ATW-MINI

Technical Guide

AIR-TO-WATER HEAT PUMP

CONTENTS

Dear Customer,

thank you for purchasing the ATW-MINI Heat Pump. We believe you will be satisfied with this product and that this product will bring comfort into your home.

As this product is a complex appliance, pay high attention to this User Guide. This guide will make you completely familiar with the product application, placing, construction and will provide you with other necessary information.

IMPORTANT WARNING

Before you connect the heat pump to the network, contact your local distributor for authorization.

Connection, service and inspections of the electrical installation can only be done by an authorized electrical installation company. The Certificate of Warranty is not valid without confirmation from such a company.

1. THE PRODUCT

The MINI Heat Pump is a split system (divided):

- Indoor unit MINI IO-15
- Outdoor unit AOY(*)14, 18, 30 36, 45, 54, WOYG112, 140, WOYK112, 140, 160
- Outdoor temperature sensor, indoor temperature sensor
- User Guide
- Certificate of Warranty

2. APPLICATION

The ATW-MINI Heat Pump is designed for heating of family houses or smaller industrial buildings. The product is to be connected to low-temperature heating systems. This heating system is best suitable for floor heating, wall and ceiling heating.

Connection to the classical wall convectors is theoretically possible, but it is limited by the maximum temperature of the output heating water (50°C, 60°C in High Power systems). At this temperature, the COP (efficiency) is lower. When connecting to the wall convectors, it is necessary to calculate the power at an input water temperature of 45-50°C and to compare it with the thermal loss of the given room.

The heat pump can be used as a source of cooling water.

3. TECHNICAL DESCRIPTION OF THE PRODUCT

Basic construction components:

- Outdoor Evaporator
  This unit is made from a steel plate with high-quality anti-corrosive treatment by electrostatic pulverized paint. The core of the unit is a two-step DC inverter compressor, which represents an innovation in the field of heat pumps and which guarantees reliability and long lifetime. Other parts include an evaporator with anti-corrosive treatment and a lifetime of over 30 years, fans with variable rotation speeds, an electronic expansion valve, controlling and measuring components.

- Indoor Unit
  The core of the unit is a high-quality refrigerant/water heat exchanger. Other essential part is a high-quality regulator with sophisticated software which is responsible not only for the operation of the heat pump but also for the total temperature regulation in the building. The regulator ensures cascade regulation of the heat pump with backup heater during insufficient power of the heat pump.
  It is also possible to connect the appliance to PC through internet interface for comfortable and effective control of the heat pump.

4. SAFETY PRECAUTIONS

The Heat Pump is an electrical appliance operating under 230V voltage! The product can only be installed and serviced by an authorized electrician. In case of fire, do not use water or foam extinguishers. Use only the dry-powder or carbon dioxide extinguishers!

In case of refrigerant leakage, switch off the outdoor unit breaker and contact the servicing organization mentioned on the label on the indoor unit. The R410A refrigerant is non-flammable, inexplosive and non-toxic. Under no circumstances should you try to stop the refrigerant leakage by yourselves. The refrigerant is generating very low temperatures (as low as -50°C). In case of indoor leakages, ventilate the room properly. In case of inhalation of refrigerant and fire exhausts, bring the exposed person into a ventilated room and call your local medical emergency number. If hit by the liquid refrigerant, dry the affected place immediately and warm it (e.g. by a blanket). If eyes are affected by the liquid refrigerant, wash them out with water and call your local medical emergency number.

In case of fire emergency, disconnect the appliance from the electrical network and extinguish the fire with dry-powder or carbon dioxide extinguishers.

In case of heating water leakage, switch off all the indoor unit breakers and contact the service organization mentioned on the label on the indoor unit.

During manipulation with the refrigerant piping (cleaning, maintenance), use protective working aids (such as gloves or glasses).

Do not insert fingers into an operating fan of the outdoor unit, serious injury might occur!

Exposing yourself to a direct airflow for extended period of time may lead to serious hyperthermia.

Local laws and standards must be observed.

5. STORAGE AND TRANSPORT

Outdoor unit AOY(*) 18, 30, 30, 36, 45, 54:

- Dust/free, non-agressive environment
- Temperature -10°C to +45°C
- Maximum humidity 90%

The outdoor unit must be stored and transported in vertical position and in the original box. If necessary, protect the fragile parts (e.g. exchanger).

ATW-MINI indoor unit:

- Dust/free, non-agressive environment
- Temperature +5°C to +45°C
- Maximum humidity 70%

6. SPECIFICATIONS

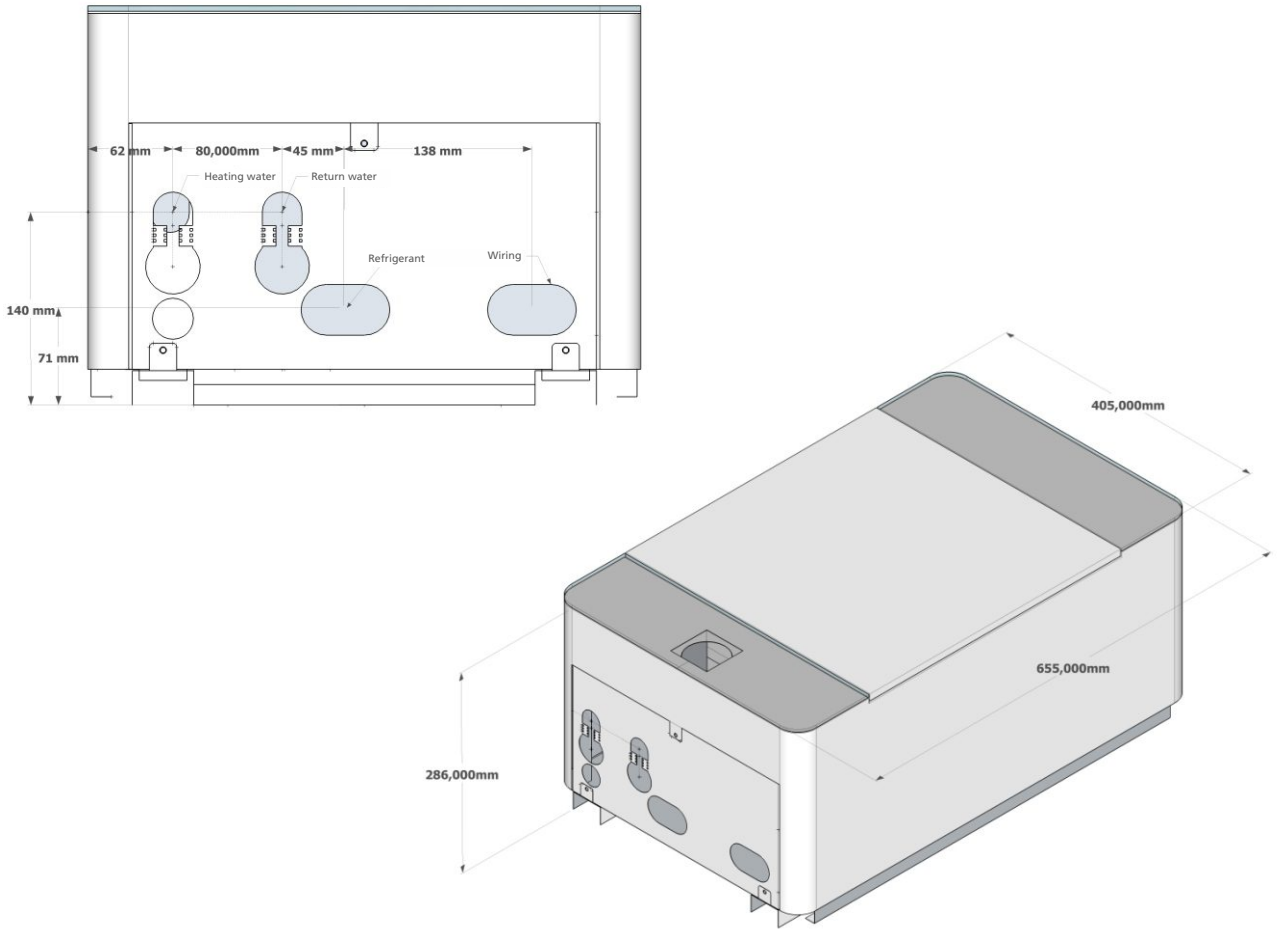
Series				Comfort					High Power		
Type				Mini 5	Mini 8	Mini 11	Mini 14	Mini 16	Mini 11 HP	Mini 14 HP	Mini 16 HP
Applicable outdoor units				AOYG18LALL WOYA60LDC	AOYG30LETL WOYA80LDC	AOYG36LETL AOYG36LATT WOYA100LDC	AOYG45LETL AOYG45LATT	AOYG54LETL AOYG54LATT	WOYK112LCT WOYG112LCT	WOYK140LCT WOYG140LCT	WOYK160LCT
+7°C / +35°C floor heating	Heating capacity		kW	5	8	11,1	14	16	11,2	14	16
	Input power		kW	1,22	1,9	2,67	3,5	4,05	2,55	3,22	3,72
	COP			4,1	4,2	4,15	4	3,95	4,4	4,35	4,3
+2°C / +35°C floor heating	Heating capacity		kW	4,06	8	10	13	14	11,2	14	15,1
	Input power		kW	1,23	2,5	3,13	3,94	4,38	3,45	4,4	4,87
	COP			3,3	3,2	3,2	3,3	3,2	3,25	3,18	3,1
-7°C / +35°C floor heating	Heating capacity		kW	3,46	7,9	8,63	11	11,5	11,2	14	15
	Input power		kW	1,31	3,12	3,6	4,4	4,79	3,92	5,15	5,56
	COP			2,65	2,53	2,4	2,5	2,4	2,86	2,72	2,7
+7°C / +45°C radiators	Heating capacity		kW	5,67	8	9,5	13,2	14,4	10,5	13,1	15,1
	Input power		kW	1,7	2,47	2,97	4,13	4,57	2,9	3,7	4,42
	COP			3,33	3,24	3,2	3,2	3,15	3,62	3,54	3,42
-7°C / +45°C radiators	Heating capacity		kW	3,15	7	7,4	9,5	10	10,5	13,1	14,5
	Input power		kW	1,56	3,41	3,61	4,5	4,85	4,16	5,39	6,39
	COP			2,02	2,05	2,05	2,11	2,06	2,52	2,43	2,27
Power source				1ø 230V, 50Hz					3ø 400V, 50Hz		
Current	Max.		A	12,5	17,5	18,5	20	25,9	8,5	9,5	10,5
Noise level (indoor unit)				42 dB/1m							
Dimensions (indoor unit)	H×W×D		cm	65,5 × 40,5 × 28,6							
Heat exchanger				plate stainless – soldered							
Fan motor				DC-variable speeds							
Noise level (Sound pressure)	dB(A)			39,0	39,0	40,0	41,0	41,0	41,0	41,0	41,0
Dimensions (outdoor unit)	H×W×D		cm	58×79×30	83×90×33		129×90×33		129×90×33		
Weight (outdoor unit)	(netto)		kg	44	62	62	98	105	109	109	109
Refrigerant				R410A							
Refrigerant amount			kg	1,35	1,7	1,7	3,35	3,35	2,5		
Connection pipes	Diameter	Liquid	mm	ø 6,35	ø 9,52	ø 9,52	ø 9,52	ø 9,52	ø 9,52		
	Diameter	Gas	mm	ø 12,70	ø 15,88	ø 15,88	ø 15,88	ø 15,88	ø 15,88		
	Length	Min. / Max.	m	5/15	5/20	5/20	5/20	5/20	5/20		
	Length (chargeless)	Max.	m	15	15	20	20	20	15		
	Height difference	Max.	m	15	15	20	20	20	15		
Operation range			°C	-15 ~ 24					-20 ~ 35		
Compressor				DC-inverter (variable-speed)							
Regulation of refrigerant circuit				electronic expansion valve							
Pressure loss of hot water (indoor unit)				105 hPa							
Max. height of water column				18 m							
Max. operation overpressure / HDW				0,18 MPa / 0,55 MPa							
Evaporator				Al-Cu vertical							
Air flow			m^3/h	600 - 2 500			1 000 - 5 500		1 000 - 7 500		
Defrosting				hot gas through reverse valve							
Heating circuit connection				G1"							
Relative humidity limits				15-95%							

Notes:

The values of heating capacity/power input/COP are based on measurement of EN14511 standard.

Sound pressure level measured at distance of 5m from the device, 1.5m from the ground.

DIMENSIONS



7. OPERATING PRINCIPLE

The heat pump appliance is used to acquire low-temperature energy from the selected source and its transfer to higher temperature level. The air to water heat pump extracts heat from the ambient air.

The core of the heat pump serves as an efficient compressor through which the refrigerant is compressed and then expanded in a hermetically closed circuit. This process makes the best of the refrigerant qualities – in this case, the ecological refrigerant R410 is used.

On the entry side (outdoor unit and its evaporator), the outdoor air is run by the fan through the heat transfer surface of the evaporator. The refrigerant, which passed through the expansion valve and is quenched to temperature lower than the temperature of the ambient air, circulates inside the evaporator.

Refrigerant is warmed on the evaporator (for example from -17°C to -10°C) and the acquired heat is stored in the refrigerant and is further "pressed" by the compressor and distributed into the condenser (indoor unit).

The refrigerant then condenses on the indoor unit plate exchanger and thus the heat is transferred to the heating medium (heating water).

The condensed refrigerant then heads back into the expansion valve and the whole cycle repeats itself over and over again.

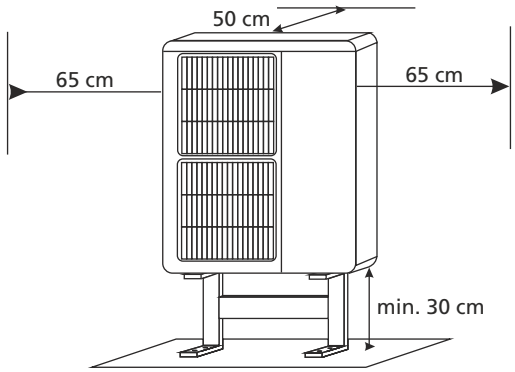
8. INSTALLATION AND POSITIONING

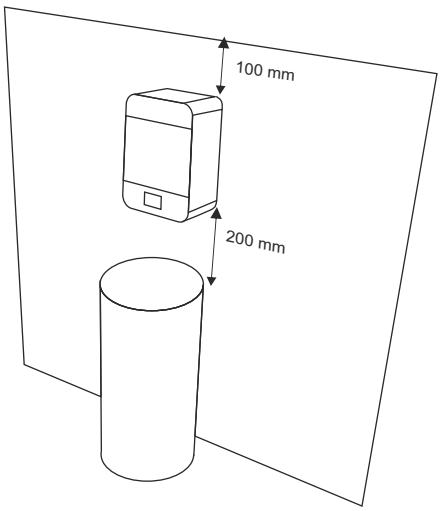
The installation must be performed by a professional company authorized by the manufacturer. Do not install the appliance by yourself. The appliance might get damaged and people injured.

It is possible to suspend the indoor unit on the wall. It has to be placed in the room in a way that enables the access for service and maintenance (see the illustration under).

The outdoor unit is to be attached to a stand supplied by the manufacturer as an accessory. The stand is necessary for an appropriate evaporator defrosting. This stand must be firmly fastened to a concrete base large enough to prevent the unit from toppling over in windy weather. Its position must be chosen with sufficient space for free airflow to the evaporator and for easy service access (see the illustration below and refer to service and installation manual for further information).

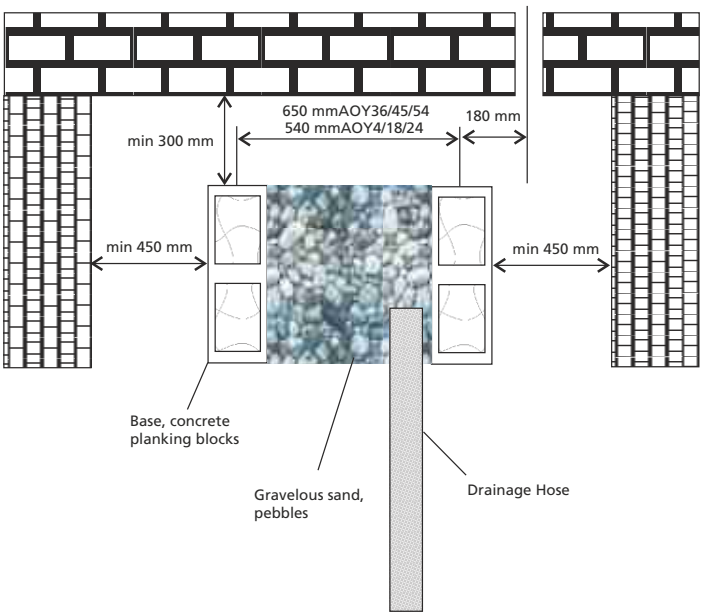
When installing the outdoor unit in a dense urban area, make sure to observe the noise regulation standards. In some cases, a noise test might be necessary.

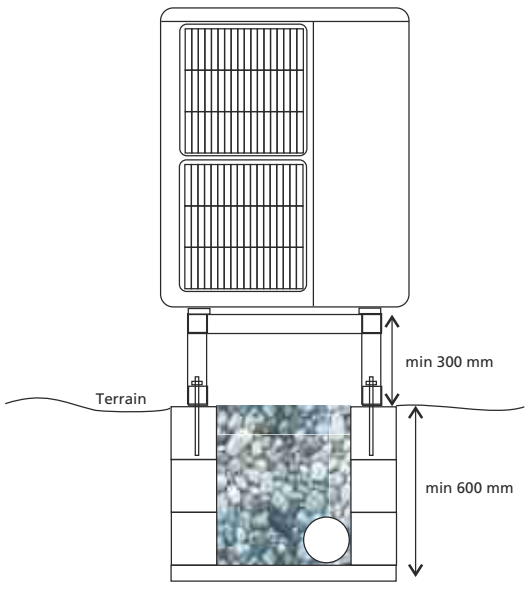




Base of the outdoor unit

It is recommended to place the outdoor unit on a concrete base. Fill the space between the planking blocks with pebbles. In winter, the condensate will drain to non-freezing depth and won't create ice coating. In case of impermeable earth, the situation can be improved by installing a drainage hose and by conducting the condensate away from the area.





9. CONNECTION OF THE REFRIGERANT CIRCUIT

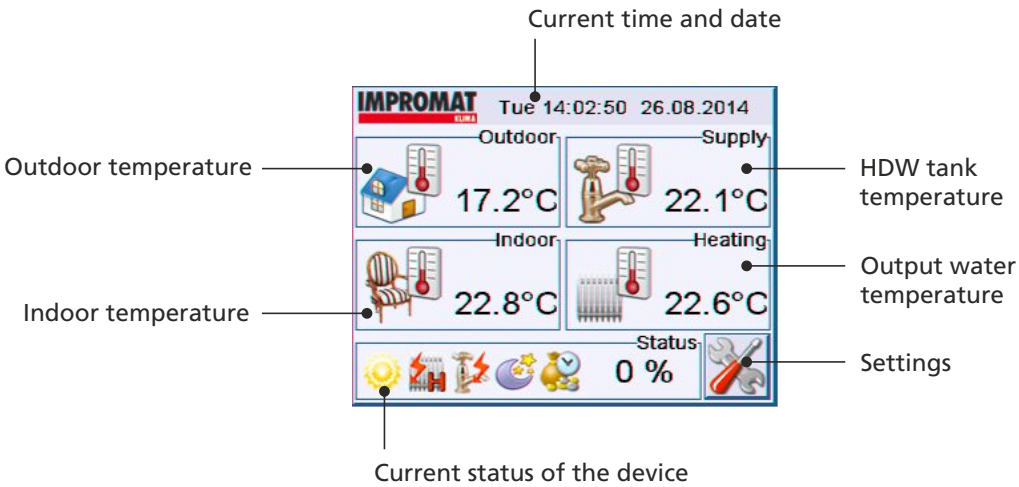
The heat pump refrigerant circuit connection must be performed by an authorized installation company or a company certified or trained in air-conditioning and refrigeration services.

Do not connect the refrigerant circuit by yourself. There is a serious danger of injury from refrigerant. The refrigerant pressure is up to 4,5Mpa and its temperature is as low as -50°C!

10. SETTING AND OPERATION

10.1. MAIN DISPLAY SCREEN

The main display screen is divided into five basic monitoring windows and buttons serving to enter the device's setting menu.

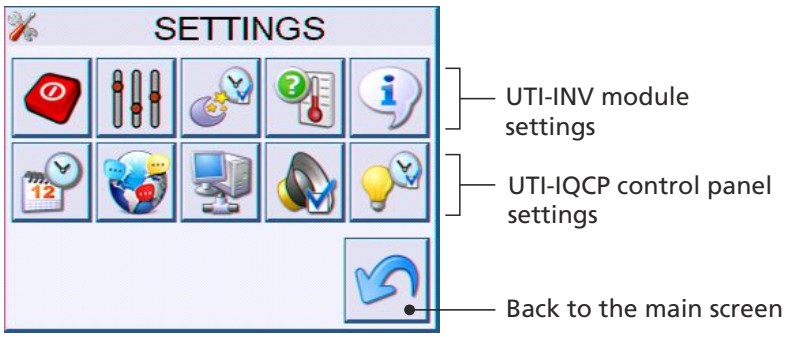


Status of the device:

- Error - call the service!
- The device operates in heating mode
- The device operates in cooling mode
- Defrosting of outdoor unit in progress
- The device is switched off
- Water heating in progress
- Water heating with first stage of bivalent activated
- Water heating with first and second stage of bivalent activated
- Summer mode is activated (only HDW heating)
- HDW heating in progress
- HDW heating using electric heating in progress
- The device is in reduced mode
- The device is in high tariff operation (rate)

10.2. SETTINGS

The Settings menu is divided into two rows of icons. The top row icons are used for the control of the UTI-INV module (mode, equitherm regulation, HDW etc.), the bottom row icons are used to set the UTI-IQCP control panel (language, time, network connection etc.).



Setting options:

- Control (ON/OFF, Cooling/Heating, Summer/Winter)
- Parameters setting (temperature sensors, operation limits, equitherm regulation etc.)
- Reduction timer
- Temperature sensors
- Device information
- Current time and date
- Language
- Network setting
- Sound setting
- Backlight

10.2.1 Basic control

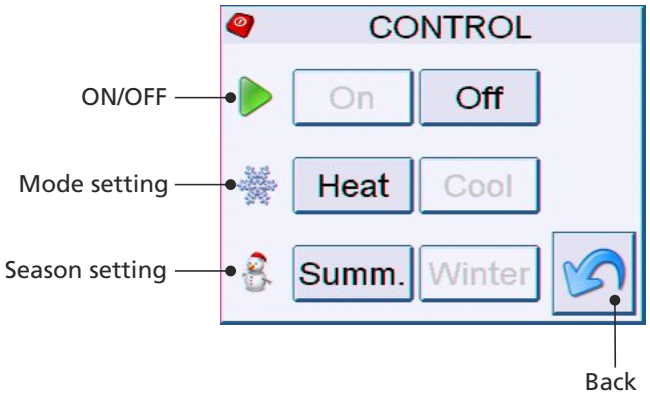
The control screen allows the setting of the device's main modes. The icons on the left show the current status.

There are three basic parameters:

On / Off - Turns the device on or off. In the ON state, all set programmes are running. In the OFF state, the divice does not perform any action. It is possible that after swiching the device off, the circulation pump might still be running for a while.

Heating / Cooling - In the heating mode, the device heats according to the heating curve, and heats the domestic hot water. In the cooling mode, the device cools the water at a preset temperature, the HDW heating is not activated.

Summer / Winter - Choosing the season. In summer mode, the device only heats the HDW tank. In winter mode, all heating operations are performed.



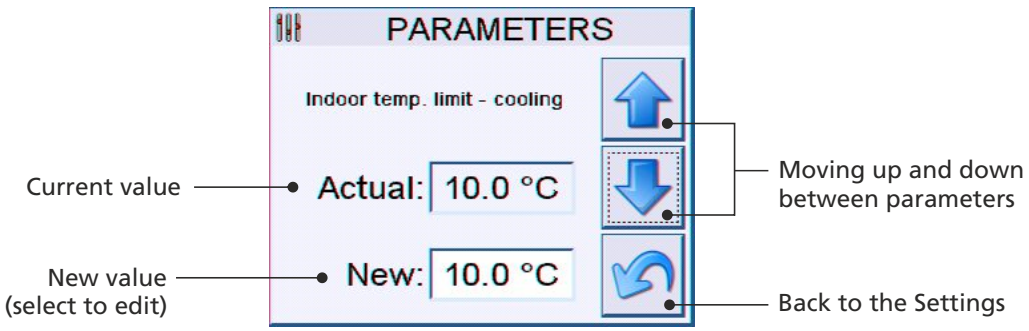
Status icons:

- The device is OFF
- The device is ON
- The device is Cooling mode
- The device is Heating mode
- The device is Winter mode
- The device is Summer mode

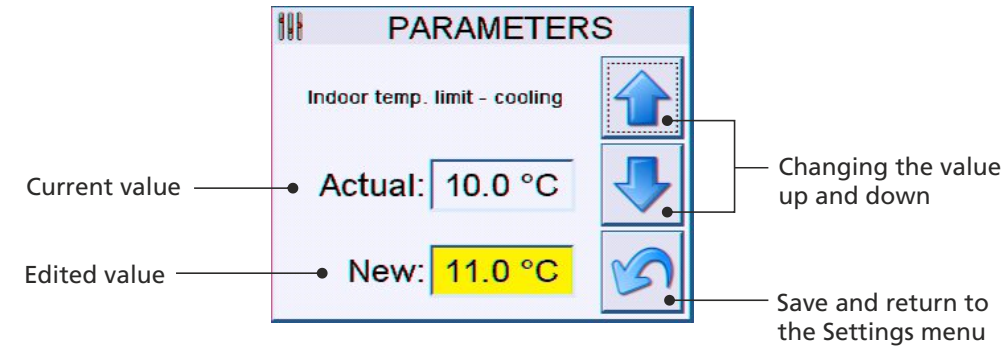
10.2.2 Parameters settings

The menu with a number of parameters that can be viewed, and modified, if necessary. The current value of the parameter is displayed. If the parameter is user-editable, a box labelled „New" is displayed.

Parameters in view mode:



Parameters in edit mode:



Parameters that cannot be edited:

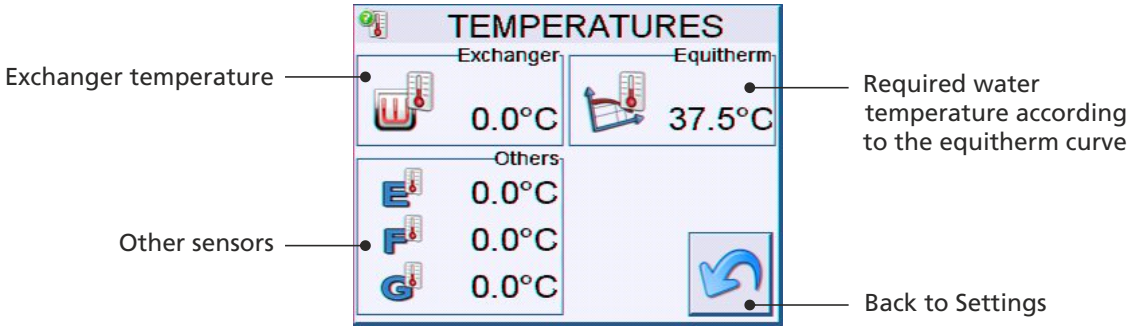
- Mode V2
- Maximum temperature of the refrigerant in the heating mode
- Minimum temperature of the refrigerant in the cooling mode
- Mode V1

Editable parameters:

- **Time limit - supply water** - time during which the HDW tank will be heated.
- **Temperature reduction - cooling** - how many degrees will the temperature increase during cooling.
- **Temperature reduction - heating** - how many degrees will the temperature decrease during heating.
- **Bivalent temperature** - outdoor temperature that causes the outdoor unit shutdown.
- **Cooling water temperature** - requied water temperature in the cooling mode.
- **Power limit - cooling** - maximum capacity of the outdoor unit during cooling mode.
- **Power limit - heating** - maximum capacity of the outdoor unit during heating mode.
- **Max. temperature - supply water** - maximum temperature in the HDW tank.
- **Min. temperature - supply water** - minimum temperature in the HDW tank.
- **Power limit - supply water** - maximum capacity of the outdoor unit during HDW heating.
- **Heating water (outdoor +20°)** - required heating water temperature at +20°C outdoor temp.
- **Heating water (outdoor +12°)** - required heating water temperature at +12°C outdoor temp.
- **Heating water (outdoor +4°)** - required heating water temperature at +4°C outdoor temp.
- **Heating water (outdoor -4°)** - required heating water temperature at -4°C outdoor temp.
- **Heating water (outdoor -12°)** - required heating water temperature at -12°C outdoor temp.
- **Heating water (outdoor -20°)** - required heating water temperature at -20°C outdoor temp.
- **Regulation constant** - value affecting the communication speed with the outdoor unit.
- **Indoor temperature limit - heating** - maximum indoor temperature in the heating mode.
- **Indoor temperature limit - cooling** - minimální indoor temperature in the cooling mode.

10.2.3 Temperature

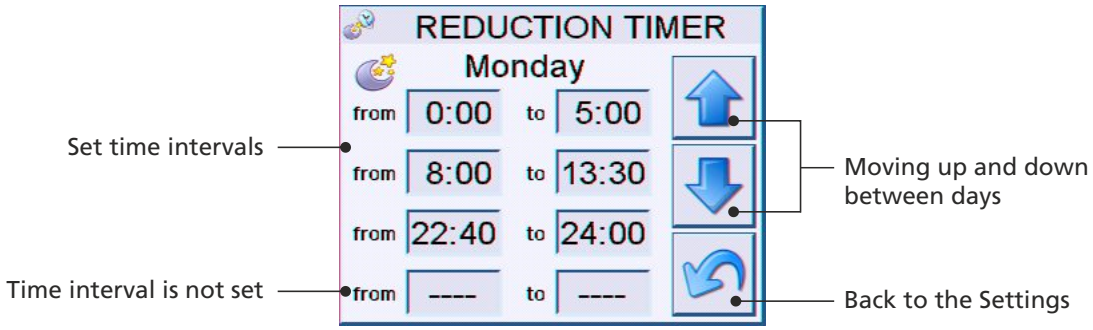
List of other temperature sensors that are not shown on the main screen. The exchanger temperature and the required temperature are displayed. The E, F and G sensors are displyed - these values are only informative and do not affect the regulation.



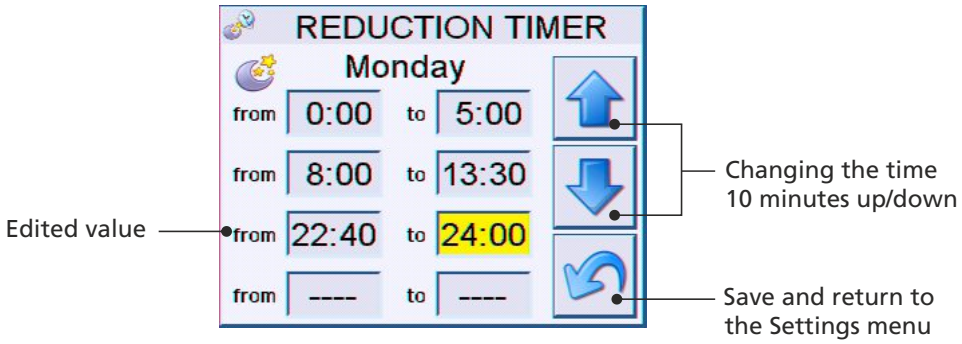
10.2.4 Reduction timer

For each day of the week, you can select up to four time intervals during which the reductution timer is active. Move between the days of the week using the arrow buttons. To set the time, click on the corresponding box and insert the value using the arrow buttons.

Moving between days of the week:

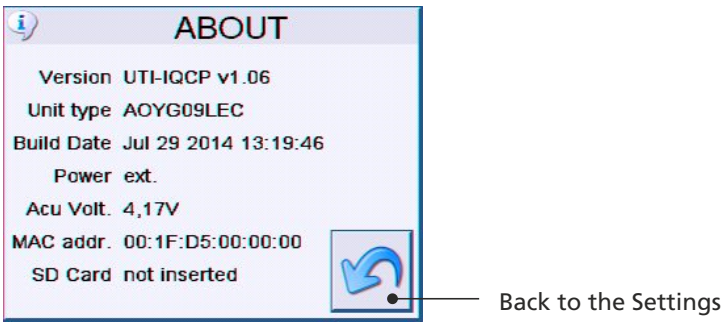


Setting the time intervals:



10.2.5 Device information

Information sheet showing the current version of the control panel, type of the outdoor unit and other information, including the MAC address of the device (if you are incorporating the panel to the network). The last line shows if the SD card is inserted.



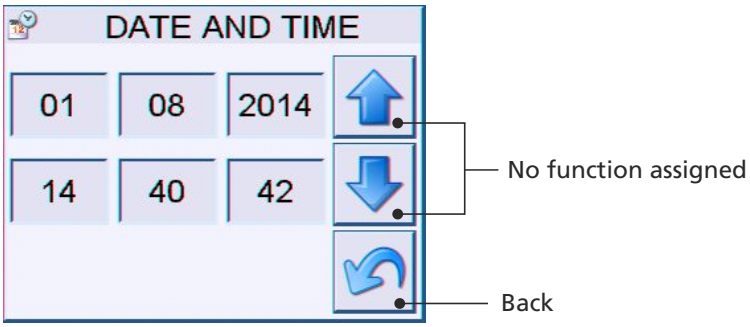
10.2.6 Language setting

The UTI-IQCP control panel offers three language versions. When you select the language, the user interface will switch to that language. By pressing the Back button, the setting will be saved and the screen will return to the Settings menu.

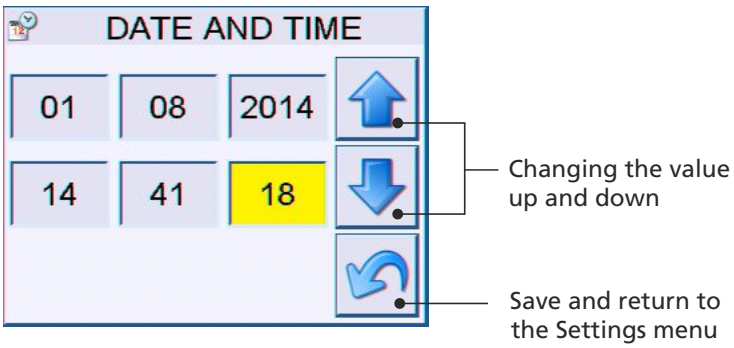
10.2.7 Current date and time

To set the current date or time, highlight the item you want to edit. The value can then be changed using the up and down arrows. By pressing the Back button, the setting will be saved and the screen will return to the Settings menu.

Date and time in view mode:

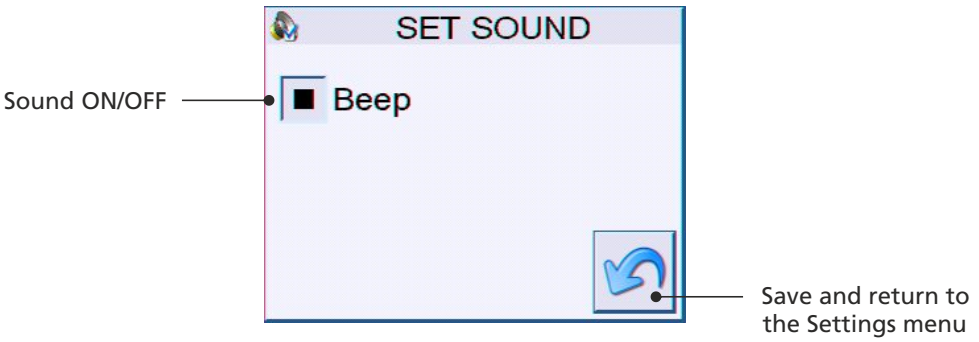


Date and time in edit mode:



10.2.8 Sound setting

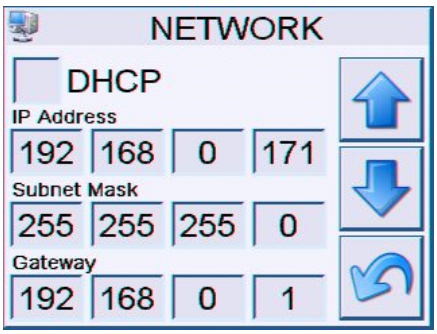
It is possible to swich the sound on or off. If the sound is on, the panel will emit beep sounds when making settings.



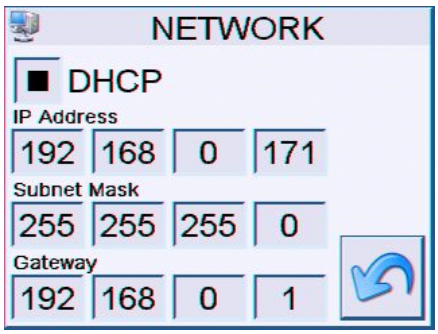
10.2.9 Network setting

It is possible to set the IP address, subnet mask and gateway of the network so that the devices can be connected to the network. If the installation permits, it is possible to activate the DHCP server.

DHCP deactivated:

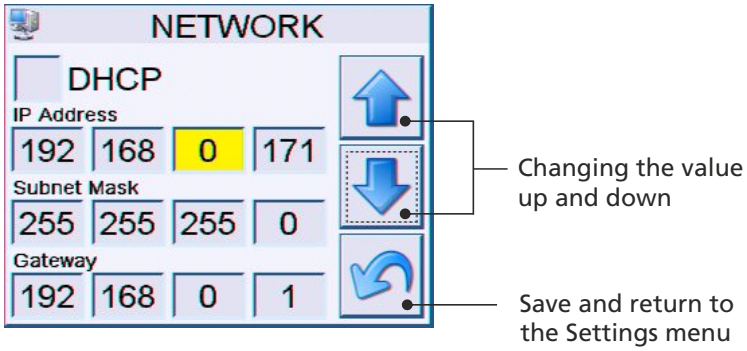


DHCP activated:



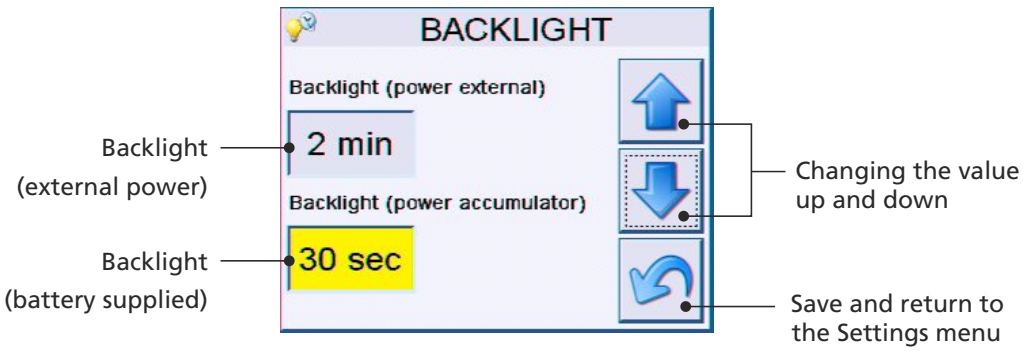
Note: If you don't know what value to set, **do not** make any changes, or connect the panel to the network. Please consult your network administrator.

To set the desired value, click on the item you want to edit. The value can be changed using the up and down arrows. By pressing the Back button, the setting will be saved and the screen will return to the Settings menu.



10.2.10 Backlight setting

To adjust the backlight of the display, highlight the item you want to edit. The value can be changed using the up and down arrows. By pressing the Back button, the setting will be saved and the screen will return to the Settings menu.



Available backlight time lengths:

- on (----), 10 seconds, 30 seconds, 1 minute, 2 minutes.

10.2.11 Factory settings

If the panel is not responding, or you have made a setting that led to a non-standard function, it is possible revert the panel to its factory settings:

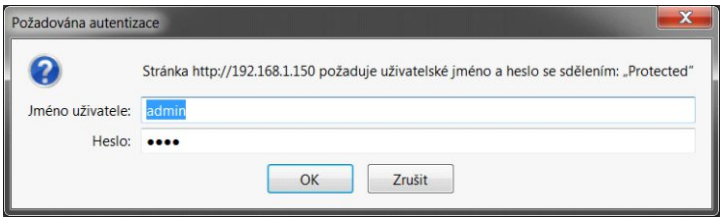
1. Press the button on the panel for more than 10 seconds. (Note: the button may not be accessible when the panel is installed in a unit.)
2. Perform the calibration – 3x upper left corner, 3x lower left corner, 3x right center.

Factory settings:

- Sound: on
- Backlight (external power): on
- Backlight (battery): 30 seconds
- Language: English
- Network settings: IP:192.168.0.100
  MASK:255.255.255.0
  GW:192.168.0.1
- Password: 1937 (user is always „admin")
- Other settings: remain in original state (timer)

10.3. WEB INTERFACE OF THE PANEL

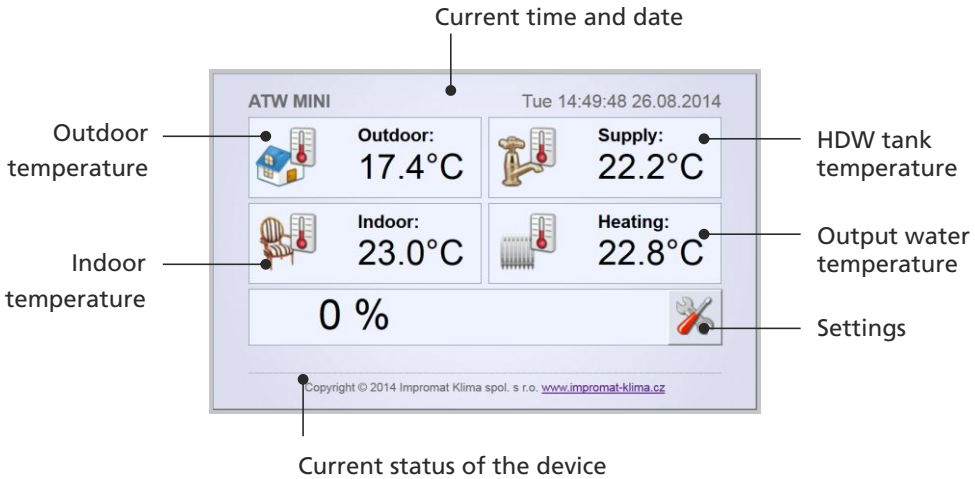
If the panel network interface is set correctly, it is possible to monitor and control the device from any web browser by entering the relevant IP address.



Default login:

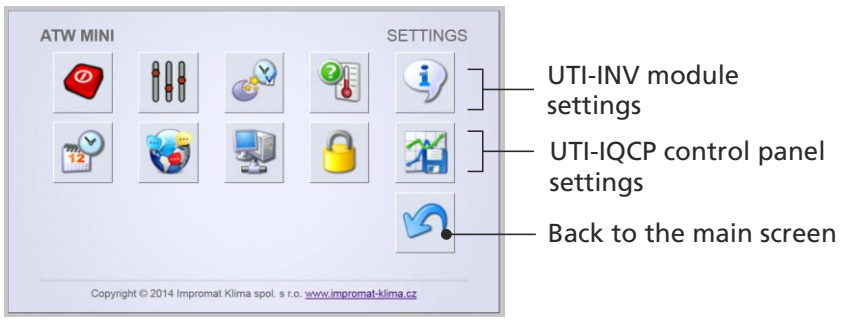
User: admin
Password: 1937

After login, the main screen is displayed. It is divided into five basic monitoring windows and buttons serving to enter the device settings.



Status of the device: The status icons are the same as on the touch panel (see Chapter 1).

The settings menu is divided into two rows of icons. The top row icons are used for the control of the UTI-INV module (mode, equitherm regulation, HDW etc.), the bottom row icons are used to set the UTI-IQCP control panel (language, time, network connection etc.).



Setting options:

Control (ON/OFF, Cooling/Heating, Summer/Winter)

Parameters setting (temperature sensors, operation limits, equitherm regulation etc.)

Reduction timer

Temperature sensors

Device information

Current time and date

Language

Network setting

Password settign

Data

Password setting

You can change your password through the web interface. If you forget your password, it is possible to revert the panel to the factory settings, which will also reset your password. Username cannot be changed.

Printscreen

If you for some reason need to create a screenshot of the touch panel (to send to your service organization, for example), you can access it from: **http:// your IP address /screen.bmp**

Data

The data from the SD card can be saved to your computer - you can analyze them or send to your service organization.

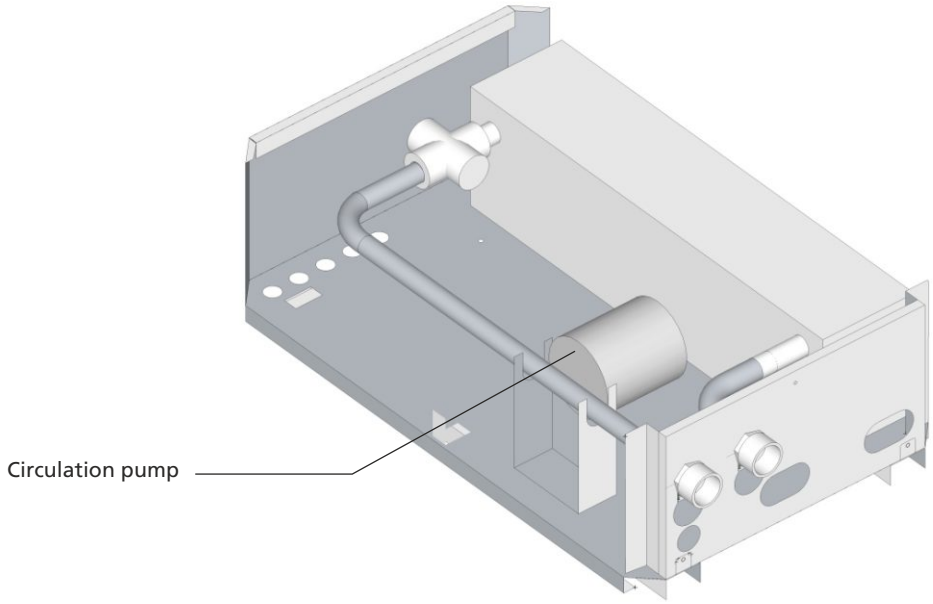
By clicking on a specific day, you can open or save the particular record. To open the *.ICH file, it is necessary to have the IMPROMAT service kit installed.

11. MAINTENANCE

Due to its design the heat pump is very easy to maintain. Basic maintenance is performed by the servicing organization once a year. During this regular maintenance, all important elements of the heat pump are checked. Special attention is paid to the correct volume of refrigerant in the circuit and a proper operation of the refrigerant circuit.

It is important to observe the outdoor unit evaporator status. The best way to clean the outdoor unit is by using the garden washer with hot water. This way, dirt and eventual frost is cleaned from the evaporator.

Do not use high pressure cleaners and any other mechanical tools (brush etc.). The evaporator is very fine and could easily be damaged. Prior to the outdoor unit evaporator cleaning, switch off the main breaker of the indoor unit!



The indoor unit requires minimal maintenance. Use a wet cloth to clean the dust from the upper casing. Be extra careful when cleaning the heat pump during its operation. It is recommended to cleaning the indoor unit after the heating season and when it is disconnected.

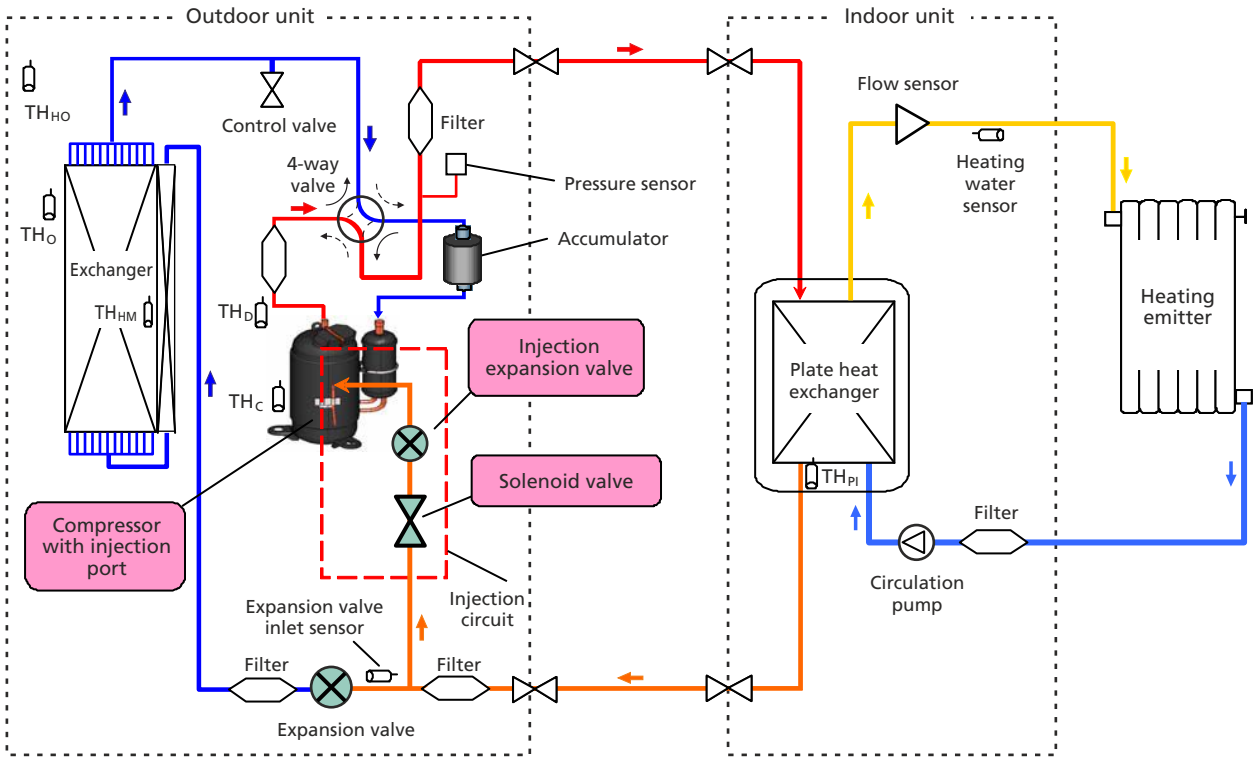
Before the heating season, check the circulation pump operation for possible jamming. This is indicated by a circulating pump lamp. The pump has a automated program which is trying for some time to release the blocked shaft. Once a year, have the functionality of the expansion tank checked. Also check the heating water filter.

All this maintenance should better be performed by an authorized organization during regular servicing.

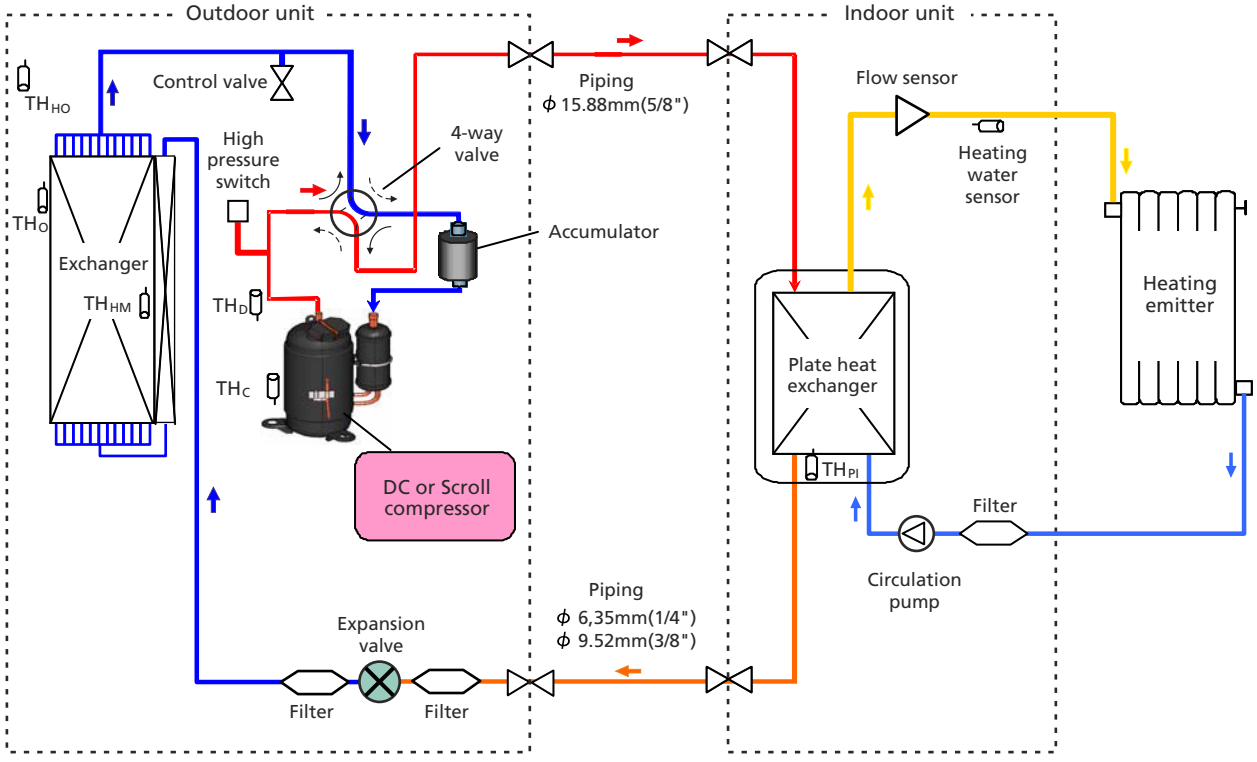
Prior to removing the heat pump cover, disconnect the heat pump from the network. There is a great risk of injury by electric current.

12. REFRIGERANT CIRCUIT

Models: High Power

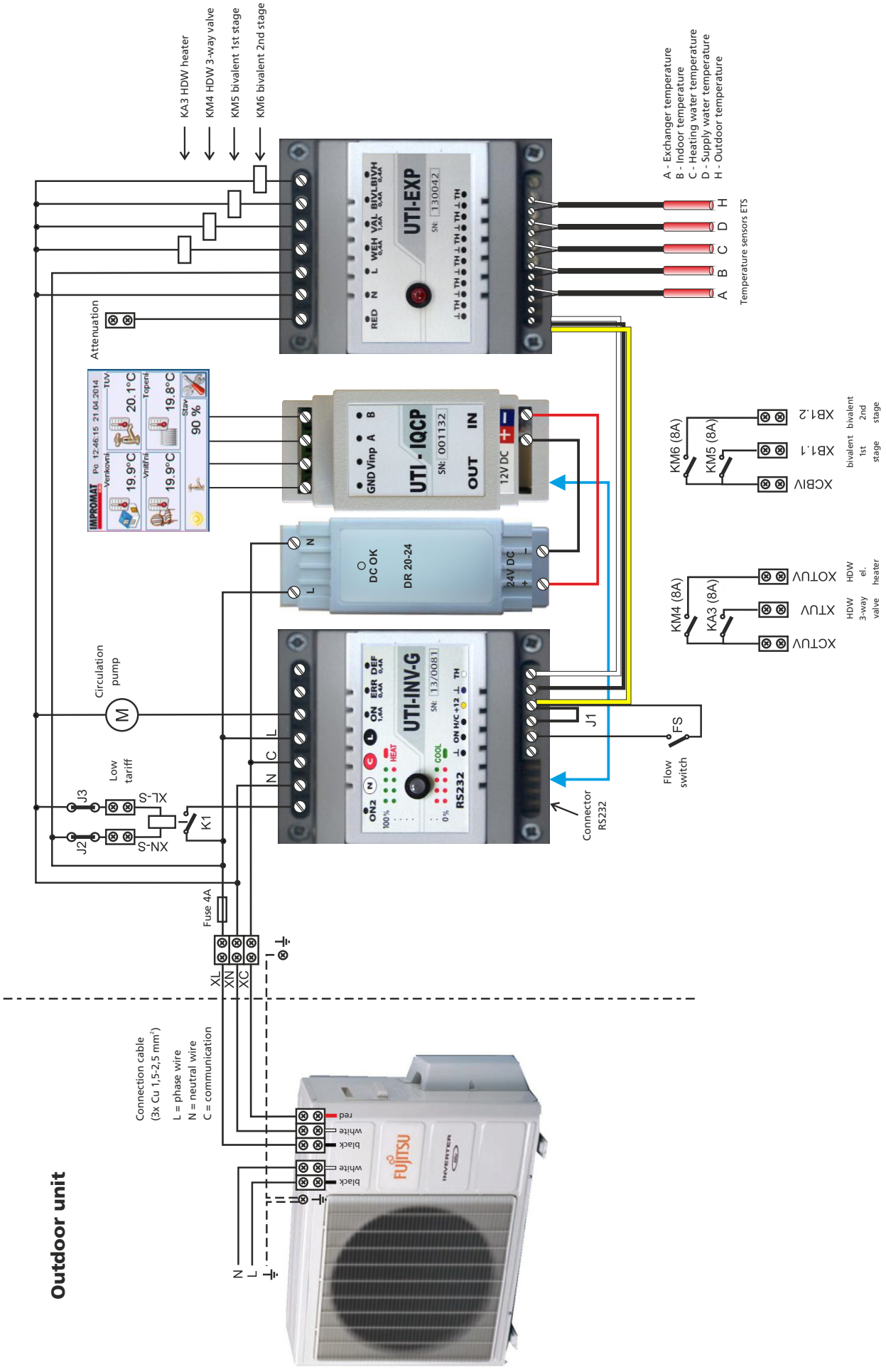


Models: Comfort

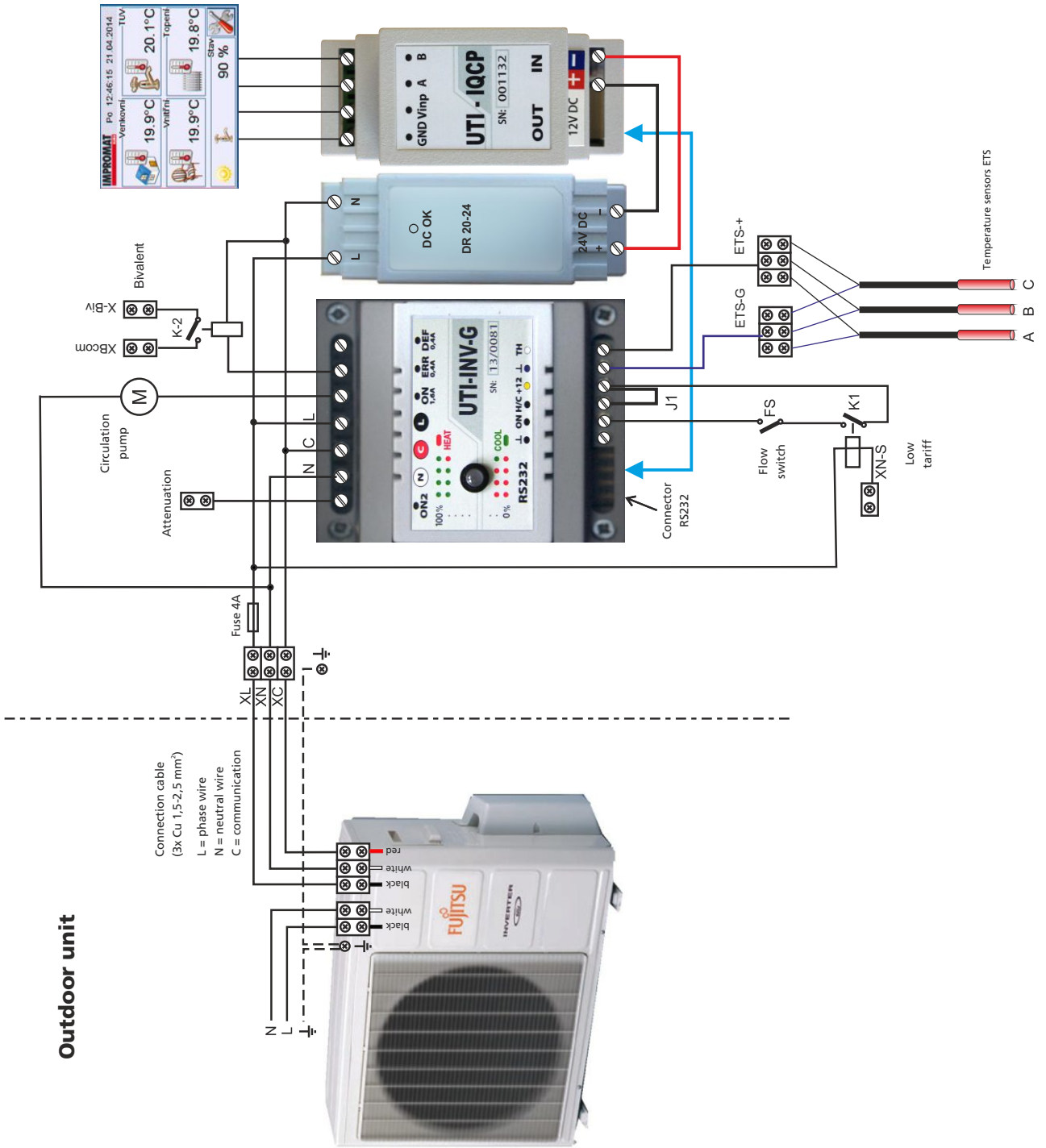


TH C	Compressor temperature sensor
TH D	Compressor discharge sensor
TH HM	Exchanger sensor - centre
TH HO	Exchanger sensor - output
TH O	Outdoor temperature sensor
TH PI	Inner exchanger sensor

13. ELECTRIC WIRING (with Expander)



ELECTRIC WIRING (without Expander)



14. INSTALLATION MANUAL

Models: MINI 5, 8, 11(HP), 14(HP), 16(HP)

⚠ CAUTION

R410A

REFRIGERANT

This product contains R410A refrigerant and polyester oil.

This product can be installed only by an authorized personnel.

For authorized personnel

⚠ DANGER	This sign indicates crucial information about protection against injury by electric current, injury by leaking refrigerant etc.
⚠ WARNING	This sign indicates important information concerning safety operation of the appliance.
⚠ CAUTION	This sign indicates information which should not be ignored.

⚠ DANGER
During any manipulation with indoor or outdoor units, it is necessary to disconnect the appliance from the electrical network. After disconnecting, it is necessary to wait for 5 minutes at least until all the electric circuit condensers are fully discharged.

This appliance contains the new refrigerant HFC (R410A).
This appliance is installed using the same technology as when installing units with common refrigerants, such as R22, R407, R134 etc. The following rules must be observed:
1. The pressure is 1,6 times higher than the pressure of common refrigerants and therefore, it is necessary to use special tools and measuring devices. Use the copper piping with homolagation for R410A refrigerant to connect the indoor and outdoor units. Use protective tools (glasses, gloves etc.) for manipulation with the refrigerant technology.
2. This appliance with R410A refrigerant has different servicing connections than common refrigerants. This different connection prevents connection of non-homologated service tools. Connection for R410A refrigerant is 1/2 UNF 20 threads per inch.
3. Do not use piping which was already used for another refrigerant with lubricating oil. Piping must be clean and dry. Storage and transport of the piping must be done in a closed environment.
4. Loading and replacement of the refrigerant must be done in a liquid state when the refrigerant is stabile and both components are in correct ratio. R410A refrigerant consists of two components.

Special tools for R410A Refrigerant

Tool	Description
Manometer	Pressure is 1,6 time higher. Using manometers for common refrigerants might cause their damage. These manometers also have different connection.
Service hose	There must be a special hose for R410A refrigerant only.
Vacuum pump	It is used as regular vacuum pump with adaptor for R410A refrigerant connection.
Leakage detector	Leakage detector must be homologated for R410A refrigerant.

Minimum wall thickness of copper piping (R410A)

Size of piping	6.35mm(1/4in.)	9.52mm(3/8in.)	12.70mm(1/2in.)	15.88mm(5/8in.)	19.05mm(3/4in.)
Wall thickness	0.80mm	0.80mm	0.80mm	1.00mm	1.20mm

15. WORKING CONDITIONS

Heat pump can be used as a heating source for heating and warming of water.

Working environment:

O.U. environment according to Czech Standard ČSN 33 2000-3	AA2-AA5; AB7; AD3
I.U. environment according to Czech Standard ČSN 33 2000-3	AA5; AB5

Heat pump must not be placed and installed in an explosive environment according to Czech Standard ČSN 33 2000-3.

Technical parameters of electrical connection:

Rated voltage	3x400/230V +/-10% 50Hz
Maximum input power	see Chapter 6. Specifications
Electrical network	TN-C-S according to Czech Standard ČSN EN 33 2000-3
Protection class	I. according to Czech Standard ČSN EN 60335-1
IP protection	outdoor unit: IPX4
	indoor unit: IP40/20

Refrigerant circuit:

Refrigerant	HF R410A CH_2F_2/C_2HF_5 - 50/50
	charge according to the type (see Specifications)
Maximum pressure	4,2 MPa (gas)
	1,05 MPa (fluid)

Technical parameters of water: Non-corrosive water

see page 23 Connection of heat pump to the heating system

The highest operation overpressure	2,5 bar
The lowest operation overpressure	0,8 bar
The highest operation temperature	60°C

Freezing of heat exchanger

Basic protection against exchanger freezing is to ensure minimum flow through the exchanger. This exchanger breakdown can only happen during exchanger defrosting. It is necessary to ensure that there is no regulation element inserted in the heating circuit which could prevent heating water circulation or strangle it seriously. At first start or after long shut-down, it is necessary to ensure that the water temperature in the heating circuit is over +10°C.

⚠ WARNING
1. Install our product in accordance with this installation manual.
2. Connection of OU and IU (refrigerant, electrics) must be made using only tools and materials mentioned in this manual.
3. Installations of refrigerant and electric circuits must be performed only by an authorized person.
4. Do not use mobile supply and piping for unit connection.
5. Do not start an appliance which is not installed completely.
6. Do not use refrigerant which is not considered high quality. Keep safety precautions mentioned on the refrigerant covering.
7. Do not add refrigerant to increase capacity.
8. Before refrigerant filling always use vacuum pump.
9. Respect safety precautions and use protective working tools during installation.

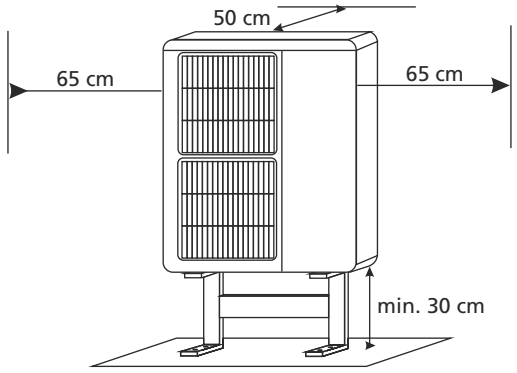
Selection of the place and installation of the equipment

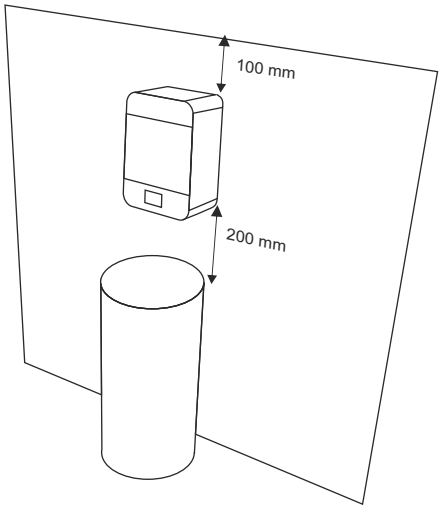
The indoor unit is designed for suspension on the wall using a mounting desk. It has to be placed in the room in a way that enables the access for service and maintenance (see the illustration under).

The outdoor unit is designed to be attached to a stand. The stand is necessary for an appropriate evaporator defrosting. This stand must be firmly fastened to a concrete base large enough to prevent the unit from toppling over in windy weather. Its position must be chosen with sufficient space for free airflow to the evaporator and for easy service access.

When installing the outdoor unit in a dense urban area, make sure to observe the noise regulation standards. In this case, a noise test might be necessary.

O.U. environment according to Czech Standard ČSN 33 2000-3	AA2-AA5; AB7; AD3
I.U. environment according to Czech Standard ČSN 33 2000-3	AA5; AB5





Connection of the refrigerant circuit

Do not exceed the maximum length of the connection piping. Failing to do this, the capacity parameters cannot be ensured and there is a risk of equipment damage.

Model	Dimension*		Length*		Max. high difference*
	Fluid	Gas	Min.	Max.	
Mini 5	6 mm	12 mm	2,5 m	25 m	15 m
Mini 8,11,14,16(HP)	10 mm	16 mm	2,5 m	30 m	20 m

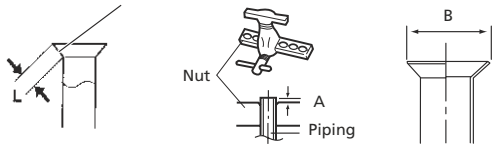
** See the technical data for the relevant outdoor unit.*

It is necessary to insulate the piping sufficiently.

Use insulation suitable for refrigerant circuits. The temperature on the piping surface can reach up to 120°C! For outdoor installation, the minimum insulation thickness should be 20 mm. For indoor installation, insulation thickness of 10-15 mm is sufficient.
The above mentioned parameters are valid for insulation that comply with thermal resistance of 0,45W(m.K) or better (at 20°C).

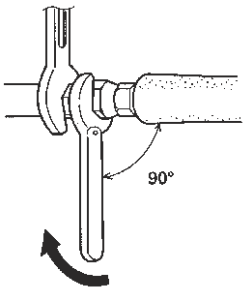
When capping, do not use mineral oils for any parts. Failing this can cause shortening of equipment's lifetime. Prior to soldering (min. 50% Ag hard), you must fill the piping with nitrogen gas to prevent flakes. Gas mustn't be under pressure.

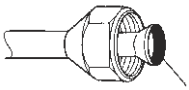
The capping must be done with high-quality refrigerator tools. Cut the piping by a cutting wheel to prevent the production of fillings. Then remove the edges caused by the cutting wheel. The capping must be done according to parameters mentioned in the table bellow:



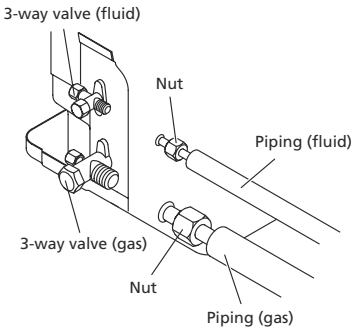
Outdoor dimension of piping	Oversize A Capping tools for R410A	Diameter of capping
6.35mm (1/4in.)	0 to 0.5	9.1
9.52 mm (3/8 in.)		13.2
12.70mm (1/2in.)		16.6
15.88 mm (5/8 in.)		19.7
19.05 mm (3/4 in.)		24.0

Hold the torque spanner in right angle to the piping. Only this way it will work correctly.





Apply alkyl benzene oil (HAB) against refrigerant leakage. Do not use mineral oils!



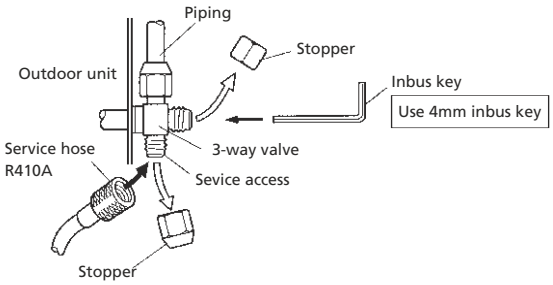
Center piping properly on 3-way valve conus.

Dimension of piping	Tightening torque
6.35mm (1/4in.) dia.	14to18N·m (140to180 kgf·cm)
9.52 mm (3/8 in.) dia.	33 to 42 N·m (330 to 420 kgf·cm)
12.70mm (1/2in.) dia.	50 to 62 N·m (500 to 620 kgf·cm)
15.88 mm (5/8 in.) dia.	63 to 77 N·m (630 to 770 kgf·cm)
19.05 mm (3/4 in.) dia.	100 to 110N·m (1000 to 1100 kgf·cm)

Deaerating

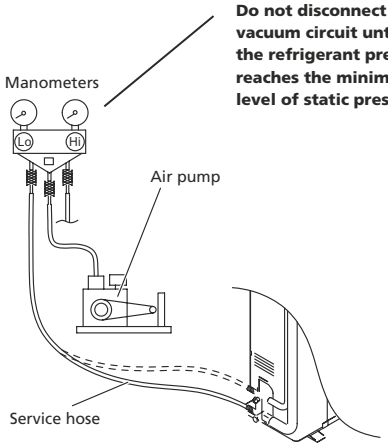
1. Unscrew the stopper of the service access on the 3-way valve (gas). Connect the manometer which is suitable for vacuum measurement and the air-pump.
2. Start up the air-pump and deaerate for about 15-20 minutes. Do not open the 3-way valves!
3. Test the tightness by shutting down the air-pump and checking the manometer after 60 minutes.
4. If there is a need for refrigerant refilling, you can refill the required amount of refrigerant at this moment.
5. After refilling the refrigerant, disconnect the service hose (be aware of refrigerant leakage – use protection aids). If not refilling the refrigerant, slowly and carefully open the 3-way valve (fluid) and fill the pipping to the level of static pressure (check the manometer). Now the service hose can be disconnected and stopper of the service access can be screwed back on.
6. Open both 3-way valves (fluid first). Return stoppers to their previous places and tighten them by the required tightening torque according to the following table.
7. Check the tightness of the refrigerant circuit by leakage detector.

Tightening torque of the stopper		
3-way valve	6.35 mm(1/4in.) dia.	20 to 25N·m (200 to 250kgf·cm)
	9.52 mm (3/8 in.) dia.	20 to 25 N·m (200 to 250 kgf·cm)
	12.70 mm (1/2in.) dia.	25 to 30 N·m (250 to 300 kgf·cm)
	15.88 mm (5/8 in.) dia.	30 to 35 N·m (300 to 350 kgf·cm)
	19.05 mm (3/4 in.) dia.	35 to 40 N·m (350 to 400 kgf·cm)
Service access		10 to 12 N·m (100 to 120 kgf·cm)



CAUTION

Do not disconnect vacuum circuit until the refrigerant pressure reaches the minimum level of static pressure.



Refrigerant refilling

All units are filled with R410A refrigerant in the factory. There is no need for refilling. In case of refrigerant leakage or loss, it is necessary to refill the volume to the value indicated on the label of the relevant outdoor unit.

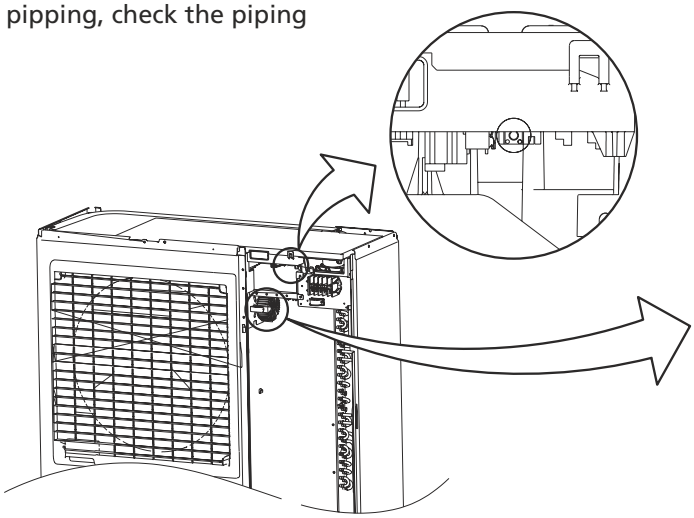
Special function

Emptying of the refrigerant circuit

When it is necessary to let the refrigerant out from piping and from the indoor unit (for example during servicing or during replacement of the units), a special outdoor unit function can be performed.

Procedure:

- Set the indoor regulator to “stop”. The unit remains under voltage.
- Wait for 5 minutes and remove the outdoor unit cover.
- Activate the function „Pump down” and the process of refrigerant emptying starts automatically. This status is confirmed by a flashing LED on the basic board (1s). The process lasts for about 1 minute.
- Prepare for closing of the 3-way valves.
- After automatic shut-down of compressors, close both valves immediately.
- Switch off the indoor unit main breaker.
- Before you disconnect the pipping, check the piping pressure with manometer.



DANGER

This part is generating high voltage.
Never touch this part.

16. WIRING

Revision and service of wiring can only be performed by authorized personnel.
Professional wiring must be confirmed on the warranty list. Wiring must comply with valid local and national electrotechnic standards. Inspection of the heat pump wiring must be performed after the installation of the heating system and after watering.

During any manipulation with IU or OU wiring, the appliance must be disconnected from the electrical network. After disconnecting, wait for at least 5 minutes until the el. circuit condensers are discharged.

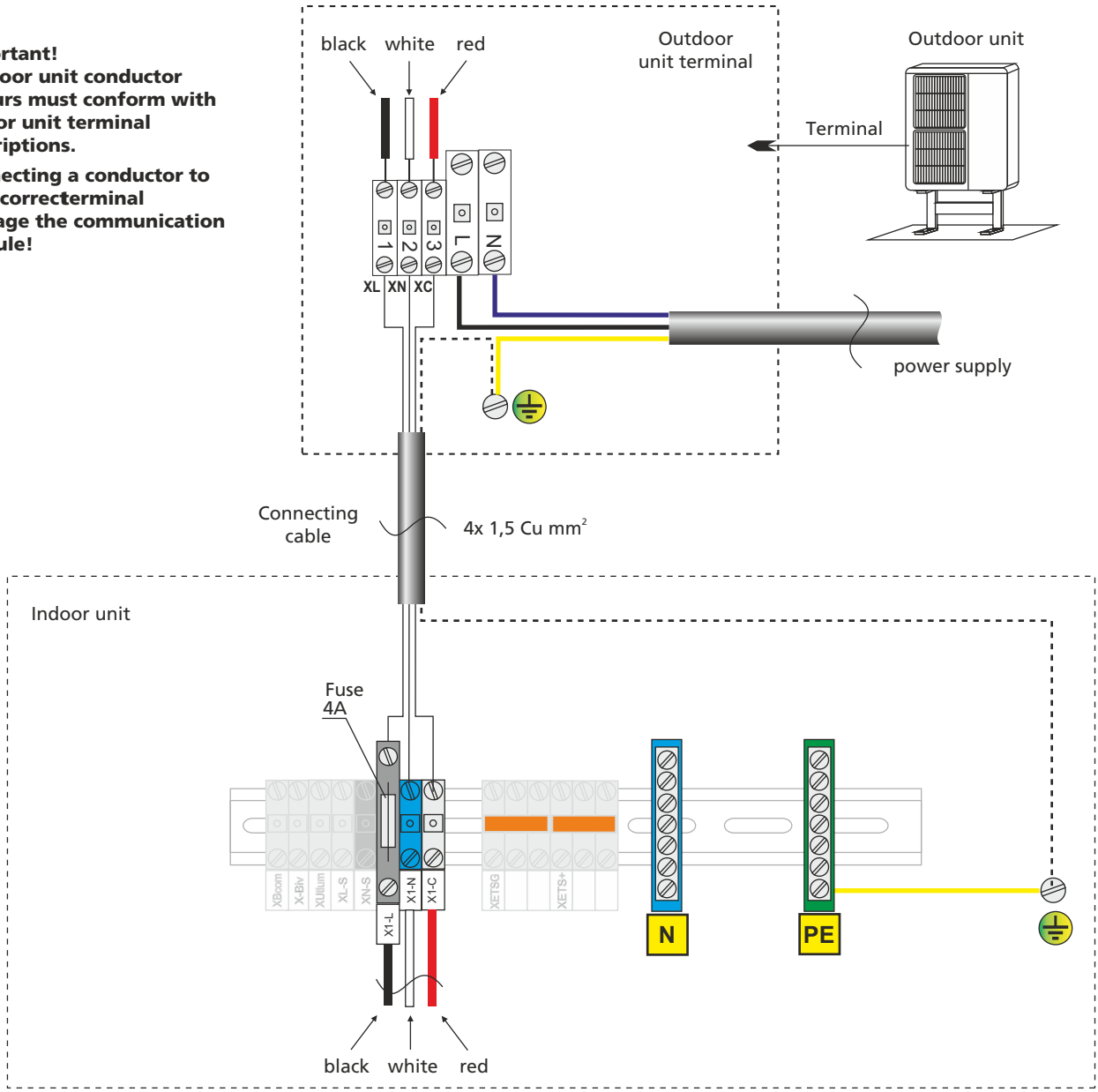
Connection of electric circuit. Wiring specifications.

Model	Power supply cable size*		Transmission cable size*	
	Max.	Min.	Max.	Min.
Mini 5	1x6mm	1x4mm	3x1,5mm	3x0,5mm
Mini 8,11,14,16(HP)	1(3)x6mm	1x(3)x4mm	3x1,5mm	3x0,5mm

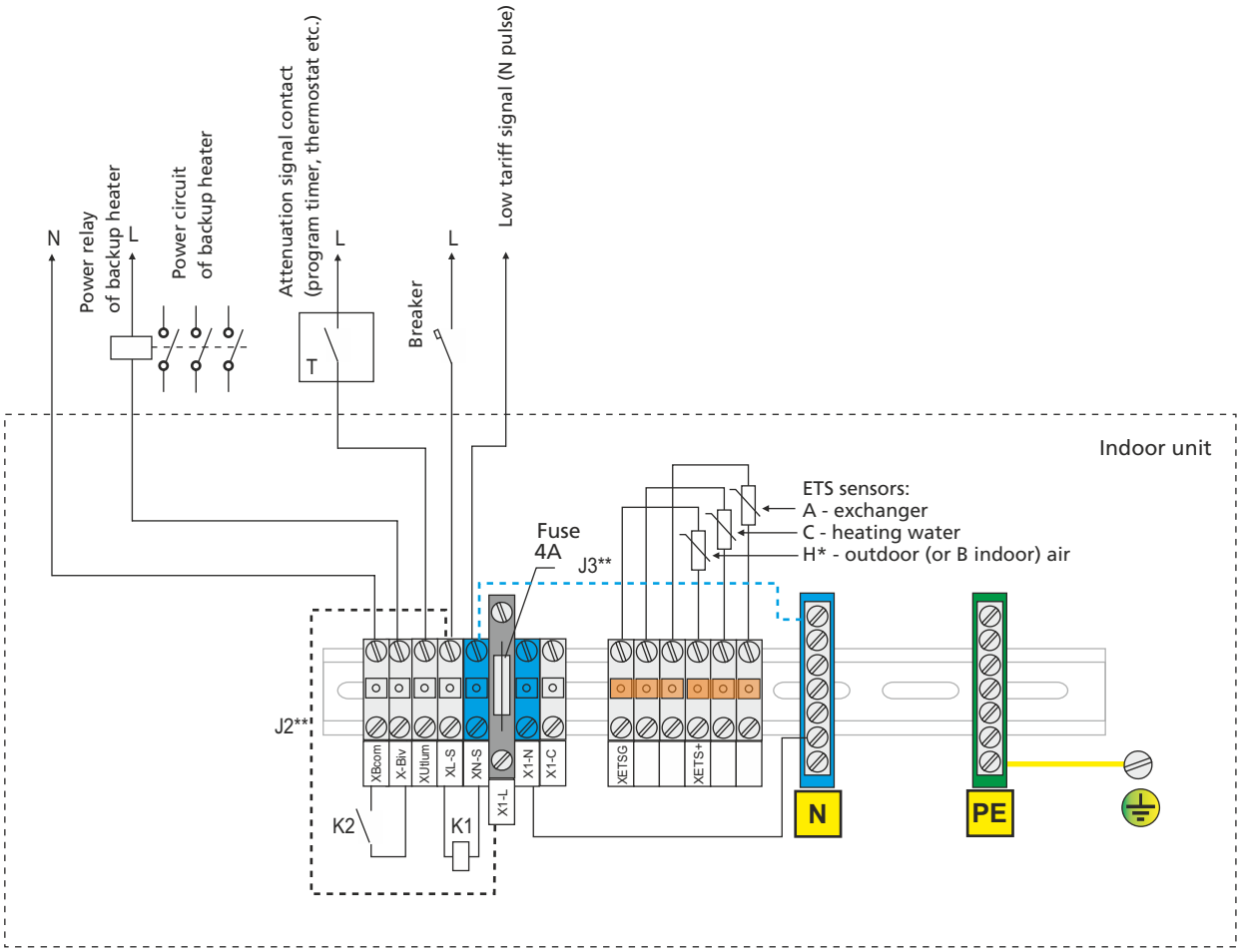
** See the technical data for the relevant outdoor unit.*

Important!
Outdoor unit conductor colours must conform with indoor unit terminal descriptions.

Connecting a conductor to an incorrecterminal damage the communication module!



External circuits - version without Expander



* Ambient temperature sensor
(This sensor must be connected. If not connected, the output water temperature is adjusted to the set value of equitherm regulation for +20°C)

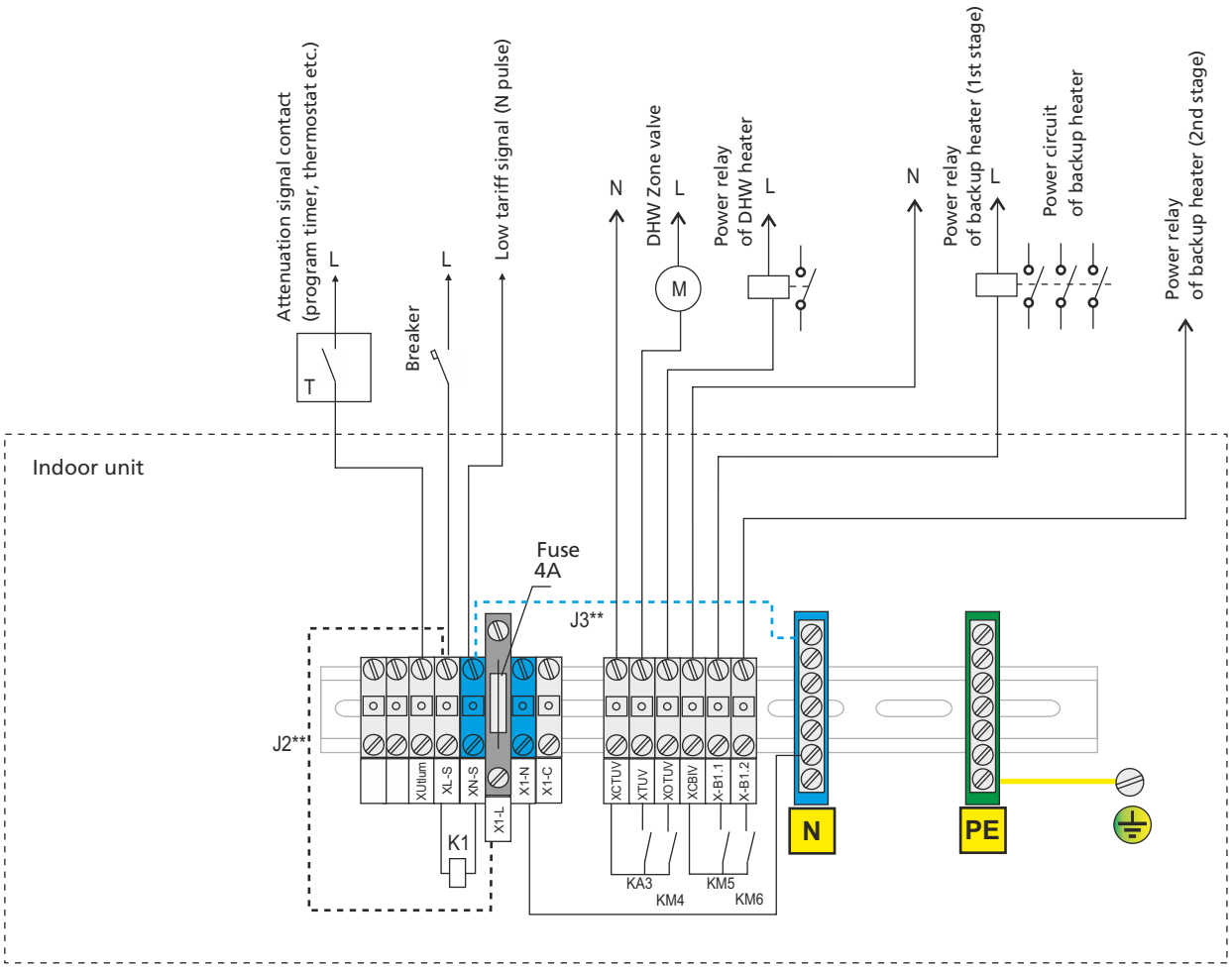
** Jumpers J2 and J3 provide permanent power to relay coil K1, in case the Low Tariff management is not in operation. When using the distribution network signal for Low Tariff management, both jumpers must be removed.

Description of the electric terminals

Indoor unit

XBiv	backup heater control, max. 0,4 A
XLS	low tariff relay supply 230VAC / 100mA (the external source must be used)
XNS	low tariff signal, input switched by neutral wire, supply current 100mA
Xutlum	attenuation external input 230VAC / 10mA) (e.g. program timer, thermostat etc.)
XETSG	ETS signal – earth
XETS+	ETS+ signal
XL,XN,XC	power supply of the indoor unit, communication with outdoor unit

External circuits - version with Expander



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Xutlum	attenuation external input 230VAC / 10mA) (e.g. program timer, thermostat etc.)
XETSG	ETS signal – earth
XETS+	ETS+ signal
XL,XN,XC	power supply of the indoor unit, communication with outdoor unit

Connection of the ETS temperature sensors

The ATW-MINI controller uses a set of digital ETS sensors to monitor the temperature. Each of the sensors is identified by an address that is assigned to it in production. If you add or change sensor, the new sensors have to be addressed using the ATW-SW software. When replacing the controller module, all connected sensors must be adressed again.
ETS sensors of probe type are supplied with a 2m cable. The wall type sensors are supplied with a 10m cable. The total lenght of the sensor cable should not be longer than 10 m (because of possible electromagnetic interference). If you need to extend the cable, use an shielded cable with at least one twisted pair. Connect the inner wires of the cable to XETSG and XETS+ terminals. The shield of the extension cable must be connected only at one end - to the chassis of indoor unit or switchboard. Do not connect the other end to anything! Without this grounding method the cable works as an antenna - this significantly impairs the sensors resistance against interference. The ends of the original sensor cable are connected to the inner wires of the extension cord. Be sure of the correct polarity as the original sensor connection.
The noise immunity can be improved by using the ferrite anti EMI components strung on the sensor cable.

Connection of the heat pump to the heating system

Planning

A high-quality project of the heating system is equally important as the used water or quality of the material. Insufficient flow of the heat supporting medium leads to an increase of condensate water and this will dramatically worsen the COP. Incorrectly projected regulation system has the same effect. On the contrary, high speeds of flow lead to corrosively erosive attack. Insufficient size of expansion tank relates directly to a possibility of the heat system corrosion.

Installation and start-up

Any small changes made to the project during its realization may cause the heating system being faulty. The quality of connections, welding and soldering procedures, wash-out and first heating-up are the main points for customer satisfaction. To save costs, only the authorized personnel is allowed to perform the heating system installation.

Used materials and equipment

This depends on the project of the heating system. The designer should avoid a solution using various materials, for example copper piping, aluminium radiators, steel boiler etc. It is impossible to protect such system against different types of corrosion in normal life. It is always profitable to use certificated materials. This applies also for the supporting materials, such as sealing, soldering flux and irons. The main reason for the total corrosion of the heating system is the usage of plastic pipes without oxygen barrier for floor heating.

Circulating water quality

The quality of the circulating water is decisive for the long-term failure-free operation of the heating system. Characteristics of the used water vary depending on the locality of the drill hole and source. Bear in mind that water similar in characteristics to drinking water is not suitable for heating systems without special treatment. The following water parameters are necessary for heating systems: water hardness, salinity, acidity and content of melted gases in water.

Water hardness is indicated by the volume of the Ca2+ and Mg2+ salts, which through the change of solubility in operating conditions create practically insoluble carbonates. Hard water scale is formed mainly on the bivalent source and its negative effects are made by the following process. First, a compact heat insulating layer is created. This reduces the total capacity of the source and causes local overheating of the exchanger. Owing to the unequal dilatation in the place of overheating, the layer compactness is broken. Loose scale pieces get to the circulating water and gradually block the cooling exchanger and the regulation valves. During the scale formation, carbon dioxide is released and causes system airlock and general corrosion. It is also necessary to replenish the missing water, which is usually unconditioned and brings undesirable effects into the system again.
Salinity describes the level of different melted salts in water. In practice, there are the Na+, K+, Fe2+ cations and the Cl- and SO42- anions. The Fe2+, Cl- and SO42- ions encourage the corrosive processes in the heating system. Water salinity is directly proportional to its electric conductivity. High water salinity facilitates electrolytic corrosion, especially when different types of metals (copper, iron) are used.

The main criterion for corrosion processes in the system is its acidity (pH). To minimalize the corrosion effect of water, the pH value should correspond to the applied materials. Note that the pH value suitable for steel is not proper for aluminium and vice versa.

The amount of melted gases in water depends on water temperature and the gas pressure. In heating water, we talk about melted air consisting mostly of N2, O2, and CO2. Chemically, nitrogen is harmless, but from the operation point of view, nitrogen reacts unfavourably as it reduces the heating capacity of water, increases the compression work and generates cavitation noise. Oxygen and carbon dioxide act corrosively and it is necessary to remove them from the water.

Most of the melted gases are removed from the heating system by deaerating. It is not possible to remove gases from circulating water without any leftover, however. With proper deaerating, the gas leftover is relatively very small and it has no significant effect on long-term lifetime and reliability of the heating system. Leftover oxygen and carbon dioxide are spent during the corrosive reactions and then the corrosion is stoped. The biggest danger is in repeated penetration of oxygen into the system. This is the most frequent cause of corrosion of the heating system. The reason might be the insufficient tightness of the system, unsuitable parameters of the expansion tank, the quality of the sealing elements or the plastic components used.

Note that for example the floor heating made from plastic piping with standard oxygen barrier does not create absolute protection against oxygen diffusion. In this case, oxygen repeatedly enters the system and the spontaneous stop of corrosion process is impossible. It is necessary to use the substances binding oxygen.

GUIDE FOR START-UP AND OPERATION OF THE HYDROTHERMAL HEATING SYSTEM

In modern hydrothermal systems, the effects of insufficient maintenance of the filling and circulating water quality or installation, start-up etc. show very quickly and markedly. The following advices will provide you with guidelines related to this problem.

1) Quality of the water

The valid Czech standard for water quality (ČSN 07 7401) is mandatory for all hydrothermal systems up to 115°C with specified capacity higher than 60kW. Water according to the said standard suits systems with lower capacity. Water conditioning in the range defined by the standard for smaller systems (flats, family houses) is not realistic in practice.

We recommend the following:

- use water with hardness of 5,6 NO maximum and with conductibility of up to 0,5 mS/cm
- pH of the circulating water can be set in relationship with corrosion resistance of the material used:
  - Steel corrosion
    - pH above 8,5 is suitable
    - pH above 10 is insignificant
  - Copper corrosion
    - pH above 10 is serious
    - pH from 8,5 up to 9 is adequate
  - Aluminium corrosion
    - pH above 7,5 is serious
    - pH from 0,5 up to 7,5 is acceptable
- when using drink water, add the anticorrosive chemicals and water hardness stabilizers
- in heating systems with mixed materials (steel, copper, aluminium), add the chemicals which are specialized for the respective system
- once a year at minimum (before the heating season), check the contents of the chemicals and refill them when necessary.

2) Wash-out of the new heating system

The article 132 the ČSN 06 0310 standard about projection and installation of the central heating specifies the equipment wash-out procedure prior to testing and start-up. Purpose of this obligation is to remove dirt from the heating system, such as mechanical dirt, fats and oils, leftover products of the welding and soldering.
The standard does not prescribe an exact procedure and therefore we recommend the following:

- if possible, use softened water for wash-out (max 5,6 NO), unconditioned drinking water may also be used,
- add a suitable non-foaming degreasing agent into the filling water according to the user guide to remove fats and oils (cold or hot water itself does not remove oils and fats),
- set the maximum flow of the circulating water (open regulation valves, max. compressor capacity),
- heat the heating system to about 6°C at the half boiler capacity (slow temperature start must be kept especially when non-softened water is used to minimalize the scale production),
- after heating, let the system operate for about half an hour,

- after the system cools down to 40°C, empty the wash-out water keeping all regulations concerning wastewater,
- clean filters from mechanical dirt,
- start filling the system with the permanent contents immediately.

3) Pressure expansion tank parameters setting

The chosen volume and pressure parameters of the expansion tank are important for long-term failure-free operation of the heating system. The requisite volume of the pressure expansion tank is determined by the ČSN 06 0830 standard. Insufficient volume and unsuitable pressure rates of the expansion tank cause repeated airlock and corrosion of the heating system. Correct volume of expansion tank should be authenticated by the designer of the heating system. The installation company is recommended to set the pressure parameters as follows. These parameters should be checked by the user once a year.

Gas overpressure (Pn) in the expansion tank:
- when setting the gas overpressure, the expansion tank must be empty (without water),
- pressure (Pn) should be 0,2 bars higher than the static height of water column (Pst) of the heating system (vertical distance between the expansion tank and the highest point of the heating system: 1m = 0,1 bar).

Filling water pressure setting (Pf):
- by opening all regulation valves, the system is filled without problems,
- pressure of the filling water (Pf) should be 0,3 to 0,5 bars higher than the gas pressure (Pn) in the expansion tank. Filling water pressure is controlled during cold conditions by manometer on the water site after deaerating.

Protective pressure setting (Psv):
- protective pressure (Psv) should be about 0,5 bars higher than the operation pressure (Pe) of the system which is heated to operation maximum. This is valid when the protective pressure Psv < 5 bars. If Psv > 5 bars then Pe + 0,9 Psv.

4) Deaerating of the heating system

Deaerating is a process which is repeated during filling, start-up and operation of the heating system.

Following rules are recommended:
- during the filling of the heating system, perform deaerating continuously,
- final deaerating should be done at maximum operation temperature of the circulating water,
- perform deaerating after 5 minute pause of the circulating pump on all deaerating loactions of the heating system,
- repeat deaerating after a few days of operation.

5) Start-up of the hydrothermal system

The system is filled with permanent filling (treated water as specifies in point 1). It is possible to start the heating system and after a successful test of the sealing.

The following rules must be kept:
- the first heating-up must be done at slow capacity start of the heat pump,
- deaerating is performed according to the instructions described above,
- operation tests are made according to the range agreed between the investor and the installing company.

6) Operation of the heating system

The first operation season is usually connected with the heating test and with regulating of the whole system.

The following tests must be performed:
- check the tightness of the heating system, do not solve the defects by refilling the lost water,
- check filter clogging and clean filters if necessary,
- drain the system only during necessary repairs and let it empty only for the shortest period,
- in danger of the system freezing, use the anti-freeze and do not empty the system,
- check and maintain the single elements (pump, boiler, regulation components, expansion valve) regularly according to the user guide,
- prior to the beginning of each heating season, check the quality of the circulating water and refill the appropriate chemicals if necessary.

TECHNICAL POSSIBILITIES AND CHEMICALS FOR PROTECTION OF HYDROTHERMAL HEATING SYSTEMS

Effects of the hard unconditioned water and related corrosion processes are generally known. Therefore, there are plenty of producers of "heating chemicals" for the filling and circulating water conditioning, anti-corrosion protection and cleaning of clogged systems.

The producer is not authorized to recommend any specific tool. Responsibility of their selection, way of application, technical effect and warranty lies with both the producer and the user.

Heating chemicals must be chosen carefully, always after the agreement with the producer. Selection should be made after checking the following known details:

- filling water hardness,
- filling water aggressiveness,
- materials of heating system (steel, copper, cast iron, plastic, aluminium and its combinations),
- type of the heating system (thermosiphon, forced circulating with expansion tank, floor heating).

It is also important to observe the proper starting dosage and refilling the heating chemicals during the operation. A professional product should include a description of a procedure for determination of the chemicals concentration in the circulating water.

Other possibilities of water conditioning in the cation-ion exchanger or desalting with reverse osmosis for economic reasons in smaller systems are out of the question. For the same reasons, physical water conditioning in small heating systems is limited to the magnetic conditioning, which only prevents the scale production.

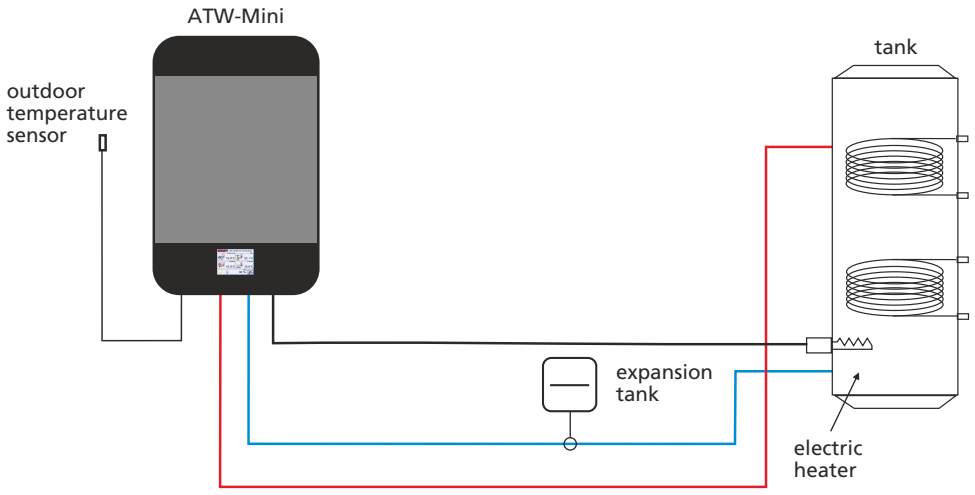
Connection of heat pump to the heating system – hydraulics

Connection of the heat pump to the heating system must be made by an authorized installation company, or after agreement and training by a professional company from the heating industry. Types of connection are pictured below.

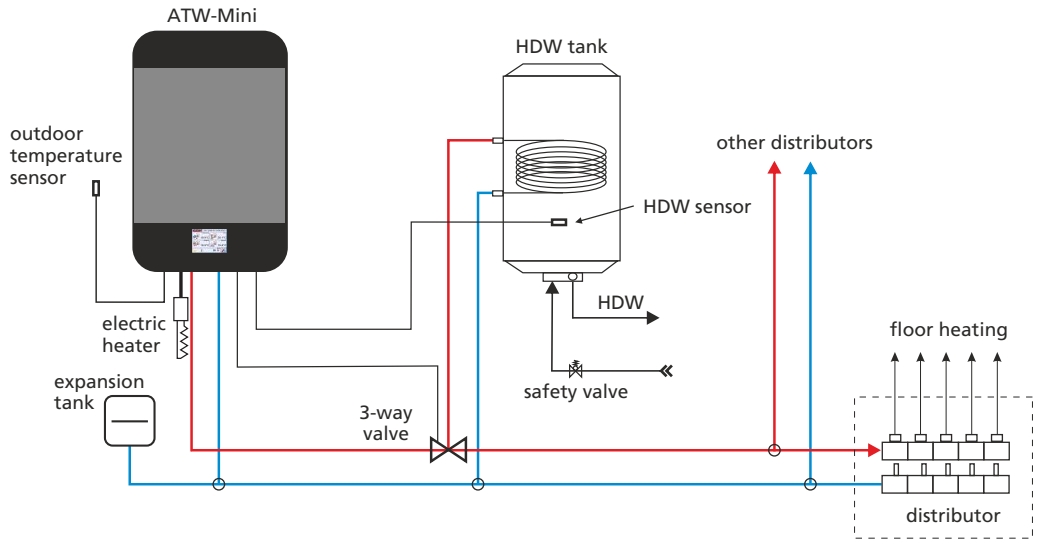
Attention, pool water mustn´t enter the plate exchanger! Always use an extra exchanger!

Attention, water of more than 60°C from another source mustn´t enter the plate exchanger!

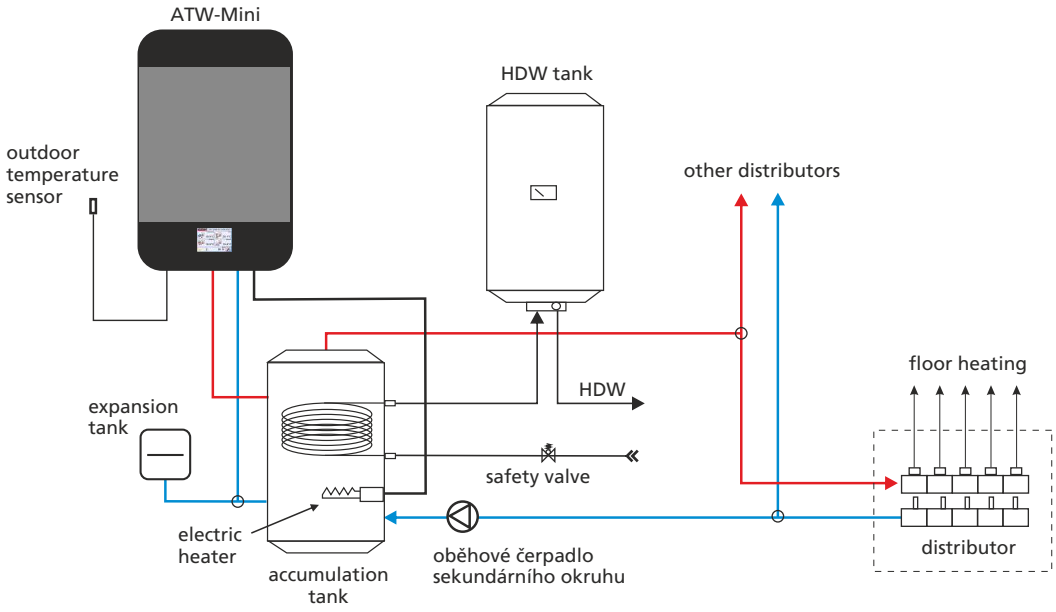
Example 1: Heating of the accumulation tank to equitherm or constant temperature.



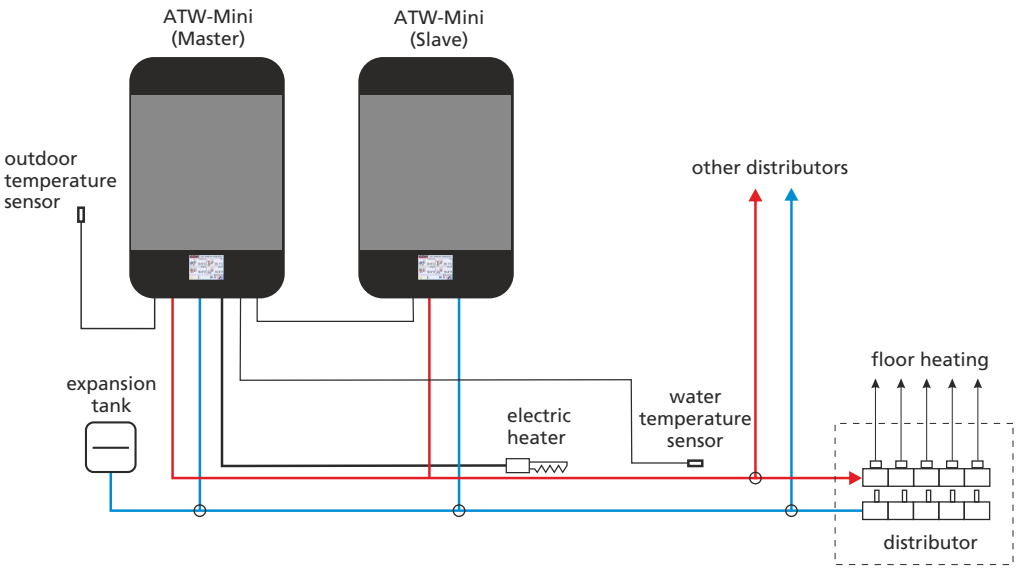
Example 3: Heating system with equitherm regulation and 3-way valve for HDW heating.



Example 2: Heating system with equitherm regulation and HDW pre-heating.



Example 4: Cascade connection for higher capacity.



Design of the hydraulic circuit

The ATW Mini heat pump is designed with respect to the easiest way of installation. All important elements of the hydraulic circuit are integrated in the indoor unit. The indoor unit contains an efficient circulation pump, an exchanger and a flow sensor. The design of the hydraulic circuit must take high demands of heat pumps into consideration for sufficient flow of the heating water (see Fig. 1).

The heat pump can operate without an accumulation tank. In this case, the following requirements must be kept: the heat pump mustn´t be disconnected from the heating system; the heat pump must have sufficient amount of thermal energy, which is taken back during the defrosting of the outdoor unit.

We do not recommend using thermostatic valves or mixing tools (typically 4-way valve). The heating water temperature regulation in the heating system is determined by the heating curve regulation included in the controlling system of the indoor unit. If there is a need to use regulation components which are regulating more than 50% of the heating water flow, the storage tank must be used. In no case do we recommend using the hydraulic compensator of dynamic pressures (balancing vessel) for connection of the heat pump to the heating system. When it is used, the efficiency of the heat pump is significantly worsened owing to its temperature drop. The balancing vessel is used only for connection of the bivalent source (if necessary) to the heating water circuit.

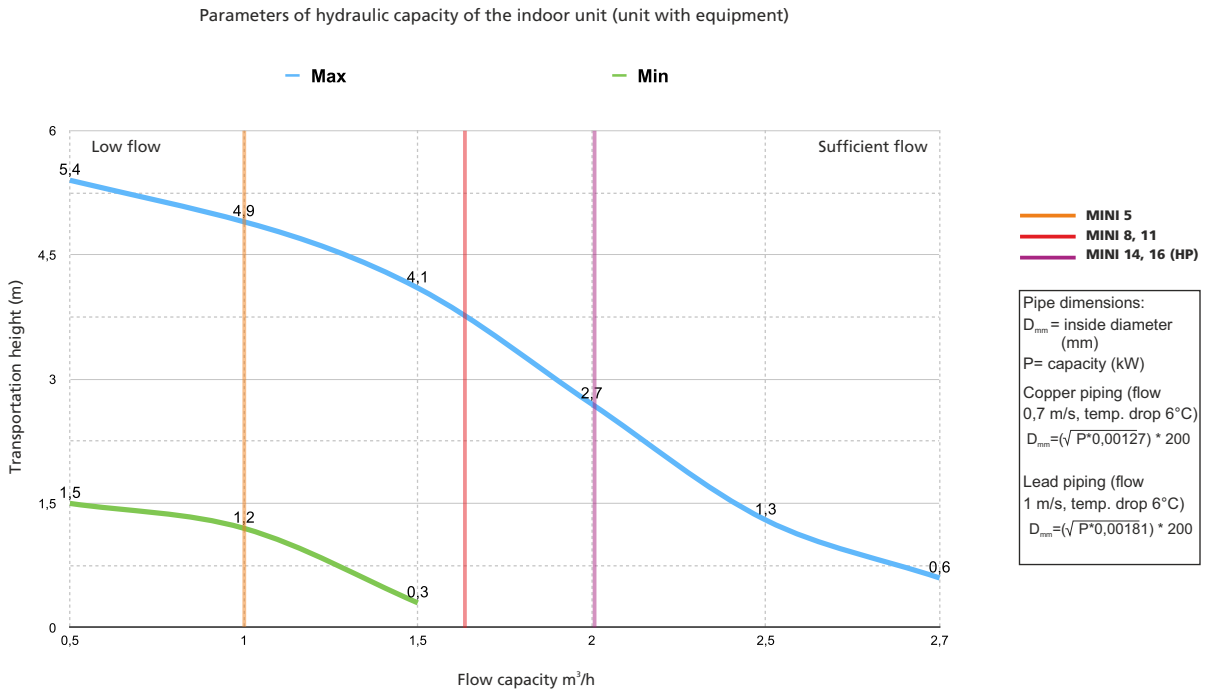
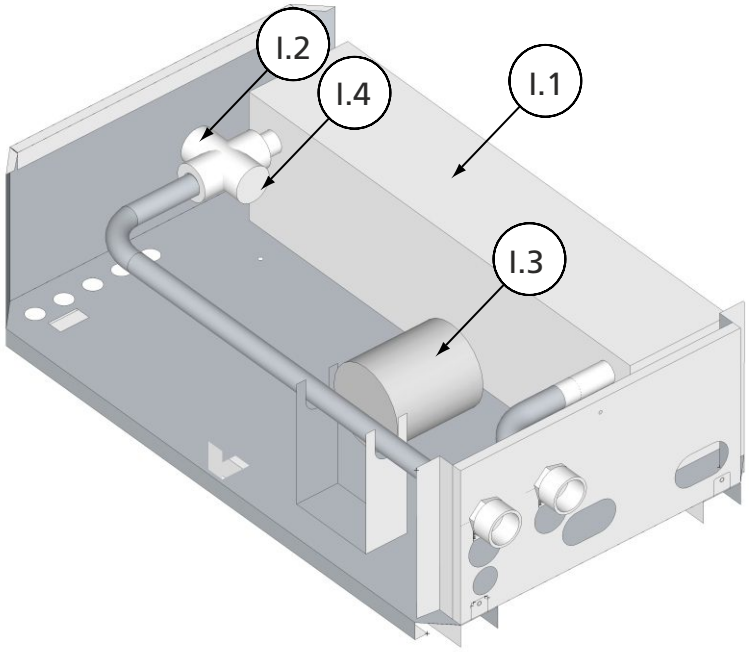


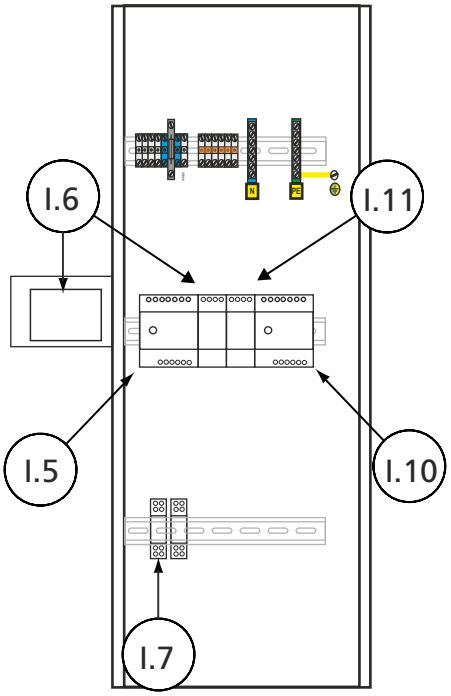
Fig. 1

DESCRIPTION OF PARTS

Indoor Unit

Model ATW-MINI





Mark	Description	Part number
I.1	Exchanger	I0002110001
I.2	Flow switch	I0002110002
I.3	Circulating pump	I0002110003
I.4	Manometer	I0002140001
I.5	Control unit	I0002110004
I.6	Control panel	I0002110009
I.7	High tariff relay	I0002110015
I.10	Expander (version with expander)	I0002110016
I.11	Power source 24V	I0002110017