GUIDELINE

Handling Brine/Water heat pumps with R290 refrigerant

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

Table of Contents

1 Important information

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1.1 Important information about refrigerants

Carriers, installers and service technicians need to understand the significance of refrigerants, refrigerating systems and heat pumps. This is crucial for ensuring safety, environmental responsibility and efficiency. Guidance from key industry standards is essential. These standards include, EN378, IEC 60335, ISO 5149, ISO 22712 and ISO 817.
Specifically the requirements on necessary information and instructions when doing installation, service or maintenance on units containing R290 (or any flammable refrigerant) are specified in the Annex DD in standard EN 60335-2-40.
Important! Prior to doing any installation, service or maintenance work on R290 heat pumps ensure that all necessary information and instructions and procedures.

1.2 Transportation and transit storage

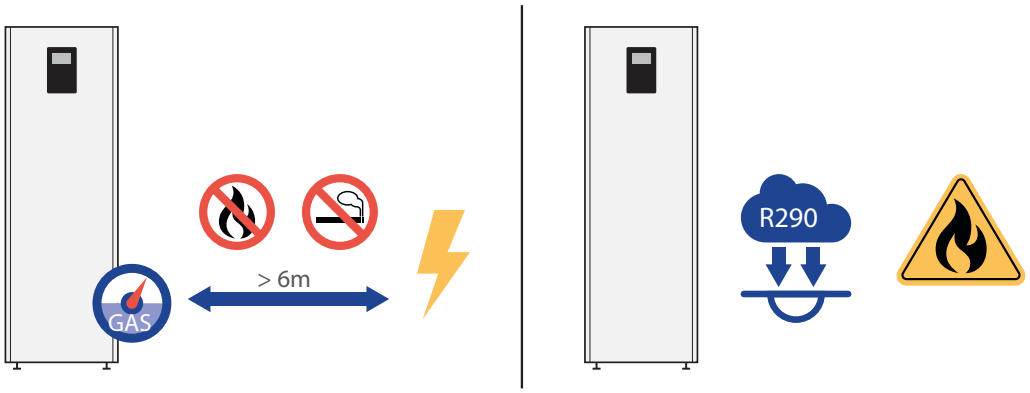
Transporting heat pumps, with a charge amount below 12kg, is exempt from the **ADR** (European Agreement concerning the International Carriage of Dangerous Goods by Road) regulations. Nevertheless, for safety considerations, the following requirements must be adhered to.

- Label packages - containing heat pumps with R290 refrigerant - with specification of new transport category UN 3358, hazard label 2.1, directional arrows, and full documentation compliance.
- Provide training for personnel involved in transporting dangerous goods.
- Ensure that a sufficiently sized powder extinguisher are readily available at all times during transportation and moving the unit.
- Prohibit smoking during transport.
- Avoid opening packages and store loaded transport units in safe locations.
- Transport heat pumps upright to prevent equipment damage during transit.
- Ensure adequate air supply during transportation to maintain safe conditions.
- Use undamaged adequate packaging for heat pump transportation.
- Ideally, store heat pumps above ground level with natural ventilation to the environment.
- Avoid potential ignition sources such as sparking and smoking.
- If damage occurs during transportation, the hazardous materials must be taken immediately to a secure outdoor area. There must be no ignition sources within a six-metre radius. The unit must be positioned in a location where the refrigerant can either disperse safely or be expertly evacuated and disposed of by a qualified service technician.
- If damage has been found on the product or packaging, and in case of suspicion of possible damage to the product, please remove the R290 refrigerant using the correct procedures before returning the heat pump.
- It is advisable to equip each transport unit with a portable gas detector, particularly when regularly transporting a large volume of heat pumps contain flammable refrigerants.

1.3 Storage

Safe storage of the brine/water heat pump with R290 refrigerant is essential to prevent accidents and ensure compliance with safety regulations. To reduce the potential risks associated with R290/propane cylinders, please follow the guidance below:

- Store in dedicated areas or cages, in dry, well-ventilated spaces away from fire risks.
- Limit access to authorised personnel only, with clear "No Smoking" and "No Naked Flames" signage.
- Store on the ground level, avoiding cellars or basements.
- Maintain easy access.
- Never store in residential premises.
- Keep upright during storage.
- Adhere to specified quantity limits for storage.
- Prevent static electricity build-up.



2 Safety protocols

2.1 Safety protocols

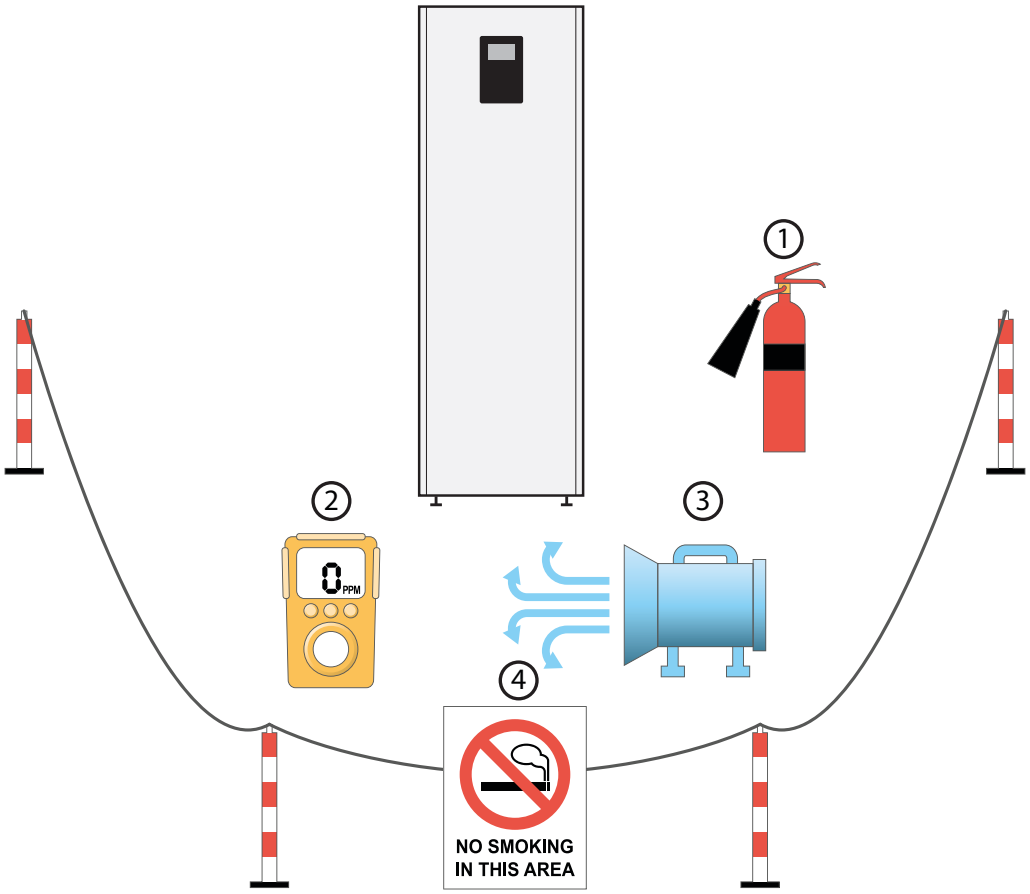
Installation, inspection, service and maintenance of a brine/water heat pump with R290 refrigerant requires strict adherence to safety protocols, to mitigate the potential hazards associated with flammable refrigerants like R290. These precautions are critical and align with safety guidelines and industry standards.

Safety considerations revolve around three fundamental preconditions that must not occur simultaneously:

- a refrigerant release,
- the presence of a flammable mixture of R290 and air,
- an active ignition source.

To prevent these occurrences, installers must follow specific safety measures and procedures.

Before working in temporary flammable zones, precautions include ensuring proper ventilation, not using a mobile phone, using non-sparking gas detectors, instructing staff, displaying no-smoking signs, and having appropriate tools and equipment.



1. Fire Extinguisher
2. Non-sparking gas detector
3. Ventilation
4. NO SMOKING IN THIS AREA

3 Recommended checks

Follow the below recommended checks ahead of installation, service or maintenance.

Service check prerequirements	Compliance Yes/No
Awareness Familiarize with the information provided by other sources, such as the system equipment manufacturers, component manufacturers, refrigerant suppliers, and Material Safety Datasheets (MSDSs). Ensure occupants become aware of manufacturer operating instructions, procedures, guidelines and safety issues regarding the equipment. Ensure awareness to evacuating the space following the accidental release of a flammable refrigerant.	
Safety distance Ensure safety distance to building openings with regards to the movement of refrigerant required. Refrigerating system sited in the open air must be positioned to avoid leaked refrigerant following into a building or otherwise endangering people and property.	
No ignition Sources Ensure no smoking in the area, including display of 'No Smoking' signs. Survey the area around the equipment before servicing to identify any potential flammability or ignition risks. Remove all sources of ignition. Be aware that a cell phone or similar electronic devices could be a source of ignition.	
Labels R290 is classified as a highly flammable category A3 gas and must be labelled accordingly.	
General Work Area Instruct anyone in the temporary flammable zones as to the nature of the work.	
Personal Protective Equipment Installers and service technicians should wear appropriate protective equipment, including chemical goggles, protective gloves, grounding probes, and anti-static bands.	
Free Air Movement Ensure that free air movement can be achieved around all parts of the system containing refrigerant. Depending on the size of the space, especially in a confined space, mechanical ventilation may need to be considered. The ventilation should displace any released refrigerant and preferably expel it externally.	
Avoidance of structural accumulation and collection R290 is heavier than air. Precautions should be made against refrigerant collecting in recesses and low points of the structure.	
Electrical Devices Perform an initial safety check of components to see if a fault exists that could compromise safety. Capacitors should be discharged with bleed resistors (minimum 2 Watt/ 10,000) or multimeters Do not work on 'live' electrical components. Maintain and enforce proper usage of ground equipment to prevent accidents and ensure safety.	
Certified Equipment Ensure to only use appropriate equipment certified for use in an R290 refrigerant context, i.e. Gas Leak Detectors and Monitors, Electrical Test meters, Portable Lighting, Non- sparking tool, etc.	
Work Space Guidelines - Good ventilation -Ensure readily access to a dry powder fire extinguisher	

4 Electrical repairs and replacement

4.1 Repair or replacement of electrical components

If electrical components are being changed, they must be fit for purpose and to the correct specification.

At all times follow Thermias recommendations, instructions and guidelines. If in doubt, consult Thermia's technical support department for further assistance.

4.2 Sealed electrical components

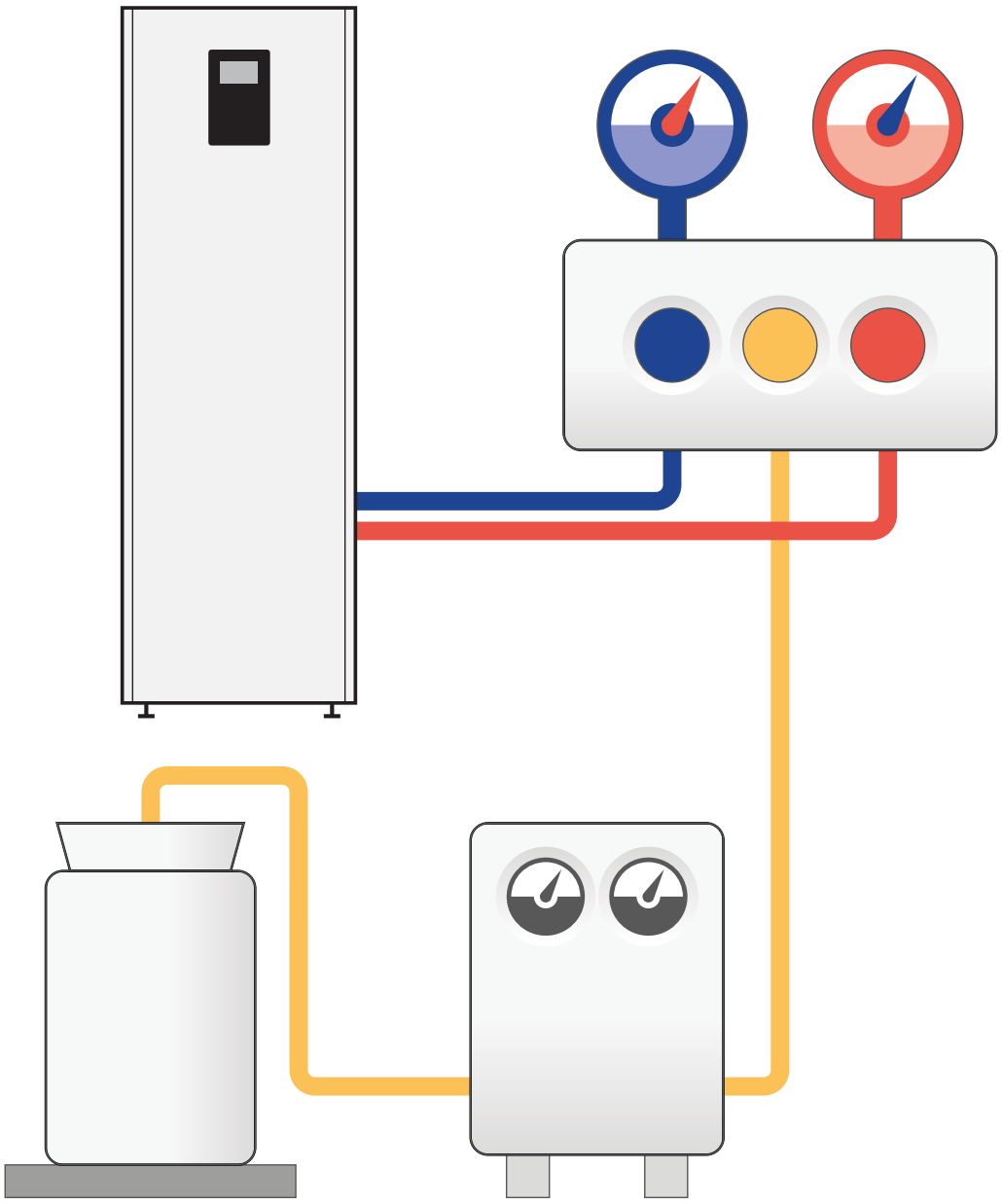
Important! Sealed electrical components that are found faulty are not to be repaired. Such sealed components must be replaced to ensure the overall safety of the unit and functionality of such components.

5 Refrigerant removal and recovery

5.1 Refrigerant removal and recovery procedure

Refrigerant removal and recovery involve the careful extraction of refrigerant gases from a refrigerant system, using specialized equipment, to ensure these gases are safely contained and recycled, preventing environmental harm and complying with regulatory standards.

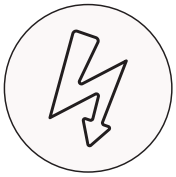
- Always use a refrigerant explicitly labelled as 'R290' and avoid using labelled ‘Propane’ alone.
- Owing to the minimal amount of the R290 charge, the precise weighing of the R290 introduced into the system is imperative to guarantee optimal performance.
- Prior to commencing work on electrical components, the corresponding power supply must be disconnected before opening any sealed parts.
- Always follow local and national regulations and conventional procedures when doing installation, service or maintenance tasks in the refrigeration circuit on heat pumps using R290 refrigerant.
- These comprehensive procedures ensure the safe and efficient installation, inspection, and maintenance of R290 systems.



6 Building and outdoor safety

6.1 Building and outdoor safety




Building safety, outdoor safety, and the involvement of the fire department are crucial when working with refrigeration systems using flammable refrigerants. Safety distances are essential to prevent refrigerant leaks from endangering people and property.

Safety zone distances are different for different heat pumps. Ensure to establish the correct designated safety zone for the applicable heat pump, please see instructions for the applicable product. The area around the outlet of the ventilation duct to the outside environment is classified as an EX Zone 2 environment.

- The designated safety zone must be free from any structural openings such as: windows, doors, light wells, sky-lights, and air inlets or outlets of ventilation systems.
- R290 refrigerant, being heavier and denser than air, tends to sink and accumulate at ground level. Therefore, there must be no recesses, deep ground openings, or excavations within the safety zone.
- The safety zone must not extend to intact buildings or public areas.
- The safety zone cannot be modified later to violate the protection rules.

Once established, the safety zone must not be altered in any way that contravenes established safety regulations.

Refrigerating equipment in the open air must be positioned to prevent refrigerant from flowing into building openings or ventilation systems. Sheltered equipment should have natural or forced ventilation to maintain safety.

7 Protection gear, Certification

When working with R290 refrigeration systems, protection equipment and certification (if nationally regulated) are of paramount importance.

For R290 the requirements for protective gear and equipment are in line with those for R32 refrigerant products.

Installers and service technicians should wear appropriate protective equipment, including chemical goggles, protective gloves, grounding probes, and anti-static bands to minimize risks associated with flammable refrigerants.

8 Decommissioning

8.1 Decommissioning

Always follow local and national regulations and conventional procedures that apply for decommissioning heat pumps using R290 refrigerant.

Prior decommissioning of a heat pump using R290 refrigerant, it is also essential that the technician is completely familiar with the equipment and all its details.

Decommissioning procedure include:

- Become familiar with the equipment and its operation.
- Isolate system electrically.
- Ensuring availability and correct usage of: - mechanical handling equipment - appropriate refrigerant recovery cylinders - all necessary personal protective equipment.
- Removal and recovery of refrigerant and oil.
- Scrapping and recycling.

8.2 Refrigerant recovery, scrapping and recycling

Product scrapping and recycling at the end of a system's life is a crucial phase that applies to refrigeration systems irrespective of the refrigerant used.

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.

Standard procedures include:

- Removal of refrigerant.
- Removal of oil.
- Dismantling the refrigeration system and related equipment.
- Appropriate labeling of the scrapped unit as well of refrigerant recycling cylinders etc
- Transporting refrigerant, oil, and hardware to designated collection stations.
- Transporting system construction materials (metals, plastics, etc.) to appropriate recycling centers.

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BWR290GL0102