November 2017

HVACR MANIFOLD RANGE

KIMO INSTRUMENTS sauermann TAULOU

Agenda

- **A. Generalities on cold groups and manifold**
- **B. Sauermann “Si-” range presentation**
- **C. Si-Manifold App presentation**
- **D. How to use the “Si-” range**

Generalities on cold groups and manifolds

- **Cold groups**

  - How to generate cold
  - Refrigerants
  - Cold room functioning
  - How to verify a cold group

- **Manifolds**

  - Function & principle
  - How to connect on a cold group
  - What kind of measurements

Cold Groups

How to generate cold ?

Fridge : positive cold room (+5°C)

Air treatment station

Thermodynamic water heater

Freezer : negative cold room (-20°C)

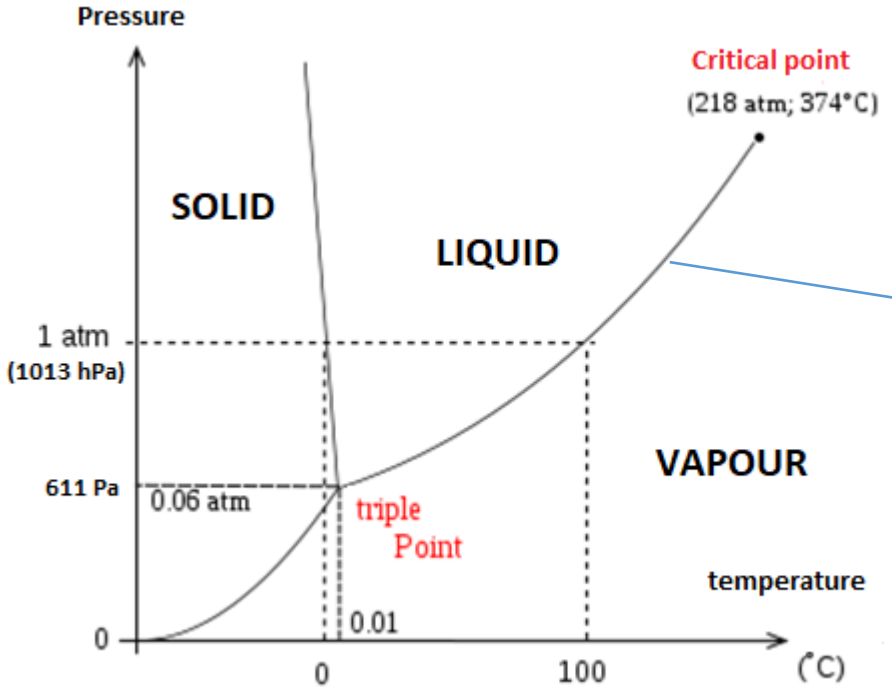
Air conditioner

Air to liquid heat pump

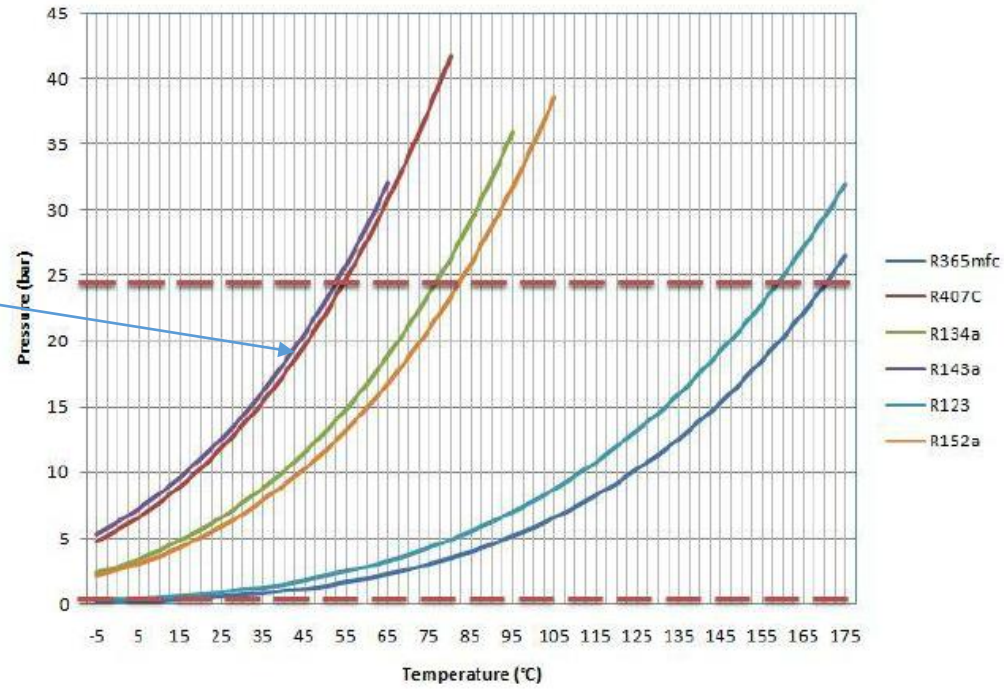
→ Need of a REFRIGERANT

Refrigerants : Definition & P/T diagram

- **Definition** : very low evaporation temperature under atmospheric pressure. This thermodynamic property allows produce cold



Water



Refrigerants

→ **The objective is to make phase changings (liquid to vapour / vapour to liquid)**

Refrigerants : Classification

- **Classification** : Norm DIN EN 8960 → 3 main groups :
  1. Pure organic substances : Hydrocarbon fluids (hydrogenated or not) : CFC / HCFC / HFC / propane / butane
  2. Mixtures of refrigerants : R-400 and R-500 series
  3. Inorganic refrigerants : Mainly composed of water, ammoniac and carbon dioxyde: R-700 serie.

- **Examples** :
  1. R-134a : Typical HydroFluoroCarbons (HFC) : 4F - 2C - 2H
  2. R-407a : mixture of R-32 (20%) – R-125 (40%) – R-134a (40%)
  3. R-744 : carbon dioxide (CO_2)

- **New refrigerant generation** : Low GWP : R-1234xy (HFO : Hydro Fluoro Olefine) selected to replace R-134a

→ Wide variety of REFRIGERANTS

- **Progressive phase out of high GWP refrigerants**
- **Evolution of the refrigerants database**

Refrigerants : Roadmap

2010

CFC → OZONE

Chlorofluorocarbure

2020

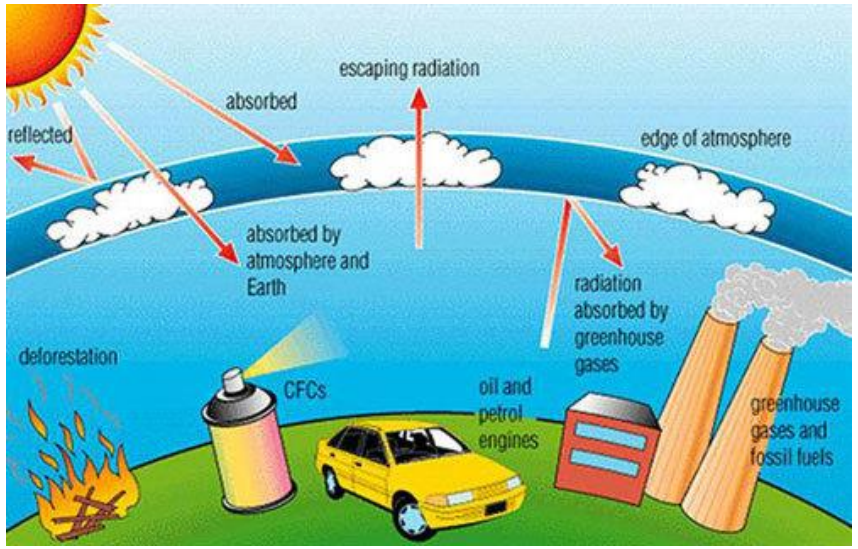
HCFC → GWP (global warming potential)

Hydrochlorofluorocarbure

HFO → GWP low / FLAMMABLE

HydroFluoro-oléfines

NATURAL REFRIGERANT NH_3 / CO_2



How to select a refrigerant ?

Market	Solution	Ex. of refrigerant
Residential	Thermo. Water Heater Air conditionner (Air/Air) Heat pump	R410A / CO_2 R513A R32
Collective	Heat pump	R410A
Industry	Chillers Heat pump Air treatment station	R410A / R1234ze R32 R134a
Food (supermarket)	Freezer Cold rooms Autonomous cols rooms	R404A / R1234yf R407A / CO_2 R452A /

How to check a cold group (set up and maintenance)?

1/ Overall checking : setpoint temperature, ambient temperature, pipe and pipe protection

2/ Manifold measurement : overheating and subcooling temperature

3/ Evacuation of refrigerant gas : Refrigerant recovery pump

How to check a cold room (set up and maintenance)?

4/ Maintenance : welding, filter replacement, compressor replacement etc ….

5/ Vacuum : remove air and humidity

6/ Tightness test : use of azote at 20 bar

7/ New refrigerant charging

8/ Tightness test using leak handheld detector

Manifold

Functions and principle

- **Functions**
  - Control of cold group functioning
    - Set up of a new cold group
    - Maintenance
  - Diagnostic of the global functioning

Pressure probes

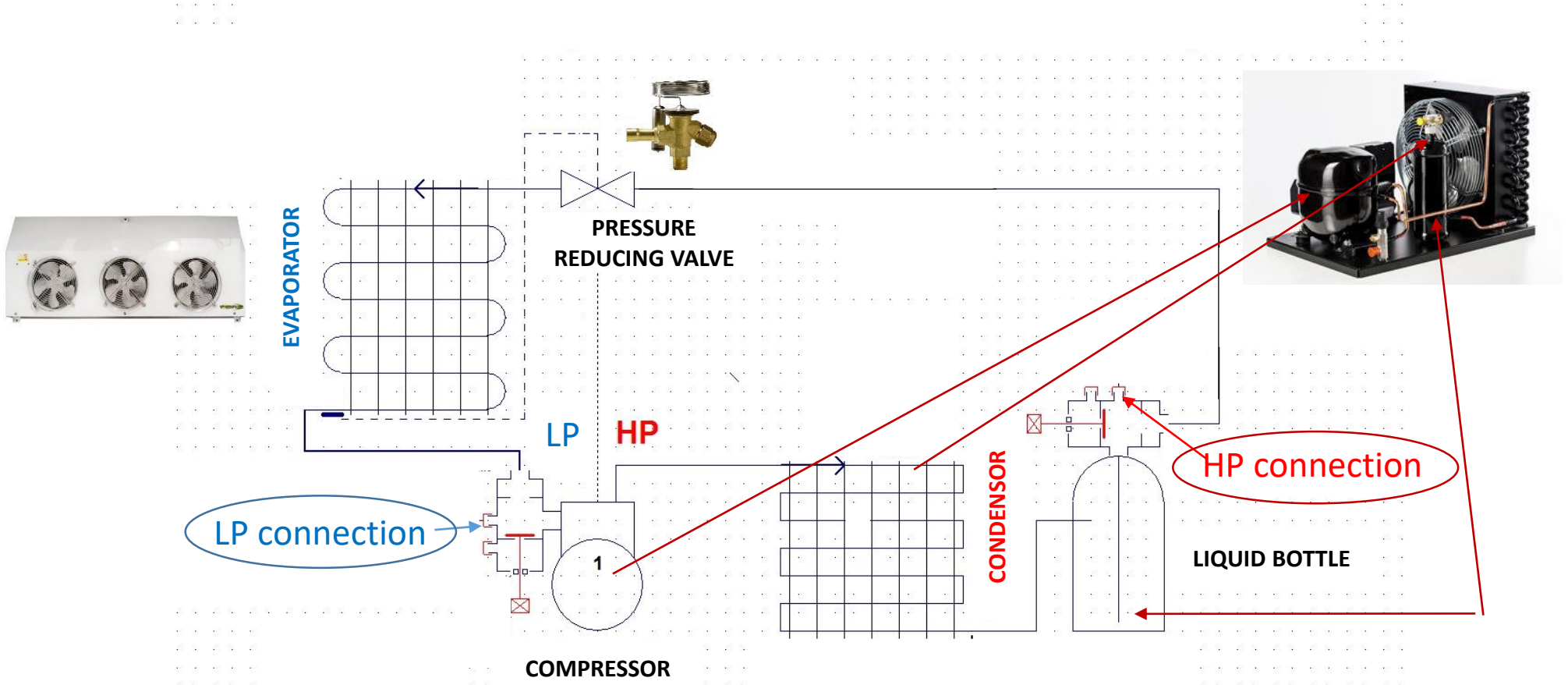
Contact temperature probes

- **Principle**
  - Measurement of key pressures
  - Checking of the gas phase (liquid or vapor) → link with the evaporation curve
  - Color code :
    - Red for High Pressure
    - Blue for Low Pressure
  - Associate with contact temperatures measurements
  - Calculation of key parameters:
    - Subcooling temperature of the Condensor
    - Overheating temperature of the Evaporator

Analog Manifold

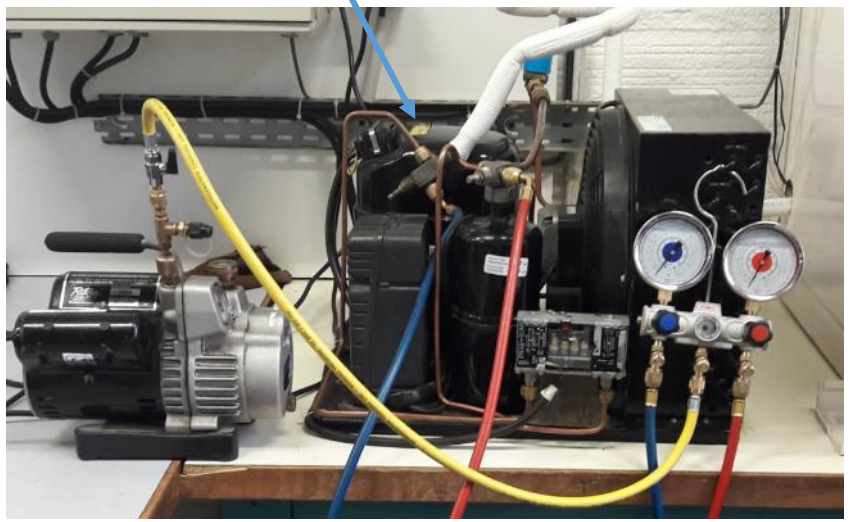
How and where to connect a manifold?

- **Dedicated valves** on cold groups



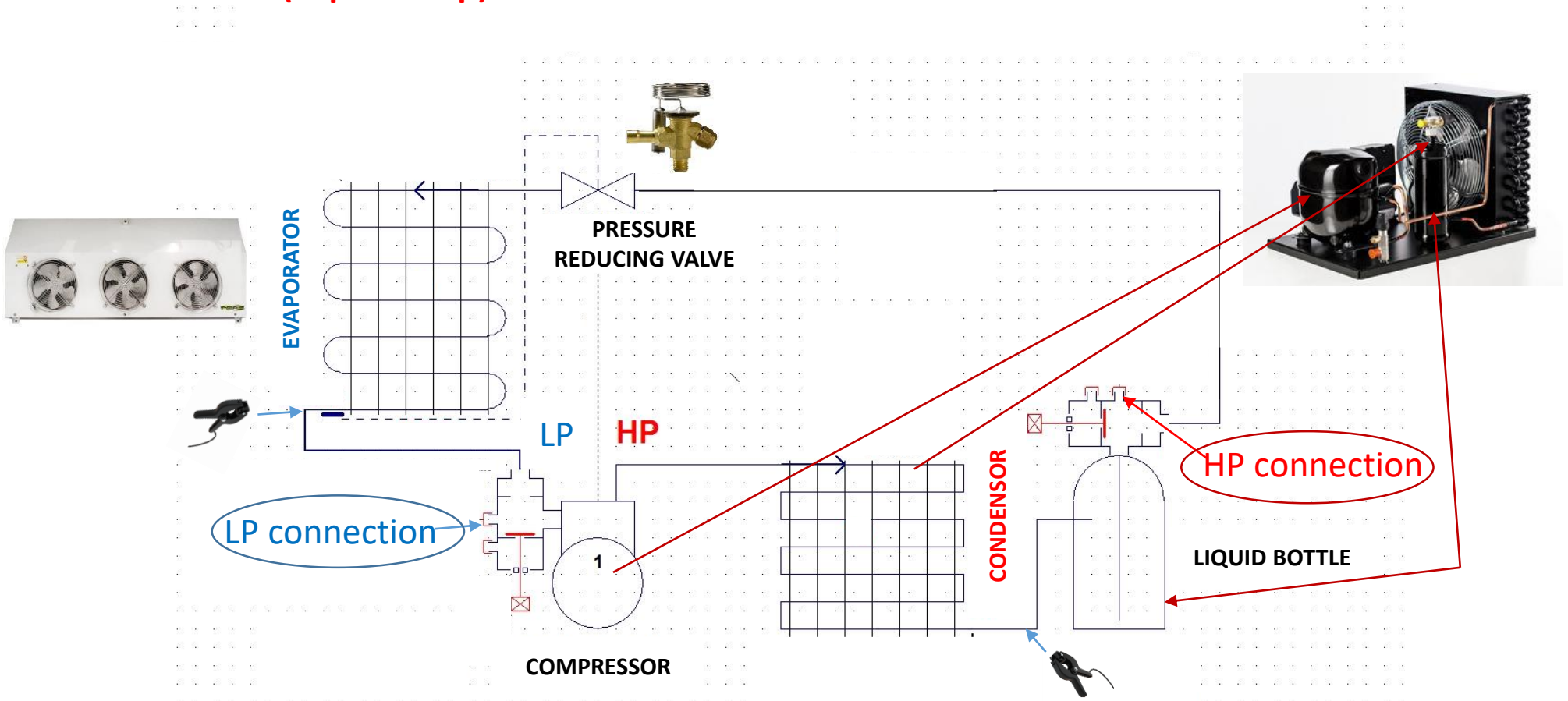
Pressure measurements on site

Pressure maintenance valve



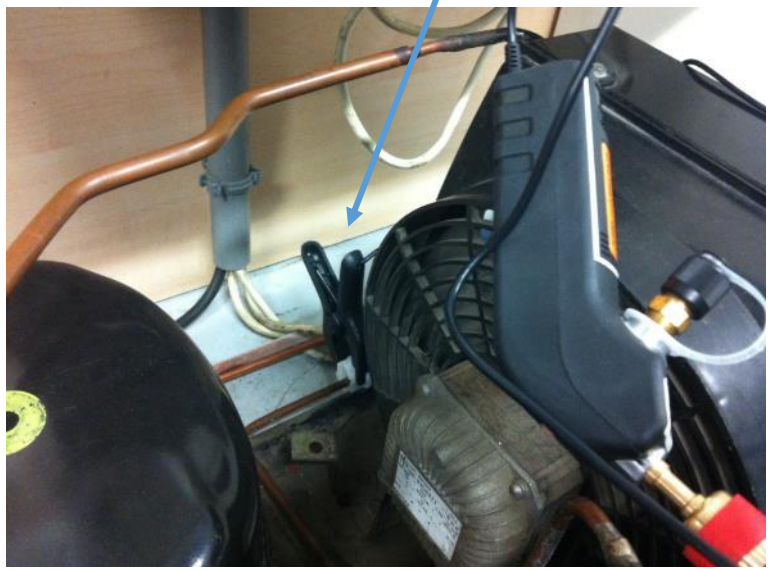
How and where to connect a temperature probe?

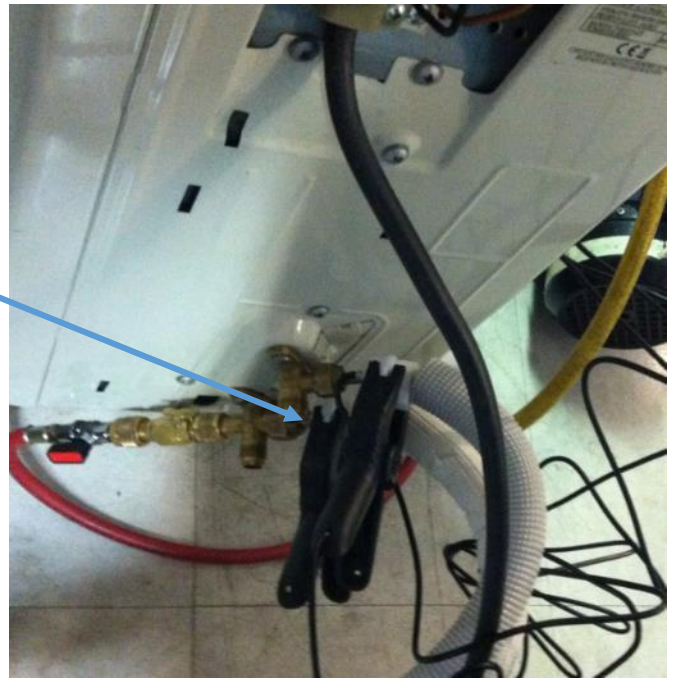
- Exit of the Evaporator (Vapor temp)
- Exit of the Condensor (Liquid temp)



Temperature measurement on site

Temperature probe





Manifold measurement exploitation

Overheating

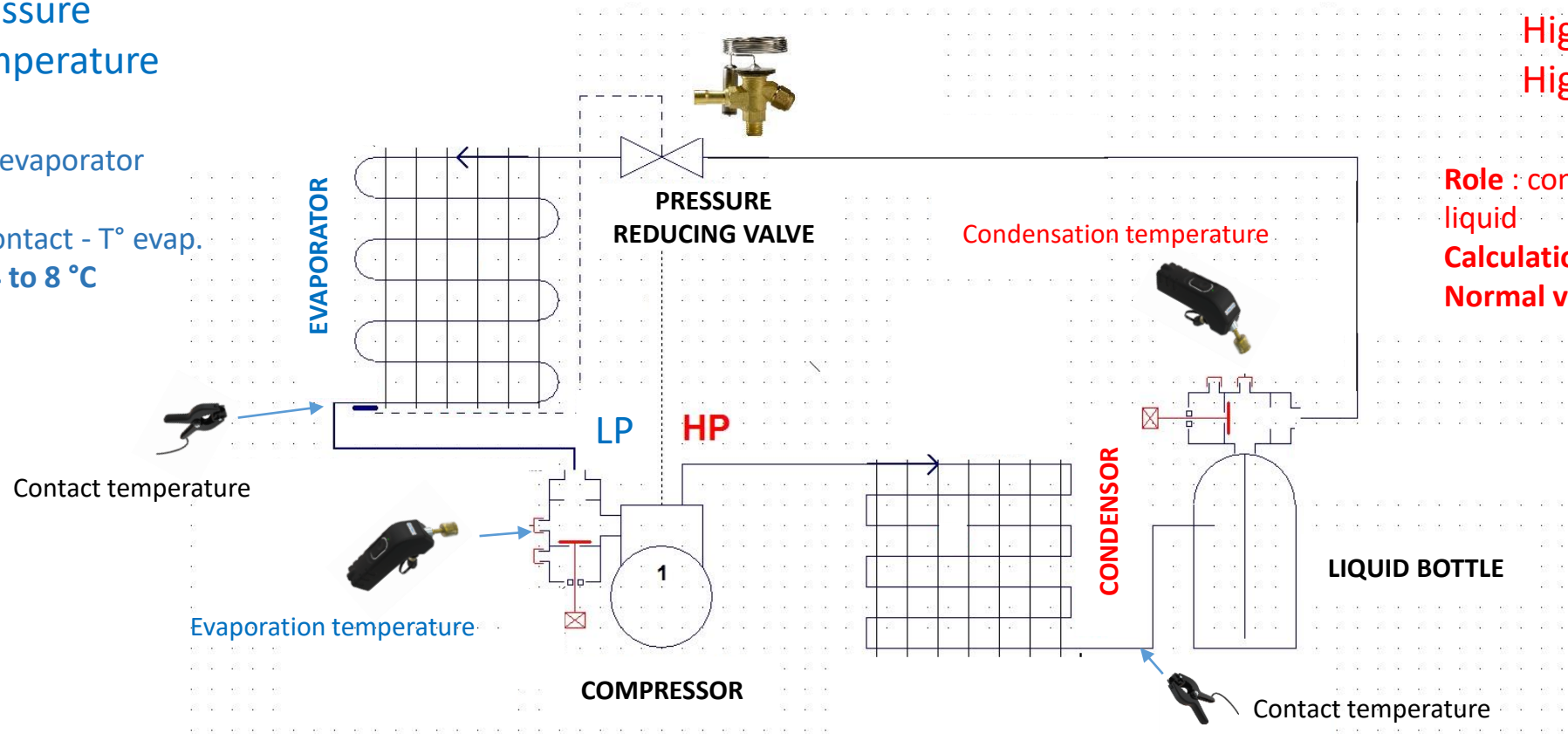
Low pressure
Low temperature

Role : controlling evaporator functioning
Calculation : T° contact - T° evap.
Normal values : **4 to 8 °C**

Subcooling

High pressure
High temperature

Role : condensator produces enough liquid
Calculation : T° cond - T° contact
Normal values : **4 to 8 °C**



Manifold measurement explanation?

Expertise of the refrigeration specialist

Overheating

Low pressure
Low temperature

Role : controlling evaporator functioning
Calculation : T° contact - T° evap.
Normal values : **4 to 8 °C**

Out of range value analysis

Overheating < 4°C

- Too much liquid in the evaporator
- Wrong pressure valve setting (too opened)
- Bad heat exchange (fan out of order, dirty filter,…)

Overheating > 8°C

- Fluid blocked (dirty filter, pipe damaged …)
- Wrong pressure valve setting (too closed)
- Lack of fluid (leakage)

Subcooling

High pressure
High temperature

Role : condensator produces enough liquid
Calculation : T° cond - T° contact
Normal values : **4 to 8 °C**

Out of range value analysis

Subcooling < 4°C

- Not enough liquid
- Lack of fluid
- Bad heat exchange (fan out of order, dirty filter,…)

Subcooling > 8°C

- Too much liquid
- Fluid is polluted (air, oil, …)

→ **If OH or SG values are out of range, additional actions have to be performed**

Sauermann « Si- » range presentation

- **Manifold : Si-RM3 / Si-RM13**
- **Vacuummeter : Si-RV3**
- **Accessories**
- **Handling**

Smart wireless manifolds

- **Si-RM3 Smart wireless manifold**

- **Si-RV3 Smart wireless vacuum probe**

- **Si-RM13 Combined manifold with smart wireless probes and 2-channel by-pass**

Nomenclature

Sales reference	Commercial denomination	Description	Picture
25555	Si-RM3	Wireless manifold Si-RM3 wireless manifold. Set.	
25554	Si-RV3	Si-RV3 wireless probe for vaccum measurement.	
25560	Si-RM1	Si-RM1 wireless pressure probe.	
25741	Si-RM2	Si-RM2 NTC clamp temperature probe.	
25627	Si-RM4	Si-RM4 transport case.	
25830	ACC25830	Set of two connectors ACC25830 for R410 gas.	

Nomenclature

Sales reference	Commercial denomination	Description	Picture
25558	Si-RM13	Si-RM13 wireless manifold type.	
25561	ACC25561	ACC25561 2-channel Manifold body.	
25831	ACC25831	Set of three charging lines ACC25831.	
25563	ACC25563	Robust transport case ACC25563.	

NOTA : The Si-Manifold mobile application is free of charge, therefore has no sales code

Positioning

Analog

Smart wireless manifold probes

Digital

100 €

200 €

240 €

350 €

800 €

600 €

Testo

Yellow Jacket

Fieldpiece

Sporlan

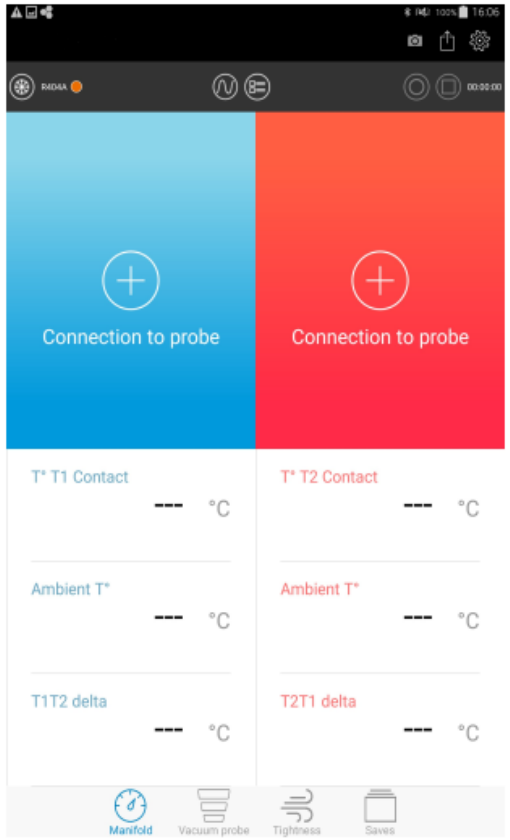
Imperial

Handling

Sauermann « Si- Manifold» App presentation

- **Overview**
- **Testing**

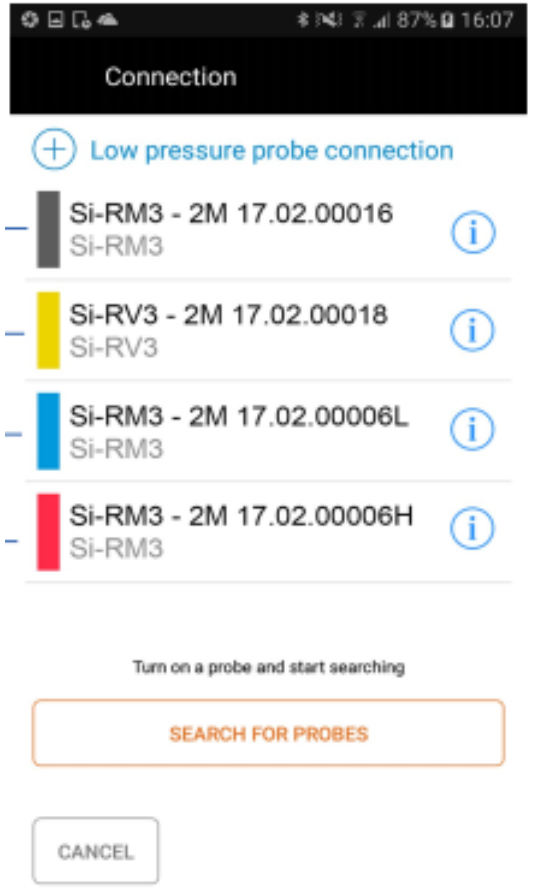
Ready to start



Portrait

Lanscape

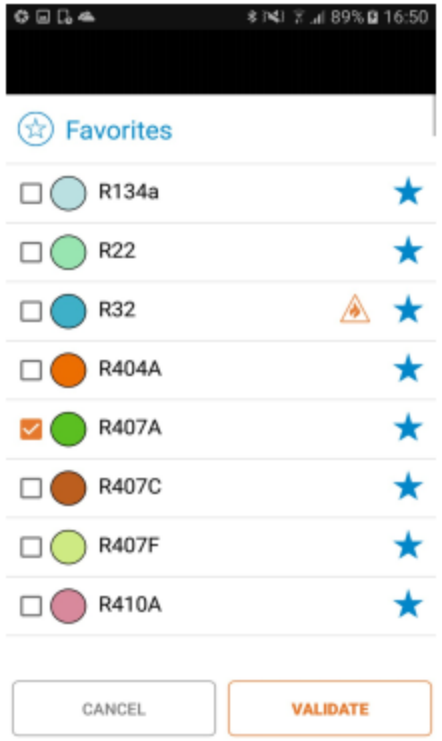
Pairing the probes



Pairing menu

LP probe is connected

Refrigerant selection



List of refrigerant : currently 124

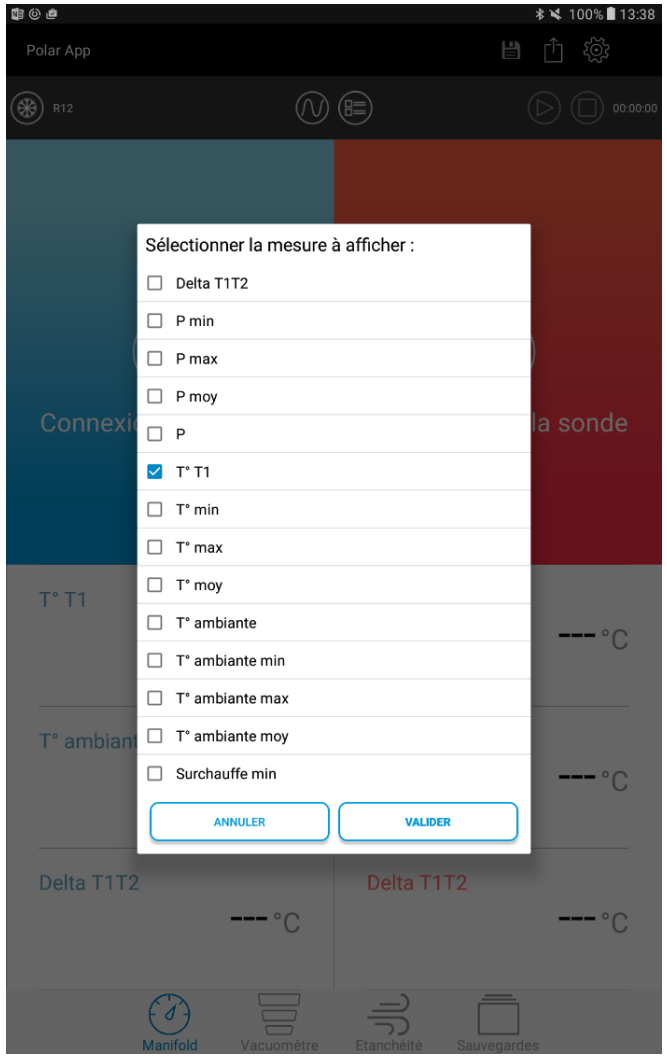
10 refrigerant can be bookmarked

The list can be changed if new refrirgerants are available in the future

Manifold

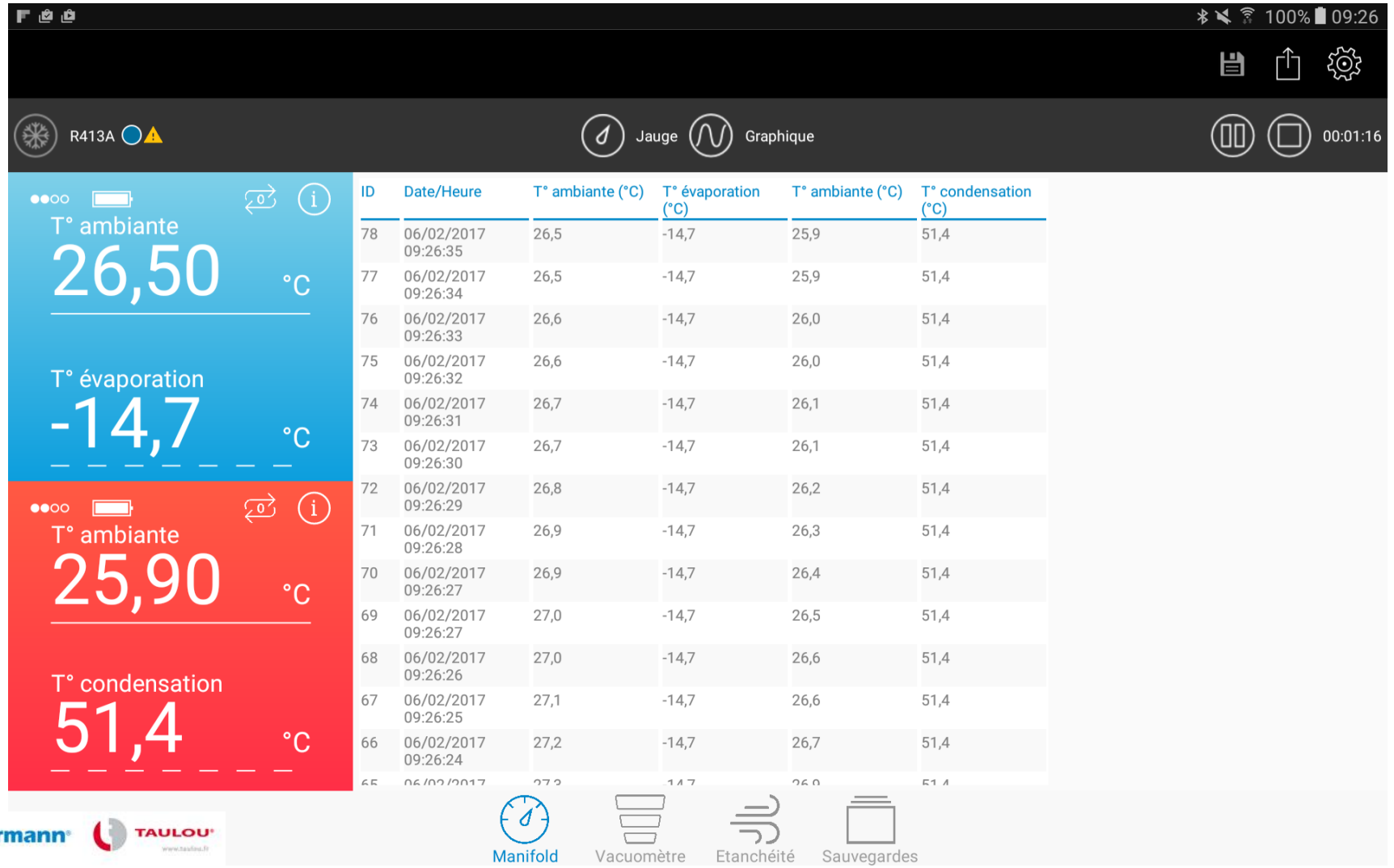

100% 16:00
R404A
Graph
Table
00:00:00
10
5.4 bar
Evap. T°
1.4 °C
Overheat
2.9 °C
0
-1
35
10
12.4 bar
Conden. T°
28.0 °C
Subcooling
0.1 °C
0
60
T° T1 Contact
4.3 °C
Ambient T°
19.2 °C
T° T2 Contact
27.9 °C
Ambient T°
20.8 °C
Manifold
Vacuum probe
Tightness
Saves

Calculations display

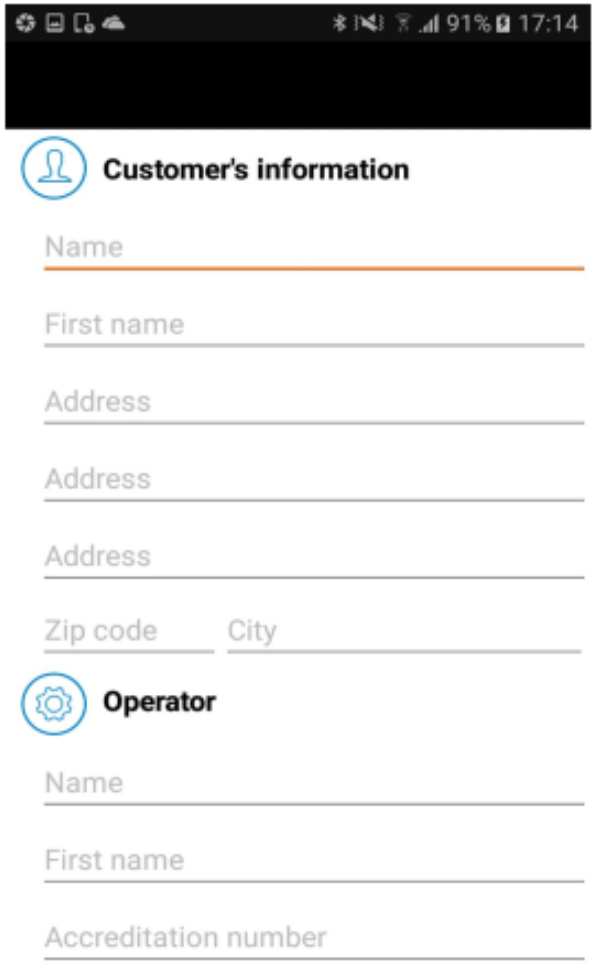


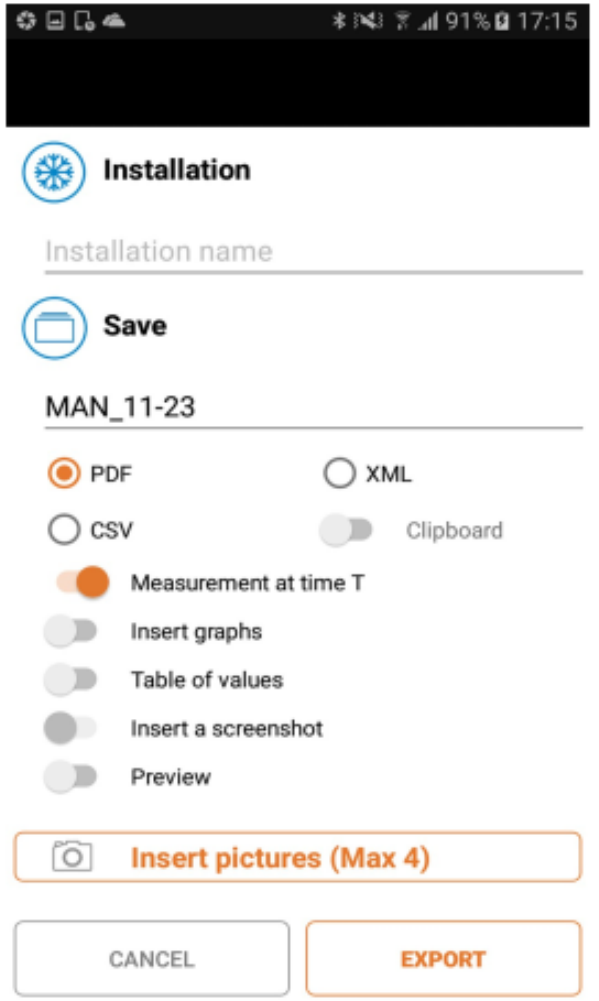
Graphic screen

Table screen



Report creation

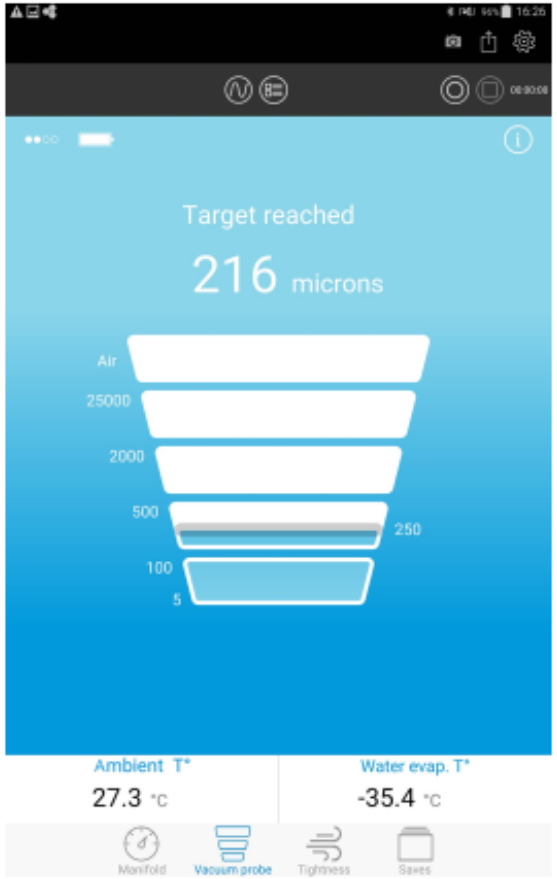




Vacuometer screens

With Si-RM3 LP probe

1 mbar = 750 microns

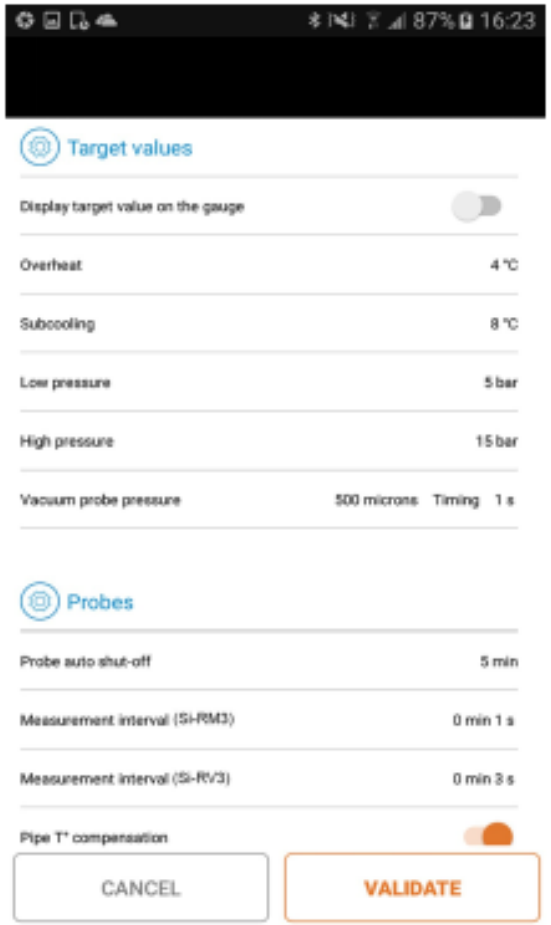


With Si-RV3

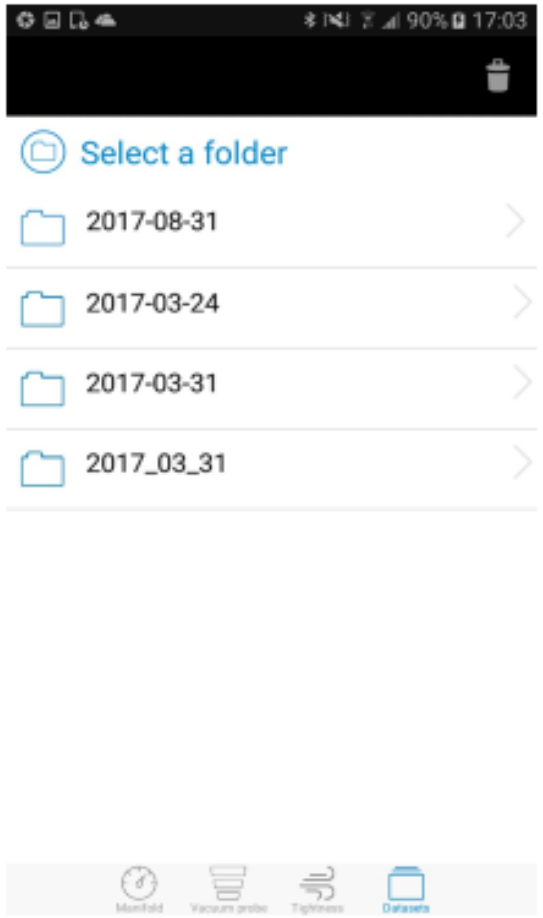
Tightness mode

With Si-RM3 HP probe

Parameters menu



Saves


90% 17:03
Select a folder
2017-08-31
2017-03-24
2017-03-31
2017_03_31

Handling

How to use the « Si- » range

- **Preparation**

- **On site usage**

Preparation : list of actions

The technician

- reads the QRcode with its smartphone
- downloads the Android application
- turns on the 2 manifold probes (LP / HP)
- turns on the vacuum gauge (can be done later)
- starts the application
- launches a probe searching
- pairs probes and saves pairing
- navigates in the "Vacuometer" menu
- connects the vacuum probe and saves the pairing
- turns off manifold probes (LP / HP) & vacuum probe and closes the app

On site usage : list of maintenance actions (1/2)

The technician : - starts the probes and the Si-Manifold app

- connects manifold probes

- makes the Auto-zero for both probes

- connects the temperature clamps on the pressure probes

- installs LP / HP probes and temperature clamps to the installation

- selects the appropriate gas

- opens th valves of the installation

- launches the recording of measurements

- reads the measurement values and the calculated (subcooling and overheating) values on the app

On site usage : list of actions (2/2)

The technician :

- compares the calculated values (OH& SC) to the reference one (installation or standard)
- makes the analysis
  - Results are consistent with the standard ones → Edition of the maintenance report
  - Results are not consistent → Launching of a technical analysis and try to solve issues (see P19)
- closes the valves of the installation
- disconnects the probes from the installation
- turns off the probes

On site usage : additional actions

The technician can :

- Navigates in the top menu:
  - change to graphic mode (icon ...)
  - display the measurement curve / values => use the zoom function
- Fullfils the customer information / Operator (pre-registered) / Installation
- Makes a backup = file name (list the data to be filled in)
- Selects the format and the data displayed on the report
- Send emails