

Installation Guide

Mega E



Thermia AB is not liable or bound by warranty if these instructions are not adhered to during installation or service.

The English language is used for the original instructions.
Other languages are a translation of the original instructions.
(Directive 2006/42/EC)

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1 About documents and decals

1.1 Introduction

The following documents are available for this product:

- **Installation Guide.** Gives thorough information on how to install the heat pump.
Available for download, see below.
- The **Commissioning Guide** contains the required information in order to commission the heat pump and tune the heating system.
Available for download, see below.
- The **Wiring Diagrams** for the heat pump intended for fault tracing and service.
Available for download, see below.
- The **User Guide** is intended for the end user and must be handed over and gone through with the end user when installation and commissioning is completed.
Supplied with the heat pump on delivery.
- The **Technical Description** contains information about the heat pump's function, fault tracing and technical data.
Available for download, see below.
- **Country specific instructions** and forms are available where relevant.
Supplied with the heat pump on delivery.
- **Self-adhesive decals** with translation text. Must be placed on the manufacturing plate in conjunction with installation.
Supplied with the heat pump on delivery.

Documents not delivered with the heat pump are available for download here:

www.thermia.com/documents

1.2 Symbols in documents

The instructions contain different warning symbols, which, together with text, indicate to the user that there are risks involved with actions to be taken.

The symbols are displayed to the left of the text and three different symbols are used to indicate the degree of danger:

Danger



Indicates an immediate danger that leads to fatal or serious injury if necessary measures are not taken.

Warning



Risk of personal injury!
Indicates a possible danger that can lead to fatal or serious injury if necessary measures are not taken.

Caution



Risk of installation damage.
Indicates a possible hazard that can lead to item damage if necessary measures are not taken.

A fourth symbol is used to give practical information or tips on how to perform a procedure.



Information regarding making the handling of the installation easier or a possible operational technical disadvantage.

1.3 Symbols on decals

The following symbols can occur on decals on the different parts of the heat pump. Which symbols are used depends on the heat pump model.

1.3.1 General



Warning, danger!



Read the documentation provided.



Read the documentation provided.



Warning, hazardous electrical voltage!



Warning, hot surfaces!



Warning, moving parts!



Warning, risk of crushing injury!



This appliance is charged with R454B, a mildly flammable refrigerant.



Service indicator: Read technical manual.

1.3.2 Electrical components

Explanation



Component, ordinary delivery according to proposed system solutions



Components, accessories according to proposed system solutions

1.3.3 Pipe connections



Tap water



Heating system



Brine system



Defrosting tank



Expansion tank with safety valve, brine



Air bleeding



Temperature and pressure relief valve



Outdoor unit



Water heater



Fan

2 Important information/Safety instructions

2.1 General safety precautions



This appliance is charged with R-454B, a mildly flammable refrigerant.

Carefully follow the precautions listed as below because they are essential to guarantee the safety of Thermia product. Store the manual in a safe place in order to be able to use it as reference after installation. Remember to hand it over to the new owner if the heat pump unit is sold or transferred. To prevent serious damage on the system and injuries to users, precautions and other notices shall be observed.

Warning



This appliance can be used by children aged 8 years and above, and by persons with reduced physical, sensory or mental capabilities or lack of experience or knowledge, provided that they are supervised or have been instructed in the safe use of the appliance and understand the hazards involved. Children must not clean or carry out user maintenance on the appliance except under adult supervision.

Warning



Ensure that children do not play with the product.

Warning



The installation must only be carried out by a qualified installation engineer, following applicable rules and regulations in addition to these installation instructions.

Caution



The heat pump must be located in a frost-free environment!

Caution



Installation and connection should be carried out in accordance with the instructions, in order to avoid subjecting local residents to noise disturbance.

Caution



The heating appliance should be placed on a stable surface that can support the gross weight of the heating appliance.

Caution



Before the heat pump is powered, you must ensure that the heating system and coolant system, including the heat pump, are filled and bled; otherwise, their circulation pumps may be damaged.

Caution



If the electrician wishes to test the electrical connections before the above is carried out, this should only be done after ensuring that the heat transfer fluid pump and coolant pump are disconnected.

Caution



When filling the coolant system the coolant pump must be operating; you must ensure that the compressor and the heat transfer pump cannot start.

Caution



This unit is equipped with a refrigerant leak detector and ventilation system for safety. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.

Caution



This appliance is intended for use by expert or trained users in shops, in light industry and on farms, or for commercial use by lay people.

Caution



In accordance with SS-EN 60335-2-40, this product is classified as not available to the public. This means that the product is designed to be handled by trained personnel and installed in machine rooms intended for heat pumps.

Caution



The maximum ambient temperature in the machine room must not exceed 30°C. For Mega E S-E, if the heat pump is operating with B10W65, or higher, in combined use with the internal immersion heater, the ambient temperature must not exceed 25°C.

Caution



Isolate the power supply to the heat pump while servicing the appliance or replacing parts.

Caution



Only spare parts approved by Thermia may be used for this appliance.



In normal operation the heat pump generates noise and vibrations. The appliance should be set up and connected in accordance with the instructions in order to avoid noise being spread to noise-sensitive areas.

Caution



Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer. The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).

Caution



The appliance shall be stored and installed so as to prevent mechanical damage from occurring.

2.2 Refrigerant

2.2.1 Refrigerant

Caution



Work on the refrigerant circuit must only be carried out by a certified refrigeration engineer.

Although the heat pump's refrigerant circuit is filled with a chlorine-free and environmentally-approved refrigerant that will not affect the ozone layer, work on this system may only be carried out by authorised persons.

The refrigerant circuit is hermetically sealed and is subject to the EC regulation 517/201. According to EC regulation 517/2014, for heat pumps containing 10 tonnes of CO₂ equivalent or more, with hermetically sealed fluorinated greenhouse gases.

For refrigerant charge, see type plate on heat pump.

2.2.2 Fire risk

The refrigerant is not combustible in normal conditions.

2.2.3 Toxicity

In normal use and normal conditions the refrigerant has low toxicity. Even though the toxicity of the refrigerant is low, it can cause injury (or even death) in abnormal circumstances or if deliberately abused.

Warning

Risk of personal injury! Spaces in which heavy vapor can collect below the level of the air must be well ventilated.

Refrigerant vapour is heavier than air, and in enclosed spaces or in areas below the level of the door, for example, seepage can give rise to high concentrations with a resultant risk of suffocation due to lack of oxygen.

Warning

Risk of personal injury! Refrigerant exposed to a naked flame creates a poisonous irritating gas. This gas can be detected by its odor even at concentrations below its permitted levels. Evacuate the area until it has been sufficiently ventilated.

2.2.4 Working on the refrigerant circuit

Warning

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised.

Warning

Do not pierce or burn.

Warning

Be aware that refrigerants may not contain an odour.

Caution

When the refrigerant circuit is repaired, the refrigerant must not be released from the heat pump - it must be handled appropriately.

Draining and refilling must only be carried out using new refrigerant (for the amount and type of refrigerant see manufacturer's plate) through the service valves.

Caution



All warranties will become void if a refrigerant, other than what Thermia specifies, is used for refilling.

2.2.5 Scrapping

Caution



When the heat pump is to be scrapped the refrigerant must be extracted for disposal. Local rules and regulations related to the disposal of refrigerant must be followed.

2.3 Electrical connection

Warning



Hazardous electrical voltage! The terminal blocks are live and can cause death through electric shock. All power supplies must be isolated before electrical installation is started. The heat pump is connected internally at the factory, for this reason electrical installation consists primarily of the connection of the power supply.

Caution



Electrical installation may only be carried out by an authorized electrician and must follow applicable local and national regulations.

Caution



The electrical installation must be carried out using permanently routed cables and must follow applicable local and national regulations. It must be possible to isolate the power supply using an all-pole circuit breaker with a minimum contact gap of 3 mm.

2.4 Maintenance check for frequency inverter

Warning



Work on the frequency inverter must be made by authorized personnel. Make sure that the main power is switched off.

Avoid dust from depositing on the drive surface, circuit boards and other electric components. These deposits act as insulation layers and hamper heat transfer to the ambient air, reducing the cooling capacity. The increased heat load causes an accelerated aging of the electrical components, thus decreasing the service life. Dust deposits that accumulate on the heat sink located on the back of the VFD will also decrease the service life of the unit.

The drive cooling fans have small bearings into which dust can penetrate and act as an abrasive. This leads to bearing damage and fan failure.

Under the conditions described above, it is advisable to clean the frequency converter during periodic maintenance. Remove dust off the heat sink and fans.

2.5 Water quality

This heat pump and its components is developed to reliable and efficient work with water qualities in line with VDI 2035. In practice this means that some general precautions should be taken:

It is recommended to use magnetite filter for all retrofit systems.

As a heating system often contains small amounts of suspended solids (rust) and sludge products from calcium oxide, precaution should be taken to ensure that the water in the heating system is as clean as possible to ensure long lasting performance and minimize the risk of reliability issues. If magnetite can be expected in the heating system, cleaning of system and /or installation of magnetite filters should always be considered. Any filters supplied with the heat pumps should always be installed. The dirt strainer should be fitted on the return line from the heating system, as close to the heat pump as possible.

Chemical and/or oil contamination shall always be avoided.

In areas where there are exceptional water conditions with regards to hard water, a softening filter may be necessary to use/install (applies to heating system, hot water and brine circuit). The softening filter softens the water, cleans any impurities and prevents lime build-up. The hot water tank is designed to work well in all normal drinking water qualities in line with the European drinking water directive (98/83/EC). With regards to chloride level this means that it is approved to up to 250 mg/l.

3 Transport, unpacking and setting-up

3.1 Transporting the heat pump

Caution



The heat pump must always be transported and stored upright in a dry environment. Secure the heat pump so that it cannot tip over during transportation.



The XL & L model is specifically designed to be able to be moved with a forklift or similar. Take necessary precautions to secure the load from overturning.

3.1.1 Unpacking

1. Check that there are no transportation damages.
2. Remove the packaging.

3.1.2 Delivery check

Check that the delivery includes the following items:

Name	Quantity
Heat pump	1
Document set	1

Sound plate kit, 086L3375 (Mega E XL & L)		
Name	Article number	Quantity
Front and rear plate	086L3376	2
Left and right side plate	086L3377	2

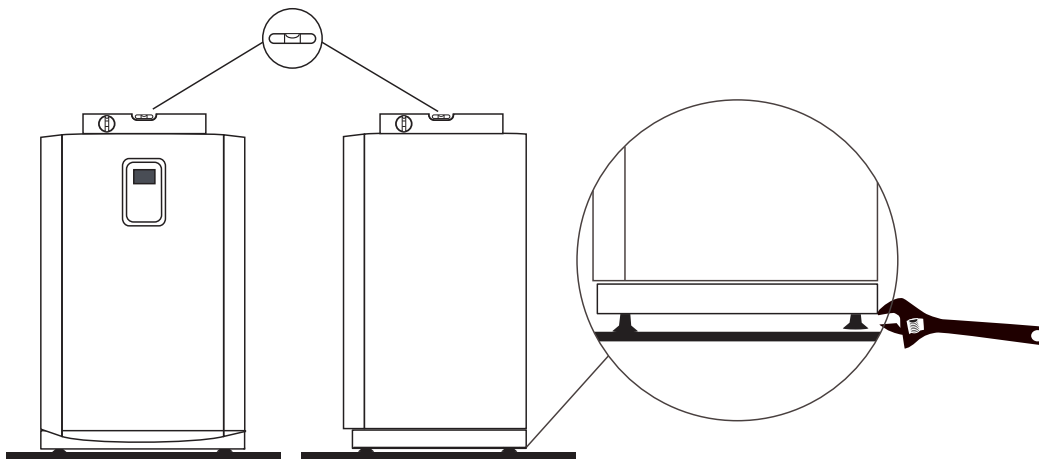
Sensor kit, 086L3546 (in the electrical cabinet)		
Name	Article number	Quantity
Outdoor sensor	086U3351	1
System supply line sensor	086L3356	1

3.2 Setting-up the heat pump

3.2.1 Recommended location

Positioning the heat pump

- The heat pump should preferably be placed against an outside wall (see chapter 'Heat pump data')
- Do not place the heat pump against walls facing noise-sensitive areas.
- Avoid placing the heat pump in the corner of a room.
- If possible, choose a location where the surfaces nearest the heat pump are soft. Avoid placing the heat pump close to large plastered or tiled areas.
- The heat pump is fitted with internal vibration isolation. However, the degree of vibration isolation achieved depends on the bearing strength of the floor. In order to achieve adequate vibration isolation, the heat pump should be placed on a concrete floor with a thickness of at least 100 mm, or another surface with equivalent characteristics.
- In order to minimise noise generation from the heat pump, the sound blocker base (included) should be fitted when the heat pump has been put into position.
- The heat pump must be placed in an area with a floor drain.
- The heat pump must be level. Make sure to adjust feet in a way that the pump stands steady. If the feet is not adjusted correctly it could cause some unwanted noise. Do the adjustment with the heat pump running on its most critical gear.



Noise and vibration

To prevent disturbing noise and vibrations from the heat pump, the following recommendations should be observed:

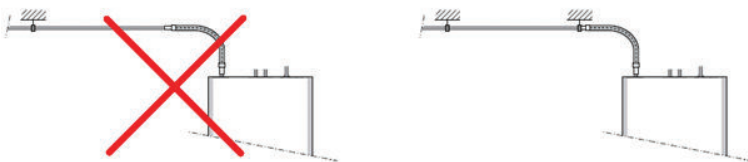
Noise

- In order to reduce the noise level inside the heat pump room, sound absorptive panels can be attached to the walls and ceiling.
- In order to reduce the noise level in adjacent rooms, reinforce the sound reduction of the heat pump room walls.
- Seal all openings from the heat pump room with air-tight material.
- Sound-dampen any joint ventilation chambers leaving the room.
- If necessary, change doors and windows to models with higher sound reduction.
- The brine and heat transfer fluid should normally be connected to the heat pump by means of a flexible hose.
- Pipes must not be attached to roofs or walls facing noise-sensitive areas.
- In cases where attachment of pipes to sensitive construction elements cannot be avoided, special elastic pipe attachments should be used.
- Not correctly adjusted feet, can cause unwanted noise.

Vibration and structure-borne sound

Structure-borne sounds can be dealt with by isolating the heat pump as much as possible from contact with sound-sensitive parts of the framework of the building.

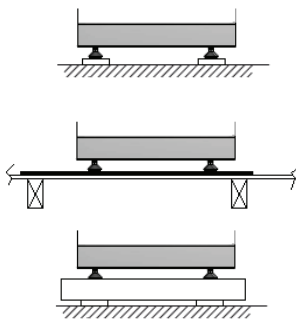
- If there are problems with specific frequencies, this can be adjusted in the display by tuning the actual gear. 50-100 rpm in either direction can make a significant improvement.
- Use flexible hoses between the heat pump and the radiator and brine system.
- The heat pump's pipe connections cause vibration. In order to prevent this vibration spreading to the heating system and frame, the pipes should be connected and laid with particular care.
- Extra weight attached tight to a pipe, or other vibrating parts, can change and dampen the vibration output due to the energy loss during the transfer to the added mass. The vibrating frequency will likely move to a lower range. Make sure to examine other gears of the compressor after making changes.



Floor preparations

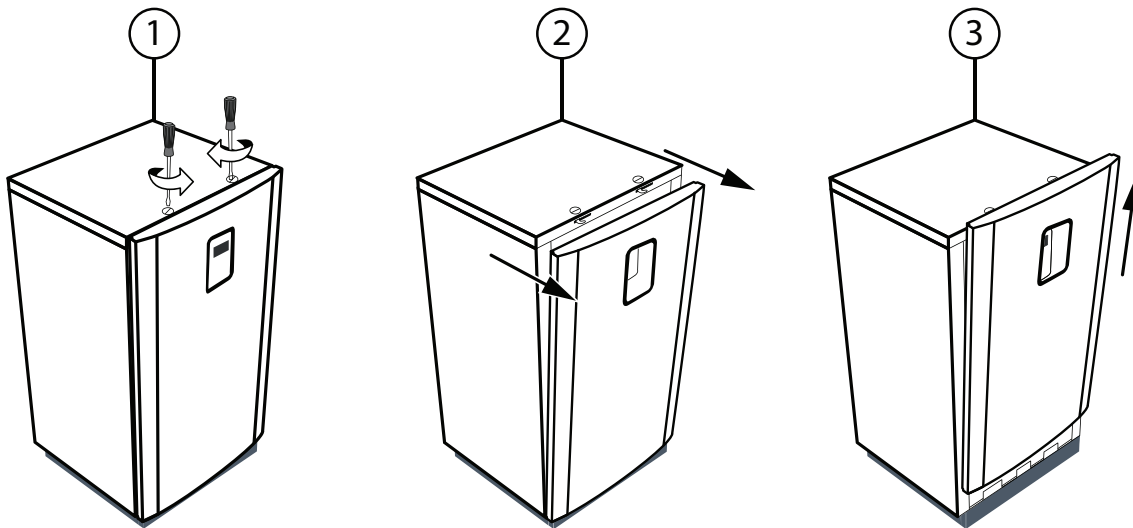
The heat pump is equipped with an internal insulation for vibrations and can therefore, in normal cases, be placed directly on the floor without taking further measures. If the heat pump is to be placed on a more sensitive floor, i.e. a wooden floor or a thinner concrete floor, some preparations might have to be made, to prevent a distribution of unwanted vibrations. See text and illustrations below.

- Lighter floors can be reinforced by supporting the weight of the heat pump with a steel plate covering, at least, one floor beam on each side of the heat pump. The plate should have a thickness of 6mm, minimum.
- Elastic shims can be placed under the feet of the heat pump, with a thickness of at least 4-6mm, depending on the weight of the heat pump.
- In extra sound sensitive spaces, a concrete base can be placed on top of elastic shims on the floor.



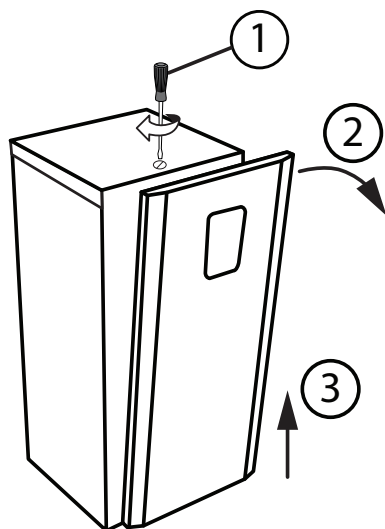
3.3 Dismantling/assemble the front cover

Mega E XL & L



1. Turn the two locks on the top panel.
2. Push the front cover out by about 25 cm.
3. Lift the front upwards and lift off.
4. When assembling the front cover, make sure to lock both screws at the top.

Mega E M, S & S-E



1. Press against the front cover and turn the catch 90° degrees anti-clockwise to release the front cover.
2. Tilt the front cover outwards.
3. Lift the front cover upwards to remove it from the heat pump.

4 Heat pump dimensions and connections (mm)

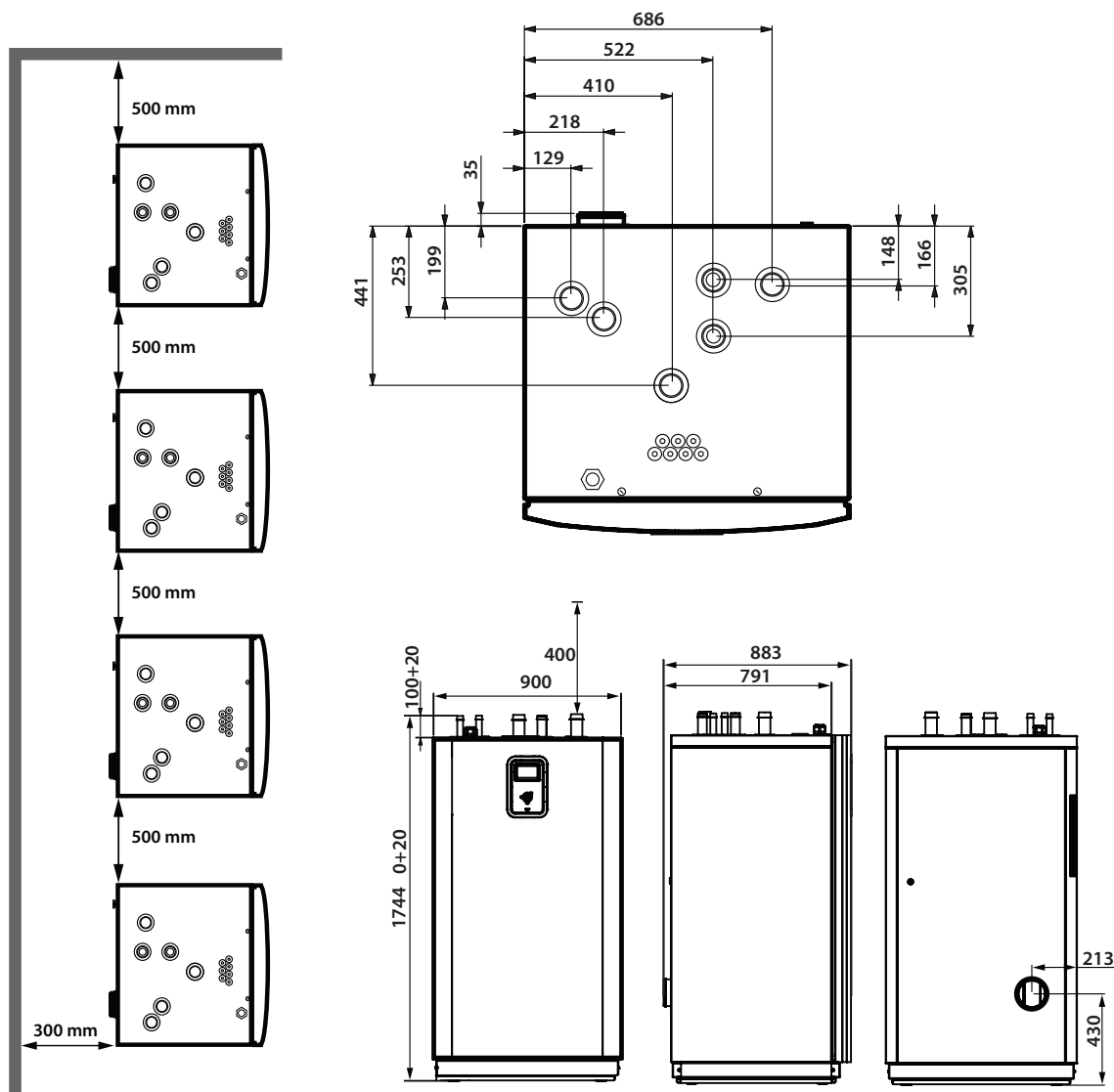
4.1 Minimum free space around the heat pump

To facilitate the installation and subsequent testing and maintenance, there must be sufficient free space around the heat pump.

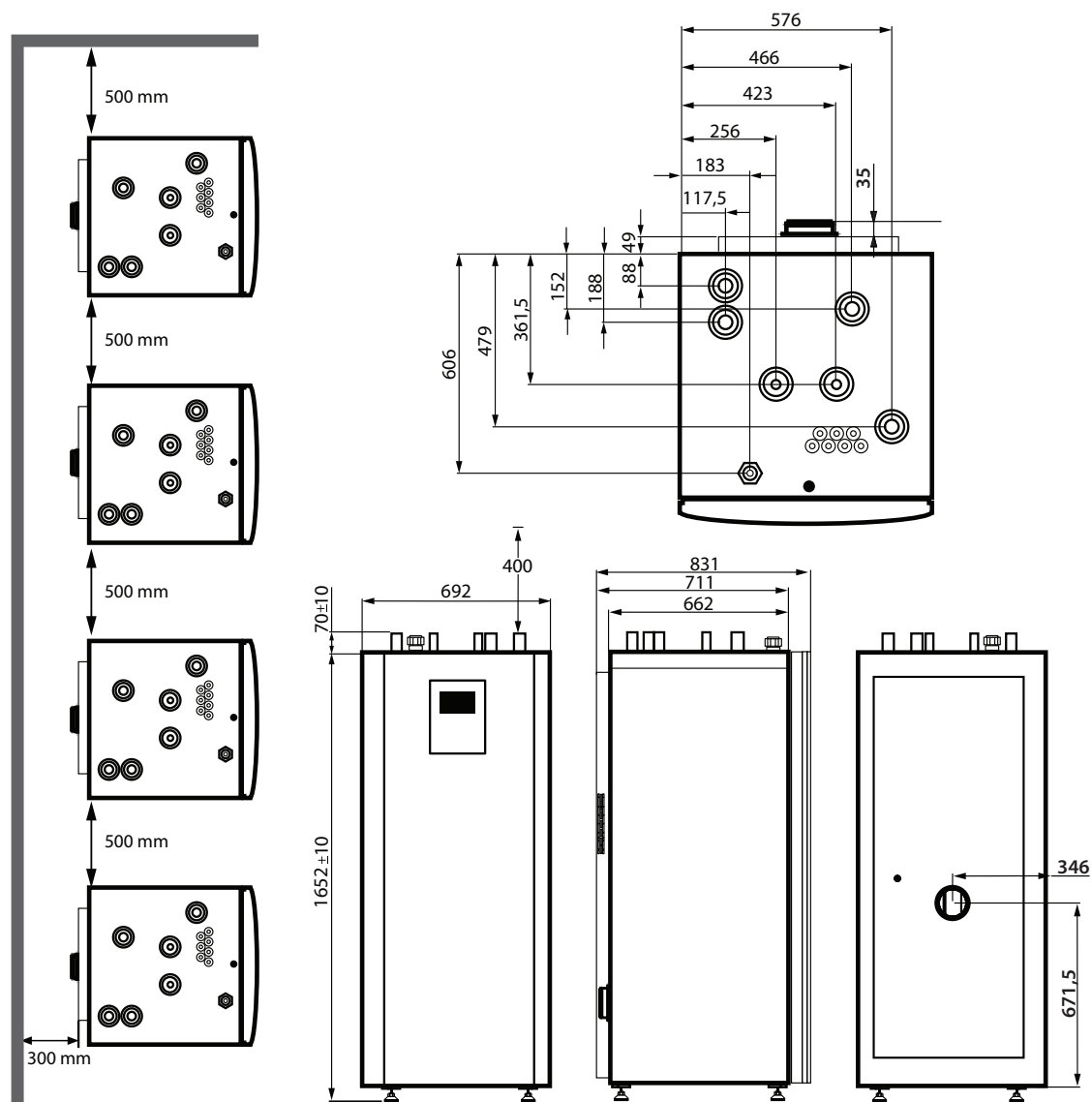
- Model XL, L, M, S & S-E: Minimum free space on the back 300 mm.

Minimum free space on the right side is 300mm, for the fan to work as intended. Recommended free space for all models is 500mm on both the left and the right side, to facilitate any maintenance

Mega E XL & L



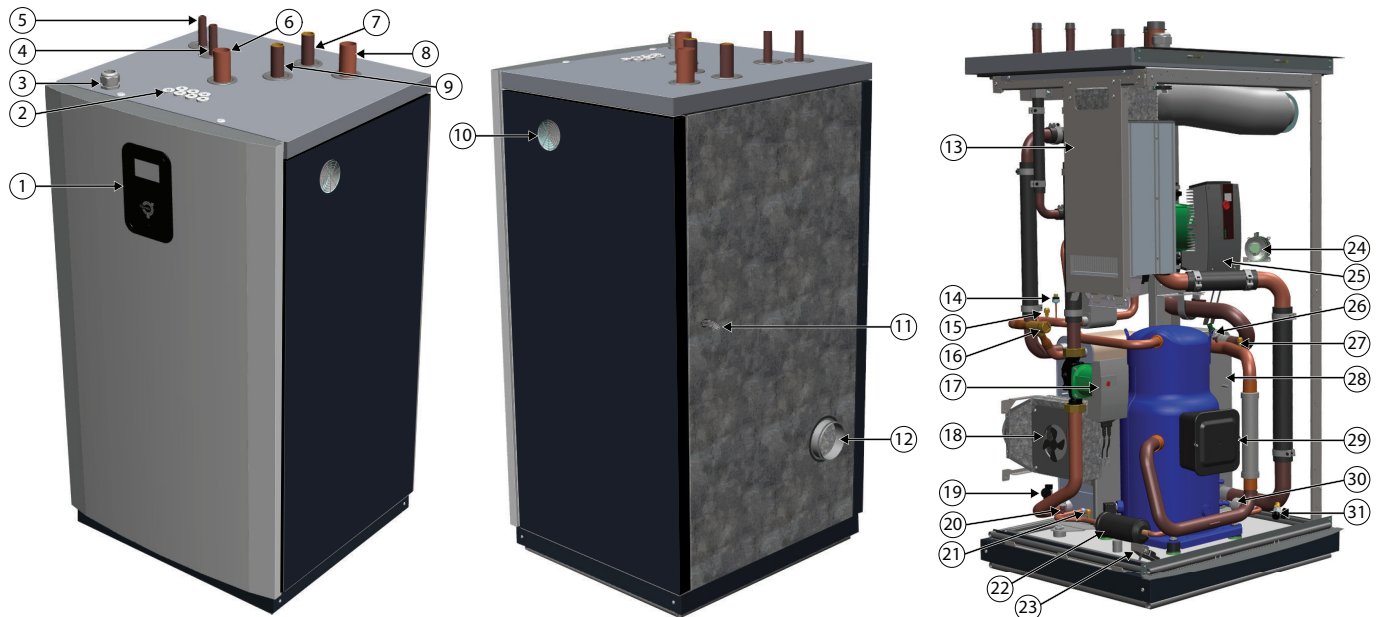
Mega E M, S & S-E



5 Components

5.1 Mega E XL & L

Image shows the position of the components (brand of components can vary).



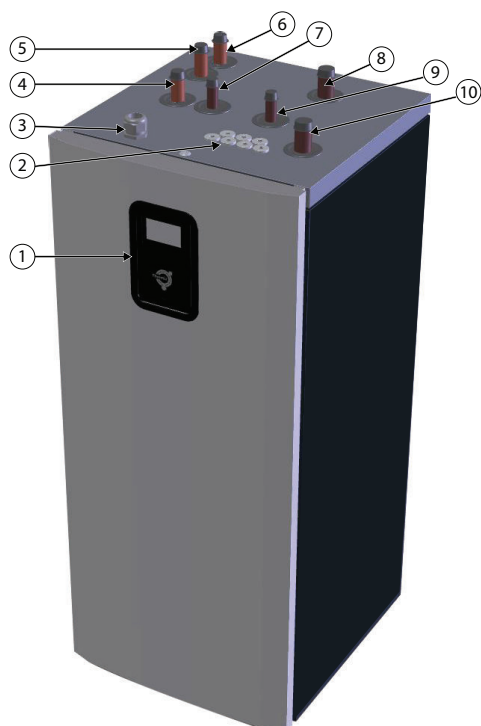
- | | |
|--|----------------------------------|
| 1. Control panel | 17. Condenser pump |
| 2. Lead-ins for communication cable and sensor | 18. Safety fan |
| 3. Lead-in for incoming supply | 19. Drain |
| 4. Returning hot gas from water heater | 20. High pressure transmitter |
| 5. Hot gas water heater | 21. Service output high pressure |
| 6. Brine out | 22. Drying filter |
| 7. Supply pipe, heating system | 23. Refrigerant sensor |
| 8. Brine in | 24. Differential pressure switch |
| 9. Return pipe, heating system | 25. Brine pump |
| 10. Fan | 26. Low pressure transmitter |
| 11. Differential pressure switch tube | 27. Service outlet, low pressure |
| 12. Ventilation pipe | 28. Evaporator |
| 13. Inverter | 29. Compressor |
| 14. High pressure switch | 30. Electronic expansion valve |
| 15. Service output high pressure | 31. Drain |
| 16. Non-return valve | |

Mega E XL & L Connections, pipe diameter in mm

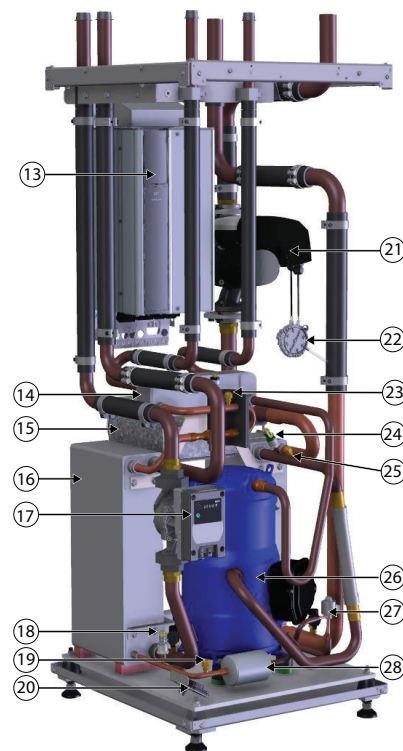
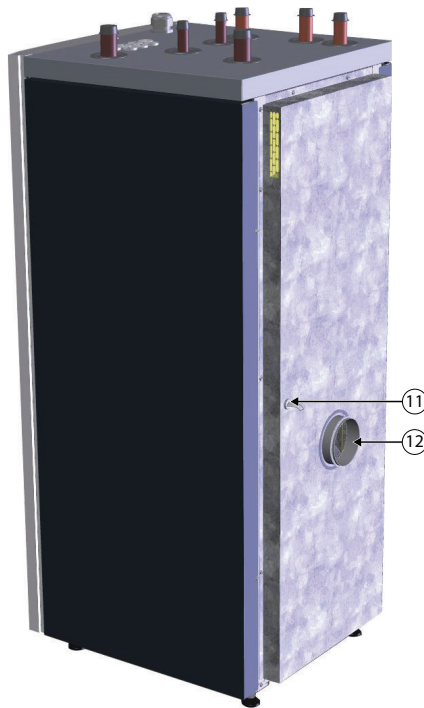
Brine	Heating system	Hot gas exchanger
54	42	28

5.2 Mega E M & S

Image shows the position of the components (brand of components can vary).



1. Control panel
2. Lead-ins for communication cable and sensor
3. Lead-in for incoming power supply
4. Return pipe, tap water system
5. Supply pipe, heating system
6. Return pipe, heating system
7. Returning hot gas from water heater
8. Brine out
9. Hot gas to water heater
10. Brine in
11. Differential pressure switch tube
12. Ventilation pipe
13. Inverter
14. Hot gas exchanger
15. Safety fan

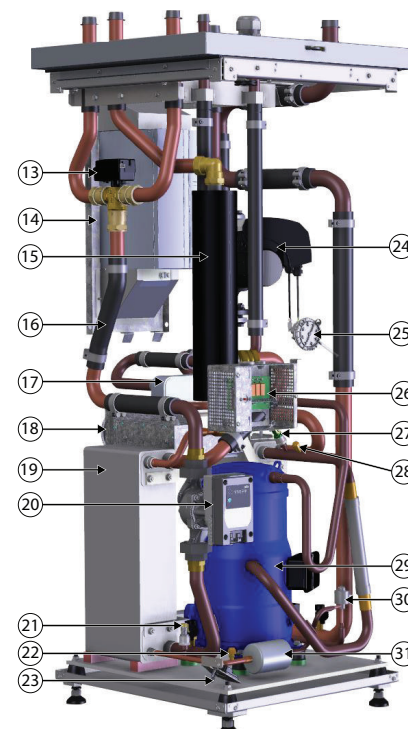
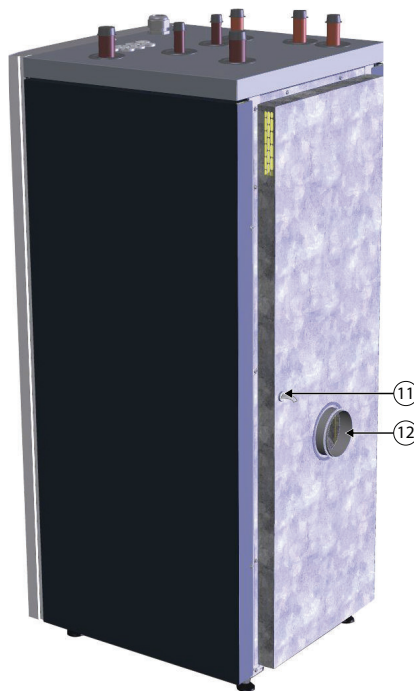
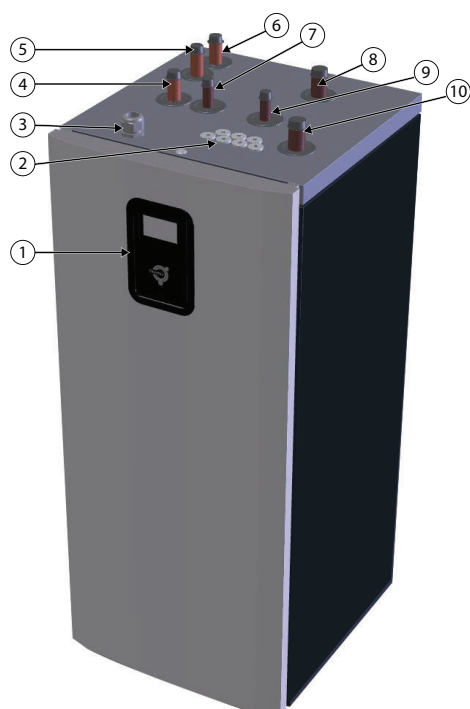


16. Condenser
17. Condenser pump
18. High pressure transmitter
19. Service output, high pressure
20. Refrigerant sensor
21. Brine pump
22. Differential pressure switch
23. pressure transmitter
24. Low pressure transmitter
25. Service output, high pressure
26. Compressor
27. Electronic expansion valve
28. Drying filter

Mega E M & S Connections, pipe diameter in mm		
Brine	Heating system	Hot gas exchanger
42	35	28

5.3 Mega E S-E

Image shows the position of the components (brand of components can vary).



- | | |
|--|-----------------------------------|
| 1. Control panel | 17. Hot gas exchanger |
| 2. Lead-ins for communication cable and sensor | 18. Safety fan |
| 3. Lead-in for incoming power supply | 19. Condenser |
| 4. Return pipe, tap water system | 20. Condenser pump |
| 5. Supply pipe, heating system | 21. High pressure transmitter |
| 6. Return pipe, heating system | 22. Service output, high pressure |
| 7. Returning hot gas from water heater | 23. Refrigerant sensor |
| 8. Brine out | 24. Brine pump |
| 9. Hot gas to water heater | 25. Differential pressure switch |
| 10. Brine in | 26. Relay output card |
| 11. Differential pressure switch tube | 27. Service outlet, low pressure |
| 12. Ventilation pipe | 28. Evaporator |
| 13. Mixing valve, heating and tap water | 29. Compressor |
| 14. Inverter | 30. Electronic expansion valve |
| 15. Internal immersion heater | 31. Drying filter |
| 16. Flexible hose | |

Mega E S-E Connections, pipe diameter in mm

Brine	Heating system	Hot gas exchanger	Tap water
42	35	28	35

6 Evacuation ventilation

6.1 Guidelines

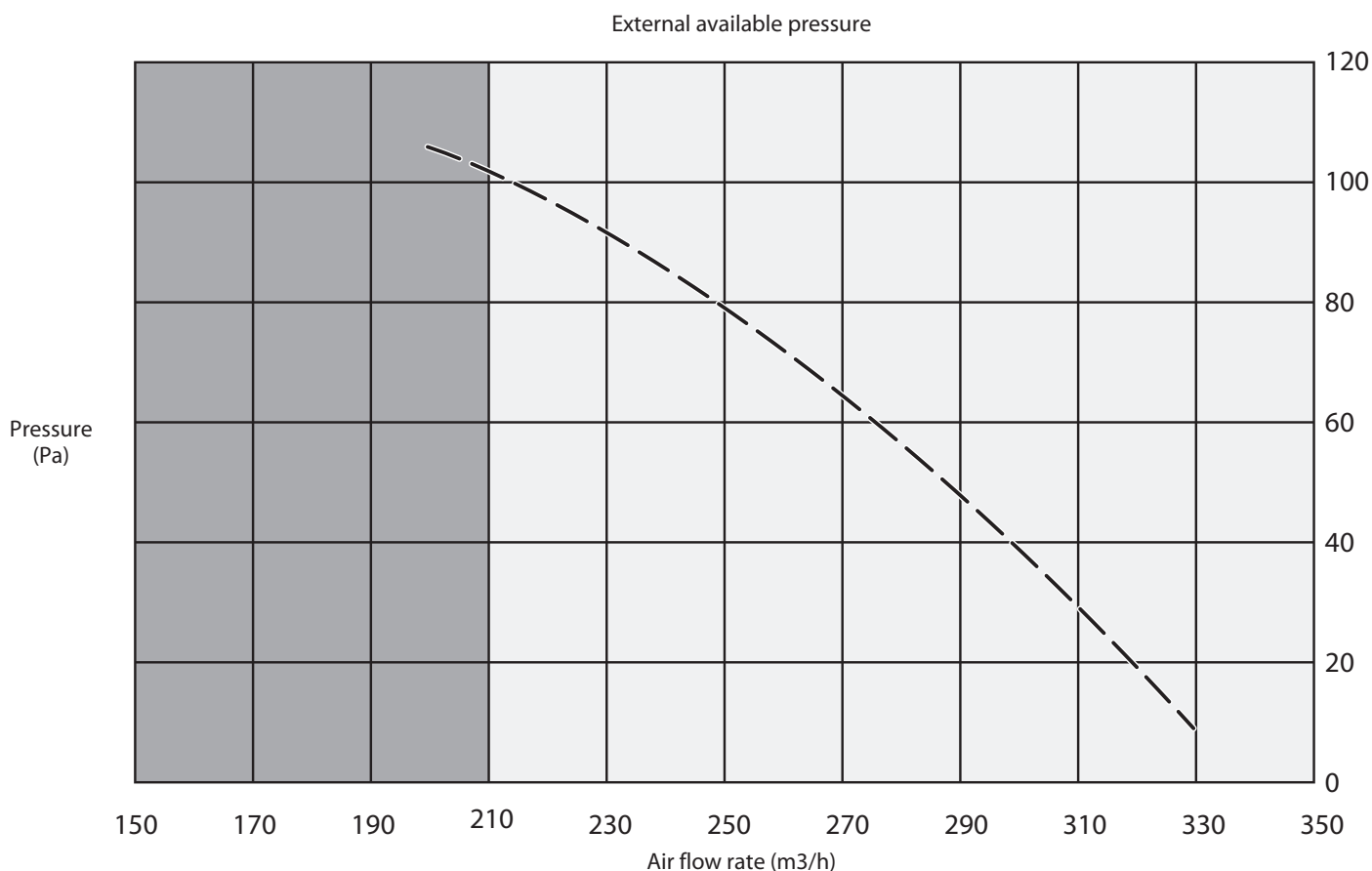


Installation of evacuation ventilation should be carried out by qualified ventilation personnel or those who have knowledge regarding flow, pressure drop and installation.

Mega E requires the cabinet to be ventilated outdoors, otherwise the installation is not approved as a closed ventilated cabinet. This is done by connecting the plug (125mm) to the back of a ventilation duct. The duct must not be connected to any other function, and be independent from the facility's ventilation system. The venting must debouch in a place without any sources of ignition and where the risk of leaking refrigerant is minimized.

Minimum rated airflow: 210 m³/h For cascade set-up is this value for each and single unit in the multiple installation.

The R454B is a **lightly** flammable refrigerant. The area must be marked with an ATEX sign at door or outlet.



External available pressure is 102 Pa with the built-in fan. The following table should be used as an approximately guide when installing the ventilation duct.

For longer pipe runs and common manifold, it is always recommended to go up in dimension. The recommendation is to always make a flow and pressure drop calculation for each individual installation to get the correct length and dimension of the ventilation pipes. It is of most important to check the manufacturer's data (pipes, bends, check valves and grilles, etc.) to get the correct information regarding flows and pressure drops, as this can differ between different manufacturers.

Duct connections Ø mm	Number of bends***	Maximum length (m). Available pressure 102Pa					
		Ventilation grilles*		Ventilation grilles**		Without ventilation grilles	
		Pipes, only	Pipes+non-return valve	Pipes, only	Pipes+non-return valve	Pipes, only	Pipes+non-return valve
125	2	26	14	-	-	32	21
125	4	21	10	-	-	28	16
125	6	17	5	-	-	23	12
160	2	100	85	65	50	108	93
160	4	94	79	59	45	102	87
160	6	88	74	54	39	96	81

* Low pressure grille. The above table is calculated with a pressure drop of 17 Pa for 125 Ø mm and 7 Pa for 160 Ø mm.

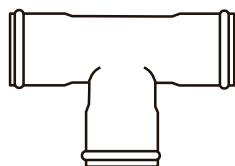
** High pressure grille. The above table is calculated with a pressure drop of 90 Pa for 125 Ø mm and 38 Pa for 160 Ø mm.

*** Using a T-Brach can result in an additional pipe reduction with -1.5 meters compared to a regular 90-degree elbow.

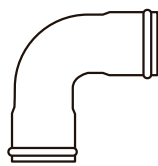
Non-return valve. The above table is calculated with a pressure drop of 32 Pa for 125 Ø mm and 15 Pa for 160 Ø mm.

Note that the examples below it can differ from different brands.

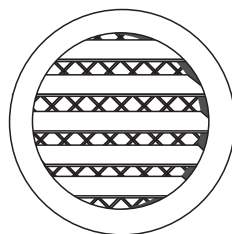
T-branch



Elbow bend

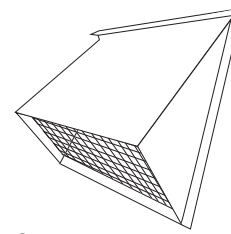


High pressure ventilation grille



Open area >50%

Low pressure ventilation grille



Open area >50%

The ventilation system must be connected and installed in a professional manner that ensures that leakage of air and leaked refrigerant does not leak from the duct into the room. Joints must be sealed. The ventilation ducts must be well suspended. Ducts in ventilation systems must be of at least Class B according to PN EN 12237:2005

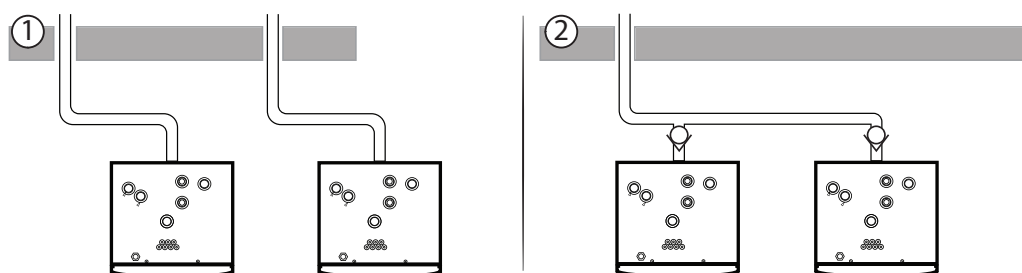
6.2 Cascade, ventilation

When installing multiple units, the ventilation system can be configured in one of the following ways:

- Individual ventilation ducts for each unit, figure 1
- Shared ventilation duct, as illustrated in figure 2.

If the ventilation system is cascaded, it is recommended to install check valves (see figure 2) to prevent air circulation between the heat pumps. This ensures proper airflow direction and avoids undesired pressure interactions between units.

When connecting the ventilation system as shown in figure 2, it is also recommended to use a larger diameter manifold pipe to minimize pressure drop and maintain optimal system performance.

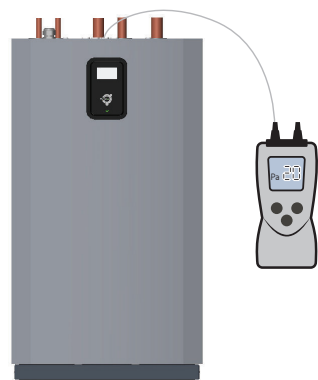


Before commissioning, it is of most important that a ventilation test is performed (see chapter "**Manual test**" in the commissioning guide).

In order for the test to be approved, a negative pressure of 20 Pa must be achieved in the cabinet for a 10-second period within one minute of starting the test. One way to test this, is to connect a pressure gauge, connected via one of the sensor ports on the top of the heat pump (see image below).



In a cascade installation, it is important to test each individual unit separately and not on multiple units at the same time, this can create the opposite effect. If the test is not approved, please investigate and make the test again until the test is approved.



6.3 External fan

If the pressure drop is too high for the built-in fan, one of the following methods can be used:

- External fan can be connected. It must be rated for a EX-classification environment. When dimensioning an external fan, it is important to consider the pressure drop for pipes, bends, check valves, and other flow restrictions, based on the manufacturer's data, as this can differ depending on manufacturer.
- In some cases, it may be sufficient to increase the pipe dimension to compensate for the pressure drop.

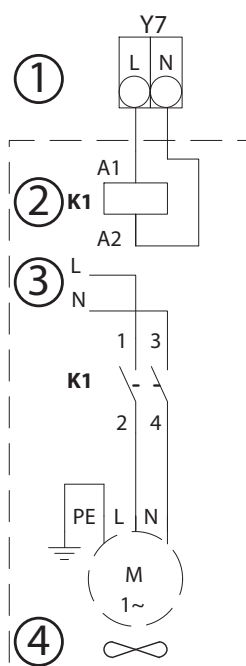
Note! For cascade installation:

- The external fan will normally draw air flow through all the connected heat pumps in parallel, and needs to be sized accordingly.
- Each heat pump must be connected to the external fan, for example via an external relay.

Single installation



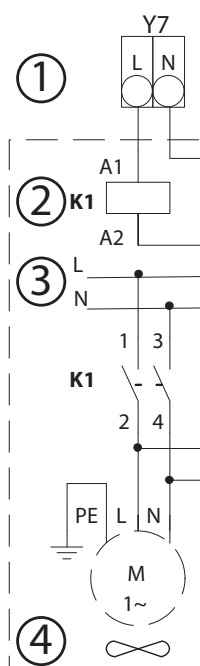
Y7: Located on safety card, connection external safety fan



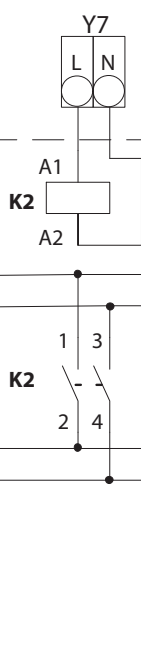
Cascade installation ->



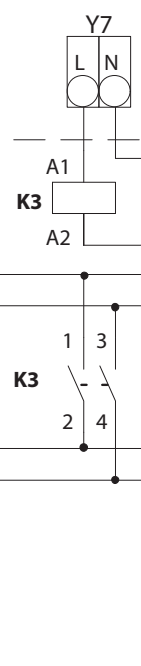
Y7: Located on safety card, connection external safety fan



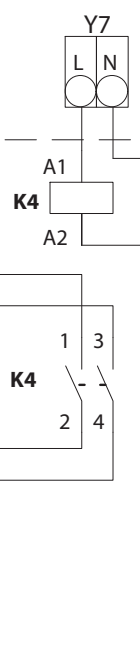
Y7: Located on safety card, connection external safety fan



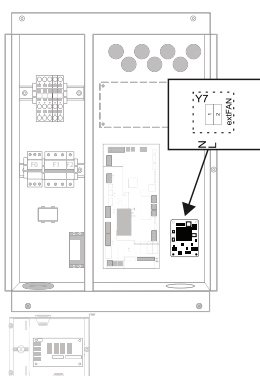
Y7: Located on safety card, connection external safety fan



Y7: Located on safety card, connection external safety fan



Safety card location



1. Terminal, for 230V control circuit only!
2. Contactor.
3. Supply 230~1N
4. External safety fan.

6.4 Safety valves and automatic vents

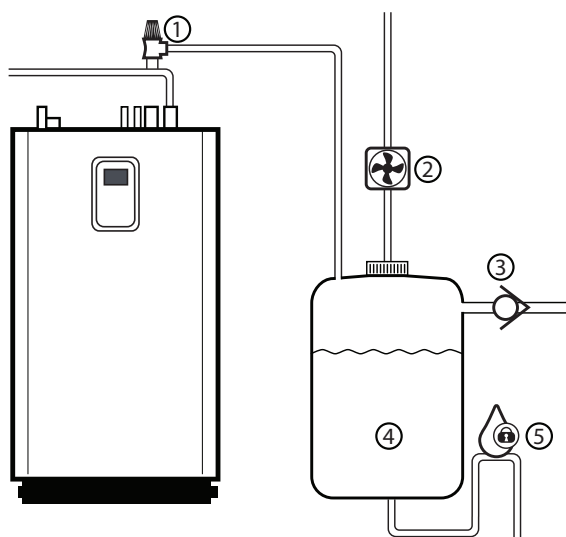
All secondary circuits must be equipped with safety valves and automatic deaerators with outlets that ensures that no leaked refrigerant ends up indoors. Consider local and national regulations.

Ventilation led outside or ventilated collection container.

- If they are led outdoors, the pipes must be designed in a way that evacuated water does not freeze. When using an outlet in a collection tank, the tank must be ventilated according to EN 378-3.
- When dimensioning automatic vents and safety valves, the pressure and temperature of the system must be taken into account. The minimum nominal flow rate for automatic vents is 15l/s.
- Recommendation is to place safety valves as close to the heat pump as possible.
- Extra automatic vents in the remaining systems that do not have a safe outlet outside, must be switched off during operation.
- If the HGW function is not used, it must be connected to the radiator circuit, or be mechanically bridged and equipped with a safety valve and automatic vent that are drawn outside or to a ventilated collection container.

Mega E safety system

The illustration below is an example of what a safety system can look like. If you have a system, where ventilation is led outdoors, see chapter 3 for system suggestions. (Thermia does not provide the equipment regarding the safety system set-up.)

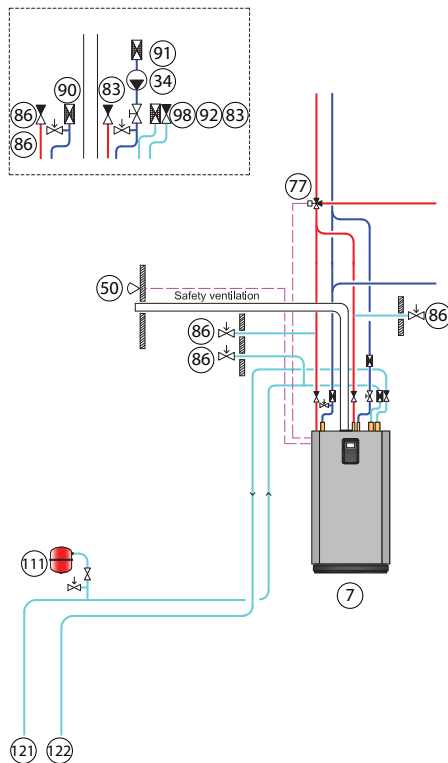


1. Safety valve
2. External fan
3. Non-return valve
4. Collection tank
5. Water lock

System overview, if HGW function is not used

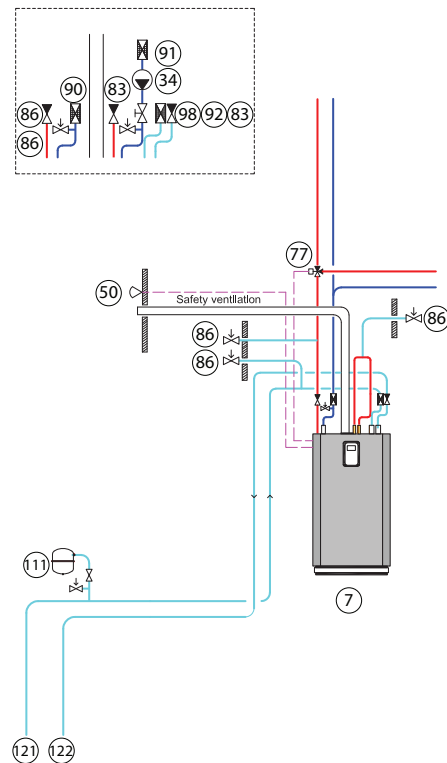
If the HGW function is not used, it must be connected to the radiator circuit, or be mechanically bridged and equipped with a safety valve and automatic vent that are drawn outside or to a ventilated collection container.

Mega E with HGW, no circulation pump



- 7. Heat pump
- 34. Circulation pump (hot gas)
- 50. Outdoor sensor
- 77. Hot water exchange valve
- 83. Non-return valve
- 86. Safety valve
- 90. Dirt strainer (condenser)
- 91. Dirt strainer (hot gas)
- 92. Dirt strainer (brine)
- 98. Flexible hose
- 111. Venting and expansion tank (brine)
- 121. Brine in
- 122. Brine out

Mega E with mechanically bridged HGW, no circulation pump



- 7. Heat pump
- 34. Circulation pump (hot gas)
- 50. Outdoor sensor
- 77. Hot water exchange valve
- 83. Non-return valve
- 86. Safety valve
- 90. Dirt strainer (condenser)
- 91. Dirt strainer (hot gas)
- 92. Dirt strainer (brine)
- 98. Flexible hose
- 111. Venting and expansion tank (brine)
- 121. Brine in
- 122. Brine out

7 Piping installation

Caution



To prevent leaks, ensure that there are no stresses in the connecting lines.

Caution



Pipe installation must be carried out by an authorised installer.

Caution



Ensure that the pipe installation is carried out in accordance with the dimensions and connection diagrams, make sure to use the prepared pipe bushing.

Caution



Bleed valves should be fitted if necessary

Caution



In a primary/secondary heat pump setup, a system circulation pump(36) **MUST** be installed, in order for the system to work. It is also recommended to use it in a stand-alone installation.

7.1 Safety valves

Warning



Radiator systems with a closed expansion tank must also be equipped with an approved manometer and safety valve. The safety valve should be to a minimum of DN 20 and have a maximum of 6 bar opening pressure, or according to country-specific requirements.

Warning



The overflow pipes from the safety valve must not be closed off. The pipes should discharge into an outlet in a frost-free area.

Warning



The connecting pipe between the expansion tank and the safety valve must slope continuously upwards. A continuous upwards slope means that the pipe must not slope downwards from the horizontal at any point.

Caution



Cold and hot water pipes and overflow pipes from safety valves must be made of heat-resistant and corrosion-resistant material, e.g. copper.

7.2 Supply and return pipes

7.2.1 Heating system supply pipe and return pipe

- Install a filter (max mesh size 0.7 mm) in the heating system's return pipe to protect the unit against foreign particles.
- Install the supply line with all the accompanying components.
- Ensure that the correctly dimensioned system pump is connected to the heating system's supply line, and connect the system pump's control cables to the correct terminal block (see connection of system pump).
- Install the return line with all the accompanying components.
- Insulate the supply and return lines.

7.2.2 Tap water connection, Mega E S-E

If the tap water connection on **Mega E S-E** is not used, it must be plugged with a bleed valve installed.

7.3 Connection brine

7.3.1 Drill holes for brine pipes



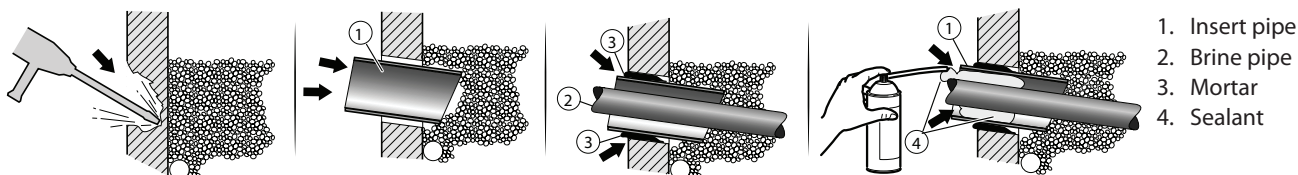
Ensure that the holes for the insert pipes are positioned so that there is room for the other installations.



The brine pipes shall have separate lead-ins. If the wall lead-ins are below the highest ground water level watertight lead-ins must be used.

The brine pipes must be insulated from the heat pump, through the walls and outside the house all the way to the collector so as to avoid condensation and prevent heat loss.

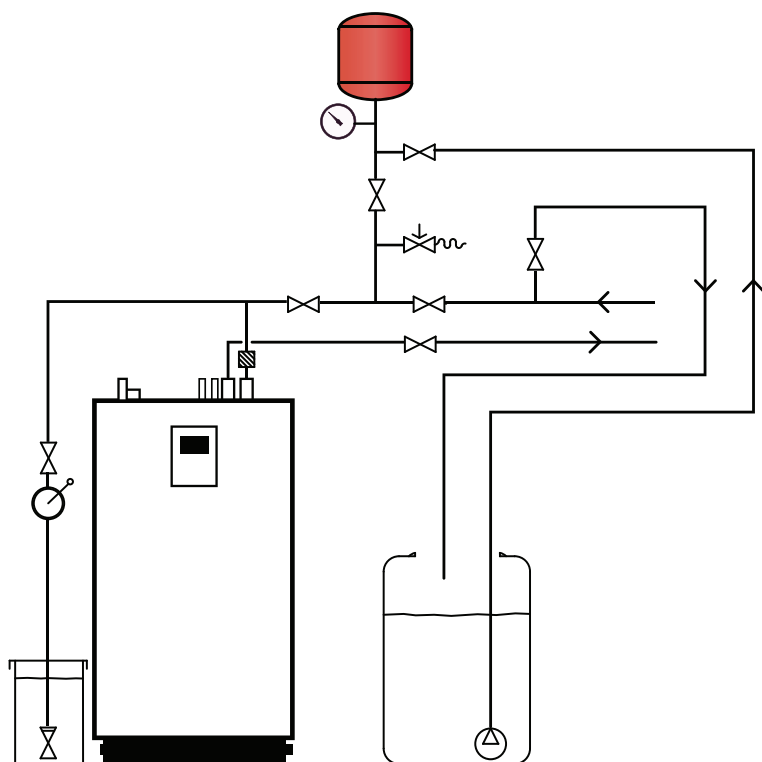
- If the brine pipes are to be routed above ground, drill holes in the walls for them.
- If the brine pipes are to be routed below ground see the instructions below.



1. Drill holes in the wall for the insert pipes (1) for the brine pipes. Follow the dimension and connection diagrams. If there is any risk of groundwater infiltration at brine pipe lead-ins, watertight grommets must be used.
2. Position the insert pipes (1) in the holes sloping downwards. The inclination must be at least 1 cm every 30 cm. Cut them at an angle (as illustrated) so that rain water cannot get into the pipes.
3. Insert the brine pipes (2) into the insert pipes in the installation room.
4. Fill in the holes around the lines with mortar (3).
5. Ensure that the brine pipes (2) are centred in the insert pipes (1) so that the insulation is distributed equally on all sides.
6. Seal the insert pipes (1) with a suitable sealant (foam) (4).

7.3.2 Connection brine

- Install a filter (maximum mesh size 0.7 mm) in the incoming brine pipe to protect the unit against foreign particles.
- Install the incoming brine pipe with all the accompanying components.
- Install the outgoing brine pipe with all the accompanying components.
- Fit both pipes with anti-diffusion condensation insulation.
- The expansion tank for brine is dimensioned in accordance with the manufacturer's instructions.
- Max. working pressure of heat source: 6 bar.



Antifreeze with anti-corrosive properties must be used in the brine collector circuit, so that frost protection down to $-17 \pm 2^{\circ}\text{C}$ is achieved.

8 Electrical installation

Warning



Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

This equipment complies with IEC 61000-3-12 (provided is not applicable for 230V versions) that the short-circuit power S_{sc} is greater than or equal to, see table, at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power S_{sc} greater than or equal to see table.

S_{sc}	XL	L	M	S	SE
MVA	3.1	2.3	2.0	2.0	2.0

The heat pump is connected internally at the factory, for this reason electrical installation consists mainly of the connection of the power supply.

Danger



Electrical voltage!
The terminal blocks are live and can be highly dangerous.
All power supplies must be switched off before the electrical installation is started.

Warning



The electrical installation may only be carried out by an authorized electrician and must follow applicable local and national regulations.

Warning



The power cable may only be connected to the terminal block intended for this purpose.
No other terminal blocks may be used!

Caution

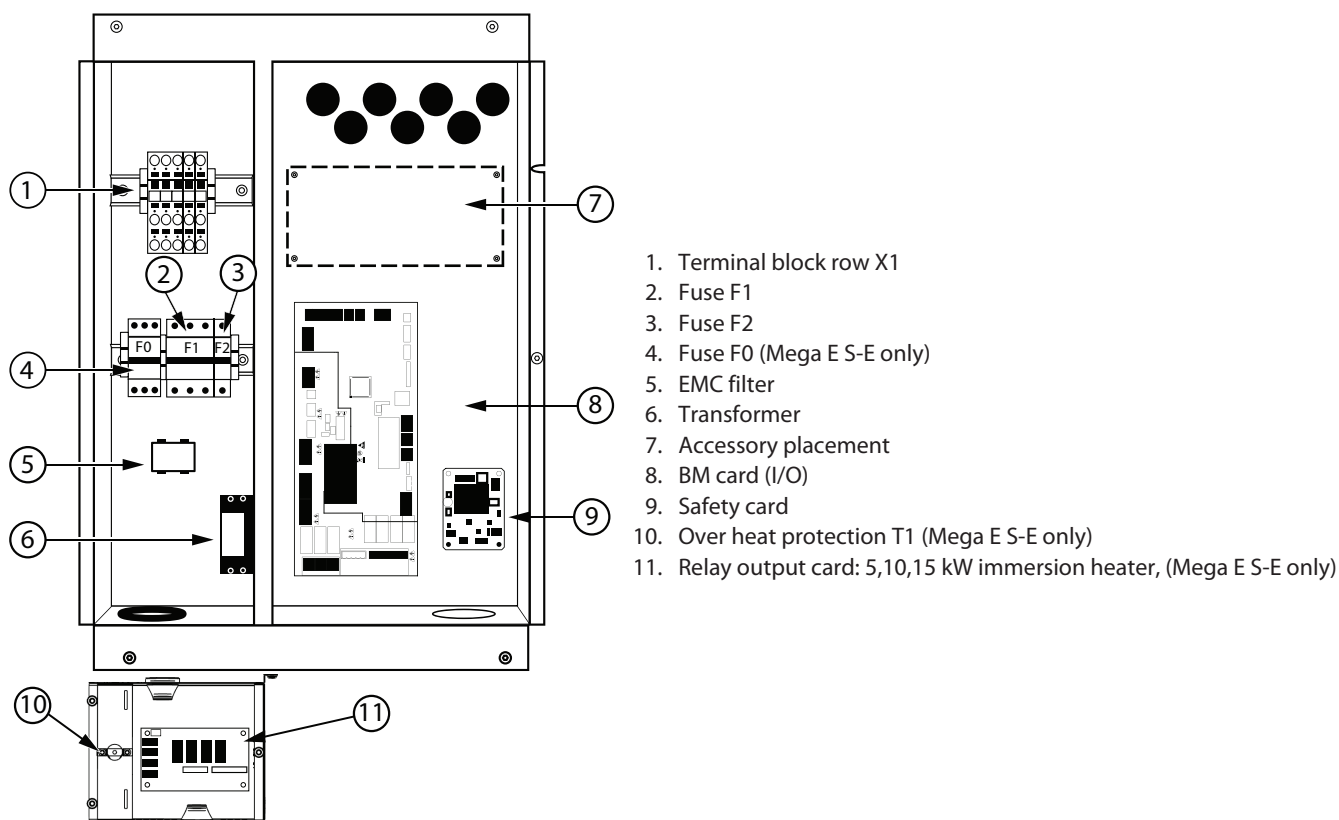


The electrical installation must be carried out using permanently routed cables and must follow applicable local and national regulations. Isolate the power supply using an all-pole circuit breaker with a minimum contact gap of 3 mm.



Use the prepared bushing for electrical cables.

8.1 Electrical components



8.2 Fuse size

Heat pump	Unit	XL	L	M	S
400V~3N 50 Hz heat pump	A	C63	C40	C32	C25

Heat pump	Unit	M	S
230V 3N~ 50 Hz heat pump	A	C50	C40

Heat pump	Unit	Compressor only	Compressor + Step 1 (5kW)	Compressor + Step 2 (10kW)	Compressor + Step 3 (15kW)
Mega E S-E 400V~3N 50 Hz	A	C25	C32	C40	C50

Installation Guide

Mega E

8.3 Estimated current for Mega E XL 400V

Rad out °C	Estimated current (A) for Mega E XL (400V~3N)						
65 °C	-	-	-	50¹	50¹	50¹	50¹
60 °C	-	-	49	50¹	50¹	50¹	50¹
55 °C	-	45	46	46	47	48	48
50 °C	41	42	42	43	44	44	45
45 °C	38	39	39	40	41	41	41
40 °C	35	36	37	37	38	38	38
35 °C	33	34	34	35	35	35	34
30 °C	31	32	32	32	32	32	30
Brine in °C	-10	-5	0	5	10	15	20

1) Highest current

8.4 Estimated current for Mega E L 400V

Rad out °C	Estimated current (A) for Mega E L (400V~3N)						
65 °C	-	-	-	-	37,0	37,2¹	37,2¹
60 °C	-	-	36,8	37,2¹	37,2¹	37,2¹	37,2¹
55 °C	-	33,7	34,1	34,5	35,7	35,4	35,7
50 °C	30,9	31,3	31,7	32,1	33,1	32,9	33,1
45 °C	28,7	29,2	29,6	30,0	30,7	30,6	30,7
40 °C	26,9	27,3	27,7	28,1	28,5	28,5	28,5
35 °C	25,2	25,6	26,0	26,3	26,3	26,5	26,3
30 °C	23,7	24,1	24,4	24,6	24,2	24,6	24,2
Brine in °C	-10	-5	0	5	10	15	20

1) Highest current

8.5 Estimated current for Mega E M 400V

Rad out °C	Estimated current (A) for Mega E M (400V~3N)						
65 °C	-	-	-	-	28,3¹	28,3¹	28,3¹
60 °C	-	-	28,3¹	28,3¹	28,3¹	28,3¹	28,3¹
55 °C	-	27,2	27,8	28,3¹	28,3¹	28,3¹	28,3¹
50 °C	24,8	25,4	26,0	26,6	27,1	27,2	27,1
45 °C	23,1	23,8	24,5	25,1	25,4	25,6	25,4
40 °C	21,7	22,5	23,1	23,7	23,7	24,0	23,7
35 °C	20,5	21,2	21,8	22,3	22,0	22,5	22,0
30 °C	19,3	20,0	20,6	21,0	20,1	20,8	20,1
Brine in °C	-10	-5	0	5	10	15	20

1) Highest current

8.6 Estimated current for Mega E M 230 V

Rad out °C	Estimated current (A) for Mega E M (230V~3N)						
65 °C	-	-	-	-	48.2	48.6	48.7
60 °C	-	-	48.7	49.5	50¹	50¹	50¹
55 °C	-	44.4	45.4	46.3	47.3	47.3	47.3
50 °C	40.3	41.3	42.4	43.3	44.2	44.4	44.2
45 °C	37.5	38.6	39.8	40.7	41.3	41.6	41.3
40 °C	35.0	36.2	37.4	38.3	38.3	38.9	38.3
35 °C	32.8	34.0	35.1	35.9	35.3	36.2	35.3
30 °C	30.8	32.0	33.0	33.6	32.1	33.3	32.1
Brine in °C	-10	-5	0	5	10	15	20

1) Highest current

8.7 Estimated current Mega E S & S-E 400V²

Rad out °C	Estimated current (A) for Mega E S & S-E ² (400V~3N)						
65 °C	-	-	-	23,7¹	23,7¹	23,7¹	23,7¹
60 °C	-	-	0,0	23,7¹	23,7¹	23,7¹	23,7¹
55 °C	-	0,0	22,4	22,6	22,9	22,9	22,9
50 °C	0,0	20,8	21,0	21,2	21,3	21,3	21,3
45 °C	19,4	19,5	19,6	19,8	19,9	19,8	19,6
40 °C	18,0	18,2	18,3	18,4	18,5	18,3	18,0
35 °C	16,8	17,0	17,1	17,2	17,1	16,9	16,4
30 °C	15,6	15,8	15,9	15,9	15,8	15,4	14,9
Brine in °C	-10	-5	0	5	10	15	20

1) Highest current

2) The table only includes estimated current in compressor-only operation. Since Mega S-E also have a built-in immersion heater, its estimated current must be added separately to the table values, with consideration on how many steps that are planned to be used. To include immersion heater estimated current,

- for Step 1 (5kW) : add 7,2 A to table value.
- for Step 2 (10kW): add 14,5 A to table value.
- for Step 3 (15kW): add 21,7 A to table value.

8.8 Connecting external supply voltage

8.8.1 Connect external supply voltage

Danger



Electrical voltage! The power cable may only be connected to the terminal block intended for this purpose. No other terminal block may be used.

Caution



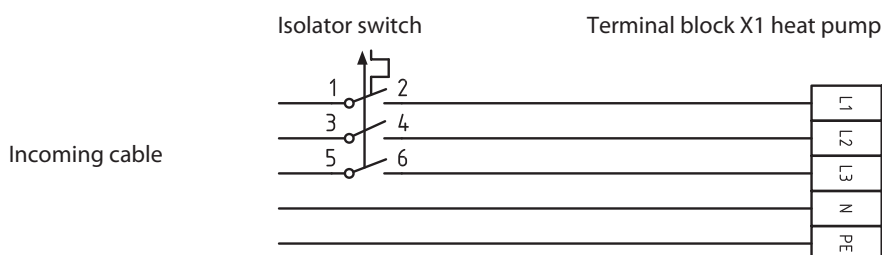
A 400V heat pump can not be wired to work on a 230V power grid, and vice versa. Make sure you follow the right wiring instructions, or it can result in critical material damage.

The frequency converter has a high leakage current and must be earthed appropriately for safety reasons according to EN 61800-5-1. The earth leakage current from the frequency converter exceeds 3,5 mA. Therefore is a good mechanical connection from the earth cable to the earth connection important, the cross-section for the protective earthing conductor must be at least 10 mm².

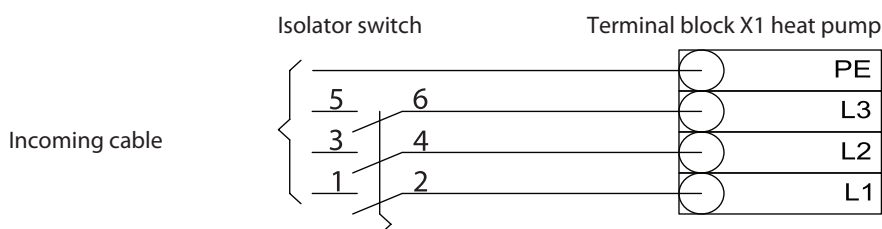
If the heat pump is connected to mains via a residual-current circuit breaker (RCCB). The RCCB should be of type B.

1. Remove the front cover from the heat pump.
2. Route the power cable through the opening in the top panel of the heat pump to the terminal blocks.
3. Localise terminal block row X1
4. Connect the power cables as follows.

8.8.2 Connection 400 V, 3-phase models



8.8.3 Connection 230 V, 3-phase models



8.9 Network connection, Online and setting up primary and secondary functionality

Thermia Online

The heat pump is factory prepared for monitoring (and as an additional service being operated) remotely via internet. (Thermia Online) In order to use the Thermia Online service:

- Make sure that there is an available internet connection (router or equivalent) in the building
- An account and registration is required to use the Thermia Online service.
For more information, see:
www.thermia.com/documents
- Make a note of the heat pump MAC-address. The MAC-address is available in the Network menu in the display

Bear in mind that firewalls, deficient connections etc. can cause problems that will prevent desired functionality. Some operators, municipal networks etc. does not allow traffic through their firewalls. Contact the internet service provider or network administrator if there are any such problems.

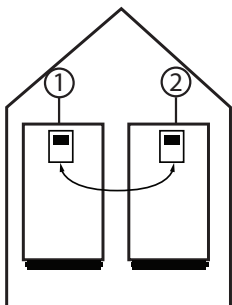
Connecting to internet

Connect the commissioned heat pump to an existing internet connection (router or equivalent). Use the RJ45 connection placed below the display (CM module) behind the front panel. Use a patch cable (not cross over cable).

Example below with no external network connection (for installations with only one secondary unit):

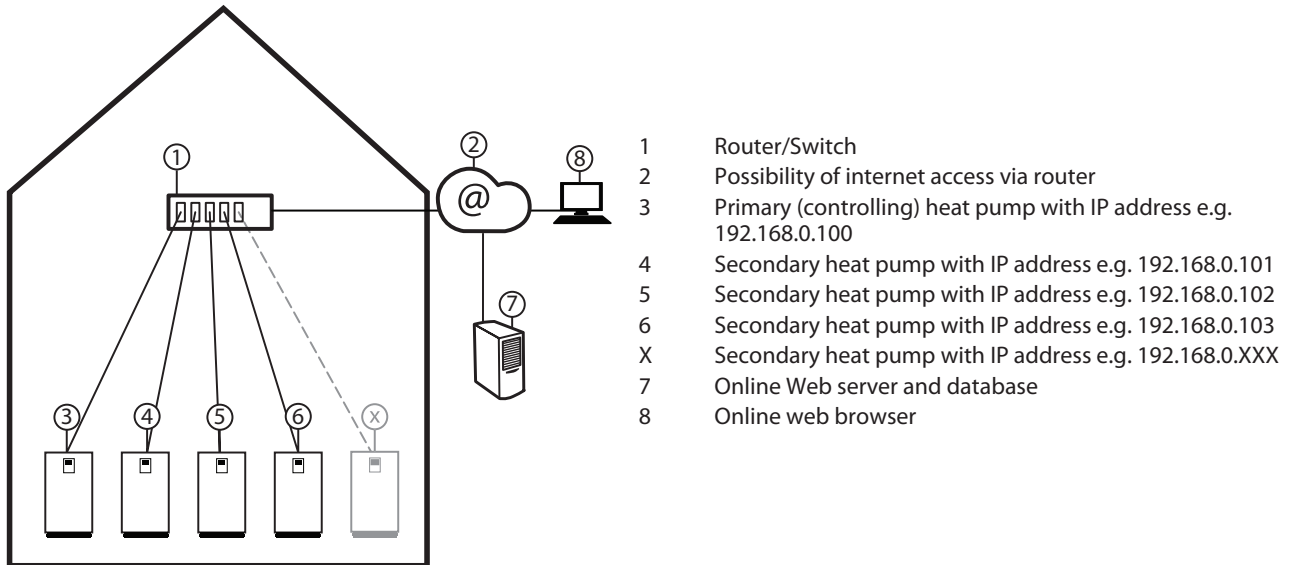
(This solution will NOT provide internet functionality. See next example if internet functionality, or router solution, is desired)

Ethernet cable: Standard Cat 5 network cable, RJ 45.



1. Primary (controlling) heat pump with IP address e.g. 192.168.0.100
2. Secondary heat pump with IP address e.g. 192.168.0.101

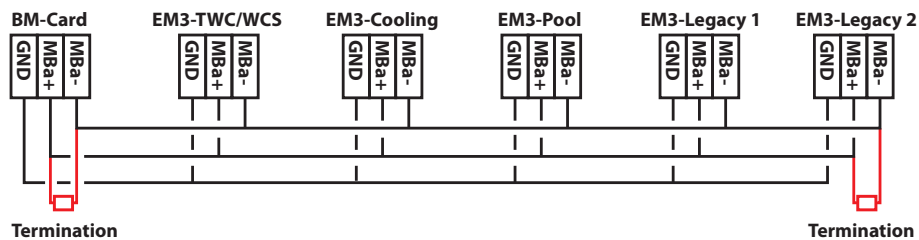
Example below with external network connection (for installations with one or more secondary units):



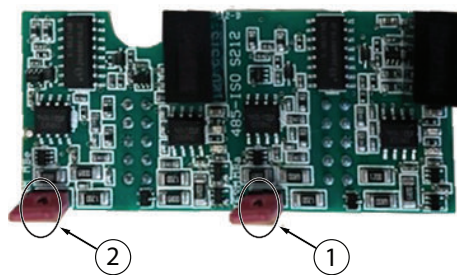
8.10 Termination on both ends of accessory- and/or BMS communication network

Termination of a communication network is needed whenever the Modbus connection is used. This to ensure that the receiver is getting the maximum signal power, by matching the characteristic impedance of the cabling using termination jumpers on each end of the communication network.

Below is a schematic example of a series of accessories and where to put the termination jumpers accordingly:



For mounting the jumper on an accessory unit, see the respective manual for that accessory. The jumpers on the BM-card in the heat pump are mounted as default, on the additional ISO-card (adjacent to the MBa2 and MBe inputs), see picture below. Remove relevant jumper if the heat pump is no longer at either end of the communication network.



1. MBa2 (expansion)
2. MBe (BMS)

Galvanic isolation

The ISO-card mounted on the BM-card has two optocouplers serving as galvanic isolation. This to reduce any transmission errors caused by ground loop interference in the system's ground scheme.

8.11 Sensor connections

8.11.1 Sensor connections

This chapter describes the most common connections of sensors and relays that can be used with this heat pump. See the Wiring Diagram for a complete map of connections.

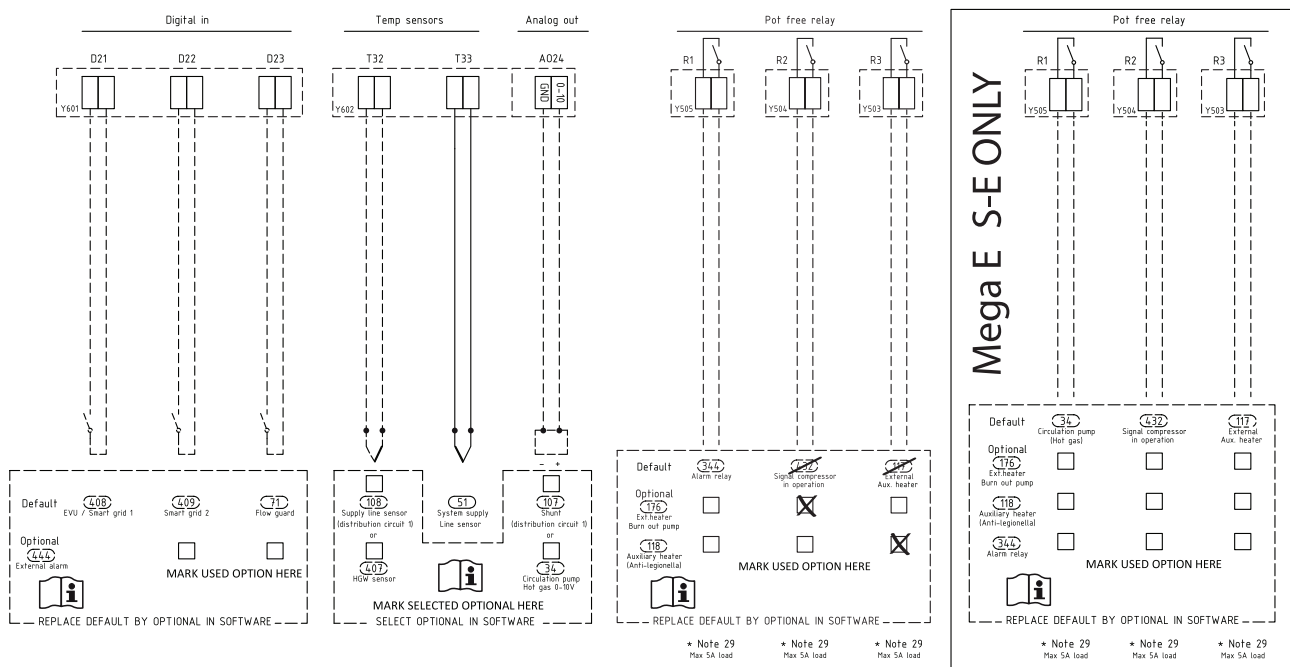
I/O connections marked with an asterisk (*), are included in a solution called Dynamic allocation. Some functions are set as default. However, depending on the installation, certain I/O's can be changed to serve other functions.

If any I/O is changed from its default configuration, it's important to mark the changes on the adhesive sheet that is mounted on the electric cabinet! Mega E S-E has a different setup for "Pot free relay". See example picture below.

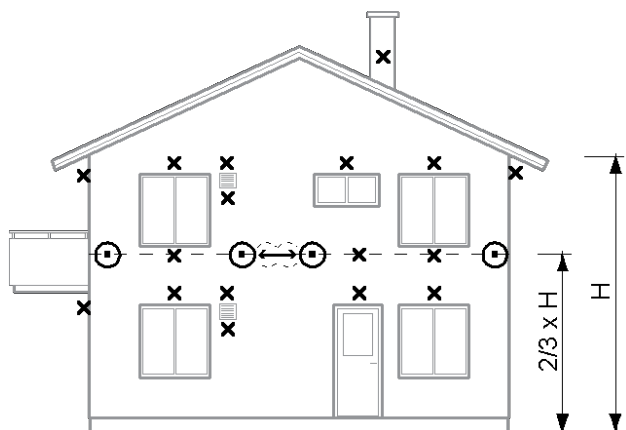
This to forward the information for the commissioning part of the heat pump.

NOTE: Functions already occupied in the configuration may need to be shut off in the display to make place for the new function.

In the example below, both "Signal compressor in operation" and "External Aux. heater" have been replaced by "Ext. heater Burn out pump" and "Auxiliary heater (Anti-legionella)" on the relay outputs.



8.11.2 Positioning and connecting outdoor sensor



Recommended location --> ●

Unsuitable location --> X

The outdoor sensor is connected by a two core cable. A maximum cable length of 50 m applies for a cross section of 0.75 mm². For greater lengths a cross section of 1.5 mm² is used, up to a maximum of 120 m.



For high buildings, the sensor should be positioned between the second and third storey. Its location must not be completely protected from the wind but not in a direct draft. The outdoor sensor should not be placed on reflective panel walls.



The sensor must be positioned at least 1 m from openings in the walls that emit hot air.

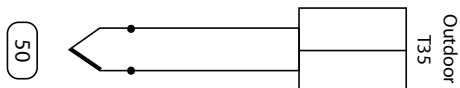


If the sensor cable is connected through a pipe, the pipe must be sealed so that the sensor is not affected by outgoing air.

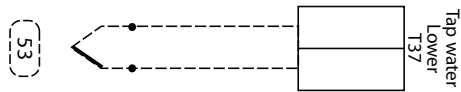


The outdoor sensor must be of PT1000 type.

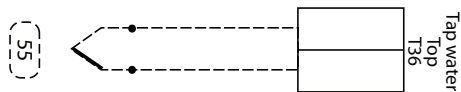
1. Position the outdoor sensor on the north or north west side of the house.
2. Connect the sensor to the heat pump's control system.



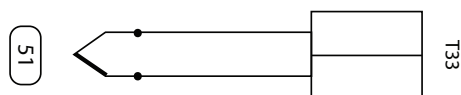
8.11.3 Connecting lower tap water sensor



8.11.4 Connecting top tap water sensor

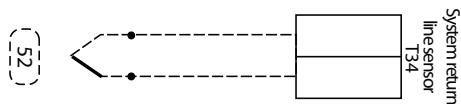


8.11.5 Connecting system supply line sensor



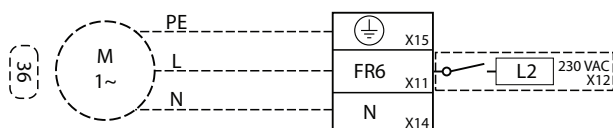
The system supply sensor must always be installed on the system's supply line after the auxiliary heating. The sensor must be positioned so that the hot water is mixed properly before passing the sensor.

8.11.6 Connecting system return line sensor



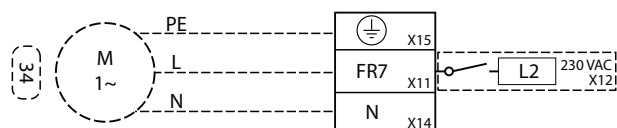
Depending on the design of the heating system it is possible to connect a system return line sensor as an accessory. This sensor is placed on the return line of the system before it goes back to the heat pump.

8.11.7 Connecting system pump

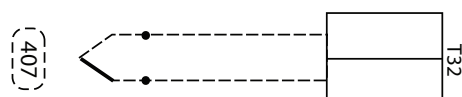


Start/stop of building's system pump 230 VAC.

8.11.8 Connecting hot gas pump with 230V supply

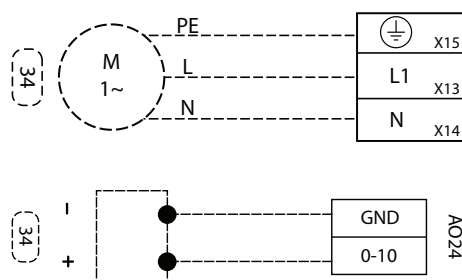


8.11.9 Connecting hot gas pump sensor

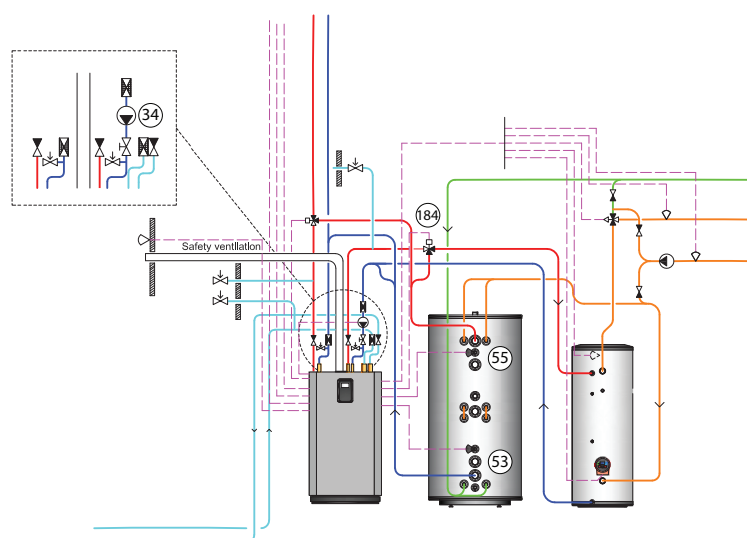


8.11.10 Connecting hot gas pump with 0-10V control signal

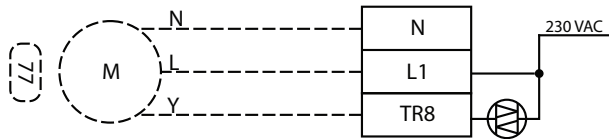
Note: You can only choose either one of the functions **Variable speed hot gas (34, 407)** or **Distribution circuit 1 (107, 108)**. So if you already installed **Distribution circuit 1**, **Variable speed hot gas** will not be an available connection.



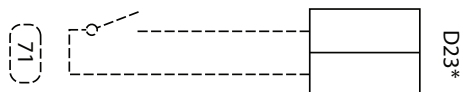
In order to get this function, **Hot water sensor top (55)** and **Hot water sensor lower (53)** needs to be installed, as seen in the system picture below.



8.11.11 Connecting reversing valve for tap water

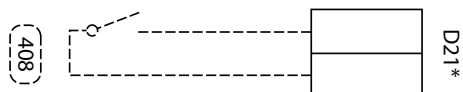


8.11.12 Connecting pressure sensor and/or flow sensor



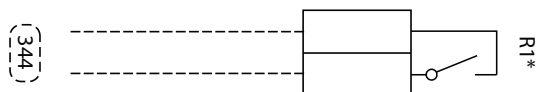
* See opening text in this chapter regarding "Dynamic allocation"

8.11.13 Connecting EVU



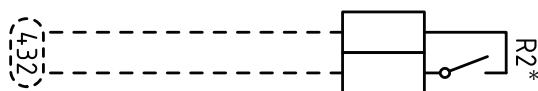
* See opening text in this chapter regarding "Dynamic allocation"

8.11.14 Connecting external sum alarm



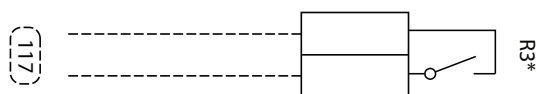
* See opening text in this chapter regarding "Dynamic allocation"

8.11.15 Connecting compressor in operation



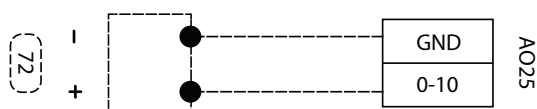
* See opening text in this chapter regarding "Dynamic allocation"

8.11.16 Connecting control signal (start/stop) for auxiliary heating



* See opening text in this chapter regarding "Dynamic allocation"

Connection 0-10V



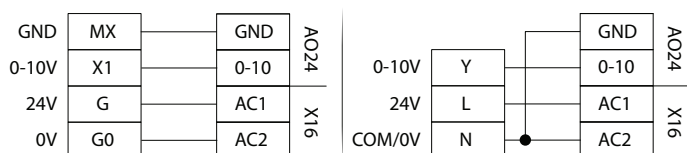
- **24V:** Connect control signal to input 0-10 and GND (AO25). Power supply is drawn from terminals AC1-AC2 (X16).
- **230V:** Power supply is drawn from terminals L1 (X13) and N (X14).

8.11.17 Connecting distribution circuit 1

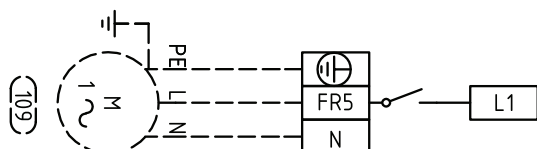
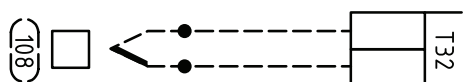
Note: You can only choose either one of the functions **Distribution circuit 1 (107, 108)** or **Variable speed hot gas (34, 407)**. So if you already installed **Variable speed hot gas**, **Distribution circuit 1** will not be available for connection.



Example 4-wire heat shunt and 3-wire heat shunt:

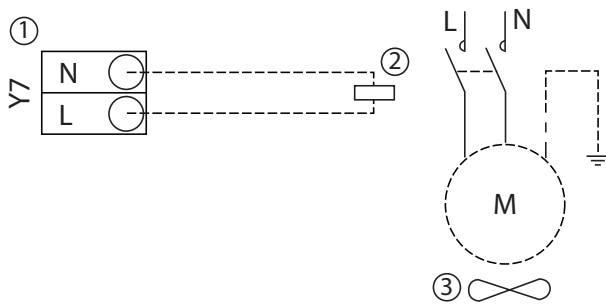


*When AC2 is connected to G0 then AC2 must be connected to G0 for all applications!



8.12 Connecting external fan to safety card

If the pressure drop is too large for the built-in fan, an external fan can be connected. It must be rated for a EX-classification environment.



1. Terminal, for 230V control circuit only!
2. Contactor
3. External safety fan.

8.13 Conversion table for sensors, PT-1000

When reading the resistance of the sensors, the sensor leads must first be disconnected from the control equipment. First measure the sensor and cable. Then measure the sensor only.

°C	ohms
-30	882
-20	921
-10	960
0	1000
10	1039
20	1078
30	1117
40	1155
50	1194
60	1232
70	1270
80	1309
90	1347
100	1385
110	1422
120	1460
130	1497

9 Installation protocol and customer information

After installation and test operation, the customer must be informed about their new heat pump installation. In the *User guide* there is a checklist regarding the information that the installer must give the customer.



The serial number must always be given for warranty matters.
Always make a note of the serial number in the installation protocol in the User Guide.

9.1 Installation protocol

Fill in the Installation protocol in the *User Guide*.

10 Service, maintenance, repair and decommissioning

10.1 Service, maintenance, repair and decommissioning

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

When troubleshooting make sure the cuff is tightly closed around the HGW pipe.

Initial safety checks shall include:

- That capacitors are discharged: This shall be done in a safe manner to avoid possibility of sparking.
- That no live electrical components and wiring are exposed while charging, recovering or purging the system.
- That there is continuity of earth bonding.

Warning



Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised.

Warning



Do not pierce or burn.

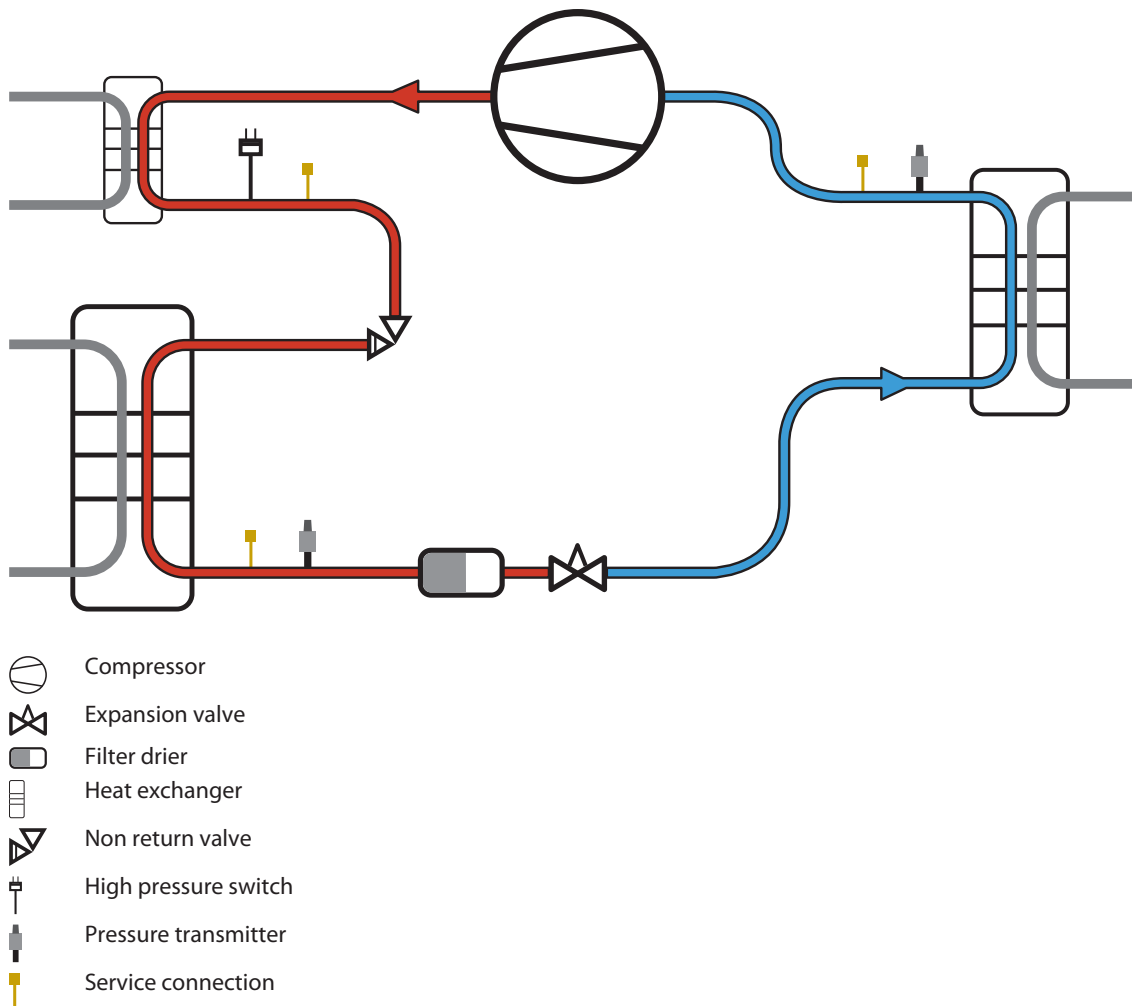
Warning



Be aware that refrigerants may not contain an odour.

10.1.1 Emptying the system

- When evacuating refrigerant and vacuuming, use the service outlet on the low pressure side and the high pressure outlet in the liquid line next to the dry filter as per normal procedure.
- But when filling use the service outlet between the hot gas exchanger and the condenser. This because the non return valve will block part of the high pressure side. When using the service outlet between the hot gas exchanger and the condenser the refrigerant will reach the entire high pressure side aiding the filling procedure.



10.1.2 For repair to the refrigerating system:

- Work shall be undertaken in accordance with the specified controlled procedure so as to minimise the risk of a flammable gas or vapour being present while the work is being performed.
- Instruct all maintenance staff and others working in the local on the nature of work being carried out. Work in confined spaces shall be avoided.
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.
- If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

- Ensure that no person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space.
- Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

10.1.3 Leak detection methods

Warning



Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

The following leak detection methods are deemed acceptable for all refrigerant systems:

- Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
- Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

If a leak is suspected, all naked flames shall be removed/extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice is followed since flammability is a consideration.

The following procedure shall be adhered to:

- Remove refrigerant;
- Open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders.

Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

- When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely. When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Decommissioning

Before carrying out decommissioning procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

- a) Become familiar with the equipment and its operation.
- b) Isolate system electrically
- c) Before attempting the procedure, ensure that:

- Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
- A personal protective equipment is available and being used correctly.
- The recovery process is supervised at all times by a competent person.
- Recovery equipment and cylinders conform to the appropriate standards.

- d) Pump down refrigerant system, if possible.
- e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- f) Make sure that cylinder is situated on the scales before recovery takes place.
- g) Start the recovery machine and operate in accordance with instructions.
- h) Do not overfill cylinders (no more than 80 % volume liquid charge).
- i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
- j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- k) Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.



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