check the plug, cable has fallen out
24	Malfunction ExV valve drive		ExV valve drive cable incorrectly inserted / faulty ARC
25	Malfunction ExV rev. valve drive		ExV reverse valve drive cable incorrectly inserted / faulty ARC
26	Malfunction ExV EVI valve drive		ExV EVI valve drive cable incorrectly inserted/ faulty Faulty ARC

27	Reserve		
28	Reserve		
29	Reserve		
30	Flow temperature	Sensor values over the limit	- Sensor failure / Wiring - Flow too low/temperature too low for defrosting - Too high flow temperature (spiral on the water heater too small)
31	Backflow temperature	Sensor values over the limit	- Sensor failure / Wiring - Temperature too low for defrosting - Too high backflow temperature (spiral on the water heater too small)
32	Energy source Flow temperature	Sensor values over the limit	- Sensor failure / Wiring
33	Energy source Backflow temperature	Sensor values over the limit	- Heat pump type configured for ground/water or water/water system - Not used for air/water systems - Sensor failure / Wiring
34	Temperature of Freon too high	Sensor values over the limit	- Check the control and influencing variables of the expansion valve - Bottleneck between condenser and evaporator - Too little coolant/freon - Compressor wear
35	Temperature of Freon on intake 1 too low	Sensor values over the limit	- Sensor failure / Wiring - Check the flow in defrosting and cooling - Expansion valve. Check the settings
36	Temperature of Freon on intake 2	Sensor values over the limit	- Sensor failure / Wiring
37	Temperature of Freon on intake 3		
38	Subcooler Output temperature	Sensor values over the limit	- Sensor failure / Wiring

39	Inlet temperature at the expansion valve	Sensor values over the limit	- Sensor failure / Wiring
40	Compressor base temperature		
41	High pressure	Sensor values over the limit	- Too little / no energy exchange - Circulation pump is not working - Flow too low/no flow - Air in the heating system - Too low pressure in the heating system - Hot water boiler with too small heat exchanger surface (spiral) and too high target hot water temperature - The water heater temperature sensor is not set or configured correctly - Diverter valves do not switch or switch incorrectly / check configuration and cables - Check the hydraulics - In direct heating circuit, servomotors/valves/thermostats closed
42	Medium pressure		- High pressure sensor faulty/ wiring
43	Low pressure	Sensor values over the limit	- Flow/temperature too low in defrost or cooling mode - The fan does not work / the air flow is blocked - Low pressure sensor faulty/wiring - Check the control and influencing variables of the expansion valve - Expansion valves do not open (wiring, actuator/valve spool, ARC) - Too little coolant/freon

44	Flange temperature	Sensor values over the limit	- The 4-way valve does not turn on - Bottleneck in the cooling circuit between the condenser and the evaporator - Sensor defect (directly to ARC) - Circulation pump not working - Too low/no flow - Air in the heating system - Too low pressure in the heating system
45	Flow Heating side	Too little or no water flow through the heat pump has been detected	- Diverter valves do not switch or switch incorrectly / check configuration and wiring - High hydraulic pressure loss in heating pipes (clean heating filters, too small pipe sections, closed valves) - In direct heating circuit, servomotors / valves / thermostats closed - The flow sensor in the heat pump is faulty, check the wiring
46	Flow Source of energy	Not used with air/water heat pumps	- Heat pump type configured for ground/water or water/water system
47	230VAC Frequency range	Mains frequency too high or too low (50Hz)	
48	Reserve		
49	Reserve		
50	DeltaT Source of energy	Not used with air/water heat pumps	- Heat pump type configured for ground/water or water/water system
51	DeltaT too high Heating side	The difference between the flow and backflow temperature is too large	- Check the flow of the heating system

52	Freon-DeltaT too low	The temperature difference between the hot gas and the condensation temperature is too small	- Check the control and influencing variables of the expansion valve - Expansion valve open too wide / no longer regulating (check wiring, stepper motor and ARC) - Non-return valves in the cooling circuit do not close completely
53	The difference in pressure VP-NP part too small	Too low pressure difference between high and low pressure during operation	- Water temperature is too low and the outside temperature is too high in the heating mode - Water temperature is too high and the outside temperature is too low in cooling mode - The compressor does not start (check the configuration and the cables between the drive and the compressor) - 4-way valve in the middle position - The compressor is broken
54	Condensation DeltaT too low	The condensation temperature drops below the backflow temperature	- Check the control and influencing variables of the expansion valve - Check the condensation temperature and the backflow temperature - The return sensor reacts too slowly when switching between hot water and heating - Too little coolant/freon
60	Working framework Compressor system	The heat pump is operating outside the prescribed operating range (calculated from condensation, evaporation temperature and speed)	- Water temperature is too low and the outside temperature is too high in the heating mode - Water temperature is too high and the outside temperature is too low in cooling mode - The heat pump works around its operating limit or outside it
61	FU-Fault Report	Frequency controller output errors can be specified via status and parameters	- Safety shutdown via FU (high pressure, flow in defrost mode,...) - Starting the FU - 400V power supply and check the cables to the compressor - Network outages

62	FU-alarm	As above	- Check the configuration - Overload or resonance at certain compressor speeds/modes - Frequency regulator defective - The compressor is broken - As above - Frequency controller does not report an error / or the error cannot be read, but the compressor still does not start
63	FU- Uneven discharge FU- Return message	Communication with the frequency regulator is working. However, the frequency controller does not accept the specified default values	- Check the configuration - Check the cables from the drive to the compressor - Check the Modbus communication line of all participants (FU, ventilator, ARC) (A,B,GND) - The ferrite cores (brushes) on the compressor cables are missing
64	Reserve		
65	Reserve		
66	Reserve		
67	Reserve		
68	Reserve		
69	Reserve		
70	The maximum compressor start-up time has been exceeded	- Check configuration	
71	ExV maximum open	Expansion valve is open 100%	- May occur at high outdoor temperatures, low water temperatures and high power - Too little coolant/freon - Narrowing in the cooling circuit between the condenser and the evaporator
72	Defrost counter (gray)	Defrost message (grey)	- Only informative

	72	Defrost counter (red)	If there are 4 defrosts within 2 hours, the error message (red) goes out.	Ice layer not completely thawed Obstruction of air flow The fan does not rotate or rotates incorrectly Check the speed of the fan and the compressor and the entered parameters of the silent mode Too high efficiency at low water temperature and outside temperatures around 0°C (adjust efficiency accordingly) Check the control and influence variables of the expansion valve Too little refrigerant/freon
	73	Maximum defrost time exceeded	The defrosting process has exceeded the maximum planned time	- Strong wind - Evaporator fins are very frozen - Increase compressor speed in defrost mode
	74	Reserve		
	100	SW-Update	Report	
	101	SW-Update required	Report	
Ambient	0	Module offline	Not possible to communicate with the module	-AHC faulty -Not related to the display -CanBUS problem (A B replaced) -Encoding switch is not set correctly to AHC
	1	Outside temperature sensor error	Sensor values over the limit	- Sensor defective/not connected/incorrectly configured
E-manager	0	Unequal value	Not related to smart meter or energy management system via Modbus	- Incorrectly connected/wired - Incorrect values sent
	1	Modbus Request 3 Error	Not related to smart meter or energy management system through Modbus	- Incorrectly connected/wired - Incorrect values sent

2	Modbus Slave offline	Not related to smart meter or energy management system via Modbus	- - -	- Incorrectly connected/wired - Sending incorrect values
3	Modbus Slave-Link Error			
4	Modbus Request 2 Error			
5	Modbus Request 1 Error			

The error code system is obtained by adding the appropriate starting offset of the module error number plus the corresponding error number.

Examples of error code systems:

Error in 1st heating circuit:

Error code	Description	Error Offset	Number of module error
00001	Offline module	1	0
00002	Flow sensor error	1	1
00003	Backflow sensor error	1	2
00004	Flow temperature is too high	1	3

Error in 2nd heating circuit:

Error code	Description	Error Offset	Number of module error
00006	Offline module	6	0
00007	Flow sensor error	6	1
00008	Backflow sensor error	6	2
00009	Flow temperature is too high	6	3

Error in boiler

Error code	Description	Error Offset	Number of module error
00151	Module offline	151	0
00152	Sensor error up	151	1
00153	Sensor error down	151	2
00154	Circulation sensor error	151	3
00155	Error fresh water sensor	151	4

Error in 2nd buffer

Error code	Description	Error Offset	Number of module error
00206	Module offline	206	0
00207	Sensor error up	206	1
00208	Sensor error down	206	2

Error heat pump 1

Error code	Description	Error Offset	Number of module error
01000	ARC offline	1000	0
01021	Flow switch activated	1000	21
01043	Low pressure	1000	43

Error heat pump 2

Error code	Description	Error Offset	Number of module error
02001	Power-On Reset	2000	1
02073	Maximum defrost time exceeded	2000	73
02100	SW-Update	2000	100


inova