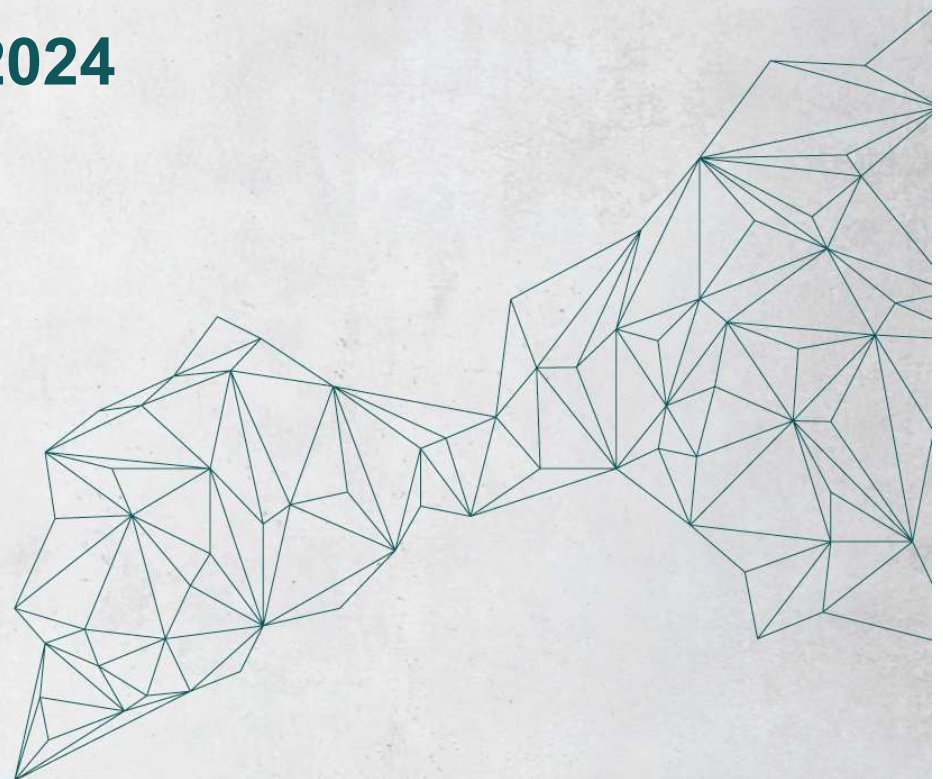


Hall 4A

CHILLVENTA

Chillventa Specialist Forums 2024
Chillventa Fachforen 2024

**CONNECTING
EXPERTS.**



Guidelines R290

Heat Pumps installation

Overview of R290 characteristics
and risk assessment for heat pumps
and installation sites



enerblue

INSPIRED BY NATURE



SUMMARY



01

ENERBLUE – STORY AND
R290 EXPERIENCE



02

EN378 AND SAFETY



03

SAFETY FOR THE UNITS



04

SAFETY FOR THE
INSTALLATION AREA





01 ENERBLUE – STORY AND R290 EXPERIENCE

01

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1.0.0

Guidelines R290
Heat Pumps installation

01

ENERBLUE – STORY AND R290 EXPERIENCE



2012 – first CO2 heat pump

2013 – first R290 chiller (prototype)

2014 → partners in the Nordics
↘ first R290 chiller sold

2014 >> 2024 10 years forward >>



1.0.1

Guidelines R290
Heat Pumps installation

01

ENERBLUE –
STORY AND R290
EXPERIENCE



Celebrating



09/10 – 3:30 p.m. our booth 4-348



Guidelines R290
Heat Pumps installation

02 EN378 AND SAFETY

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01

ENERBLUE – STORY AND
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2.0.0

Guidelines R290
Heat Pumps installation

02

EN378 AND SAFETY

Let's start from R290...

ACCORDING TO EN378	R290
Chemical Name	Propane
Molecular Formula	C_3H_8
Safety Class	A3
PED fluid group	1
Molecular Mass	44,0 g/mol
ODP	0
GWP [100 years ITH]	3
Autoignition temperature	470 °C
Critical Temperature	96,74 °C
Critical Pressure	4.251 kPa

FLAMMABLE

AIR = 29 g/mol



2.0.1

Guidelines R290
Heat Pumps installation

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02 EN378 AND SAFETY

UNI EN 378

EN 378-1:2021-06
BASIC
REQUIREMENTS,
DEFINITIONS,
CLASSIFICATION
AND SELECTION
CRITERIA



378



EN 378-2:2018-04
DESIGN,
CONSTRUCTION,
TESTING, MARKING
AND
DOCUMENTATION



EN 378-4:2017-03
OPERATION,
MAINTENANCE,
REPAIR AND
RECOVERY



EN 378-3:2020-12
INSTALLATION SITE
AND PERSONAL
PROTECTION



2.0.2

Guidelines R290
Heat Pumps installation

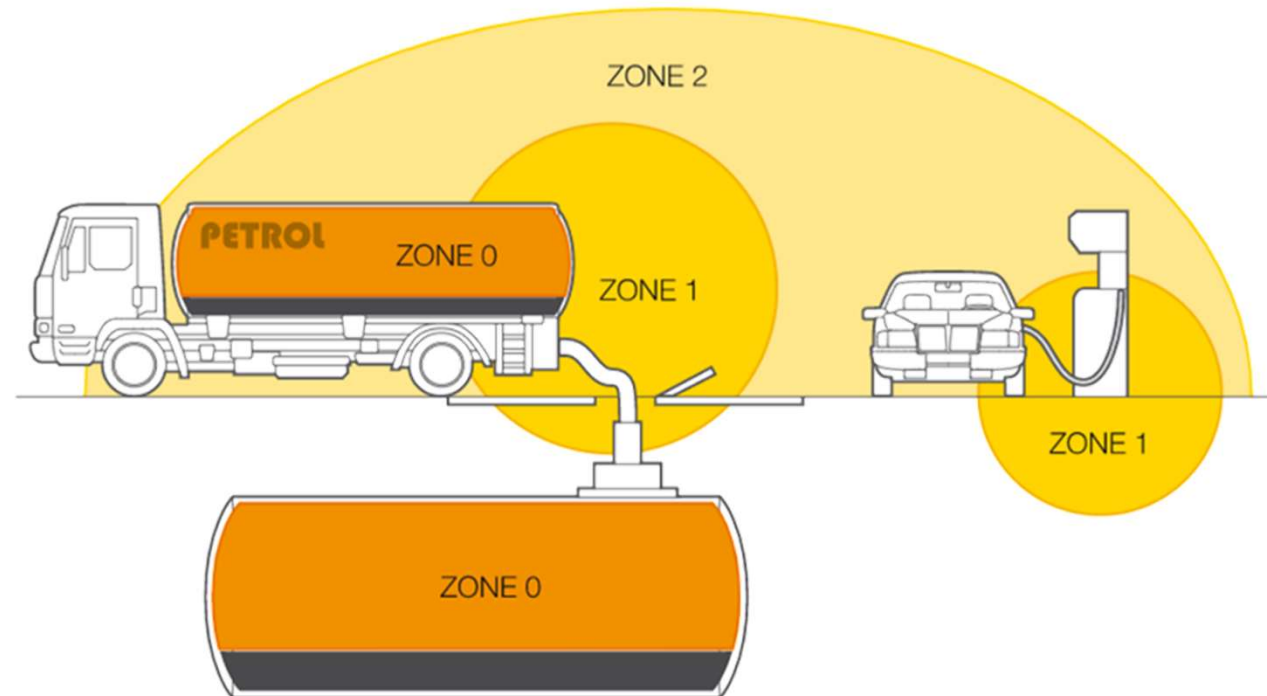
02

EN378 AND SAFETY

- **ZONE 0**
explosive gas atmosphere is present **continuously** or for **long periods** or frequently
- **ZONE 1**
explosive gas atmosphere is **likely** to occur in **normal operation occasionally**
- **ZONE 2**
explosive gas atmosphere is **not likely** to occur in normal operation but, if it does occur, will persist for a **short period only**

DEFINITION OF ATEX

ATEX zoning example:





03 SAFETY FOR THE UNITS



01

ENERBLUE – STORY AND
R290 EXPERIENCE



02

EN378 AND SAFETY



03

SAFETY FOR THE UNITS



04

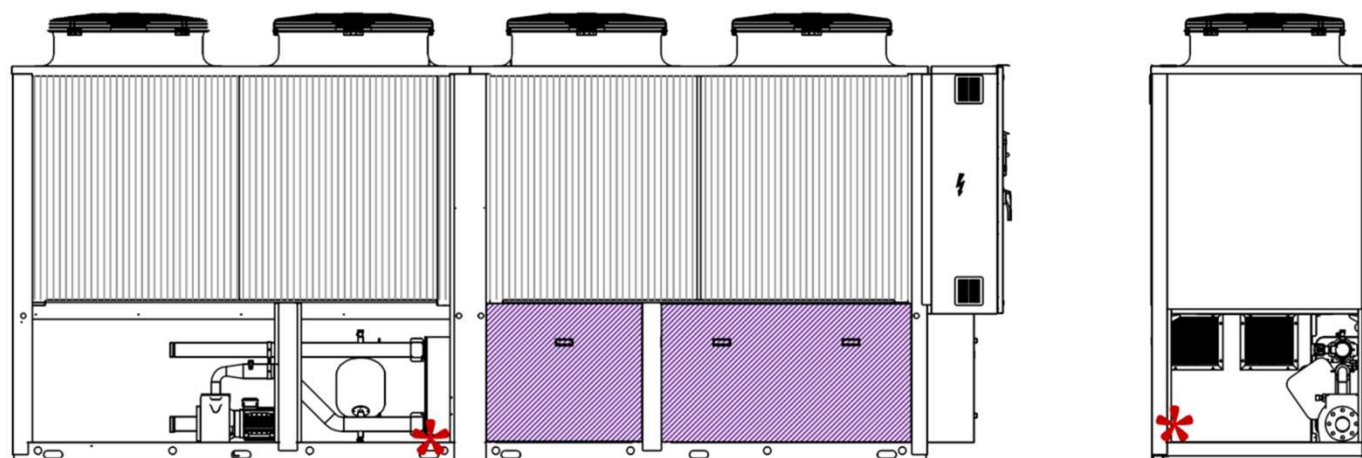
SAFETY FOR THE
INSTALLATION AREA



03 SAFETY FOR THE UNITS

SAFETY THEORETICAL APPROACH

Controlled leakage / Uncontrolled leakage



compressor housing internal zone-2

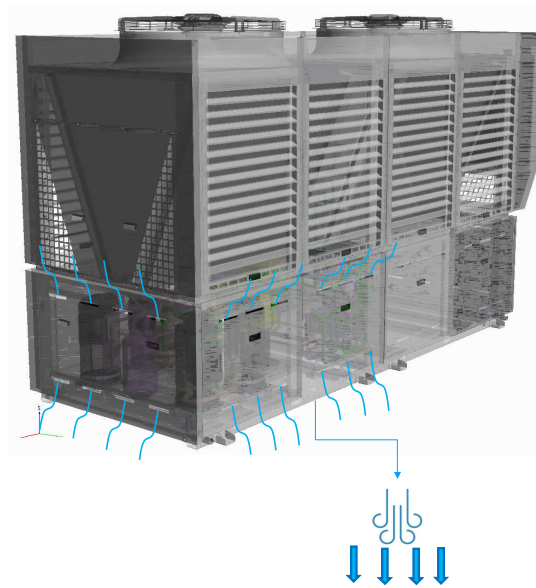
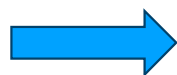
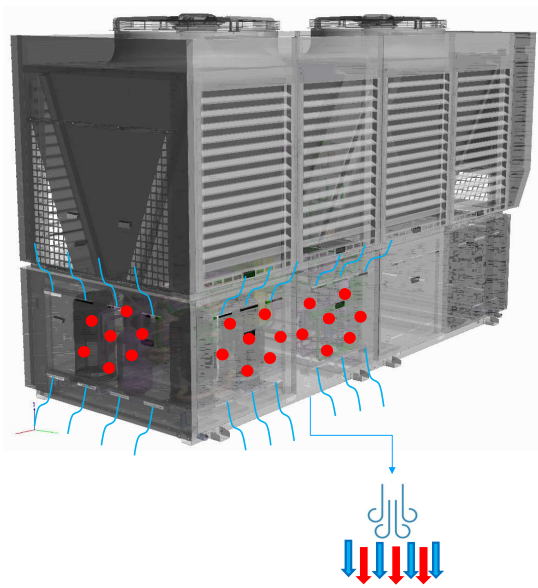
*** Location of PRV vent**

03 SAFETY FOR THE UNITS

SAFETY EXPERIMENTAL APPROACH

LEAKAGE IN THE COMPRESSORS BOX

We introduced R290 (1gr/s and 3gr/s) with different directions inside the compressors box.





03 SAFETY FOR THE UNITS



FORCED VENTILATION SYSTEM

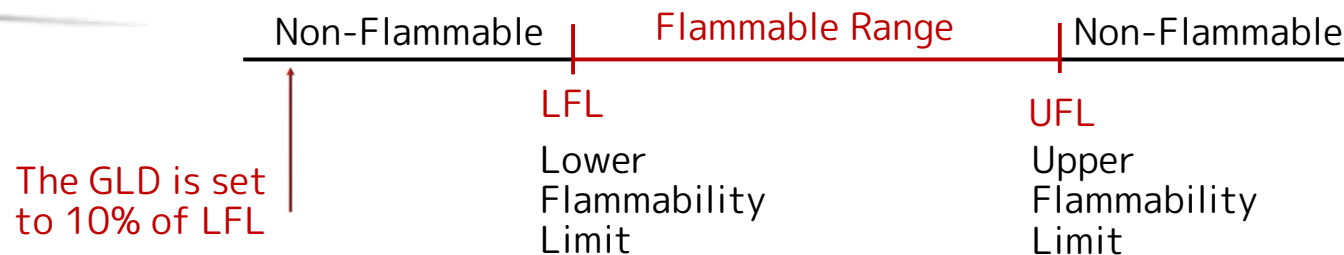
ATEX EXTRACTION FAN

- Compressors are closed in a box equipped with ATEX certified extraction fan;
- Fan running at low speed during normal function;
- Maximum fan speed in case of leakage signalization

LEAKAGE DETECTOR

- Gas presence sensor able to reveal a Propane gas presence in the air with a sensibility of 10% necessary explosion quantity (LFL).
- In case of leakage, the power supply of the complete unit will be switched off except for the sensor and the extraction fan.

Flammability Limits





04 SAFETY FOR THE INSTALLATION AREA



01

ENERBLUE – STORY AND
R290 EXPERIENCE



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SAFETY FOR THE UNITS



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SAFETY FOR THE
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4.0.0

Guidelines R290
Heat Pumps installation

04

SAFETY FOR THE INSTALLATION AREA

It must be ensured that in the category 2 zone:

- There are no sparks or sources of ignition;
- No drains, floor drainage etc.
- No pedestrian zone;
- No access for people without appropriate authorization/qualification

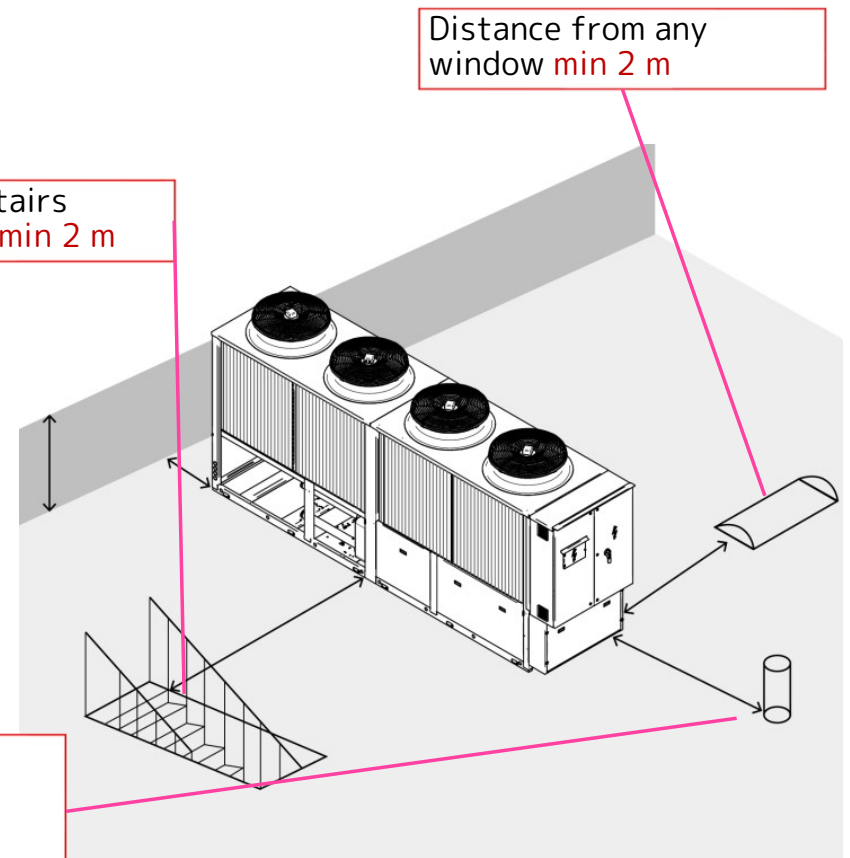
INSTALLATION SUGGESTIONS

ATEX ZONE 2 - SAFETY DISTANCES

Distance from stairs
(→ Downstairs) **min 2 m**

Distance from any
window **min 2 m**

Distance from air
discharge pipe or any
kind of drain
min 2 m





4.0.1

Guidelines R290
Heat Pumps installation

04

SAFETY FOR THE INSTALLATION AREA



INSTALLATION SITE

UNIT TYPE	REFRIGERANT CHARGE	UNIT POSITIONING	LEAK DETECTOR?	EXTRACTION FAN MANAGEMENT
STEEL	Refrigerant charge per circuit always lower than 5kg	OCCUPIED SPACE	NO	Fan always running
	Refrigerant charge per circuit lower than 5kg	OCCUPIED SPACE	YES	Fan running only in case of alarm from gas detector
IRON	Refrigerant charge per circuit higher than 5kg	MACHINERY ROOM		



4.0.2

Guidelines R290
Heat Pumps installation



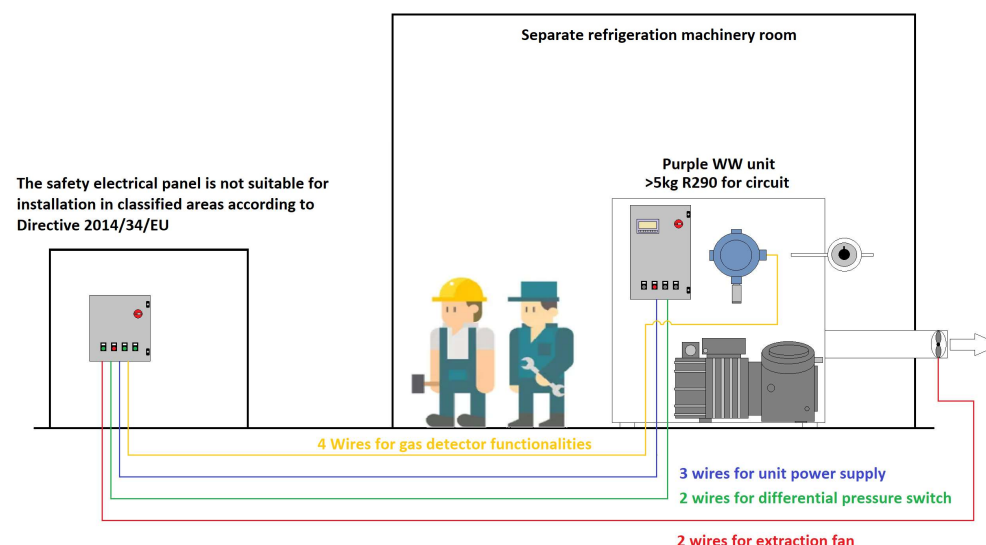
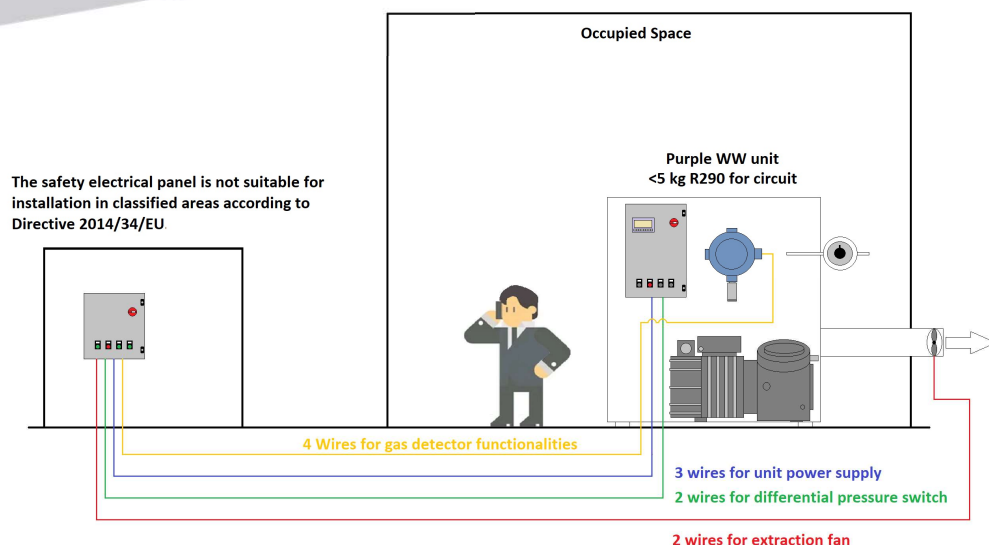
04

SAFETY FOR THE INSTALLATION AREA

SAFETY ELECTRICAL BOARD

R290 charge < 5kg
for circuit

R290 charge > 5kg for
circuit





4.0.3

Guidelines R290
Heat Pumps installation

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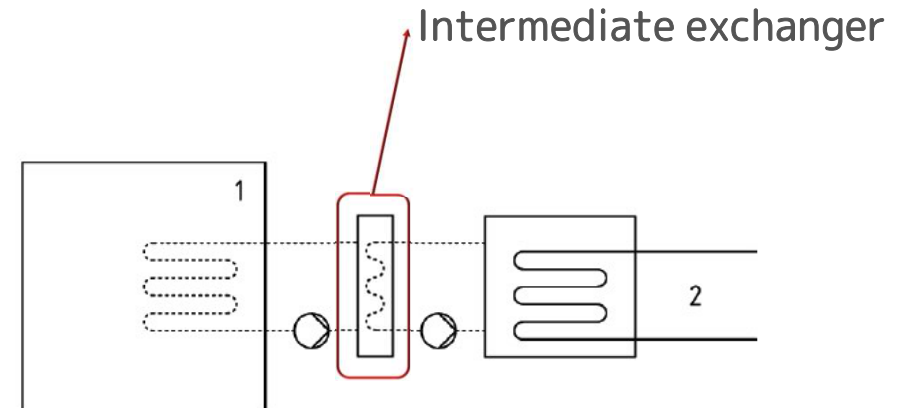
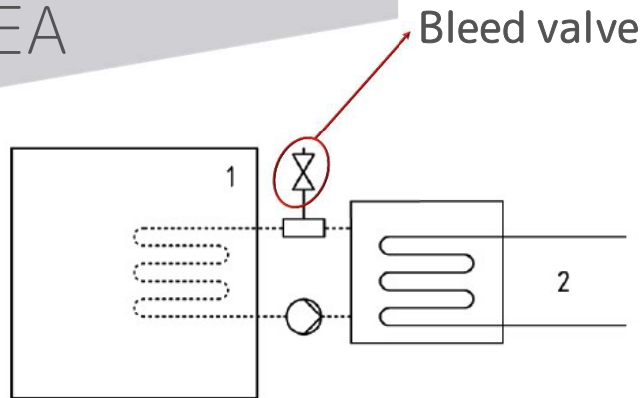


04

SAFETY FOR THE INSTALLATION AREA

WATER SIDE CONNECTIONS

To avoid any refrigerant entering the water circuit in case of leakage, solutions which can be applied are various:



Warning: when making the hydraulic connection to the heat exchangers, it is necessary to provide automatic bleeding valve. Valve allows the evaporation of refrigerant gas (R290) that in case of failure should migrate through the exchanger in the water circuit.

Thanks for your attention



09/10 – 3:30 p.m. our booth 4-348



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