Addendum to Manuals for units with refrigerant, for conformity to the Pressure Equipment Directive (PED) 97/23/EC or 2014/68/EU and Machinery Directive 2006/42/EC

This manual covers equipment manufactured by Trane or for Trane by the following manufacturer:
Société Trane, 1 rue des Amériques 88190, Golbey FRANCE

Refrigerant	Global Warming Potential
R-134a	1430
R-407C	1774
R-410A	2088
R-404A	3922
R-513A	631
R-1234ze	7
R-1233zd	4.5

This equipment contains fluorinated greenhouse gases.

The type and quantity of refrigerant per circuit and the global warming potential of the refrigerants implemented in Trane air conditioning and refrigeration equipment are indicated on the nameplate of each product in accordance with EU Regulation 517/2014/EU (F-gas Regulation).

The operator (contractor or end user) must check local environmental regulations impacting installation, operation and disposal of the equipment; in particular need to recover environmentally harmful substances (refrigerant, oil, antifreeze agents, etc.).

Do not vent into the atmosphere any refrigerant. The handling of refrigerant shall be fulfilled by a qualified service engineer.

This document applies to all TRANE brand refrigeration units relating to, amongst other items:

- compliance with requirements of the Pressure Equipment Directive 97/23/EC or 2014/68/EU,
- the Machinery Directive 2006/42/EC, and their transcription into national law.

Users must also refer to national or local regulations relating to the installation, use and periodic checking of such equipment.

1. Responsibilities

1.1. Design/manufacture

TRANE is responsible in its capacity as manufacturer, for the equipment produced under the TRANE brand and for conformity assessment procedures, according to applicable regulations and the risk categories set out by these regulations.

For the Pressure Equipment Directive, TRANE shall also assess the entire machine as a whole.

1.2. Operation/Repair

The owner of the refrigeration unit is responsible for applying national regulations relating to installation, commissioning, operation of pressure equipment and assemblies and for the periodic checks which are governed by national or local regulations applicable for the site of the installation. In addition, the owner is responsible for keeping the regulatory documents which he has been given in a safe place and, should the case arise, for updating the monitoring file and any other administrative formalities (declarations, periodic inspections, requalification).

The final user is responsible for carrying out any maintenance, monitoring and repairs required to ensure the equipment continues to operate safely. If the operator has the requisite skills to do so, he must carry out the necessary operations to ensure the equipment operates safely, or if he does not, he must arrange for a skilled technician to carry out these operations. He must decommission the equipment if the safety of the equipment is impaired.

The final user must have the necessary personnel to operate, monitor and carry out maintenance on pressure equipment. He must provide said personnel with all the necessary documents for the performance of these tasks.

2. Residual risks

Refrigeration units carry the following risks to which the user must pay particular attention and the user must wear Personal Protective Equipment which is suitable for all operations:

- Risk of hot or cold surfaces: compressors, all connecting pipes, tank and oil separator
- Risk of cuts: heat exchanger fins, sharp edges on parts and metal panels
- Risk of moving parts: fans, motors, belt-driven transmissions,
- Electrical risks: any cabinet or component fitted with a visible electrical power cable.
- Risk of pressurised fluids: the refrigeration circuit containing refrigerant and sometimes a pressurised lubricant. Any fluid(s) must be collected before opening the circuit or when disassembling a component according to current regulations.
- Risk of asphyxiation: an accidental rejection of refrigerant in a closed area may cause a lack of oxygen. The machinery should be installed in a well ventilated room (see EN 378-3).
- Risk of scald: Do not block any refrigerant leak with the finger or other body parts. If contact with skin, wash with water and soap. In case of refrigerant projection in the eye, immediately rinse thoroughly with water and visit a doctor.

3. Caution for installation and use

The refrigerant systems manufactured by Société Trane SAS are equipment intended to be used by professionals.

The final user is responsible for their equipment for which the installation, use and maintenance conditions are subject to national labour codes, rules of use in national services and European directives, such as, for example

- 89/391/EEC regarding the health and safety of workers at work

- 2009/104/EC concerning the minimum safety and health requirements for the use of work equipment

- 89/654/EEC concerning the minimum safety and health requirements for the workplace

- 842/2006 on certain fluorinated greenhouse gases (F-gas)

These regulations define the requirements in terms of risk analysis, risk evaluation, staff training and protection, periodic reviews and re-qualification.

- Follow the directives provided in the Trane documentation to carry out the installation and fitting.
  No part of the machinery should be used as a step, rack, support or lifting device, except those intended for this purpose.
- Do not climb onto the unit. Use a suitable platform or step-ladder.
- The piping shall not transfer any axial or radial load, nor vibration to the pressure vessels.
- At the fi rst start, the end user has to open a logbook for the record of the service and maintenance operations.
- The insulating materials used by TRANE are chemically neutral so as not to react with piping and container materials.
- Nevertheless, it is recommended to check the condition of the insulating materials from time to time.

4. Precautions on exposure to refrigerants.

The main risk posed by the refrigerants mentioned in this document is the risk of asphyxiation. In the event of a major leak, therefore, it is vitally important to ensure an oxygen level of at least 19% in the breathing air of personnel.

All refrigerants are heavier than air (M=29). This means that there is a risk of them accumulating in the low-level parts of installations.

The refrigerants used by TRANE may have Occupational Exposure Limits stipulated by national regulations.

In the absence of such regulations, reference should be made to the safety data sheets in accordance with Annex II of the REACH Regulation 1907/2006/EC.

Before undertaking any hot work (grinding, welding, brazing, etc.), operators must on the one hand ensure compliance with the regulations (hot work permit) and on the other hand ensure that no refrigerants are present in the vicinity of the work (empty circuit to avoid sudden rise in pressure). Care must also be taken to avoid the risk of thermal decomposition of the refrigerant.

In order to avoid any escape of refrigerant into the building via the fresh air intake vents, account must be taken of the position of the machines installed on the building's exterior with respect to these fresh air intakes and the direction of the prevailing winds.

Additional precaution for R-1234ze

The water condensation machines must be installed in a machinery room within the meaning of the EN 378-3 Standard.

Even if it is not required by the F-Gas regulation, Trane nevertheless recommends that the R-1234ze be retrieved, that leak search tests be practised regularly and in combination with the services of an HFC-certified service company.

The air condensation machines must be placed so that no R-1234ze leak can enter into the building via the air vent ducts, doors or any other opening.

If the machinery room contains combustion equipment or air compressors in other Trane equipment, the air supplying the first equipment must be taken outside the machinery room so as to prevent the R-1234ze from penetrating the air intake.

The machine must not be near any equipment whose surface temperature exceeds 294°C.

The machinery room must have sufficient air exchange, in conformity with the national regulations. If the machinery room is occupied temporarily, the default of 2 air exchanges per hour is sufficient.

In an emergency, the air flow from the ventilation must be

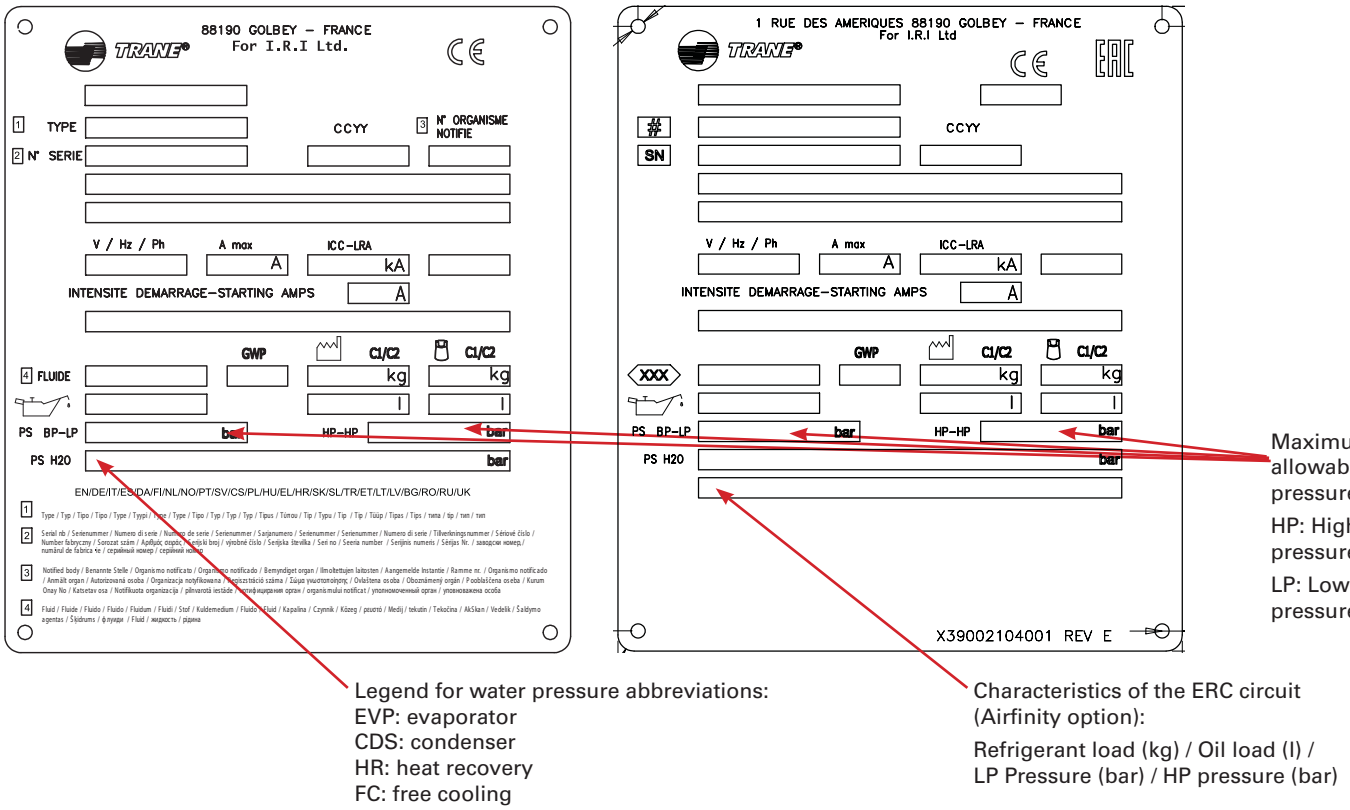
$Q=0.014xm^3/s$

with

Q is the air flow in m^3/s

And m is the mass of R-1234ze contained in the largest refrigeration circuit.

Fig 1: Trane manufacturer plates



R-1234ze is potentially fl ammable above 30°C and within a concentration range of between 5.7% (V/V) and 11.3% (V/V) but with a minimum energy requirement of 61 J. It is recommended to avoid any hot work and the presence of a naked fl ame in direct proximity to units and when handling refrigerants.

For GVAF and GVWF centrifugal machines, it is imperative to use hoses and refrigerant transfer equipment specifically designed for the refrigerant in question to avoid any contamination of the refrigerant circuits.

5. Pressure Equipment included in refrigeration systems

The pressure equipment shall be used for their intended working conditions mentioned on the product nameplate. The additional loads due to wind, snow, ice, earthquake have not been considered.

The refrigerants used by TRANE are classed in group 2 for the PED (non-corrosive, non-toxic, non-inflammable).

Note: if changing the refrigerant, the operator must ensure that:

- the new refrigerant is classed in the same group
- the pressure does not exceed the maximum allowable pressure indicated on the various components.
- the new refrigerant does not cause any compatibility issues with the equipment fitted to the machine.
- If you require further information, please contact your local Trane sales office.

The water side of the heat exchangers is designed for category 2 fluids. This includes solutions containing antifreeze such as for example:

Ethylene glycol – CAS number 107-21-1 classification Acute Tox. 4 H302 according to regulation 1272/2008/EC.

Propylene glycol - CAS number 57-55-6 – not classified under Acute Tox. 4 H302 and according to regulation 1272/2008/EC.

When solutions containing antifreeze are used, periodic checks of the following as a minimum:

- the concentration
- the presence of corrosion inhibitors must be carried out:
- within the first two months of charging
- then at appropriate intervals according to the manufacturer's recommendations for these products.

5.1. Protecting the system against exceeding of permissible limits

The admissible limits for TRANE refrigeration machines are indicated on the product nameplate.

Type of machine	Refrigerant	LP PS (bar)	HP PS (bar)	LP TS (°C)	HP TS (°C)
RTAC	R-134a	14	25	56	87
RTAF	R-134a/R-513A/R-1234ze	14	25	67	93
RTAD	R-134a	16	25	67	81
RTHD	R-134a	14	16	56	81
CGAN-CXAN-CGCL	R-407C	20	29.5	52	93.5
	R-134a	20	29.5	70	95
CGWH-CCUH-CGWN-CCUN	R-407C	20	29.5	52	93.5
	R-134a	20	29.5	70	93.5
CGA-CXA-VGA-VXA-TTA-TWA	R-407C	21	30	54	94
RTWD	R-134a/R-1234ze	14	21	67	85
RTUD	R-134a	14	25	56	81
TKD-TKH-YKD-YKH-WKD-WKH	R-407C	14	25	67	81
TKD-TKH-YKD-YKH-WKD-WKH-DKD-DKH	R-410A	29	44.5	49	93.5
CGAM-CXAM	R-410A	31.1	44.5	52	93.5
CGAX-CXAX	R-410A	31.1	44.5	52	93.5
CGWN-CCUN	R-410A	29	44.5	49	93.5
TSD-TSH-WSD-WSH-YSD-YSH	R-410A	29	44.8	49	93.5
CVGF	R-134a	15.18	15.18	63	63
CVHH/CDHH	R-1233zd	3.1	3.1	58	58
RTAE	R-134a	13.7	24	55	85
GVAF/GVWF/GVSF	R-1234ze	13	13	64	64
	R-134a	13	18.8	54	71
IC-IH # 038-039-040-050-060-065-075-085 # 048-049-058-059-063-064-100-110-130	 R-410A R-410A	 28 29.5	 43 44.5	 58 52	 93 93.5
RTWF/RTSF	R-134a/R-513A R-1234ze	14 14	25 25	56 67	81 87
RTHF	R-134a/R-513A R-1234ze	14 14	16 16	56 67	81 73
CGAF-CXAF	R-410A	30.2	44.5	51	93.5

The protection against exceeding the allowable limits and the choice of safety devices result from an analysis of the dangers and the application of standards EN 378-1 and EN378-2 last version.

The relations between the different protective devices are taken from the annex D of EN14276-1.

For heat exchangers with a water circuit, the maximum water temperature is the following:

		Evaporator		Condenser	
Compressor type	Refrigerant	PS (bar)	TS max water (°C)	PS (bar)	TS max water (°C)
Screw	R-134a/R-513A	14	56	16	61
		16	61	21	72
				25	80
	R-1234ze	14	67	16	73
		16	73	21	85
				25	93
Scroll	R-407C	20	52	29.5	68
		21	54		
	R-410A	29	49	44.5	68
		31.1	52		
Centrifugal	R-1234ze	13	64	13	64
	R-134a	13	52.5	18.8	67

If there is a risk of chilled water returning to Trane equipment exceeding the above value, a protective device must be fitted by the customer.

Protection for TRANE machinery manufactured in Europe:

Protection against exceeding of allowable limits is provided according to the requirements of EN 378-2:

- The independent circuit pressure generator or generators (screw or scroll compressor(s)) are protected by a manual or automatic reset pressure switch.
- For equipment fitted with screw or centrifugal compressor(s), the circuit is protected by one or more safety valves.
- For equipment fitted with scroll-type compressor(s), no safety valve is required for standard equipment.
- For GVAF systems equipped with a centrifugal compressor, a pressure limiting device is not required.

Note: details of the protective devices is given in the Declaration of Conformity of the assembly.

RTUD, CCUN, CCUH and RAUL

For «split» units: the fitter is responsible for fitting a safety valve if at least one of the following conditions is met:

- the pressure generator is a screw compressor (RTUD);
- one of the pressure equipment to be connected has a maximum allowable pressure (PS) up to the value indicated on the product nameplate;
- the refrigerant charge can be isolated in one or more pressure equipment by a valve that can be operated without any tool by a non-authorized person as defined in EN 378-2.

If the site added equipment have a PS lower than the PS stated on the TRANE product nameplate, it is recommended to add a second pressure switch in series with the TRANE high pressure switch.

The second pressure switch shall have the following characteristics:

- Setting below the TRANE safety pressure switch
- Setting below any additional safety accessories added on site (refer to annex D of the EN14276-1)
- Modification of the control module setting parameter (refer to appropriate TRANE document or contact your local Trane sales office)

In any case, all modifications of the TRANE equipment shall be documented and appropriate documentation (Declaration of conformity, justification, etc.) shall be added to the equipment documentation file.

The safety valves must be selected by the fitter according to

- his assessment of any dangerous phenomena
- the various components used
- any specific requirements relating to the site.

If there will be a supply of heat close to the machine, the customer must protect the machine in accordance with current local Building and Fire Safety Regulations.

All pressure safety devices are supplied factory-set by the manufacturer. The safety valves are sealed to prevent the valve rating from being modified. The pressure setting is indicated on the body of the valve or on a label on the valve. If the sealing is damaged, the safety valve must be replaced immediately.

External fire (PED annex 1, point 2.12):

In the event of an external fire, no additional protective device is provided to be used on the units for damage limitation. If the unit has undergone a fire, a thorough assessment should be conducted on it before using it again.

Under no circumstances must the settings of the safety devices exceed the values for the maximum allowable pressure indicated on the product nameplate.

To find out

- the type and number of safety devices fitted to the equipment : see the declaration of conformity for the unit or any other document for split type systems.
- the safety device specifications: contact your nearest TRANE service team.

Fitting the valves

Case 1

The safety valves are fitted to the line or on a pressure vessel. The replacement of the safety valve should only be carried out:

- When the machine is switched off
- When the refrigerant charge is removed (in the refrigerating part protected by the safety valve)
- By a skilled engineer and always under his direct supervision.

Case 2

The safety valves are factory-fitted on a changeover device which is fitted with a safety valve on each of the two outlets. Ensure that the changeover switch is never in the intermediate position, i.e. with two crossovers (move the operating device to its end stop). If a safety valve is removed to be checked or replaced, ensure that there is always an active safety valve on each of the changeover switches fitted to the unit.

When rupture discs are fitted, they are always fitted before the safety valve. To ensure that the disc is always leaktight, check the pressure between the disc and the safety valve using a pressure gauge. If the pressure equals that of the device to be protected, replace the rupture disc.

IMPORTANT: when fitting the equipment, take into account the risk of opening the safety valves in terms of personal safety or nearby air extraction systems.

Do not block or switch up the safety devices. Do not install the safety valves in series or conversely.

In some cases, it may be necessary to connect the safety valve outlet to a drain line. Under no circumstances should the loss of pressure in this line exceed the value stated in the standard EN 13136, "Refrigerating systems and heat pumps — Pressure relief devices and their associated piping — Methods for calculation" or the value given by the valve manufacturer.

When isolation valves are installed between HP and LP sides in the refrigerating system, it should be only used by a skilled engineer with a specific tool. If not, the valve shall be blocked in opened position before starting the refrigerating system.

5.2 Checks and Inspections

National and local regulations may define the checks and inspections to be carried out on the equipment installed. The contents, the qualification of operators and the frequency of these operations differ for each regulation.

All checks and inspections have to be recorded in the unit logbook.

However, Trane recommends the following are checked on at least an annual basis:

- That the pressure equipment matches the types and models stated on the declaration of conformity;
- That the settings are suited for the maximum allowable conditions;
- That the pressure switch is operating correctly (manual test lever);
- By means of a visual inspection of the valve, check:
  - That the seal is leaktight;
  - That the safety valve operates correctly, providing adequate protection for the equipment to which it is fitted;
  - That the valve outlet is not blocked (by dust, objects, etc.).
  - That there is no external oxidation,
  - That there is no damage,
  - That the seal is intact
- By means of a general visual inspection of the condition of the various pieces of pressure equipment check:
  - that there is no corrosion on the metal parts (chassis, casing, boxes, refrigerant lines, etc.)
  - that there is no frost or humidity, particularly under the insulating materials
  - regular and follow-up applications of anticorrosion product for use in water
  - that there are no vibrations or unusual noises
  - all other parameters which establish that the installation is in a good condition

6. Repairing machines and replacing the safety devices

Any repairs or changes to be made to pressure equipment, including safety devices, must be carried out in accordance with national regulations covering such equipment and parts.

Note: any repair or operation on a refrigeration unit which may generate heat (brazing, welding etc.) must be carried out with the machine empty of refrigerant and under an inert atmosphere when there is a risk of oxidation. Take particular care not to introduce any oxygen into the machine: there is a risk of it exploding with the oils and lubricants

A safety device must only be replaced by a safety device of the same type, having at least equivalent specifications. Otherwise, a sizing report must be attached to the follow-up document.

The "CE" or EU declaration of conformity for the new device must be attached to the follow-up document.

Depending on the application and the operator's experience of safety devices; TRANE recommends that the safety valves are replaced in the following cases:

- the points checked during the periodic check above are not observed;
- the valve has already been operated;
- the seal is no longer leaktight;
- if the requirements of national regulations in force in the country in which the equipment is installed are no longer observed;
- for territories covered by French regulations: in the 6 months preceding periodic requalification (as set out in Article 26 of the amended Ministerial Decree of 15 March 2000 and related circular BSEI 06-080 of 6 March 2006 article 26b) for equipment with a pressure volume product above 3000 bar.litre.

With the exception of the periodic requalifications required by national regulations, pressure equipment must never exceed the maximum value indicated on the product nameplate.

The quality of fluid used in the machine must meet the commercial specifications for refrigerants as defined in standards such as ARI 700 and NF E 29-785.

Some precautions have to be taken in changing the refrigerant type:

- The refrigerant shall have been approved by Trane and the compatibility with the material used in the refrigerant system (oil, copper, gasket,…) has to be checked
- The saturated pressure at the maximum working temperature shall not exceed the maximum working pressure indicated on the product nameplate;
- The maximum working pressure shall not change the risk category of the pressure equipment included and the assembly;
- The parameters set in the module of regulation have to be checked for the new refrigerant.
- An approval for use from the manufacturer has to be included in the unit logbook

Any leak detected during periodic checks or inspections has to be repaired.

TRANE recommends performing periodic oil analyses to ensure that there is no acidification or usual water content which could lead to corrosion in the refrigeration circuit.

Should the installations be stopped for a prolonged period of time, the user will take all the necessary preservation measures for maintaining the pressurised equipment in good condition and will ensure to carry out the corresponding monitoring operations. In particular, the user will perform periodic inspections to ensure that the shut-off valves are not leaking.

7. Machine documentation

All the regulatory documentation supplied when the equipment was commissioned must be kept in a safe place by subsequent owners of the equipment. This documentation includes:

- the "CE" or EU declaration(s) of conformity provided by the manufacturers,
- the TRANE instruction manual(s),
- a record of all changes made to the machine during its service life.

The safety valve is manufactured, set and sealed by the manufacturer according to a module of evaluation of the PED. The EC declaration of conformity delivered is also the setting certificate.

Refer to local or national regulations for details of how long records of inspection and regulatory checks should be held on file.

If no period is specified, TRANE recommends holding records on file for the duration of the service life of the machine or equipment.

8. Contents of the EC declaration of conformity for Machinery directive (article 1.7.4.2 c)

The EC declaration of conformity or declaration of incorporation is issued as a separate document which contains the following:

- name and address of manufacturer
- name and address of the person authorized to compile the technical file
- reference of equipment (type, model) and for some of them serial number
- List of all applicable EU directives which request the CE marking
- List of harmonized standard and other technical document
- Date, location, name and function of signatory

For quasi-machines ('Split'), the declaration specifies:

- that the essential safety requirements from the Machinery directive be applied and fulfilled
- that the manufacturer undertakes to transmit the relevant information, upon the national authorities' reasoned request
- that this quasi-machine cannot be implemented before the unit into which it is incorporated has undergone an evaluation procedure

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